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

Prepared by the Western Screech-Owl, *macfarlanei* subspecies Recovery Team

BRITISH COLUMBIA
The Best Place on Earth

Ministry of Environment

February 2008

About the British Columbia Recovery Strategy Series

This series presents the recovery strategies that are prepared as advice to the Province of British Columbia on the general strategic approach required to recover species at risk. The Province prepares recovery strategies to meet our 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?

Species at risk recovery is the process by which the decline of an endangered, threatened, or extirpated species is arrested or reversed, and threats are removed or reduced to improve the likelihood of a species' persistence in the wild.

What is a recovery strategy?

A recovery strategy represents the best available scientific knowledge on what is required to achieve recovery of a species or ecosystem. A recovery strategy outlines what is and what is not known about a species or ecosystem; it also identifies threats to the species or ecosystem, and what should be done to mitigate those threats. Recovery strategies set recovery goals and objectives, and recommend approaches to recover the species or ecosystem.

Recovery strategies are usually prepared by a recovery team with members from agencies responsible for the management of the species or ecosystem, experts from other agencies, universities, conservation groups, aboriginal groups, and stakeholder groups as appropriate.

What's next?

In most cases, one or more action plan(s) will be developed to define and guide implementation of the recovery strategy. Action plans include more detailed information about what needs to be done to meet the objectives of the recovery strategy. However, the recovery strategy provides valuable information on threats to the species and their recovery needs that may be used by individuals, communities, land users, and conservationists interested in species at risk recovery.

For more Information

To learn more about species at risk recovery in British Columbia, please visit the Ministry of Environment Recovery Planning webpage at:

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

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Disclaimer

This recovery strategy has been prepared by the Western Screech-Owl, *macfarlanei* subspecies Recovery Team, as advice to the responsible jurisdictions and organizations that may be involved in recovering the species. The British Columbia Ministry of Environment has received 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, *macfarlanei* 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 and all members of the recovery team 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 on the recovery team.

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 strategy. The Ministry of Environment encourages all British Columbians to participate in the recovery of the Western Screech-Owl, *macfarlanei* subspecies.

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RESPONSIBLE JURISDICTIONS

The British Columbia Ministry of Environment is responsible for producing a recovery strategy for the Western Screech-Owl, *macfarlanei* subspecies under the *Accord for the Protection of Species at Risk in Canada*. Environment Canada's Canadian Wildlife Service participated in the preparation of this recovery strategy.

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EXECUTIVE SUMMARY

The Western Screech-Owl, *macfarlanei* subspecies, is a small, grayish-brown owl with dense streaks and finer barring on the chest, yellow eyes and feather "ear" tufts on the head (see cover photo). It was designated as Endangered in Canada by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) in May 2002 and is Red-listed in British Columbia. The designation of this subspecies by COSEWIC as Endangered is due to the extremely small population size (<250 adults) and historical loss of its native riparian woodland breeding habitat in the lowland valleys of the Southern Interior of British Columbia, particularly in the Okanagan and lower Similkameen watersheds.

This cavity-nesting species requires riparian habitat with mature, large diameter trees for nesting and roosting, as well as suitable adjacent woodlands and edges of open habitats, with suitable perches, for foraging.

Important knowledge gaps include incomplete inventory, very limited population monitoring, difficulties with identifying subspecies boundaries, and a poor understanding of foraging habitat.

The goal of this strategy is to maintain a viable, well-distributed population of mature Western Screech-Owls, *macfarlanei* subspecies, in secure habitat within the known range of the subspecies in British Columbia.

Sufficient information is not currently available to quantify long-term population and habitat targets. Knowledge gaps will be addressed through the objectives and action plan for the subspecies over the next 5 years and a quantified goal will be incorporated into an updated strategy.

The 5-year recovery objectives (2008 to 2012) are to:

1. secure a minimum of 400 ha of occupied nesting habitat at priority sites and a suitable amount of adjacent foraging habitat, distributed throughout the known range, by 2012; and
2. address knowledge gaps associated with population size, distribution, demographics and viability, habitat requirements, distribution and quality, subspecies genetics, clarification of threats including road mortality, pesticides and predation, and the identification of critical habitat by 2012.

