

Breeding Distribution of the Lewis's Woodpecker in the East Kootenay Trench in Relation to Fire History

John M. Cooper

Manning, Cooper and Associates
1278 Laurel Road, Sidney, BC, V8L 5K8, Canada
jcooper@islandnet.com

Cameron Gillies¹

Manning, Cooper and Associates
1278 Laurel Road, Sidney, BC, V8L 5K8, Canada

ABSTRACT

The East Kootenay Trench of British Columbia was surveyed for nesting Lewis's woodpeckers (*Melanerpes lewis*) in June and July of 1997 and 1998. Forty-seven active nests were found in 1997, and 85 were found in 1998. Nest trees were mainly burned ponderosa pine and Douglas-fir snags. Nests occurred in 4 habitat types: burned coniferous forest, open mature ponderosa pine forest, grassland with isolated veteran ponderosa pines, and riparian cottonwood. Distribution of nests was clumped indicating that preferred habitat was not randomly distributed. In 1998, 59% of nests found were in burns that had suffered stand-destroying fires and 19% were in open, mature ponderosa pine forest with an obvious history of frequent fires. The remainder were found mainly in remnant ponderosa pine vets or riparian black cottonwood. Only a few hundred hectares of open mature ponderosa pine forest which is still suitable for breeding Lewis's woodpeckers exists in the East Kootenay Trench, but an estimated several thousand hectares of mature or older ponderosa pine stands could be enhanced for breeding habitat. An unknown percentage of these stands has likely become unsuitable for Lewis's woodpeckers because of in-filling of younger-aged trees. Currently, ponderosa pine or Douglas-fir forests that suffer stand-destroying fires provide the bulk of available breeding habitat.

Key words: black cottonwood, breeding habitat, Douglas-fir, East Kootenay Trench, fire, Lewis's woodpecker, *Melanerpes lewis*, *Pinus ponderosa*, ponderosa pine, *Pseudotsuga menziesii* var. *glauca*.

The Lewis's woodpecker (*Melanerpes lewis*) is an uncommon woodpecker of dry, open forests in the southern Interior of British Columbia (Campbell et al. 1990), where it reaches the northern limit of its range (American Ornithologists' Union 1983). A recent status report (Cooper et al. 1998) has suggested that populations are declining province-wide and, indeed, breeding populations have disappeared from the coast of British Columbia (Campbell et al. 1990). Consequently, the Lewis's woodpecker is on the provincial Blue List as a candidate species for designation as vulnerable (B.C. Ministry of Environment, Lands and Parks 1998).

This woodpecker requires open coniferous and/or deciduous forest with relatively large diameter dead or dying trees for breeding habitat (Sousa 1983). In British Columbia, most pairs build nests in large, decayed ponderosa pine (*Pinus*

ponderosa) or black cottonwood (*Populus balsamifera*) (Campbell et al. 1990) and tend to breed in valley bottoms and foothills rather than on mountain slopes. In general, burned ponderosa pine forest is considered optimal habitat (Tobalske 1997).

The status of the Lewis's woodpecker in British Columbia is relatively well known in the Okanagan/Thompson region (e.g., Cannings et al. 1987, Campbell et al. 1990). Small numbers were thought to breed in the East Kootenay region, but that population's distribution and abundance was uncertain (Cooper et al. 1998). Surveys were designed mainly to determine breeding distribution, habitat use, and potential for habitat enhancement in the East Kootenay Trench eco-section, but this paper addresses the relationship of fire history to breeding distribution.

STUDY AREA

The study was conducted in the East Kootenay region of southeastern British Columbia. Surveys were restricted to the East Kootenay Trench (EKT) eco-section from the Canada/U.S. border north to Spillamacheen. The EKT is a relatively narrow eco-section that runs roughly north/south

¹ Present address: Tierra Consulting, Box 245 Windermere, BC V0B 2L0

from the border to Golden and includes the valley bottom and lower slopes of the Kootenay River and Columbia River valleys. The EKT also contains all of the Ponderosa Pine (PP) biogeoclimatic (BEC) zone and virtually all of the Interior Douglas-fir (IDF) BEC zone in the Southern Interior Mountains Ecoprovince (Demarchi 1995).

