



**Garry Oak
Ecosystems
Recovery Team**

LEWIS'S WOODPECKER
STEWARDSHIP ACCOUNT

For the Garry Oak Ecosystems of Southwestern British Columbia



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Executive Summary

The Lewis's Woodpecker has been extirpated from its former range in the Georgia Depression, although it still occurs in the southern interior and southeastern British Columbia. The species was also been extirpated in Washington and Oregon, west of the Cascades. In all three jurisdictions, habitat loss or degradation is considered the primary cause of their decline. Lewis's Woodpeckers require very open woodland or grassland with scattered trees (wooden utility poles can substitute) with an abundant supply of insects. Oak ecosystems and burnt areas were former habitats used by coastal populations. Oak habitats have been lost through urban or agricultural development. Fire suppression has prevented the creation of new burnt areas and has also prevented maintenance of existing open areas, resulting in the infilling of open woodlands by conifers and dense shrubs.

Protection and enhancement of suitable breeding habitat are necessary to provide potential nest sites for dispersing birds to discovery. Because the availability of nest cavities is widely believed to be the limiting factor for this species, management recommendations guiding Lewis's Woodpecker recovery efforts emphasize the need to retain existing wildlife trees and also to supplement the available cavities with artificial 'planted' snags or nest boxes. Additional recommendations include: avoid pesticide applications that severely impact insect populations and control the encroachment of shrubs and trees into open habitat areas.

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1. Introduction

The Garry Oak Ecosystems Recovery Team (GOERT) has established a list of plant, invertebrate and vertebrate species that are a priority for future research and recovery efforts in the Georgia Depression Ecoprovince (i.e., southeastern Vancouver Island and the lower Fraser Valley) of southwestern British Columbia. The species selected rely on the Garry oak (*Quercus garryana*) or associated ecosystems (e.g., coastal bluffs, sparsely vegetated areas) for the majority or an important part of their lifecycle and are either in decline or are currently extirpated from the region.

Lewis's Woodpecker (*Melanerpes lewis*), a priority vertebrate species as identified by GOERT, has been extirpated from the Garry oak and associated ecosystems of the Georgia Depression of British Columbia. This stewardship account has been prepared for GOERT to summarize what is known about this species and to make management recommendations. The account is an initial step towards the development of a recovery plan, with the long term objective of restoring this species to its former coastal range in the Garry oak ecosystems of British Columbia.

a) Taxonomy

No subspecies of Lewis's Woodpecker are recognized (AOU 1957; Cannings 1998). The population of interest for this stewardship account is that which formerly occupied the Georgia Depression Ecoprovince.

The spelling of this species common name has recently been formally changed from Lewis' to Lewis's Woodpecker. Other former scientific names for the species used in the literature include *Picus torquatus*, *Picus lewis* and *Asyndesmus lewis* (AOU 1957; Bock 1970).

2. Range and Known Distribution

a) Global range

Lewis's Woodpeckers breed from the southern interior of British Columbia, east to southeastern corner of the province, south through Washington, Oregon and central California and, to the east, through southwestern South Dakota and northwestern Nebraska, central Arizona, southern New Mexico and eastern Colorado (Tobalske 1997; Cannings 1998). Within this range, distribution is not continuous, but is patchy, with birds concentrated in areas with suitable habitat (Tobalske 1997).

Lewis's Woodpeckers are partial migrants that typically winter in the pine-oak ecosystems of southern Oregon south to northern Baja California, Mexico (AOU 1957; Hadow 1973; Howell and Webb 1995; Tobalske 1997). Some individuals do, however, occasionally over-winter as far north as the Okanagan Valley of southern British Columbia (Cannings et al. 1987; Campbell et al. 1990) and, formerly, on Vancouver Island (Cowan 1940; AOU 1957). One individual may have recently (2001) over-

wintered on southern Vancouver Island (D.E. Allinson pers. comm.). Vagrant, dispersing birds may be found over a much larger range, typically in the fall and winter, with some birds occurring as far east as Manitoba in the north (Hatch 1981) and northeastern Mexico in the south (Howell and Webb 1995).