Secure habitat is Western Screech-Owl, macfarlanei subspecies habitat (see "Habitat and biological needs" section) that is managed to maintain screech-owls over a long time period (100 years). This may involve protection in any form including following best management practices for maintaining Western Screech-Owls, macfarlanei subspecies and their habitat; stewardship agreements; conservation covenants; eco-gifts; sale of private lands by willing landowners; land use designations and management on Crown lands; and protection in federal, provincial, and local government protected areas.

One or more Recovery Action Plans will be completed by 2012.

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BACKGROUND

Species Assessment Information from COSEWIC

Date of Assessment: May 2002
Scientific Name: *Megascops kennicottii macfarlanei*
Common Name: Western Screech-Owl, *macfarlanei* subspecies
Status: Endangered
Canadian Occurrence: British Columbia
Reason for Designation: This subspecies has a very low population in Canada, where it depends on mature riparian woodlands for nesting and roosting. These woodlands have been heavily impacted by agricultural and urban developments over the last century. It also relies on cavities in old, large trees for nesting and roosting—trees that have become rare even within the woodlands that remain.
Status History: The species was placed in the Data Deficient category in April 1995. It was split according to subspecies in May 2002. The *macfarlanei* subspecies was designated Endangered in May 2002. Last assessment based on an update status report.

Description of the Species

The Western Screech-Owl, *macfarlanei* subspecies, is a small, grayish-brown owl with dense streaks and finer barring on the chest, yellow eyes, and feather "ear" tufts on the head (see cover photo). Adults are 19–26 cm long and weigh between 120 and 305 g (Cannings and Angell 2001).

Populations and Distribution

Global range: The Western Screech-Owl, *macfarlanei* subspecies, resides in the mountainous regions of western North America from south-central British Columbia, eastern Washington and Oregon, most of Idaho, western Montana, and extreme northeastern California (Figure 1).

Canadian range: The breeding range of this subspecies in Canada is restricted to south-central British Columbia (Figure 2). Breeding records are from the Okanagan valley (COSEWIC 2002). north to Vernon (J. Hobbs, pers. comm., 2005), the southeastern Similkameen valley (J. Hobbs, pers. comm., 2005), Shuswap valley between Cherryville and Mable Lake (H. Davis, pers. comm., 2006), and the Kootenay valley near Creston (Beaucher and Dulisse 2004). The subspecies may breed at least occasionally in the Kettle and Thompson valleys (COSEWIC 2002). There is a Screech-Owl population in the Fraser River drainage near Lillooet (J. Hobbs, pers. comm., 2005), but the subspecific identity of these birds is in question, since the population is contiguous with *M. k. kennicottii* coastal populations. In Alberta, the species is listed as a vagrant (Semenchuk, ed. 1992); there are two records from Waterton Lakes National Park in the southwestern corner of Alberta, as well as single records from Cardston and Lethbridge. In Saskatchewan, the species is listed as hypothetical; birds were heard calling in the springs of 1992 and 1994 in the Cypress Hills (Smith 1996).

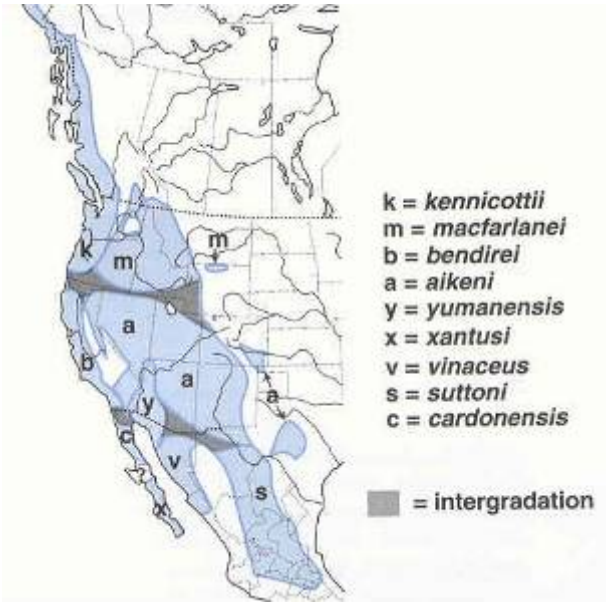

Figure 1. Global range of Western Screech-Owl, *macfarlanei* subspecies*;* marked "m" on map (from Cannings and Angell 2001).

