Species at Risk Act
Recovery Strategy Series

Amended Recovery Strategy for the Horned Lark *strigata* subspecies (*Eremophila alpestris strigata*) and Recovery Strategy for fhe Vesper Sparrow *affinis* subspecies (*Pooecetes gramineus affinis*) in Canada

Horned Lark *strigata* subspecies and Vesper Sparrow *affinis* subspecies

2016

Government of Canada
Gouvernement du Canada

Canada

Recommended citation:

Environment and Climate Change Canada. 2016. Amended Recovery Strategy for the Horned Lark *strigata* subspecies (*Eremophila alpestris strigata*) and Recovery Strategy for the Vesper Sparrow *affinis* subspecies (*Pooecetes gramineus affinis*) in Canada. *Species at Risk Act* Recovery Strategy Series. Environment and Climate Change Canada, Ottawa. ix + 36 pp.

For copies of the recovery strategy, or for additional information on species at risk, including the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) Status Reports, residence descriptions, action plans, and other related recovery documents, please visit the Species at Risk (SAR) Public Registry[1].

Cover illustration: Horned Lark *strigata* subspecies: Randall Moore
Vesper Sparrow *affinis* subspecies: Suzanne Beauchesne

Également disponible en français sous le titre
« Programme de rétablissement révisé de l'Alouette hausse-col de la sous-espèce *strigata* (*Eremophila alpestris strigata*) et Programme de rétablissement du Bruant vespéral de la sous-espèce *affinis* (*Pooecetes gramineus affinis*) au Canada »

© Her Majesty the Queen in Right of Canada, represented by the Minister of Environment and Climate Change, 2016. All rights reserved.
ISBN 978-0-660-06702-5
Cat. no. En3-4/29-2016E-PDF

Content (excluding the illustrations) may be used without permission, with appropriate credit to the source.

[1] http://sararegistry.gc.ca/default.asp?lang=En&n=24F7211B-1

PREFACE

The federal, provincial, and territorial government signatories under the Accord for the Protection of Species at Risk (1996)[2] agreed to establish complementary legislation and programs that provide for effective protection of species at risk throughout Canada. Under the *Species at Risk Act* (S.C. 2002, c.29) (SARA), the federal competent ministers are responsible for the preparation of recovery strategies for listed Extirpated, Endangered, and Threatened species and are required to report on progress within five years after the publication of the final document on the SAR Public Registry.

The Minister of Environment and Climate Change is the competent minister under SARA for the Horned Lark *strigata* subspecies and Vesper Sparrow *affinis* subspecies and the Minister responsible for the Parks Canada Agency is also a competent minister under SARA for the Horned Lark *strigata* subspecies. This recovery strategy has been prepared as per section 37 of SARA. To the extent possible, it has been prepared in cooperation with the Government of British Columbia, Garry Oak Ecosystems Recovery Team, Nanaimo Area Land Trust, American Bird Conservancy, Vancouver Airport Authority, Nanaimo Airport Commission, and the State of Washington (Department of Fish and Wildlife). The British Columbia Ministry of Environment has reviewed and accepts this document as scientific advice.

Success in the recovery of these species depends on the commitment and cooperation of many different constituencies that will be involved in implementing the directions set out in this strategy and will not be achieved by Environment and Climate Change Canada and the Parks Canada Agency, or any other jurisdiction alone. All Canadians are invited to join in supporting and implementing this strategy for the benefit of the Horned Lark *strigata* subspecies and Vesper Sparrow *affinis* subspecies and Canadian society as a whole.

This recovery strategy will be followed by one or more action plans that will provide information on recovery measures to be taken by Environment and Climate Change Canada and the Parks Canada Agency and other jurisdictions and/or organizations involved in the conservation of the species. Implementation of this strategy is subject to appropriations, priorities, and budgetary constraints of the participating jurisdictions and organizations.

The recovery strategy sets the strategic direction to arrest or reverse the decline of the species, including identification of critical habitat to the extent possible. It provides all Canadians with information to help take action on species conservation. When critical habitat is identified, either in a recovery strategy or an action plan, SARA requires that critical habitat then be protected.

In the case of critical habitat identified for terrestrial species including migratory birds SARA requires that critical habitat identified in a federally protected area[3] be described in the *Canada Gazette* within 90 days after the recovery strategy or action plan that identified the critical habitat

[2] http://registrelep-sararegistry.gc.ca/default.asp?lang=en&n=6B319869-1#2

[3] These federally protected areas are: a national park of Canada named and described in Schedule 1 to the *Canada National Parks Act*, The Rouge National Park established by the *Rouge National Urban Park Act*, a marine protected area under the *Oceans Act*, a migratory bird sanctuary under the *Migratory Bird Convention Act, 1994* or a national wildlife area under the *Canada Wildlife Act* see ss. 58(2) of SARA.

is included in the public registry. A prohibition against destruction of critical habitat under ss. 58(1) will apply 90 days after the description of the critical habitat is published in the *Canada Gazette*.

For critical habitat located on other federal lands, the competent minister must either make a statement on existing legal protection or make an order so that the prohibition against destruction of critical habitat applies.

If the critical habitat for a migratory bird is not within a federal protected area and is not on federal land, within the exclusive economic zone or on the continental shelf of Canada, the prohibition against destruction can only apply to those portions of the critical habitat that are habitat to which the *Migratory Birds Convention Act, 1994* applies as per SARA ss. 58(5.1) and ss. 58(5.2).

For any part of critical habitat located on non-federal lands, if the competent minister forms the opinion that any portion of critical habitat is not protected by provisions in or measures under SARA or other Acts of Parliament, or the laws of the province or territory, SARA requires that the Minister recommend that the Governor in Council make an order to prohibit destruction of critical habitat. The discretion to protect critical habitat on non-federal lands that is not otherwise protected rests with the Governor in Council.

ACKNOWLEDGMENTS

Gratitude is owing to the members of the Garry Oak Ecosystems Recovery Team's Vertebrates at Risk Recovery Implementation Group for their ongoing work with respect to the conservation of the Horned Lark *strigata* subspecies and Vesper Sparrow *affinis* subspecies. All the members of the Horned Lark *strigata* and Vesper Sparrow *affinis* Recovery Team are thanked for the invaluable contribution of their time and individual expertise. The Recovery Team also benefited immeasurably from the expertise of Recovery Team advisors Dr. Scott Pearson and Bob Altman. These two individuals have generously shared information from their research on these species in Washington and Oregon and have actively participated in team meetings and provided extensive reviews of earlier drafts of this document. Past and present managers of the Nanaimo Airport are also thanked for granting access to the site and for their cooperation and assistance with vegetation management issues. This recovery strategy is dedicated to the late Tom Gillespie who contributed many hours of observation and conservation efforts for the Vesper Sparrow *affinis* subspecies and Horned Lark *strigata* subspecies on Vancouver Island.

The members of the Horned Lark *strigata* and Vesper Sparrow *affinis* Recovery Team are:

Bob Altman – American Bird Conservancy (advisor to the Recovery Team)
Suzanne Beauchesne – Cooper Beauchesne and Associates Ltd.
Alaine Camfield – Canadian Wildlife Service, Environment and Climate Change Canada
Trudy Chatwin – British Columbia Ministry of the Environment
John Cooper – Cooper Beauchesne and Associates Ltd.
Wendy Easton – Canadian Wildlife Service, Environment and Climate Change Canada
Kevin Fort (Chair) – Canadian Wildlife Service, Environment and Climate Change Canada
Libor Michalak – Next Environmental Inc.
Nicholas Page – Raincoast Applied Ecology
Scott Pearson – Washington Department of Fish and Wildlife (advisor to the Recovery Team)
Simon Robinson – Vancouver International Airport Authority

EXECUTIVE SUMMARY

The Recovery Strategy for the Horned Lark *strigata* subspecies (*Eremophila alpestris strigata*) with consideration for the Vesper Sparrow *affinis* subspecies (*Pooecetes gramineus affinis*) in Canada was originally posted in 2007. It has been amended to update timelines in the critical habitat schedule of studies and for the completion of an action plan for Horned Lark *strigata*, and to reflect the fact that Vesper Sparrow *affinis* is now a listed wildlife species under the *Species at Risk Act*. Other changes include: updates to the recovery feasibility section in response to new information; updated survey information; an identification of critical habitat for the Vesper Sparrow *affinis* and editorial changes to make the document align with current guidelines and templates.

This revised recovery strategy outlines a multi-species approach for the Horned Lark *strigata* subspecies (henceforth: Horned Lark *strigata*) and Vesper Sparrow *affinis* subspecies (henceforth: Vesper Sparrow *affinis)*. It was recognized that there is considerable overlap between these species with respect to current and historical distribution in Canada, general ecological requirements, and principal threats to the species and their habitat. In addition, many of the professional biologists involved have extensive knowledge of both species. Adopting a multi-species approach to recovery planning also represents an opportunity to make efficient use of conservation resources. Current and historical populations of both species are patchily distributed and, together with isolated populations in the United States, each comprises a single metapopulation in the Pacific Northwest. Thus, recovery of Canadian populations will contribute significantly to the global recovery of the two subspecies.

Horned Lark *strigata*

The Horned Lark *strigata* (*Eremophila alpestris strigata*) was assessed as Endangered by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) in 2003 and added to Schedule 1 of SARA in 2005.

The Horned Lark *strigata* is a subspecies of the Horned Lark, a small tan and yellow passerine with a black facial mask and ear tufts or “horns.” The Horned Lark *strigata* is an open habitat specialist, breeding in both dune and grassland habitats which have a high percentage of bare ground, short, sparse herbs or grasses, and few or no trees and shrubs. No individuals are currently known to occur or breed in Canada, but numerous confirmed historical breeding records exist. The historical distribution of the Horned Lark *strigata* in Canada is restricted to southwestern British Columbia, where it occurred only on southeastern Vancouver Island and in the lower Fraser River valley from Chilliwack west to the mouth of the Fraser River.

The population and distribution objective for this species is to establish and maintain a breeding population of a total of at least 10 breeding pairs distributed across a minimum of three sites within its historical breeding range in Canada.

Broad strategies to be taken to address the threats to the survival and recovery of the species are presented in the section on Strategic Direction for Recovery.

No critical habitat can be identified for the Horned Lark *strigata* at this time, as it is not known which specific sites with suitable or restorable habitat may be used. The persistence of this species in Canada is threatened primarily by loss or degradation of habitat due to urban and industrial development, increased disturbance at remaining suitable or restorable sites, modern agricultural practices, and infilling of most remaining open spaces by exotic vegetation. In addition, lark dune habitat has been lost due to improved dyking techniques in the Fraser River delta.

Vesper Sparrow *affinis*

The Vesper Sparrow *affinis* (*Pooecetes gramineus affinis*) was assessed as Endangered by COSEWIC in April 2006 and added to Schedule 1 of SARA in 2007.

The Vesper Sparrow *affinis* is a subspecies of the Vesper Sparrow, a large sparrow with a whitish eye ring, a chestnut shoulder patch, and white outer tail feathers. Like the Horned Lark *strigata*, the Vesper Sparrow *affinis* is a bird of open habitats, favouring areas with a high percentage of bare ground and short, sparse herbs or grasses. In contrast, however, it selects open habitats with scattered trees or shrubs, which it uses for singing perches and escape cover. In Canada, the Vesper Sparrow *affinis* currently breeds only on Vancouver Island at a single site. Historically, it has been reported during the breeding season on Vancouver Island from the Englishman River estuary in the north to Cobble Meadows and Mill Bay to the south. It was also formerly a local breeder in the Fraser Lowland on British Columbia's southwest mainland coast.

Like the Horned Lark *strigata*, the persistence of this species in Canada is threatened primarily by loss or degradation of habitat due to urban and industrial development, and infilling of most remaining open spaces by exotic vegetation. In addition, future development at the Nanaimo Airport and in surrounding properties may pose a threat to the persistence of the species in Canada, depending on the specific nature and on-site location of the development. It is acknowledged that conservation actions at the Nanaimo Airport site, such as habitat modification or enhancement, must be compliant with Transport Canada regulations. Nonetheless, innovative recovery measures that meet both the objectives of safety and recovery of species at risk will be sought.

The population and distribution objective for this species is to establish and maintain a breeding population of a total of at least 30 breeding pairs distributed across a minimum of at least three sites (i.e., the current site, plus two additional sites) within its historical breeding range in Canada.

Broad strategies to be taken to address the threats to the survival and recovery of the species are presented in the section on Strategic Direction for Recovery.

