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Effects of Disturbance on Birds of Conservation Concern in Eastern Oregon and Washington

Abstract

The effects on birds of forest insects, tree diseases, wildfire, and management strategies designed to improve forest health (e.g., thinning, prescribed burns, road removal, and spraying with pesticides or biological microbial agents) are discussed. Those bird species of concern that occur in forested habitats in eastern Oregon and Washington include the bald eagle (*Haliaeetus leucocephalus*), peregrine falcon (*Falco peregrinus*), harlequin duck (*Histrionicus histrionicus*), upland sandpiper (*Bartramia longicauda*), northern goshawk (*Accipiter gentilis*), ferruginous hawk (*Buteo regalis*), and black rosy finch (*Leucosticte arctoa*). In addition, seven species of woodpeckers and nuthatches were considered because of their rare status. Forest disturbances that create dead trees and logs are critical to cavity-nesting birds because the dead trees with their subsequent decay provide nesting and roosting habitat. The insects associated with outbreaks or dead trees provide prey for the woodpeckers and nuthatches. The loss of nest or roost trees as a result of disturbance could be detrimental to bald eagles, goshawks, or ferruginous hawks, while the loss of canopy cover could be detrimental to harlequin ducks and goshawks or to prey of some of the raptors. The more open canopies created by thinning may be beneficial to a species like the black rosy finch, yet detrimental to some woodpeckers due to a decrease in cover. Prescribed burning may be beneficial to those woodpeckers primarily associated with ponderosa pine (*Pinus ponderosa*) stands and detrimental to other woodpeckers because of the loss of coarse woody debris. Removal of roads is likely to benefit most of these species because of the subsequent decrease in human activity. Recovery plans for bald eagles and peregrine falcons are available for managers to use in managing habitat for these species.

Introduction

This literature synthesis includes information on birds that occur primarily in forested habitats, have distributions in eastern Oregon and Washington, and are of concern. We used the Natural Heritage classification system for consistency and included species here that were given State ranks of S1-S3 for Oregon and Washington or Federal status of threatened, endangered, and candidate species. The bald eagle (*Haliaeetus leucocephalus*) was reclassified from endangered to threatened in 1995. The peregrine falcon (*Falco peregrinus*) was de-listed by the U.S. Fish and Wildlife Service in September 1999, but is still considered sensitive in Oregon and Washington. The other species include the harlequin duck (*Histrionicus histrionicus*), upland sandpiper (*Bartramia longicauda*), northern goshawk (*Accipiter gentilis*), ferruginous hawk (*Buteo regalis*), and black rosy finch (*Leucosticte arctoa*). We have also included a number of the primary cavity nesters in this account that are considered rare, including the white-headed woodpecker (*Picoides albolarvatus*), pygmy nuthatch (*Sitta pygmaea*), white-breasted nuthatch (*S. carolinensis*), Lewis' woodpecker (*Melanerpes lewis*), black-backed woodpecker (*P. arcticus*), three-toed woodpecker (*P. tridactylus*), and pileated woodpecker (*Dryocopus pileatus*). Although there are additional species of concern that inhabit grasslands, we do not address them in this paper.

This account is not intended as an exhaustive literature review due to space restrictions. It is intended to provide readers with a brief introduction to the habitat used and potential effects of disturbance and forest management strategies for each species if known. The management strategies being considered generally include thinning, prescribed burns, road removal, and spraying with pesticides and biological microbial agents, although there may be other treatments that apply. Additional information and references on life history and distribution can be found in the following sources: Atlas of Oregon Wildlife (Csuti et al. 1997), Breeding Birds of Washington State (Smith et al. 1997), and individual species accounts in The Birds of North America (see species accounts by different authors in literature cited).

Bald Eagle

In eastern Oregon and Washington, bald eagles are typically winter migrants associated with major river drainages although some nesting occurs here as well (Marshall 1996). The majority of nesting occurs in the western Cascade Range and along

the coast where the birds nest in trees or cliffs overlooking aquatic foraging areas (Anthony et al. 1982, Anthony and Isaacs 1989). Trees used for nesting and roosting are typically of large diameter and occur in mature or old-growth coniferous forest (Keister and Anthony 1983, Peterson 1986, Anthony and Isaacs 1989). Diet consists of fish, waterfowl, small mammals, and carrion (Buehler 2000). A recovery plan (US Fish and Wildlife Service 1986) is available for use by managers.

