Species at Risk Act
Recovery Strategy Series

Recovery Strategy for the Lewis's Woodpecker (*Melanerpes lewis*) in Canada

Lewis's Woodpecker

2017

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

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

Preface

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

The Minister of Environment and Climate Change and Minister responsible for the Parks Canada Agency is the competent minister under SARA for the Lewis's Woodpecker and has prepared this recovery strategy, as per section 37 of SARA. To the extent possible, it has been prepared in cooperation with the Province of British Columbia, Indigeneous Organizations and affected stakeholders as per section 39(1) of SARA.

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

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

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

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

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

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

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

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

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

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

Acknowledgments

This document borrows significantly from the Management Plan for the Lewis's Woodpecker (*Melanerpes lewis*) in Canada (Environment Canada 2014). All those involved in the development of that earlier plan are gratefully acknowledged. The current recovery strategy could not have been completed without the efforts of the Lewis's Woodpecker Expert Review Committee. Members include: Megan Harrison and Tanya Luszcz (Environment and Climate Change Canada, Canadian Wildlife Service); Orville Dyer, Ted Antifeau, Lisa Tedesco, John Surgenor, Donna Romain, and Julie Steciw (British Columbia Ministry of Natural Resource Operations); Chris Gill, John Cooper, and Les Gyug (consultants); the late Mary Sandy (Esh-kn-am Cultural Resources Management Services); and with support from Andrea Norris under contract to Environment and Climate Change Canada, Canadian Wildlife Service.

Executive Summary

The Lewis's Woodpecker (*Melanerpes lewis*) is a medium-sized migratory woodpecker. It is a semi-colonial nester that breeds in low elevation habitats of south-central and southern interior British Columbia (B.C.), and south to the U.S.-Mexico border. Breeding habitats include dry, open Ponderosa Pine (*Pinus ponderosa*) forests/grasslands, mature riparian cottonwood (*Populus* spp.) stands, and recently burned Ponderosa Pine- or Douglas-fir (*Pseudotsuga menziesii*)-dominated forests. It winters in the pine-oak ecosystems of southern Oregon south to areas in northern Mexico; however, up to six birds have been observed annually overwintering within B.C. The Lewis's Woodpecker was assessed as Threatened in 2010 by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) as a result of a small population size, ongoing evidence of population declines (both in Canada and rangewide), and persistent threats to the species' habitat. The species was listed as Threatened under Schedule 1 of the *Species at Risk Act* (SARA) in 2012.

In B.C., this species breeds in six geographic regions: Okanagan-Similkameen, Thompson-Nicola, Boundary, East Kootenay, West Kootenay, and Cariboo-Chilcotin. The population is currently estimated to be at least 371 pairs.

Recovery of the Lewis's Woodpecker is considered biologically and technically feasible.

Primary threats to the Lewis's Woodpecker include housing & urban areas and annual & perennial non-timber crops (i.e., residential and agricultural development), problematic native species (i.e., pine beetle – especially in the Thompson-Nicola region), and fire & fire suppression.

The population and distribution objective is to maintain or increase the regional populations and the distribution of Lewis's Woodpeckers within Canada, with the exception of the extirpated Georgia Depression population, where recovery is not currently considered feasible.

The broad strategies to be taken to address the threats to the survival and recovery of the species are presented in Section 6.2, Strategic Direction for Recovery.

Sufficient critical habitat has been identified in the Thompson-Nicola, Boundary, East Kootenay, and West Kootenay to support the population and distribution objectives for those regions. The critical habitat identified in the Okanagan-Similkameen and Cariboo-Chilcotin regions is not sufficient to support the population and distribution objectives for those areas. A schedule of studies is included that outlines the studies required before the critical habitat identification can be completed.

One or more action plans will be posted on the Species at Risk Public Registry within five years of the final posting of the recovery strategy.

Recovery Feasibility Summary

Based on the following four criteria that Environment and Climate Change Canada uses to establish recovery feasibility, recovery of Lewis's Woodpecker has been deemed technically and biologically feasible.

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. The breeding population within Canada is believed to be at least 371 pairs and is contiguous with populations within the United States. Successfully fledged young are observed annually in all regions where the species occurs in B.C. This does not apply to the extirpated Georgia Depression population.

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

Yes. There is currently sufficient suitable habitat available to support the current nesting population of Lewis's Woodpeckers in B.C. (over 4,500 km^2, according to the current habitat suitability model), and additional habitat could be made available through proven restoration/augmentation approaches (e.g., cottonwood habitat restoration, prescribed burning, topping and fungal inoculation to create nest trees from live trees, and nest box installation). This does not apply to the extirpated Georgia Depression population where most of the habitats historically occupied by Lewis's Woodpeckers no longer exist.

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

Yes. The principal threats to Lewis's Woodpeckers are habitat loss and degradation. It is feasible to limit loss of breeding habitat within Canada through a combination of regulatory tools, stewardship initiatives, and education/outreach. The threats to breeding habitat are most severe in the Thompson-Nicola region as a result of the large-scale mortality of nesting trees (Ponderosa Pine) due to the mountain pine beetle outbreak. While the severity and spatial extent of the impact of habitat loss on wintering grounds and in migratory stopover areas is not yet understood, it should be possible to clarify the impact through research and to help mitigate the impact through participation in international habitat conservation initiatives.

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

Yes. Possible recovery techniques exist and in some areas are already being implemented to create/enhance habitat, to ensure that critical features of existing habitat are not lost, and to address other threats.

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1. COSEWIC* Species Assessment Information

Date of Assessment: April 2010

Common Name (population): Lewis's Woodpecker

Scientific Name: *Melanerpes lewis*

COSEWIC Status: Threatened

Reason for Designation: In Canada, this woodpecker breeds only in British Columbia. Its population is small, with fewer than 1000 individuals, and there is evidence of ongoing declines in parts of its Canadian range where it has been monitored over time. The global population (Canada and the USA) is also showing significant declines. Threats include habitat loss and degradation from increasing urban and agriculture development, and fire suppression. Recent surveys have shown the species to be far less numerous than previously believed.

Canadian Occurrence: British Columbia

COSEWIC Status History: Designated Special Concern in April 1999. Status re-examined and confirmed in November 2001. Status re-examined and designated Threatened in April 2010.

* COSEWIC (Committee on the Status of Endangered Wildlife in Canada)

2. Species Status Information

Globally, the rank assigned to the Lewis's Woodpecker *(Melanerpes lewis)* is G4 (apparently secure; NatureServe 2012). However, within several jurisdictions, the species is listed as apparently secure to imperiled (Table 1). The approximate area of habitat predicted to support breeding for the Lewis's Woodpecker in B.C. is over 4,500 km^2, which is less than 10% of the global range for the species (Gyug 2013a; Table 2).

Table 1. List and description of various conservation status ranks for the Lewis's Woodpecker (from NatureServe 2014, B.C. Conservation Data Centre 2014 and B.C. Conservation Framework 2013).

Global (G) Rank	National (N) Rank	Sub-national (S) Rank	COSEWIC Status	B.C. Conservation Status
G4 (apparently secure)	Canada: N2 (imperiled) U.S.A.:N4N4B (apparently secure/ breeding and non-breeding)	British Columbia (S2B) Arizona (S4) California (SNR) Colorado (S4) Idaho (S3B) Kansas (SNA) Montana (S2B) Navajo Nation (S4) Nebraska (S2) Nevada (S3) New Mexico (S3B, S3N) Oklahoma (S2) Oregon (S2S3B) South Dakota (S3B,S3N) Utah (S3) Washington (S2S3) Wyoming (S2)	T (Threatened)	Red List Conservation Framework Priority 2 under Goal 3[a]

G/N/S 1: Critically Imperiled; 2: Imperiled; 3: Vulnerable; 4: Apparently Secure; 5: Secure; NR: Unranked; NA: Not Applicable; B: Breeding.

[a] *Goal 3: Maintain the diversity of native species and ecosystems. Priority 2: second-highest priority.*

3. Species Information

3.1 Species Description

The Lewis's Woodpecker is a medium-sized (26-28 cm in length) woodpecker with a greenish black head, back, wings, and tail, and a distinctive pinkish red belly. It has a dark red face patch and prominent silvery gray collar and upper breast (see cover photo). The plumage colouration of the Lewis's Woodpecker distinguishes it from other woodpeckers. Viewed from afar, it resembles a crow, jay or nutcracker; particularly in flight. Sexes are similar in size and colour. Juveniles are distinct from adults, being overall black and more brownish-black dorsally, generally lacking the extensive gray, red, and pink coloration of adults. In both adults and juveniles the legs and feet are gray, the bill is black, and the iris is dark.

3.2 Species Population and Distribution

The Lewis's Woodpecker occurs only in western North America, from south-central B.C. to the U.S.A.'s international boundary with Mexico, and its breeding distribution is closely associated with that of Ponderosa Pine (Vierling et al. 2013; Figure 1). It is mainly migratory and typically winters in the pine-oak ecosystems of southern Oregon

south to northern Baja California, and Mexico (Hadow 1973, Vierling et al. 2013), although one to six birds per year have wintered in the Okanagan Valley between 2000 and 2011 (National Audubon Society 2013). In Canada, the Lewis's Woodpecker currently breeds only in the south-central and southern interior of B.C. (Figure 2; Vierling et al. 2013). The largest numbers of breeding individuals occur in the following geographic regions of B.C.: Boundary, Okanagan-Similkameen and Thompson-Nicola, followed by the East Kootenay. Estimates for the Cariboo-Chilcotin region are expected to be low, and occurrence is rare in the West Kootenay (Table 2). The Georgia Depression population is extirpated and recovery is not considered feasible; therefore, this region is not considered further in this recovery strategy. Finally, breeding has been reported in southwestern Alberta, but these are considered to be vagrant individuals (Semenchuk 1992).

The distribution and amount of breeding habitat for the Lewis's Woodpecker in Canada was estimated using a habitat suitability model, which was produced from correlations between known nesting locations, and habitat variables including mean annual precipitation, mean annual temperature, elevation and latitude ranges (Gyug 2013b). Based on spatially explicit habitat data, the model generated predictions about the distribution and amount of suitable habitat across B.C., ranging from areas most likely to contain breeding pairs (class one) to those not likely (class six). The approximate area of habitat predicted to support breeding for the Lewis's Woodpecker in B.C. is over 4,500 km^2 (Gyug 2013a; Table 2). This is less than 10% of the global range for the species.