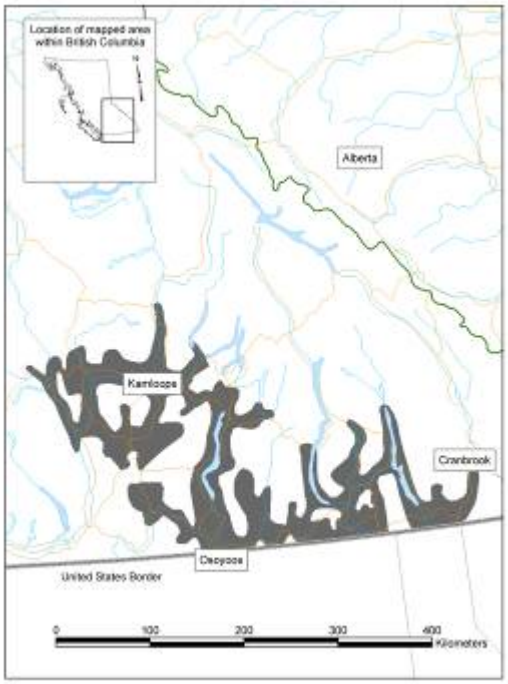

Figure 2. Canadian range of the Western Screech-Owl, *macfarlanei* subspecies, based on known and expected distribution. Note that Alberta and Saskatchewan records (listed as vagrant and hypothetical, respectively) are not included.

Percent of global distribution in Canada: Less than 5% of the global range of this subspecies occurs in Canada.

Distribution trend: The trend in distribution is poorly known, but probably stable. With increased survey effort, new breeding sites are being found in British Columbia; these expand the known distribution but are not indicative of an expanding population.

Population abundance

Global range: The subspecies is ranked as Secure, G5T4, by NatureServe (2005). The global population is unknown, but is estimated to be less than 10,000 mature individuals (R.J. Cannings, pers. comm., 2003).

Canadian range: The Canadian population is 50–200 individuals (COSEWIC 2002). The subspecies is ranked Critically Imperiled in Canada, N1, and British Columbia, S1 (NatureServe 2005).

Percent of global population in Canada: Less than 5% of the global population of this subspecies is estimated to be in Canada, based on its distribution.

Population trend: The population trend in Canada is unknown but is probably declining due to continued loss and degradation of habitat (see "Threats" section).

Needs of the Western Screech-Owl, *macfarlanei* subspecies

Habitat and biological needs

In general, Western Screech-Owl, *macfarlanei* subspecies is found in deciduous valley bottoms and low-elevation riparian areas and to a lesser degree wooded urban areas. Areas with black cottonwood (*Populus trichocarpa*) are often favoured for nesting but water birch (*Betula occidentalis*) and trembling aspen (*Populus tremuloides*) are also associated with occurrences of screech-owls. Suitable nesting habitat typically includes patches of cottonwood, water birch, and aspen, with moderate to dense understorey of shrubs (MWLAP 2004). The only available research from B.C. suggests that core nesting sites are about 10 ha in size (H. Davis pers. comm. 2006). The presence of wildlife trees for nest cavities is important; these trees have a diameter at breast height (dbh) greater than 30 cm and have cavity openings greater than 7.5 cm in diameter (Cannings and Angell 2001). Screech-owls also will use artificial nest boxes in suitable foraging habitat. Roosts, in nests or other cavities or on branches, are important for shelter, concealment, and defense of young. They may be recognized by the presence of owls, whitewash, or pellets. There also must be adequate adjacent foraging habitat (woodlands; edges of open habitats including fields and pasture; riparian, coniferous, wetland, or other habitats with suitable perches). Home range size, including nesting and foraging habitat, averaged 77 ha and ranged from 26 to 144 ha (n = 3) based on preliminary telemetry data in the Shuswap River area, using minimum convex polygons (H. Davis, pers. comm., 2006). Suitable habitats are generally below 1000 meters in elevation and mostly below 600 meters in elevation (COSEWIC 2002).

