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Management Recommendations for Washington's Priority Habitats and Species

Elizabeth Rodrick and Ruth Milner, Technical Editors

Washington Department of Wildlife
Wildlife Management, Fish Management, and Habitat Management Divisions

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KEY POINTS:

Habitat Requirements:

- Selkirk Mountains, mature to old growth forest.
- Spring - cedar-hemlock & lower elevation zones..
- Early winter - cedar-hemlock zone & ecotone with subalpine fir.
- Late Winter and Summer - alpine and spruce-fir zones.
- Diet - winter: arboreal lichens, Other seasons: lichens, herbs, mushrooms, shrub leaves, grasses, & sedges.

Management Recommendations:

- Maintain large blocks of all seasonal habitats, emphasizing critical summer and early winter habitats.
- Maintain forest corridors between seasonal ranges.
- Avoid clearcuts.
- Use road closures to control access and hunting in wintering areas.
- Allow some lower elevation forest stands to mature.

C: 5/7/91 BR

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* These reports will be mailed later under separate cover.

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Washington Department of Wildlife

Management Recommendations for Priority Species

Introduction

The Washington Department of Wildlife's (WDW) Priority Habitats and Species (PHS) program provides three products:

- Lists of the WDW's most important habitats and species;
- Management recommendations for each priority habitat and species; and
- Maps showing the geographic location of priority habitats and species.

This document contains the management recommendations for forest associated priority species. Other PHS products are available upon request.

SOURCE: The attached management recommendations are strategies for providing suitable habitat for priority wildlife species. An illustration of the species and its general geographic distribution accompany the text. These recommendations were prepared by WDW biologists, the PHS Core Team, and PHS Technical Advisory Committee using the most current scientific literature and expert comment.

Additionally, maps are available from WDW showing the specific geographic location of each priority habitat and species as a point or polygon at a scale of 1:24,000. Please follow the procedures described in the "WDW Fish & Wildlife Data Sources" publication, dated May 1991, when ordering this information.

USE: The recommendations are intended for site specific discussions with landowners to encourage retention and enhancement of suitable wildlife habitat. A management prescription may provide more or less habitat than what the recommendations indicate. Monitoring is encouraged to evaluate the effectiveness of the prescriptions.

AVAILABILITY: These recommendations are the first in a series for use by landowners, natural resource managers, biologists, and planners from private and public organizations. Management recommendations will be developed for additional species and habitats as the PHS Program completes its remaining phases statewide. Management recommendations for priority habitats are being developed and should be ready by late summer 1991. Each document is three-hole punched to allow for periodic review and updating as more information becomes available. Each report is dated on the last page in the lower right hand corner.

PUBLIC OUTREACH: These management recommendations are being provided to county and city planners for the purpose of assisting them in complying with

the Growth Management Act of 1990 and meeting the September 1, 1991 deadline for classifying and designating critical areas. Simultaneous distribution is being made to the Timber/Fish/Wildlife cooperators for their information and review. Technical comments should be directed to the editors, Elizabeth Rodrick or Ruth Milner. Biologists in WDW's regional offices should be contacted for assistance in interpreting the information for field use.

WDW REGIONAL OFFICES:

Region 1 - N. 8702 Division
Spokane, WA 99218
(509) 456-4082
Sacn - 545-4082

Region 2 - P.O. Box 850
1540 Alder St. NW
Ephrata, WA 98823
(509) 754-4624
Scan - 282-2298

Region 3 - 2802 Fruitvale Blvd.
Yakima, WA 98902
(509) 575-2740
Scan - 558-2740

Region 4 - 16018 Mill Creek Blvd.
Mill Creek, WA 98012
(206) 775-1311
Scan - 348-6509

Region 5 - 5405 NE Hazel Dell Ave.
Vancouver, WA 98633
(206) 696-6211
Scan - 476-6211

Region 6 - 905 E. Heron
Aberdeen, WA 98520
(206) 533-9335
Scan - 234-2600

Date: 5/21/91

FORESTED PRIORITY SPECIES

AMPHIBIANS, REPTILES, BIRDS, MAMMALS, & INVERTEBRATES

SPECIES (& CODE)	CRIT(1)	STATUS(2)	REGIONS(3)	MAP INFO(4)	MAP CRIT(5)	MAPPING GUIDELINES(6)
FISH						
Bull trout *Salvelinus confluentis*	3	game	1 2 3 4 5 6	line	IO, B	documented occurrences
Dolly Varden *Salvelinus malma*	3	game	_ _ _ 4 5 6	line	IO, B	documented occurrences
Kokanee *Oncorhynchus nerka*	3	game	1 2 3 4 5 6	line	IO, B	documented occurrences
Mountain sucker *Catostomus platyrhynchus*	2	SM	1 2 3 _ _ _	line	IO	documented occurrences
Mountain whitefish *Prosopium williamsoni*	3	game	1 2 3 4 5 6	line	IO	documented occurrences
Olympic mudminnow *Novumbra hubbsi*	1	SC	_ _ _ _ 5 6	line	IO	documented occurrences
Pygmy whitefish *Prosopium coulteri*	2	SM	_ _ 3 4 _ _	line	IO	documented occurrences
Rainbow/Steelhead trout *Oncorhynchus mykiss*	3	game	1 2 3 4 5 6	line	IO, B	documented occurrences
Searun/Coastal cutthroat *Oncorhynchus clarki*	3	game	_ _ _ 4 5 6	line	IO, B	documented occurrences
Westslope cutthroat *Oncorhynchus lewisi*	3	game	1 2 3 _ _ _	line	IO, B	documented occurrences
AMPHIBIANS						
Dunn's salamander *Plethodon dunni*	1	SC	_ _ _ _ 5 6	pt	IO	documented occurrences
Larch Mountain salamander *Plethodon larselli*	1	SC	_ _ _ _ 5 _	pt	IO	documented occurrences
Van Dyke's salamander *Plethodon vandykei*	1	SC	_ _ _ _ 5 6	pt	IO	documented occurrences
Spotted frog *Rana pretiosa*	1	SC	_ _ _ 4 5 6	pt	IO	documented occurrences
REPTILES						
Western pond turtle *Clemmys marmorata*	1	ST	_ _ _ 4 5 6	poly	IO	documented occurrences

SPECIES (& CODE)	CRIT(1)	STATUS(2)	REGIONS(3)	MAP INFO(4)	MAP CRIT(5)	MAPPING GUIDELINES(6)
BIRDS						
Common loon *Gavia immer*	1	SC	1 2 3 4 5 6	pt	B	documented breeding sites
Great blue heron (ARHE) *Ardea herodias*	2	SM	1 2 3 4 5 6	poly	B	breeding areas, concentrations in feeding areas
Sandhill crane (GRCA) *Grus canadensis*	1	SE	1 2 _ _ 5 _	poly	B, RLC, M	breeding areas, concentrations in staging and feeding areas
Harlequin duck *Histrionicus histrionicus*	3	game	1 2 3 4 5 6	pt	B, IO	documented occurrences
Cavity-nesting ducks (CANED) includes Wood Duck, Bufflehead, Common & Hooded Mergansers, Barrow's Goldeneye	3	game	1 2 3 4 5 6	pt or poly	B	documented breeding sites
Marbled murrelet *Brachyramphus marmoratus*	1	SC	_ _ _ 4 _ 6	poly	B	documented breeding areas
Golden eagle *Aquila chrysaetos*	1	SC	1 2 3 4 5 6	pt	B	documented breeding sites
Bald eagle *Haliaeetus leucocephalus*	1	ST	1 2 3 4 5 6	poly	B, RSC CR, T	breeding sites, communal roosts, wintering areas, regularly used perch trees
Northern goshawk *Accipiter gentilis*	1	SC	1 2 3 4 5 6	pt	B	documented breeding sites
Osprey *Pandion haliaetus*	2	SM	1 2 3 4 5 6	pt	B	documented breeding sites
Peregrine falcon (FAPE) *Falco peregrinus*	1	SE	1 2 3 4 5 6	poly	B, RI	breeding sites, wintering sites
Blue grouse *Dendragapus obscurus*	3	game	1 2 _ _ 5 _	pt or poly	RSC, B	documented occurrences, winter concentrations
Merriam's turkey *Meleagris gallopavo*	3	game	_ _ _ _ 5 _	poly	RSC, RLC	roosts, documented occurrences
Band-tailed pigeon (COFA) *Columba fasciata*	3	game	_ _ _ 4 5 6	pt	B, RSC	breeding sites, mineral springs
Yellow-billed cuckoo *Coccyzus americanus*	1	SC	_ _ _ 4 _ _	pt	IO, RI	documented occurrences
Spotted owl *Strix occidentalis*	1	SE	_ 2 3 4 5 6	poly	IO	documented occurrences
Flammulated owl *Otus flammeolus*	1	SC	1 _ 3 _ _ _	pt	B, RI	documented occurrences
Vaux's swift *Chaetura vauxi*	1	SC	1 2 3 4 5 6	pt	B, CR	breeding sites, communal roosts
White-headed woodpecker *Picoides albolarvatus*	1	SC	1 2 3 _ 5 _	pt	B, RI	documented occurrences

SPECIES (& CODE)	CRIT(1)	STATUS(2)	REGIONS(3)	MAP INFO(4)	MAP CRIT(5)	MAPPING GUIDELINES(6)
Lewis' woodpecker *Melanerpes lewis*	1	SC	1 2 3 _ 5 _	pt	B	breeding sites
Black-backed woodpecker *Picoides arcticus*	2	SM	1 _ 3 4 _ _	pt	B, RI	documented occurrences
Pileated woodpecker *Dryocopus pileatus*	1	SC	1 2 3 4 5 6	pt	B	breeding sites, feeding territory
Purple martin *Progne subis*	1	SC	_ _ 3 4 5 6	pt	B	breeding sites; note wetland feeding areas
Western bluebird *Sialia mexicana*	1	SC	1 2 3 4 5 6	pt	B	breeding sites; note grass feeding areas
MAMMALS						
Pygmy shrew *Sorex hoyi*	1	SC	1 _ _ _ _ _	pt	IO	documented occurrences
Townsend's big-eared bat *Plecotus townsendii*	1	SC	_ _ _ 4 5 _	pt	B, CR	breeding & roosting sites
Western gray squirrel (SCGR) *Sciurus griseus*	1	SC	_ 2 3 4 5 6	poly	IO	breeding & foraging areas, oak-conifer woodlands
Pocket gopher *Thomomys talpoides* and *Thomomys mazama*	1	SC	_ _ _ 4 5 _	poly	IO	breeding area
Lynx *Lynx canadensis*	3	game	1 2 3 _ _ _	poly	IO	documented occurrences
Gray wolf *Canis lupus*	1	SE	_ 2 _ 4 _ _	pt	IO	documented occurrences
Grizzly bear *Ursus arctos*	1	SE	1 2 _ 4 _ _	pt	IO	documented occurrences
Marten *Martes americana*	3	game	1 2 3 4 5 _	pt	IO	documented occurrences
Fisher *Martes pennanti*	1	SC	_ _ _ _ 5 6	pt	IO	documented occurrences
Mountain goat *Oreamnos americanus*	3	game	1 2 3 4 5 6	poly	RSC, B	documented occurrences, year-round concentrations
Moose *Alces alces*	3	game	1 2 _ _ _ _	poly	IO	documented occurrences
Rocky mountain mule deer *Odocoileus hemionus hemionus*	3	game	1 2 3 _ 5 _	poly	RLC, M RSC, B	documented occurrences
White-tailed deer *Odocoileus virginianus*	3	game	1 2 _ _ _ _	poly	RLC, M RSC, B	documented occurrences
Columbian white-tailed deer *Odocoileus virginianus leucurus*	1	SE	_ _ _ _ 5 _	poly	RSC	documented occurrences

SPECIES (& CODE)	CRIT(1)	STATUS(2)	REGIONS(3)	MAP INFO(4)	MAP CRIT(5)	MAPPING GUIDELINES(6)
Columbian black-tailed deer *Odocoileus hemionus columbianus*	3	game	_ _ _ 4 5 6	poly	RLC, M	documented occurrences RSC
Elk *Cervus canadensis*	3	game	1 _ 3 4 5 6	poly	RLC, M RSC, B	documented occurrences
Mountain caribou *Rangifer tarandus*	1	SE	1 _ _ _ _ _	pt or poly	IO	documented occurrences
Bighorn sheep *Ovis canadensis*	3	game	1 2 3 _ _ _	poly	RSC, B RLC	documented occurrences, breeding areas
INVERTEBRATES						
Beller's ground beetle *Agonum belleri*	1	SC	_ _ _ 4 _ _	pt	IO	documented occurrences
Hatch's click beetle *Eanus hatchii*	1	SC	_ _ _ 4 _ _	pt	IO	documented occurrences
Long-horned leaf beetle *Donacia idola*	1	SC	_ _ _ 4 _ _	pt	IO	documented occurrences
Golden hairstreak *Habrodais grunus herri*	1	SC	_ _ _ 4 _ _	pt	IO	documented occurrences
Oregon silverspot fritillary *Speyeria zerene hippolyta*	1	ST	_ _ _ _ _ 6	pt	IO	documented occurrences

(1) CRIT (Criteria) codes:

1 = Species determined to be in danger of failing, declining, or vulnerable due to factors such as limited numbers, disease, predation, exploitation or habitat loss or change. These are both state listed and state candidate species for endangered, threatened, and sensitive classification that occur in forest environments.

