

Recovery Plan for the Western Screech-Owl, *kennicottii* subspecies (*Megascops kennicottii kennicottii*) in British Columbia



Prepared by the Ministry of Environment



March 2013

About the British Columbia Recovery Strategy Series

This series presents the recovery strategies or recovery plans that are prepared as advice to the Province of British Columbia on the general strategic approach required to recover species at risk. Recovery strategies or recovery plans are prepared in accordance with the priorities and management actions assigned under the British Columbia Conservation Framework. The Province prepares recovery strategies to ensure coordinated conservation actions and meet its commitments to recover species at risk under the *Accord for the Protection of Species at Risk in Canada*, and the *Canada –British Columbia Agreement on Species at Risk*.

What is recovery?

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Recommended citation

Ministry of Environment. 2013. Recovery plan for the Western Screech-Owl, *kennicottii* subspecies (*Megascops kennicottii kennicottii*) in British Columbia. B.C. Ministry of Environment, Victoria, BC. 23pp.

Cover illustration/photograph

Jared Hobbs

Additional copies

Additional copies can be downloaded from the B.C. Ministry of Environment Recovery Planning webpage at:

<<http://www.env.gov.bc.ca/wld/recoveryplans/rcvry1.htm>>

Publication information

Library and Archives Canada Cataloguing in Publication

Recovery plan for the western screech-owl, *kennicottii* subspecies (*Megascops kennicottii kennicottii*) in British Columbia [electronic resource] / prepared by the Ministry of Environment.

(British Columbia recovery strategy series)

Includes bibliographical references.

Electronic monograph in PDF format.

ISBN 978-0-7726-6682-6

1. Western screech owl--British Columbia. 2. Wildlife recovery--British Columbia. I. British Columbia. Ministry of Environment II. Series: British Columbia recovery strategy series

QL696 S83 R42 2013

333.95'897

C2013-980026-3

Disclaimer

This recovery plan has been prepared by the Ministry of Environment, as advice to the responsible jurisdictions and organizations that may be involved in recovering the species. The British Columbia Ministry of Environment has developed this advice as part of fulfilling its commitments under the *Accord for the Protection of Species at Risk in Canada*, and the *Canada-British Columbia Agreement on Species at Risk*.

This document identifies the recovery strategies that are deemed necessary, based on the best available scientific and traditional information, to recover Western Screech-Owl, *kennicottii* subspecies populations in British Columbia. Recovery actions to achieve the goals and objectives identified herein are subject to the priorities and budgetary constraints of participatory agencies and organizations. These goals, objectives, and recovery approaches may be modified in the future to accommodate new objectives and findings.

The responsible jurisdictions have had an opportunity to review this document. However, this document does not necessarily represent the official positions of the agencies or the personal views of all individuals involved in the review.

Success in the recovery of this species depends on the commitment and cooperation of many different constituencies that may be involved in implementing the directions set out in this plan. The B.C. Ministry of Environment encourages all British Columbians to participate in the recovery of Western Screech-Owl, *kennicottii* subspecies.

ACKNOWLEDGEMENTS

The recovery plan was prepared by Doris Hausleitner (Seepanee Ecological Consulting). Input was also provided by Jared Hobbs and Sean Pendergast (Ministry of Forests, Lands and Natural Resource Operations), Dick Cannings (Bird Studies Canada), Kyle Elliot (University of Manitoba), Ian Robertson (Robertson Environmental Services Ltd.), Tania Tripp (Madrone Environmental Services), Katie Christie (University of Alaska Fairbanks), and Greg Ferguson (Stanley Park Ecology Society). Guidance and editorial review was provided by Leah Westereng (B.C. Ministry of Environment). This document follows the B.C. guide for recovery planning (Ministry of Environment 2010a).

EXECUTIVE SUMMARY

The Western Screech-Owl, *kennicottii* subspecies (*Megascops kennicottii kennicottii*) is a small grey-brown owl with feather “ear” tufts and yellow eyes. It occurs on the west coast of North America from Oregon to Alaska.

The Western Screech-Owl, *kennicottii* subspecies was designated as Special Concern in 2002 by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC); however, it was uplisted to Threatened in 2012 due to its small and declining number of mature individuals (COSEWIC 2012). It was listed in 2005 as Special Concern in Canada on Schedule 1 of the *Species at Risk Act* (SARA) and is now awaiting the decision of the Governor in Council regarding its reclassification to Threatened. In British Columbia, the Western Screech-Owl, *kennicottii* subspecies is ranked S3 (special concern) by the Conservation Data Centre and is on the provincial Blue list. The B.C. Conservation Framework ranks the Western Screech-Owl, *kennicottii* subspecies as a priority 1 under goal 2 (prevent species and ecosystems from becoming at risk) and priority 2 under goal 3 (maintain the diversity of native species and ecosystems). It is protected from capture and killing, under the B.C. *Wildlife Act*. Recovery is considered to be biologically and technically feasible.

The Western Screech-Owl inhabits low-elevation coniferous and deciduous, multi-aged forests, adjacent to riparian areas. They are a secondary cavity-nesting species and require large diameter trees with excavated cavities for breeding. The species may be limited demographically as they are short lived and have a moderate reproductive output.

Threats to Western Screech-Owls include residential and commercial development (land conversion to housing and urban areas, commercial and industrial areas, and tourism and recreational areas); logging and wood harvesting within potential habitat; agricultural development; transportation and service corridors; removal of wildlife trees within recreational areas and on private land; changes in riparian communities due to hydroelectric development; and predation by Barred Owls (*Strix varia*).

The population and distribution goal is to ensure stable or increasing populations of Western Screech-Owl, *kennicottii* subspecies in British Columbia and ensure there is no reduction in either the extent of occurrence or area of occupancy within its present range in B.C.

The recovery objectives are:

1. Protect priority breeding habitat for Western Screech-Owl, *kennicottii* subspecies distributed throughout its range in British Columbia.
2. Establish and implement a monitoring program to assess trends in occupancy and habitat availability across the subspecies range.
3. Assess and mitigate current threats for the known populations.
4. Address knowledge gaps (e.g., subspecies distribution and abundance, home range, habitat requirements, Barred Owl impact).

RECOVERY FEASIBILITY SUMMARY

The recovery of Western Screech-Owl, *kennicottii* subspecies in B.C. is considered technically and biologically feasible based on the criteria outlined by the Government of Canada (2009):