b) Canadian range

Within Canada, Lewis's Woodpeckers only regularly occur in southern British Columbia (see below; AOU 1957). It is presumed extirpated as a breeding species in southwestern Alberta, where it is now considered a vagrant species (Semenchuck 1992; Natureserve 2002). There are a few records of vagrant birds as far east as Manitoba (Hatch 1981).

c) Provincial range

In British Columbia, Lewis's Woodpeckers are currently relatively common in the East Kootenay Trench (Cooper and Beauchesne 2000), rare in the West Kootenays (S. Bennett pers. comm.), common in the Okanagan and Thompson (Cannings et al. 1987), and rare north of the South Thompson River north to the Cariboo (Cooper et al. 1998).

The Georgia Depression breeding population is considered extirpated (see Range changes, below, for extent of former range: Campbell et al. 1990; Fraser et al. 1999)

Single birds are still occasionally found on southern Vancouver Island (D.E. Allinson pers. comm.) as well as the lower Fraser Valley (R. Toochin pers. comm.) mainly during the post-breeding season. The origin of these birds is unknown.

d) Range changes

The Lewis's Woodpecker has been extirpated from its former range on Vancouver Island and the lower mainland (Campbell et al. 1990). They formerly bred on eastern Vancouver Island from Victoria to Comox, and in the lower Fraser River valley from West Vancouver to Chilliwack (see Fig. 1: Cooper et al. 1998). The coastal breeding population was restricted to low elevations (Campbell et al. 1990).

In Washington, the species has also been extirpated from its former breeding range on San Juan Island, the Olympic Peninsula and most other sites through western Washington (Smith 1997; Rogers et al. 1997). In Oregon, the species was "still doing well" in the Oregon white oak (*Quercus garryana*) / ponderosa pine (*Pinus ponderosa*) habitat east of Mount Hood in Wasco County in 1988 (Galen 1989 in ODFW 1992). Elsewhere in that state the breeding distribution has contracted since the 1940's (ODFW 1992). It is now extirpated from oak ecosystems in Oregon (B. Altman pers. comm.).

Fig. 1: Locations of historic breeding sites and recent non-breeding records of Lewis's Woodpecker in the Georgia Depression, British Columbia. Base map from the Gazetteer of Canada, Vol. British Columbia, 1985.



3. Status of Species

a) Population size

The Lewis's Woodpecker is currently considered extirpated from the Garry oak ecosystems of southwestern British Columbia, with no breeding pairs remaining (Fraser

et al. 1999). In other regions of the province, Cooper et al. (1998) estimate that the total population may be between 350 and 600 breeding pairs. In 1998, 85 nesting pairs were found in the East Kootenay Trench (Cooper and Beauchesne 2000). There are no estimates of the total, rangewide population size (Tobalske 1997).

b) Population trends

The last breeding record for Vancouver Island was from 1961; the last breeding record for the lower Fraser River valley was from 1963 (Campbell et al. 1990; Cooper et al. 1998). The extirpation of the Georgia Depression population coincided with widespread declines throughout the species range (Tobalske 1997), including Washington and Oregon, west of the Cascades (B. Altman pers. comm.).

Elsewhere in British Columbia, baseline population data are lacking or has only recently been collected, therefore trends cannot be determined (Cooper and Beauchesne 2000). There are insufficient data from Breeding Bird Surveys to determine trends for this species in Canada (Sauer et al. 2000). Range-wide, Christmas Bird Count and Breeding Bird Survey data indicate a population decline of approximately 60% between 1969 and 1999 (Tobalske 1997; Sauer et al. 2000).

c) Global, Canadian, and provincial rank

The Lewis's Woodpecker is considered moderately threatened globally (Natureserve 2002). In the western provinces and states it is vulnerable or imperiled (see Table 1). The Conservation Data Centre ranks this subspecies as S3B (vulnerable breeder) provincially and SXB (extirpated) in the Georgia Depression (BC CDC 2002). The Committee on the Status of Endangered Wildlife in Canada (COSEWIC) considers Lewis's Woodpecker a "Species of Special Concern" (Velland and Connolly 1999).