Potential Effects of Insects, Disease, Fire, and Management Strategies

Any disturbance agent (fire, insects, disease) that kills the large-diameter trees used for nest or roost trees and their surrounding stands would be detrimental to bald eagles. Forest health and protection treatment strategies (thinning, prescribed fire, salvaging, and spraying with pesticides or biological microbial agents) would have a minimal impact on this species as long as nesting and roosting habitats are protected. Protecting riparian and aquatic habitats is particularly critical for this species because of their association with this habitat for nesting, roosting, and foraging. Urban and recreational development, logging, mineral extraction, and other forms of human activity pose the greatest threat to bald eagle nesting, roosting, and foraging habitats (US Fish and Wildlife Service 1986, Buehler 2000).

Peregrine Falcon

Peregrine falcons nest on cliffs in relatively open habitat from low-elevation grasslands to high-elevation pine forests in all successional stages (Ratcliffe 1980, Verner and Boss 1980, Brown 1985, Ehrlich et al. 1992). They prey almost exclusively on birds (Verner and Boss 1980), and many of the prey species are associated with riparian habitats. A recovery plan for the American peregrine falcon is available (Pacific Coast American Peregrine Falcon Recovery Team 1982).

Potential Effects of Insects, Disease, Fire, and Management Strategies

The primary impact of disturbances on peregrine falcons is in how it affects their prey. Peregrine falcons nest on cliffs in relatively open habitat, so their nesting habitat is not influenced by disturbance processes. Tree mortality associated with fire, insects, and disease may affect the prey base of peregrine falcons. Protecting riparian and aquatic habitats may be an important consideration for this species because many of their avian prey species are found here. Human disturbance at nest sites can inhibit reproductive success.

Harlequin Duck

Harlequin ducks are sea ducks that winter in coastal areas and migrate inland to nest along swiftly flowing mountain streams in eastern Oregon and Washington, as well as areas to the east (Cassirer and Groves 1991, Cassirer et al. 1991). Little is known of this species in eastern Oregon and Washington, although populations have been investigated in Idaho (Cassirer et al. 1991), Montana (Kuchel 1977, Wallen 1987), and British Columbia (Vermeer 1983). In northern Idaho, streams used by this species were usually in mature to old-growth forests, although breeding areas in the Teton Mountains occurred in streams with shrubby riparian vegetation with younger Douglas-fir (*Pseudotsuga menziesii*) in the overstory (Cassirer and Groves 1991).

Potential Effects of Insects, Disease, Fire, and Management Strategies

The potential effects of disturbance agents on harlequin ducks are unknown, although tree mortality could influence nesting and brood-rearing habitat and benthic invertebrate biomass. Logging that removes habitat or alters stream flow and increases siltation (which negatively affects invertebrate prey) is probably the main source of breeding habitat degradation (Robertson and Goudie 1999). Harlequin ducks would benefit if logging, road building, and human disturbances are avoided along stream reaches they use (Cassirer and Groves 1991) and if woody debris and riparian vegetation in and adjacent to streams is maintained (Lewis and Kraege n.d.)

Upland Sandpiper

The breeding range of the upland sandpiper includes portions of eastern Oregon and Washington (Scott 1987), although populations here are small and disjunct. This species nests in loose colonies in tall grass in drier grasslands (Udvardy 1977) and is associated with open stands of ponderosa pine (*Pinus ponderosa*). Little informa-

tion is available on this species in Oregon and Washington, although more information is available from the Midwest (Higgins and Kirsch 1975, Ailes and Toepfer 1977, Ailes 1980). This species is primarily insectivorous, but also consumes seeds (Sayler and Martin 1996).

Potential Effects of Insects, Disease, Fire, and Management Strategies

The effects of disturbances on this species would be minimal, although the loss of small grasslands due to encroachment from fire suppression could be detrimental. Prescribed fire may be beneficial to this species by removing shrubs and trees and maintaining a predominantly grassland environment (McAllister 1995). Cutting of snags and trees adjacent to small grasslands would eliminate perching habitat. In the West, overgrazing is detrimental to their habitat (Ehrlich et al. 1992, McAllister 1995).

Northern Goshawk

The northern goshawk is characteristic of mature forest types with a high degree of canopy cover. In addition to forest cover type, stand structure, patch size, landscape features, coarse woody debris, dead trees, understory vegetation, openings, and canopy closure are important to goshawks and their prey (Graham et al. 1999). Goshawks forage below the canopy on a variety of birds and mammals. Management recommendations for this species have been provided in the southwestern United States (Reynolds et al. 1992).