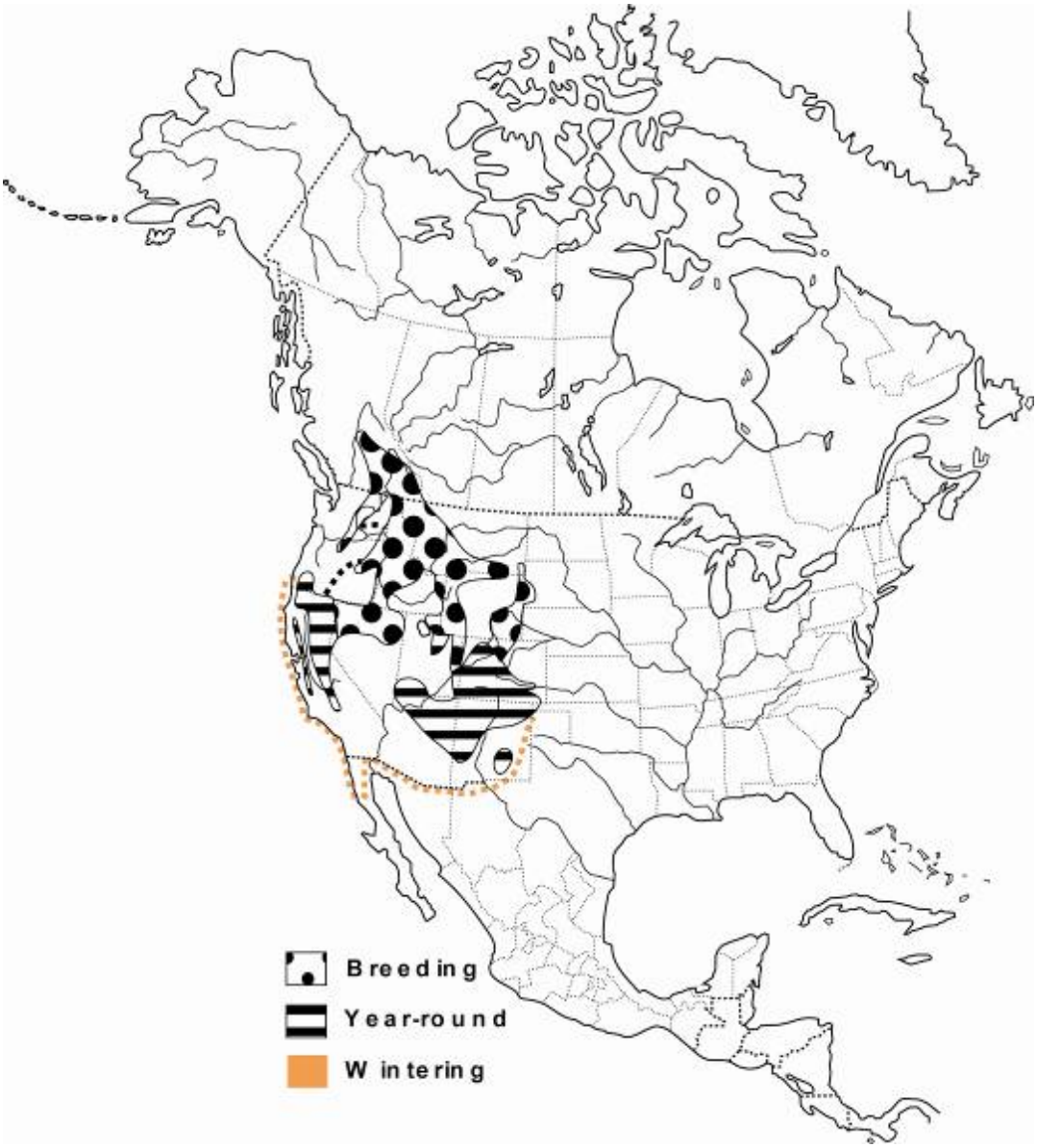

Figure 1. Global distribution of Lewis's Woodpecker. Polka dots show breeding season only (with the exception of rare wintering birds); horizontal lines shows year round distribution. The species winters irregularly south and west to the orange dotted line (Birds of North America Online 2005).

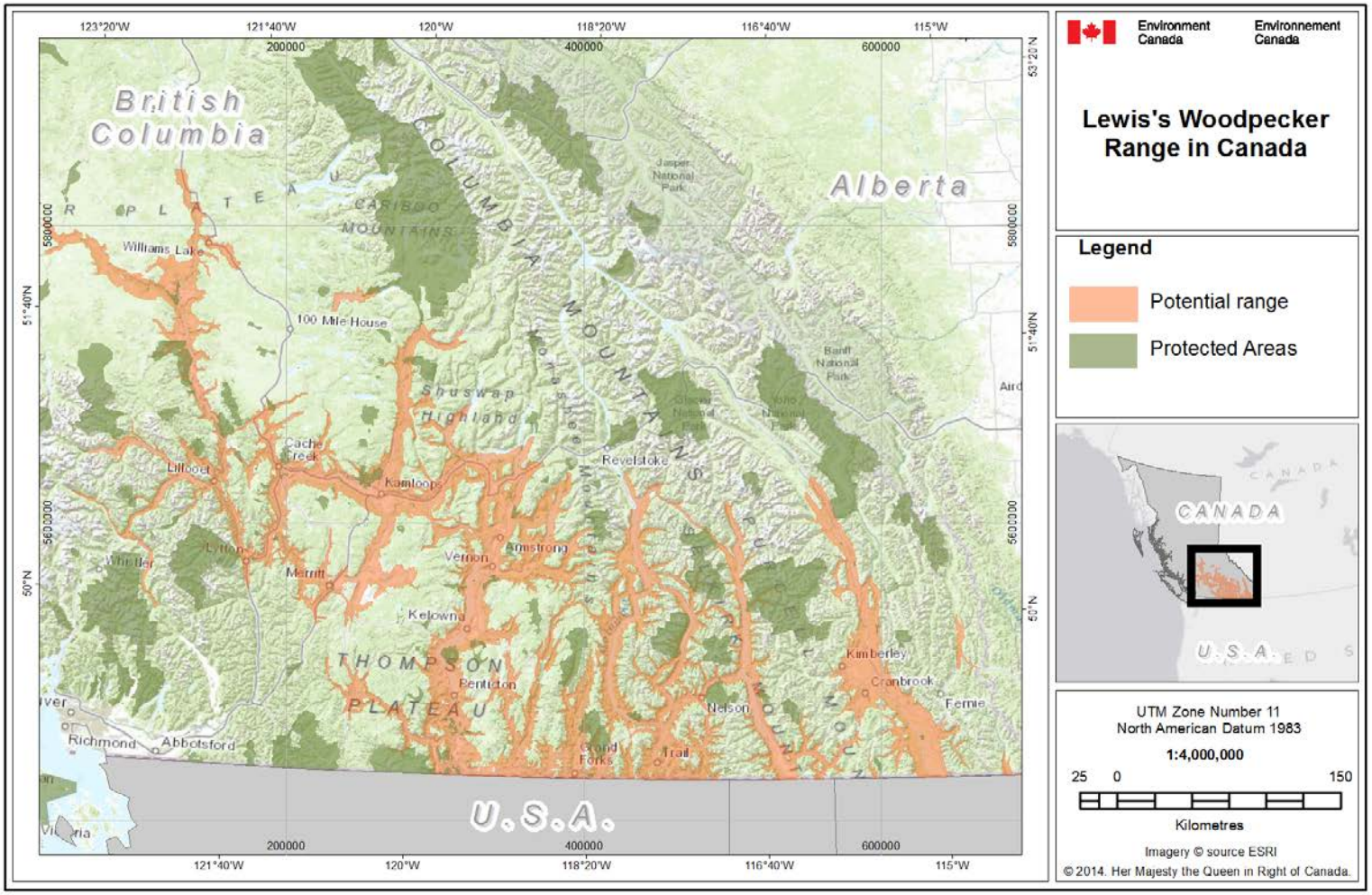

Figure 2. Range for Lewis's Woodpecker within British Columbia, based on >97% presence of all known nest sites within the biogeoclimate zone comprising overlapping mean annual precipitation, mean annual temperature, elevation and latitude ranges (Gyug 2013a).

Based on surveys conducted between 2006 and 2013, the total population of Lewis's Woodpeckers in B.C. is at least 371 pairs, although the actual population is likely significantly larger because estimates in the Thompson-Nicola and Okanagan-Similkameen are only partially complete (Table 2). The currently estimated population in Canada represents less than 1% of the species' global population. Surveys prior to 2011 were focused on obtaining information about occupied areas and suitable habitat, and were not specifically designed to determine population size. Starting in 2011, work was initiated to establish rigorous baseline population estimates for each region. Currently, the best available information on population size is derived from a combination of these opportunistic as well as more rigorous methods. Therefore, these are coarse estimates with significant uncertainty.

Table 2. Summary of Lewis's Woodpecker population estimates (2006-2013) and area (km^2) of habitat predicted to be suitable based on >97% presence of all known nest sites within the biogeoclimate zone comprising overlapping mean annual precipitation, mean annual temperature, elevation and latitude ranges, in each region of B.C.

Region and Subregion	Estimated # of nests/pairs[b]	Area[c]
Cariboo-Chilcotin	**10-20**	-
Thompson-Nicola	**>118 (71-204)**	**1967**
Fraser (Lytton-Lillooet)	*TBD*	*456*
Kamloops	*118 (71-204)*	*605*
Merritt	*TBD*	*255*
Spences Bridge	*TBD*	*291*
Savona-Cache Creek	*TBD*	*360*
Okanagan-Similkameen	**110-145**	**1450**
Central Okanagan	*TBD*	*381*
Similkameen	*TBD*	*429*
South Okanagan	*TBD*	*640*
Boundary	**173 (127-254)**	**235**
East Kootenay	**93 (53-199)**	**878**
West Kootenay	**0-15**	-
Total	**371-837**	**4531**

[b] Gyug (2013b) for Kamloops, Boundary, and East Kootenay estimates. Dulisse and Harrison (2013) for West Kootenay. Luszcz and Sawicz unpublished data (2007) for Cariboo-Chilcotin and Okanagan-Similkameen. Where available, means and 95% confidence intervals are shown (in brackets). Note that baseline estimation work has yet to occur within several subregions in the Thompson-Nicola and Okanagan-Similkameen (denoted by 'TBD').

[c] Habitat predicted to be of very low (class 5) or higher suitability based on the Gyug (2013a) model. The Gyug (2013a) model does not apply to the Cariboo-Chilcotin or West Kootenay; the area of potentially suitable habitat within those regions is currently unknown.

Although Breeding Bird Survey results suggest a significant range-wide decline of 2.9% (95% CI: -8.5 to -0.9%) per year between 1966 and 2011, there are insufficient data to provide credible trends for this species in Canada (Sauer et al. 2012).

In the East Kootenay region, 22% fewer nests were found in 2007 than in a survey of the same geographic area a decade earlier (Beauchesne and Cooper 2007). There is evidence that the species' range in Canada has contracted considering that extirpation of breeding populations has occurred in the lower Fraser River Valley and on Vancouver Island (Cowan 1940), in southwestern Alberta (Semenchuk 1992), and in the area surrounding Golden and Revelstoke, B.C. (Cooper et al. 1998). This range contraction is believed to be the result of habitat loss attributable to urban expansion, riparian flooding due to hydroelectric development, and fire suppression.

3.3 Needs of the Lewis's Woodpecker

Lewis's Woodpeckers are birds of open forest, riparian woodland or grassland with scattered trees (Vierling et al. 2013). In B.C., Lewis's Woodpecker breeding habitats currently include the following (Campbell et al. 1990, Cooper et al. 1998, Cooper and Beauchesne 2000, Cooper and Gillies 2000):

1. dry open Ponderosa Pine or Douglas-fir forests, and open grasslands, with fire-maintained features, low stem densities, veteran Ponderosa Pines or Douglas-firs, abundant wildlife trees, and rich herb and shrub layers;
2. mature to old riparian cottonwood stands typically adjacent to grassland, agricultural field, shrub-steppe, or open woodland habitats; or
3. recently burned (<30 years) Ponderosa Pine and Douglas-fir dominated forests with standing snags resulting from stand-destroying fires.

In B.C., the open forest and grassland, and riparian habitat types are typically found at <950 m elevation, whereas burned forest habitats can occur as high as 1265 m elevation (T. Antifeau, pers. comm. 2008, Cooper et al. 1998). A fourth habitat type found in the Georgia Depression (southeastern Vancouver Island and the lower Fraser Valley), open Garry oak forest, was historically used by Lewis's Woodpeckers for breeding (Campbell et al. 1990).

The presence of large trees in a state of partial to advanced decay for nesting (Vierling et al. 2013, Cooper and Beauchesne 2000; Zhu 2006) and relatively open areas for foraging appears to be essential for Lewis's Woodpecker (Bock 1970, Sousa 1983, Tobalske 1997, Cooper et al. 1998). Lewis's Woodpecker typically uses existing nest holes or natural cavities (Bock 1970, Saab et al. 2004; Zhu 2006), but will excavate its own cavities in highly decayed wood (Vierling et al. 2013). Unlike other woodpeckers, Lewis's Woodpeckers lack the skull structure and highly developed bill that facilitate wood excavation (Goodge 1972), which may explain their greater reliance on trees with existing cavities. Lewis's Woodpeckers will frequently re-use nest trees and often the same cavity (Linder and Anderson 1998, Cooper and Gillies 2000, Ferguson and Iredale 2007). In foraging areas, an understory layer of shrubs, grass or herbaceous cover that produces berries or provides habitat for insect populations is an important Lewis's Woodpecker breeding habitat component (Sousa 1983; Cooper and Beauchesne 2000). They will abandon breeding habitats if insect prey abundance is limited (Bock 1970).