Table 1. Status of the Lewis's Woodpecker (Velland and Connolly 1999; BC CDC 2002; Natureserve 2002).

Jurisdiction	Rank	Qualifier
BC	Blue List = SB3 (provincial population excluding Georgia Depression) Red List = SXB (Georgia Depression population)	Vulnerable provincially, extirpated from the Georgia Depression
WA	S3B/S3N	Vulnerable
OR	S3B/S3N A State Sensitive Species (populations on both sides of the Cascades, the western interior valleys and Columbia Basin)	Vulnerable
CA	S2B/S2N	Imperiled
COSEWIC	Special Concern	
US ESA	Not listed	

d) Related forms threatened

No other woodpeckers of this genus occur in British Columbia.

e) Special scientific interest

The Lewis's Woodpecker is a cavity nesting bird. Cavity nesters are sometimes considered indicator species because they require structural features that are often lost in modern forest management and urban development (Backhouse 1995). Sustainable breeding populations of these species indicate healthy woodlands ecosystems and help to maintain general avifauna diversity (Guy et al. in press). Restoration of an extirpated species presents a great challenge for wildlife managers.

4. Life History

a) General

Very little is known about the breeding ecology of Lewis's Woodpecker in the Georgia Depression; therefore most of the following information is inferred from data available from other regions.

b) Diet and foraging behaviour

During the breeding season, Lewis's Woodpeckers primarily forage by hawking flying insects. Hunting techniques include both extended feeding flights with complicated aerial maneuvers or short sallies from a prominent perch within an open area. Structures used for hunting perches include snags or dead topped trees and man-made structures such as telephone poles and fence posts. Insects taken include flying beetles, moths and butterflies (Tobalske 1997; SMB unpublished data).

Lewis's Woodpeckers will also glean insects from tree trunks, branches, bushes and the ground (Bock 1970; Short 1982; Raphael and White 1984). This feeding technique may provide an important alternate food source when weather limits flying insect availability. For example, during a rainy period early in the breeding season in the East Kootenay Trench, Lewis's Woodpeckers were frequently observed feeding on tent caterpillars in low bushes but were not observed fly-catching. When the weather cleared a few days later, fly-catching resumed and was the only foraging technique observed (SMB unpublished data).

Berries and other fruit are also taken, particularly late in the nesting season as fruit ripens. Near Churn Creek, in the south Cariboo, nestlings were fed ripe Saskatoon berries (JMC unpublished data). In the Okanagan, damage to commercial apple crops by this species has been documented (Cannings et al. 1987). Acorns and, in some regions, corn are consumed in the winter (Hadow 1973; Cannings 1987; Vierling 1997). There are no data for berries or fruits consumed in the Georgia Depression but the authors assume that

Lewis's Woodpeckers would have consumed native and non-native berries as well as domestic fruits.

Lewis's Woodpeckers cache food. This behaviour is prevalent in the winter although it also occurs during the breeding season. Food is typically stored in the cracks of bark or telephone poles (Tobalske 1997; SMB unpublished data). In the Okanagan this species has been observed storing acorns of the introduced Red Oak (*Quercus rubra*) in the cracks of power poles (Cannings et al. 1987).

c) Reproduction

The Lewis's Woodpecker is considered a primary excavator although it typically reuses an existing cavity for its nest sites (Cooper and Beaudesne 2000). The cavity may have been excavated by a conspecific, Northern Flicker (*Colaptes auratus*) or Hairy Woodpecker (*Picoides villosus*), or it may have been naturally created (Bock 1970; Raphael and White 1984; Vierling 1997; Linder and Anderson 1998; Cooper and Beaudesne 2000). The Lewis's Woodpecker is a "weak" excavator, therefore, to create a new nest cavity, it requires a weak entry point such as a delimbed site with exposed heart rot or a very decayed or burnt snag (see general habitat requirements for other nest site details: Tobalske 1997; SMB unpublished data).