The PP zone occurs at the lowest elevations, is dry and very warm in summer, and has forest dominated by ponderosa pine. Stands are often open and stand structure is strongly affected by fire. Open grasslands occur frequently. Douglas-fir (*Pseudotsuga menziesii*) occurs on moister sites, trembling aspen (*Populus tremuloides*) occurs in riparian areas, and black cottonwood occurs on floodplains. The IDF zone occurs from the valley up to about 1,400 m in the EKT, is dry and warm in summer, and has forest dominated by Douglas-fir. At lower elevations and on dry sites ponderosa pine occurs frequently. Lodgepole pine (*Pinus contorta*) and western larch (*Larix laricina*) occur frequently in stands with frequent crown fires. Grasslands also occur frequently (Meidinger and Pojar 1990).

METHODS

The EKT was surveyed for nesting pairs in June and July of 1997 and 1998. We surveyed areas where we knew breeding occurred (from existing data or communication with knowledgeable persons), or in areas that appeared to have suitable habitat. About 125 person-days of surveys were conducted over the 2 years.

We believe that most areas in the EKT with suitable habitat were surveyed at least once, and that in 1998, we had surveyed all areas with concentrations of breeding pairs, unlike in 1997. Therefore, rather than combining results from 1997 and 1998, results from 1998 are considered to more accurately reflect real breeding distribution.

Nests were found by (1) either searching suitable habitat for adult birds, then, once having located them, watching until they returned to the nest cavity; or (2) by walking through suitable habitat and tapping on snags with cavities to flush birds from their nest. Lewis's woodpeckers are relatively wary compared with most other woodpeckers in British Columbia, and most birds on nests left their cavities as we approached the nest tree. Birds that were feeding young would be cautious about returning to their nests if we were nearby. In some cases, nests were easily located, in others, repeat visits were required to locate the nest tree.

Data on nest trees and associated habitat were collected as required on the provincial Ecosystem Field Form and Wildlife Tree Assessment Form. Data on fire history and extent of ponderosa pine forest in the East Kootenay Trench were obtained from files at the British Columbia Ministry of Forests, Research Branch.

RESULTS

DISTRIBUTION OF BREEDING AREAS

Breeding localities were distributed within the EKT from near Invermere, south to Newgate near the Canada/U.S. border. Forty-seven nests were found in 1997 and 85 were found in 1998; 60% of the 1997 nests were reoccupied in 1998. Most nests in 1998 were concentrated in 4 areas: Finlay Creek Burn (36%), Newgate (21%), Wycliffe (13%), and Dutch Creek Burn (8%). The remaining nests were found from Ta Ta Creek and Wasa north to Skookumchuck (9% in scattered locations), at the Fairmont Golf Course (7%), and east of Lake Koocanusa (5%) (Fig. 1). Most nests were clumped in a few general locations within the EKT and large tracts of the EKT appeared to have no breeding pairs.

Nests were found from valley-bottom elevation of 750 up to 1,110 m; 79% of nests were found between 750 and 1,000 m, and 21% were found between 1,000 and 1,110 m. All nests above 1,000 m were in burns. Fourteen of the 18 nests found above 1,000 m were in the Finlay Creek Burn. In this burn, a few birds were observed at elevations above 1,200 m, but no nests were found. We concluded that those birds may have been nonbreeders, or failed breeders, that may have moved to slightly higher elevations to forage. No birds were found above 1,200 m, even in large burns that appeared to provide usable habitat. For example, the Ram Creek Burn, which is about 15 km southeast of the Finlay Creek Burn and burned in the same year, destroyed most stands and created many square kilometres of open habitat with numerous snags. This burn is above 1,400 m and no nesting birds were found.

BREEDING HABITAT

General Breeding Habitat Classes

Nests were found only in the PP (38%) and IDF (62%) zones. Nest trees occurred in 3 broad habitat classes: ponderosa pine (37%), Douglas-fir/ponderosa pine (53%), and riparian (10%). Nesting habitat was also classified in a more descriptive manner: recent (<30 years) burns that had a stand-destroying fire (59%), open ponderosa pine forest (19%), riparian (13%), and grassland with scattered trees (8%) (Table 1).