Periodic fire in Ponderosa Pine forests is thought to be important in creating suitable habitat characteristics for Lewis's Woodpecker (Cooper and Gillies 2000, Saab and Vierling 2001), and fire suppression may represent a limiting factor affecting the abundance and reproductive success of the species in this habitat type (Saab et al. 2004, Gentry and Vierling 2007, Saab et al. 2007, S.M. Beauchesne unpubl. data).

In B.C., Lewis's Woodpeckers nest in live and dead coniferous and deciduous trees. Of 224 nests found in 2006, 70% were in dead trees, 28% were in live trees, and 2% were in utility poles (Luszcz and Sawicz 2007). Ponderosa Pine, Black Cottonwood (*Populus balsamifera*) and Douglas-fir are the most common nest tree species in B.C. (Luszcz and Sawicz 2007). Lewis's Woodpeckers also have nested in Western Larch (*Larix occidentalis*), Trembling Aspen (*Populus tremuloides*), and Paper Birch (*Betula papyrifera*; Cooper et al. 1998; Luszcz and Sawicz 2007). Historically, Lewis's Woodpeckers also nested in Garry Oak (*Quercus garyana*) trees in the Georgia Depression (Beauchesne and Cooper 2002).

Lewis's Woodpeckers are not strongly territorial; individuals sometimes nest semi-colonially or in close proximity to one another (Vierling et al. 2013). Nest distributions have been described as clumped (Linder and Anderson 1998; Vierling et al. 2013), and multiple active nests have been found in the same tree (Tashiro-Vierling 1994, Vierling 1997, Cooper and Beauchesne 2000). When territory defense does occur, it includes only the area around the nest cavity and immediate vicinity (Vierling et al. 2013). The size of territories (when birds are exhibiting territoriality) has not been recorded in B.C.. Territorial behaviour has been studied in Washington and Oregon, and an average territory size of 6.1 hectares (ha) per pair (equivalent to a 138 m radius circle around the nest) has been recorded (Thomas et al. 1979). Home ranges for Lewis's Woodpeckers may broadly overlap. Foraging flights of more than 1 km from the nest have been observed (S. M. Beauchesne unpubl. data, Newlon 2005). Analysis of the distance from first detections (during point count surveys) to nest locations for survey work completed in B.C. between 2011 and 2013 showed that detections (usually birds on foraging trips) were generally within ~400 m of their nest location (upper 95% confidence interval on the mean; n = 51; Environment and Climate Change Canada, unpublished data). This estimate has been supported by expert opinion (L. Gyug and J. Cooper, pers. comm.).

Most Lewis's Woodpeckers winter in pine-oak ecosystems of southern Oregon south to northern Baja California, Mexico. Loss of wintering habitat (oak woodlands and their acorns) in the southwestern U.S.A. may be as important to population declines in Lewis's Woodpecker as the loss of breeding habitat (C. Bock pers. comm. in Cooper et al. 1998). The few birds that do over-winter in B.C. typically use urban areas, orchards or vineyards (Siddle and Davidson 1991, D. Cannings, pers. comm.). The availability of storage sites for seeds or grains is an important habitat feature which may be provided by crevices in power poles or the bark of old cottonwoods (Tashiro-Vierling 1994, Tobalske 1997, Vierling 1997). Wintering habitat is considered limited due to the lack of available forage (Vierling et al. 2013).

4. Threats

4.1 Threat Assessment

Table 3. International Union for Conservation of Nature (IUCN)[d] threats summary for the Lewis's Woodpecker in Canada.

Threat		Impact (calculated)[e]	Scope (next 10 Yrs)[f]	Severity (10 Yrs or 3 Gen.)[g]	Timing[h]
1	**Residential & commercial development**	**Medium**	**Restricted (11-30%)**	**Extreme (71-100%)**	**High (Continuing)**
1.1	Housing & urban areas	Medium – Thompson-Nicola, OK-Similkameen, East Kootenay Low - Boundary, West Kootenay, Cariboo-Chilcotin	Restricted (11-30%) – Thompson-Nicola, OK-Similkameen, East Kootenay Small (1-10%) – Boundary, West Kootenay, Cariboo-Chilcotin	Extreme (71-100%)	High (Continuing)
2	**Agriculture & aquaculture**	**Medium**	**Restricted (11-30%)**	**Extreme (71-100%)**	**High (Continuing)**
2.1	Annual & perennial non-timber crops	Low Medium – OK-Similkameen	Small (1-10%) Restricted (11-30%) – OK-Similkameen	Extreme (71-100%)	High (Continuing)
2.3	Livestock farming & ranching	Unknown	Restricted (11-30%)	Unknown	High (Continuing)
4	**Transportation & service corridors**	**Low**	**Small (1-10%)**	**Extreme (71-100%)**	**High (Continuing)**
4.1	Roads & railroads	Low	Small (1-10%)	Extreme (71-100%)	High (Continuing)
4.2	Utility & service lines	Low	Small (1-10%)	Extreme (71-100%)	High (Continuing)
5	**Biological resource use**	**Medium**	**Restricted (11-30%)**	**Serious (31-70%)**	**High (Continuing)**
5.3	Logging & wood harvesting	Low Medium – East & West Kootenays	Small (1-10%) Restricted (11-30%) – East & West Kootenays	Moderate (11-30%) Serious (31-70%) – East & West Kootenays	High (Continuing)
6	**Human intrusions & disturbance**	**Low**	**Small (1-10%)**	**Moderate (11-30%)**	**High (Continuing)**
6.1	Recreational activities	Low	Small (1-10%)	Moderate (11-30%)	High (Continuing)
6.3	Work & other activities	Low	Small (1-10%)	Moderate (11-30%)	High (Continuing)

Threat		Impact (calculated)[e]	Scope (next 10 Yrs)[f]	Severity (10 Yrs or 3 Gen.)[g]	Timing[h]
7	Natural system modifications	**High**	**Large (31-70%)**	**Serious (31-70%)**	**High (Continuing)**
7.1	Fire & fire suppression	Medium High – East Kootenay	Restricted (11-30%) Large (31-70%) – East Kootenay	Serious (31-70%)	High (Continuing)
8	Invasive & other problematic species & genes	**High**	**Large (31-70%)**	**Extreme (71-100%)**	**High (Continuing)**
8.1	Invasive non-native/alien species	Unknown	Restricted (11-30%)	Unknown	High (Continuing)
8.2	Problematic native species	Unknown High – Thompson-Nicola	Unknown Large (31-70%) – Thompson-Nicola	Unknown Extreme (71-100%) – Thompson-Nicola	High (Continuing)
9	Pollution	**Unknown**	**Large (31-70%)**	**Unknown**	**High (Continuing)**
9.3	Agricultural & forestry effluents	Unknown	Large (31-70%)	Unknown	High (Continuing)
11	Climate change & severe weather	**Unknown**	**Pervasive (71-100%)**	**Unknown**	**High (Continuing)**
11.1	Habitat shifting & alteration	Unknown	Pervasive (71-100%)	Unknown	High (Continuing)
11.4	Storms & flooding	Unknown	Large (31-70%)	Unknown	High (Continuing)

[d] Classification of Threats adopted from IUCN-CMP, Salafsky et al. (2008).

[e] **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.

[f] **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%).

[g] **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%).

[h] **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

IUCN 1 Residential & Commercial Development

1.1 Housing & urban areas

Further habitat loss throughout much of the Lewis's Woodpecker's range in B.C. is anticipated , due to human population growth and expansion. Between 2013 and 2023, population size (and by extension, urban development) is predicted to increase by 8.9, 5.3, 4.4, 2.0, and 1.0% within the Thompson Nicola, Okanagan-Similkameen, East Kootenay, Cariboo, and Kootenay Boundary Regional Districts, respectively (Province of British Columbia 2013). Zoning data (2013) from the City of Kamloops and Regional District of the Okanagan Similkameen (RDOS) indicated that 1,895 and 4,124 ha of potentially suitable Lewis's Woodpecker habitat (classes 1-4, Gyug 2013a), respectively, fell within zones where commercial and residential development was possible. There were also 1,953 ha and 933 ha of potentially suitable habitat within development permit areas in Kamloops and the RDOS, respectively.

IUCN 2 Agriculture & Aquaculture

2.1 Annual & perennial non-timber crops

Within the Okanagan- Similkameen region alone over 5900 ha are devoted to fruit, berry, and nut orchards (B.C. Ministry of Agriculture and Lands 2006). The total area of land devoted to agriculture has increased steadily in the Okanagan-Similkameen region since 1996 (B.C. Ministry of Agriculture and Lands 2006). It is expected that this trend will continue. Zoning data (2013) from the City of Kamloops and the RDOS indicated that 22 and 7511 ha of potentially suitable Lewis's Woodpecker habitat (classes 1-4, Gyug 2013a), respectively, fell within areas zoned for agricultural development.

2.3 Livestock farming & ranching

Long-term or concentrated presence of livestock (impacting vegetation through both grazing/browsing and trampling) may degrade habitat by reducing herb and shrub layer quality with respect to insect production (Belsky et al. 1999;., Abele et al. 2004). In Arizona, insect species abundance was four to ten times higher in grazing exclosures compared to grazed habitat (Rambo and Faeth 1999). In a 1997 study of Lewis's Woodpeckers breeding in Colorado, Vierling found that birds avoided nesting in heavily grazed habitats and suggested that this was possibly due to low insect abundance.However, Vierling (1997) also found that in more lightly grazed areas, Lewis's Woodpeckers were actually more likely to select nest trees in grazed vs ungrazed habitats, suggesting that lighter levels of grazing could be beneficial. Given that livestock grazing could be either harmful or beneficial depending upon its impact to the vegetation (and consequently the capacity of the vegetation to produce insects), the population-level impact of this threat is currently unknown.

IUCN 4 Transportation & Service Corridors

4.1 Roads & railroads

Vehicular traffic increases the risk of mortality through collision, as evidenced by four documented cases for Lewis's Woodpecker between 1998 and 2008, and three cases alone in 2014 (S.M. Beauchesne unpubl. data; K. Baric pers. comm.; J. Hobbs pers. comm.; T. Luszcz, pers. comm.). Adult Lewis's Woodpeckers have been observed on occasion, feeding on insects, and drinking from puddles, on asphalt roads (R. Howie, pers. comm.; P. Rodriguez de la Vega, pers. comm.; K. Fort, pers. comm.), which may increase their risk of collision with vehicles. While no study has examined the significance of vehicle collisions for Lewis's Woodpeckers specifically, a recent analysis of mortality factors for all Canadian landbirds found that vehicle collisions were responsible for the fourth highest number of mortalities of the 27 factors examined (Calvert et al. 2013).

4.2 Utility & service lines

Construction is either underway or planned for a number of electrical, oil, and gas transportation infrastructure projects. This will be most significant in the Thompson-Nicola and Cariboo regions. The new electrical transmission infrastructure is also predicted to greatly increase the capacity for additional industrial development within the area (M. Sandy, pers. comm.). Zoning data (2013) from the City of Kamloops and the RDOS indicated that 256 ha and 162 ha of potentially suitable Lewis's Woodpecker habitat (classes 1-4, Gyug 2013a), respectively, fell within zones where industrial development was possible. An additional 14,643 ha of potentially suitable habitat fell within RDOS areas zoned for resource extraction (e.g., forestry, mining, etc.).