2 = Uncommon species, including Monitor species, occurring in forest environments and that may be affected by habitat loss or change.

3 = Species in forest environments for which the maintenance of a stable population and surplus for recreation may be affected by habitat loss or change.

(2) STAT (Status) codes:

SE - State Endangered	SC - State Candidate (for Endangered, Threatened, or Sensitive)
ST - State Threatened	SM - State Monitor
SS - State Sensitive	game - game species, subject to hunting/fishing regulations
FT - Federally Threatened	nongame - wildlife species that is not hunted or fished

(3) Regional divisions of Washington Department of Wildlife in which the species is found and included on the PHS list:
Region 1: Asotin, Columbia, Ferry, Garfield, Lincoln, Pend Oreille, Spokane, Stevens, Walla Walla, & Whitman counties.
Region 2: Adams, Douglas, Franklin, Grant, and Okanogan counties.
Region 3: Benton, Chelan, Kittitas, and Yakima counties.
Region 4: Island, King, Pierce, San Juan, Skagit, Snohomish, and Whatcom counties.
Region 5: Clark, Cowlitz, Klickitat, Lewis, Skamania, and Wahkiakum counties.
Region 6: Clallam, Grays Harbor, Jefferson, Kitsap, Mason, Pacific, and Thurston counties.

(4) Map info:

Species occurrences will be mapped as:
polygons (**poly**), which are areas greater than 10 acres
points (**pt**), which are areas less than 10 acres
lines (**line**), which are narrow, linear areas (eg., streams, rivers)

(5) Map criteria:

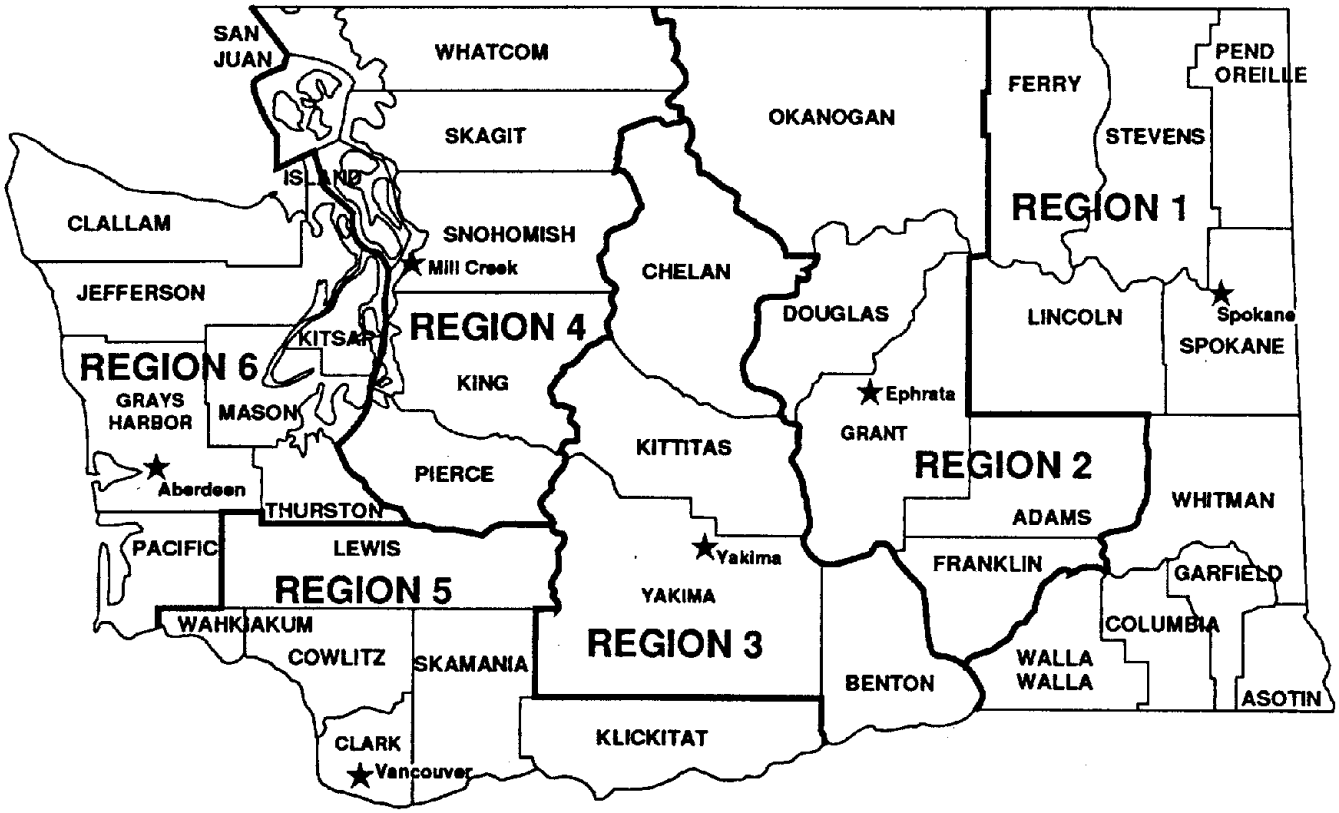
B - Breeding	CR - Communal or Colonial Roosts
RI - Regular Individual Occurrence	HO - Haul Out Sites
RLC - Regular Large Concentrations	IO - Individual Occurrence
RSC - Regular Small Concentrations	M - migration (migratory stopovers)

(6) Mapping guidelines: Used in conjunction with map criteria to determine what kinds of information are mapped for each species.

Washington Department of Wildlife

Management Recommendations for Priority Habitats and Species

State of Washington



Includes Department of Wildlife Regional Boundaries and Offices

Washington Department of Wildlife

Management Recommendations for Priority Species

Status Abbreviations Defined

FEDERALLY LISTED SPECIES

FE - FEDERAL ENDANGERED - A species which is in danger of extinction throughout all or a significant portion of its range.

FT - FEDERAL THREATENED - A species which is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range.

FC - FEDERAL CANDIDATE - Includes formally proposed endangered or threatened species and candidate species 1 or 2 for which the U.S. Fish and Wildlife Service has (1) enough or (2) some information to indicate biological vulnerability and threat.

FS - FEDERAL SENSITIVE - A species that is informally considered a sensitive species by the U.S. Fish and Wildlife Service, Region One.

STATE LISTED SPECIES

SE - STATE ENDANGERED - A species, native to the state of Washington, that is seriously threatened with extirpation throughout all or a significant portion of its range within the state. Endangered species are legally designated in WAC 232-12-014.

ST - STATE THREATENED - A species, native to the state of Washington, that is likely to become endangered in the foreseeable future throughout a significant portion of its range within the state without cooperative management or the removal of threats. Threatened species are legally designated in WAC 232-12-011.

SS - STATE SENSITIVE - A species , native to the state of Washington, that is vulnerable or declining and is likely to become endangered or threatened in a significant portion of its range within the state without cooperative management or the removal of threats. Sensitive species are legally designated in WAC 232-12-011.

SC - STATE CANDIDATE - These species are under review by the Department for possible listing as endangered, threatened, or sensitive. A species will be considered for State Candidate designation if sufficient scientific evidence suggests that its

status may meet criteria defined for endangered, threatened, or sensitive in WAC 232-12-297. Currently listed State Threatened or State Sensitive Species may also be designated as a State Candidate Species if their status is in question. State Candidate Species will be managed by the Department, as needed, to ensure the long-term survival of populations in Washington. They are listed in WDW Policy 4802.

SM- STATE MONITOR - State monitor species will be managed by the Department , as needed, to prevent them from becoming endangered, threatened, or sensitive. A species will be considered for State Monitor designation for the following reasons:

1) it was at one time classified as endangered, threatened, or sensitive;
2) it requires habitat that has limited availability during some portion of its life cycle;
3) it is an indicator of environmental quality;
4) its population status must be determined through further field investigations;
5) it has unresolved taxonomy which may bear upon its status classification;
6) it may be competing with and impacting other species of concern; or
7) it has significant popular appeal.

State Monitor Species are listed in WDW Policy 4803.

Species already classified in a category that provides adequate management emphasis, survey work, and data maintenance (e.g., game animals, game birds, furbearers, etc.) will not be designated as State Monitor Species.

Priority Species Management Recommendations

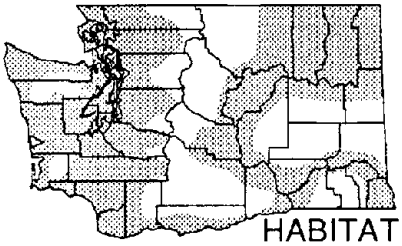
Washington Department of Wildlife
Management Recommendations for Priority Species

Haliaeetus leucocephalus

Bald Eagle

RANGE: Breeds mainly in Alaska, Canada, the Pacific Northwest states, the Rocky Mountain states, the Great Lake states, Florida, and Chesapeake Bay. Winters over most of the breeding range, primarily from southern Alaska and southern Canada southward (USFWS 1986, AOU 1983).

WASHINGTON DISTRIBUTION: Resident near large waters west of the Cascade Mountains, with scattered breeding areas in eastern Washington. Primary winter range includes the Olympic Peninsula, the San Juan Islands, Puget Sound and its major tributaries, the Cowlitz and Columbia rivers, and Hood Canal.



HABITAT REQUIREMENTS: The bald eagle is found along the shores of saltwater, and freshwater lakes and rivers. In Washington, breeding territories are located in predominantly coniferous, uneven-aged stands with old-growth components (Anthony et al. 1982). Territory size and configuration are influenced by a variety of habitat characteristics, including availability and location of perch trees for foraging, quality of foraging habitat, and distance of nests from waters supporting adequate food supplies (Watson, pers. comm.). Habitat models for nesting bald eagles in Maine show that the eagles are selecting areas with 1) suitable forest structure, 2) low human disturbance, and 3) highly diverse or accessible prey (Livingston et al. 1990).

Breeding - Bald eagles typically build large stick nests in mature or old growth trees, which are generally used over successive years. In Washington, courtship and nest building activities generally begin in January and February. Egg-laying begins in March or early April, with eaglets hatching in mid-April or early May. Eaglets usually fledge in mid-July and often remain in the vicinity of the nest for another month (Anderson et al. 1986). On portions of the breeding range where waterways do not freeze, adult eagles may remain on the territory year-round. Juvenile eagles often drift from their nest area during winter to gather at areas with concentrated food (Watson, pers. comm.).

Sizes of eagle nest trees are dictated by the forest type and tree species found within a geographic area; eagles apparently select for structure rather than tree species (Anthony et al. 1982, Anthony and Isaacs 1989). A typical nest tree is dominant or co-dominant with the overstory, and is usually live, but often has a dead or broken top with a limb structure to support the nest. The nest tree usually provides an unobstructed view of nearby water, and has stout upper branches that form flight windows large enough to accommodate the bird's large wingspan (Grubb 1976).

Bald eagle nests typically are located within the top 7m (20') of the tree (USFWS 1986). Territories may contain alternate nests. Grubb (1980) found that alternate nest trees in territories of Washington birds were located an average of 322m (1050') from occupied nests. Although the reasons for construction of alternate nests are unclear, they may facilitate successful reproduction if the primary nest is disturbed or destroyed. Within a territory, additional snags and trees with exposed lateral limbs or dead tops are used as perches, roosts, and defense stations (USFWS 1986).

The three main factors affecting distribution of nests and territories are 1) nearness of water and availability of food, 2) suitable trees for nesting perching, and roosting, and 3)the number of breeding-aged eagles(Stalmaster 1987). Grubb (1980) found an average territory radius of 2.5km (1.6 mi.) in western Washington. However, on the lower Columbia River where productivity is low, the mean home range size and minimum distance between eagle nests were 22 km^2 (13.6 mi^2) and 7.1 km (4.4 mi), respectively (Garrett et al. 1988). Distances between concurrently occupied territories may be important in maintaining productivity when the above factors are limiting.

Wintering - Migrant eagles begin arriving at their traditional wintering grounds during late October (Anderson et al. 1986). Wintering bald eagles concentrate in areas where food is abundant and disturbance is minimal. The birds use perches during the day, which mainly are selected according to their proximity to a food source (Steenhof et al. 1980 in USFWS 1986). Perch trees tend to be the tallest available, and preferred branches are consistently used. A variety of tree species, both alive and dead, are used for perching (Stalmaster 1976).

Wintering birds may roost communally at night near major foraging areas. Studies have shown that eagles conserve energy by roosting in protected habitat. Tree species type varies with geographic area, but communal roost stands generally are uneven-aged with a multi-layered canopy. Roosts typically are established in isolated areas in old-growth stands that have trees larger than the surrounding trees. Roost trees apparently are selected according to their height, diameter, and growth form, and for the protection they offer from wind, inclement weather, and human disturbance. Eagles may gather in staging trees located between the feeding grounds and the roost trees, prior to entering the night roost (Hansen et al. 1980, Anthony et at. 1982, Stalmaster 1987).