Critical habitat for Vesper Sparrow *affinis* is identified in this recovery strategy at the site recently occupied by the species in Canada. The critical habitat is characterized by open areas with short, sparse grass or herbaceous cover and intermittent bare ground, needed for nesting and foraging. Scattered shrubs and small trees, as well as larger trees on the eastern periphery, are

present on the site and considered critical habitat as they are used extensively by the birds as escape cover and singing perches.

Separate action plans for both species will be completed by 2020.

RECOVERY FEASIBILITY SUMMARY

Based on the following four criteria that Environment and Climate Change Canada uses to establish recovery feasibility, there are unknowns regarding the feasibility of recovery of the Horned Lark *strigata* subspecies and the Vesper Sparrow *affinis* subspecies. In keeping with the precautionary principle, this recovery strategy has been prepared as per section 41(1) of SARA, as would be done when recovery is determined to be technically and biologically feasible. This recovery strategy addresses the unknowns surrounding the feasibility of recovery.

1. Individuals of the wildlife species that are capable of reproduction are available now or in the foreseeable future to sustain the population or improve its abundance.

2. Sufficient suitable habitat is available to support the species, or could be made available through habitat management and restoration.

3. The primary threats to the species or its habitat (including threats outside of Canada) can be avoided or mitigated.

4. Recovery techniques exist to achieve the population and distribution objectives, or can be expected to be developed within a reasonable timeframe.

Horned Lark *strigata*

1. Unknown, the U.S. population represents a potential source for passive recolonisation of the subspecies in Canada; however,this may be unlikely because the population is declining range-wide.

2. Yes, although suitable habitat is likely limited at the present time, some suitable habitat likely exists and more could be made available through habitat restoration activities (e.g., there is significant potential for creation of new habitat through deposition of dredge spoils).

3. Yes, it is possible to address or mitigate all known significant threats to the Horned Lark *strigata* through recovery actions at priority sites.

4. Yes, effective recovery techniques exist, including, but not limited to, invasive species removal and predator control.

Vesper Sparrow *affinis*

1. Unknown. A small breeding population persisted in British Columbia from at least 2002 to 2010 at which time the population appeared to be self-sustaining. However, from 2011 to 2013, the known population declined, with no breeding recorded in 2012 and 2013. One nest was suspected in 2014 (based on observations of a pair of birds carrying food during the late nesting period), but was not confirmed (Beauchesne 2014b). Additional potential source populations exist in the United States, but recolonisation may be unlikely because the population is declining range-wide.

2. Yes, in addition to the currently occupied site, some additional suitable habitat may currently be available in British Columbia (e.g., Nanaimo Estuary) and other areas are potentially available for restoration (e.g., Gulf Islands National Park Reserve).

3. Yes, it is possible to address or mitigate all known significant threats to the Vesper Sparrow *affinis* in Canada through recovery actions at priority sites.

4. Yes, effective recovery techniques exist, including, but not limited to, habitat restoration (e.g., invasive species removal, native species planting) and population management (e.g., predator control).

As these subspecies occur at the northern part of their continental ranges in Canada, and the vast majority of their continental distributions and populations occur in the United States, it is important to note that population changes at the continental level may have a significant effect on recovery feasibility in Canada. As the continental populations of these species are experiencing ongoing downward population trends, their ranges may contract away from the current peripheries, and individuals may immigrate towards the centre of the ranges. In such a case, despite best efforts described in this strategy to ensure that sufficient suitable habitat is available and key threats are mitigated, the numbers of these species in Canada may continue to decline.

TABLE OF CONTENTS

1. BACKGROUND

This recovery strategy outlines a multi-species approach for the Horned Lark *strigata* and Vesper Sparrow *affinis*. It was recognized that there is considerable overlap between these species with respect to current and historical distribution in Canada, general ecological requirements, principal threats to the species and their habitat, and biological expertise. Adopting a multi-species approach to recovery planning also represents an opportunity to make efficient use of conservation resources. This revised document represents an update to the earlier "Recovery Strategy for the Horned Lark *strigata* subspecies (*Eremophila alpestris strigata*) with consideration for the Vesper Sparrow *affinis* subspecies (*Pooecetes gramineus affinis*) in Canada", which was published prior to the formal listing of Vesper Sparrow *affinis* subspecies on the *Species at Risk Act* (SARA) Schedule 1.

2. COSEWIC* SPECIES ASSESSMENT INFORMATION

Date of Assessment: November 2003

Common Name: Horned Lark *strigata* subspecies

Scientific Name: *Eremophila alpestris strigata*

COSEWIC Status: Endangered

Reason for Designation: Although this subspecies has always been rare in Canada, it has declined steadily throughout its range over the last 50 years and is now nearly extirpated from Canada.

Canadian Occurrence: British Columbia (B.C.)

COSEWIC Status History: Designated Endangered in November 2003.

Date of Assessment: April 2006

Common Name: Vesper Sparrow *affinis* subspecies

Scientific Name: *Pooecetes gramineus affinis*

COSEWIC Status: Endangered

Reason for Designation: This songbird, a subspecies of the Vesper Sparrow, is found in Canada only in coastal grasslands in the extreme southwestern corner of British Columbia, where it now breeds only at one site with a population of about 5 pairs. The taxon is declining in the United States as well, where it has a restricted distribution in western Washington and Oregon. Habitat loss is the greatest threat, both through direct destruction of habitat for urban development and through invasion by alien plant species.

Canadian Occurrence: B.C.

COSEWIC Status History: Designated Endangered in April 2006.

*COSEWIC = Committee on the Status of Endangered Wildlife in Canada.

3. SPECIES STATUS INFORMATION

Table 1. List and description of various conservation status ranks for Horned Lark *strigata* and Vesper Sparrow *affinis* (from NatureServe 2009, B.C. Conservation Data Centre 2010, and B.C. Ministry of Environment 2010).

Global (G) Rank[1]	National (N) Rank	Canada Status	Sub-national (S) Rank	B.C. Conservation Status
Horned Lark *strigata*				
G5T2	Canada: NXB United States (U.S.): N2	COSEWIC: Endangered SARA: Schedule 1 (Endangered)	B.C.: SXB Oregon: S2B Washington: S1B	• Red List • Conservation Framework Priority 1 under Goal 3[2]
Vesper Sparrow *affinis*				
G5T3	Canada: N1B U.S.: NNR	COSEWIC: Endangered SARA: Schedule 1 (Endangered)	B.C.: S1B California S3 Oregon: S2B, S2N Washington: S1B	• Red List • Conservation Framework Priority 1 under Goal 3

[1] Ranking: T: subspecies; X: Presumed Extirpated; NR: Unranked; B: Breeding; G/T/N/S1: Critically Imperiled; 2: Imperiled; 3: Vulnerable; 4: Apparently Secure; 5: Secure.
[2] Goal 3: Maintain the diversity of native species and ecosystems. Priority 1: Highest conservation priority.

4. SPECIES INFORMATION

4.1 Species Description

Horned Lark *strigata* subspecies

The Horned Lark (*Eremophila alpestris*) is the only true North American member of the lark family (Alaudidae). It is a slender ground-dwelling passerine of open country. The adult male is distinctively marked with a dark facial mask and breast band that contrasts with the pale face and throat. The "horns" for which the species is named are tiny, black feather tufts that are apparent only at close range. The tail is square and blackish with pale central feathers and whitish edges that are evident in flight. The Horned Lark *strigata* is smaller than the other subspecies. The upperparts are dark brown and the nape is walnut brown. The bird has a yellow throat and eye stripe and yellowish underparts (Beason 1995). There is heavy brown streaking on the sides of the breast that should allow separation of males to subspecies in the field (Sibley 2000). In the hand, the longest uppertail covert is distinctly streaked (Pyle 1997). Adult females are similar to males, but they are duller and smaller and lack "horns." Females cannot be separated to subspecies in the field. Juveniles of both sexes are generally duller than adult females (Sibley 2000).

Vesper Sparrow *affinis* subspecies

The Vesper Sparrow (*Pooecetes gramineus*) is a medium- to large-sized sparrow (length approximately 16 cm) with a chestnut shoulder patch (lesser coverts), white outer tail feathers, and a whitish eye ring (Sibley 2000). Sexes are similar in appearance. Juveniles are similar in appearance to adults, but duller, and they usually lack chestnut lesser coverts (Pyle 1997).

The three Canadian subspecies of Vesper Sparrow (*P. g. confinis*, *P. g. gramineus*, and *P. g. affinis*) are similar in appearance and cannot be reliably separated in the field, varying only in shading and measurements. The Vesper Sparrow *affinis* has medium greyish brown upperparts and white underparts with a buff tinge. Vesper Sparrow *confinis*, the common B.C. interior subspecies, has pale greyish brown upperparts and creamy underparts. Vesper Sparrow *affinis* is slightly smaller overall than *confinis* and has a shorter tail (Pyle 1997).

4.2 Population and Distribution

Current and historical populations of both taxa in Canada, together with those in the U.S., likely comprise a single metapopulation.

Horned Lark *strigata* subspecies

Horned Larks are found across much of North America and Eurasia. The breeding distribution of Horned Lark *strigata*, however, is restricted to the Georgia Basin/Puget Trough, the coast of Washington, and islands in the lower Columbia River (Beason 1995, Rogers 2000, Pearson and Altman 2005, Stinson 2005) (Figure 1). The centre of its breeding distribution is the glacial outwash prairies of the south Puget Sound area of western Washington (Rogers 2000). The Canadian population is extremely small, and may be extirpated: the last observation of a Horned Lark *strigata* in Canada was made in 2002 (COSEWIC 2003). U.S. researchers estimated that the Washington and Oregon population was likely fewer than 1000 individuals in 2005, based on breeding and winter surveys (Pearson and Altman 2005). Altman (2011) estimated the breeding population of Horned Lark *strigata* in prairie-oak habitats west of the Cascade Mountains in Oregon, Washington, and British Columbia to be between 1170 and 1610.

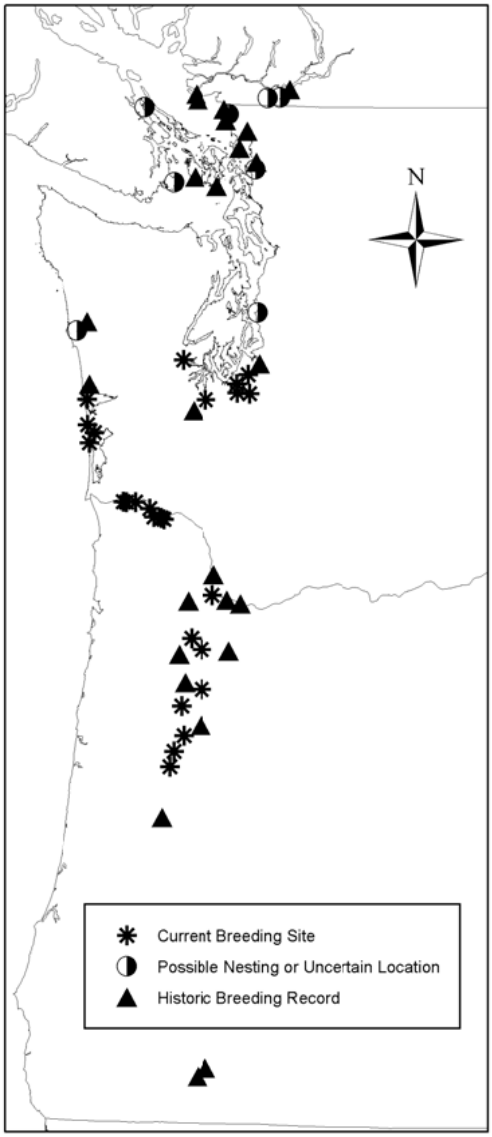

Figure 1. Current and historic Horned Lark *strigata* breeding localities and possible historic nesting or uncertain breeding season locations. All current breeding sites are in Washington and Oregon states. Map based on information from Altman 1999, Rogers 2000, Pearson and Hopey 2005, Stinson 2005.