- 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.**
Yes. A current estimate of the breeding population is 750–1500 individuals. There are populations in southeast Alaska (stable) and Washington (in decline) that could provide further dispersing individuals and genetic variability.
- 2. Sufficient suitable habitat is available to support the species or could be made available through habitat management or restoration.**
Yes. Sufficient habitat is currently available to support this subspecies. This might not be the case for the population in the Lower Mainland where severe fragmentation will limit dispersing individuals. Habitat enhancement, restoration, or conservation efforts in these locations need to consider habitat connectivity.
- 3. The primary threats to the species or its habitat (including threats outside Canada) can be avoided or mitigated.**
Yes. The primary threat to the species is loss of low-elevation habitat. Much of this has occurred historically due to hydroelectric development, forestry, agricultural, industry, and human inhabitation. Currently, southern populations are under threat from urban, commercial, and agricultural development; identifying and protecting remaining habitat will be paramount to the population persisting in urban settings. Northern populations occur primarily on Crown land where the greatest threat is removal of habitat for forestry. Identifying breeding areas and providing conservation under Wildlife Habitat Areas can help mitigate these threats. Wildlife Habitat Areas have been used as a fine-scale conservation tool for protection of breeding habitat Western Screech-owl *macfarlanei*. Listing the Western Screech-Owl, *kennicottii* subspecies in the Category of Species at Risk under the *Forest and Range Practices Act*, which enables habitat management tools such as Identified Wildlife Management Strategy, is pending. Upon listing there will be a lag time of three to five years before protective measures such as Wildlife Habitat Areas are implemented (J. Hobbs, pers. comm. 2013). Predator control is a controversial means for achieving population objectives; it will be necessary to determine whether Barred Owl (*Strix varia*) predation is causing declines in species detectability, occupancy, or both. Losses due to highway mortality will be difficult to mitigate.
- 4. Recovery techniques exist to achieve the population and distribution objectives or can be expected to be developed within a reasonable timeframe.**
Yes. Habitat conservation stewardship, management, and restoration techniques exist that will be suitable to achieve population objectives. Enhancement programs can be effective in creating additional nesting options. Control of Barred Owls is currently being tested for Northern Spotted Owls (*Strix occidentalis*) recovery in British Columbia and in the United States.

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1 COSEWIC* SPECIES ASSESSMENT INFORMATION

Date of Assessment: May 2012
Common Name (population):** Screech-Owl *kennicottii* subspecies, Western
Scientific Name: *Megascops kennicottii kennicottii*
COSEWIC Status: Threatened
Reason for Designation: This small owl has shown serious declines in the southern part of its range in Metro Vancouver, Victoria, and the Gulf Islands areas, where it has nearly disappeared over the last 10 to 15 years. Based on observed declines reported in Alaska, it has likely also declined in the northern part of its range, but the magnitude of the decline is unknown. The population is thought to be relatively small (less than 10 000 adults) and the owls face ongoing threats including predation from newly established populations of Barred Owls, and the removal of dead trees and snags, which serve as nest sites and roosts.
Canadian Occurrence: B.C.
COSEWIC Status History: Species considered in April 1995 and placed in the Data Deficient category. It was split according to subspecies in May 2002. The *kennicottii* subspecies was designated Special Concern in May 2002. Status re-examined and designated Threatened in May 2012.

* Committee on the Status of Endangered Wildlife in Canada.

** Common and scientific names reported in this recovery plan follow the naming conventions of the British Columbia Conservation Data Centre, which may be different from names reported by COSEWIC.

2 SPECIES STATUS INFORMATION

Western Screech-Owl, <i>kennicottii</i> subspecies^a	
Legal Designation:	
FRPA : ^b No	B.C. <i>Wildlife Act</i> : ^c Schedule A SARA Schedule : 1– Special Concern (2005) ^d
OGAA : ^b No	
Conservation Status^e	
B.C. List: Blue B.C. Rank: S3 (2009) National Rank : N3 (2011) Global Rank: G5T4 (2003)	
B.C. Conservation Framework (CF)^f	
Goal 1: Contribute to global efforts for species and ecosystem conservation.	Priority: ^g 3 (2010)
Goal 2: Prevent species and ecosystems from becoming at risk.	Priority: 1 (2010)
Goal 3: Maintain the diversity of native species and ecosystems.	Priority: 2 (2010)
CF Action Groups:	Compile Status Report; Monitor Trends; Planning; Send to COSEWIC; Habitat Protection; Habitat Restoration; Private Land Stewardship; Species and Population Management

^a Data source: B.C. Conservation Data Centre (2012) unless otherwise noted.

^b No = Not listed in one of the categories of wildlife which require special management attention to address the impacts of forest and range activities on Crown land under the *Forest and Range Practices Act* (FRPA; Province of British Columbia 2002) and/or the *Oil and Gas Activities Act* (OGAA; Province of British Columbia 2008).

^c Schedule A = Designated as wildlife under the B.C. *Wildlife Act*, which offers it protection from direct persecution and mortality (Province of British Columbia 1982).

^d This subspecies is awaiting decision by the Governor in Council regarding its reclassification to Threatened as this species was uplisted to Threatened by COSEWIC in 2012 (COSEWIC 2012).

^e S = subnational; N = national; G = global; T = refers to the subspecies level; B = breeding; X = presumed extirpated; H = possibly extirpated; 1 = critically imperiled; 2 = imperiled; 3 = special concern, vulnerable to extirpation, or extinction; 4 = apparently secure; 5 = demonstrably widespread, abundant, and secure; NA = not applicable; NR = unranked; U = unrankable.

^f Data source: Ministry of Environment (2010b).

^g Six-level scale: Priority 1 (highest priority) through to Priority 6 (lowest priority).

3 SPECIES INFORMATION

3.1 Species Description

The Western Screech-Owl, *kennicottii* subspecies (*Megascops kennicottii kennicottii*) is a small grey-brown owl with feather “ear” tufts and yellow eyes (Cannings and Angell 2001). Its breast and belly are pale with dark vertical streaks. Male and female plumage is similar in appearance but males weigh less (152 g, $n = 14$ vs. 186 g, $n = 15$) and are smaller in size (mean wing chord = 168.4, $n = 42$) than females (mean wing chord = 174.5, $n = 38$) (Earhart and Johnson 1970; Gehlbach 2003). Western Screech-Owl, *kennicottii* subspecies is more brown than grey in appearance and is approximately 20% smaller in mass than the interior subspecies, *M. k. macfarlanei* (Cannings and Davis 2007).

3.2 Populations and Distribution

Western Screech-Owl, *kennicottii* subspecies occurs in low-elevation valley-bottoms in western North America. This subspecies is distributed from north of Juneau in southwest Alaska through British Columbia, Washington, and south to the Rogue River of Oregon (Figure 1; Gehlbach 2003, Proudfoot *et al.* 2007). Western Screech-Owl, *kennicottii* subspecies occurs from the Pacific coast of this range east to the crest of the Cascade Mountains (Gehlbach 2003).