IUCN 5 Biological Resource Use

5.3 Logging & wood harvesting

Lewis's Woodpeckers are not currently considered to be threatened by commercial forest harvesting because the stand densities in their nesting habitats are too low for harvesting to be economically viable. However, there is considerable evidence illustrating the loss of Lewis's Woodpecker nest trees to firewood cutting, including trees with multiple nests, in the East and West Kootenay regions (Cooper et al. 1998; Beauchesne and Cooper 2007; T. Antifeau pers. comm.; Dulisse and Harrison 2013). This threat may be less of a concern in other regions, where firewood-cutting is suspected to be less prevalent (L. Tedesco, pers. comm.).

IUCN 6 Human Intrusion & Disturbance

6.1 Recreation activities

Increased human population on the west coast and in the southern interior of B.C. has led to increased activity in the remaining natural areas. Although Lewis's Woodpeckers in some areas have become de-sensitized to human disturbance, most birds are very

wary of people near their nest site, and will stay away from the nest until the intruder is no longer detected in the vicinity (COSEWIC 2010). Bock (1970) found that birds subjected to sustained disturbance occasionally deserted their nest. In addition, off-road recreational vehicle use has increased significantly in several regions in recent decades, particularly so in the East Kootenay. The Koocanusa Reservoir area, for example, is an important nesting area for Lewis's Woodpeckers but is also increasingly popular for off-road vehicle enthusiasts. Off-road vehicles have the potential to impact Lewis's Woodpecker habitat by damaging understory vegetation. Noise from off-road vehicles may also disturb birds during nesting, potentially altering foraging behavior (including nestling provisioning).

6.3 Work and other activities

Selective removal of current and future nest trees for human-safety, aesthetic, or other reasons can combine to have significant population-level effects (Fraser et al. 1999). Danger tree removal practices in forest management operations, in parks and protected areas with public access, along transportation and transmission corridors and on private lands continue to result in loss of suitable nest trees. Some accidental mortality due to vineyard netting has also been reported (Vellend and Connolly 1999).

IUCN 7 Natural System Modifications

7.1 Fire & fire suppression

Fire plays an important role in maintaining the open structure in Lewis's Woodpecker breeding habitats, and fire suppression in lowland Ponderosa Pine forests is believed to be a significant threat. Fire suppression leads to degradation of breeding habitat by allowing dense stands of young Ponderosa Pine to develop and by allowing invasion by Douglas-fir (Cooper et al. 1998). Fire suppression is believed to have contributed to the extirpation of Lewis's Woodpeckers from the Fraser River Valley area; Lewis's Woodpeckers were common in Vancouver and North Vancouver between 1920 and 1940 in areas that had been burned or logged, but disappeared as forests regenerated and ongoing fire suppression prevented new open habitats from being created (Cooper et al. 1998). In addittion, fuel management activities in areas occupied by Lewis's Woodpeckers can reduce habitat suitability by reducing the understory vegetation (particularly fruit-bearing trees/shrubs) that the birds rely on for food resources.

Stand-replacing fires in mature and old-growth forests can create new Lewis's Woodpecker habitat by creating open habitat with standing snags, but the quality of these burn habitats declines over time with post-fire succession (COSEWIC 2010). Therefore, if the rate of habitat creation via fire is lower than the rate of habitat degradation due to succession, suitable Lewis's Woodpecker habitat will decline in the long term. If the fires are too hot, they may completely destroy Lewis's Woodpecker nesting habitat.

Currently, the percentage of the population occupying burns (relative to the other habitat types) is disproportionately high in the East Kootenay region compared to the other regions, so ongoing fire suppression in that area may have a particularly high (negative) impact on the local population.

IUCN 8 Invasive & Other Problematic Species & Genes

8.1 Invasive non-native/alien species

Competition for nest cavities from introduced species (e.g., European Starlings *Sturnus vulgaris*) is frequently listed as a threat to Lewis's Woodpeckers (Campbell et al. 1990, Lewis et al. 2002, Galen et al. 2003, COSEWIC 2010). In the Okanagan, 43% of cavities used by Lewis's Woodpeckers in one year were occupied by earlier-nesting European Starlings in the following year (Zhu 2006). However, some sources indicate a level of tolerance between the two species, and even in the Okanagan example, there was no clear evidence that Lewis's Woodpeckers had actually been displaced by Starlings. In addition, Starling populations have been declining significantly in B.C. (-3.9% between 1966 and 2011; 95% C.I.: -5.0 to -2.7%; Sauer et al. 2012), so their potential impact has declined in recent years. Ongoing Starling control programs should continue to enforce this trend. Currently, the population-level impact of this threat is unknown.

8.2 Problematic native species

Pine beetle epidemics represent a significant current and potential threat to Lewis's Woodpecker habitat. Mountain and Western Pine Beetles (*Dendroctonus ponderosae and D. brevicomis*) have infested 83,325 ha of Ponderosa Pine forests within Lewis's Woodpecker's Canadian range (Maclauchlan et al. 2008). The area of potentially suitable habitat (classes 1-4, Gyug 2013a) within the infested area is over 12,000 ha. This may create a short-term supply of decaying trees suitable for nesting Lewis's Woodpeckers, but the length of time these trees remain suitable is far shorter compared to trees that died from other causes. Observations from the Thompson-Nicola region, where the infestation has thusfar been the most severe, suggest that almost all pine beetle-killed trees fall within a few years of death (T. Dickinson, T. Manning, J. Surgenor, pers. comm.). Given the extent of the outbreak within the Thompson-Nicola region (fatal infestation in nearly 100% of Ponderosa Pine), this will very soon result in a dramatic loss in nest tree availability. This is particularly notable in the Thompson-Nicola region where over 55% of known nests have occurred within Ponderosa Pine habitat types. It will be several decades before trees of a suitable size and decay class are available again to support nesting Lewis's Woodpeckers in many areas. Although similar levels of infestation have not yet been observed in the other regions, it is possible that this may happen throughout the range under future climate change scenarios.

IUCN 9 Pollution

9.3 Agricultural & forestry effluents

Lewis's Woodpeckers are mainly insectivorous during the breeding season (Tobalske 1997). The effects of pesticide use, both direct and indirect, on Lewis's Woodpecker are of particular concern in the fruit and grape growing regions of B.C. like the Okanagan and Similkameen valleys. Declines in insectivorous bird populations have been linked to an increased use of neonicitinoids (Hallmann et al. 2014). Currently, the population-level impact of this threat on Lewis's Woodpecker is unknown.

IUCN 11 Climate Change & Severe Weather

11.1 Habitat shifting and alteration and 11.4 Storms and flooding

Climate change may affect Lewis's Woodpecker populations in a variety of ways, including northward habitat shifts, earlier arrival on breeding grounds and earlier breeding initiation, and increased rates of habitat loss due to increases in the extent and severity of pine beetle outbreaks (Logan et al. 2003) and/or increases in high wind events (IPCC 2007), which may cause nest trees to blow down prematurely. Currently, the population-level impact of this threat is unknown.

5. Population and Distribution Objectives

The population and distribution objective is to maintain or increase the regional populations and the distribution of Lewis's Woodpeckers within Canada.

Rationale:

COSEWIC designated Lewis's Woodpecker as Threatened in part based on a small population size and (inferred) ongoing population decline (COSEWIC 2010). However, our estimates of the historical and current population size within Canada are uncertain[4], so it is not possible to set reliable numerical recovery targets at this time. The preliminary estimates of current baselines provided in Table 2 can be used as interim guidance for individual regions; however, it would be premature to reference those numbers explicitly within the overall objective before the more rigorous population estimation work is completed in all regions. Work to establish a reliable trend monitoring approach and more accurate baseline population estimates for all regions is currently underway.

[4] Preliminary work to establish rigorous population baselines in all regions (initiated in 2011) revealed significant uncertainty/inaccuracy in the previous population estimates (which were largely derived from opportunistic surveys). The population objective in the earlier management plan (Environment Canada 2014) was more precise/quantitative than was actually realistic, given the accuracy of the population size information available at that time. The current population and distribution objective (in this recovery strategy) better acknowledges/reflects that remaining uncertainty.

Reversing the decline of Lewis's Woodpecker may not be possible within all regions. In the Thompson-Nicola Region, a pine beetle edipemic has resulted in vast reductions in the availability of nest trees within open Ponderosa Pine habitats and it will not be possible to completely restore this habitat even with augmentation approaches such as nest box placement and fungal inoculation of remaining live trees; therefore, the only realistic objective for this region is to ensure that the overall population is maintained.

In other regions such as the Okanagan-Similkameen, Boundary, and East Kootenay, where the threats are more manageable, the objective is to increase the population and expand it back into areas it had previously occupied.

6. Broad Strategies and General Approaches to Meet Objectives

6.1 Actions Already Completed or Currently Underway

Habitat Protection

- Approximately 17,867 ha of the most suitable Lewis's Woodpecker habitat (suitability classes 1-4, Gyug 2013a) falls within existing provincial ecological reserves, parks, and protected areas.
- An acquisition in 2013 by the Nature Conservancy of Canada (NCC) in the South Okanagan includes 711 ha of suitable Lewis's Woodpecker habitat. Other NCC properties include 452 ha of suitable habitat. Properties held by the Nature Trust of B.C. include 3869 ha of suitable habitat.

Habitat Management

- As of December 2013, the Province of B.C had established 37 Wildlife Habitat Areas (WHAs) under the *Forest and Range Practices Act* (B.C. Ministry of Environment 2014) that included suitable habitat for Lewis's Woodpecker (5266 ha). An additional four WHAs are proposed for Lewis's Woodpeckers, covering 79 ha of suitable habitat.
- The South Okanagan Wildlife Management Area (WMA) was expanded in 2013, and contains 973 ha of suitable habitat. The McTaggart-Cowan WMA, established in 2013, contains 1760 ha of suitable habitat.
- The Rocky Mountain Trench Ecosystem Restoration Program (http://www.trench-er.com) is working to restore open grassland and open forest habitat using maintenance burns, understory slashing and prescribed burning between 2011 and 2017 in the Kootenays. Approximately 2140 ha of currently suitable habitat falls within this area (and more will become suitable as a result of the treatments). Similar work is taking place in the Cariboo-Chilcotin and Thompson-Nicola (J. Steciw and M. Sandy, pers. comm. 2013). Restoration work within riparian cottonwood

habitats is also planned within the Boundary Region (L. Tedesco, pers. comm. 2013).
- In the East Kootenay region, the Rocky Mountain Trench Ecosystem Restoration Program has been inoculating selected live trees with native heart rot fungi for the purpose of creating future wildlife trees for cavity-nesters. This work is being continued by the Fish and Wildlife Compensation Program (FWCP). Preliminary results have been encouraging; only three years after treatment three of the inoculated trees have already been excavated/occupied by primary cavity nesters.
- Approximately 22,685 ha of suitable Lewis's Woodpecker habitat falls within Important Bird Areas (although this designation does not protect or manage habitat directly, it promotes bird conservation through increasing awareness and generating support for local conservation initiatives).
- Environment and Climate Change Canada and B.C. Ministry of Forests, Lands, and Natural Resource Operations staff are working with the Granby Wilderness Society to map riparian cottonwood and identify priority sites for stewardship and restoration projects in the Boundary region (T. Luszcz, pers. comm. 2013).
- A watershed management plan for the Kettle and Granby river valleys is underway in the Boundary region (L. Tedesco, pers. comm. 2013).
- A nest-box program by Lake Windermere District Rod & Gun Club; will erect nest-boxes in 2015 and implement long-term monitoring program targeted at Lewis's Woodpeckers (R. Hoar, pers. comm. 2014).
- Columbia Wetlands Waterbird Survey program in the East Kootenay aims to establish an Important Bird Area (IBA), and Wildsight-Golden will partner with CWS to design and implement East Kootenay roadside surveys as part of the volunteer-based long-term monitoring program (R. Darvill, pers. comm. 2014).