The distribution of the Horned Lark *strigata* in Canada is restricted to southwestern B.C., where it historically occurred only on southeastern Vancouver Island and in the lower Fraser River valley from Chilliwack west to the mouth of the Fraser River (Campbell et al. 1997). The Horned Lark *strigata* is known to have bred in the lower Fraser River valley. Breeding records are concentrated near the mouth of the Fraser River on Sea Island, Iona Island, and Lulu Island. Other confirmed historical breeding localities include the University of B.C. at Point Grey and near Chilliwack (Campbell et al. 1997). Breeding has not been documented on Vancouver Island or the southern Gulf Islands. However, it is possible that this subspecies did breed at these locations in the past, as some suitable habitat would have been available and birds were known

to occur in the area (Munro and McTaggart-Cowan 1947, Beauchesne 2003, COSEWIC 2003). Central eastern Vancouver Island probably represents the northern limit of suitable habitat and range of this subspecies. Although most historical records for the Horned Lark *strigata* on Vancouver Island are not from the peak breeding season, it seems likely that these sightings were of breeding birds, occurring as they did in presumed nesting habitat. Historically, the Vancouver Island and lower Fraser River valley populations were likely very small and locally distributed. Given that these areas represent the northern extent of the geographic range of this taxon, it is also likely that not all apparently suitable habitats were utilized.

Trend information for the Horned Lark *strigata* subspecies, specifically, is not available through the Breeding Bird Survey (BBS); however, the Horned Lark (all subspecies) has undergone a significant range-wide decline (Sauer et al. 2008). Insufficient data exists to infer trend for Horned Lark in B.C. (Sauer et al. 2008).

Vesper Sparrow *affinis* subspecies

Vesper Sparrows are widespread in appropriate habitat across North America. Vesper Sparrow *affinis* occurs in a disjunct population in the Pacific Northwest, separated from the interior subspecies (i.e., Vesper Sparrow *gramineus*, *confinis*, and *altus*) by the Cascade Mountain Range (American Ornithologists' Union 1957, Pyle 1997, Cannings 1998, Rogers 2000, Campbell et al. 2001, Jones and Cornely 2002, Altman 2003). This subspecies' current breeding range exhibits a patchy distribution from southeastern Vancouver Island south through western Washington and Oregon and possibly extreme northwestern California (Figure 2). Specifically, the subspecies bred in one location in Del Norte County, California; breeds rarely in coastal grasslands in Coos and Curry Counties, and the Willamette and Umqua valleys, in Oregon; and populations persist in the lower Columbia River, south Puget Sound, and the San Juan Islands in Washington. In Canada, the species occurred historically in the lower Fraser River valley and southeastern Vancouver Island, but is now limited to a single site on Vancouver Island.

In Canada, the Vesper Sparrow *affinis* is currently known to breed only on southeastern Vancouver Island at a single site: the Nanaimo Airport and immediately adjacent land, near Cassidy (Beauchesne 2002a, 2003, 2004a, 2006, 2007, 2008, 2009, 2010b 2011, 2012, 2014b). Historically, it has been reported during the breeding season on Vancouver Island from the Englishman River estuary in the north to Cobble Meadows and Mill Bay to the south; however, recent rangewide inventory attempts have failed to locate the species at any of the historically occupied sites (Beauchesne 2010a, 2014b). It was also formerly a local breeder in the Fraser Lowland on B.C.'s southwest mainland coast. The last confirmed breeding record for that area is from 1968 (Campbell et al. 2001). The historical population size is unknown, but it is likely that the subspecies was never common in Canada, as it was never recorded in large numbers or from more than a few sites.

The breeding population of Vesper Sparrow *affinis* in prairie-oak habitats west of the Cascade Mountains in Oregon, Washington, and British Columbia was estimated to be between 1540 and 2770 (Altman 2011). In Canada, the population on southeastern Vancouver Island ranged between 2 and 7 breeding pairs over 2002 to 2010 (Beauchesne 2002a, 2003, 2004a, 2006, 2007, 2008, 2009, 2010b, 2011). In 2011 the breeding population declined to 1 pair, and in 2012 and

2013 no breeding pairs were detected (Beauchesne 2012, 2013, 2014a). One nest was suspected in 2014 (based on observations of a pair of birds carrying food during the late nesting period), but was not confirmed (Beauchesne 2014b).

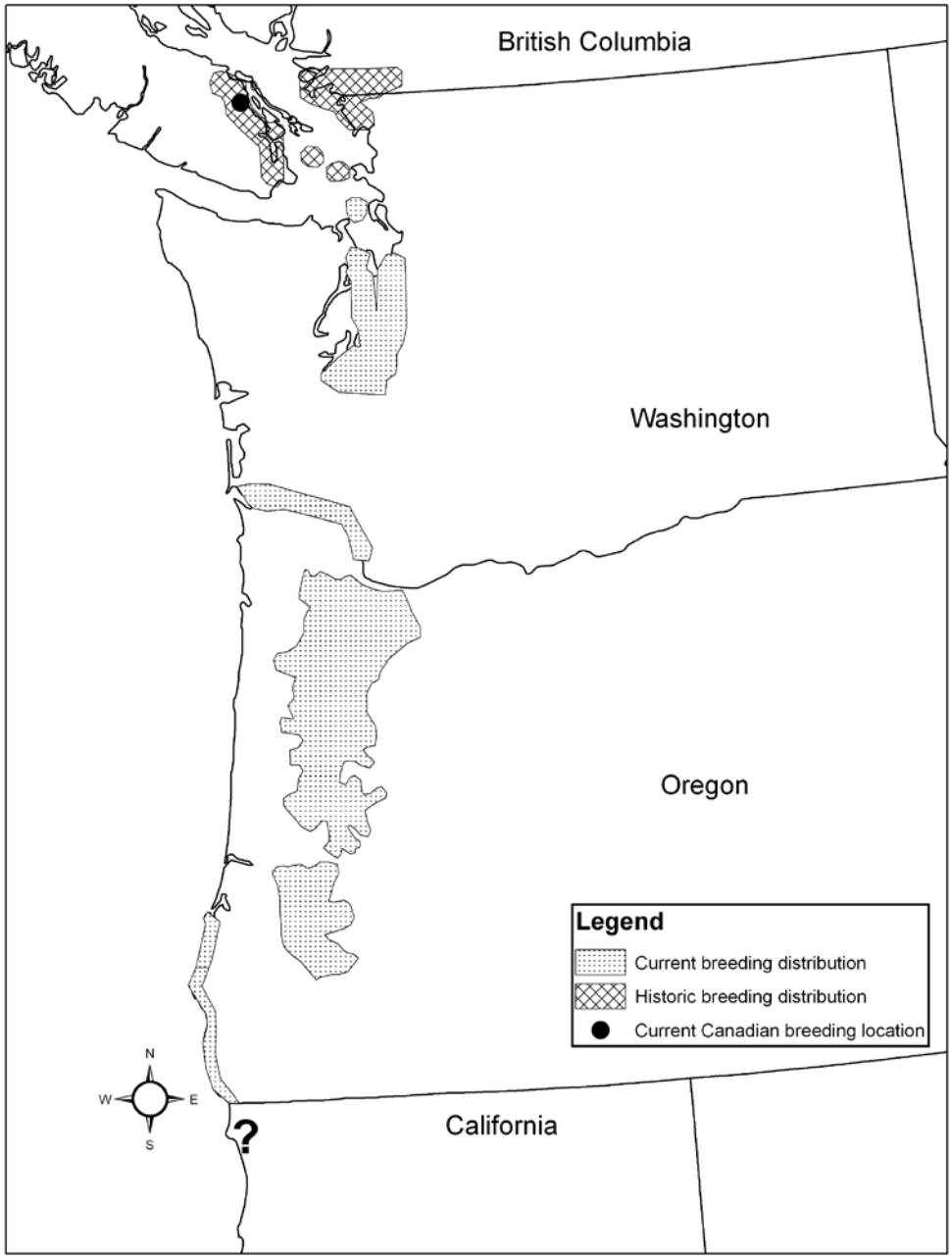

Figure 2. Current and historic breeding distribution of the Vesper Sparrow *affinis* in Canada and the U.S. Map prepared by Environment and Climate Change Canada based on information from Rogers 2000, COSEWIC 2006, S. Pearson (pers. comm.), B. Altman (pers. comm.).

4.3 Needs of the Horned Lark *strigata* and Vesper Sparrow *affinis*

Horned Lark *strigata*

The Horned Lark *strigata* is a ground-nesting passerine. Across their range, Horned Larks are birds of open areas with short, low-density vegetation (Beason 1995). Horned Lark *strigata* habitat requirements are similar to those of other subspecies. The common characteristics of all breeding sites are short sparse vegetation dominated by grasses and forbs with very few or no trees or shrubs and a relatively high percentage of bare (i.e., non-vegetated) ground (Pearson and Altman 2005).

In Washington State, the Horned Lark *strigata* breeds primarily in the glacial outwash prairies of south Puget Sound. These prairies are remnant grasslands that likely developed shortly after the last ice age. Subsequent regional climate change, beginning about 6000 years ago, resulted in a shift to moister conditions that typically produced a succession to forest ecosystems. However, prairie conditions were maintained in some areas as a result of a high frequency of low-intensity fires, most set by First Nations peoples (Crawford and Hall 1997). The soils of these prairies are deep, have low nutrient levels, and drain rapidly. These characteristics, along with the frequent anthropogenic burning, also helped maintain the prairie grassland condition.

Other breeding sites in Washington and Oregon include airfields, dredge spoil islands in the Columbia River, sandy coastal beaches, and disturbed areas on military training bases (Rogers 2000, Pearson and Altman 2005). In the Willamette Valley of Oregon, the Horned Lark *strigata* breeds in agricultural fields, generally selecting sparsely vegetated fallow fields (Pearson and Altman 2005). The majority of the global population of the Horned Lark *strigata* is believed to winter along the lower Columbia River and in the Willamette Valley (Pearson and Altman 2005).

In B.C., larks have used agricultural fields, airports, beaches, sand dunes, short-grass playing fields, roadsides, and other areas with a high percentage of bare ground. Documented breeding habitat is restricted to short-grass fields in agricultural areas, airports, and estuaries and to sparsely vegetated, sandy beaches along the lower Fraser River (Butler and Campbell 1987, Campbell et al. 1997). Horned Lark *strigata* is believed to have used Garry oak ecosystems, especially those recently burned by First Nations peoples (Garry Oak Ecosystem Recovery Team 2003).

The size of the habitat patch is also likely important. Grassland sites may need to be very large to be effective (Vickery et al. 1994). In the U.S., habitat patches in the Puget Lowlands grassland areas used by the Horned Lark *strigata* ranged in size from 131 to 390 ha. In coastal areas, the Horned Lark *strigata* breeds adjacent to expanses of open water; under these conditions, it uses habitat patches as small as 10 ha (S. Pearson, pers. comm.).

Availability of large patches of suitable breeding habitat with low levels of disturbance during the nesting period appears to limit the extant distribution of this species in Canada. In many areas with otherwise suitable habitat, activity of machinery, people, livestock, or domestic pets can

destroy or depredate nests directly. Additionally, anthropogenic disturbance can lead to frequent flushing of nesting birds, resulting in nest abandonment and increased rates of nest predation (Pearson and Altman 2005).

Vesper Sparrow *affinis*

The Vesper Sparrow *affinis* is also a ground-nesting passerine. Like the Horned Lark *strigata*, the principal limiting factor for this species is believed to be the availability of suitable habitat with low disturbance levels during the nesting season. Vesper Sparrows are grassland birds, preferring dry, open areas with short, sparse grass or herbaceous cover, and patches of bare ground (Campbell et al. 2001, Dechant et al. 2001, Jones and Cornely 2002, Appendix A). Structural diversity of vegetation is important; however, taller vegetation, such as scattered or edge shrubs or trees, is used for cover and for singing perches, whereas areas with shorter vegetation are used for foraging and nesting (Davis and Duncan 1999, Beauchesne 2002a, 2003, 2004a). In foraging areas of western Washington, the Vesper Sparrow *affinis* used sites with a mean cover of 32% bare ground, with the remaining cover consisting of grasses and forbs (Rogers 2000). Fence posts, wire fences, and other human-made structures may also be used as singing perches (Beauchesne 2002b). A combination of short-grass and herbaceous ground cover, bare dirt, and scattered taller vegetation seems to be preferred (see numerous citations in Dechant et al. 2001).

Several studies indicate that Vesper Sparrows avoid permanent pasture and hayfields (see Campbell et al. 2001, Jones and Cornely 2002) or areas where shrubs were completely removed and the site planted with grass (Castrale 1982). In Saskatchewan, Vesper Sparrows did occur in hayfields (McMaster et al. 2005). However, sparrows initiated nesting in habitat that had clumps of short vegetation with considerable amounts of bare dirt until mid-June, after which the vegetation grew in height and density. On southeastern Vancouver Island, hayfields tend to support dense, tall vegetation early in the breeding season, precluding nesting by the Vesper Sparrow *affinis*.