Near Wycliffe, Wasa, and Ta Ta Creek almost all habitat depends on large dead or decayed ponderosa pine nesting trees, which are rare habitat features. At Finlay Creek, Dutch Creek, and east of Lake Koocanusa, almost all habitat is associated with stand-destroying burns that have left numerous snags for nesting. The only location where nesting occurs in open, repeatedly burned but live ponderosa pine forest is near Newgate.

Nest Trees

Most nests were found in ponderosa pine (40%) or Douglas-fir (35%) trees or snags, but also in trembling aspen (7%),

paper birch (*Betula papyrifera*) (5%), black cottonwood (4%), power poles (4%), or western larch (4%). Nest trees tended to be relatively large and decayed. Of 34 ponderosa pine nest trees, 21 were dead (12 were burned) and 13 were live. Of 30 Douglas-fir nest trees, 29 were burned and dead, and 1 was live but deformed (by lightning). We found noticeable differences in mean tree height, diameter at breast height (dbh), cavity height, presence of bark, and decay class between ponderosa pine and Douglas-fir nest trees. Ponderosa pine nest trees were taller (15.5 vs. 8.5 m), had larger dbh (59 vs. 48 cm), and were less decayed (3.5 wildlife

tree decay class vs. 6.2) compared with Douglas-fir nest trees. Much of this difference is explained by all but one Douglas-fir nest tree being burned, dead, and decayed whereas many ponderosa pine nest trees were live or in very large dead vets.

Extent of Suitable Habitat

The EKT runs more or less north/south through 3 timber supply areas (TSAs). Estimates of forest area with ponderosa pine as the leading tree species in the 3 TSAs are Golden, 0 ha; Invermere, 5,448 ha; and Cranbrook, 21,185 ha. These