Feeding - Sufficient, consistent, accessible, and uncontaminated food resources may be the most critical components of winter and breeding habitat for bald eagles (USFWS 1986, Stalmaster 1987). Because eagles often depend on dead or weakened prey, their diet may vary locally and seasonally. Various carrion, including spawned salmon taken from gravel bars along wide, braided river stretches, are important food items during fall and winter (Stalmaster et al. 1985, Stalmaster 1987). Waterfowl often are taken as well, especially near hunting areas where crippled and dead birds occur (Watson, pers. comm.). Anadromous and warm-water fishes, small mammals, carrion, and seabirds are consumed during the breeding season (USFWS 1986, Anderson et al. 1986).

In Maine, bald eagles nested near waters with abundant prey, shallow lakes with high diversity of warm water fishes, and marine habitats with a high variety of diadromous fish (Livingston et al. 1990).

Activities that disturb eagles while feeding, especially during winter, can cause them to expend more energy, which increases their susceptibility to disease and poor health (Stalmaster 1987).

LIMITING FACTORS:

Prey availability and temporal disturbances from human activities probably are most critical to bald eagle productivity and survival. Availability of suitable nesting and roosting habitat will limit distribution.

Although bald eagle populations recently have increased, cumulative habitat changes over time may cause eagles to move, confine them to small areas, and cause gradual population decline (Stalmaster 1987).

MANAGEMENT RECOMMENDATIONS:

Under the Washington State Bald Eagle Protection Rules (WAC-232-12-292) a cooperative Site Management Plan is developed whenever activities that alter habitat are proposed near a verified nest territory or communal roost. Each Site Management Plan is based on the unique characteristics of individual eagles and their home range, as well as surrounding land uses, in relation to the proposed activity and landowner goals.

Nests - Management strategies for bald eagles are evolving as researchers conduct more studies on eagle nesting and the effects of human activities on nesting success.

Anthony and Isaacs (1989) indicate that management of nest sites for older and more contiguous forests with low human disturbance will result in higher productivity. High tree density and moderate canopy closure are important to visually buffer human activities and to protect the nest and nest-tree from blowdown. Management for an uneven-sized forest dominated by Douglas fir west of the Cascades, and ponderosa pine east of the Cascades, will enhance the potential for nesting in the future. They also propose minimum nest-tree and forest stand requirements for bald eagle nest sites in three forest types. As many mature trees as possible should be maintained to ensure that forage, perch, and roost trees are protected. Large trees are also important sources for alternate nests.

Selective logging may be prescribed to maintain or enhance desired characteristics of nesting or roosting habitat (Stalmaster 1987). Livingston et al. (1990) found that eagle nests may occur near habitat edges, but excess forest edge appears to degrade habitat quality. Clearcut practices seem to deter breeding eagles from using otherwise suitable lakes.

Human activities around nest trees during the nesting season can disturb the eagles causing abandonment or reduced reproductive success and should be avoided (Anthony et al 1982).

In Washington, Grubb (1980) found that productive nests were further from permanent human activity, an average of 120m (400'), than from unproductive nests. Fraser et at. (1985) found that eagle nests were further from the shoreline in developed areas, that nests were further from clusters of houses than random points, and that 79% of eagles flushed from the nest at 300m (1000') at the approach of pedestrian. In Maine, nesting bald eagles avoided disturbed areas near lakes and marine shorelines (Livingston et al. 1990).

The Pacific States Bald Eagle Recovery Plan advises that site specific management plans should be developed by local groups or agencies. The plan further suggests temporary restrictions during the critical nesting and wintering periods on disturbing activities such as camping, blasting,

fireworks, and timber harvest within 400m (1300') of screened nests or within 800m (2600') of visible nests (USFWS 1986).

Anthony and Isaacs (1989) recommend that habitat alterations not occur within 400m (1300') of nests and that disturbing activities within 800m (2600') of nests should be time restricted. This is based on their research and Harris' (1984) work on maintaining the integrity of old-growth forest stands.

While maintaining unaltered old-growth stands may provide optimum bald eagle habitat, the necessary structural characteristics may be supplied in a properly managed forest overtime. The long term viability of nest sites in managed stands should be studied.

The Washington Department of Wildlife does not recommend standard buffer distances, but works with landowners using the flexible, territory zoning concept (fig. 1) to design site-specific management plans. The regional zoning technique (fig. 1) is used where concentrated nesting occurs.

Activities that render nesting habitat undesirable, such as logging, construction and frequent human intrusion, are restricted within the core nest area (protected area), near perch, forage and roost trees or foraging habitats. Topography and vegetation can provide screening that will minimize the impacts of disturbing activities.

Bald eagles are generally intolerant of human activities during the nesting season, but individual pairs may vary in the amount of activity that they will tolerate. In order to minimize the risks of causing a nest failure, logging, construction, camping, blasting and other activities that potentially could disturb eagles are restricted within the buffer zone (conditioned area) from January 1 through August 15(Anderson, pers. comm., Watson, pers. comm., McMillan pers. comm., Anthony and Isaacs 1989). However, if an eagle pair has been productive with specific ongoing activities or if the nest is verified as unoccupied, these activities may be allowed to continue.

Roosts - Bald eagle communal roosts (all trees used by three or more birds on consecutive nights) also warrant a Site Management Plan. Management typically involves restricted timber harvest and road closures near winter roosts from November 1 through April 1, maintenence of a permanent buffer around core roosting areas and protection of all staging trees. Permanent developments or alterations should not occur in the core or buffer areas.

The Pacific States Bald Eagle Recovery Plan recommends temporary buffers of 400m (1300') around screened roosts and 800m (2600') around visible roosts (USFWS 1986).

Perching and Foraging Areas - Stalmaster and Newman (1978) found that 50% of wintering eagles in open areas flushed at 150m (500') but 98% would tolerate human activities at 300m (1000').

Eagles should be allowed to feed unmolested, particularly during the morning hours when they are most active. They often ground feed in open areas with concentrated food resources and need at least a 450m (1500') buffer distance from human activity and permanent structures. Timing restrictions may be needed for activities that disturb feeding eagles, such as fishing and boating. Artificial feeding may be warranted during critical winter periods when food is temporarily unavailable (Stalmaster 1987, USFWS 1986).

Leave strips of tall perch trees from 50-100m (160'-330') wide along shorelines of major feeding areas. The wider strips are recommended in areas with greater human activity. In perching areas where little screening cover is present, buffer zones of 250-300m (800'-1000') are suggested (Stalmaster 1987).

Carefully review the following activities that may impact major eagle habitat: hydro-projects, irrigation, dredging, transportation of oil and other toxic compounds, application of herbicides and pesticides, introduction of exotic species, etc.

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Watson, J. Wildlife biologist, Washington Department of Wildlife, Mill Creek, WA.

Young, L. Wildlife biologist, Washington Department of Natural Resources, Olympia, WA.

KEY POINTS:

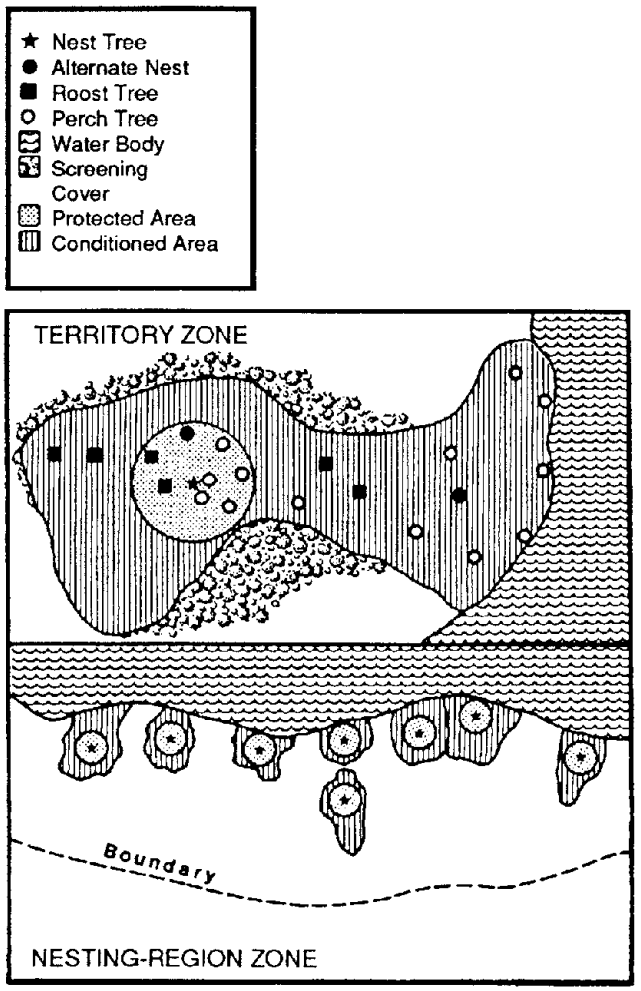
Habitat Requirements:

- Breeding - Uneven-sized forest stands with old-growth-like structural components along shorelines, and adequate food resources.
- Wintering - Day Perches: Tall trees, especially deciduous and snags along shorelines.
  Night Roosts: Uneven-sized, multi-layered, mature/old-growth stands that provide protection from weather.
- Feeding - Adequate food resources including spawned salmon, carrion, and waterfowl near nesting, perching, and roosting areas.
- Freedom from disturbance.

Management Recommendations:

- Develop site-specific management plans using the flexible, territory zoning concept.
- Design a protected core area and a conditioned buffer area surrounding nesting territories and communal roosts. Consider eagle habitat use, topography, habitat fragmentation, food resources, and human activities.
- Use timing restrictions for activities that may disturb eagles during critical periods: Breeding - Jan. 1-Aug. 15 and Wintering - Nov. 1-Apr. 1.
- Avoid use of toxic biocides.
- Leave strips of perch trees along shorelines.
- Provide a buffer around major foraging areas.

Figure 1: Management strategy for protecting bald eagles (Adapted from Stalmaster 1987).



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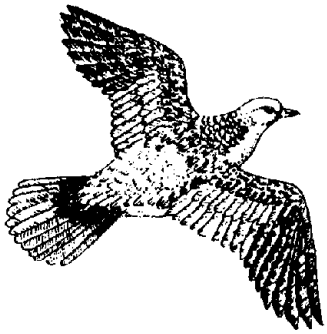


Columbia fasciata

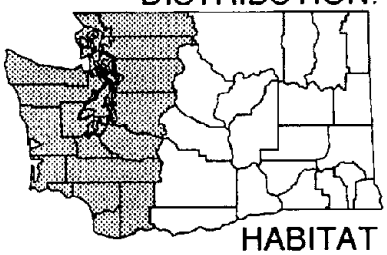
Washington Department of Wildlife

Management Recommendations for Priority Species

Band-tailed Pigeon

RANGE: The Pacific Coast Population of band-tailed pigeons breeds from mid-British Columbia south to Baja California. The eastern limit of distribution is generally the western slope of the Cascade and Sierra Nevada mountain ranges, to 4200m elevation (Pacific Flyway Council 1983). Winter range of the species is mainly in California south of Redding, although a limited number of band-tails winter in Mexico.

WASHINGTON DISTRIBUTION: The band-tailed pigeon occurs mainly in Western Washington. During breeding season most of the population occurs below 300 m (1000 feet) elevation (Jeffrey 1989). In late summer these birds move into higher elevations in response to ripening fruits and berries, and by late September most band-tails depart for southern wintering areas (Jeffrey 1989).



HABITAT REQUIREMENTS: During spring migration, band-tails are known to use agricultural crops for food, including peas and grains, as well as acorns, buds, blossoms, young leaves and needles, and persistent fruits and berries (Sanderson 1977). During the breeding season (April-September), band-tails are most common in coast forests with good interspersion of seral stages and openings, abundant food resources, and mineral springs (Sanderson 1977). Band- tail nests occur in conifers or broad-leaf trees, typically 4.5 to 12 m (15 to 40 feet) above ground, and may be loosely colonial in distribution or well dispersed (Sanderson 1977). Primary food sources include cascara, elderberry, wild cherry, huckleberry, dogwood, and madrone (Sanderson 1977). During fall, primary food includes acorns, other nuts, berries, and fruits (Jeffrey 1989).

During the breeding season, band-tails are known to seek sources of mineral salts necessary for the production of "crop milk" for feeding young (Sanderson 1977). Natural sources of these minerals are from mineral springs and specific marine shorelines, although some birds are known to use areas where salt blocks are placed for livestock (Sanderson 1977). Use of mineral springs by the same birds year after year has been documented by banding analysis (Jarvis, pers. comm.).

LIMITING FACTORS: Distribution of mineral sources in relation to food resources may limit band-tail nesting use of an area. Development or land management practices which degrade or destroy mineral springs and foraging areas may limit band-tail use of an area.

MANAGEMENT RECOMMENDATIONS: Protect mineral springs and other mineral sources which are extremely important if not critical for band-tailed pigeons. These must be protected from destruction and/or degradation, which includes removal of surrounding

trees used for perching. In some cases, mineral sources can be enhanced by removal of dense vegetation limiting bird access, and springs can be created from natural seeps in pigeon use areas by burying mineral salts. Maintain berry, fruit and mast producing shrubs and trees which provide food sources for this species, particularly in clearcuts in proximity to mineral sources. Avoid herbicide applications which impact food resources.