Habitat patch size may also be important (Kershner and Bollinger 1996, Rogers 2000, Vickery et al. 1994). For example, in Washington, the Vesper Sparrow *affinis* is currently found primarily in large prairie areas, but not in small patches of similar habitat (S. Pearson, pers. comm.). In eastern Oregon, however, Vesper Sparrows have been recorded breeding in areas smaller than 4 ha (B. Altman, pers. comm., in Jones and Cornely 2002), and on Vancouver Island, the extant population has occurred in an area of suitable habitat of approximately 10 ha (Beauchesne 2002a). Populations of Vesper Sparrow *affinis* may therefore be able to persist in smaller habitat patches than those required for the Horned Lark *strigata*. However, the minimum habitat patch size requirement for Vesper Sparrow *affinis* is currently unclear. Studies of other Vesper Sparrow subspecies have suggested that patches should be larger than 10 ha to support a breeding population (Samson 1980, Herkert 1991).

On Vancouver Island, the plant community at the known breeding site includes both native and non-native flora. Birds frequently use clumps of introduced Scotch Broom (*Cytisus scoparius*) for singing perches and escape cover. They forage on the ground in adjacent open areas with gravelly soil and sparse forb and grass cover (Beauchesne 2002a, 2003, 2004b, 2006, 2007,

2010b, 2011, 2012, 2013, 2014). Nests monitored since 2005 have been associated with a range of native and non-native plant species, including English plantain (*Plantago lanceolata*) (Beauchesne 2006), mown Scotch Broom (Beauchesne 2006, 2007, 2012), sparse grasses (Beachesne 2007, 2008, 2011), Trailing Blackberry (*Rubus ursinus*) (Beauchesne 2007), and thistle (*Circium* sp.) (Beauchesne 2008).

Multi-species Habitat Management

Given their similar habitat requirements, management of habitat at a single site for the Vesper Sparrow *affinis* and the Horned Lark *strigata* is possible. However, for management purposes, it is important to recognize that Vesper Sparrows require some shrub cover in open areas, whereas larks avoid shrubby areas. In many open habitats, the lark may nest in the middle of larger open areas and the sparrow may use the edges where both short and tall vegetation are available. This has been demonstrated at study sites in Washington State, where both species occur (Rogers 2000). In this recovery strategy, it is not expected that any sites be managed specifically for both species, as the currently most suitable candidate sites for each species are not likely to overlap geographically.

5. THREATS

5.1 Threat Assessment

Table 2. Threat Assessment Table

Threat	Level of Concern[1]	Extent	Occurrence	Frequency	Severity[2]	Causal Certainty[3]
Habitat Loss and Degradation						
Development	High	Widespread	Historic, Current and Anticipated	Continuous	High	High
Livestock grazing and cultivation	Low	Widespread	Historic	Continuous	Moderate	Medium
Accidental Mortality						
Small Population / Distribution Effects	High	Widespread	Current and Anticipated	Continuous	High	Medium
Bird strikes	Moderate (Horned Lark *strigata*) Low (Vesper Sparrow *affinis*)	Localized	Historic and Current	Recurrent	Moderate (Horned Lark *strigata*) Low (Vesper Sparrow *affinis*)	Medium
Changes in Ecological Dynamics or Natural Process						
Predators	Moderate	Localized	Current	Continuous	High	Medium
Fire suppression	Moderate	Widespread	Historic, Current	Continuous	Unknown	Low
Exotic, Invasive, or Introduced Species						
Exotic plants	Moderate (Horned Lark *strigata*) High (Vesper Sparrow *affinis*)	Widespread	Current and Anticipated	Continuous	Moderate (Horned Lark *strigata*) High (Vesper Sparrow *affinis*)	High
Disturbance or Harm						
Human intrusion	Low	Localized	Current and Anticipated	Recurrent	Low	Medium

Pollution						
Pesticides	Low	Localized	Historic and Current	Recurrent	Unknown	Low

[1] *Level of Concern: signifies that managing the threat is of high, medium, or low concern for the recovery of the species, consistent with the population and distribution objectives. This criterion considers the assessment of all the information in the table.*

[2] *Severity: reflects the population-level effect (i.e., High: very large population-level effect, Moderate, Low, Unknown).*

[3] *Causal Certainty: reflects the degree of evidence that is known for the threat (i.e., High: available evidence strongly links the threat to stresses on population viability; Medium: there is a correlation between the threat and population viability (e.g. expert opinion); Low: the threat is assumed or plausible).*

5.2 Description of Threats

Threats ranked as "low concern" in Table 2 are not described in this section.

Habitat Loss and Degradation

Development

Loss of high-quality breeding habitat is considered the primary threat for both species. Although the extent of breeding habitat in the Georgia Basin for the Horned Lark *strigata* has always been limited, suitable open habitats, including 95% of the Garry oak and associated ecosystems (Fuchs 2001), have been lost as a result of industrial, commercial, and residential developments and dyking (Campbell et al. 1997). It is assumed that prior to European settlement, Garry oak ecosystems, prairies associated with Garry oak ecosystems, and other sparsely vegetated or burnt areas would have been the key open habitats used by the breeding Vesper Sparrow *affinis*. At the Nanaimo Airport, the existing breeding Vesper Sparrow *affinis* population uses an area that is away from the vicinity of buildings and human activity. However, habitat in this area is vulnerable to potential future activities, such as airport expansion (e.g., wider, longer, or new runways), construction of new airport infrastructure (e.g., airport buildings, aircraft hangars, parking areas for vehicles and equipment), and expansion of ancillary commercial operations (e.g., expanded recreational vehicle sales or other new businesses). As the airport and immediately adjacent land is the only extant breeding site for the subspecies in Canada, future development at this site may pose a threat to the persistence of the species in Canada.

In addition to absolute habitat loss, development has resulted in changes to the size and spatial configuration of suitable habitat patches. The minimum patch size for the Horned Lark *strigata* may vary depending on the landscape context. Although the Horned Lark *strigata* may require patches no larger than 10 ha within an open landscape (e.g., dunes, coastal island or coastal prairie habitats), a suitable habitat patch would likely need to be larger if surrounded by forest, buildings, or other tall structures that reduce visibility (Ribic et al. 2009). In general, U.S. data suggest that smaller patches are suitable only in habitats directly adjacent to the coast, whereas inland sites must be much larger (S. Pearson and B. Altman, pers. comm.). The Vesper Sparrow *affinis* appears to use smaller areas of suitable habitat (Altman 2000), within an appropriate landscape context (Vickery et al. 1994). For example, at the Nanaimo Airport and immediately

adjacent land, the population is breeding in an area less than 10 ha in size (Beauchesne 2004a) within an open, largely treeless, grass and forb dominated landscape. Recent habitat inventory work within a 20 km radius of the existing population has confirmed that similar sized patches of suitable or restorable habitat are scarce, but do exist (Hill 2009). However, none are directly adjacent to the airport site and many are not being currently managed in a way that is favourable to Vesper Sparrow breeding (e.g., Vesper Sparrows avoid areas that are converted to permanent pasture and hayfields (see Campbell et al. 2001, Jones and Cornely 2002) or areas where shrubs are completely removed and the site planted with grass (Castrale 1982)). These factors likely combine to reduce the chances of the current population expanding into any of these neighbouring sites, should the population at the Nanaimo Airport increase beyond the habitat's carrying capacity (Beauchesne 2003, 2004a, 2010a).

Accidental Mortality

Small Population/Distribution Effects

Past estimates of Horned Lark *strigata* population size in the U.S., based on breeding and winter surveys by researchers, put the population at less than 1000 individuals (Pearson and Altman 2005). Altman (2011) estimated the breeding population of Horned Lark *strigata* in prairie-oak habitats west of the Cascade Mountains in Oregon, Washington, and British Columbia to be between 1170 and 1610. Genetic work suggests that the remaining birds are genetically distinct, while also having remarkably low genetic diversity. Samples all shared the same haplotype[4], whereas all other Horned Lark subspecies exhibited multiple haplotypes (Drovetski et al. 2005). Genetic data do not currently exist for the Vesper Sparrow *affinis*, although patterns of genetic differentiation for other coastal grassland species suggest that this subspecies will be genetically distinct and isolated from subspecies occurring elsewhere in North America (Ruegg and Smith 2002, Drovetski et al. 2005). Small population size and low genetic diversity cause these subspecies to be especially vulnerable to stochastic events, such as severe weather events or disease outbreaks. Given that source populations for the Horned Lark *strigata* in B.C. are now remote (i.e. nearest populations are in south Puget Sound in Washington State), the probability of recolonization after a catastrophic event would be extremely low. The nearest U.S. population of the Vesper Sparrow *affinis* is on the San Juan Islands, which consisted of one pair at American Camp and two pairs near Pear Point Road, Friday Harbour, in 2013 (B. Altman, pers. comm.). The distance between this latter population and the Nanaimo Airport is approximately 110 km. The overall breeding population of Vesper Sparrow *affinis* in prairie-oak habitats west of the Cascade Mountains in Oregon, Washington, and British Columbia was estimated to be between 1540 and 2770 (Altman 2011).

Because the Vesper Sparrow *affinis* currently occurs in very small numbers at a single site in Canada, this population is particularly vulnerable to extirpation. A single catastrophic event on the Nanaimo Airport grounds or adverse weather conditions on the wintering grounds have the potential to eliminate the entire Canadian breeding population.

[4] A set of closely linked genetic markers present on one chromosome which tend to be inherited together.

Bird Strikes

U.S. military reports indicate that Horned Larks are the most commonly reported aviation bird strike victim of any species (Bird/wildlife Aircraft Strike Hazard Team 2006). Horned Lark flight behaviour, including a tendency to fly at considerable altitude during mating displays, likely exposes them to a greater risk than that experienced by other grassland species. Horned Larks (*strigata* subspecies) have been found dead along the runways of military airport breeding locations in Washington State (Pearson and Altman 2005). During the breeding season, the Horned Lark *strigata* is also vulnerable to automobile strikes, as it often selects nest sites on or directly adjacent to gravel roads (S. Pearson and B. Altman, pers. comm.).

As the Vesper Sparrow *affinis* is not known to frequent roadside habitats, the risk of automobile strikes for this species is likely lower. At the Nanaimo Airport, air strikes by planes are unlikely, as Vesper Sparrows do not engage in high-altitude flights to the same extent as do larks and they tend to frequent areas farther away from runways at this site, since the shrub component is removed from areas within 100 m of the strip. However, the Nanaimo Airport is occasionally used by helicopters and ultra-light aircraft that may approach, hover over, or land in Vesper Sparrow habitat, possibly leading to direct or indirect mortality.

Changes in Ecological Dynamics or Natural Process

Predators

The effects of predators may also limit these species. Predation was the primary source of nest failure in the Horned Lark *strigata* at nearly all sites studied in the Puget Lowlands, Washington coast, Columbia River, and Willamette Valley (Altman 1999, Pearson and Hopey 2005). Vesper Sparrow researchers have found that predation is a major cause of nest failure, with rates of up to 63% (reviewed in Jones and Cornely 2002). For both species, urbanization and other human activities tend to lead to increased predation pressure from introduced predators, particularly domestic and feral cats (George 1974, Cooper 1993, Coleman et al. undated), as well as some native predators, such as corvids (Marzluff and Neatherlin 2006). No nest predation information is available for the Vesper Sparrow *affinis* population at the Nanaimo Airport, although domestic and feral cats have been observed at the site (S. Beauchesne, pers. comm.). Predation by corvids and feral cats is a known and ongoing threat for both species, wherever they occur. For both species, the proximity of any known or potential suitable sites to urbanized areas increases the risk of predation from introduced and some native predators.

Fire Suppression

For both species, suitable habitat in the Georgia Basin may have been more abundant in the past due to more frequent fires, both natural and of First Nations origin. However, fire suppression practices, especially around developed areas, have allowed natural succession to infill previously open and suitable habitats (i.e., infilling by native plants, such as Douglas-fir (*Pseudotsuga menziesii*) and Common Snowberry (*Symphoricarpos albus*)). In a recent controlled burn experiment in the U.S., the Horned Lark *strigata* was more abundant in burned plots versus control plots in the post-breeding period (Pearson and Hopey 2005). Late summer burns appear to be more beneficial for the Horned Lark *strigata*, as regeneration of vegetation is not as vigorous, possibly allowing birds to locate and capture invertebrate prey more easily.

