RAPTOR HABITAT USE IN BURNED FORESTS

Management Brief

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Peregrine Falcon. ©Marcus Cosentino

INTRODUCTION

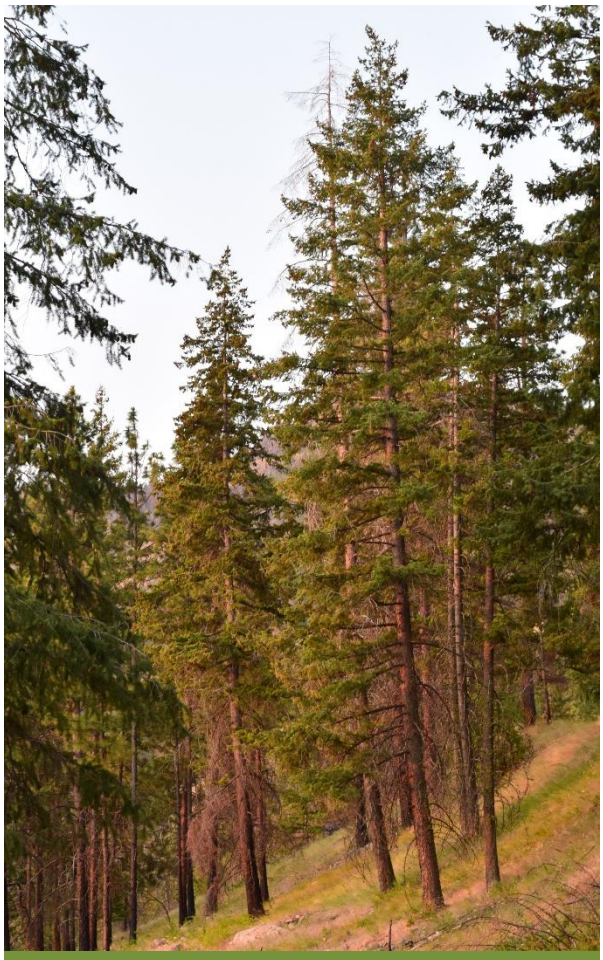
Raptors are apex predators (Natsukawa and Sergio 2022) whose hunting affects the populations of their prey, small mammals and birds (Steenhof and Kochert 1988). Globally, many raptor populations are declining, in part because of changes in wildfire and losses of habitat.

The Thompson-Okanagan is a biodiversity hotspot located in south-central British Columbia (Bezener et al. 2004). Although the region has historically experienced low to moderate severity fires in which most vegetation survives (Goemans and Ballamingie 2012), increased fire severity and frequency in BC due to climate change (Nitchke and Innes 2008) makes appropriate management of forests after fire important for raptor conservation.

Raptor Distribution in Okanagan Forests

Raptors in the Okanagan Valley include diurnal Osprey, Hawks, Eagles, Vultures, Falcons, and Kestrels), and the nocturnal owls (Turnbull and Campbell 1989). 18 diurnal raptor species and 15 owl species can be found in British Columbia (Turnbull and Campbell 1989). Some species are present in the province year-round, while others migrate to BC seasonally. The Thompson-Okanagan provides valuable habitat that supports all diurnal raptor species found in the province (Turnbull and Campbell 1989). Additionally, while several diurnal raptors occur throughout BC, the breeding ranges of Osprey, Sharp-shinned Hawks, Cooper's Hawks, Golden Eagles, and Peregrine Falcons are restricted to the southern portion of the province, including the Thompson-Okanagan. Swainson's Hawks and Prairie Falcons in BC breed only in the Thompson-Okanagan, and Turkey Vultures breed only in the Okanagan Valley and near the southern coast. The Okanagan Valley is also one of only 4 areas where the Broad-winged Hawk has been recorded in BC (Turnbull and Campbell 1989). Osprey conservation in the region is also important, as Canada is believed to hold a large portion of the world's population of this species (Kirk and Hyslop 1998).