Lewis's Woodpeckers are assumed to be monogamous. Clutches in British Columbia usually contain four to six eggs (Campbell et al. 1990). Sexes alternate incubation during the day; the male incubates at night (Tobalske 1997). Eggs hatch in 12 to 14 days (Baicich and Harrison 1997). Both sexes feed young (Tobalske 1997; SMB unpublished data). Young fledge after 20 to 30 days and remain near the nest, tended by parents, for about 10 days after fledging (Campbell et al. 1990; Baicich and Harrison 1997).

In British Columbia, the nesting period may extend from mid-May through to August (Campbell et al. 1990). In the Georgia Depression, the authors estimate that the peak in breeding activity would be between late May and early July. Lewis's Woodpeckers raise a single brood each season (Tobalske 1997). Observations in the East Kootenay of one pair feeding nestlings while a neighbouring pair were engaged in courtship behaviour suggests a potential re-nesting attempt, or it may have been immature birds engaged in delayed mating behaviour (SMB unpublished data).

d) Site fidelity

Site fidelity is difficult to establish unequivocally because very few researchers have marked individuals (Tobalske 1997). However, the same cavities are often used in successive years (Bent 1939; Tobalske 1997; Linder and Anderson 1998). In the East Kootenay Trench, 60% of nest cavities found in 1997 were reused in 1998 (Cooper and Beaudesne 2000). In addition, where cavities had been destroyed between breeding seasons, a pair was often found nesting nearby (Cooper and Beaudesne 2000). The accumulated evidence suggests that there is strong site fidelity.

e) Territory

Lewis's Woodpecker home ranges frequently overlap with other conspecifics (Bock 1970; Cooper and Beaudesne 2000). Breeding distribution tends to be clumped and may be described as semi-colonial, occasionally with more than one pair in a single tree (Kavanaugh 1991 in Roderick and Milner 1991; Vierling 1997; Tobalske 1997; Cooper and Beaudesne 2000). Cooperative breeding activity has been reported with more than two adults tending the same nest (Tobalske 1997; SMB unpublished data). Neighbouring pairs have also been observed assisting in nest defense (SMB unpublished data).

Individuals may forage over a large area. In the East Kootenay Trench, birds were observed travelling more than one kilometer from their nest to forage, suggesting that some home ranges may be extensive (SMB unpublished data). Alternatively, Lewis's Woodpeckers also sometimes use their nest tree as a hawking perch, hunting in the immediate vicinity of the nest (SMB unpublished data).

f) Causes of mortality

Nest failure can result from predation. Elsewhere in British Columbia Black Bears (*Ursus americanus*) have been documented preying on woodpecker nests, including Lewis's Woodpeckers (Walters and Miller 2001; SMB unpublished data). In the Garry oak ecosystem of southeastern Vancouver Island Black Bears are uncommon and there would be few other predators able to tear open an oak cavity to get at the young. Mustelid species (e.g., Short-tailed Weasel *Mustela erminea anquinae*), rodents (e.g., Deer Mouse *Peromyscus maniculatus*) and snakes (e.g., Common Garter Snake *Thamnophis sirtalis* and Western Terrestrial Garter Snake *T. elegans*) may be able to enter cavities to consume eggs or small nestlings. Other species (e.g., House Wren *Troglodytes aedon*) may destroy eggs or kill nestlings while usurping a nest cavity (Walters and Miller 2001).