Exotic, Invasive or Introduced Species

Exotic Plants

The introduction of invasive plants such as Scotch Broom, Common Gorse (*Ulex europaeus*), Himalayan Blackberry (*Rubus discolor*), and tall non-native grasses has led to infilling of important habitats for Horned Lark *strigata* and Vesper Sparrow *affinis*. This change in vegetation structure has reduced the suitability of most of the remaining old-field, Garry Oak, and sand dune habitats for the Horned Lark *strigata* (Fraser et al. 1999). Because the Vesper Sparrow *affinis* requires a combination of short vegetation, bare ground, and shrub cover, this species tolerates some infilling by invasive species such as Scotch Broom, and will even use that plant as a singing perch and for escape and nest cover (Beauchesne 2002a, 2003, 2006, 2007, 2012). However, Vesper Sparrows are excluded from areas where shrubs completely dominate open areas (Jones and Cornely 2002). If left unmanaged, Scotch Broom can degrade formerly open habitats to the point where they become unsuitable. Other invasive plant species may have structural similarities to native species and may not be detrimental to breeding birds of either species. For example, Vesper Sparrow *affinis* nests in and adjacent to the Nanaimo Airport have been situated directly adjacent to English Plantain (Beauchesne 2006).

The role of invasive plant species at the Nanaimo Airport site is complex. Although ingrowth of Scotch Broom at the Nanaimo Airport site appears to threaten habitat quality in some areas, others areas, presumably with lower soil quality, appear to maintain a stable level of shrub density favoured by the birds. It is important to emphasize that optimal habitat quality for Vesper Sparrow *affinis* likely lies somewhere in the middle of a continuum of shrub density. It should be noted that ongoing management will be required in order to prevent natural succession from occurring at this highly disturbed site. Although not native, Scotch Broom is used by the birds and, at appropriate densities, appears to meet the structural shrub requirement of Vesper Sparrow *affinis* at the Nanaimo Airport site.

6. POPULATION AND DISTRIBUTION OBJECTIVES

Population and Distribution Objective for Horned Lark *strigata*

- Establish and maintain a breeding population of at least 10 breeding pairs distributed across a minimum of three sites within its historical breeding range in Canada.

Historical occurrence and habitat availability data (COSEWIC 2003) suggest that this species' population was likely never large enough to be self-sustaining, and was possibly ephemeral, in Canada; and likely always depended on immigration from the U.S. Consequently, achieving a "minimum viable population" is not a reasonable objective; as such a small population will always be vulnerable to extirpation due to stochastic events in Canada or on the wintering grounds. Populations likely increased in the Fraser River valley as a result of anthropogenic activities that created temporary suitable habitat in the first half of the 20th century. Subsequent agricultural intensification and urbanization in this region have resulted in the elimination of the vast majority of this habitat. Based on U.S. patch size data for Horned Lark *strigata* populations

utilizing inland grassland sites (see Section 1.4), the remaining patches in the Fraser Valley are likely not large enough to be suitable. From this perspective, the effective potential breeding range should now be limited to sparsely vegetated coastal dune or meadow habitats elsewhere in the Lower Mainland and southeastern Vancouver Island. The population and distribution objective considers the limited available information on historical abundance and is believed to be achievable given the likely extent of remaining suitable and restorable habitat. Three sites are believed to be the minimum number that still allows for some redundancy and accounts for the possibility of stochastic events which could destroy one or more sites. This objective is considered achievable in part because of the likelihood that suitable sites will benefit a suite of species at risk, and therefore not require incremental recovery efforts specifically for this species. The three sites for Horned Lark *strigata* will not necessarily be the same sites used for Vesper Sparrow *affinis*.

Population and Distribution Objective for Vesper Sparrow *affinis*

- Establish and maintain a breeding population of at least 30 breeding pairs distributed across a minimum of at least three sites, including the current site, plus two additional sites, within its historical breeding range in Canada.

Like the Horned Lark *strigata*, this species was likely never abundant and possibly ephemeral in Canada. Consequently, achieving a "minimum viable population" is not a reasonable objective, because such a small population will always be vulnerable to extirpation due to stochastic events in Canada or on the wintering grounds. However, the Vesper Sparrow *affinis* was historically more abundant and widespread than it is currently, so an increase in the population and distribution is appropriate. While few of the remaining suitable or restorable sites could support more than 10 pairs, expanding the number of occupied sites is important in order to increase the probability of persistence from a metapopulation perspective. Expanding the population to three sites might be possible if an existing population in the U.S. could act as a "source" from which to increase the overall Canadian population. Three sites are believed to be the minimum number that still allows for some redundancy and accounts for the possibility of stochastic events that could destroy one or more sites. The three sites for Vesper Sparrow *affinis* will not necessarily be the same sites used for Horned Lark *strigata*.

7. BROAD STRATEGIES AND GENERAL APPROACHES TO MEET OBJECTIVES

7.1 Actions Already Completed or Currently Underway

i) The Nanaimo Airport has participated actively in stewardship of Vesper Sparrow nesting habitat, previously through a stewardship agreement, and recently through the development of a site management plan (Beauchesne 2002c,Radcliffe 2010). Environment and Climate Change Canada continues to work collaboratively with the airport towards stewardship and conservation.

ii) Specific activities ongoing at the Nanaimo Airport include: habitat restoration work to reduce infilling of habitat by invasive exotic species; installation of fencing to deter access by species that can pose a safety risk to the airport (e.g., deer, feral rabbits); planting of both artificial and native low growing and frangible plants; research to better document habitat used by the breeding Vesper Sparrow *affinis*; and annual inventory of the breeding population (Beauchesne 2002a, 2003, 2004a, 2006, 2007, 2008, 2009, 2010b, 2011, 2012, 2013, 2014a,b).

iii) The Nanaimo Area Land Trust (NALT) has developed a stewardship program with some of the local landowners adjacent to the Nanaimo Airport. In addition, a landowner contact program was undertaken in 2007-2008, focused primarily on identification of additional suitable or restorable habitat for Vesper Sparrow *affinis* within 20 km of the Nanaimo Airport. Several potential suitable or restorable sites were identified, but further work is required to determine whether current land use is consistent with Vesper Sparrow breeding requirements. Previously, NALT has also held public information events and conducted media interviews to increase awareness and identification of the species, and to promote stewardship.

iv) The Garry Oak Ecosystems Recovery Team (GOERT) is coordinating conservation and recovery of Garry oak ecosystems in B.C. The Vertebrates at Risk Recovery Implementation Group of the GOERT is coordinating recovery actions for five species of birds associated with these ecosystems, including the Horned Lark *strigata* and the Vesper Sparrow *affinis* (Beauchesne 2004b).

v) Habitat restoration work is underway in a number of areas managed for the purpose of conservation within the range of the Horned Lark *strigata* and the Vesper Sparrow *affinis*, some of which will benefit these species and other ground-nesting birds (e.g., Nanaimo River estuary by the Nature Trust and BC Conservation Lands program).

7.2 Strategic Direction for Recovery

Table 3: Recovery Planning Table for Horned Lark *strigata*

Threat or limitation	Priority[1]	Recommended approaches to meet recovery objectives
Broad Strategy 1: Complete an assessment of candidate sites featuring sparsely vegetated coastal dune or meadow habitat for suitability.		
Knowledge gap on the identification of suitable sites.	Urgent	• Identify and map candidate sites. • Develop habitat suitability ratings and conduct site assessments, in cooperation with U.S. researchers. • Develop a prioritized list of suitable sites.
Broad Strategy 2: Secure, restore, create, preserve, or manage three of the most suitable sites.		
All	Necessary	• Assess habitat restoration requirements. • Recruit landowners and volunteers to participate in restoring landscape connectivity. • Develop and implement regional and site-specific management plans at existing sites.
Broad Strategy 3: Collaborate with international partners.		
Small population/ distribution effects Knowledge gap related to U.S. threats	Beneficial	• Work with colleagues in the U.S. to identify and mitigate threats in adjacent U.S. breeding habitats, along migratory routes, and in overwintering areas. • Maintain relationships with U.S. researchers to benefit from continuing research, in particular with respect to demographic rates in natural versus anthropogenic habitats and patch size requirements for birds nesting in sparsely vegetated coastal dune or meadow habitats.

[1] *"Priority" reflects the degree to which the broad strategy contributes directly to the recovery of the species or is an essential precursor to an approach that contributes to the recovery of the species.*

Table 4: Recovery Planning Table for Vesper Sparrow *affinis*

Threat or Limitation	Priority[1]	General Description of Research and Management Approaches
Broad Strategy 1: Manage and protect the habitat at the recently occupied site to support the current population and facilitate its increase by a minimum of 2 to 3 pairs[5].		
All	Urgent	• Renegotiate a stewardship agreement with the Nanaimo Airport, with the intent of protecting critical habitat. • Continue monitoring the extant breeding population. • Experimentally evaluate the effect of invasive exotic plant species management on habitat selection and productivity of Vesper Sparrow *affinis* using currently unoccupied areas of the site and, where appropriate, in currently occupied areas. • Evaluate the impacts of predation, and implement mitigation measures if necessary. • Explore innovative solutions to create alternate habitat features, such as perches and cover, to meet the safety needs of the airport and habitat needs of Vesper Sparrow *affinis*.
Broad Strategy 2: Complete an assessment of candidate sites with appropriate structural characteristics for suitability.		
Development	Necessary	• Re-evaluate a list of candidate sites within the subspecies' historical range in Canada for consideration as potential habitat for the Vesper Sparrow *affinis*. • Map sites. • Assess sites for suitable and/or restorable habitat using species expertise (develop habitat suitability ratings and conduct assessment). • Develop a prioritized list of suitable sites; with those sites closest to the existing Nanaimo Airport site likely being a higher priority to encourage increased probability of metapopulation persistence via opportunities for inter-patch movement and dispersal.
Broad Strategy 3: Secure, restore, preserve, or manage two additional sites of the most suitable candidates identified by 2015.		
All	Necessary	• Assess habitat restoration requirements. • If feasible, restore any currently unsuitable potential breeding habitat such that it could be subsequently identified as critical habitat for Vesper Sparrow *affinis* (e.g., Nanaimo Estuary). • Through expansion of the existing landowner contact program, recruit landowners and volunteers to participate in restoring landscape connectivity. • Develop and implement regional and site-specific management plans, preferably in the context of formal stewardship agreements. • Implement periodic regional inventory work, as appropriate.
Broad Strategy 4: Analyze the feasibility of active relocation of the Vesper Sparrow *affinis* to suitable unoccupied habitat.		
Small population/ distribution effects	Beneficial	• Design and implement a feasibility research program for active relocation in collaboration with species experts.

[5] It is acknowledged that conservation actions at the Nanaimo Airport site, such as habitat modification or enhancement, must be compliant with Transport Canada regulations. Nonetheless, innovative recovery actions that will meet both the objectives of safety and recovery of species at risk will be sought.

Threat or Limitation	Priority[1]	General Description of Research and Management Approaches
Broad Strategy 5: Collaborate with international partners.		
Small population/ distribution effects	Beneficial	• Work with colleagues in the U.S. to identify and mitigate threats in adjacent U.S. breeding habitats, along migratory routes, and in overwintering areas. • Consult with U.S. researchers on the species' management.

[1] "Priority" reflects the degree to which the broad strategy contributes directly to the recovery of the species or is an essential precursor to an approach that contributes to the recovery of the species.

8. CRITICAL HABITAT

8.1 Identification of the Species' Critical Habitat

Horned Lark *strigata*

It is not possible to identify critical habitat for the Horned Lark *strigata* at this time.

No individuals are currently known to breed or over-winter in Canada. For the purposes of passive recolonization, some sites with suitable or restorable habitat remain, although they are widely dispersed, uncommon, and their relative suitability for future occupancy by Horned Lark *strigata* still needs to be assessed. Passive recolonization would involve colonization of currently suitable, restorable, or newly created habitat by dispersing individuals from U.S. populations. The likelihood of which is unknown; although an observation of an individual male in 2002 indicates it is possible. The recovery team has determined that an active reintroduction program is not feasible. Active reintroduction would involve direct reintroduction of birds captured and imported from U.S. populations and subsequent intensive management and monitoring. Methodologies for successful reintroduction of grassland passerines are currently not well developed. Also, there is uncertainty concerning the feasibility of introducing individuals from U.S. populations, as those populations are also at risk and the species is proposed for listing as Threatened on the U.S. *Endangered Species Act*. Finally, the relative potential of natural (e.g., dune, natural grassland) versus anthropogenic (e.g., airports, dredge spoil islands) habitats to sustain populations of the Horned Lark *strigata* is unknown. Some anthropogenic habitat types (e.g., airports) may be population sinks for the Horned Lark *strigata*, in that populations breeding at these sites would need constant augmentation of new individuals in order to persist. However, U.S. research to date has not been able to determine whether anthropogenic sites differ in habitat quality from natural habitats, due in large part to insufficient data with respect to relative adult survival in these habitat types (S. Pearson, pers. comm.).