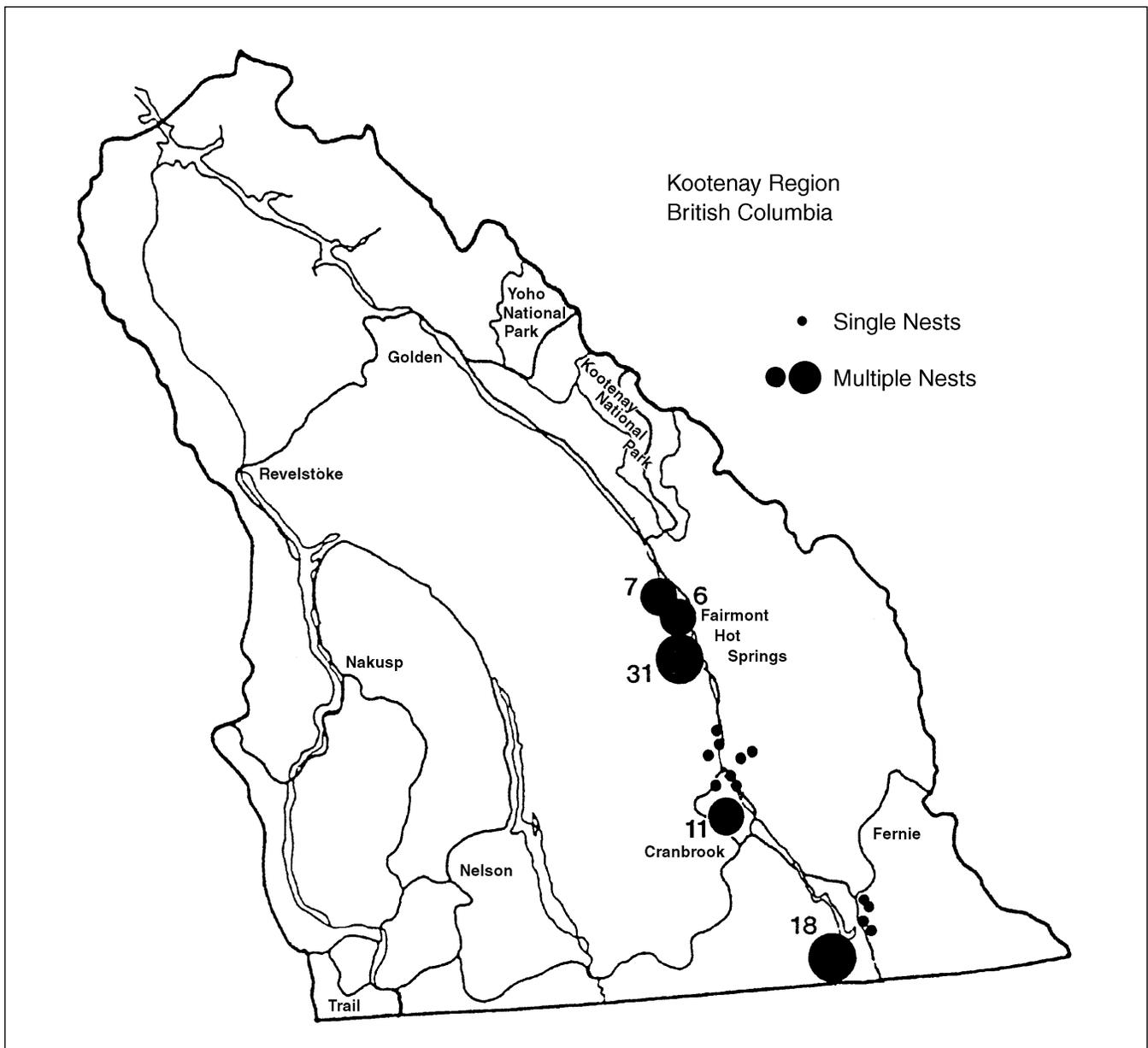


Figure 1. Locations of 85 Lewis's woodpecker nests in the East Kootenay Trench, 1998.

Table 1. General habitats used by nesting Lewis's woodpeckers, 1998.

	All nest trees	Pond. pine	Douglas -fir	Western larch	Black cottonwood	Trembling aspen	Paper birch	Utility pole
<i>Biogeoclimatic zones</i>								
Ponderosa pine	32	18	8	0	1	4	0	1
Interior Douglas-fir	51	16	22	3	2	2	4	2
<i>Broad habitat class</i>								
Black cottonwood riparian	8	0	0	0	3	1	4	0
Ponderosa pine	31	18	8	0	0	4	0	1
Douglas-fir/Ponderosa pine	44	16	22	3	0	1	0	2
<i>General habitat description</i>								
Riparian	11	3	0	0	3	1	4	0
Grassland ^a	7	5	0	0	0	1	0	1
Open forest ^b	16	8	3	0	0	4	0	1
Recent burn ^c	49	18	27	3	0	0	0	1

^a Open grassland with very scattered trees.

^b Open stand with fire history.

^c Stand-destroying burn <30 years old.

estimates are for Crown land only, and do not include stands on private land. Of the stands on Crown land, 17% (3,611 ha) in the Cranbrook TSA and 21% (1,143 ha) in the Invermere TSA are mature or older (>120 years) (B.C. Ministry of Forests 1998).

Considerable but unknown numbers of ponderosa pine occur on private lands in the EKT. Almost all of the largest (>80 cm dbh) snags used for nesting grew on private lands. Most of these trees were at the edge of open grasslands or farmlands.

FIRE HISTORY IN THE EKT AND LEWIS'S WOODPECKER OCCURRENCE

Between 1969 and the early 1990s, 44 fires >20 ha in size occurred in the EKT between the border with the United States and Brisco. Most fires were caused by human activity (31) or lightning (11) (B.C. Ministry of Forests unpubl. data). Many

of these burns did not appear to have suitable habitat for Lewis's woodpeckers, and some were not surveyed because of access problems. Nine of the burns have habitat suitable for breeding but only 4 contained breeding pairs. One additional area that burned before 1969 (Wolf Creek) contained 1 breeding pair (Table 2).

DISCUSSION

Fire strongly influences the ecology of the PP and IDF zones. Stand-maintaining surface fires were common, occurring on average every 5–15 years in the PP zone; and on average every 10–20 years in the IDF. Crown fires are rare in the PP zone, but occur in the IDF on average every 150–250 years (Daigle 1996). Surface fires are relatively low intensity fires that burn surface debris, kill shrubs and seedlings, thin out

Table 2. Burned areas that appeared to contain suitable breeding habitat for Lewis's woodpeckers (LEWO), year and cause of fire, and numbers of nests found.