Research and Monitoring

- A preliminary long-term trend monitoring strategy for Lewis's Woodpeckers in Canada was developed and piloted in 2011 (Gyug 2011). This built upon several prior inventory projects (Cooper and Beauchesne 2000; J. Hobbs unpubl. data; Dulisse 2006; Luszcz and Sawicz 2007; Jackett et al. 2007; Ferguson and Iredale 2007; Beauchesne and Cooper 2007; Nicola Tribal Association, unpubl. data). Work has continued in 2012, 2013, and 2014 to further test and adapt the strategy (Gyug 2013b).
- A habitat suitability model has been developed using habitat and occurrence data (collected as part of the trend monitoring strategy development), provincial climate and vegetation mapping, and orthophoto interpretation (Gyug 2013a).
- Research on Lewis's Woodpecker nest site selection and reproductive success was conducted in the South Okanagan in 2004 and 2005 (Zhu 2006). Another project was initiated in 2013 and continued to 2014 to evaluate habitat type-specific reproductive success and nest tree occupancy and survival in the South Okanagan and Boundary regions.
- The Wildlife Tree Stewardship Program Okanagan-Similkameen (WiTS-OS) has been monitoring Lewis's Woodpecker nest trees on private and other lands in the

South and Central Okanagan and Similkameen valleys since 2007 with the help of volunteers.

Outreach, Education, and Engagement

- A federal management plan for the Lewis's Woodpecker was published in 2014 (Environment Canada 2014). This plan contained an appendix of Best Management Practices.
- To encourage private landowners and naturalists to report sightings of Lewis's Woodpecker, fact sheets, articles and specific requests have been periodically distributed since 2006.
- Outreach and engagement with fruit and grape growers in the Okanagan and Similkameen Valleys has occurred between 2006 and 2013 through the Okanagan Similkameen Conservation Alliance and the South Okanagan Similkameen Stewardship Program.
- Outreach work is being undertaken with forestry companies operating in the Thompson-Nicola and West and East Kooteney regions (M. Sandy and T. Antifeau, pers. comm. 2013), with ranchers and First Nations in the Nicola region (C. Gill, pers. comm. 2013), and with private landowners in the Boundary region (T, Luszcz, pers. comm. 2013).
- The Garry Oak Ecosystem Recovery Team continues to distribute information on the extirpated Georgia Depression population including an informational insert in their field manual titled, *Species at Risk in Garry Oak and Associated Ecosystems in British Columbia* (GOERT 2003).

6.2 Strategic Direction for Recovery

Table 4. Recovery Planning Table

Threat or Limitation	Priority[i]	Broad Strategy to Recovery	General Description of Research and Management Approaches
IUCN 5.3 logging & wood harvesting; IUCN 6.3 work & other activities	High[j]	Threat mitigation	• Pursue initiatives to limit cutting of potential nest trees (e.g., enhanced danger tree assessment guidelines for municipalities)
IUCN 7.1 fire & fire suppression; IUCN 8.2 problematic native species	Medium		• Pursue habitat augmentation and restoration approaches where breeding habitat has been lost or degraded
All (except IUCN 8.2 problematic native species)	High	Habitat protection and management	• Protect[k] high quality habitat
All threats	High		• Encourage use of Best Management Practices (Environment Canada 2014)
IUCN 2.3 livestock farming & ranching; IUCN 5.3 logging & wood harvesting; IUCN 7.1 fire & fire suppression; IUCN 8.1 invasive non-native/alien species; IUCN 8.2 problematic native species (outside of the Thompson-Nicola); IUCN 9.3 Agricultural & forestry effluents; IUCN 11 climate change.	High	Research and monitoring	• Monitor populations to determine how severity of impacts change over time (e.g., ensure that impacts predicted to be low do not increase in severity to medium, high or very high) • Quantify the impacts of threats where severity is unknown
Knowledge gaps	High		• Implement a long-term monitoring strategy for establishing population trends and distribution within the range.
	Medium		• Collect information needed to understand the population-level impacts of future habitat supply (e.g., habitat type-specific reproductive success and nest tree occupancy and survival)
	Medium		• Identify life history stages that most limit population growth
	Medium		• Determine migratory routes and key wintering habitats and threats
	Medium		• Identify the spatial extents and important characteristics of foraging habitats

	Medium		• Evaluate the degree of connectivity between the populations in each of the Canadian regions
	Medium		• Monitor the effectiveness of existing management/protection measures (e.g., WHAs)
All threats	Medium	Outreach, education, and stewardship	• Work with existing stewardship programs and initiatives (including those acting on both private and First Nations land) to mitigate threats, conserve priority habitats, and gather additional information needed to guide species recovery (e.g., traditional knowledge)
Knowledge gaps; Threats on wintering grounds	Medium		• Collaborate with international partners to coordinate cross-border conservation efforts

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

[j] Even though this threat is ranked low in all regions except the Kootenays, mitigation of this threat is listed as a high priority because the retention of nest trees has the potential to result in a large, and positive impact on populations. Furthermore, the impact of this threat is likely to increase in the future, with increased salvage logging and tree removal due to disturbances such as beetle outbreaks in other regions (Thompson-Nicola and likely to spread to Okanagan-Similkameen, and others)

[k] This may include voluntary stewardship agreements, conservation covenants, sale by willing vendors on private lands, land use designations on Crown lands, and protection in federal, provincial and local government protected areas.

7. Critical Habitat

7.1 Identification of the Species' Critical Habitat

Section 41 (1)(c) of SARA requires that recovery strategies include an identification of the species' critical habitat to the extent possible, as well as examples of activities that are likely to result in its destruction. More precise boundaries may be mapped, and additional critical habitat may be added in the future if additional research supports the inclusion of areas beyond those currently identified. A primary consideration in the identification of critical habitat is the amount, quality, and locations of habitat needed to achieve the population and distribution objectives.

Critical habitat for the Lewis's Woodpecker is identified in the following 6 regions:

1. Okanagan-Similkameen (57,080 ha)
2. Thompson-Nicola (97,529 ha)
3. Boundary (12,962 ha)
4. East Kootenay (18,129 ha)
5. West Kootenay (2,910 ha)
6. Cariboo-Chilcotin (50 ha)

The area within which critical habitat for the Lewis's Woodpecker occurs was defined using a habitat suitability model (Regions 1-4), and nesting locations (Regions 5 & 6). The currently available data is insufficient to completely identify critical habitat in the Okanagan-Similkameen and Cariboo-Chilcotin regions. A schedule of studies (section 7.2) has been established to provide the information necessary to complete the identification of critical habitat needed to meet the population and distribution objectives. The identification of critical habitat will be updated when the information becomes available, either in an amended recovery strategy or in an action plan.

Identification of critical habitat using modeled suitable habitat (Regions 1-4)

The area within which critical habitat for the Lewis's Woodpecker occurs within the Okanagan-Similkameen, Thompson-Nicola, Boundary, and East Kootenay regions was identified using a habitat suitability model (Gyug 2013a), which includes all three broad habitat types: open Ponderosa Pine, riparian cottonwood, and burns. The model area was delineated based on provincial Mean Annual Temperature, Mean Annual Precipitation, latitude, elevation and Biogeoclimatic Ecosystem Classification variant mapping. The model area was then split up into 400 m x 400 m cells and relative suitability rankings were assigned to each cell in a step-down fashion using key Lewis's Woodpecker habitat attributes pulled from Vegetation Resource Inventory mapping, Digital Elevation Modelling, orthophoto interpretation, and field assessment (Gyug 2013a). Classes 1-4 ("very high" to "low"[5] suitability) of the model were deemed

[5] Categories of habitat suitability in the model are a relative ranking against provincial bench-mark sites which have very high densities of individuals. Therefore, the "low" habitat suitability category simply

necessary to support the current population because they included 85% of known nests (34% were contained in class 4 alone). For any known nest trees that fell outside of habitat classed 1-4 (i.e., the remaining 15% of the population), additional critical habitat was identified based on a radius equivalent to the estimated foraging distance (400 m) surrounding each tree.

Identification of critical habitat based on nesting locations (Regions 5 and 6)

The spatial coverage of the Gyug (2013a) model did not extend into the West Kootenay and Cariboo-Chilcotin regions. In the West Kootenay, the majority of recent nests have been located in a large burn situated along the Pend d'Oreille River southeast of Trail (Dulisse and Harrison 2013). Consequently, the entire Pend d'Oreille burn was identified as an area within which critical habitat occurs. Additional critical habitat was identified based on known nest trees (outside of the burn) surrounded by a radius equivalent to the estimated foraging distance (400 m). In the Cariboo-Chilcotin, survey intensity has been lower, so the locations of key habitats needed to support the population are not completely known. Consequently, critical habitat was identified based only on known nest trees surrounded by a 400 m radius. The remainder of the critical habitat in this region remains to be identified.

Biophysical attribute description:

Within the geospatial boundaries indicated in Figures 3-8, critical habitat is identified wherever the specific biophysical attributes required to support Lewis's Woodpeckers occur. The best current estimate of foraging distance is 400 m (based on Environment and Climate Change Canada, unpublished data and supported by expert opinion – L. Gyug and J. Cooper, pers. comm. 2014). Consequently, 400 m is considered to be the critical distance surrounding any known or potential nest tree within which key foraging habitat attributes must be present. Specific attributes of nesting and foraging habitat include:

Nesting:

- Known nest trees, alive or standing dead, occupied by Lewis's Woodpecker at any time in the past (includes some utility poles[6])

OR

means low suitability relative to the high suitability bench-marks, not low in absolute terms. "Low" suitability areas still possess the characteristics required to support nesting Lewis's Woodpeckers and do contain a large percentage of the population (34% of known nests, Gyug 2013a); however, there is much less certainty about the locations of the critical characteristics (and thus potential nests/territories) within those areas.

[6] Utility poles are selected for nesting when suitable natural alternatives are not available, therefore, in those cases, the poles are serving as a critical nesting structure for the species. However, this is a rare occurrence (<2% of nests found to date have been within utility poles).

- Potential nest trees, alive or standing dead[7]:
    - Ponderosa Pine, Black Cottonwood, or Douglas-fir (burned or not burned), Trembling Aspen, Paper Birch, Western Larch, or Subalpine Fir (*Abies lasiocarpa*); and
    - >30 cm dbh[8] in Ponderosa Pine or Black Cottonwood stands[9], or >24 cm dbh in burned stands; and
    - with cavities 5 cm in diameter or greater (Zhu unpublished data), or classified as decay class 2 or higher (Fenger et al. 2006) which are trees of a significantly advanced stage of decay to facilitate excavation by Lewis's Woodpeckers;

AND

Foraging (within 400 m of a known or potential nest tree [as defined above]):

- standing trees not exceeding 35% canopy closure (Zhu et al. 2012), to provide perching, foraging and food caching substrate; and
- presence of fruit-bearing shrubs and perennial grasses in an understory layer to provide food sources critical during the late breeding to post-breeding period. Presence constitutes a single fruit-bearing shrub (e.g., Saskatoon [*Amelanchier alnifolia*], currant [*Ribes* spp.], Chokecherry (*Prunus virginiana*)] or a 10 square meter or larger patch with >20% cover of perennial grasses. Any 10 square meter sample plot with perennial bunchgrass cover <20% is considered severely altered in British Columbia rangelands (Delesalle et al. 2009), so perennial grass cover >20% constitutes presence.

The area(s) containing critical habitat for Lewis's Woodpecker are presented in Figures 3-8. Critical habitat for Lewis's Woodpecker in Canada occurs within the shaded red or yellow polygon(s) (unit(s)) shown on each map where the critical habitat criteria and methodology described in this section are met.