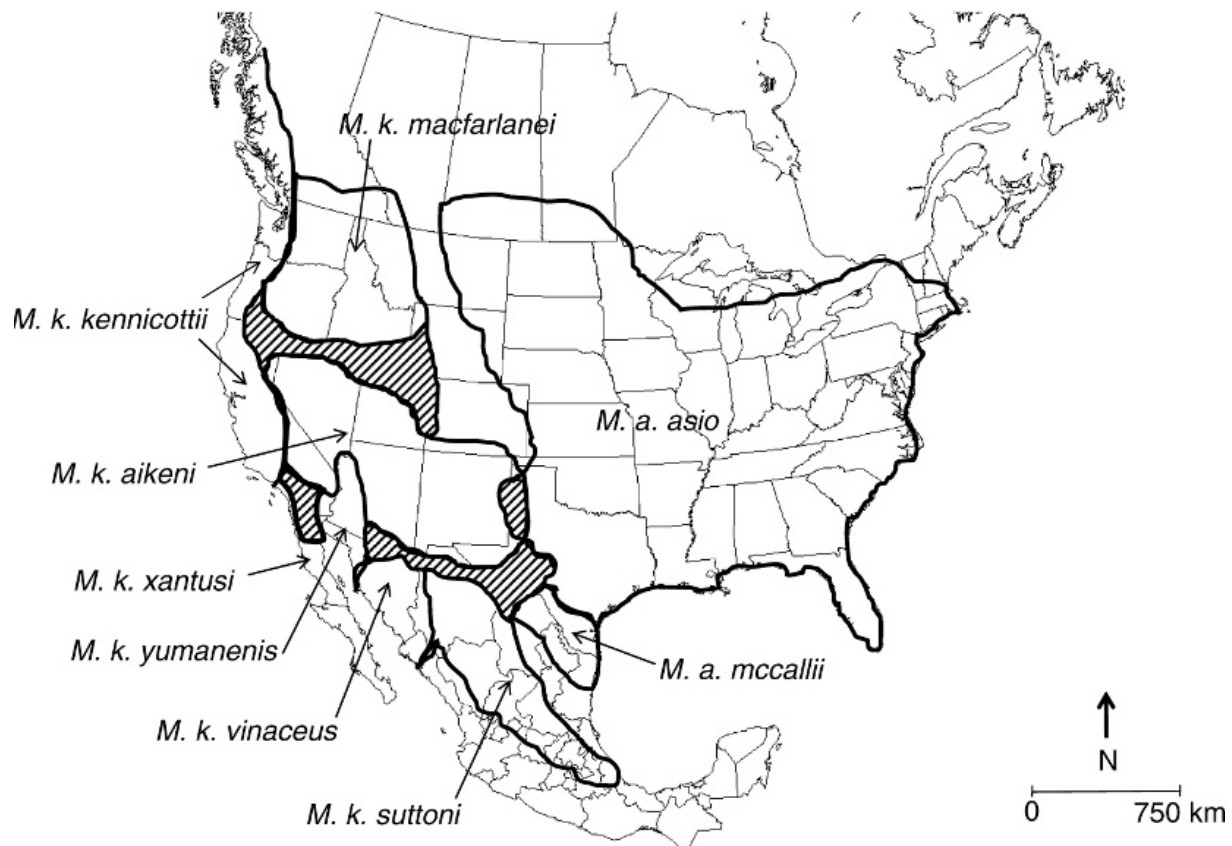


Figure 1. Western Screech-Owl, *kennicottii* subspecies distribution in North America (Proudfoot *et al.* 2007). Areas with diagonal lines are approximate intergrade zones.

In British Columbia, Western Screech-Owl, *kennicottii* subspecies is primarily distributed on the coast (except Haida Gwaii) east to the crest of the Cascade and Coast Mountains (Figure 2; Gehlbach 2003; B.C. Conservation Data Centre 2012). Most locations for this subspecies are from Vancouver Island and the southern mainland; however, some records exist from the Kitimat Valley and Skeena River (Chaundry-Smart 2002). Taxonomy of Western Screech-Owls (*kennicottii* vs. *macfarlanei*) in the Cascade Forest District could not be determined by vocal analysis (Hausleitner *et al.* 2007). However, the Western Screech-Owls in this area are currently considered to be the interior subspecies based on habitat association (Cannings and Davis 2007).

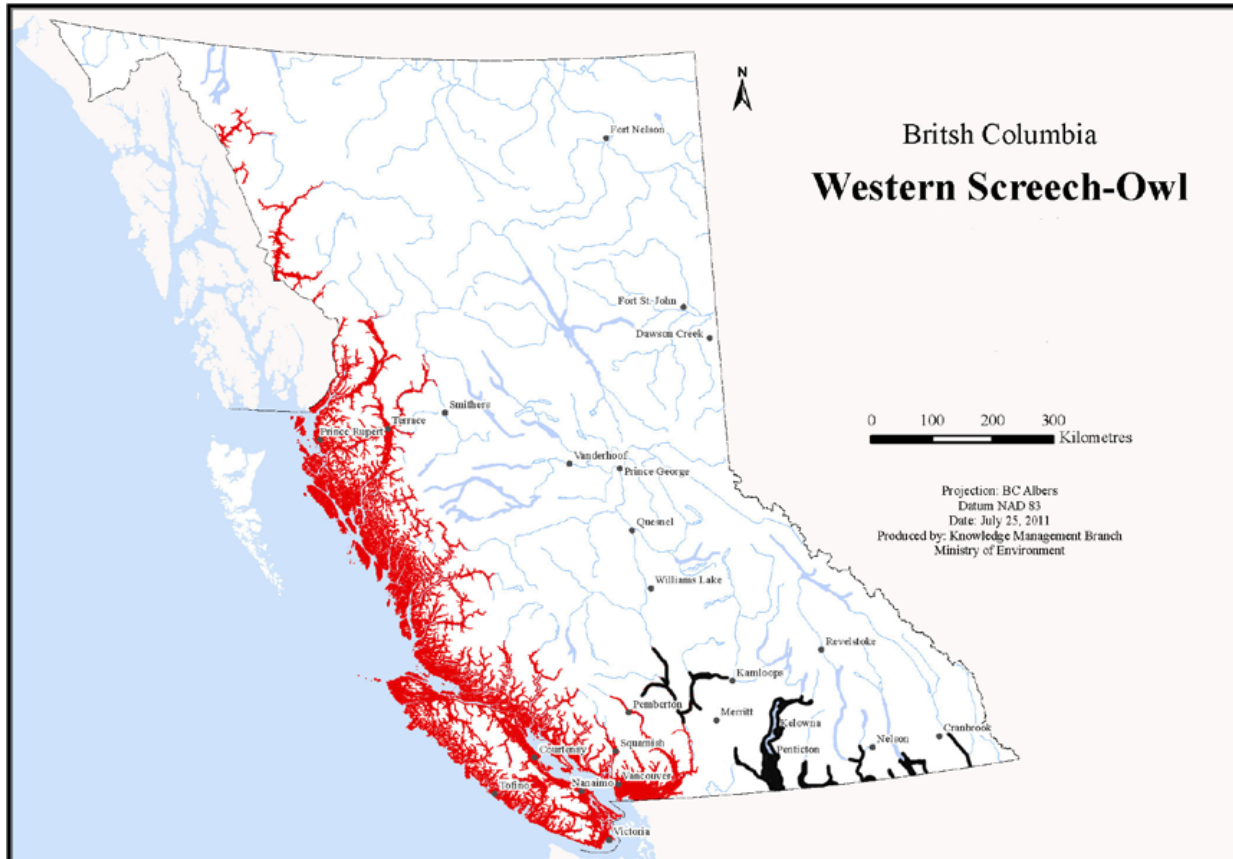


Figure 2. Western Screech-Owl, *kennicottii* subspecies distribution (in red) in British Columbia. The range of the interior subspecies (*macfarlanei*) is shown in black.

Because of its reliance on lowland riparian forests, most of the suitable Western Screech-Owl habitat on southern Vancouver Island and the mainland coast south of Powell River occurs on private land (COSEWIC 2012). The species may no longer occur in a number of municipal, regional and provincial parks in metro Vancouver (Elliot 2006) but it still occurs in several protected areas on Vancouver Island. On northern Vancouver Island and the central and northern coast, much of Western Screech-Owl habitat occurs on Crown land.