Burn location	Year of fire	Cause	Maximum no: LEWO nests found 1997 or 1998
Dutch Creek	1971 (1985)	Human	9
Finlay Creek	1985	Human	31
Lake Enid	1994	Unknown	0
Ram Creek	1985	Lightning	0
Wolf Creek	1957	Human	1
NW Marysville	1979	Human	0
St. Mary's Reserve	1963	Human	0
Wild Horse River	1986	Human	0
E Baynes Lake	1982	Human	2
Newgate	1970	Lightning	18

younger stands, burn off lower branches of larger trees, yet rarely kill larger trees. The result includes higher crowns, branchless trunks, more widely spaced and larger trees, open understories, and open space under the canopy, all features that seem to be preferred by nesting Lewis's woodpeckers.

Fire history explains much of the distribution of nesting Lewis's woodpeckers. All of the breeding pairs found near Dutch Creek (7 pairs) and Finlay Creek (31 pairs) were in areas that had suffered stand-destroying fire. In the Dutch Creek Burn, nesting birds used mainly decadent snags left standing after the 1971 burn. This burn has long been known to be a "hot spot" for nesting Lewis's woodpeckers (Cooper et al. 1998). However, snags used for nesting are in soft condition and will fall soon. In addition, regenerating forest will fill in the open spaces that Lewis's woodpecker requires. Both of these inevitabilities will make the Dutch Creek Burn unsuitable habitat for breeding. At Finlay Creek, all 31 nests were found in the 1985 burn, and 25 of those nests were concentrated within a 600-ha section.

At Newgate, breeding pairs (18 pairs) occurred in 1 of 2 types of habitats. Some nests were in burned forest (1970) where a few snags remained standing amidst wide open spaces. These burned snags are fragile; one of the 1997 nesting sites and several potential nest sites had fallen or were knocked over between the 1997 and 1998 field seasons. The rest of the nest sites were in live ponderosa pines in open stands or clumps that had obvious fire history (repeated quick fires that destroyed undergrowth but did not kill the mature trees). These stands looked to have had many small (<20 ha so did not appear in the B.C. Ministry of Forests database), low intensity fires (stand structure consistent with that resulting from repeated fires every 5–20 years).

Extent of Suitable Habitat

Open ponderosa pine stands are extremely scarce in the East Kootenay Trench. They are created through repeated low-intensity fires that occur every 5–20 years. For example, a site at Lake Koocanusa showed a mean fire interval of 6.8 years, and a site near Canal Flats showed a mean fire interval of 20.6 years (Daigle 1996). Probably the best and most perpetual, Lewis's woodpecker nesting habitat in the study area was in the Strauss Wildlife Reserve near Newgate, where repeated fires have created the conditions previously described. We estimate that of the about 4,700 ha of mature or older ponderosa pine in the EKT, only a few hundred hectares have habitat attributes suitable for breeding Lewis's woodpeckers. The remainder are thought to be unsuitable mainly because stem densities and canopy closure are too high.

Burns with stand-destroying fires supply considerable suitable breeding habitat, as shown by concentrations of nests at Dutch Creek Burn, Finlay Creek Burn, and parts of Newgate. But these habitats are temporary. Several studies have shown that burns are typically used from a few years

after the fire to about 40 years post-fire (Boek 1970, Tobalske 1997, Linder and Anderson 1998). In the EKT, most burned areas are providing temporary breeding habitat because nest trees are dead and will fall soon. Assuming that fires will be suppressed, regenerating forests will choke the open spaces. Two of these areas last had fires in 1970 and 1971; nesting trees in both areas are fragile.

In the Okanagan Valley, 44% of nests were found in black cottonwoods (Cannings et al. 1987), whereas we found only about 4% in black cottonwoods in the EKT. In the Okanagan Valley, that result was thought to be partially influenced by observer bias towards searching of riparian areas for nests. In the East Kootenays, conversely, observer bias favoured coniferous forest, as riparian areas were largely inaccessible. However, several apparently suitable stands of black cottonwoods (e.g., St. Mary River, Elk River, Bummars Flats, Bull River, Baynes Lake) were surveyed and nesting Lewis's woodpeckers were found in only 1 stand. The limited data indicate that riparian forest is used less for nesting in the EKT than in the Okanagan Valley.