Potential predators of fledged young and adults include birds of prey (e.g., Red-tailed Hawk *Buteo jamaicensis*, Coopers Hawk *Accipiter cooperii*, Sharp-shinned Hawk *A. striatus*, Merlin *Falco columbarius*, American Kestrel *F. sparverius*; Hadow 1973; Tobalske 1997; SMB unpublished data). Domestic cats (*Felis catus*) are competent predators of small and medium sized bird species (George 1974; Stallcup 1991; Coleman and Temple 1993; Cooper 1993; Coleman et al. 2002). Lewis's Woodpecker fledglings would be potential prey for cats. The high population density of domestic and feral cats found in urban areas in the Georgia Depression could impact first year survivorship (Cooper 1993; SMB unpublished data).

Cold wet weather during the nestling period can effect abundance of flying insects available for food thus reducing the nesting success of insectivorous species (J.C. Finlay pers. comm.). Lewis's Woodpecker can, however, use alternate food sources and will target fruit or insects within shrubs including tent caterpillars (SMB unpublished data). Cached food reserves may also help them survive prolonged periods of poor weather.

Lewis's Woodpeckers carcasses have been found beside a busy road (Mark Nyhof pers. comm.). Their sometimes erratic fly-catching flight and habit of nesting or perching on roadside power poles make them particularly vulnerable to collision.

g) Migration

Most Lewis's Woodpeckers in British Columbia are migratory, although a few birds occasionally overwinter in the Okanagan and individuals have in the past occasionally overwintered on southeastern Vancouver Island (Cowan 1940; Cannings et al. 1987). Birds typically arrive in the province within the first two weeks of May. Flocks of juveniles and adults gather in late summer with peak autumn movement between late August and early September. Few birds remain after the end of September (Campbell et al. 1990).

Dispersing Lewis's Woodpeckers are occasionally reported on the coast as far north as Masset on the Queen Charlotte Islands (Campbell et al. 1990). There are also recent fall records of individual birds on southeastern Vancouver Island, presumably representing a post-breeding dispersal (see Table 2). Likewise, individuals are reported in the lower Fraser Valley on a nearly annual basis although they do not seem to stay as they are typically seen by a single observer (R. Toochin pers. comm.).

Table 2: Recent Lewis's Woodpecker records from Vancouver Island (D.E. Allinson pers. comm; M.G. Shepard, pers. comm.).

Month	Year	Location	Age	Comments	Observer
Sept.	2002	Rocky Point Bird Observatory	Juv.		DEA
Fall	2001	Prospect Lake	Juv.		VNHS*
October	1995	Otter Point	Adult		DEA
Dec. to Jan.	1994	South of Duncan	Juv.	First reported on the Duncan CBC	DEA and others
Sept.	1992	East Sooke Park	?		MGS

* this individual was reported on the Victoria Natural History Society's Rare Bird Alert and seen by multiple observers.

5. Habitat Description

a) General habitat requirements

Lewis's Woodpeckers are birds of very open forest or grassland with scattered trees (Sousa 1983). Trees are required for perches and for nesting. Large open areas are necessary for foraging. Three distinct habitats are often described: open areas with scattered trees (e.g., oak ecosystems), riparian forests adjacent to open areas; and burns (Bock 1970; Galen 1989 in ODFW 1992; Campbell et al. 1990; Rodrick and Milner 1991; Vierling 1997; Cooper and Beauchesne 2000; Cooper and Gillies 2000; Saab and Vierling 2001).

Trees that are used for nesting are often large in diameter and are in a state of partial to advanced decay (wildlife tree class 2 to 7; Tobalske 1997; Cooper and Beaudesne 2000; Guy et al. in press). The understory in foraging areas may have low shrubs, grass or herbaceous cover (Cooper and Beaudesne 2000). A shrub layer that produces berries or provides habitat for insect populations is an important habitat component (Sousa 1983).

Occasional fire benefits this species by providing large, landscape-level habitat areas. Lewis's Woodpeckers use fire-maintained open ponderosa pine forest (Cooper and Gillies 2000), and regular, low intensity fires would also have been important in maintaining habitat suitability in the Garry oak ecosystem. Fire reduces forest encroachment in open areas by killing the shrub and seedling layer and also helps promote decay of larger trees (Saab and Dudley 1998).