The extent of occurrence based on a minimum convex polygon over the range of the subspecies in Canada is approximately 150 000 km² (COSEWIC 2012). The total number of breeding pairs has been estimated at 750-1500 and current trends estimate a 20–30% decline between 1995 and 2010 (COSEWIC 2012). Where inventory exists, the subspecies appears relatively stable on

north and western Vancouver Island (Jackett *et al.* 2008; Tripp and Menzies 2008; COSEWIC 2012). The most dramatic population declines are occurring in the highly urbanized southern range of the species in British Columbia. Abundance of the species in metro Vancouver, Victoria, and the Gulf Island area may have decreased by 90% (COSEWIC 2012). Twenty-two occupied locations in the Lower Mainland were surveyed five or more times using call playback methods from 1997 to 2002 (Elliot 2006). None of the sites ($n = 14$) that were occupied at the start (1997–2000) were occupied at the end of the sampling period (2001–2002; Elliot 2006).

3.3 Needs of the Western Screech-Owl, *kennicottii* Subspecies

3.3.1 Habitat and Biological Needs

Home range

Pairs are non-migratory and they reside year-round on their territories (Cannings and Angell 2001). In stable populations on northern and central Vancouver Island, territories are re-occupied on an annual basis (Mico and Van Enter 2000; Pendergast and Pendergast 2003; Jackett *et al.* 2008; Tripp and Menzies 2008), despite a high adult turn-over rate (Tripp and Otter 2006). Outside of breeding, male and female owls select different habitat (Davis and Weir 2010).

The density of Western Screech-Owls in southern California was reported as 2.1 territories per kilometre of river channel with an average distance of 420 m between nest sites (Feusier 1989). On southern Vancouver Island adjacent territories may be as close as 200 m when separated by an estuary (J. Hobbs, pers. comm. 2012). Home range sizes from four individuals in Campbell River were 7.2, 8.2, and approximately 30 and 50 ha using minimum convex polygons (S. Pendergast, pers. comm. 2012). Another individual did not have enough locations to assess home range; however it moved more than 3 km in a linear distance from its capture location (S. Pendergast, pers. comm. 2012). Western Screech-Owls on the southwestern mainland appear to be persisting in small forest fragments of less than 30 ha (Robertson 2000; Elliot 2006), however reproductive productivity is unclear at these sites. Annual home range sizes reported in southeastern Alaska were 551 ha ($SD = 148$ ha, $n = 10$; Kissling and Lewis 2009). They speculate home ranges of Western Screech-Owls that occur south of Alaska would be smaller with a greater prey base (Kissling and Lewis 2009).

General habitat requirements

Western Screech-Owls inhabit low elevation coniferous stands or mixed coniferous forests adjacent to permanent water (Settingington 1998; Christie 2000; Kissling and Lewis 2009). While *M. k. kennicottii* are associated with old-growth forests (Mico and Van Enter 2000), they can also be found in mature second-growth stands between 30 and 100 years old, provided older remnant structure exists within stands (Settingington 1998; Christie 2000; Mico and Van Enter 2000; Robertson *et al.* 2000; Pendergast and Pendergast 2003).

Core areas are characterized by moderate ground cover, low understory, and relatively open canopy cover (25–50%; Settingington 1998; Christie 2000). These stands may be dominated by Douglas-fir (*Pseudotsuga menziesii*), western hemlock (*Tsuga heterophylla*), western redcedar

(*Thuja plicata*), grand fir (*Abies grandis*), red alder (*Alnus rubra*), big-leaf maple (*Acer macrophyllum*), Garry oak (*Quercus garryana*), and arbutus (*Arbutus menziesii*) (Settingington 1998; Christie 2000).

Nesting requirements

Western Screech-Owls require large trees with suitable cavities and the largest diameter trees in stands are selected for nesting (Christie 2000; Kissling and Lewis 2009; COSEWIC 2012). Two natural cavities described by Christie (2000) on Vancouver Island were in Douglas-fir and red alder trees. One of these cavities was naturally formed and the other excavated by a primary nesting species. Nest cavities were at a mean height of 12.5 m on trees with a DBH (diameter at breast height) of 53 cm ($n = 3$). Four nests were described in southeast Alaska (Kissling and Lewis 2009). They were found in large (DBH = 68.1 ± 4.7 cm, height 21.4 ± 3.3 m) live ($n = 1$) and dead ($n = 3$) western hemlock trees. Nest cavities faced easterly and were at a height of 11.9 ± 2.7 m. At least three nest boxes have been used on Vancouver Island, and some have seen use in multiple years (Christie 2000; Tripp and Menzies 2008; J. Hobbs, pers. comm. 2012).

Roosting requirements

Roosting owls were most often reported against the tree trunk in coniferous trees with thick canopy cover (Christie 2000; Robertson *et al.* 2000). On southern Vancouver Island owls were found roosting at a mean height of 21.8 m in trees with a DBH of 53.7 cm and height of 26.8 m ($n = 6$; Christie 2000). Western Screech-Owl roost locations on the southwestern mainland were in western hemlock (50%), western redcedar (40%), and Douglas-fir trees (10%; Robertson *et al.* 2000). Western Screech-Owls in southeastern Alaska roosted in western hemlock trees (49%), Sitka spruce (25%), or Alaska yellow-cedar (*Chamaecyparis nootkatensi*) (22%), unidentified snags (3%), and red alder (2%, $n = 110$; Kissling and Lewis 2009).

Foraging requirements

Foraging habitat has not been reported for the Western Screech-Owl, *kennicottii* subspecies. For the interior subspecies this consists of perches on habitat edges near a breeding range. These edges may occur near a riparian feature, between forests and meadows, or in open canopy forests (Davis and Weir 2008).

3.3.2 Limiting Factors

Western Screech-Owl, *kennicottii* subspecies may be limited by the fact that adults are not long lived and have moderate reproductive output. Average generation time of Western Screech-Owls is about three years (COSEWIC 2012). Western Screech-Owls begin breeding at one year of age and produce two or three young each year (Cannings and Angell 2001). Nest success and juvenile survival can have the largest influence on population growth in species where adults are not long lived and have moderate reproductive output (Clark and Martin 2007). High annual turn-over rates (28–64%) on Vancouver Island suggest there are low annual survival rates of Western Screech-Owl, *kennicottii* subspecies (Tripp and Otter 2006). Radio-telemetry studies of *M. k. macfarlanei* in the Shuswap and Kootenay regions also indicate low annual survival rates and high territory turn-over (Davis and Weir 2007; Hausleitner and Dulisse 2011). Only 66% of

35 juvenile *M. k. macfarlanei* owls survived the nine weeks from fledging to dispersal (Ellsworth and Belthoff 1999). In the west Kootenays, one of four Western Screech-Owls radio-marked survived from fledging to dispersal (Hausleitner and Dulisse 2011).