We found no Lewis's woodpeckers in 3 areas in the EKT that appeared suitable. The most puzzling of these was the lack of nesting pairs found on the east side of Lake Koocanusa. This area is directly across the lake from Newgate, where many pairs nested. Although unused nest holes were found in several areas with seemingly usable habitat, only 1 nest was found—in a small trembling aspen. A burn along the lower foothills of the Wild Horse River, near Fort Steele appeared to offer ideal habitat—hundreds of dead snags spread out over a large low elevation open area. We anticipated finding breeding pairs there but none was found in 1997 or 1998. An area near Wasa contained 2 apparent nest cavities but no birds were seen in 1997 or 1998.

MANAGEMENT IMPLICATIONS

Most nests were found on Crown land, including the areas with relatively high concentrations of nesting pairs. Management of these areas could, therefore, provide for Lewis's woodpecker breeding habitat. The most desirable habitat type is probably open and mature ponderosa pine forest. If relatively frequent fire regimes are allowed, this type of habitat may be maintained at various localities in the PP and IDF zones.

Breeding habitat could be enhanced through mechanical brushing of stands with mature stems but which are "choked" with regeneration, followed by selective logging of some stems, and, possibly, prescribed burning. Many hundreds of hectares could probably be enhanced for Lewis's woodpecker breeding habitat by these methods. Of an estimated 4,700 ha of mature or older ponderosa pine in the Invermere and Cranbrook TSAs, only a few hundred hectares could be currently classed as suitable habitat.

Some management potential for habitat on private land also exists. Many of the largest remaining ponderosa pine snags in the EKT occur on private lands. Most landowners were pleased that a rare woodpecker was living on their property; therefore public education may be used to encourage landowners to retain important habitat features such as large, decayed ponderosa pines. While these individual snags may stand for some time, they are exceedingly rare in the area, and are subject to cutting for firewood, as possible danger trees (for those trees near buildings), or for "aesthetic" reasons at the discretion of the landowner. Because most large ponderosa pine have been removed, once the trees with active cavities fall, there will be no live, large ponderosa pine trees to replace them, and pairs must either use alternate tree species or age classed, or not nest in the area.

Improved management following stand-destroying fires could help conserve breeding habitat for Lewis's woodpeckers. Standing burned trees are frequently harvested for timber or firewood, and areas are replanted. In the Finlay Creek and Dutch Creek burns, both of which were harvested post-burn, nesting Lewis's woodpeckers are often found only in the few remaining large diameter snags. Retention of more snags would increase the availability of potential nest trees. This could be best accomplished by leaving more snags during post-burn harvesting, and blocking road access to discourage firewood cutting.

If fire frequency remains low, then the relatively small amount of open and mature ponderosa pine forest in the EKT will inevitably decline and possibly disappear. In the long term, reduced fire decreases the health of fire-dependent ecosystems by making areas more susceptible to stand-destroying fires, and by changing diversity of plants and animals that occur there. Ultimately, Lewis's woodpecker may become even more dependent on stand-destroying fires to provide breeding habitat in the EKT.

ACKNOWLEDGEMENTS

The authors thank the Habitat Conservation Trust Fund for funding this project. Special thanks to M. Chutter (B.C. Ministry of Environment, Lands and Parks) for his encouragement and administrative support. M. Nyhof cheerfully worked long but happy days looking for nests, recording data, and solving problems. D. Cooper and J. Cooper found some Lewis's woodpeckers in unusual places. Many thanks to dozens of local naturalists and residents, and government personnel who took an interest in this project. B. Warkentin (B.C. Ministry of Environment, Lands and Parks) provided a

great overview of the study area by driving us through most of the potential habitat in the East Kootenays, showing us the best access to remote sites, and saving us much time. Also thanks to B. Warkentin for his historical perspective on habitat changes in the East Kootenay.