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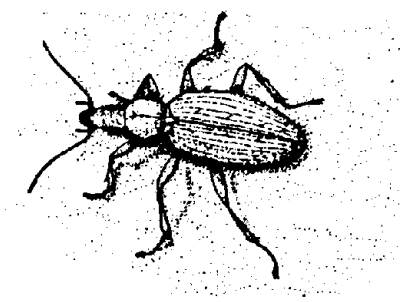
KEY POINTS:

Habitat Requirements:

- Mineral springs or other mineral sources.
- Mixed coniferous and deciduous forests, mixed seral stages, with openings.
- Availability of berry, fruit, and mast producing shrubs and trees.

Management Recommendations:

- Protect and enhance mineral springs and other mineral sources.
- Maintain berry, fruit, and mast producing shrubs and trees by limiting herbicide applications, particularly near mineral springs but also throughout the foraging range of band-tails.



Washington Department of Wildlife

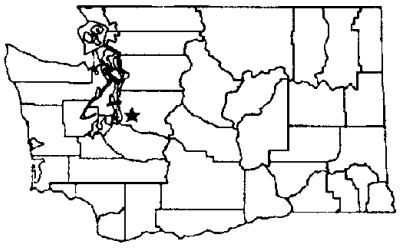
Management Recommendations for Priority Species

Agonum belleri

Beller's Ground Beetle

RANGE: Lowland sphagnum bogs of Washington, Oregon, and southwestern British Columbia (Johnson 1979, 1986).

WASHINGTON DISTRIBUTION: Historically known from Snohomish County and King County. Currently confirmed only in King County (Johnson 1979).



HABITAT REQUIREMENTS: Beller's ground beetles inhabit eutrophic sphagnum bogs associated with lakes below 1000m (3280') elevation. The bogs have very little surface drainage and tend to be acidic (Johnson 1979, Fitzgerald 1966). Johnson (1979) found Beller's ground beetles inhabiting the life zone immediately adjacent to open water at King's Lake bog. The area was characterized as primarily a free-floating band of *Sphagnum* spp. with some vascular plants including round-leaf sundew (*Drosera rotundifolia*), bog cranberry (*Vaccinium oxycoccos*), and cottongrass (*Eriphorum chamissonis*). Beller's ground beetles were not found in the surrounding dryer life zones of the bog. The beetles probably scavenge on plant and animal materials (Dawson 1965). In laboratory tests, Johnson (1979) maintained them on invertebrates, while Fitzgerald (1966) observed them eating conifer seeds.

LIMITING FACTORS: Availability of sphagnum bogs with living, floating sphagnum mat.

MANAGEMENT RECOMMENDATIONS: The Beller's ground beetle no longer occurs at Chase Lake due to severe habitat alterations from peat mining and housing developments (USFWS 1978). Activities that might alter the condition of sphagnum bogs where Beller's ground beetles are known to occur should be prevented. These activities include peat mining, filling, draining, construction within the bogs, and other perturbations. Changing the natural water level or flow rate within the bogs should also be prevented. Sediment inflow from surrounding land use activities may affect survival of Beller's ground beetle and should be avoided (Johnson 1986).

Ground beetles appear to be more susceptible to the effects of pesticides than other insect groups (Thiele 1977). Insecticides, and herbicides that could damage wetland vegetation, should not be applied in sphagnum bogs. Persons wanting to apply chemicals to adjoining lands should not apply them if stormwater runoff or wind drift will carry the chemicals into the bog. Stormwater runoff should not be diverted into sphagnum bogs. Deci-

sions about chemical applications should be made on a site specific basis and should consider type of chemical used, season, topography and other relevant features.

Exotic fish could potentially prey upon beetle larvae and should not be introduced into wetlands where Beller's ground beetles occur.

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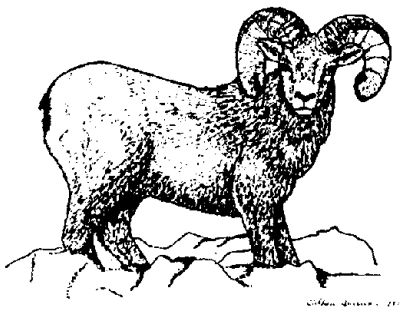
KEY POINTS:

Habitat Requirements:

- Inhabit sphagnum bogs associated with lakes below 91 m (300') elevation.
- Inhabit life zone immediately adjacent to open water.

Management Recommendations:

- Prevent activities that may alter the condition of sphagnum bogs (e.g., peat mining, filling, draining, construction).
- Maintain the natural water level or flow rate within sphagnum bogs.
- Prevent sediment inflow from adjacent uplands.
- Avoid applying insecticides or herbicides in or near sphagnum bogs.
- Avoid diverting stormwater runoff into sphagnum bogs.
- Do not introduce exotic fish into lakes or wetlands associated with sphagnum bogs.



Ovis canadensis

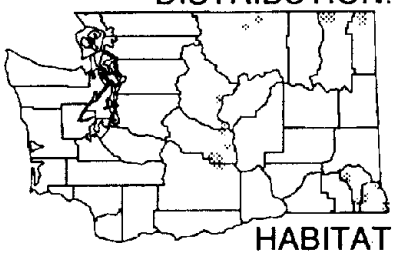
Washington Department of Wildlife

Management Recommendations for Priority Species

Bighorn Sheep

RANGE: The Rocky Mountain bighorn sheep is found in Alberta, South Dakota, Utah, Washington, Oregon, Nevada, New Mexico, Colorado, Montana, and Wyoming, while the California bighorn sheep is found as scattered populations along the eastern slopes of the Cascade Mountains in British Columbia, Washington, Oregon, and California, as well as in Idaho, Nevada, and North Dakota (Trefethen 1975).

WASHINGTON DISTRIBUTION:



Local populations of Rocky Mountain bighorn sheep are found in the Selkirk Mountains on Hall Mountain and in the Blue Mountains near Joseph Creek and the Wenaha- Tucannon Wilderness. Local populations of California bighorn sheep are found on the Sinlahekin, Wooten, Colockum, Oak Creek, and L.T. Murray Wildlife Areas, as well as in Swakane Canyon, Mount Hull, Vulcan Mountain, and the Asotin Creek-Cottonwood Creek areas (Johnson 1983).

HABITAT REQUIREMENTS: Bighorn habitat consists primarily of grasslands or grass/shrub habitats adjacent to, or intermixed with precipitous terrain characterized by rocky slopes, ridges and cliffs, or rugged canyons. The rolling hills and low-growing vegetation that allows bighorns to see predators from a distance (Johnson 1983). This rugged terrain also serves as escape cover and lambing areas.

Optimum winter range is on south-facing slopes with a predominance of bluebunch wheatgrass, Sandberg bluegrass, Junegrass, and Idaho fescue, or a mixture of shrubs and bunchgrasses. Bighorns prefer to forage on open slopes in the winter, but will utilize forested areas for cover during storms (Johnson 1983).

Bighorn sheep lambing areas are isolated, rugged, steep areas of irregular size with sparse trees and shrubs with both water and native forage no more than 0.5 km (0.3 mi) away. Ewes typically seek the most precipitous terrain of their range for lambing to escape the threat of predation.

LIMITING FACTORS: An abundance of climax, native, low-growing vegetation adjacent to or intermixed with precipitous terrain is necessary (Johnson 1983). Human disturbance, especially during winter and through mid-June that is within 0.8 km (0.5 mi), contributes to displacement and population decline (Hammitt and Cole 1987). Diseases and parasites can limit populations. Entire populations in other states and provinces have been decimated by disease contracted from domestic sheep.

MANAGEMENT RECOMMENDATIONS: Maintain some thermal and escape cover patches of at least .4 ha (1 acre) on summer ranges. Avoid human and dog use on foot and in vehicles within 0.8 km (0.5 mi) in winter and through mid-June (Hammit and Cole 1987). Roads on sheep range lead to disturbance and poaching problems that can be avoided by road closures during periods of bighorn use. Use prescribed burning every three years as necessary to maintain grassland forage areas. Develop water sources where needed. Prohibit domestic sheep grazing and limit livestock grazing on sheep ranges.

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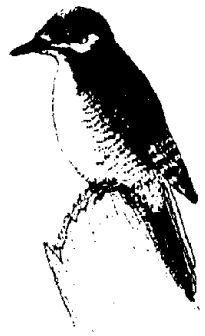
KEY POINTS:

Habitat Requirements:

- Climax plant communities of subalpine, grassland, shrub-grass, desert, and fire-created grassland types.
- Adjacent or nearby rocky slopes, ridges, cliffs, or rugged canyons.
- Escape terrain.
- Freedom from disturbance 0.5 to one mile.

Management Recommendations:

- Maintain some cover patches.
- Maintain vigorous, native grassland habitats.
- Create food and water sources as necessary.
- Eliminate certain public uses seasonally.
- Eliminate domestic sheep grazing and limit livestock grazing on bighorn sheep ranges.



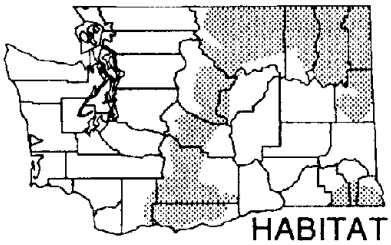
Picoides arcticus

Washington Department of Wildlife
Management Recommendations for Priority Species

Black-backed Woodpecker

RANGE: Boreal forests of North America, Cascade Mountains, and northern portions of the Sierra Nevada and Rocky Mountains.

WASHINGTON DISTRIBUTION: East slope of the Cascade Mountains and coniferous forests to the east.



HABITAT REQUIREMENTS: Black-backed woodpeckers inhabit lodgepole pine, ponderosa pine, and mixed conifer forests with a preference for mature and old growth stages and fire or insect damaged stands. They have a spotty distribution with populations responding to prey abundance. Since these woodpeckers feed on insects (mainly larvae of wood-boring beetles) they are particularly abundant in forests with old burns, blowdown areas, and insect infestations. They seek insects by chipping scaly bark from dead and dying trees (Short 1974).

Little is known about the ecology of this species. Two recent studies, following pine beetle outbreaks in northeast and central Oregon, provide more information.

Nesting - In northeast Oregon, on a managed (50 year old selective cut) ponderosa pine and mixed conifer forest, the black-backed woodpecker predominantly nested in ponderosa pine and lodgepole pine. The nest trees were tall (> 15 m or 50'), small diameter (< 50 cm or 20" dbh), and recently dead (< 5 yr) (Bull et al. 1986).

In the central Oregon mixed conifer and lodgepole pine forests, the black-backed selected for mature and old growth stands and nested exclusively in lodgepole pines. They avoided young stands and logged areas for both nesting and feeding. All nest trees, both live and dead, had heartrot and a mean dbh of 28 cm (11"). (Goggans et al. 1988).

Feeding - In northeast Oregon the black-backed woodpecker foraged in all four forest types in both live and dead trees. The trees averaged 19 m (62') in height with a dbh of 34 cm (13") and were dead less than two years. The larvae of pine beetles constituted 75% of the woodpeckers diet.

Foraging in central Oregon occurred in mature and old growth stands on live and dead trees, almost exclusively on beetle-infested lodgepole pine averaging 38 cm (15") dbh.

Roosting - The woodpeckers roosted mainly in lodgepole pine in cankers, trunk scars, mistletoe clumps, or directly on the trunk. Again, they selected for mature and old growth with an average 40% canopy. The roost trees averaged 28 cm (11") in diameter and 20m (65') tall (Goggans et al. 1988).

Goggans et al. (1988) documented home ranges using radio telemetry. Three home ranges varied from a size of 72 ha (178 ac) to 328 ha (810 ac).

LIMITING FACTORS:

Availability of uncut old burns and insect damaged forests with numerous decayed snags.

MANAGEMENT RECOMMENDATIONS:

Mature and old growth lodgepole pine forest stands are declining throughout the Cascade Mountain range. They are being harvested because of infestations of pine beetles.

Forest management that "sanitizes" and maintains lodgepole pine forests in short rotation for young, disease-resistant tree crops, will prevent insects and heartrot. Unfortunately, it also will result in population declines of black-backed woodpeckers (Goggans et al. 1988).

Goggans et al. (1988) recommend the black-backed woodpecker rather than the three-toed woodpecker, as a management indicator species for mature and old growth lodgepole pine forests, because they use a wider elevation range and respond better to recordings used for monitoring.

To maintain maximum populations in managed stands, Neitro et al. (1985) recommend leaving 30 snags/100 ha (12/100 ac) > 43 cm (17") dbh.

Goggans et al. (1988) suggest that the traditional approach of managing cavity nesters, by retaining specific numbers of snags and green replacement trees, may not maintain viable populations of black-backed woodpeckers. It is unlikely that enough foraging substrate would be provided for this specialized feeder. They may require large areas of decadent, multi-layered older forests.

Further, Goggans et al. (1988) propose that Woodpecker Management Areas be withdrawn from commercial or salvage forestry and placed under special management to promote mature and old growth stand conditions. These management areas may be within existing or proposed reserve areas. They should encompass 387 ha (956 ac) of lodgepole pine or pine-dominated mixed conifer forest in mature or old growth condition. Some areas should be above and some below 1370 m (4500') elevation to accommodate pairs of three-toed woodpeckers as well. The size of the management area is based on home range size during abundant food supply and may need to be increased when prey populations decline.

In addition, forest succession after a fire should be allowed to proceed naturally, versus the practice of salvage and planting. Similarly, insect-infested trees and large blowdown areas should be left uncut or partially cut to provide habitat for these woodpeckers. Complete salvage eliminates both nesting and feeding habitat.