4 THREATS

Threats are defined as the proximate activities or processes that have caused, are causing, or may cause in the future the destruction, degradation, and/or impairment of the entity being assessed (population, species, community, or ecosystem) in the area of interest (globe, nation, or subnation). For purposes of threat assessment, only present and future threats are considered.¹ Threats presented here do not include biological features of the species or population such as inbreeding depression, small population size, and genetic isolation; or likelihood of regeneration or recolonization for ecosystems, which are considered limiting factors.²

For the most part, threats are related to human activities, but they can be natural. The impact of human activity may be direct (e.g., destruction of habitat) or indirect (e.g., invasive species introduction). Effects of natural phenomena (e.g., fire, hurricane, flooding) may be especially important when the species or ecosystem is concentrated in one location or has few occurrences, which may be a result of human activity (Master *et al.* 2009). As such, natural phenomena are included in the definition of a threat, though should be applied cautiously. These stochastic events should only be considered a threat if a species or habitat is damaged from other threats and has lost its resilience, and is thus vulnerable to the disturbance (Salafsky *et al.* 2008) so that this type of event would have a disproportionately large effect on the population/ecosystem compared to the effect they would have had historically.

¹ Past threats may be recorded but are not used in the calculation of Threat Impact. Effects of past threats (if not continuing) are taken into consideration when determining long-term and/or short-term trend factors (Master *et al.* 2009).

² It is important to distinguish between limiting factors and threats. Limiting factors are generally not human induced and include characteristics that make the species or ecosystem less likely to respond to recovery/conservation efforts.

4.1 Threat Assessment

The threat classification below is based on the IUCN-CMP (World Conservation Union–Conservation Measures Partnership) unified threats classification system and is consistent with methods used by the B.C. Conservation Data Centre and the B.C. Conservation Framework. For a detailed description of the threat classification system, see the [CMP website](#) (CMP 2010). Threats may be observed, inferred, or projected to occur in the near term. Threats are characterized here in terms of scope, severity, and timing. Threat “impact” is calculated from scope and severity. For information on how the values are assigned, see [Master *et al.*](#) (2009) and table footnotes for details. Threats for the Western Screech-Owl, *kennicottii* subspecies were assessed for the entire province (Table 1).

Table 1. Threat classification table for Western Screech-Owl, *kennicottii* subspecies.

Threat #	Threat description	Impact ^a	Scope ^b	Severity ^c	Timing ^d	Population(s) or location(s)
1	Residential & commercial development	Medium	Restricted	Serious	High	
1.1	Housing & urban areas	Medium	Restricted	Serious	High	Lower Mainland, southern Vancouver Island
1.2	Commercial & industrial areas	Medium	Restricted	Serious	High	Lower Mainland, southern Vancouver Island
1.3	Tourism & recreation areas	Low	Restricted	Slight	High	Lower Mainland, southern Vancouver Island
2	Agriculture & aquaculture	Low	Small	Slight	High	
2.1	Annual & perennial non-timber crops	Low	Small	Slight	High	Lower Mainland, southern Vancouver Island
2.3	Livestock farming & ranching	Low	Small	Slight	High	Lower Mainland, southern Vancouver Island
4	Transportation & service corridors	Medium	Restricted	Serious	High	
4.1	Roads & railroads	Medium	Restricted	Serious	High	Lower Mainland, southern Vancouver Island
4.2	Utility & service lines	Low	Small	Slight	High	All
5	Biological resource use	Medium	Restricted	Serious	High	
5.3	Logging & wood harvesting	Medium	Restricted	Serious	High	All

Threat #	Threat description	Impact ^a	Scope ^b	Severity ^c	Timing ^d	Population(s) or location(s)
7	Natural system modifications	Negligible	Negligible	Slight	High	
7.2	Dams & water management/use	Negligible	Negligible	Slight	High	Northern and western Vancouver Island, coastal British Columbia
8	Invasive and other problematic species and genes	High-Medium	Pervasive	Moderate-Serious	High	
8.1	Invasive non-native/alien species	High-Medium	Pervasive	Moderate-Serious	High	All
11	Climate change & severe weather	Unknown	Large	Unknown	High	
11.3	Temperature extremes	Unknown	Large	Unknown	Low	All
11.4	Storms & flooding	Unknown	Large	Unknown	High	All

^a **Impact** – The degree to which a species is observed, inferred, or suspected to be directly or indirectly threatened in the area of interest. The impact of each threat is based on Severity and Scope rating and considers only present and future threats. Threat impact reflects a reduction of a species population or decline/degradation of the area of an ecosystem. The median rate of population reduction or area decline for each combination of scope and severity corresponds to the following classes of threat impact: Very High (75% declines), High (40%), Medium (15%), and Low (3%). Unknown: used when impact cannot be determined (e.g., if values for either scope or severity are unknown); Not Calculated: impact not calculated as threat is outside the assessment timeframe (e.g., timing is insignificant/negligible or low as threat is only considered to be in the past); Negligible: when scope or severity is negligible; Not a Threat: when severity is scored as neutral or potential benefit.

^b **Scope** – Proportion of the species that can reasonably be expected to be affected by the threat within 10 years. Usually measured as a proportion of the species' population in the area of interest. (Pervasive = 71–100%; Large = 31–70%; Restricted = 11–30%; Small = 1–10%; Negligible < 1%).

^c **Severity** – Within the scope, the level of damage to the species from the threat that can reasonably be expected to be affected by the threat within a 10-year or three-generation timeframe. Usually measured as the degree of reduction of the species' population. (Extreme = 71–100%; Serious = 31–70%; Moderate = 11–30%; Slight = 1–10%; Negligible < 1%; Neutral or Potential Benefit ≥ 0%).

^d **Timing** – High = continuing; Moderate = only in the future (could happen in the short term [< 10 years or 3 generations]) or now suspended (could come back in the short term); Low = only in the future (could happen in the long term) or now suspended (could come back in the long term); Insignificant/Negligible = only in the past and unlikely to return, or no direct effect but limiting.

4.2 Description of Threats

The overall province-wide Threat Impact for this species is High. Reported Western Screech-Owl population declines have been most dramatic on southern Vancouver Island and the Lower Mainland (COSEWIC 2012); where threats due to habitat loss as a result of urbanization are most severe. Major threats range-wide include residential and commercial development and logging and wood harvesting leading to degradation of habitat and fragmentation of habitat. Additionally, a shift in the natural predator–prey system with an increase in the distribution and abundance of Barred Owls is a threat; although impacts have not been properly quantified, they may be a leading cause for population declines. Details are discussed below under the IUCN-CMP level 2 headings.

Most habitat fragmentation in this species range has occurred historically. The species populates low-elevation riparian habitat, which has been historically impacted by urbanization, forestry, agriculture, and hydro-electric development. The impact of each threat below considers only *present and future threats*.

4.2.1 High-Medium and Medium Impact Threats

IUCN-CMP Threat 1.1 Housing and urban areas; 1.2 Commercial and industrial

Concern over Western Screech-Owl habitat loss focuses on regions experiencing the most dramatic population declines: southern Vancouver Island and the Lower Mainland (COSEWIC 2012). Urban development and the decline of low elevation riparian habitat have been cited as the reasons for these declines (Fraser *et al.* 1999; Robertson *et al.* 2000; Elliot 2006). Robertson *et al.* (2000) reported high occurrence of Western Screech-Owls (51% of sites surveyed) in the Lower Mainland. Post surveys, these sites were partially or completely cleared for land development. Indeed, Elliot (2006) re-surveyed these sites two years later and did not detect any Western Screech-Owls. Any additional habitat loss and fragmentation in urban settings will prohibit dispersing owls from recolonizing habitat fragments (Elliot 2006).