[7] Potential nest trees include those that may already be used by the species for nesting (but where this has not been recorded/documented by Environment and Climate Change Canada) as well as those that are not yet being used but have the potential for use because they share common attributes with known nests. Both are critical for supporting the current nesting population, given that nest trees are a dynamic resource (falling/decaying beyond use and being replaced by new trees over time) and Lewis's Woodpeckers may use different trees within the same area from year to year.

[8] Based on 309 Lewis's Woodpecker nest trees with estimated or measured diameter at breast height (dbh) (Environment Canada, unpublished data). The dbh number given for both burned and unburned stands is the mean minus one standard deviation.

[9] Stand is "a community of trees sufficiently uniform in species composition, age, arrangement, and condition to be distinguishable as a group from the forest or other growth on the adjoining area, and thus forming a silviculture or management entity." Source: Haddon, B.D. (editor). 1988. Forest inventory terms in Canada. Part II. Glossary. Web edition updated 2005. Canadian Forest Services, Petawawa National Forestry Institute, Chalk River, Ont. < https://cfs.nrcan.gc.ca/termsl> Accessed August 2017.

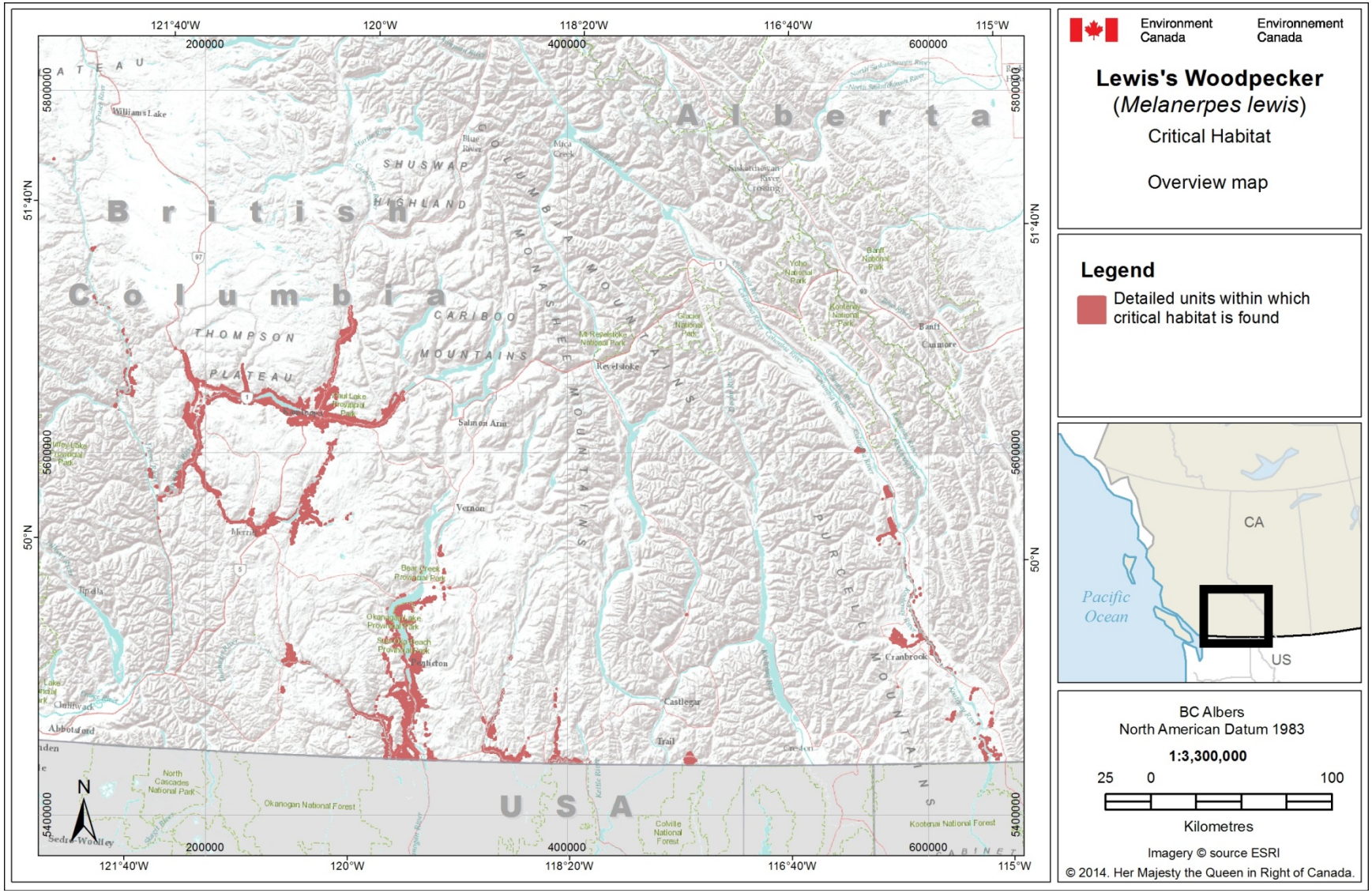

Figure 3. Critical habitat for Lewis's Woodpecker in Canada occurs within the red shaded units where the criteria and methodology set out in section 7.1 are met. USA landbase (shaded grey) is excluded.

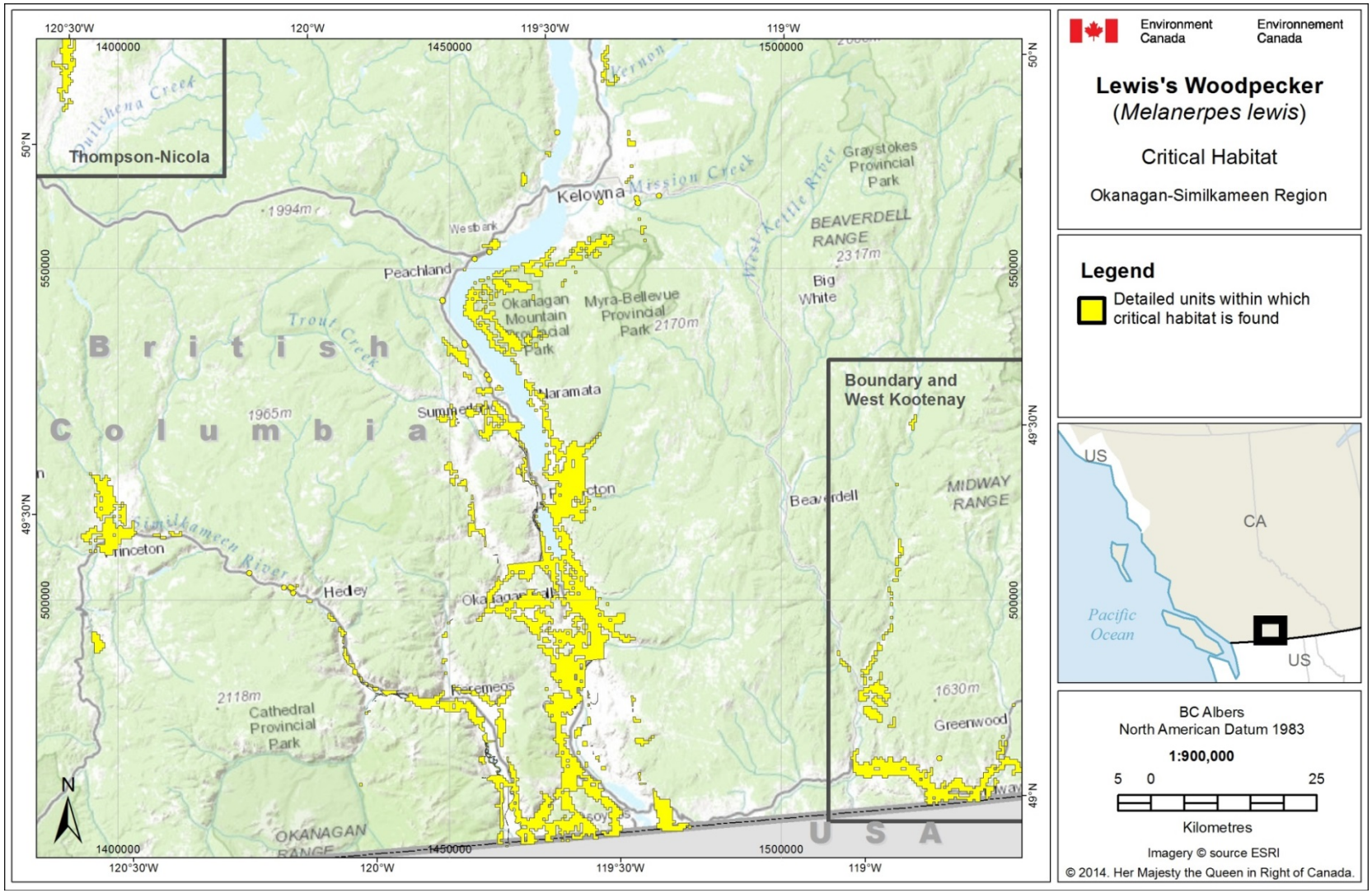

Figure 4. Critical habitat for Lewis's Woodpecker in the Okanagan-Similkameen region (Thompson-Nicola and Boundary regions are partially visible to the northwest and east) occurs within the yellow shaded units where the criteria and methodology set out in section 7.1 are met. USA landbase (shaded grey) is excluded. Critical habitat in this region includes two federally protected areas: Vaseux-Bighorn National Wildlife Area and Vaseux Lake Bird Sanctuary.

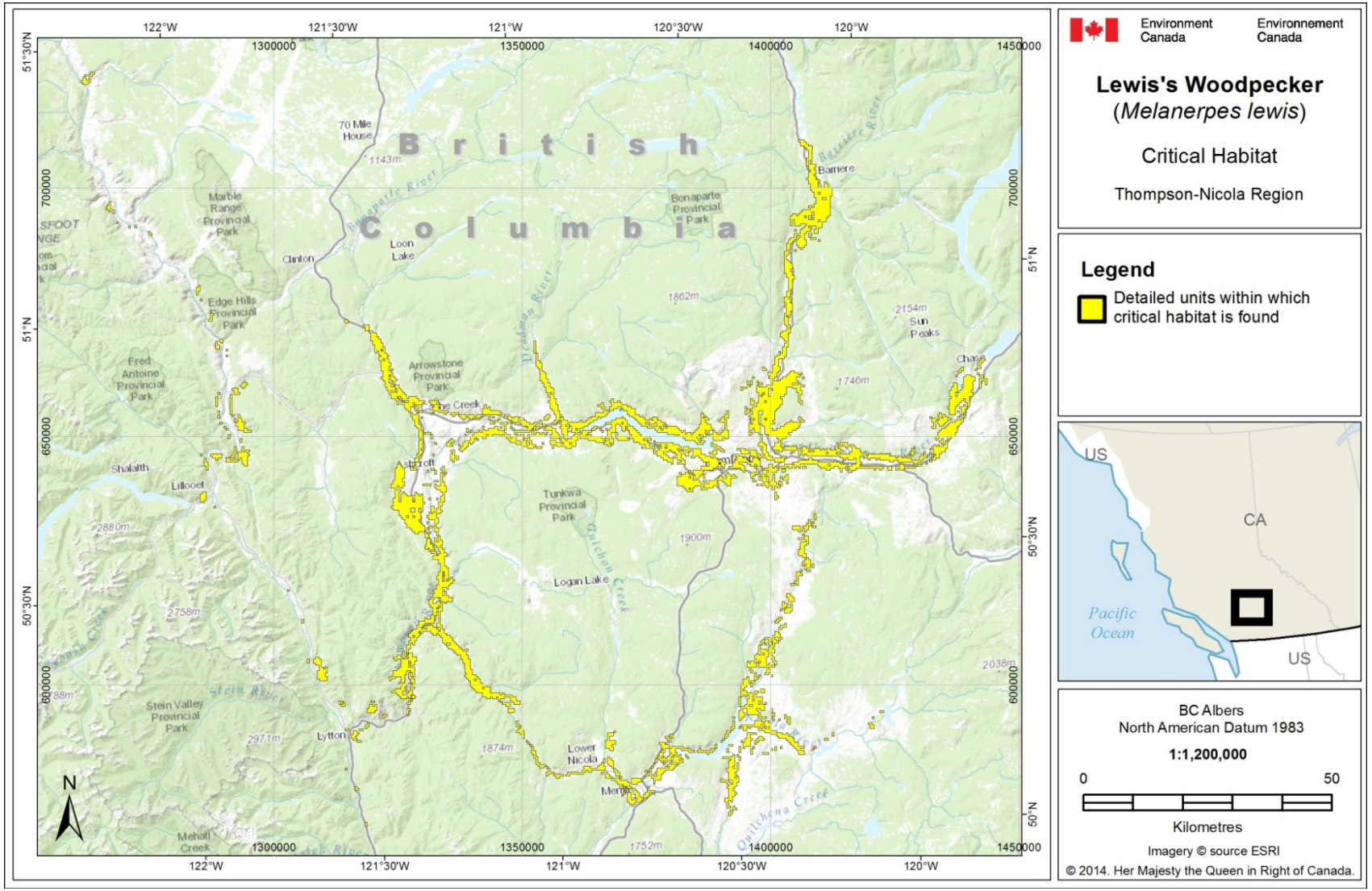

Figure 5. Critical habitat for Lewis's Woodpecker in the Thompson-Nicola region occurs within the yellow shaded units where the criteria and methodology set out in section 7.1 are met.