Woodpeckers, along with other insectivores, play an important role in reducing insect populations at endemic levels. Biological control of forest insects is preferred over use of insecticides. It has a longer term effect to regulate future insect outbreaks and is less costly. Management to increase

woodpecker populations should have the secondary benefits of increasing other insectivorous birds and controlling insect outbreaks (Takekawa et al. 1982).

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KEY POINTS

Habitat Requirements:

- Inhabit mature and old growth lodgepole pine, ponderosa pine, and mixed conifer forests with numerous standing dead trees.
- Most abundant in fire and insect-infested stands.
- Forage on insects, mainly beetles, in pole and small sawtimber-sized snags.

Management Recommendations:

- For harvested areas, retain 12 snags > 17" dbh/100 ac.
- Establish Woodpecker Management Areas of approximately 1000 ac within existing or proposed forest reserves. The areas should be in lodgepole pine or pine-dominated forest above and below 4500'.
- Limit insecticide use and promote biological control of insects.

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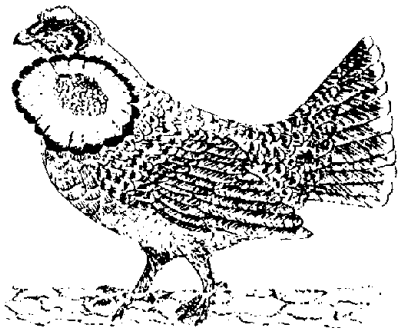


Dendragapus Obscurus

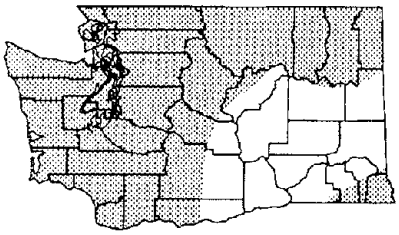
Washington Department of Wildlife

Management Recommendations for Priority Species

Blue Grouse

RANGE: Blue grouse range from southern Alaska, the south Yukon, southwest Mackenzie, and west Alberta southward along the offshore islands to Vancouver and along the coast to northern California, and in the mountains to southern California, and north and eastern Arizona and west central New Mexico (Johnsgard 1973). This range includes the northern and central Rocky Mountains and Pacific coastal regions of western North America (Aldrich 1963).

WASHINGTON DISTRIBUTION: Blue grouse are found in mountainous areas throughout the state, whenever open coniferous forests are present (Soil Conservation Service 1969). They are closely associated with true fir (Abies) and Douglas fir (Pseudotsuga) forests (Johnsgard 1973). Hunter survey results from the 1989 season indicated that blue grouse were harvested from all counties except: Adams, Benton, Franklin, Grant, Island, and San Juan (Washington Department of Wildlife unpublished data).



HABITAT REQUIREMENTS: Blue grouse breed in open foothills and are closely associated with streams, springs, and meadows. Much of the food they require comes from the succulent vegetation growing in these areas. In fall they migrate to higher elevations where they winter on fir needles. (Soil Conservation Service 1969).

Blue grouse have strong fidelity to wintering areas and require large fir trees for food and roosting (Cade 1984). Fir (Abies) needles constitute 60 percent of the blue grouse diet in the area west of the Cascade Mountains (Beer 1943). In other areas, true fir and Douglas fir are the major food sources. They are often supplemented with larch and pine needles (Boag 1963). Important forbs and grasses in drier climates include: balsamroot, buckwheat, dwarf mistletoe, dandelion, agoseris, strawberry, clover, sedge, daisy or fleabane, knotweed, manzanita or bearberry, huckleberry, pussy toes, elderberry (fruit), hawksbeard, dock, starwort, lupine, and china lettuce. (Beer 1943, Boag 1963). A study on Vancouver Island indicated that 90 percent of adult blue grouse foods included: bracken fern, willow, Oregon grape, blackberry, huckleberry, salal, and cat's ear (Johnsgard 1973). Insects are an important food source especially for young chicks in the first ten days of life (Beer 1943).

Blue grouse use stream bottoms and gentle slopes during the spring and summer. In the Methow Valley of Washington, 78 percent of survey locations were on slopes of less than ten percent (Washington Department of Game 1961).

Conifer thickets are a key component of male breeding areas. The edges of these thickets and clearings are characteristic of high quality breeding habitat. Selective logging and small clearcutting produces good blue grouse habitat by creating uneven aged timber stands with numerous 20 to 60 year old thickets (Martinka 1972).

Nests are usually located near logs, or under low tree branches in open timber (Johnsgard 1973). In Idaho, Smith (1990) states that nesting occurs in brushy areas with tall sagebrush providing the most preferred sites.

Broods use areas with high plant density, interspersion of types, and high canopy coverage. Bare ground should be less than 11 percent and the average effective height of grass and forbs should be 20 cm (8"). Grass and forb cover in areas of highest use range from 53 to 85 percent. The forb component of high use areas is 11 to 41 percent. Typically, broods feed within 90m (100 yd) of brush/tree cover. As the broods get older, they switch to riparian areas and shrubby vegetation (Mussehl 1962).

LIMITING FACTORS:

Current reforestation practices of high density replanting, herbicide application and fertilization result in rapid tree canopy closure which reduces blue grouse use (Zwickel and Bendell 1985, Bendell and Elliott 1967). In drier areas, intense grazing of open lowland forests reduces the quality and availability of breeding habitat (Mussehl 1962, Seaburg 1966, Zwickel 1972).

MANAGEMENT RECOMMENDATIONS:

Logging activity and fire in the low to mid-elevations can open up the forest canopy which may improve breeding habitat, but heavy grazing on lower slopes can be deleterious (Johnsgard 1973). Preferred brooding areas for blue grouse include grass and forb communities that are up to 30cm (12") high. Deferred or moderate grazing preserves nesting, brooding, and feeding cover (Soil Conservation Service 1969). Grazing should be managed for maximum forb production. The grazing intensity must be light enough to allow grass/forb vegetation to reach an effective, standing height of 20cm (8") (Mussehl 1962, Seaburg 1966).

In densely forested areas like Vancouver Island, Canada, openings created by logging and fires are very important to blue grouse. Succession is naturally rapid, but is accelerated by dense plantings of Douglas fir. Allowing the tops of hills and low productivity sites to remain unplanted would be beneficial to blue grouse as breeding areas (Zwickel and Bendell 1985, Johnsgard 1973). Forbs should always be included in seed mixes when reseeding range and forest land where blue grouse occur (Seaburg 1966). Mussehl's (1962) study showed that blue grouse preferred sites composed of at least 11 percent forbs.

Cade (1984) recommended the use of clearcuts smaller than 250m (800') across and leaving at least 40 trees per hectare with a minimum 24cm (9") dbh on wintering areas. Selective cuts or long rotations greater than 60 years are also better for wintering blue grouse than clearcuts (Cade and Hoffman 1990). Retain known winter roost areas including mature, mistletoe-laden Douglas fir thickets near ridges (McKeel and Quinn pers. comm.).

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KEY POINTS:

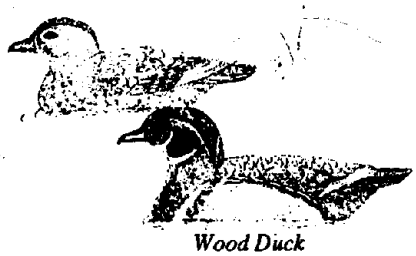
Habitat Requirements:

- Open forests in the low to mid elevations for breeding areas.
- Rangeland that has 8" tall vegetation from May through August, during the brood rearing stage.
- The vegetation should have from 11 to 40 percent broadleaf plants (forbs).
- Insects are important for the first several days of life for young chicks.
- Wintering areas in higher elevations that contain Fir (Abies) and Douglas fir (Pseudotsuga) forests.

Management Recommendations:

- Selective cutting or small clearcuts should be conducted in areas known to contain wintering or breeding blue grouse.

- At least 100 trees per acre that are larger than 9" dbh should be left standing.
- Openings should be less than 800 ft. wide to allow blue grouse movement across them.
- Retain known winter roosts, including mature Douglas fir thickets near ridges.
- All logging operations should include revegetation with a high percent age of forbs and a variety of trees rather than single plantings that include one or two species.
- Grazing should be light so that an effective height of 8" for grasses and forbs is maintained from May through August. Another option would be to postpone grazing until after August 1.
- Streams, springs, and meadows should be protected from livestock grazing and logging operations so that lush vegetation, shrubs, and deciduous trees remain for blue grouse brooding and feeding.



Wood Duck

Washington Department of Wildlife

Management Recommendations for Priority Species

Cavity-Nesting Ducks

Bucephala islandica
Barrow's Goldeneye
Bucephala clangula
Common Goldeneye
Bucephala albeola
Bufflehead
Aix sponsa
Wood Duck
Lophodytes cucullatus
Hooded Merganser

RANGE: These five species of cavity-nesting ducks vary in distribution by species. Along the Pacific Coast, the goldeneyes and bufflehead winter from Alaska to California, while the wood duck and hooded merganser occur south of Alaska during winter. The Barrow's goldeneye and bufflehead breed from Alaska to California. Hooded mergansers and wood ducks breed from British Columbia southward, while the common goldeneye breeds mainly in isolated areas of Washington northward to Alaska (Bellrose 1976).

WASHINGTON DISTRIBUTION: The wood duck and hooded merganser breed mainly in western Washington, but are also found in some areas of eastern Washington. The bufflehead and Barrow's goldeneye are more restricted to the Cascades, the Columbia Basin, and highland areas of northcentral and northeastern Washington. The common goldeneye is restricted to the extreme northeast corner of the state. All species are more common in the winter west of the Cascades, except for the wood duck which winters in the greatest numbers in the Yakima Valley (Bellrose 1976).

HABITAT REQUIREMENTS: Cavity nesting ducks in Washington (in descending order of importance: wood duck, Barrow's goldeneye, hooded merganser, bufflehead, and common goldeneye) nest primarily in late forest successional stages, adjacent to low gradient rivers, sloughs, lakes, and beaver ponds (Thomas 1979, Brown 1985, Parker 1990). All species except wood ducks (adults) feed primarily on animal matter in wetland areas, ranging by species from aquatic insects to small fish. Adult wood ducks feed mainly on aquatic and emergent plants, acorns and other seeds, including waste grain; young wood ducks are more dependent on animal matter (Bellrose 1976).

All five species nest almost exclusively in tree cavities, either made by other avian species or occurring naturally. Cavity nesting duck population levels are related to the availability of nesting sites (Dow and Fredga 1983). Cavities offer protection from weather and predators, and the same cavities are often used by the same birds annually (Dow and Fredga 1983). As a general rule, minimum cavity dimensions to accomodate these species should

include an entrance hole at least 9 cm in diameter, with the internal cavity at least 25 cm deep and 1.9 cm in diameter (3.5" hole, 10" x 7.5") (Bellrose 1976). The minimum dbh of nest trees should be 30 cm (12 inches) (Soulliere 1988). Wood ducks and hooded mergansers prefer natural cavities (20-65 feet) above ground or water (McGilvrey 1968, Bellrose 1976) while the other species are most often found in natural cavities 4.8 - 7.6 m (10-25 feet) above ground or water (Johnsgard 1975). Optimal density of potential nest sites is 2 or more per hectare (five or more per acre) (Sousa and Farmer 1983).

Cavity use is also dependent upon cavity orientation and canopy height (Soulliere 1988) as well as proximity of suitable brood habitat, predator levels, and competition from other cavity nesting species (Peterson and Gauthier 1985). The canopy around the cavity should be open and not overhang the entrance (Bellrose 1976). Optimal brood habitat includes shallow wetlands within 0.8 km (0.5 mile) of cavities, with 50-75% overhanging woody vegetation and/or emergent vegetation for brood escape cover (Sousa and Farmer 1983), and abundant downed logs or low islands (Webster and McGilvrey 1966).

LIMITING FACTORS:

Lack of suitable cavities near water, as well as lack of adequate brood escape cover and foraging areas can be limiting for these species. Nest predation and competition from other cavity-nesters can also limit population levels, in addition to lack of mast or waste grain for wood ducks.

MANAGEMENT RECOMMENDATIONS:

Maintain and create snags near suitable wetlands to meet the minimum cavity size and density requirements noted above, and maintain mast producing trees and shrubs (e.g. oaks, hazelnuts). Provide downed timber and create low islands for breeding/brood use (McGilvrey 1968). Avoid logging flooded timber and leave woody vegetation along the shores of nesting and brood areas (McGilvrey 1968). Use of herbicides/pesticides near wetlands may adversely impact invertebrate levels, as well as aquatic and emergent vegetation. Backflood trees/downed timber to create snags/brood habitat.

Provide predator-proof nest boxes for wood ducks in areas where natural cavity sites are limited (less than five per acre) but other habitat requirements above are met (Bellrose 1976). The decision to provide nest boxes to supplement existing cavities/nest boxes should consider occupancy rates of existing suitable nest sites, i.e. if existing sites are underutilized, other habitat factors may be limiting. Nest boxes should be annually maintained, located over water if possible, wood duck boxes should be designed and placed following Shay (1990) or Bellrose (1976), and other species' boxes should follow Lumsden et al., 1988.