Nest cavities tend to be found in trees with a certain degree of decay. These trees are selectively removed in urban areas as veteran trees may pose a threat to human activities or structures.

IUCN-CMP Threat 4.1 Roads and railways

Highway road and train traffic mortalities may also contribute to *M. k. kennicottii* declines (Campbell *et al.* 1990). From 1995 to 2005, sixteen Western Screech-Owls were found killed by vehicle traffic in the Lower Mainland and Central Fraser Valley (Preston and Powers 2006).

IUCN-CMP Threat 5.3 Logging and wood harvesting

The B.C. range of Western Screech-Owls has been impacted by extensive historical logging. Western Screech-Owl habitat on north and western Vancouver Island and the mainland coast north of Powell River mainly occurs on Crown land (COSEWIC 2012). The forest land base continues to be intensively managed due to the high demand for forest products. Intensive forest

management practices, including pre-commercial thinning, pruning, removal of select tree species, fertilization practices, and clearcut harvesting, can have detrimental effects on populations of Western Screech-Owls.

Forest management practices in British Columbia have targeted the removal of large coarse woody debris during forest harvesting (Caza 1993, Arsenault 2002). Large coarse woody debris is in short supply in intensively managed coastal forests (Densmore 2011), and will likely impact the abundance of prey for Western Screech-Owls by decreasing habitat for small mammals. Additionally, wildlife trees may be removed in areas where forestry personnel are working due to the potential danger of these trees falling over. Furthermore, some resource districts have implemented salvage programs that remove commercially valuable standing dead trees within second-growth forests, effectively removing suitable nest trees for Western Screech-owls and decreasing the amount of large coarse woody debris in the stand (E. McClaren, pers. comm. 2013).

IUCN-CMP Threat 8.1 Invasive non-native/alien species

There has been a change in predator–prey dynamic in the region: the arrival and expansion of Barred Owls on coastal British Columbia appears to coincide with Western Screech-Owl declines (Elliot 2006; COSEWIC 2012). Several researchers have reported Western Screech-Owl predation by Barred Owls and attacks or silent flights into call playbacks (COSEWIC 2012).

Western Screech-Owl detectability during call-playback surveys is impacted by the presence of Barred Owls as Western Screech-owls may remain silent during surveys to avoid predation (Kissling *et al.* 2010; Acker 2012). The impact that Barred Owls have on Western Screech-Owl populations has not yet been quantified but will likely increase in the coming years as Barred Owls become more established (Acker 2012). Future monitoring will need to tease out whether the presence of Barred Owls is influencing occupancy or detectability or both occupancy and detectability of Western Screech-Owls (Kissling and Lewis 2009).

4.2.2 Low, Negligible, and Unknown Impact Threats

IUCN-CMP Threat 1.3 Tourism and recreation areas

The loss of large, mature trees in riparian habitat may reduce the quality of low-elevation riparian habitat for breeding Western Screech-Owls. These trees are often removed in parks where public safety is an issue, since decaying trees are considered a windfall hazard.

IUCN-CMP Threat 2.1 Annual and perennial non-timber crops; 2.3 Livestock farming and ranching

Loss of Western Screech-Owl habitat may occur due to removal of forested habitat for agricultural purposes or the degradation of habitat due to livestock grazing. The shrub and herbaceous understories of riparian woodlands are either directly grazed by livestock or cleared and burned by ranchers to provide additional food and shade for cattle (COSEWIC 2012). Riparian areas are sometimes diverted to provide water for livestock and cattle can trample riparian areas. These threats may be more prevalent in the southern portion of the subspecies range where there is a greater ranching and livestock industry.

IUCN-CMP Threat 4.2 Utility & service lines

Independent Power Producers (IPP) projects may impact Western Screech-Owl habitat through road and utility line development that removes riparian forested habitat, and increases edge to forest ratios, which in turn may make Western Screech-Owls more vulnerable to Barred Owl predation. Currently there are 31 IPP projects in operation in British Columbia, but there were 437 applications as of December 2007 (Ministry of Environment 2008).

IUCN-CMP Threat 7.2 Dam and water management/use

Since the 1940s there has been hydroelectric development in the Campbell River watershed resulting in the loss of approximately 50 km² of riparian forest habitat (Tripp and Menzies 2008). Current threats of hydroelectric development are in the area of IPPs. These projects typically do not divert much water thus the impact to this species due to changes in water is considered negligible. Impacts to the species from IPPs will be seen more in habitat removal for access and power transmission (see Threat 4.2).

IUCN-CMP Threat 11. Climate change and severe weather

It is unknown at this time how climate change will manifest itself over the species range and how it will impact species reproduction and survival. Severe weather changes can negatively impact owl reproduction (Peery *et al.* 2012). For Northern Spotted Owls, cold, wet weather during the nesting period reduces reproduction likely by direct chilling effects on eggs and young, whereas hot, dry weather tends to decrease survival likely via direct effects on owls or indirect effects on prey availability (Peery *et al.* 2012). These impacts can be devastating to a species that already has moderate reproductive output such as the Western Screech-Owl, *kennicottii* subspecies.

Storms and flooding due to climate change may negatively impact riparian breeding habitat of Western Screech-Owls. For example, in the Bella Coola Valley, spring floods in both 2011 and 2012 washed away large tracts of riparian habitat (D. Cannings, pers. comm. 2012).

5 RECOVERY GOAL AND OBJECTIVES

5.1 Population and Distribution Goal

The population and distribution goal is to ensure stable or increasing populations of Western Screech-Owl, *kennicottii* subspecies in British Columbia and ensure there is no reduction in either the extent of occurrence or area of occupancy within its present range in B.C.

5.2 Rationale for the Population and Distribution Goal

The total number of breeding pairs has been estimated between 750-1500 with a 20–30% decline between 1995 and 2010 (COSEWIC 2012). To prevent worsening the status of this subspecies from Threatened to Endangered, it is necessary to stop any further decline. Finding a large number

of breeding pairs on the largely un-surveyed North coast of British Columbia could improve the status of this species.

Where inventory exists, the subspecies appears relatively stable on north and western Vancouver Island (Jackett *et al.* 2008; Tripp and Menzies 2008; COSEWIC 2012). For these populations the goal is to maintain existing levels of occupancy. In the highly urbanized southern range of the species in British Columbia where the most dramatic population declines are occurring, the goal is to maintain, and if possible, increase occupancy. Occupancy levels of the northern coast are currently unknown; until current levels of occupancy have been obtained it will be difficult to assess whether the goal of stable or increasing populations and no reduction in area of occupancy is being met.

Baseline information to develop quantifiable targets for recovery is not currently available: less than 10% of suitable habitat on the B.C. coast has been assessed for occupancy and current abundance estimates are based on estimates of habitat availability and home range sizes. Obtaining this information will be a part of the recovery planning process (Table 3).

5.3 Recovery Objectives

1. Protect³ priority breeding habitat for Western Screech-Owl, *kennicottii* subspecies distributed throughout its range in British Columbia.
2. Establish and implement a monitoring program to assess trends in occupancy and habitat availability across the subspecies range.
3. Assess and mitigate current threats for the known populations.
4. Address knowledge gaps (e.g., subspecies distribution and abundance, home range, habitat requirements, Barred Owl impact).