Other extirpated species that would have used this habitat type of habitat include Western Bluebird (*Sialia mexicana*) and Western Meadowlark (*Sturnella neglecta*). Because Lewis's Woodpeckers forage over grasslands and will nest in these situations if there is even a single tree (a telephone pole may be used as a substitute; Cooper and Beaudesne 2000) this species habitat requirements also overlap with Coastal Vesper Sparrow (*Pooecetes gramineus affinis*) and Streaked Horned Lark (*Eremophila alpestris strigata*). In the East Kootenay Trench, in places where Lewis's Woodpeckers are abundant, Western Bluebirds, Western Meadowlarks and Vesper Sparrows are usually also common (SMB unpublished data).

Some Lewis's Woodpeckers are able to co-exist with humans (Linder and Anderson 1998). Nests have been recorded in backyards, golf courses, beside busy roads and beside a city parking lot (Cannings et al. 1987; Cooper and Beaudesne 2000). However, the majority of birds nest in more remote situations and are prone to disturbance (Bock 1970; SMB unpublished data; Mark Nyhof pers. comm.). Bock (1970) found that birds subjected to continued disturbance occasionally deserted their nest. No studies to date have compared the nesting success of birds subjected to human disturbance compared with those in remote situations.

b) Habitat availability and net trends in habitat change

In the Georgia Depression, prior to the arrival of Europeans, suitable habitat would have been available in Garry oak ecosystems or burnt forest patches. After the arrival of Europeans, early logging practices would have provided additional habitat by creating openings and leaving snags and large stumps that would have provided nest sites (Campbell et al. 1990). After the 1940s, the removal of snags for firewood reduced the suitability of those sites and more efficient, modern logging practices left fewer potential nest sites. Meanwhile, over the past century, Garry oak ecosystems declined in area, primarily due to urban development and clearing for agriculture (Fuchs 2001). It is estimated that 1-5% of the original oak ecosystem remains in British Columbia.

In addition, even where some live oaks are retained, dead and declining trees, required by Lewis's Woodpeckers for nesting, have often been removed resulting in further loss of suitable habitat. In oak woodland ecosystems, there are very few recruitment trees to replace those lost to development and old age (Rogers et al. 1997; Fuchs 2001).

Fire suppression has resulted in the infilling of Garry oak ecosystems by conifers and dense exotic shrubs (Fuchs 2001; PIF 2002), resulting in forests that are too dense for Lewis's Woodpeckers foraging requirements. Fire suppression also prevents the creation of new areas of burned forest, a habitat often used in interior British Columbia and elsewhere (Cooper and Gillies 2000).

In Washington and Oregon, west of the Cascades, available suitable habitat has also declined for similar reasons (Smith et al. 1997; PIF 2002).

6. Threats to the Species

Peripheral populations are more subject to extirpation when range-wide declines occur. The Georgia Depression ecoprovince population, therefore, was particularly vulnerable to extirpation.

Loss and alteration of habitat is widely believed to be the greatest threat to this species throughout its range (Rodrick and Milner 1991; ODFW 1992; Fraser et al. 1999). The Garry oak ecosystems in southwestern British Columbia have undergone substantial change in the past few decades with less than 5% of the original ecosystem remaining (Fuchs 2001). Modern forest practices that eliminated natural patterns of burns also limit the amount of suitable habitat available (Smith et al. 1997). Reduced habitat suitability may prevent reestablishment of the species.

Suitable nest cavities are often thought to be the limiting resource for this species. Removal of dead trees and limbs may be the single habitat alteration with the greatest negative impact to this species (Fraser et al. 1999).