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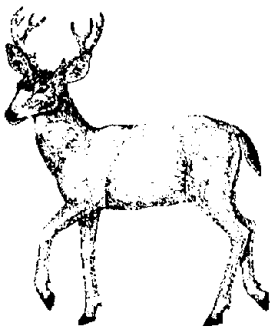
KEY POINTS: Habitat Requirements:

- Natural cavities with entrance 3.5 inches in diameter and minimum internal dimensions of 10 inches deep, 7.5 inches diameter.
- Minimum dbh of nest trees 12 inches.
- Natural cavities preferred by wood ducks and hooded mergansers are 20-65 feet high, 10-25 feet high for other species.
- Optimal density of potential nest sites is five or more per acre, within one-half mile of suitable brood habitat.
- Suitable brood habitat consists of shallow wetlands with 50-75% cover and abundant downed logs or low islands.

Management Recommendations:

- Maintain and create snags near suitable wetlands to meet the minimum cavity requirements noted above.
- Avoid logging flooded timber and maintain 50-75% woody and emergent vegetation in shallow wetlands.
- Provide and maintain nest boxes where lack of suitable cavities is limiting potential production.



Odocoileus hemionus columbianus

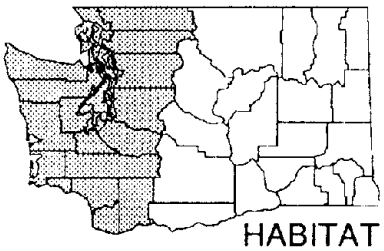
Washington Department of Wildlife

Management Recommendations for Priority Species

Columbian Black-tailed Deer

RANGE: The Columbian black-tailed deer represents one subspecies of the mule deer/ black-tailed deer group. It occurs in coastal coniferous forests from central British Columbia south to northern California as well as in the coastal chaparral regions of central California (Wallmo 1981).

WASHINGTON DISTRIBUTION: Black-tailed deer occur in all forested habitats west of the Cascade Crest. Along the crest, there is a region of integration with adjacent populations of Rocky Mountain mule deer (O. h. hemionus).



HABITAT REQUIREMENTS: Like other cervids, black-tailed deer require the juxtaposition of food, water, and cover. Water is generally available in western Washington. Cover is used by deer for purposes of hiding and thermal regulation, as well as for foraging during times when open forage areas may not be available (Brown 1985).

Forage areas are all areas with less than 60 percent combined canopy cover where trees and shrubs are more than 2m (7') tall and there is an understory of shrubs and herbaceous vegetation.

Habitat elements include hiding, thermal, and optimal cover for deer. Hiding cover provides screening vegetation that covers 90 percent of a standing deer, at 60m (200') or less (Brown 1985).

Thermal cover includes forest stands at least 12m (40') tall, with tree canopy cover of at least 70 percent. Optimal cover is a forest stand with four layers (overstory, canopy, sub-canopy, shrub layer, and herbaceous layer) and an overstory canopy with trees that average over 53cm (21") in diameter at breast height. Optimal cover has 70 percent or greater crown closure and is in the old growth or large saw timber stand condition (Brown 1985). This combination of characteristics provides a relatively snow-free, sheltered environment with available forage even during winter storms.

Extensive open roads, particularly arterial roads, reduce deer use of habitat for some distance from the road perimeter (Perry and Overly 1977, Willms 1971, Witmer 1981).

LIMITING FACTORS: Deer numbers decline rapidly following canopy closure of regenerated timber stands. Deer population studies on the Clemons Tree Farm (Taylor and Johnson, 1976) reveal favorable forage declines as conifer overstory shades out smaller plants. A system of small patch or block clearcuts is important to

provide forage and cover in close proximity. The availability of adequate browse on deer winter range is the most crucial factor in deer survival and successful reproduction (Brown 1961). Silvicultural practices that suppress browse reduce habitat for deer. Deer generally decline if elk increase (Taber and Radaeke 1981).

MANAGEMENT RECOMMENDATIONS:

Winter range may be generalized as being below 670-820m (2,200- 2,700') in elevation on slopes less than 60 percent, depending on the severity of the winter, in the western Cascades; below 600m (2,000') and above urbanized areas in the Puget Sound trough and lowlands of southwest Washington; below 460m (1,500') with slopes less than 60 percent on the Olympic Peninsula.

Forage and cover blocks should be sized as described under habitat requirements and well-distributed on summer range with a minimum of 40 percent of a 2.6 sq. km (one-square-mile) area in cover, of which at least half is thermal cover.

On winter range, roads open to public use should be limited to 0.5 mile of road per one square mile of habitat. Construction standards should be of the lowest that is feasible, with screening vegetation adjacent.

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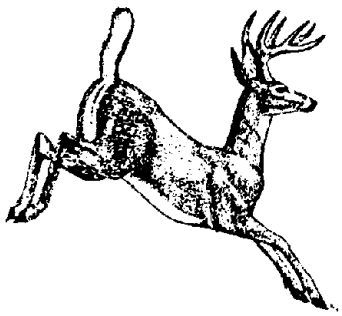
KEY POINTS: Habitat Requirements

- Average seasonal use area is about one square mile.
- Early successional stages are primary feeding areas.
- Cover and forage areas need to be interspersed.
- Browse plants are important forage components.
- Optimal cover stands are necessary during periods of heavy snow.

Management Recommendations

- A mixture of cover and forage areas must occur at the scale of a typical deer seasonal home range (one square mile).
- Maintain a mixture of cover and forage through time.
- Encourage the growth of browse species.
- Manage the open road system at minimum feasible levels and densities.



Washington Department of Wildlife

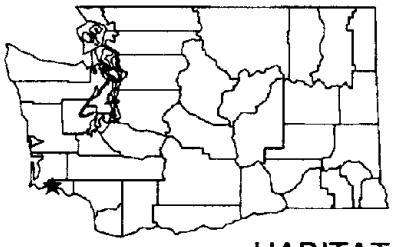
Management Recommendations for Priority Species

Odocoileus virginianus leucurus

Columbian White-tailed Deer

RANGE: Originally found in the Cowlitz River drainage, and the lower Columbia River area to the upper Willamette Valley. Now confined to a small area near the mouth of the Columbia River and in the upper Umpqua River drainage near Roseburg, Oregon. The species is listed as state and federally endangered.

WASHINGTON DISTRIBUTION: Found only in Wakhiakum County on islands in, and along the banks of, the Columbia River.



HABITAT REQUIREMENTS: Columbian white-tailed deer inhabit riparian forest, brushland, and pasture on islands and within the floodplain near the mouth of the Columbia River (Suring 1974, Gavin et al. 1984). They were originally associated with native tidal spruce forest communities along the Columbia and Cowlitz Rivers.

Feeding preferences of the Columbian white-tailed deer shift seasonally. Studies at the Columbian White-tailed Deer National Wildlife Refuge show herbs to be preferred foraging items spring through fall. Use of browse is most important in winter and fall (Dublin 1980).

Adequate cover is apparently very important to the deer. Suring and Vohs (1979) reported little use of those portions of pastures located more than 250m (750') from woodland edge. The deer apparently prefer plant communities that provide both forage and cover; park forest community is preferred. Other important plant communities include open canopy forest, sparse rush, and dense thistle (USDI 1983).

LIMITING FACTORS: Availability of sufficient woodland cover for feeding and resting. Loss of former habitat to human development and competition for undeveloped habitat by black-tailed deer (Clark, pers. comm.).

MANAGEMENT RECOMMENDATIONS: Pastures in areas managed for Columbian white-tailed deer should not be greater than 500m (1,500') across, and optimally should be much narrower. Shrub and tree cover should be interspersed within pastures used by deer. In areas characterized by extensive pasture with little woody vegetation, fences should be constructed to exclude cattle and allow reestablishment of shrub

and forest communities. Planting of trees (spruce, alder, willow) and shrubs such as salal and ninebark will help reestablishment of browse and cover in extensive pasturelands.

In areas where clearings for the deer are desirable, cattle grazing and haying can be used to maintain short-grass fields, which provide nutritious forage for Columbian white-tailed deer (Clark, pers. comm.). The deer avoid areas where cattle are present (Suring 1974, Gavin 1979). Therefore, grazing should be used on a seasonal basis during the plant growing season and cattle should be removed after clearing has been achieved.

Cattle should be fenced out of woodland communities managed for Columbian white-tailed deer because they trample important browse plants.

Maintaining tidal spruce forest communities intact will protect the native habitat of the Columbian white-tailed deer (Davison 1979). Riparian habitats should be protected from degredation caused by logging, grazing and brush removal.

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KEY POINTS:

Habitat Requirements:

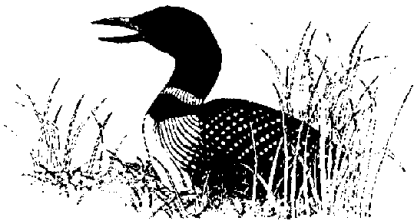
- Inhabit riparian forest, brushland and pasture at the mouth of the Columbia River.
- Seldom forage more than 228m (750 ft.) from woodland edge.
- Prefer habitat types that provide both cover and forage.
- Graze herbs from spring through fall, browse woody plants during fall and winter.
- Avoid areas where cattle are present.

Management Recommendations:

- Maintain tidal spruce forests and protect riparian areas.
- Exclude cattle from woodland habitats.
- Avoid large expanses of unbroken pasture; small, narrow pastures

should be interspersed with tree and shrub cover.

- If pastures lack woody vegetation, allow trees and shrubs to reestablish: plant trees and shrubs, and exclude cattle.
- Use haying and seasonal grazing to maintain short-grass fields; remove cattle once favorable deer foraging conditions have been created.



Washington Department of Wildlife

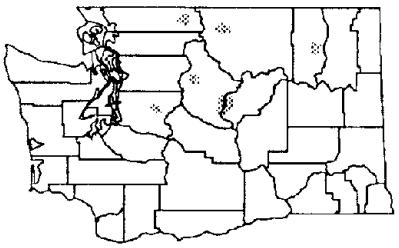
Management Guidelines for Species of Concern

Gavia immer

Common Loon

RANGE: Alaska, Canada, Iceland, Greenland, and the northern tier of the lower 48 United States.

WASHINGTON DISTRIBUTION: Abundant migrants arrive from the north to winter along the coast of Washington. Migrants are also seen annually on lakes in northeastern Washington. Summer populations are very low; single breeding pairs are confirmed in lakes in King, Whatcom, Chelan, Douglas, Ferry and Okanogan Counties. (Only breeding distribution is shown on map.)



HABITAT REQUIREMENTS: Common loons breed on large wooded lakes with large populations of fish. Studies of feeding habits on loon breeding grounds are limited. However, Vermeer (1973) found that lakes where breeding loons were present were also used by successful anglers. Loons were absent from many lakes and sloughs that offered poor fishing to anglers, suggesting that healthy fish populations are requisite for breeding pairs.

Common loons nest on both islands and the mainland at the waters' edge or within 1.5 m of shore (Vermeer 1973). Several studies have shown that loons prefer to nest on islands (McIntyre 1975, Ream 1976, Titus and Van Druff 1981, Vermeer 1973) and breeding success is probably higher on insular sites (McIntyre and Mathisen 1977, Titus and Vandruff 1981). Nests may also be located in emergent vegetation. The same nest site may be re-used in successive years (Strong et al. 1987).

Heavy recreational use may be a key factor causing declines in loon productivity because the birds are very susceptible to disturbance during nesting. Titus and Vandruff (1981) found that loons in lakes where motorboats were absent were more successful at hatching eggs compared to those nesting in lakes where motor boats were present. Vermeer (1973) found more breeding pairs in areas with fewer resorts, cottages, and campsites; this was also observed in Finland (Lehoten 1970 in Vermeer 1973). Heimberger et al. (1983) showed that breeding success declined as the number of cottages within 150 m of the nest increased.

LIMITING FACTORS: The availability of isolated lakes with undisturbed shoreline or undisturbed island nesting sites may limit loon breeding in Washington.

MANAGEMENT RECOMMENDATIONS: Because common loons may re-use nests from year to year, protection of known nesting and nursery areas is essential. Access to nesting islands by

campers and other visitors should be restricted during the breeding season from April 1 to September. Camping on islands can adversely affect loon productivity and may cause nest abandonment (Ream 1976). Building within 150 m of a loon nest should be avoided year round in order to maintain a permanent buffer around nests.

The absence of suitable nesting islands may limit breeding common loons. In areas where natural islands are unavailable, artificial islands can be provided. In one study, McIntyre and Mathisen (1977) successfully used sedge mat obtained from boggy lakes and bounded on the edges with poles to create nesting islands. Cedar log rafts were also found to be effective. An artificial nest island was successfully used on Lake Chester Morse in 1990.

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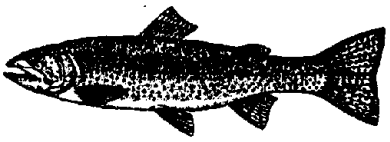
KEY POINTS:

Habitat Requirements:

- Breed on large wooded lakes.
- Large fish populations.
- Nest on islands or within 1.5 meters of shore.
- Nesting preference of islands.
- May nest on emergent vegetation.
- Nests may be reused.
- Very susceptible to nest disturbance.
- Intolerant of recurrent disturbance within 150 meters.

Management Recommendations:

- Protection of known nest and nursery sites.
- Restrict disturbance of nest sites from April to September.
- Erect no structures within 150 meters of nesting sites.
- Provide artificial islands - (sedge mats, cedar log rafts).