6 APPROACHES TO MEET OBJECTIVES

6.1 Actions Already Completed or Underway

The following actions have been categorized by the action groups of the B.C. Conservation Framework (Ministry of Environment 2010b). Status of the action group for this species is given in parentheses.

Compile Status Report (complete)

- COSEWIC report completed (COSEWIC 2012).

Send to COSEWIC (complete)

- Western Screech-Owl, *kennicottii* subspecies assessed as Threatened (COSEWIC 2012).

³ Protection can be achieved through various mechanisms including: voluntary stewardship agreements, conservation covenants, sale by willing vendors on private lands, land use designations, and protected areas.

Planning (in progress)

- BC Recovery /Plan completed (this document, 2013).

Monitor Trends (in progress)

- Inventory is ongoing range-wide by volunteers in the British Columbia-Yukon Nocturnal Owl Surveys (2000-present) and the Audubon Society Christmas Bird Counts (1983-present)
- Inventory occurred in 2008 in central and northern Vancouver Island (Jackett *et al.* 2008)
- Inventory and monitoring occurred over five years in Campbell River Watershed 2000–2007 (Tripp and Menzies 2008)
- Inventory has occurred in the Nimpkish Valley of northern Vancouver Island 1995–1997, 2002–2006 (COSEWIC 2012)
- Inventory has occurred in metro Vancouver (Robertson *et al.* 2000; Elliott 2006)
- Inventory has occurred in Clayoquot Sound in 1997 (Ross and Egan 1997)
- Inventory has occurred on southern and central Vancouver Island 2001–2003 (Tripp and Otter 2006)

Habitat Protection and Private Land Stewardship (in progress)

- 160 nest boxes installed as a habitat enhancement experiment in Campbell River system
- Some habitat protection from urban development and forestry practices are being provided by existing regional, provincial, and national parks (Table 2).

Table 2. Existing parks within the range of the Western Screech-Owl, *kennicottii* subspecies.

Existing parks within Western Screech-owl range ^a	Threat ^b	Site
National Park (29 000 ha)	1.3, 5.3	Pacific Rim National Park
Provincial Park (16 450 ha)	1.3, 5.3	Carmanah Walbran Provincial Park
Provincial Park (3491 ha)	1.3, 5.3	Clayoquot Arm Provincial Park
Provincial Park (477 ha)	1.3, 5.3	Goldstream Provincial Park
Provincial Park (3950 ha)	1.3, 5.3	Nimpkish Lake Provincial Park
Provincial Park (6634 ha)	1.3, 5.3	Woss Lake
National Park (299 ha)	1.3, 5.3	Alaksen National Wildlife Area
Municipal Park (178 ha)	1.3	Bear Creek Park
Regional Park	1.3	Burnaby Lake Park
Provincial / Regional Park (2042 ha)	1, 1.3,2.1	Burns Bog
Regional Park	1.3	Campbell Valley Regional Park
Municipal Park (90 ha)	1.3	Central Park
Municipal Park	1.3	Crescent Park
Municipal Park	1.3	Deer Lake Park
Municipal Park	1.3	Green Timbers Park
Municipal Park (32 ha)	1.3	Redwoods Park
Provincial/Regional Park	1.3	UBC Endowment Lands Ecological Reserve
Regional Park	1.3	Spanish Banks Beach
National/Municipal Park (400 ha)	1.3	Stanley Park
Provincial Park (97 ha)	1.3	Montague Harbour Marine Park

^a Overall park area reported. Suitable Western Screech-owl habitat within the park would be much smaller.

^b Threat numbers according to the IUCN-CMP classification (see Table 1 for details).

Species and Population Management (in progress)

- Draft account for Western Screech-Owl, *kennicottii* subspecies written and listing in the Category of Species at Risk under the *Forest and Range Practices Act*, which enables habitat management tools as per the Identified Wildlife Management Strategy is pending.
- Western Screech-Owls have been identified as a species of interest in the Campbell River Watershed Action Plan (FWCP 2011).
- Radio-telemetry monitoring and home range analysis has occurred on four individuals in the Campbell River watershed (S. Pendergast, pers. comm. 2012)

6.2 Recovery Planning Table

Table 3. Recovery planning table for Western Screech-Owl, *kennicottii* subspecies.

Objective	CF action group ^a	Threat or concern addressed ^c	Priority ^d	Actions to meet objectives	Performance measure ^b
1	HP, PS	1., 1.2, 1.3, 2.1, 2.3, 5.3, 7.2	Essential	Identify high priority sites for protection	<ul style="list-style-type: none"> • Territories identified and mapped by 2015
	HP, PS	1.1, 1.2, 1.3, 2.1, 2.3	Essential	Conserve all breeding habitat within known territories in the Lower Mainland / southern Vancouver Island areas and use environmental protection tools under current legislation (Development Permit Areas, Riparian Areas Regulation).	<ul style="list-style-type: none"> • Conservation options explored by 2018
	HP, PS	1., 1.2, 1.3, 2.1, 2.3, 5.3, 7.2	Necessary	Identify and protect nest trees throughout the sub-species range	<ul style="list-style-type: none"> • Nest sites identified and habitat described by 2018 • Conservation options explored (private land stewardship, Wildlife Habitat Areas, Riparian Management Areas) by 2018
	HP	5.3, 7.2	Essential	List the Western Screech-Owl, <i>kennicottii</i> subspecies in the Category of Species at Risk under the Forests and Range Practices Act	<ul style="list-style-type: none"> • Western Screech-Owl, <i>kennicottii</i> subspecies in the Category of Species at Risk by 2013
2	MT	Knowledge Gap	Essential	Model habitat suitability	<ul style="list-style-type: none"> • Current occupancy and distribution estimated and precision improved by 2014 • Population and habitat trends estimated and mapped by 2015 • Long-term monitoring plan for populations and habitat initiated by 2015
			Essential	Assess occupancy and distribution using a statistically robust, inventory plan	
			Essential	Establish a long-term monitoring plan for populations and habitat	
			Necessary	Improve knowledge of territory turn-over	

Objective	CF action group ^a	Threat or concern addressed ^c	Priority ^d	Actions to meet objectives	Performance measure ^b
				rates, reproductive success, and local threats	initiated by 2016.
3	HP, PS	All	Essential	Determine land use and ownership within suitable habitat	<ul style="list-style-type: none"> • Land ownership determined by 2015
	HP, PS	1.1, 1.2, 1.3, 2.1, 2.3	Essential	Identify and encourage protection of nest trees on private land, recreational parks, and urban settings.	<ul style="list-style-type: none"> • Nest sites identified and habitat described by 2017
			Beneficial	Promote habitat stewardship on private land	<ul style="list-style-type: none"> • Communication plan completed • Outreach material developed and presented
	HR	1.1, 1.2, 1.3, 2.1, 2.3	Essential	Restore or enhance habitat (nest tree creation, nest box installation) on private land, in parks, and in urban settings to promote connectivity in the Lower Mainland/ southern Vancouver Island	<ul style="list-style-type: none"> • Treatment sites identified by 2017 • Wildlife tree creation reviewed and implemented if feasible by 2018 • Nest box program implemented by 2018
	HP	5.3	Necessary	Develop and implement forestry best management practices (BMP) to maintain suitable habitat.	<ul style="list-style-type: none"> • BMP developed 2014 • Implement BMP by forest industry by 2015 • Evaluate effectiveness of BMP by 2017
	HP, PS	4.1	Beneficial	Promote conservation of habitat in areas with low-traffic volume to help decrease mortality due to vehicle collisions.	<ul style="list-style-type: none"> • Territories identified and mapped • Conservation options explored
	HP	1.1, 1.2, 1.3, 2.1, 2.3, 5.3	Beneficial	Increase awareness of wildlife tree values and cavity-nesting species among private land-owners, parks personnel, regional and municipal districts, range tenure holders, and forest workers	<ul style="list-style-type: none"> • Communication plan completed • Outreach material developed and presented
HP	7.2	Beneficial	Determine extent of IPP proposals in known Western Screech-Owl habitat or in potentially suitable unsurveyed habitat	<ul style="list-style-type: none"> • IPP managers notified • Conservation options explored 	