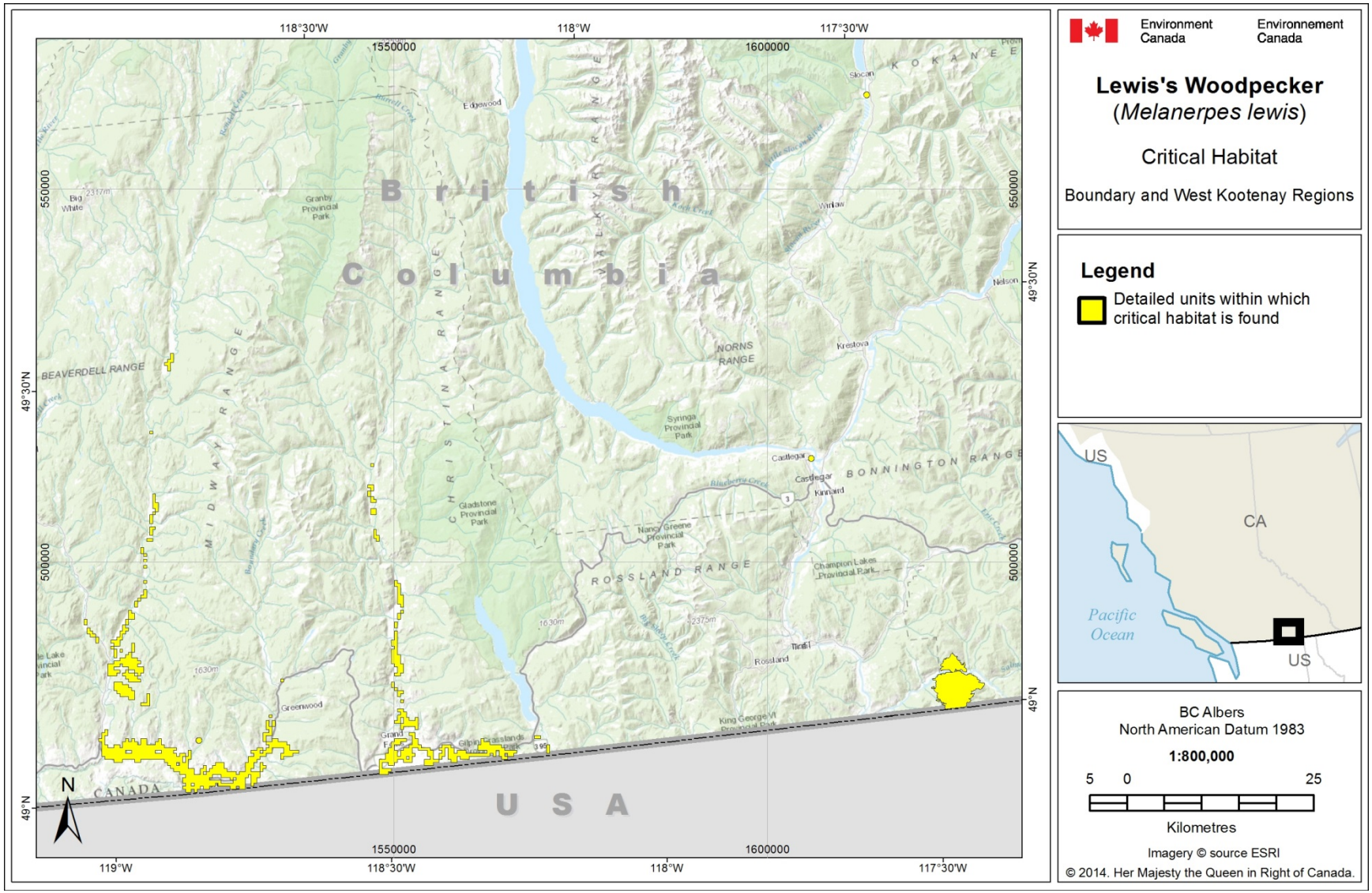

Figure 6. Critical habitat for Lewis's Woodpecker in the Boundary and West Kootenay regions occurs within the yellow shaded units where the criteria and methodology set out in section 7.1 are met. USA landbase (shaded grey) is excluded.

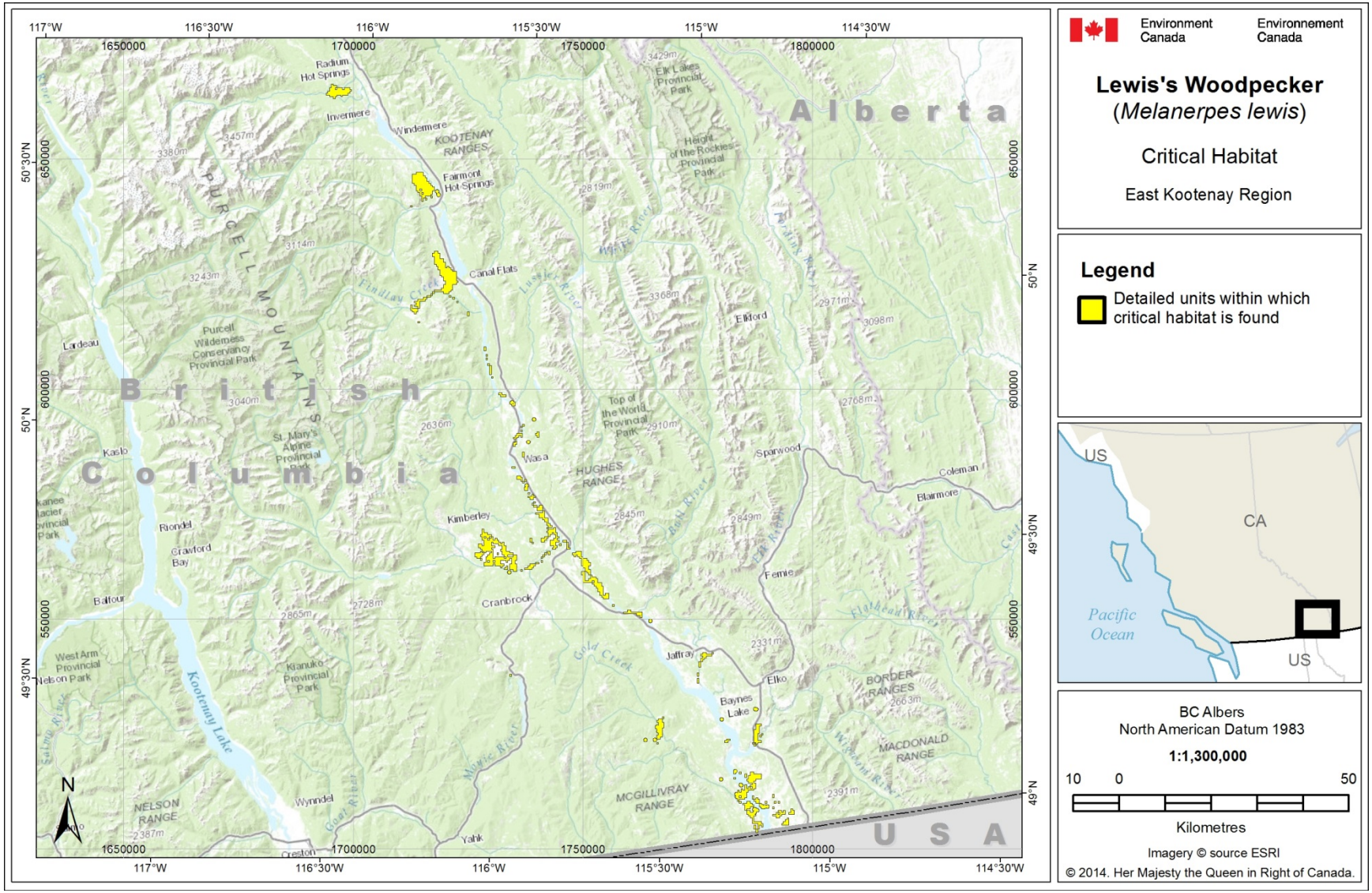

Figure 7. Critical habitat for Lewis's Woodpecker in the East Kootenay region occurs within the yellow shaded units where the criteria and methodology set out in section 7.1 are met. USA landbase (shaded grey) is excluded.

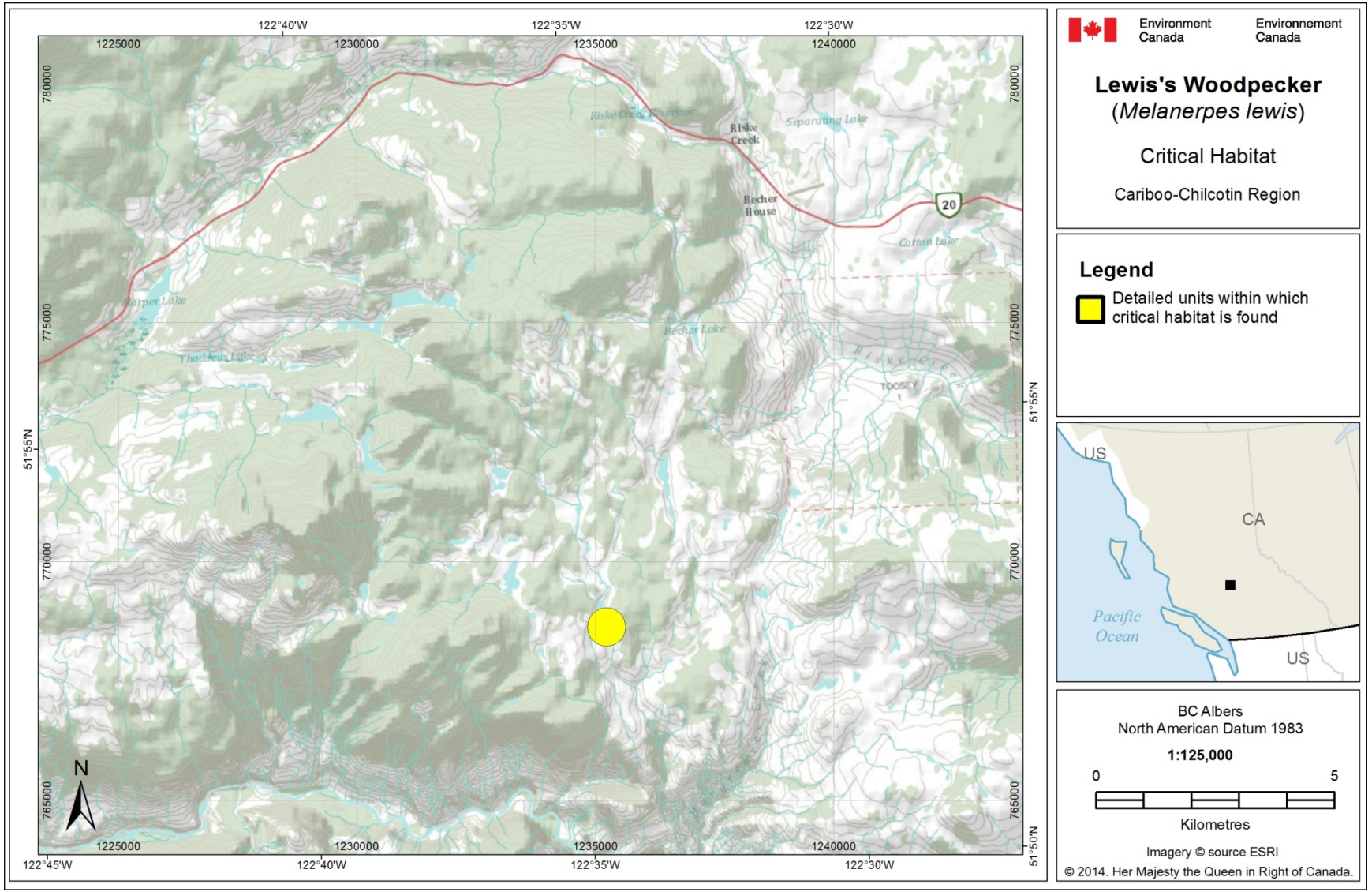

Figure 8. Critical habitat for Lewis's Woodpecker in the Cariboo-Chilcotin occurs within the yellow shaded units where the criteria and methodology set out in section 7.1 are met.