Washington Department of Wildlife
Management Recommendations for Priority Species

Cutthroat Trout

Oncorhynchus clarki clarki
Coastal Resident and Anadromous Cutthroat Trout
Oncorhynchus clarki lewisi
Westslope Cutthroat Trout

RANGE: Cutthroat trout occur in North American generally west of the Rocky Mountains.

WASHINGTON DISTRIBUTION: The coastal cutthroat trout is widely distributed in the lower Columbia River, Coastal, and Puget Sound drainages, and wherever there is access to the ocean. Westslope cutthroat trout is present in the Cascade Mountains and in many waters of central and eastern Washington.

HABITAT REQUIREMENTS: Two subspecies of *Oncorhynchus clarki* are recognized in Washington state. There are both anadromous (sea-run) and resident coastal cutthroat trout. However, the critical habitat requirements for these two species while in freshwater are generally thought to be similar.

Cutthroat trout habitat consists of gravelly coastal streams and lakes, inland alpine lakes, and small rivers and estuaries (Scott and Crossman 1973, Wydoski and Whitney 1979). They are frequently found in well oxygenated cool headwater of tributaries. Spawning occurs in fine gravel and eggs are deposited in redds in well oxygenated running water. Anadromous cutthroat favor spawning in the headwater tributaries to larger streams with summer low flows ranging from 4 cfs - 10 cfs (Johnston 1981). Anadromous juvenile cutthroat will remain in their spawning streams for one or more years before migrating to salt water. The primary diet consists of aquatic and terrestrial insects, planktonic crustaceans, crayfish, salmon eggs, and small fish.

LIMITING FACTORS: Stream temperatures which exceed the normal spawning range, a lack of spawning and rearing habitat, high sedimentation of spawning grounds, and/or a lack of preferred food items will also limit the population and range of cutthroat trout. Exposure to heavy metals and other pollutants during "smolting" can inhibit migratory behavior in anadromous cutthroat trout.

MANAGEMENT RECOMMENDATIONS: The maintenance of riparian vegetation is essential for controlling stream temperature, providing cover, and protecting against lateral erosion. Removal of streamside vegetation lowers canopy density (shading) and increases sedimentation. Increases in solar radiation raise stream temperatures thereby negatively impacting spawning, hatching, and rearing survival. Increased sedimentation contributes to the loss of spawning habitat and decreases the diversity of aquatic invertebrates and other food items (Newbold et al. 1980, Noss 1983, Heede 1985). Buffer zones along stream

banks should be at least the width of the height of the tallest tree or 15.2 m (50 ft) whichever is larger. This vegetative buffer will provide erosion control, and maintain natural stream temperatures and the diversity of aquatic invertebrates (Meehan et al. 1977, Newbold et al. 1980). In Washington, this can range up to 60 m (200 ft.). This "zone of influence" (Meehan et al. 1977) should be maintained along stream banks which provide cutthroat trout habitat, and any other stream which directly or indirectly influences cutthroat trout. Road construction and maintenance activities should be avoided adjacent to streams with cutthroat trout. In-stream structures such as bridges, piers, boat ramps, or culverts must not impede the natural movements of cutthroat trout.

REFERENCES:

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Wydoski, R.S. and R.R. Whitney. 1979. Inland fishes of Washington. Univ. of Wash. Press, Seattle, WA.

KEY POINTS:

Habitat Requirements:

- Inhabit gravelly lowland coastal streams and lakes, inland alpine lakes, and small rivers and estuaries.
- Prefer cool, well oxygenated water in tributary headwaters.
- Spawn in redds on bottoms consisting of fine gravel in well oxygenated running water with summer low flows ranging from 5 cfs - 10 cfs.
- Newly hatched fry remain in their redds for several weeks. *Anadromous juveniles migrate after one to two years.
- Feed on aquatic and terrestrial insects, planktonic crustaceans, crayfish, salmon eggs, and dead salmon.

Management Recommendations:

- Buffer zones of at least the width of the height of the tallest tree (or 15.2 m (50 ft) whichever is wider) should be maintained along stream banks which provide cutthroat trout habitat, and any other stream which directly or indirectly influences cutthroat trout habitat.

- Road construction and maintenance activities should be avoided adjacent to streams which provide cutthroat trout habitat.
- In-stream structures such as bridges, piers, boat ramps, or culverts must not impede the natural movements of cutthroat trout.
- Waters inhabited by anadromous cutthroat parr should not be treated with metal based herbicides during the period March 11 - June 15.

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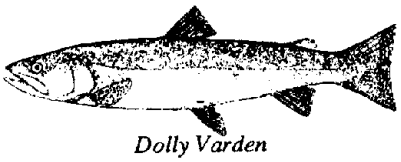
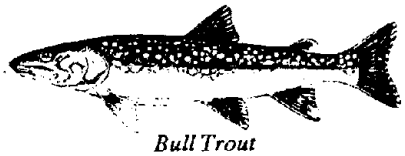


Dolly Varden



Bull Trout

Washington Department of Wildlife

Management Recommendations for Priority Species

Salvelinus malma
Dolly Varden
Salvelinus confluentus
Bull Trout

Dolly Varden/Bull Trout

RANGE: The historical distribution of the bull trout and Dolly Varden extended from 41 to 60 degrees north latitude. North of the 49th parallel, the bull trout is found in most drainages on both sides of the continental divide (Cavender 1978).

WASHINGTON DISTRIBUTION: Bull trout and Dolly Varden are found throughout the coastal and inland streams and lakes of Washington.

HABITAT REQUIREMENTS: Dolly Varden/bull trout share similar life histories, which include residents to headwater streams, fluvial, adfluvial, and/or anadromous. They have been categorized as opportunistic feeders, feeding on a variety of water column organisms (fish) and bottom dwellers (insects) (Thompson and Tufts 1967, Shepard et al. 1984, Pratt 1984). Spawning occurs in the upper reaches of clear streams in areas of flat gradient, uniform flow and uniform gravel or small cobble. Juveniles (less than 100 mm) are primarily bottom- dwellers, occupying positions above, on, or below the bottom. Fry are found in shallow, slow backwater side channels and eddies (Shepard et al. 1984, Elliott 1986). Older individuals are found in deeper and faster water compared to juveniles. Adults are often found in pools sheltered by large, organic debris or "clean" cobble substrate (McPhail and Murray 1979).

LIMITING FACTORS: Stream temperatures which exceed the normal spawning and egg incubation range, 2-4 degrees C (35-39¤F), a lack of spawning and rearing habitat, high sedimentation on spawning grounds, and/or a lack of preferred food items will also limit the population and range of bull trout and Dolly Varden.

MANAGEMENT RECOMMENDATIONS: The maintenance of riparian vegetation is essential for controlling stream temperature, providing cover, and protecting against lateral erosion. Removal of streamside vegetation lowers canopy density (shading) and increases sedimentation. Increases in solar radiation raises stream temperatures thereby negatively impacting spawning, hatching, and rearing survival. Increased sedimentation contributes to the loss of spawning habitat and decreases the diversity of aquatic invertebrates and other food items (Newbold et al. 1980, Noss 1983, Heede 1985). Buffer zones along stream banks should be at least the width of the height of the tallest tree or 15.2 m (50 ft), whichever is

wider. The vegetative buffer will provide erosion control, and maintain natural stream temperatures and diversities of aquatic invertebrates (Meehan et al. 1977, Newbold et al. 1980). In Washington, this can range up to 60 m (200 ft.). This "zone of influence" (Meehan et al. 1977) should be maintained along stream banks which provide bull trout and Dolly Varden habitat, and any other stream which directly or indirectly influences bull trout. Road construction and maintenance activities should be avoided adjacent to streams with bull trout and Dolly Varden. In-stream structures such as bridges, piers, boat ramps, or culverts must not impede the natural movements of bull trout and Dolly Varden.

REFERENCES:

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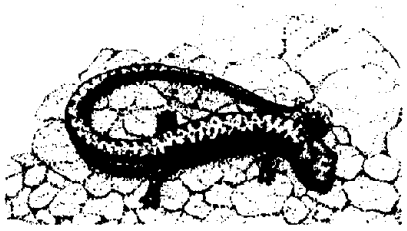
Wydoski, R.S. and R.R. Whitney. 1979. Inland fishes of Washington. Univ. of Wash. Press, Seattle, WA.

KEY POINTS: Habitat Requirements:

- Cool waters of lakes or pools in streams sheltered by large organic debris and clean cobble substrate.
- Spawning habitat consists of gravel or small cobble in upper reaches of clear streams in areas of flat gradient.
- Fry inhabit shallow, slow backwater and side channels.

Management Recommendations:

- Buffer zones of at least the width of the height of the tallest tree (or 15.2 m (50 ft), whichever is wider) should be maintained along stream banks which provide bull trout and Dolly Varden habitat, and any other stream which directly or indirectly influences bull trout and Dolly Varden habitat.
- Road construction and maintenance activities should be avoided adjacent to streams which provide bull trout and Dolly Varden habitat.
- In-stream structures such as bridges, piers, boat ramps, or culverts must not impede the natural movements of bull trout and Dolly Varden.



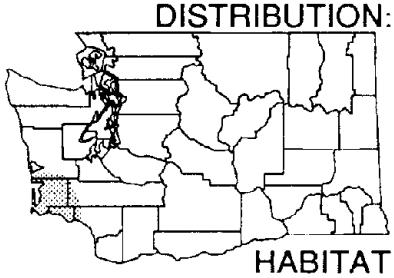
Washington Department of Wildlife
Management Recommendations for Priority Species

Plethodon dunni

Dunn's Salamander

RANGE: Extreme northeast California, western Oregon, and southwest Washington (Brodie 1970).

WASHINGTON DISTRIBUTION: The southwest corner of the state including the western edge of Cowlitz County and most of Pacific and Wahkiakum Counties.



HABITAT REQUIREMENTS: Dunn's salamanders are found in wet, heavily shaded, rocky substrate, including moist talus slopes, seepages, and stream borders. The ground surfaces are usually covered with several inches of duff (Dumas 1956, Nussbaum et al. 1983). These salamanders also use downed logs for cover and feeding. Preferred logs probably have bark ranging from intact to absent, and texture ranging from intact to small, soft pieces (Bartels et al. 1985).

LIMITING FACTORS: Availability of moist, rocky substrate or decaying logs that are well-shaded.

MANAGEMENT RECOMMENDATIONS: Maintain streamside corridors adjacent to all size classes of streams with rocky or gravelly banks. These salamanders require both the moisture and the increased erosion protection provided by these corridors. Leave understory plants and noncommercial trees in gravel and rock seepage areas during logging operations to prevent desiccation of habitat. Maintain at least 50% shade along stream banks and wet talus seepage areas.

Where logging occurs, a minimum of 5 uncharred hard logs at least 5cm (12") diameter and at least 7m (20') long, per hectare (2.5 acres) should be retained. All soft logs of this size should also be retained (Bartels et al. 1985).

Dunn's salamander habitat includes many streamsides that are not used by significant numbers of resident game fish or anadromous fish (classified as Type 4 or Type 5 waters under the State Forest Practice Regulations). Logging should not occur within 7.6m (25') of these waters when Dunn's salamanders are present; however, a 25m (69') buffer is perferred (Wilson, pers. comm.).

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Wilson, A. Research Zoologist, Washington State Univ., Pullman, WA.

KEY POINTS:

Habitat Requirements:

- Inhabit wet, heavily shaded, rocky substrates in forested sites.

Management Recommendations:

- Maintain streamside corridors adjacent to all size classes of streams with rocky or gravelly banks.
- Leave understory plants and noncommercial trees in seepage areas during logging operations.
- Maintain at least 50% shade along stream banks and wet talus seepage areas.
- Retain all soft, downed logs and at least 5 hard logs 5 cm diameter and 7 m long per hectare where logging occurs.
- Avoid logging within 7.6 m of Type 4 and Type 5 waters.

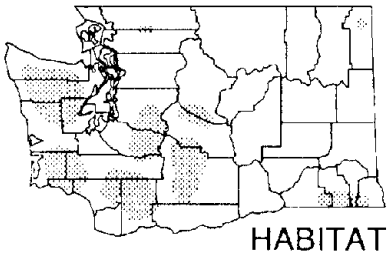
Cervus elaphus

Washington Department of Wildlife Management Recommendations for Priority Species

Elk

RANGE: Four currently recognized subspecies of elk (Cervus elaphus) in North America occur as follows: (1) Roosevelt - along the northwest Pacific Coast from Vancouver Island south to Humboldt County, California; (2) Rocky Mountain - the Rocky Mountain region from central British Columbia and Alberta south to Arizona and New Mexico; (3) Tule - portions of central California; and (4) Manitoba - parts of Manitoba and Saskatchewan (Bryant and Maser 1982).

WASHINGTON DISTRIBUTION: Elk occur over most of the Olympic Peninsula and the Coast Range. In the western Washington Cascades, elk are scattered in parts of Whatcom, Skagit, and King counties, the Snoqualmie drainage north of I-90, as well as south of I-90 to the Columbia River. On the eastern slopes of the Cascades, populations occur in portions of Chelan, Kittitas, and Yakima counties. In extreme eastern Washington, elk inhabit the Blue Mountains and a small population is scattered in parts of the Selkirk Range.