Potential Effects of Insects, Disease, Fire, and Management Strategies

Timber harvest is the principal threat to breeding populations of goshawks (Squires and Reynolds 1997), so those disturbances or management strategies that result in the death or removal of nesting trees or a reduction in stand density and canopy closure would be detrimental to this species. Fire suppression, grazing, insect and tree disease outbreaks can result in the deterioration or loss of nesting habitat (Graham et al. 1999). Pesticides do not appear to be a major threat.

Ferruginous Hawk

Although ferruginous hawks typically occupy open shrubland habitats, they nest in trees (primarily junipers) or on cliffs and can occur in forested areas (Lokemoen and Duebbert 1976, Woffinden and Murphy 1977, Jasikoff 1982, MacLaren et al. 1988, Woffinden and Murphy 1989). Diet includes medium-sized mammals, such as ground squirrels and rabbits and hares (Schmutz and Hungle 1989).

Potential Effects of Insects, Disease, Fire, and Management Strategies

It is unlikely that disturbances will significantly affect this species because it is primarily associated with more open habitats. Sayler and Martin (1996) stated that the reduction of nest trees would be detrimental, but that habitat alteration to earlier seral stages and less dense forests may increase prey populations. Livestock grazing could influence prey species abundance and indirectly affect this species. Roads and other human disturbances may be a factor in habitat use of this species and may influence their nest placement (Gilmer and Stewart 1983). Population declines may be attributed to the effects of cultivation, grazing, poisoning and controlling small mammals, mining, and fire in nesting habitats (Bechard and Schmutz 1995).

Black Rosy Finch

The black rosy finch typically occurs above timberline, migrates altitudinally, and breeds on cliffs and rocks at high elevation (French 1959, King and Wales 1964, Scott 1987). In winter, this species roosts in abandoned buildings, mine shafts, and abandoned swallow nests (Leffingwell and Leffingwell 1931, Miller and Twining 1943). This species is primarily a seed-eater, where 97% of the crop contents are seeds of plant species found at high elevations, and 3% are insects (French 1959). Nestlings are fed primarily insects until fledging.

Potential Effects of Insects, Disease, Fire, and Management

Loss of tree canopy due to mortality from insects and disease may benefit this species, because seed-producing forbs and shrubs may be fostered in early seral stages following timber harvest (Sayler and Martin 1996). Disturbance agents are likely to have minimal effect on nesting habitat because it occurs above timberline in rocks and cliffs. Spraying with herbicides could be detrimental to

this species depending on the plant species targeted. Grazing primarily from sheep and human recreational activities in alpine tundra could have a negative effect on habitat of the black rosy finch (Wisdom et al. 2000).

Cavity-Nesting Birds

A number of the primary cavity nesters, the woodpeckers and nuthatches, occur in low numbers and in restricted habitats. The primary cavity-nesting birds associated with old forests of ponderosa pine, namely the white-headed woodpecker, pygmy and white-breasted nuthatches, are perhaps the most uncommon because of the limited distribution and loss of habitat in ponderosa pine habitats. Species accounts in The Birds of North America are available for the white-headed woodpecker (Garrett et al. 1996) and white-breasted nuthatch (Pravosudov and Grubb 1993). Information from studies conducted on white-headed woodpeckers in central Oregon is provided in Dixon (1995), Frenzel (1999), and Frenzel and Popper (1998). All three of these species nest in large-diameter (53-80 cm dbh) trees (Wisdom et al. 2000), although the nuthatches use natural cavities more often than they excavate their own nest cavity (McEllin 1979, Brawn and Balda 1988, Milne and Hejl 1989). White-headed woodpeckers rely heavily on soft snags for nest sites (Milne and Hejl 1989, Garrett et al. 1996). All of these species forage largely on live trees, typically ponderosa pine (Bock 1969, Bull et al. 1986, Dixon 1995).

The Lewis' woodpecker is also often associated with stands of ponderosa pine, riparian areas, and recently burned areas (Tobalske 1997, Saab and Dudley 1998). Unlike the other woodpeckers, they are aerial insectivores and require openings for foraging maneuvers, and are often classified as a specialist in burned pine forests (Tobalske 1997). This species requires large snags in an advanced state of decay for nesting (Bock 1970, Raphael and White 1984).

Cavity-nesting species less commonly associated with older stands of mixed conifer include the black-backed woodpecker, three-toed woodpecker, and pileated woodpecker. Accounts in The Birds of North America are available for the black-backed (Dixon and Saab 2000) and pileated woodpecker (*Dryocopus pileatus*) (Bull and Jackson 1995).