Raptors in Burned Forests



Low severity burn that has retained most pre-fire trees. ©Steffani Singh

British Columbia has faced increased severity and frequency of wildfires in recent years (Baron et al. 2022, Nitchke and Innes 2008). The Okanagan Valley specifically has frequently seen several large-scale fires of note in the past two decades, such as the 2003 Okanagan Mountain Park Fire (25,600 ha), the 2009 Terrace Mountain Fire (9277 ha), the 2021 White Rock Lake Fire near Fintry (83,342 ha), and the 2023 McDougall Creek Fire (13,970 ha), among hundreds of smaller wildfires every year (BC Wildfire Service 2024).

Such frequent, intense, and large fires alter the structure of forests in the Thompson-Okanagan (Gyug 2013) by removing vegetative cover, and may affect the ability of raptors to persist in the region. These fire-induced changes may affect the availability of habitat features used by diurnal raptors and the prey that they rely on. Diurnal raptors are more abundant in areas that have trees to perch in from which they can hunt, trees to nest in (platform nests or trees with cavities), and high prey abundance (Preston 1990, Niemi and Hanowski 1997).

The post-fire habitats in burned forests are highly variable, depending on fire severity and post-fire management. Severe burns have many dead standing trees called “snags”, while a low severity fire that burned only at ground level would retain living trees from before the fire. Salvage logging is also a common post-fire management practice in which burned trees are logged for timber, although salvage logging can make burned forests less habitable for wildlife (Volkman and Hodges 2024).

Determining species-specific, fine-scale habitat preferences of raptors in burned landscapes is necessary to inform land management as to which features of post-fire forests should be maintained to promote short and long-term raptor recolonization.

Raptor Habitat Use in Burned Forests

Burned forests in the Thompson-Okanagan were sampled in 2023 and 2024 for raptor occupancy. Forests were categorized based on time-since-fire: (1) recent (fires that burned in 2021 and 2023), (2) young (2016- 2020), (3) early regeneration (2006-2010), and (4) regenerating (2000-2005). The sampling period coincided with the breeding season of raptors in BC, during which they call the most and are easiest to detect. Owls were sampled through acoustic surveys (recording units), while diurnal raptors were sampled through visual observations. Habitat use was evaluated through vegetation surveys following methods adapted from the Field Manual for Describing Terrestrial Ecosystems 2nd Edition (B.C. Ministry of Forests and Range and B.C. Ministry of Environment 2010), as well as GIS layers from the BC Data Catalogue.

The following fire-affected provincial and regional parks were included in our sample sites:

- Darke Lake Provincial Park (burned in 2017)
- Goat's Peak Regional Park (2009)
- John's Family Conservancy Regional Park (2003)
- Myra-Bellevue Provincial Park (2003)
- Okanagan Provincial Park (2003)

Burned forest in Okanagan Mountain Provincial Park. ©Dimetri Dacosta

RAPTOR HABITAT USE IN BURNED FORESTS

Raptors were found in burned forest patches that still had large, standing trees, whether dead or alive. Few raptors were found in areas that had been logged post-fire.

How long ago a forest burned was also a crucial aspect of raptor presence, as older burned areas had more tree and shrub regrowth than those that burned recently. While raptors returned to burned forests as soon as 1 year post-fire, their abundance increased with the number of years that passed since the forest burned. Owls were present 1-2 years post-fire only in low severity burn patches that retained pre-fire characteristics.

The following raptor species were found in fire-affected provincial and regional parks in the Okanagan Valley in 2023 and 2024.

Species	Darke Lake	Goat's Peak	John's Family	Myra-Bellevue	Okanagan Mountain
Owls					
Boreal Owl	x				
Flammulated Owl			x		
Great-Horned Owl			x		x
Northern Pygmy-owl	x				x
Diurnal Raptors					
Bald Eagle					x
Golden Eagle				x	
Osprey		x			x
Red-tailed Hawk		x	x	x	
Turkey Vulture			x	x	x
American Kestrel				x	x
Merlin				x	

**An "x" indicates that the species was present.*

Flammulated Owl in a low severity burn. ©Marcus Cosentino

MANAGEMENT RECOMMENDATIONS FOR RAPTOR CONSERVATION IN FIRE-AFFECTED PARKS

1. Retain large standing trees and snags for all raptors.

Forest raptors need trees to nest and perch in. Therefore, retaining large trees and snags after fire is important for raptor recolonization. For example, the average diameter of trees in areas where owls were detected was 19.5 cm, reflecting mature trees.