Limiting factors

The Western Screech-Owl, *macfarlanei* subspecies is a predator that relies on habitat that supports sufficient densities of prey species. It requires mature, large diameter trees (>30 cm dbh) with cavities excavated by woodpeckers and/or natural decay for both roosting and nesting sites. Since it is non-migratory, it is likely sensitive to severe winter weather, a factor that is especially important at the northern edge of its range. Dispersal distances range from 5 to 15 km away from nest sites (MWLAP 2004).

Ecological role

The Western Screech-Owl, *macfarlanei* subspecies is believed to be a generalist predator, feeding on various prey including mice, small birds, small fish, frogs, salamanders, crayfish, slugs, worms, and large insects. The only significant predators on screech-owls are larger owls such as Barred Owls (*Strix varia*) and Great Horned Owls (*Bubo virginianus*). Research studies will attempt to determine diet of Western Screech-Owls, *macfarlanei* subspecies in B.C., and relationships with other predators (see "Knowledge Gaps").

Importance to People

This species is often sought after by birders and attracts interest by the naturalist community. Its propensity for using nest boxes makes it a species of interest to many people and justifies enhancement activities. To the knowledge of the recovery team, this species is neither commercially exploited for food, clothing or revenue, nor is it hunted or bred in captivity. The full cultural use and significance of the Western Screech-Owl, *macfarlanei* subspecies to First Nations peoples is not presently available. Screech-owls were "not bothered" by the Secwepemc people, in south-central B.C., who consider them to be messengers. Owl feathers are sometimes collected but no information was reported connecting screech-owls with food, technology, economic, kinship, medicinal, or trade uses (Secwepemc Fisheries Commission 2005).

Threats

Habitat loss or degradation

Urban, agricultural, and hydroelectric developments are the most significant general threats to the Western Screech-Owl, *macfarlanei* subspecies (COSEWIC 2002). Urban and agricultural developments have destroyed and degraded substantial amounts of mature riparian woodland over the past century (MWLAP 1998) and remaining habitat is highly fragmented. About 87% of the water birch and 32% of the cottonwood habitats have disappeared from the south Okanagan and lower Similkameen valleys over the past century (Dyer and Lea 2001). Most remaining habitat is on private land and development continues to be a threat. Mature and/or old trees, particularly cottonwood with suitable nesting and roosting cavities, have been cleared for urban or agricultural conversion, and are often selectively removed because of safety concerns. Hydroelectric developments in the Columbia and Kootenay valleys and along the Bridge River have flooded, altered, and fragmented suitable riparian habitat (T. Antifeau, J. Hobbs, pers. comm., 2005). Livestock grazing, and burning to clear shrubs have reduced or altered suitable habitats along the Nicola valley (J. Hobbs, pers. comm., *in* MWLAP 2004). Water use through

licensed systems or wells may be affecting cottonwood at some sites as a result of lowered water tables (J. Hobbs and R. Hall, pers. comm., 2005) and requires investigation.

Accidental mortality
Collisions with vehicles may also be a significant threat in local areas. Four road-killed owls were reported along a 6-km length of road in one year in the south Okanagan and others have been reported throughout much of the range (BCMOE unpubl. data).

Changes in ecological dynamics or natural processes
Changes in predator–prey dynamics may be increasing predation on the Western Screech-Owl, *macfarlanei* subspecies. Barred Owls have recently expanded their range in British Columbia, making them a new predation threat to screech-owls (Cannings and Angell 2001). As a result of this range expansion, screech-owls may be impacted by increased, direct mortality, or other responses to the presence of Barred Owls; this requires investigation.

Pollution
The pesticide Dichloro-Diphenyl-Trichloroethane (DDT) was used in great quantities in British Columbia orchards until the 1970s, and its derivatives are still present in high levels in local birds (Elliott *et al.* 2005). DDT may adversely affect animal development, physiology, morphology, and behaviour (Fry 1995; Giesy *et al.* 2003; Zala and Penn 2004 and Rogan and Chen 2005 *in* Iwaniuk *et al.* 2006; Elliott *et al.* 2005). Persistent pesticides (DDT and derivatives) may pose a threat, particularly in the Okanagan valley, but no toxicity information is currently available for screech-owls. Research is required.