Objective	CF action group ^a	Threat or concern addressed ^c	Priority ^d	Actions to meet objectives	Performance measure ^b
	HP	5.3	Beneficial	Notify forestry stakeholders of species occupancy and use protection tools available under current forestry regulation (Riparian Management Regulation)	<ul style="list-style-type: none"> • Communication plan completed • Outreach material developed and presented
	HR	All	Beneficial	Prioritize areas for restoration or enhancement	<ul style="list-style-type: none"> • Protocol implemented to inform decisions
	HP	Knowledge Gap	Essential	Estimate home range sizes of Western Screech-Owls at a minimum of 10 territories from two or more populations	<ul style="list-style-type: none"> • Home range size analysis used in Wildlife Habitat Areas, Riparian Management Areas and Riparian Areas Regulation by 2018
4	HP	Knowledge Gap	Essential	Assess habitat requirements at a minimum of 10 territories from two or more populations	<ul style="list-style-type: none"> • Habitat suitability maps revised using current data by 2018 • Conservation methods assessed using current data by 2018 • Improved understanding of habitat impacts by 2018 • Improved understanding of relationship of home range and demographics to habitat quality by 2018
	SPM	Knowledge Gap, 8.1	Essential	Measure the impact of Barred-Owl predation on Western Screech-Owls using multi-species radio-telemetry from two or more populations	<ul style="list-style-type: none"> • Improved understanding of cause-specific mortality by 2020 • Impact of Barred Owls assessed by 2020 • Control options explored if impact is deemed as limiting populations by 2020

^a This refers to the B.C. Conservation Framework action groups (Ministry of Environment 2010b). MT = Monitor Trends; SPM = Species and Population management; HP = Ecosystem and habitat Protection; HR = Habitat Restoration, PS = private land stewardship.

^b Performance measures for objectives and other implementation activities. Note that by definition beneficial activities can start any time and so no timeline is included for these actions.

^c Threat numbers according to the IUCN-CMP classification (see Table 1 for details).

^d Essential (urgent and important, needs to start immediately); Necessary (important but not urgent, action can start in 2–5 years); or Beneficial (action is beneficial and could start at any time that was feasible).

7 INFORMATION ON HABITAT NEEDED TO MEET POPULATION AND DISTRIBUTION GOAL

To meet the recovery goal for this species, it is recommended that specific habitat attributes be identified for the Western Screech-Owl, *kennicottii* subspecies and locations of habitat are geospatially described on the landscape, to facilitate maintenance of population connectivity through habitat conservation.

7.1 Description of Survival/Recovery Habitat

Within their areas of occupancy, Western Screech-Owls have basic ecological requirements: nesting, roosting, and foraging habitat and the spatial arrangement of these attributes. The description of these ecological requirements found in Section 3.3.1 reflects our current knowledge of what constitutes survival/recovery habitat.

7.2 Studies Needed to Describe Survival/Recovery Habitat

Additional research is needed before survival/recovery habitat can be fully described (Table 4).

Table 4. Studies needed to describe survival/recovery habitat to meet the population and distribution goal for Western Screech-Owl, *kennicottii* subspecies.

Description of activity	Outcome/rationale	Timeline
Habitat Suitability modeling	<ul style="list-style-type: none"> Map all potential Western Screech-Owl habitat within the species range to be used in an inventory plan 	2013
Inventory/ Monitoring	<ul style="list-style-type: none"> Create an occupancy monitoring plan and conduct inventory at a subsample of potential territories over ≥ 2 years Map potential, high quality breeding habitat using detections 	2013–2018
Assess population demographics, home range, habitat use, and cause-specific mortality through radio-telemetry study in territories of differing habitat quality	<ul style="list-style-type: none"> Improve knowledge of survival and reproductive success in relation to habitat. Assess population dynamics distribution, home range size and dispersal success in unfragmented and fragmented habitat Characterize habitat selection Develop detailed descriptions of survival/recovery habitat requirements. Geospatially describe Western Screech-Owl, <i>kennicottii</i> subspecies habitat 	2013–2020

7.3 Specific Human Activities Likely to Damage Survival/Recovery Habitat

Threats to Western Screech-Owl habitat are primarily concerned with habitat removal or degradation. The primary threats to riparian habitat targeted by owls include destruction or degradation of habitat due to urban/commercial land development and forestry activities that remove trees from mixed forests adjacent to riparian features. Removal of habitat can result in

patches that are too small to sustain owls or patches too fragmented to enable colonizing by dispersing owls. Increasing patchiness may also result in greater vulnerability to traffic and predators (Table 5).

Changes to a nest stand, disturbance of eggs or young, and the physical removal of a nest tree are the most destructive activities for reproduction. Many nests occur in snags that may be targeted for removal on private land or recreational areas due to threat to human safety. Removal of trees adjacent to a nest tree may also increase the chance of it becoming subject to windthrow. Removal or degradation of the shrub understory may result in a reduction of available prey.

Table 5. Specific human activities likely to damage survival/recovery habitat for Western Screech-Owl, *kennicottii* subspecies.

Specific activity	Threat ^a or concern
Removal of mixed-forest habitat adjacent to riparian ecosystems so that existing patches are small or fragmented from each other	1, 2, 4.1, 5.3, 8.1
Removal of shrub understory to the point where it reduces the amount of available prey	1, 2, 5.3, 7.2
Removal of suitable nest trees (e.g., on private land, parks, or recreational areas due to safety concerns)	1
Removal of trees within a nest stand	1, 2, 5.3, 7.2

^aThreat numbers according to the IUCN-CMP classification (see Table 1 for details).

8 MEASURING PROGRESS

Performance indicators provide a way to define and measure progress toward achieving the population and distribution goal. The success of the recovery program will be determined primarily through monitoring occupancy of populations and habitat trends range-wide every five years. If monitoring indicates that the known populations are stable or increasing, the amount of known suitable habitat is likely stable. Individual recovery actions will be evaluated using performance measures (Table 3).

9 EFFECTS ON OTHER SPECIES

Primary recovery activities for Western Screech-Owls include maintaining old and mature trees with nest cavities and retaining mixed-forest stands adjacent to riparian areas. Recovery activities will likely have positive effects on other cavity-nesting species and wildlife species that depend on riparian habitat.

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