7.2 Schedule of Studies to Identify Critical Habitat

Table 5. Schedule of studies to complete the identification of critical habitat for Lewis's Woodpecker.

Description of Activity	Outcome/Rationale	Timeline
Complete additional surveys for Lewis's Woodpeckers and their habitats in the Cariboo-Chilcotin region.	Sufficient critical habitat to support the population and distribution objectives is identified in the Cariboo-Chilcotin region.	2017-2022
Work cooperatively with applicable organizations to complete the identification of critical habitat in the Okanagan-Similkameen region.	Critical habitat that is sufficient to support the population and distribution objectives is identified in the Okanagan-Similkameen.	2017-2022

Although the current identification of critical habitat is considered sufficient to support the population and distribution objectives in all regions except the Okanagan-Similkameen and Cariboo-Chilcotin, it is important to note that burned habitat is particularly dynamic. At regular intervals (at least every five years), burn information should be reviewed and newly burned areas that meet the critical habitat criteria should be considered for inclusion as critical habitat. Similarly, existing burned habitats that have lost their critical attributes (through natural succession) should be removed.

7.3 Activities Likely to Result in the Destruction of Critical Habitat

Understanding what constitutes destruction of critical habitat is necessary for the protection and management of critical habitat. Destruction is determined on a case by case basis. Destruction would result if part of the critical habitat were degraded, either permanently or temporarily, such that it would not serve its function when needed by the species. Destruction may result from a single or multiple activities at one point in time or from the cumulative effects of one or more activities over time (Government of Canada 2009).

Activities described in Table 6 include those likely to cause destruction of critical habitat for the species; however, destructive activities are not limited to those listed.

Table 6. Examples of activities likely to result in destruction of critical habitat for Lewis's Woodpecker.

Description of Activity	Description of Effect	Additional Information
Removal of any known nest tree[l] or modification of these trees (e.g., through topping or limbing) such that nesting cavities are no longer accessible.	This will result in direct loss of potential nesting habitat.	Related threats: IUCN 1.1 housing & urban areas, IUCN 2.1 annual & perennial non-timber crops, IUCN 4.2 utility & service lines, IUCN 5.3 logging & wood harvesting. Applies anytime. Some trees may be currently used but not known (due to imperfect survey coverage) and others have the potential to be used in the future.
Significant removal of 'potential nest trees'[m]	This can result in direct loss of nesting habitat because some of those trees may be currently used but not known (due to imperfect survey coverage) and others have the potential to be used in the future.	Related threats: IUCN 1.1 housing & urban areas, IUCN 2.1 annual & perennial non-timber crops, IUCN 4.2 utility & service lines, IUCN 5.3 logging & wood harvesting. Applies anytime.
Significant removal of standing mature trees within 400 m of a known or potential nest tree	This will result in loss of perching, foraging and food caching substrate.	Related threats: IUCN 1.1 housing & urban areas, IUCN 2.1 annual & perennial non-timber crops, IUCN 4.2 utility & service lines, IUCN 5.3 logging & wood harvesting. Applies anytime.
Replacement of open forest habitats (<35% canopy closure) with closed forest (>35% canopy closure).	Deliberate alteration of natural disturbance regimes can result in dense forest habitats that are not suitable for Lewis's Woodpeckers' aerial foraging.	Related threat: IUCN 5.3 logging & wood harvesting (reforestation), IUCN 7.1 fire & fire suppression. Applies anytime.
Significant clearing or destruction of understory vegetation (i.e., grass and shrub layers) within 400 m of a known or potential nest tree.	Significant clearing or destruction of understory vegetation can indirectly lead to loss of food resources and reduced foraging potential because understory vegetation is required to produce the insects that are consumed by Lewis's Woodpeckers.	Related threats: IUCN 1.1 housing & urban areas, IUCN 2.1 annual & perennial non-timber crops, IUCN 2.3 livestock farming & ranching, IUCN 4.2 utility & service lines, IUCN 6.1 recreational activities. Insect food resources are most critical during the spring pre-nesting and nesting period (April-July) and become less important during the post-nesting period (August-October), so removal outside of the breeding period may not result in destruction. However, if the method of removal results in the absence or significant reduction of vegetation by the following breeding season, this will likely result in destruction.

Description of Activity	Description of Effect	Additional Information
Significant removal or destruction of fruit-bearing trees/bushes within 400 m of a known or potential nest tree.	Significant removal of fruit-bearing trees and bushes can result in loss of food resources (fruits and berries), reducing foraging potential.	Related threats: IUCN 1.1 housing & urban areas, IUCN 2.1 annual & perennial non-timber crops, IUCN 2.3 livestock farming & ranching, IUCN 4.2 utility & service lines, IUCN 6.1 recreational activities. Fruits and berries are most critical during the late breeding and post-nesting periods (mid-June to October); however, winter removal of fruit-bearing trees and bushes would impact the critical habitat the following year because these plants are relatively long-lived perennials and are not able to re-grow within one year.

[l] Note that some, but not all known Lewis's Woodpecker nest trees (both existing/known and potential) are marked with Wildlife Tree signs.

[m] s defined in section 7.1.

Certain (potentially destructive) activities may be carried out in areas containing critical habitat for Lewis's Woodpeckers provided that measures are taken to avoid unacceptable impacts to critical biophysical attributes. Some suggested measures are provided in Appendix B. Proponents may also contact Environment and Climate Change Canada – Canadian Wildlife Service, Pacific and Yukon Region, for additional guidance.

8. Measuring Progress

The performance indicators presented below provide a way to define and measure progress toward achieving the population and distribution objectives.

- Trend monitoring indicates that populations in regions 1-6 are either stable or increasing by 2022.
- Monitoring of Lewis's Woodpeckers and their habitats at the range margins indicates that the range is either stable or expanding by 2022.

9. Statement on Action Plans

One or more action plans will be posted on the Species at Risk Public Registry within five years of the final posting of the recovery strategy.

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Appendix A: Effects on the Environment and Other Species

A strategic environmental assessment (SEA) is conducted on all SARA recovery planning documents, in accordance with the *Cabinet Directive on the Environmental Assessment of Policy, Plan and Program Proposals*[10]. The purpose of a SEA is to incorporate environmental considerations into the development of public policies, plans, and program proposals to support environmentally sound decision-making and to evaluate whether the outcomes of a recovery planning document could affect any component of the environment or any of the Federal Sustainable Development Strategy's[11] (FSDS) goals and targets.

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

Most of the measures listed in this recovery strategy (monitoring, research, and habitat protection) are not intrusive, so are not expected to have negative effects on non-target species. Enhancement and protection of habitat for Lewis's Woodpeckers should benefit or be neutral for most other wildlife species at risk associated with riparian cottonwood habitat (e.g., Western Screech-Owl [*Megascops kennicottii*]), open Ponderosa Pine forests (e.g., Flammulated Owl [*Otus flammeolus*]), and grasslands (e.g., Burrowing Owl [*Athene cunicularia*]). However, some habitat enhancement activities, such as prescribed burns, could negatively affect other species (e.g., rare plant species or wildlife species that prefer more closed forest structure). All sites will have to be carefully evaluated to determine which suite of species will benefit the most from restoration and management efforts. A balance will be required to ensure that all species have sufficient habitat areas for conservation and recovery.

[10] www.ceaa.gc.ca/default.asp?lang=En&n=B3186435-1
[11] www.ec.gc.ca/dd-sd/default.asp?lang=En&n=F93CD795-1

Appendix B: Best Management Practices to Minimize Impacts to Lewis's Woodpecker's Habitat

The following best management practices (BMPs) are provided as guidance to limit impacts to Lewis's Woodpecker's habitat. Whether a given activity has resulted in, or is likely to result in, the destruction of critical habitat will need to be assessed on a case by case basis. For further information on the application of these best management practices, for the prevention of critical habitat destruction, please contact Environment and Climate Change Canada – Canadian Wildlife Service, Pacific and Yukon Region. ECCC-CWS will work with individual sectors/groups to develop more detailed region- or industry-specific BMPs where needed.

Avoidance of destruction during vegetation management (as per Threats 4, 5, 7, and 8 in Table 3)

- Incorporate provisions for the maintenance of Lewis's Woodpecker critical habitat attributes into vegetation management planning
    - Plan all vegetation management activities for outside the nesting season (September – April)
    - Pre-map known nest trees within proposed management areas and flag for retention
    - Provide a mechanism for vegetation management crews to identify and flag potential nest trees
        - In very sparse stands (<10% canopy closure), flag all potential nest trees for retention
        - In higher-density stands (10-35% canopy closure), flag trees with the greatest potential suitability (e.g., Ponderosa Pine, Black Cottonwood, and burned trees [any species]; largest size classes) for retention
    - Where modification (e.g., topping or limbing) of known/potential nest trees is necessary, avoid cuts that remove or eliminate access to the nesting cavities
    - Where removal of mature trees within 400 m of a flagged known/potential nest tree is necessary, prioritize removal of smaller (<20 cm dbh) trees and non-preferred species (i.e., not Ponderosa Pine or Black Cottonwood)
    - Where understory vegetation brushing/clearing within 400 m of a flagged known/potential nest tree is necessary:
        - Use mechanical removal, rather than herbicides
        - Prioritize non-fruitbearing species for removal

Avoidance of destruction during urban/park management (as per Threats 1 and 6 in Table 3)

- Incorporate provisions for the maintenance of Lewis's Woodpecker critical habitat attributes into urban/park planning
    - Have potential danger trees within parks/urban areas assessed by a certified danger tree assessor following the protocol described in the *Wildlife/Danger Tree Assessor's Course Workbook* (Wildlife Tree Committee of B.C. 2012) so

that every effort can be made to retain wildlife trees as an alternative to removal
    - Re-route trails away from known nest trees

Avoidance of destruction in livestock operations (as per Threat 2 in Table 3)

- Incorporate provisions for the maintenance of Lewis's Woodpecker critical habitat attributes into range use plans
    - Manage grazing in critical habitat areas to provide for high-quality herb and shrub layers for insect production.
    - Do not concentrate livestock in critical habitat areas because concentrations of cattle may destroy known or potential nest trees.