Burned forests and other insect-infested forests provide key conditions for nesting and foraging of the black-backed woodpecker (Goggans et al. 1988, Marshall 1992, Hutto 1995, Caton 1996, Hoffman 1997, Saab and Dudley 1998, Wisdom et al. 2000). Black-backed woodpeckers are highly nomadic and may concentrate in burned areas taking advantage of the abundance of invertebrates for several years following the fire. This species feeds largely on larvae of bark beetles and wood-boring beetles (Marshall 1992), which are obtained by scaling bark from trunks (Bull et al. 1986) and by excavating logs and bases of large-diameter tree trunks (Villard 1994). Habitat and foraging strategies used by three-toed woodpeckers are similar to those used by black-backed woodpeckers, although three-toed woodpeckers use higher elevations and spruce (*Picea* spp.) and lodgepole pine (*Pinus contorta*) habitats more often (Bock and Bock 1974, Hogstad 1976, Villard 1994).

Pileated woodpeckers are associated primarily with older stands because they nest in large-diameter snags, roost in large-diameter hollow trees, and forage on ants in large-diameter logs and snags (Bull et al. 1992a, 1992b; Bull and Holthausen 1993; Bull and Jackson 1995; Torgersen and Bull 1995).

Potential Effects of Insects, Disease, Fire, and Management Strategies

Primary cavity nesters depend heavily on disturbance agents (insects, disease, and fire) that result in dead or hollow trees. These cavity-nesting birds typically excavate nest and roost cavities each year, and most species require some degree of decay in the wood to enable them to excavate (Bull et al. 1997). In addition, the majority of the primary cavity nesters are insectivorous and many prey on bark beetles (Marshall 1992) and defoliators (Torgersen and Torgersen 1995).

Salvaging dead or dying trees is typically detrimental to woodpeckers because the trees removed are the very ones used for nesting and foraging (Scott 1979). Wisdom et al. (2000) suggested that portions of burned forests not be salvaged to maintain contiguous burned stands of at least 387 ha to increase habitat quality and abundance for fire-associated species. In portions that are salvaged, they recommend retaining at least 104 snags per ha in a clumped distribution. In post-wildfire habitat in Idaho, Saab and Dudley (1998) reported that many bird species studied selected nest sites

with higher tree densities than that measured at random sites, and cavity nesters as a group selected clumps of snags rather than snags in evenly-spaced distributions. However, nesting density and success of Lewis' woodpeckers was higher in the salvage-logged units than in unlogged units (Saab and Dudley 1998).

Prescribed burning and thinning of undesirable tree species can be used to restore dominance of ponderosa pine to sites where transition to other cover types has occurred. Prescribed underburning, thinning of only small-diameter trees, and uneven-aged management can help accelerate the development of mid-successional forests to old forests in mixed coniferous forests. However, it is important that old forests in both low-elevation ponderosa pine and broad-elevation mixed-conifer forests be considered simultaneously in the design of conservation strategies. For example, efforts to restore the composition and structure of lower montane forests may involve thinning or use of fire in areas where shade-tolerant species now dominate. However, such areas currently serve as source habitats for many of those species associated with older, mixed-conifer stands, so the retention of an appropriate network of these habitats would be essential for restoring lower montane forests in a manner that provides habitat for species associated with both older ponderosa pine stands and older mixed-conifer stands (Wisdom et al. 2000).

Spraying with biological microbial agents (virus, bacteria) could influence food abundance of some of the woodpeckers and many of the secondary cavity nesters because they have been observed feeding on western spruce budworm (*Choristoneura occidentalis*) and/or Douglas-fir tussock moth (*Orgyia pseudotsugata*) (Torgersen and Torgersen 1995). The extent of these effects would depend on the number of non-target species affected and the area treated. Treatment with *Bacillus thuringiensis* var. *kurstaki* (B.t.k.) has resulted in a decrease in richness and/or abundance of non-target lepidoptera larvae during the year of treatment, and recovery to pre-treatment levels took 1-2 years for most species (USDA Forest Service 2000). Nest success of some secondary cavity nesters, like chickadees, could be negatively affected after treatment with B.t.k. because of a loss of prey. The use of insect attractants or dispersal agents is unlikely to have a large effect on cavity-nesting birds.

Road closure and removal will benefit the cavity nesters because it eliminates access for wood cutting, which has been a primary factor in a decrease in the number of nest and roost sites (Wisdom et al. 2000). Roads also create habitat edge, which may be beneficial to those species that prefer edges, but may be detrimental to those species that avoid edges or experience increased mortality near or along edges (Marcot et al. 1994).

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Note

This special issue of *Northwest Science* is a set of papers reviewing the state of knowledge about disturbance processes in eastern Oregon and Washington, related management practices, and effects on key management issues.