After fire, raptors were far more abundant in unlogged forests than in logged areas. Of 28 owls we recorded in 2023, only 2 individuals were found in salvaged forests. We believe that the owls detected in salvaged areas were only passing through because they called only a few times after midnight for less than a week. If the owls were nesting in the area, we would expect them to call regularly at dawn and dusk for many weeks. Diurnal raptors were occasionally observed passing over salvaged areas, but were not observed perching there. A pair of osprey had the only raptor nest found in a salvaged burn. The nest was built atop a high-voltage transmission tower, indicating the need raptors have for a structure to nest in. For forests that burned in 2021 and 2006-2010, all unsalvaged burn patches had a higher average raptor detection rate than salvaged spots.

For conservation of raptors in burned forests, large, living, and dead-standing trees should be retained after fire. As salvage logging typically removes larger trees, which are also the trees used by raptors to roost and nest, logging in burned forests will hinder raptor recolonization.

2. Retain low to moderate severity burned patches as refugia for owls.

There were significantly fewer owls in areas that burned severely, which had many dead trees and little canopy cover. Smaller species like Northern Pygmy-owls and Flammulated Owls were mostly found in areas where large trees from before the fire survived. Great Horned Owls, a large species, were found in both low and moderate-severity burned patches, which were sometimes adjacent to high-severity areas. Owls may use areas with substantial tree cover as protection from diurnal predators when they rest during the day (Hayward and Garton 1984).

Unburned, low and moderate severity patches within burns that retain pre-fire characteristics should be preserved as refugia for owls after fire.

3. Retain severely burned patches for conservation of hawks, eagles, vultures, and falcons.

Diurnal raptors were far more abundant in severely burned patches than in areas that burned with moderate severity, and were nearly absent in patches burned with low severity. Red-tailed Hawks, Osprey, and American Kestrels were mostly found in areas that burned with high and moderate severity. Turkey Vultures, Merlin, Northern Harriers, Golden Eagles, and Bald Eagles were only recorded in areas burned at high severity, and Red-tailed Hawks and Osprey were only found nesting in these areas.

Severely burned forests contain mostly dead trees and are often seen as less valuable landscapes for wildlife. However, they are still used for hunting, nesting, and roosting by diurnal raptors. Diurnal raptors may prefer severe burns as they have less foliage, making it easier to find prey. The openness of severely burned forests may also facilitate species typically associated with grasslands like the Northern Harrier. Salvage logging these areas is damaging to raptors.

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Appendix 1: Checklist of Raptor Species in the Okanagan Valley

Common Name	Scientific Name
Owls	**Strigidae and Tytonidae**
Barn Owl	*Tyto alba*
Boreal Owl	*Aegolius funereus*
Flammulated Owl	*Psiloscops flammeolus*
Great Grey Owl	*Strix nebulosa*
Great-Horned Owl	*Bubo virginianus*
Long-eared Owl	*Asio otus*
Northern Pygmy-owl	*Glaucidium californicum*
Northern Saw-whet Owl	*Aegolius acadicus*
Western Screech-owl	*Megascops kennicottii*
Hawks and Eagles	**Accipitridae**
Bald Eagle	*Haliaeetus leucocephalus*
Cooper's Hawk	*Accipiter cooperii*
Golden Eagle	*Aquila chrysaetos*
Osprey	*Pandion haliaetus*
Red-tailed Hawk	*Buteo jamaicensis*
Sharp-shinned Hawk	*Accipiter striatus*
Vultures	**Cathartidae**
Turkey Vulture	*Cathartes aura*
Falcons	**Falconidae**
American Kestrel	*Falco sparverius*
Merlin	*Falco columbarius*
Peregrine Falcon	*Falco peregrinus*