LITERATURE CITED

- American Ornithologists' Union 1983. Check-list of North American birds. Lawrence, KS. 877pp.
- Bock, C. E. 1970. The ecology and behavior of the Lewis' Woodpecker (*Asyndesmus lewisi*). Univ. Calif. Publ. Zool. 92:1-100.
- B.C. Ministry of Environment, Lands and Parks. 1998. Birds, mammals, reptiles, and amphibians at risk in British Columbia: the 1998 Red and Blue Lists. Wildl. Branch, Victoria, BC.
- B.C. Ministry of Forests. 1998. Timber supply review, Nelson Forest Region [electronic file]. Victoria, BC.
- Campbell, R. W., N. K. Dawe, I. Metaggart-Cowan, J. M. Cooper, G. W. Kaiser, and M. C. E. McNall. 1990. The birds of British Columbia - Diurnal birds of prey through woodpeckers. Royal B.C. Mus., Victoria, BC, and Can. Wildl. Serv., Delta, BC. 636pp.
- Cannings, R. A., R. J. Cannings, and S. G. Cannings. 1987. Birds of the Okanagan Valley, British Columbia. Royal B.C. Mus., Victoria, BC.
- Cooper, J. M., C. Siddle, and G. Davidson. 1998. Status of the Lewis' Woodpecker (*Melanerpes lewis*) in British Columbia. B.C. Minist. Environ., Lands and Parks, Wildl. Branch, Victoria, BC. Wildl. Work. Rep. No. WR-91.
- Daigle, P. 1996. Fire in the dry interior forests of British Columbia. B.C. Minist. For., Victoria, BC. Exten. Note 08.
- Demarchi, D. A. 1995. Ecoregions of British Columbia [map]. B.C. Minist. Environ., Lands and Parks, Wildl. Branch, Victoria, BC. Scale 1:2,000,000.
- Linder, K. A., and S. H. Anderson. 1998. Nesting habitat of Lewis' Woodpeckers in southeastern Wyoming. J. Field Ornithol. 69:103-116.
- Meidinger, D., and J. Pojar. 1991. Ecosystems of British Columbia. B.C. Minist. For., Res. Branch, Victoria, BC.
- Sousa, P. J. 1983. Habitat suitability index models: Lewis' Woodpecker. U.S. Fish Wildl. Serv., Washington, DC.
- Tobalske, B. W. 1997. Lewis' Woodpecker (*Melanerpes lewis*). In The birds of North America, No. 284. A. Poole, and F. Gill, eds. Academy of Natural Sciences, Philadelphia, PA, and American Ornithologists' Union, Washington, DC. 28pp.

Deep-sea trench, also called oceanic trench, any long, narrow, steep-sided depression in the ocean bottom in which occur the maximum oceanic depths, approximately 7,300 to more than 11,000 metres (24,000 to 36,000 feet). They typically form in locations where one tectonic plate subducts under another. The deepest known depression of this kind is the Mariana Trench, which lies east of the Mariana Islands in the western North Pacific Ocean; it reaches 11,034 metres (36,200 feet) at its deepest point.

crustal generation and destruction
Three-dimensional diagram showing crustal generation and destr

Both Lewis's and white-headed woodpeckers are designated 'at risk' in the Pacific Northwest (appendix A). Table 2 Percentages of nests located in dead trees by strong and weak excavators of the Pacific Northwest. In the Pacific Northwest, 69 vertebrate species consistently seek cavities in dying or dead trees, and more use such cavities opportunistically. Another 47 or more species respond positively to increasing amounts of down wood (appendix A). The 90 species of forest-dwelling vertebrates in the Pacific Northwest listed as "sensitive" or "at risk," include 30 species requiring cavities and 21 species strongly associated with down wood.

Mapping Suitable Lewis's Woodpecker Nesting Habitat in a Post-Fire Landscape. Article (PDF Available) in Northwest Science 90(4):421-432 September 2016 with 125 Reads. How we measure 'reads'. the Lewis's woodpecker which is a species of conservation interest in multiple states and throughout its range in British Columbia, Canada with habitat loss and degradation proposed as contributing factors in the species decline. The purpose. remote sensing data through statistical relationships are advancing the range and detail of forest characteristics able to be mapped.