The schedule of studies outlines how these knowledge gaps will be addressed. It will not be possible to identify critical habitat until candidate sites are assessed as being currently suitable or can be restored to a condition of suitability.

Vesper Sparrow *affinis*

In Canada, the Vesper Sparrow *affinis* is currently known to occur only on southeastern Vancouver Island at the Nanaimo Airport near Cassidy, B.C. (Beauchesne 2002a, 2003, 2004a, 2006, 2007, 2008, 2009, 2010b, 2011, 2012, 2013, 2014a,b).

The population and distribution objective for Vesper Sparrow *affinis* is to establish populations at three sites in Canada (i.e., maintain the currently occupied site, plus establish two additional sites). In this recovery strategy, critical habitat is only identified at the Nanaimo Airport site. Other habitats with potentially suitable or restorable habitat have not yet been identified and assessed. Consequently, the material here only represents a partial identification of critical habitat, based on the best available information. A schedule of studies (see Section 8.2) has been included to complete the identification of critical habitat.

Biophysical Attributes

To carry out its life processes, the Vesper Sparrow *affinis* requires habitat for nesting, foraging, perching, and singing. These can all occur in one area, or it is possible to have perching and singing habitat in an adjacent area (i.e., within a territory) that is not suitable for nesting. Foraging can occur opportunistically anywhere within a territory. In addition, an open area that is ≥10 ha in size is required to support a breeding population of Vesper Sparrows (Samson 1980, Herkert 1991).

The biophysical attributes of the nesting and foraging habitat consists of open areas with short, sparse grass or herbaceous cover, and intermittent bare ground. While clear suitability thresholds are not yet known, suitable amounts can be inferred from a study of Vesper Sparrow *affinis* habitat selection further south in the breeding range, and from studies of the *gramineus* and *confinus* subspecies (Appendix A). The biophysical attributes of the perching and singing habitat are scattered shrubs and small trees.

At this site, the shrub component is dominated by Scotch Broom, a non-native, invasive species that is targeted for removal in other parts of southeastern Vancouver Island. It is important to note that this plant provides an important element of habitat structure (i.e., singing perch, escape and nest cover) without which the site would not be suitable as Vesper Sparrow *affinis* breeding habitat. Other native species could presumably perform this function equally well, but it remains unclear whether replacement of the Scotch Broom and other non-native vegetation with native species would improve habitat quality or suitability for Vesper Sparrow *affinis* at this site. While native plant species may be desirable for a broader range of biodiversity values and may possibly result in the reduction of ongoing vegetation management efforts, non-native plants, including Scotch Broom and English Plantain, will be tolerated within Vesper Sparrow *affinis* habitat at the Nanaimo Airport and immediately adjacent land until habitat restoration strategies at this site are further evaluated and developed (Table 4).

Critical Habitat Identification

The area within which critical habitat is identified for the Vesper Sparrow *affinis* contains all actively defended territories[6] observed between 2002 and 2014 (Beauchesne 2002a, 2003, 2004a, 2006, 2007, 2008, 2010b, 2011, 2012, 2013, 2014a,b). The methodology for monitoring the population at the Nanaimo Airport consists of intensive searches for Vesper Sparrows and their nests during the breeding period (i.e., early May to late July). Territory location and size estimates were derived by observing habitat features and singing perches used by the birds. A bird-banding program commenced in 2005, allowed for the identification of individual birds and greater certainty in mapping of individual territory boundaries.

Location of Vesper Sparrow *affinis* Critical Habitat

Critical habitat for Vesper Sparrow *affinis* in Canada is identified for one site found at the Nanaimo Airport and immediately adjacent land in B.C. (Figure 3). Within the represented area, critical habitat is defined as any habitat that possesses the biophysical attributes outlined above.

[6] Active territory defense includes singing from regular perches along the territory periphery, as well as physical interactions with neighbouring territory holders.

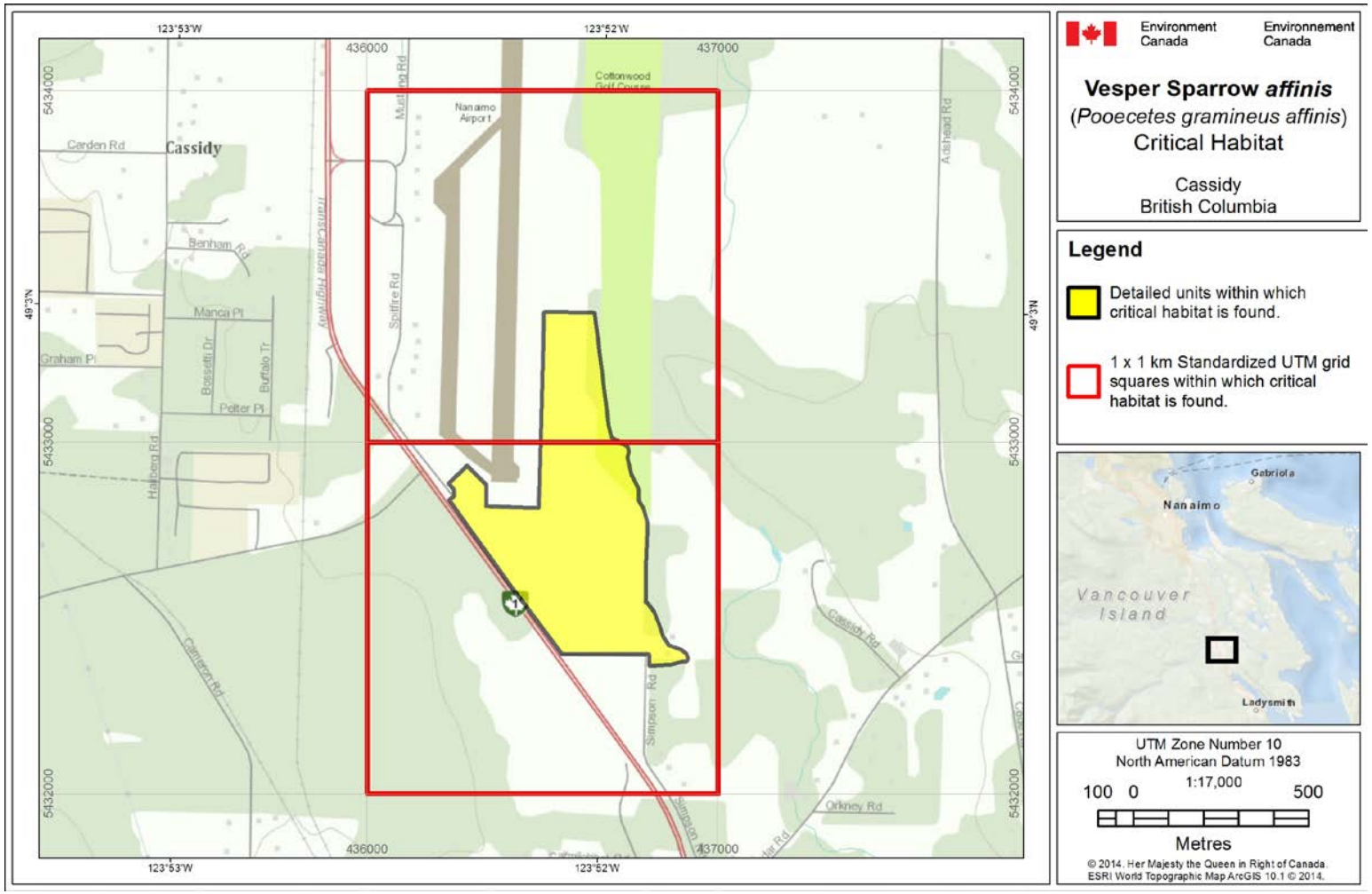

Figure 3. Critical habitat for Vesper Sparrow *affinis* is found near the southern portion of the Nanaimo Airport near Cassidy, B.C. Critical habitat occurs within the yellow coloured polygon where the biophysical attributes set out in Section 8.1 are found. The 1 km x 1 km UTM grid overlay (red outline) shown on this figure is a standardized national grid system that indicates the general geographic area containing critical habitat. Areas outside of the yellow shaded polygons do not contain critical habitat.

8.2 Schedule of Studies to Identify Critical Habitat

Horned Lark *strigata*

Table 5. Schedule of studies to identify critical habitat for Horned Lark *strigata*.

Description of Activity	Rationale	Timeline
1. Compile a list of candidate sites within the subspecies' historical range in Canada for consideration as potential habitat for the Horned Lark *strigata*.	Additional information about possible suitable habitat patches is gained.	2016-2017
2. With the assistance of species experts, identify and assess candidate sites as unsuitable, suitable, or restorable.	Additional information about possible suitable habitat patches is gained.	2017-2018
3. Identify, map, and prioritize suitable sites featuring sparsely vegetated coastal dune and meadow habitats for the Horned Lark *strigata* and identify them as critical habitat.	Critical habitat is identified.	2017-2018
4. Identify, map, and prioritize coastal sites with habitat restoration potential for the Horned Lark *strigata*. Identify restored sites as critical habitat, as required, to achieve the population and distribution objectives.	Habitat is restored to a state appropriate for identification as critical habitat.	2017-2018

Vesper Sparrow *affinis*

This recovery strategy has only partially identified critical habitat for Vesper Sparrow *affinis*, in that the population and distribution objective requires that populations be established at a minimum of three sites. It should be noted that the utility of identification of additional sites does not hinge on the development of active re-introduction techniques, as natural re-colonization of identified sites via dispersal from the extant breeding population in the U.S. is thought to be possible. Consequently, it may be possible to identify additional critical habitat following the completion of the following studies:

Table 6. Schedule of studies to identify additional critical habitat for Vesper Sparrow *affinis*.

Description of Activity	Rationale	Timeline
1. Assess results of landowner contact and habitat inventory conducted in the Nanaimo area and determine whether suitable and/or feasibly restorable sites exist within the search area.	Additional information about possible suitable habitat is gained.	2016-2017
2. If no suitable/restorable sites are identified in the Nanaimo area, conduct additional habitat inventories within an expanded search area.	Additional information about possible suitable habitat is gained.	2016-2017
3. If suitable/restorable sites do exist in the Nanaimo area or in the expanded search area, identify the most suitable of these sites as critical habitat.	Critical habitat is identified.	2016-2018
4. If no sites are located that are currently suitable, identify, map, and prioritize sites with habitat restoration potential. Identify restored sites as critical habitat, as required, to achieve the population and distribution objectives.	Habitat is restored to a state appropriate for identification as critical habitat.	2016-2018

8.3 Activities Likely to Result in the Destruction of Critical Habitat

Activities that are likely to result in destruction of critical habitat are based on known habitat needs and habitat-related threats. Destruction would result if part of the critical habitat were degraded, either permanently or temporarily, such that it would not serve its biological function for the species. Destruction may result from single or multiple activities at one point in time or from the cumulative effects of one or more activities over time.

Vesper Sparrow *affinis* requires sparse grass or forb cover with intermittent bare ground for nesting and foraging, and shrubs and trees for song perches and escape and nest cover. Examples of activities that are likely to result in the destruction of critical habitat, through the elimination of one or more of these key features include, but are not limited to, those listed in Table 5.

If surveys (i.e., auditory or visual detection) indicate that Vesper Sparrow *affinis* are not present in an area defined as critical habitat during a given breeding season[7], then vegetation in these areas may be mowed during that season if the biophysical attributes and biological function of the critical habitat will be maintained or return to its previous condition prior to the following breeding season. The specifics of such activities need to be discussed with Environment and Climate Change Canada prior to these activities being implemented for any given breeding season. If these conditions are followed, mowing of vegetation when Vesper Sparrows are not present will not be considered destruction of critical habitat.

[7] Multiple surveys by qualified professionals with specific Vesper Sparrow *affinis* expertise are required to confirm no evidence of species presence prior to May 20th which is the latest known date of the species' arrival to British Columbia.

Table 7. Activities likely to result in destruction of critical habitat for Vesper Sparrow *affinis*.