Lewis's Woodpeckers are insectivores during the breeding season (Tobalske 1997). Urbanization and agricultural practices that increasingly depend on pesticides have undoubtedly altered the insect community, resulting in a reduction of this food source that would likely have been detrimental (Sample et al. 1993; Boulton et al. 1999). The long-term effects of sub-lethal levels of dietary pesticide exposure are difficult to determine with certainty (Gard et al. 1993), and have never been studied in Lewis's Woodpecker. However, over the long-term, pesticide exposure may cause indirect effects through reduced fitness resulting in lowered reproductive success (Burkpile et al. 2002) or reduced adult survivorship (Sibly et al. 2000). It is impossible to know if contaminants have had an adverse effect on this species, but the potential cannot be ruled out for any insectivorous species that forages in agricultural areas (Gard et al. 1993).

The decline in Lewis's Woodpecker populations coincides with the arrival of European Starlings (*Sturnus vulgaris*) on the west coast of British Columbia (Campbell et al. 1990),

Washington, and Oregon (B. Altman pers. comm.). Competition with European Starlings has been discounted as a threat to the species in other regions because Lewis's Woodpeckers tend to dominate in aggressive encounters (Cannings et al. 1987; Vierling 1998; SMB unpublished data). In addition, on several occasions both species have been found nesting in the same tree (SMB unpublished data), indicating some level of tolerance and ability to share resources. However, where there are few remaining cavities and a very large population of starlings, as is found in the Georgia Depression, competition may be more intense, and the cumulative effect may be detrimental (Campbell et al. 1997; K. Vierling, pers. comm.).

Increased human population has led to increased activity in Garry oak ecosystems. Although the species does co-exist with humans in some areas, with some individuals becoming very desensitised to human disturbance, the majority of birds are very wary of people near their nest site (Bock et al. 1970; M. Nyhof pers. comm.; SMB unpublished data). Disturbed birds will stay away from the nest until the intruder is no longer detected in the vicinity of the nest site (M. Nyhof pers. comm.). Frequent disturbance could, therefore, lead to nest failure.

A highly concentrated human population density brings other associated threats. Domestic and feral cats populations are higher, leading to greater mortality risk. An increase in vehicular traffic increases the risk of mortality through collision.

7. Management Recommendations

a) Habitat ownership and protection

There are no known active breeding sites for Lewis's Woodpecker in the Georgia Depression. Suitable habitat, however, is available in patches of Garry oak ecosystems in regional parks (e.g., Mount Tolmie, Mount Douglas), on Department of National Defence land (e.g., Rocky Point), and on private land, outside of protected areas.

Management of privately owned land is primarily at the discretion of the individual landowner. There are bylaws in some municipalities protecting mature oak trees; however, removal of trees is often permitted in development situations. Given the continual development pressure on southeastern Vancouver Island and the lower mainland, it is unlikely that additional suitable habitat will be created in the future (Campbell et al. 2001). Therefore stewardship of existing habitat is very important.

b) Current management policies and actions

Management policies that specifically incorporate stewardship of habitat for Lewis's Woodpecker in the Georgia Depression are not known to exist. Current management practices designed to protect Garry oak and associated ecosystems are generally compatible with this species, however these management practices are only just coming to the attention of a range of jurisdictions and are not yet widely practiced.

Under the BC Forest Practices Code, wildlife habitat areas (WHAs) may be established for nesting Lewis's Woodpeckers. To date, two WHAs have been established in the East Kootenay Trench (T. Antifeau pers. comm.). No WHAs for Lewis's Woodpecker are in existence in the Georgia Depression.

c) Recommended prescriptions

Areas with highly suitable habitat for Lewis's Woodpecker should be secured as part of the goal of establishing a network of protected areas that represent the full diversity of woodland ecosystems and grassland habitats (Fuchs 2001). Protected areas should be as large as possible to maintain ecological integrity.