Actions Already Completed or Underway

- Screech-owl Habitat Suitability Models are complete for most of the Okanagan valley based on Terrestrial Ecosystem or Sensitive Ecosystem Mapping.
- Mapping of historical riparian habitats is underway in the Okanagan valley, as well as in the Columbia Basin, through the Columbia Basin Fish and Wildlife Compensation Program (CBFWCP) Dam Impact Project.
- Stewardship activities through The Land Conservancy and the South Okanagan–Similkameen Stewardship Program (Riparian Rewards and Cottonwoods of the Similkameen projects) are underway to determine land tenure and make landowner contact for occupied Screech-owl habitats.
- Screech-owl inventory is ongoing throughout the range in British Columbia.
- A research project on radio-tagged owls, currently underway along the Shuswap River between Cherryville and Mabel Lake, is investigating home range size, habitat use, reproductive success, and mortality.
- Screech-owl is listed under the Identified Wildlife Management Strategy (*Forest and Range Practices Act*). Six wildlife habitat areas have been approved.
- Screech-owl habitat is being enhanced and restored along Inkameep Creek and the Okanagan River channel.
- Habitat is conserved in several provincial, regional, and municipal parks and on private conservation lands or covenant areas administered by The Nature Trust and TLC The Land Conservancy of B.C.

Knowledge Gaps

Inventory and monitoring requirements: Western Screech-Owl, *macfarlanei* subspecies territories are generally well known in the central and south Okanagan valley, but additional inventory is needed in the Similkameen valley, north Okanagan (Vernon), Kettle valley (Rock Creek and Grand Forks areas), West and East Kootenays (Castlegar, Trail, Salmo, Creston, Cranbrook, and Fernie), Fraser, Thompson, and Shuswap drainages. Monitoring data is limited and is important throughout the range to confirm site persistence, identify local threats, and evaluate recovery success.

Biological/ecological research requirements: Very little is known about the characteristics of foraging habitat and home range for this species. While nesting and roosting habitats are generally linked to riparian zones, more information is needed on detailed vegetation structure. Foraging may take place in habitats adjacent to riparian areas and must be considered when identifying habitat use and critical habitat for this species. Population ecology, including habitat use, reproductive success, and survival in relation to breeding and foraging habitat, is a high priority for research.

Threat clarification research requirements: Mortality due to road kills is not well quantified and its significance is unclear. Toxicology studies would be very useful in determining if any threats from pesticide residues may be impacting Western Screech-Owls, *macfarlanei* subspecies. Recent studies in the Okanagan valley have revealed high levels of persistent pesticide residues (DDE) in valley-bottom species (Elliott *et al.* 2005) but no local information is available for Screech-Owls. Barred Owls, which prey on screech-owls, have extended their range into B.C. and increased in numbers, which may have changed predator–prey interactions. However, the significance of this change is unclear and requires clarification.

Genetic information and population ecology: The relationships among the small population of screech-owls found in the Lillooet–Cache Creek area, the *M. k. kennicottii* populations of the lower Fraser valley, and the *M. k. macfarlanei* populations of the other areas are unknown. This knowledge would allow a more informed decision as to whether to include these populations in any future consideration of status, population viability, and recovery.

RECOVERY

Recovery Feasibility

The recovery of Western Screech-Owl, *macfarlanei* subspecies in Canada is feasible with moderate effort (Table 1). An existing breeding population of 50–200 individuals is reasonably well connected to populations to the south in Washington, Idaho, and northwest Montana, so captive breeding and reintroduction will not be necessary. Approximately 80 sites, where at least one owl has been detected, are known. Apparently suitable habitat exists at more than 200 additional sites. There is no known, unavoidable threat that precludes recovery. The primary techniques anticipated for recovery are standard methods of habitat stewardship, management, securement, enhancement, and restoration that have been generally successful in other areas. Other threat factors such as mortality along roads will be harder to alleviate, but screech-owls

have a moderate capacity to rebound demographically, since they probably begin breeding at 1 year of age and can produce 2–3 young per pair on average (Cannings and Angell 2001).