Activity	Habitat feature destroyed	Biological function lost
Nesting and foraging habitat.		
Mowing during the breeding season (April 1 to August 20) when the species is known to be present. Or, mowing at any time such that the biophysical attributes and biological function of the critical habitat will not return to its previous condition prior to the following breeding season. The specifics of such activities need to be discussed with Environment and Climate Change Canada prior to these activities being implemented for any given breeding season.	Sparse grass or forb cover.	Nesting and foraging.
Seeding of rhizomatous mat-forming grasses.	Sparse grass or forb cover and intermittent bare ground.	Nesting and foraging.
Perching and singing habitat.		
Significant shrub and/or tree removal.	Trees and shrubs.	Song perches and escape and nest cover.
Both habitat types (nesting and foraging and perching and singing).		
Complete vegetation removal.	All	All

9. MEASURING PROGRESS

The performance indicators presented below provide a way to define and measure progress toward achieving the population and distribution objectives. Specific progress towards implementing the recovery strategy will be measured against indicators outlined in subsequent action plans.

Every five years, success of recovery strategy implementation will be measured against the following performance indicators:

Horned Lark *strigata*:

- Has a breeding population of at least 10 breeding pairs distributed across a minimum of three sites been established and maintained?

Vesper Sparrow *affinis*:

- Has a breeding population of at least 30 breeding pairs distributed across a minimum of three sites been established and maintained?

10. STATEMENT ON ACTION PLANS

Separate action plans for each species will be completed by 2020. The previously posted recovery strategy indicated that an action plan would be completed for Horned Lark *strigata* by March 31, 2009. The reason the date is being amended is that more work is required to assess the candidate dune sites for suitability for Horned Lark *strigata*. This work will be completed along with other remaining steps in the schedule of studies between 2016 and 2018, with additional time allowed for the preparation and posting of the action plan.

11. REFERENCES

Altman, B. 1999. Status and conservation of grassland birds in the Willamette Valley. Unpublished report submitted to Oregon Department of Fish and Wildlife, Corvallis, Oregon.

Altman, B. 2000. Conservation strategy for landbirds in lowlands and valleys of western Oregon and Washington. Unpublished report prepared for Oregon-Washington Partners in Flight. Available: http://southsoundprairies.org/documents/western_lowlands.pdf (accessed July 27, 2008).

Altman, B. 2003. Vesper Sparrow. Pp. 542-545 *in* Birds of Oregon: A general reference. D.B. Marshall, M.G. Hunter, and A.L. Contreras, Eds. Oregon State University Press, Corvallis, Oregon.

Altman, B. 2011. Historical and Current Distribution and Populations of Bird Species in Prairie-Oak Habitats in the Pacific Northwest. Northwest Science 85(2): 194-222.

Altman, B. In prep. Conserving State Strategy Species in Pacific Northwest Prairie and Oak Habitats: a Bi-State Partnership. Annual Report, American Bird Conservancy.

American Ornithologists' Union. 1957. Check-list of North American birds. 5th edition. American Ornithologists' Union, Baltimore, Maryland. 691 pp.

B.C. Conservation Data Centre. 2010. B.C. Species and Ecosystems Explorer. B.C. Ministry of Environment, Victoria, B.C. Available: http://a100.gov.bc.ca/pub/eswp/ (accessed November 15, 2010).

B.C. Ministry of Environment. 2010. Conservation framework. Victoria, B.C. Available: http://www.env.gov.bc.ca/conservationframework/index.html (accessed November 15, 2010).

Beason, R.C. 1995. Horned Lark (*Eremophila alpestris*). *In* The Birds of North America, No. 195. A. Poole and F. Gill, Eds. Academy of Natural Sciences, Philadelphia, Pennsylvania, and American Ornithologists' Union, Washington, D.C. 24 pp.

Beauchesne, S.M. 2002a. Coastal Vesper Sparrow inventory on southeastern Vancouver Island, 2002. Unpublished report prepared for the Garry Oak Ecosystems Recovery Team, Victoria, B.C.

Beauchesne, S.M. 2002b. Coastal Vesper Sparrow stewardship account. Unpublished report prepared for the Garry Oak Ecosystems Recovery Team, Victoria, B.C.

Beauchesne, S.M. 2002c. Coastal Vesper Sparrow Stewardship Agreement between the Nanaimo Airport and the Garry Oak Ecosystems Recovery Team Vertebrates at Risk Recovery Action Group. Unpublished report prepared for the Garry Oak Ecosystems Recovery Team, Victoria, B.C.

Beauchesne, S.M. 2003. Coastal Vesper Sparrow inventory on southeastern Vancouver Island, 2003. Unpublished report prepared for the Garry Oak Ecosystems Recovery Team, Victoria, B.C.

Beauchesne, S.M. 2004a. Coastal Vesper Sparrow inventory on southeastern Vancouver Island, 2004. Unpublished report prepared for the Garry Oak Ecosystems Recovery Team, Victoria, B.C.

Beauchesne, S.M. 2004b. Recovery challenges for birds at risk in Garry oak ecosystems of British Columbia. Species at Risk Conference, Victoria, B.C.

Beauchesne, S.M. 2006. Coastal Vesper Sparrow monitoring at the Nanaimo Airport, 2005. Unpublished report prepared for the Garry Oak Ecosystems Recovery Team, Victoria, B.C.

Beauchesne, S.M. 2007. Coastal Vesper Sparrow monitoring at the Nanaimo Airport, 2006. Unpublished report prepared for the Garry Oak Ecosystems Recovery Team, Victoria, B.C.

Beauchesne, S.M. 2008. Coastal Vesper Sparrow monitoring at the Nanaimo Airport, 2007. Unpublished report prepared for the Garry Oak Ecosystems Recovery Team, Victoria, B.C.

Beauchesne, S.M. 2009. Coastal Vesper Sparrow Population Monitoring and Habitat Management at the Nanaimo Airport, Cassidy, B.C. 2008. Unpublished report prepared for Environment Canada, Canadian Wildlife Service, Delta, B.C.

Beauchesne, S.M. 2010a. Vesper Sparrow *affinis* Regional Inventory - Vancouver Island and the Canadian Gulf Islands, May to July, 2009. Unpublished report prepared for Environment Canada, Canadian Wildlife Service, Delta, B.C. and the Garry Oak Ecosystems Recovery Team, Victoria, B.C.

Beauchesne, S.M. 2010b. Vesper Sparrow *affinis* Population Monitoring and Habitat Management at the Nanaimo Airport, Cassidy, B.C., 2009. Unpublished report prepared for Environment Canada, Canadian Wildlife Service, Delta, B.C. and the Garry Oak Ecosystems Recovery Team, Victoria, B.C.

Beauchesne, S.M. 2011. Coastal Vesper Sparrow Population Monitoring and Habitat Management at the Nanaimo Airport, Cassidy, B.C,: 2010 Field Season. Unpublished report prepared for Environment Canada, Canadian Wildlife Service, Delta, B.C. and the Garry Oak Ecosystems Recovery Team, Victoria, B.C.

Beauchesne, S.M. 2012. Coastal Vesper Sparrow Population Monitoring at the Nanaimo Airport, Cassidy, B.C,: 2011 Field Season. Unpublished report prepared for Environment Canada, Canadian Wildlife Service, Delta, B.C.

Beauchesne, S.M. 2013. Coastal Vesper Sparrow Population Monitoring at the Nanaimo Airport, Cassidy, B.C,: 2012 Field Season. Unpublished report prepared for Environment Canada, Canadian Wildlife Service, Delta, B.C.

Beauchesne, S.M. 2014a. Coastal Vesper Sparrow Population Monitoring at the Nanaimo Airport, Cassidy, B.C,: 2013 Field Season. Unpublished report prepared for Environment Canada, Canadian Wildlife Service, Delta, B.C.

Beauchesne, S.M. 2014b. Vesper Sparrow Regional Inventory Vancouver Island and the Canadian Gulf Islands - May to July 2014. Unpublished report prepared for Environment Canada, Canadian Wildlife Service, Delta, B.C.

Bird/wildlife Aircraft Strike Hazard Team. 2006. Top 50 United States Air Force wildlife strikes by count. Aviation Safety Division, U.S. Air Force. Available: http://afsafety.af.mil/SEF/Bash/web_spec_count_stat.html (accessed July 5, 2006).

Butler, R.W. and R.W. Campbell. 1987. The birds of the Fraser River delta: populations, ecology, and international significance. Occasional Paper No. 65. Canadian Wildlife Service, Ottawa, Ontario. 73 pp.

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. Vol. 3: Passerines. Flycatchers through vireos. University of British Columbia Press, Vancouver, B.C. 693 pp.

Campbell, R.W., N.K. Dawe, I. McTaggart-Cowan, J.M. Cooper, G.W. Kaiser, A.C. Stewart, and M.C.E. McNall. 2001. The birds of British Columbia. Vol. 4: Passerines. Wood warblers through Old World sparrows. Royal British Columbia Museum, Victoria, B.C., and Canadian Wildlife Service, Delta, B.C. 739 pp.

Cannings, R.J. 1998. The birds of British Columbia - a taxonomic catalogue. Wildlife Bulletin No. B-86. Wildlife Branch, B.C. Ministry of Environment, Lands, and Parks, Victoria, B.C. vii + 252 pp.

Castrale, J.S. 1982. Effects of two sagebrush control methods for nongame birds. Journal of Wildlife Management 46:945-952.

Coleman, J.S., S.A. Temple, and S.R. Craven. Undated. Cats and wildlife: a conservation dilemma. Unpublished report prepared for the University of Wisconsin. Available: http://wildlife.wisc.edu/extension/catfly3.htm (accessed September 1, 2003).

Cooper, J.M. 1993. Breeding Bird Surveys in the Airport Reserve on Sea Island, Richmond, British Columbia. Unpublished report prepared by LGL Limited for Transport Canada, Richmond, B.C. 34 pp.

COSEWIC. 2003. COSEWIC assessment and update status report on the Horned Lark *strigata* subspecies *Eremophila alpestris strigata*. Committee on the Status of Endangered Wildlife in Canada, Ottawa, Ontario. vi + 23 pp. Available: http://www.sararegistry.gc.ca/species/speciesDetails_e.cfm?sid=790.

COSEWIC 2006. COSEWIC assessment and status report on the Vesper Sparrow *affinis* subspecies *Pooecetes gramineus affinis* in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. vi + 22 pp. Available: http://www.sararegistry.gc.ca/species/speciesDetails_e.cfm?sid=924#docs.

Crawford, R.C. and H. Hall. 1997. Changes in the south Puget Sound prairie landscape. Pp. 11-15 *in* Ecology and conservation of the south Puget Sound prairie landscape. P. Dunn and K. Ewing, Eds. The Nature Conservancy of Washington, Seattle, Washington. 289 pp.

Davis, S.K. and D.C. Duncan. 1999. Grassland songbird occurrence in native and crested wheatgrass pastures of southern Saskatchewan. Pp. 211-218 *in* Ecology and conservation of grassland birds of the Western Hemisphere. P.D. Vickery and J.R. Herkert, Eds. Cooper Ornithological Society, Camarillo, California (Studies in Avian Biology 19).

Dechant, J.A., M.F. Dinkins, D.H. Johnson, L.D. Igl, C.M. Goldade, and B.R. Euliss. 2001. Effects of management practices on grassland birds: Vesper Sparrow. Northern Prairie Wildlife Research Center, Jamestown, North Dakota. 40 pp. Available: www.npwrc.usgs.gov/resource/literatr/grasbird/download/vesp.pdf (accessed July 5, 2006).

Drovetski, S.V., S.F. Pearson, and S. Rohwer. 2005. Streaked Horned Lark *Eremophila alpestris strigata* has distinct mitochondrial DNA. Conservation Genetics 6(6):875-883.

Environment Canada. 2006. Species at Risk Public Registry. Available: www.speciesatrisk.gc.ca.

Fraser, D.F., W.L. Harper, S.G. Cannings, and J.M. Cooper. 1999. Rare birds of British Columbia. Wildlife Branch and Resource Inventory Branch, B.C. Ministry of Environment, Lands and Parks, Victoria, B.C. viii + 244 pp.

Fuchs, M.A. 2001. Towards a recovery strategy for Garry oak and associated ecosystems in Canada: ecological assessment and literature review. Technical Report GBEI/EC-00-0300. Canadian Wildlife Service – Pacific and Yukon Region, Environment Canada. 106 pp.