The management, maintenance and enhancement of potential nesting habitat would increase the likelihood that dispersing individuals would find a suitable nesting site in the region. Efforts should be concentrated in permanently protected areas. However, because Lewis's Woodpecker habitat is not restricted to protected areas, a variety of land managers should be involved to increase the potential of their recovery. These include forest company biologists, utility company vegetation managers, private landowners and urban planners. Forest companies should be encouraged to adopt silviculture practices that favor cavity nesters. Utility corridors can be important refuges for birds of open forest (Manning et al. 2000; King and Byers 2002), therefore right-of-way vegetation managers should be encouraged to maintain vegetation structure to mimic natural Garry oak ecosystem characteristics. Private landowners should be encouraged to manage woodlands and adjacent openings to maintain and enhance existing nesting habitat. Conservation covenants could be used to protect good breeding habitat on private lands. Urban planners should be encouraged to retain wildlife trees wherever possible and to incorporate green spaces that could provide potential nesting habitat or act as a buffer to other habitat areas.

Specific management prescriptions for stewards of Lewis's Woodpecker habitat includes:

- Retain wildlife trees and dead limbs where they do not present a safety hazard as these structures are essential for cavity nesting species. Where snags have been removed, replacements could be 'planted' to provide potential nest sites. In mixed open forest, individual live trees of other species (i.e., Douglas Fir) may be selected to topping or fungal inoculation, in an effort to accelerate wildlife tree development (E.T. Manning pers. comm.).
- Measures to control or reduce population size of European Starling should be considered as pressure from competition might impact nesting success of this and other rare cavity nesting birds.
- An active feral cat control should be adopted in potential nesting areas, possibly in conjunction with animal welfare agencies such as the SPCA.

- Scotch broom (*Cytisus scoparius*) and other invasive shrubs should be replaced with native berry producing shrubs, to provide a late summer food source.
- Pesticide use should be avoided during the breeding season so that the flying insect population is not impacted.
- Should a nest site be established, more intense management prescriptions may be considered including the restriction public access if practical.

d) Potential to re-establish species

Re-establishing the species will be a difficult task. Natural re-establishment would require dispersing birds to pass through the region and find suitable habitat and a mate. Occasional post breeding records of juveniles have been documented, however these are usually single birds and are in the region in the fall or early winter (i.e., outside of the breeding season; see Table 2).

There are very few examples of human assisted reintroduction of woodpeckers. Artificial cavity construction and translocation of the Red-cockaded Woodpecker has been successfully undertaken in some instances in the southeastern United States (Jackson 1994). Techniques developed for that species could be considered for Lewis's Woodpecker, however, there are considerable ecological differences between the two species, so caution should be exercised in drawing parallels.

e) Recommended further work

Potential Lewis's Woodpecker nesting habitat in the Georgia Depression should be surveyed, described, catalogued and mapped to develop a permanent record of quality potential nesting habitat. Because nest cavities are considered an essential habitat feature, habitat descriptions should include quantification of available cavities. Other important data that should be collected includes the amount of tree canopy closure, percent cover of shrub layer, and an estimation of the number of tree stems per hectare.

Where habitat enhancement procedures are undertaken, the site should be monitored to determine the effectiveness of the prescription applied. An adaptive habitat management may then evolve.

Prior to considering reintroduction efforts, every effort should be made to ensure that there is sufficient suitable habitat to support reintroduced birds. Although this species occurred in the region in the early 1960s, there have been dramatic changes to the oak ecosystem since that time (Fuchs 2001). A comparison of habitat quality in the Georgia Depression, with habitat that currently supports healthy populations elsewhere, should be undertaken to determine if the features of the oak ecosystems of southwestern British Columbia are currently adequate to support this species.

Woodpecker nest box designs could be tested in areas where Lewis's Woodpeckers continue to nest in high densities (e.g., the newly established Wildlife Habitat Area in Newgate). If a box structure is found to be suitable (i.e., used for nesting) a nest box program could be considered for the Garry oak ecosystems in southwestern British Columbia, to provide potential nest cavities where wildlife trees are lacking.

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