Table 1. Recovery feasibility

Recovery criteria	Western Screech-Owl
1. Are individuals capable of reproduction currently available to improve the population growth rate or population abundance?	Yes. See above.
2. Is sufficient habitat available to support the species or could it be made available through habitat management or restoration?	Yes. See above.
3. Can significant threats to the species or its habitat be avoided or mitigated through recovery actions?	Yes. See above.
4. Do the necessary recovery techniques exist and are they known to be effective?	Yes. See above.

Recovery Goal

Maintain a viable, well-distributed population of Western Screech-Owls, *macfarlanei* subspecies, in secure[1] habitat within the known range of the subspecies in British Columbia.

Rationale for the Recovery Goal

Historic population size and distribution are not known. Historic habitat distribution and quantity are also not known for much of the species' range. This precludes identification of a credible restoration target for the historic population. Habitat that has been destroyed by urban and agricultural development is unlikely to be restored to historic levels making restoration of historic habitat levels impractical, if they could be determined. Habitat size and distribution requirements are poorly quantified. Potential habitat is not currently mapped and inventory is not complete. These knowledge gaps prevent quantification of population or habitat conservation targets at this time. The goal, to maintain a viable and well-distributed population, is based on recovery team consensus to ensure the subspecies will not be extirpated in Canada. Short-term habitat targets are presented in the objectives section. Knowledge gaps will be addressed during the next 5 years and a quantified goal will be incorporated into an updated strategy.

[1] Secure habitat is Western Screech-Owl, *macfarlanei* subspecies habitat (see "Habitat and biological needs" section) that is managed to maintain screech-owls over a long time period (100 years). This may involve protection in any form including following best management practices for maintaining Western Screech-Owls, *macfarlanei* subspecies and their habitat; stewardship agreements; conservation covenants; eco-gifts; sale of private lands by willing landowners, land use designations and management on Crown lands; and protection in federal, provincial, and local government protected areas.

Recovery Objectives

1. **Secure[2] a minimum of 400 ha* of occupied nesting habitat at priority sites and a suitable amount of adjacent foraging habitat, distributed throughout the known range, by 2012.**

2. **Address knowledge gaps associated with population size, distribution, demographics and viability, habitat requirements, distribution and quality, subspecies genetics, clarification of threats including road mortality, pesticides and predation, and the identification of critical habitat by 2012.**

* It is necessary to conserve a portion of the species' habitat to ensure that the population persists in the short term while knowledge gaps are being addressed. Four hundred hectares of core nesting habitat was identified as a short-term habitat protection target based on recovery team consensus in the absence of strong scientific data. The team identified protection of a minimum of 40 sites, with one pair per site, as necessary to support the species in the short-term and reasonable to achieve by 2012, based on existing conservation tools. This represents approximately one-half of the known detections in 2004. Nesting habitat requirements appear to be less flexible than foraging habitat needs and are better quantified. About 10 ha is the size of core nesting sites (H. Davis, pers. comm., 2006). Forty sites times 10 ha per site totals 400 ha. Priority sites will be locations where screech-owls have been detected during the breeding season and, ideally, where successful reproduction has been confirmed. Foraging habitat requirements will vary depending on the site and may include deciduous or coniferous forest, agricultural fields, river, shrub-steppe, grassland, and some urban areas. Male foraging territories are approximately 50 ha (Cannings and Davis 2007) and generally surround the core nesting habitat. This target will be revised as better information becomes available.

Approaches Recommended to Meet Recovery Objectives

A broad strategy to address threats will include habitat protection, habitat management, inventory and monitoring, research, and outreach (Table 2). These tasks generally will be accomplished through voluntary stewardship and partnerships such as the South Okanagan–Similkameen Conservation Program (SOSCP). Habitat protection may take many forms including stewardship agreements and conservation covenants on private lands; land use designations on Crown lands; and protection in federal, provincial, and local government areas. A single-species approach is required due to limited habitat overlap with other species assessed by COSEWIC as at risk. Cooperation with fishery conservation and enhancement programs should be considered.