Garry Oak Ecosystem Recovery Team. 2003. Streaked Horned Lark *Eremophila alpestris strigata:* Species at Risk in Garry Oak and Associated Ecosystems in British Columbia. Available: http://www.goert.ca/documents/SARFS_eremalpe.pdf (accessed November 2, 2010).

George, W.G. 1974. Domestic cats as predators and factors in winter shortages of raptor prey. Wilson Bulletin 86:384-396.

Government of Canada. 2009. *Species at Risk Act* Policies. Environment Canada. Available: http://www.sararegistry.gc.ca/document/default_e.cfm?documentID=1916 (accessed January 4, 2010).

Herkert, J.R. 1991. An ecological study of the breeding birds of grassland habitats within Illinois. Ph.D. Thesis, University of Illinois, Urbana.

Hill, D. 2009. Assessment of potential nesting habitat for the Coastal Vesper Sparrow within a 10km radius of the Collishaw Airport in Cassidy, B.C.: Summary report . Unpublished report prepared for the Garry Oak Ecosystems Recovery Team and Nanaimo and Area Land Trust.

Jones, S.L. and J.E. Cornely. 2002. Vesper Sparrow (*Pooecetes gramineus*). *In* The Birds of North America, No. 624. A. Poole and F. Gill, Eds. The Birds of North America, Inc., Philadelphia, Pennsylvania. 28 pp.

Kershner, E.L. and E.K. Bollinger. 1996. Reproductive success of grassland birds at east-central Illinois airports. American Midland Naturalist 136(2):358-366.

Marzluff, J.M. and E. Neatherlin. 2006. Corvid response to human settlements and campgrounds: Causes, consequences, and challenges for conservation. Biological Conservation 130:301-314.

McMaster, D.G., J.H. Devries, and S.K. Davis. 2005. Grassland birds nesting in haylands of southern Saskatchewan: landscape influences and conservation priorities. Journal of Wildlife Management 69:211-221.

Munro, J.A. and I. McTaggart-Cowan. 1947. A review of the bird fauna of British Columbia. Special Publication No. 2. B.C. Provincial Museum, Victoria, B.C. 285 pp.

NatureServe. 2009. NatureServe Explorer: An online encyclopedia of life [web application]. Version 4.7. NatureServe, Arlington, Virginia. Available: www.natureserve.org/explorer (accessed May 5, 2014).

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, Washington. 25 pp.

Pearson, S.F. and M. Hopey. 2005. Streaked Horned Lark nest success, habitat selection, and habitat enhancement experiments for the Puget lowlands, coastal Washington, and Columbia River islands. Natural Areas Program Report 2005-1. Washington Department of Natural Resources. Olympia, Washington.

Pyle, P. 1997. Identification guide to North American birds: Part 1. Slate Creek Press, Bolinas, California. 732 pp.

Radcliffe, G. 2010. Nanaimo Airport Site Management Plan for Coastal Vesper Sparrow (*Pooecetes gramineus affinis*). Unpublished draft report. Prepared for Nanaimo Airport Commission and Environment Canada's Canadian Wildlife Service.

Ribic, C.A., R.R. Koford, J.R. Herkert, D.H. Johnson, N.D. Niemuth, D.E. Naugle, K.K. Bakker, D.W. Sample, and R.B. Renfrew. 2009. Area sensitivity in North American grassland birds: patterns and process. The Auk 126:233-244.

Rogers, R.E., Jr. 2000. The status and microhabitat selection of Streaked Horned Lark, Western Bluebird, Oregon Vesper Sparrow, and Western Meadowlark in western Washington. M.Sc. Thesis, Evergreen State College, Olympia, Washington. xi + 178 pp.

Ruegg, K.C. and T.B. Smith. 2002. Not as the crow flies: a historical explanation for circuitous migration in Swainson's Thrush (*Catharus ustulatus*). Proceedings of the Royal Society of London, Series B 269:1375-1381.

Samson, F.B. 1980. Island biogeography and the conservation of nongame birds. Transactions of the North American Wildlife and Natural Resources Conference 45:245-251.

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. USGS Patuxent Wildlife Research Center, Laurel Maryland. Available: http://www.mbr-pwrc.usgs.gov/bbs (accessed November 20, 2010).

Sibley, D.A. 2000. National Audubon Society: the Sibley guide to birds. Random House, Toronto, Ontario.

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, Washington. 129 + xii pp.

Vickery, P.D., Hunter, M.L., and J.V. Wells. 1992. Use of a new reproductive index to evaluate relationship between habitat quality and breeding success. Auk 109:697-705.

Vickery, P.D, M.L. Hunter, Jr., and S.M. Melvin. 1994. Effects of habitat area on the distribution of grassland birds in Maine. Conservation Biology. 8:1087-1097.

Wray, T. and R.C. Whitmore. 1979. Effects of vegetation on nesting success of Vesper Sparrows. Auk 96:802-805.

12. PERSONAL COMMUNICATIONS

Bob Altman. Coordinator, American Bird Conservancy.
Scott Pearson. Senior Research Scientist, Washington Department of Fish and Wildlife Service.
Suzanne Beauschesne. Environmental Consultant, Cooper Beauchesne and Associates Ltd.

13. APPENDIX A: VEGETATION RANGE SUMMARY FOR VESPER SPARROW *AFFINIS* AND OTHER SUBSPECIES

Table A1. Percent cover of vegetative growth forms by Ecoregion in Washington and Oregon at singular plots where bird was detected and sum of 5 plots associated with the detection (Altman, in prep.).

Ecoregion	Bird Detection Plot					Bird Plot Plus Four Random (n=5)				
	Herb	Shrub	Tree	Bare	Other[1]	Herb	Shrub	Tree	Bare	Other
Puget Lowlands (n=13)	80.38	8.46	5.38	10.38	11.92	80.17	6.74	2.37	7.78	12.17
Willamette Valley (n=31)	73.10	9.52	8.55	7.58	1.29	84.20	6.39	3.53	5.57	0.59
Umpqua Valley (n=18)	73.95	14.47	13.68	13.68	0.79	78.65	12.74	4.17	6.32	0.46
Rogue Basin (n=10)	70.50	2.50	0	4.50	1.20	70.90	1.00	2.30	17.90	4.00

[1] Other includes thatch, woody debris, and rock.
Totals may exceed 100%

Table A2. Percent herbaceous height cover by category by Ecoregion in Washington and Oregon at singular plots where bird was detected and sum of 5 plots associated with the detection (Altman, in prep.).

Ecoregion	Bird Detection Plot				Bird Plot Plus Four Random (n=5)			
	1	1-2	2-3	>3	1	1-2	2-3	>3
Puget Lowlands (n=13-17)	63.85	26.92	6.54	2.69	65.35	25.19	7.91	2.09
Willamette Valley (n=31)	55.10	23.00	17.70	4.19	55.90	28.65	14.46	1.80
Umpqua Valley (n=19)	58.42	34.34	6.12	0.53	61.04	32.71	4.61	0.53
Rogue Basin (n=10)	74.00	21.00	5.00	0	73.30	23.30	3.40	0

Height in feet

From initial results of vegetation sampling, the optimal habitat for Vesper Sparrow *affinis* at sites sampled in Ecoregions in Washington and Oregon is 70-85% herbaceous cover, <15% shrub cover, 5-15% bare ground, and <15% tree cover, with herbaceous cover in mid to late May of 55-75% <1 foot, 20-35% 1-2 feet, <15% 2-3 feet, and <2% >3 feet.

Table A3. Means of vegetation measurements within nest patches or territories of Vesper Sparrows (*confinus* and *gramineus* subspecies). Standard deviations are in brackets. Ranges are in italics.

Area	Mean grass cover (%)	Mean forb cover (%)	Mean bare ground (%)	Mean shrub cover (%)	Mean height (cm)	Reference
West Virginia						
Successful nests (n = 15)	**23.7** (7.6)	**26.9** (18.6)	**32.9** (20.7)		**64.0** (14.5)	Wray and Whitmore (1979)
Unsuccessful nests (n = 24)	**23.1** (9.2)	**20.5** (15.6)	**44.8** (20.1)		**67.1** (21.0)	
Central British Columbia						
Successful nests (n = 77)	**47.1** (12.9) *19.0-82.3*	**18.0** (11.0) *3.0-56.0*	**5.6** (5.6) *0.0-30.0*		**20.2** (10.9) *4.9-55.5*	Nancy Mahony, unpubl. data.
Unsuccessful nests (n = 43)	**43.7** (14.9) *16.3-80.3*	**18.0** (1.5) *2.3-46.3*	**5.6** (4.8) *0.0-20.0*		**17.6** (6.4) *7.8-43.1*	
Maine						
High success territories (n = 124)	**42.8** (15.6)	**37.0** (15.6)	**21.9** (7.8)	**37.6** (16.7)		Vickery et al. (1992)
Low success territories (n = 28)	**45.2** (32.3)	**40.3** (32.3)	**23.0** (15.9)	**38.4** (26.5)		

14. APPENDIX B: EFFECTS ON THE ENVIRONMENT AND OTHER SPECIES

A Strategic Environmental Assessment (SEA) is conducted on all SARA recovery planning documents, in accordance with the *Cabinet Directive on the Environmental Assessment of Policy, Plan and Program Proposals*[8]. The purpose of a SEA is to incorporate environmental considerations into the development of public policies, plans, and program proposals to support environmentally sound decision-making and to evaluate whether the outcomes of a recovery planning document could affect any component of the environment or any of the Federal Sustainable Development Strategy's[9] (FSDS) goals and targets.

Recovery planning is intended to benefit species at risk and biodiversity in general. However, it is recognized that strategies may also inadvertently lead to environmental effects beyond the intended benefits. The planning process based on national guidelines directly incorporates consideration of all environmental effects, with a particular focus on possible impacts on non-target species or habitats. The results of the SEA are incorporated directly into the strategy itself, but are also summarized below in this statement.

This recovery strategy will clearly benefit the environment by promoting the recovery of the Horned Lark *strigata* subspecies and Vesper Sparrow *affinis* subspecies. The potential for the strategy to inadvertently lead to adverse effects on other species was considered. The SEA concluded that this strategy will clearly benefit the environment and will not entail any significant adverse effects.

Efforts to restore and protect open grassland and coastal sand dune habitats will be beneficial to many species that rely on these scarce and declining ecosystems. Any success in increasing habitat supply (i.e., area and quality) and reducing disturbance in these habitats will be especially beneficial to other ground-nesting birds that use sparsely vegetated habitats, such as Killdeer (*Charadrius vociferus*), Common Nighthawk (*Chordeiles minor;* COSEWIC and SARA Threatened), and Savannah Sparrow (*Passerculus sandwichensis*).

Other listed species with similar habitat requirements include two arthropods. The Taylor's Checkerspot (*Euphydryas editha taylori*) is listed as Endangered on Schedule 1 of SARA and requires sparsely vegetated grasslands (Environment Canada 2006). The Sand Verbena Moth (*Copablepharon fuscum*) is also listed as Endangered on Schedule 1 of SARA and is an obligate herbivore of Yellow Sand Verbena (*Abronia latifolia*), a plant that occurs only in sand dune environments (Environment Canada 2006). Contorted-pod Evening Primrose (*Camissonia contorta*) is listed as Endangered on Schedule 1 of SARA and also utilizes dry, open, and sandy coastal habitats on southeastern Vancouver Island. Management of habitats for both the Horned Lark *strigata* and the Vesper Sparrow *affinis* can be compatible with the requirements of these three species.

[8] http://www.ceaa.gc.ca/default.asp?lang=En&n=B3186435-1
[9] http://www.ec.gc.ca/dd-sd/default.asp?lang=En&n=CD30F295-1

There are, however, many species that do not favour sparsely vegetated habitats or that may be damaged by habitat restoration efforts (e.g., rare plant species affected by controlled burns). All sites will have to be carefully evaluated to determine which suite of species will benefit the most from restoration and management efforts. A balance will be required to ensure that all species have sufficient habitat areas for conservation and recovery.

In the U.S., the Horned Lark *strigata* now breeds on sites formerly used by Caspian Terns (*Sterna caspia*). Terns were removed from these sites prior to utilization of the sites by the Horned Lark *strigata*. Habitat creation through the deposition of dredge spoils may result in creation of tern habitat as well. Although Caspian Terns are not common in the Lower Mainland, at least one breeding colony does occur in the Fraser River delta. If the presence of terns reduces the suitability of newly created habitat, it may be necessary to manage these sites to prevent colonization by tern.