2 Secure habitat is Western Screech-Owl, macfarlanei subspecies habitat (see "Habitat and biological needs" section) that is managed to maintain screech-owls over a long time period (100 years). This may involve protection in any form including following best management practices for maintaining Western Screech-Owls, macfarlanei subspecies and their habitat; stewardship agreements; conservation covenants; eco-gifts; sale of private lands by willing landowners; land use designations and management on Crown lands; and protection in federal, provincial, and local government protected areas.

Recovery planning table

Table 2. Recommended approaches for recovery

Objective	Threat or concern addressed	Broad approach/ strategy	Priority	Activities
1	Habitat loss or degradation	Habitat securement	Urgent	Prioritize sites for habitat stewardship and securement.
			Urgent	Implement private landowner contact program to develop stewardship or acquisition agreements on occupied habitat.
			Urgent	Work with municipal and regional governments to incorporate habitat stewardship into planning processes such as Community Plans and bylaws.
			Urgent	Work with First Nations to identify and implement opportunities for cooperative habitat conservation projects both on and off reserves.
			Urgent	Establish wildlife habitat areas through the Identified Wildlife Management Strategy.
		Public outreach	Urgent	Develop and implement a communication plan identifying target audiences and key messages to improve community-based conservation.
		Habitat management	Beneficial	Implement habitat restoration and enhancement activities for sites identified in a prioritized list.
2	Knowledge gap	Research	Urgent	Map potential habitat and inventory suitable sites with no previous detection.
			Urgent	Implement a research program at a minimum of 10 occupied sites to clarify breeding and foraging habitat requirements and reproductive success using telemetry.
			Urgent	Work with aboriginal groups to identify traditional knowledge about the species.
			Necessary	Investigate the potential impacts associated with increased, direct mortality or other responses to the presence of Barred Owls.
			Necessary	Review and update best management practices for Screech-Owls and encourage land managers to use them.
			Beneficial	Design and implement a protocol for monitoring habitat and population trends.
			Beneficial	Implement genetic analysis of coastal and interior Screech-Owl populations.
			Beneficial	Monitor road mortality to quantify potential impacts.
			Beneficial	Monitor carcasses to assess presence of pesticide residues.

Performance Measures

- Have 400 ha of occupied nesting habitat been protected by 2012?
- Has a foraging habitat target been identified by 2010?
- Has the foraging habitat target, identified above, been protected by 2012?
- Has a prioritized research strategy been developed to address knowledge gaps by 2008?
- Have priority research questions been answered by 2012?
- Has an inventory and monitoring strategy been developed by 2008?
- Has the inventory and monitoring strategy been implemented by 2012?
- Has at least one action plan been developed by 2012?

Critical Habitat

Identification of the species' critical habitat

No critical habitat, as defined under the federal *Species at Risk Act* [S. 2], is proposed for identification at this time. Relatively little is known about the specific habitat needs, population numbers, or distribution of the subspecies and more definitive work must be completed before any specific sites can be formally proposed as critical habitat. It is expected that critical habitat will be proposed within a recovery action plan following both consultation and development of stewardship options with affected landowners and organizations, and completion of outstanding work required to identify specific habitat and area requirements for this species.

Occupied habitat is poorly known. Approximately 80 sites have been identified since 1993 (BCMOE 2005). However, the proportion of these sites that remain active is unknown, due to limited monitoring, and is estimated to be much lower. Potentially suitable habitat has been identified at more than 200 additional sites (J. Hobbs, pers. comm., 2005) but inventory and habitat research at these and other sites are required to properly propose critical habitat.

The schedule of studies outlines additional research and analysis required to address the biological and technical limitations that prevent identification of critical habitat in this recovery strategy (Table 3). The scope and timelines in this schedule of studies are believed to be realistic and achievable, and are expected to result in an accurate proposal for critical habitat identification in an action plan document.

Recommended schedule of studies to identify critical habitat

Table 3. Schedule of studies

Description of activity	Outcome	Timeline
Develop and implement an annual population and habitat inventory and monitoring program	• Map potential, high quality nesting habitat using terrestrial ecosystem mapping, ortho-photos, or other methods. • Use potential habitat to prioritize and stratify inventory and monitoring activities. • Identify occupied areas and re-occupancy rates. • Compare occupied and unoccupied areas to better quantify habitat needs. • Improve precision of the population estimate and distribution. • Improve knowledge of site persistence, reproductive success, and potential local threats. • Identify high priority sites for protection.	2007–2012
Characterize population ecology, including demography and habitat characteristics, through a research program.	• Quantify characteristics of breeding and foraging habitat quality, distribution, and home range size. • Improve knowledge of survival and reproductive success in relation to habitat. • Develop more accurate and detailed descriptions of habitat requirements for protecting and managing habitat. • Improve understanding of potential threats, particularly mortality sources and habitat impacts. • Improve understanding of food requirements. • Improve understanding of genetic relationships between subspecies to more accurately assess population distribution and numbers.	2007–2012

Existing and Recommended Approaches to Habitat Protection

Habitat protection for existing locations can be established through stewardship and other mechanisms by following best management practices; voluntary stewardship agreements; conservation covenants; eco-gifting; sale by willing private land owners; land use designations on Crown lands; and protection in federal, provincial, and local government protected areas.

Approximately 16% of known Western Screech-Owl, *macfarlanei* subspecies sites in the B.C. Interior are on conservation lands. These sites include Adams Bird Sanctuary, Summerland; Woodhaven Regional Park and Mission Greenway, Kelowna; Hardy Falls Regional Park, Peachland; Creston Valley Wildlife Management Area; Inkaneep Provincial Park, Oliver; Kalamalka Lake Provincial Park, Vernon; White Lake Grasslands Protected Area; and three Land Conservancy covenants in the south Okanagan. One private land site has a stewardship agreement through The Land Conservancy (TLC) and at least five sites are being sensitively managed or enhanced in conjunction with TLC or the South Okanagan–Similkameen Stewardship Program. Six wildlife habitat areas have been approved on provincial Crown land.

Recovery actions in the south Okanagan valley should be implemented through the South Okanagan–Similkameen Conservation Program Landscape Recovery Plan and coordinated primarily with fish habitat protection and enhancement projects and Yellow-breasted Chat (*Icteria virens auricollis*) habitat recovery projects. Actions should also be integrated into existing programs in areas outside of the South Okanagan–Similkameen where possible. Existing programs include stewardship, inventory, and monitoring projects led by First Nations, local government park and community plans, Partners in Flight, land use designations on Crown lands, Bird Studies Canada owl monitoring, and local stewardship or outreach groups such as The Land Conservancy and Allan Brooks Nature Centre.

Effects on Other Species

Restoration of habitat for the Western Screech-Owl, *macfarlanei* subspecies will benefit many other riparian-dependent species from the full range of native taxa, including plants, invertebrates, amphibians, reptiles, birds, and mammals. Care will be taken to ensure that restoration for Yellow-breasted Chats and Western Screech-Owls, *macfarlanei* subspecies will be compatible. While Screech-Owls, *macfarlanei* subspecies are predators, the impact of a restored population on other species of conservation concern [e.g., Great Basin Spadefoot (*Spea intermontana*), Tiger Salamander (*Ambystoma tigrinum*), Yellow-breasted Chat, and Northern Leopard Frog (*Rana pipiens*)] is unknown but likely negligible.

Socioeconomic Considerations

Recovery of this species and restoration of threatened habitats that it is associated with will contribute to biodiversity, health, and improved functioning of riparian ecosystems. It also will enhance opportunities for appreciation of special spaces and species, thereby contributing to overall social values in the southern interior of B.C. Protection of natural spaces, biodiversity, and recreation values provides value to the local economy. This species is often sought after by birders and attracts interest by the naturalist community. Recovery actions could affect the private land development, agricultural and range, recreation, forestry, hydroelectric, dam/dike operations, and maintenance sectors. The expected magnitude of these effects is expected to be low due to a voluntary stewardship approach.

Statement on Action Plans

One or more Recovery Action Plans will be completed by 2012.

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