HABITAT REQUIREMENTS: Generally, the winter and summer ranges of a herd of elk are geographically separate. Forested areas are often an important component of winter range, particularly in western Washington. In eastern Washington, extensive areas of winter range primarily consist of shrub-steppe, bunch grass, or shrub plant communities adjacent to forest zones (Brown 1985, Thomas 1979).

Winter range limits elk herds but, lack of water in the eastern Cascades and in portions of the Blue Mountains may reduce use of habitat seasonally. Summer range consists of well-distributed, moderate-sized patches of forage openings and cover areas. The optimal ratio of cover and forage area depends on the season of use and the amount of disturbance. For elk summer ranges in the Blue Mountains a cover/forage ratio of 40 to 60 was considered near optimum (Thomas 1979). In intensively managed westside forests the optimal cover/forage ratio is likely be to near 60 to 40 although under sustained yield this ratio could not be maintained through time.

If possible, elk will avoid sites with snow accumulation in excess of 46 cm(18"). Use of forage areas depends on their proximity to cover. Use is most concentrated within 60m (200') of the cover edge (Brown 1985) and becomes insignificant beyond 180m (600') of the edge (Thomas 1979). Elk can do well in the absence of traditional conifer "cover" as long as the elk are not disturbed. They are very sensitive to disturbance on open winter ranges. Elk will travel 1.6km (1mi.) for water, but availability of water within 300m (1,000') of foraging areas is optimal.

Hiding cover is any vegetation capable of hiding 90 percent of a standing adult elk/deer at 60m (200') or less. Hiding cover is very important on arid

summer ranges especially if road density is high. In heavily roaded areas we should retain at least 50 percent cover on summer range.

Thermal cover patches vary in size with size, structure, and availability of bedding areas determining how the stand will be used (Brown 1985). Most deer and elk use of cover stands occurs 180-300m (600 to 1,000') from the edge of openings (Brown, 1985). Thermal cover tree stands have a canopy closure of at least 70 percent with trees over 12m (40') tall (Thomas 1979). Optimal thermal cover, is particularly important on winter ranges where it not only interrupts snow but also may provide additional forage due to litter and lichen fall. These areas contain mature trees averaging over 54cm (21") in diameter at breast height, four or more canopy layers, and scattered, small (less than 1/8 acre) openings with forage (Brown 1985).

Elk show reduced use of areas with open road densities greater than 1.5 miles per square mile of habitat. Densities of one mile per square mile affect use of winter range. All human disturbance affects survival and effective reproduction during crucial times of the year (Perry and Overly 1977, Sachet 1988).

Elk calving habitat contains water within 300m (1,000'), occurs on terraces or slopes less than 15 percent, and is generally found on south or west slopes (Brown 1985, Thomas 1979). Calving areas have forage areas 0.4-16ha (1-40 acres) in size, with 1.2-4 ha (3-10 acre) patches being preferred. These patches are within 180m (600') of cover. Optimally hiding cover patches are more than 60m (200') wide and must cover more than 90 percent of an adult elk standing at least 60m (200') away. The tree canopy closure is greater than 70 percent and trees are over 12m (40') in height. Forty percent of the calving area should be composed of these hiding cover patches. Elk are particularly susceptible to human disturbance on calving grounds during the period from May 1-June 30 (Sachet 1988, Thomas 1979).

Special features of elk habitat include travel corridors and wallows. These features are characterized by screening vegetation and lack of disturbance (Brown 1985). During the hunting season disturbances causes elk to seek the largest cover patches in their range. At other times of the year, smaller cover patches within 180m (600') of foraging areas are most important.

LIMITING FACTORS:

Either cover or forage may be limiting to elk, particularly on winter ranges or in calving habitats. Elk do not readily use areas more than a mile from water. Proper size and spacing of forage areas permits full utilization, assuming disturbance is minimal. Road densities that exceed 1.5 miles per square mile of habitat will significantly reduce elk use of adjacent habitat.

MANAGEMENT RECOMMENDATIONS:

Winter range often occurs at lower elevations along foothills, valley edges, and steep canyons, although actual use areas during a given year vary depending on the severity of weather, the accessibility of various vegetation types, and the amount of disturbance. Some representative boundaries are: (1) below 760m (2,500') in elevation in western Washington; (2) below 1400m (4,500') in eastern Washington portions of the Colockum and Yakima herds; (3) below 1070m (3,500') in the Blue Mountains; and (4) below 950m (3,100') in northeast Washington.

Forage and cover blocks should be sized as described under habitat requirements and well-distributed on summer range. Winter range in eastern Washington should have at least 40 percent of each moderate-sized 2000-4000 ha (5,000-10,000 acres) drainage being in cover patches, of which half is thermal cover (Thomas 1979). On the westside, a minimum of 60 percent

cover is desirable on winter ranges. At least 20 percent of the cover paths should be optimal thermal cover. These forage and cover patches should be well-distributed throughout the drainage. Travel corridors of hiding or thermal cover quality should be retained to connect summer with winter ranges.

Elk calving habitat should be protected from disturbance from May 1-June 30. Habitat should be provided within 300m (1,000') of water on gentle slopes that contain at least 40 percent of the area in cover patches. Forage openings should occur as small, scattered patches. Cover patches should be at least 60m (200') wide and have a canopy that exceeds 70 percent of trees more than 12m (40') tall. Elk wallows and crucial water sources, such as springs in eastern Washington, should be protected from grazing and screening vegetation retained.

Open road densities should not exceed 1.5 miles per square mile of habitat on summer range or one mile per square mile on winter range. On open arid winter ranges in eastern Washington road densities of one mile per square mile are still too much. Road management in these areas may be simply no more than one mile of road per square mile and no snow plowing. On critical winter ranges roads should be closed when snow exceeds 46cm (18"). Roads should be closed in elk calving habitat during the calving season.

Forage seeding in clearcuts, range treatments such as burning, fertilizing, or seeding, and cistern or spring developments in arid environments all are effective ways to enhance elk habitat (Brown 1985, Thomas 1979).

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KEY POINTS: Habitat Requirements:

- A mixture of cover and forage areas.
- Relative freedom from human disturbance during certain times of the year.
- Optimal cover stands are used during heavy snow periods.
- Calving areas, travel corridors, and wallows are sensitive features.

Management Recommendations:

- Keep open road densities at or below 1.5 miles per square mile on summer range or 1 mile per square mile on winter range.
- Limit clearcut size to 40 acres or less.
- Protect sensitive features of elk habitat.
- Reduce disturbance on winter range during the winter season.
- Except for arid areas of eastern Washington where thermal cover is sparce, at least 50 percent of thermal cover should be retained in winter range.
- Provide water sources where water is limiting and enhance elk forage sources by burning, fertilizing or seeding palatable native species.

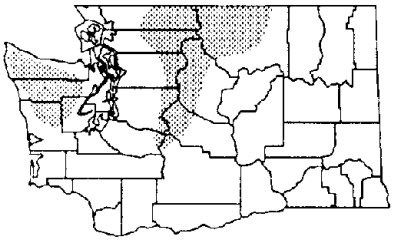
Washington Department of Wildlife
Management Recommendations for Priority Species

Martes pennanti

Fisher

RANGE: Occurs exclusively in North America. Currently found in Canada below 60° N latitude from Hudson's Bay to James Bay (Powell 1982). In the United States, fishers occur in portions of the Appalachian Mountains from New England south to West Virginia, northern Wisconsin, Minnesota, and Michigan, northern Idaho, western Montana, and as far south as northern California along the West Coast (Allen 1983).

WASHINGTON DISTRIBUTION: Historic records indicate the fisher was concentrated primarily in remote portions of the Olympic Mountains, with additional distributions along the Cascades and far east as the Okanogan Valley (Scheffer 1938). The species is apparently absent from the southern and eastern portions of the state (Yocom and McCollum 1973), but presumably still occurs on the Olympic Peninsula (Houston and Seaman 1985), and in other parts of its historic range.



HABITAT REQUIREMENTS: Fishers inhabit dense coniferous and mixed coniferous/deciduous forests with extensive, continuous canopy (Buck 1983, Allen 1983). Mature to old-growth stands are generally preferred due to the increased availability of cover and den sites that these stands afford (deVos 1951, Ingram 1973). However, second-growth forests with good cover may also be used. Habitat that offers cover to fishers and their prey is critical in winter. Mixed conifer/hardwood stands where 50 to 90% of the overstory is composed of evergreen trees are assumed to provide optimum winter habitat (Allen 1983).

Riparian areas, ridgelines, and lake shores, located in and adjacent to forests, are used by fishers for foraging and as movement corridors (Buck et al. 1983, Allen 1983, deVos 1951). Fishers apparently do not limit their home ranges to a single major ridge or drainage, but may use more than one ridge as well as major and minor drainages (Buck et al. 1979). This species will not travel far into large openings (Ingram 1973) and clearcut areas are avoided, especially in winter (deVos 1951, Irvine et al. 1964, Powell 1982).

Fishers feed on a variety of small to medium-sized mammals and birds, and carrion. Ingram (1973) found that northern flying squirrels, snowshoe hares, and Douglas squirrels were important food items in Oregon.

Young fishers are reared in maternity dens, which are located high in large hollow snags or logs (Buck et al. 1979). Adults also use a variety of temporary shelters and sleeping sites including hollow logs, tree cavities, brush piles, snow dens, and burrows of other animals (Allen 1983).

Home range size estimates for fishers have ranged from 158 ha to 3,887 ha

(0.61 to 15 sq. mi.)(Buck et al. 1979, Allen 1983). Allen (1983) estimated that at least 259km^2 (100 mi.^{2}) of suitable contiguous habitat was necessary for an area to be successfully inhabited by a population of fishers.

LIMITING FACTORS:

The fisher has been eliminated from much of its original range because of extensive timber harvest and overtrapping (Powell 1982).

MANAGEMENT RECOMMENDATIONS:

Large tracts, at least 259 km^2 (100 mi.^{2}) of mature, uneven-aged forest stands with at least 80% canopy closure should be maintained where fishers are present. Ideally created openings should be no longer than 91m (100 yd.) and should follow contours of the land (Ingram 1973).

Where logging must occur, clearcut areas should be kept small or narrow and interspersed with uncut areas. Management using small clearcuts on long rotations that maintains most of the forest in mature age classes would provide fisher habitat (Allen 1983). Clearcuts should be revegetated as soon as possible, using the same species composition that harvesting removed.

Maintain forested cover on ridgelines and in drainage bottoms that are or could be used by fishers. Retain and encourage as much ground cover as possible in cutover areas to provide adequate cover for the fisher's prey. Maintain snags, downed woody material, and hollow trees to provide potential den sites for fishers (Ingram 1973, Allen 1983).

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KEY POINTS: Habitat Requirements:

- Inhabit dense coniferous and mixed coniferous/deciduous forests with continuous canopy cover; avoid clearcuts and other large openings.
- Utilize riparian areas, ridgelines, and lake shores for movement and foraging.
- May use more than one drainage.
- Feed on mammals and birds.
- Require large snags or hollow logs for rearing young.

Management Recommendations:

- Maintain large tracts of mature, uneven-aged forest (at least 259 km^2, 100$mi.^2$) of stands with at least 80% canopy closure.
- Openings should be no longer than 91m (100 yd.) and should follow land contours.
- Intersperse clearcut areas among uncut areas; keep clearcuts as small as possible and revegetate as soon as possible.
- Maintain forested cover on ridgelines and in drainage bottoms.
- Retain snags, "defective" trees, and logs in harvest areas.

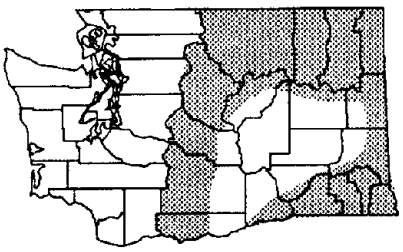
Otus flammeolus

Washington Department of Wildlife Management Recommendations for Priority Species

Flammulated Owl

RANGE: Mountainous areas of western North America from Guatemala to Canada.

WASHINGTON DISTRIBUTION: Uncommon resident in Washington, east of the crest of the Cascade Mountains (Franklin, Benton, Okanogan, Grant, Yakima, Lincoln, Klickitat, Adams, Spokane, Douglas, Walla Walla, Whitman and Kittitas Counties). Possibly locally common in appropriate habitat in the Blue Mountains (Goggans, pers. comm.).



HABITAT REQUIREMENTS: Flammulated owls are found above 914m (3000') in ponderosa pine and grand fir-Douglas fir forests with relatively open canopies (Guenther and Kucera 1978, Jones and Stokes Assn. 1980). Several studies have found this owl primarily associated with mature to old yellow pine stands (Bull and Anderson 1978, Goggans 1986, Linkhart et al. 1986 in Reynolds and Linkhart 1987). Marcot and Hill (1980) found them in stands dominated by Douglas fir with either ponderosa pine or California black oak. These owls apparently require high levels of habitat diversity as well (Goggans 1986). Their home ranges are composed of foraging, nesting, and roosting habitats.

The owls are insectivorous; grasshoppers and moths were the most important prey groups in a study in Oregon (Johnson 1963, Goggans 1986). They forage on the ground, in the air, and on foliage in early seral stages (Thomas et al. 1979), along the edges of clearings, or in open stands of mature and old-growth forests (Goggans 1986; Bull, per. comm.). Grasslands in and adjacent to forest stands are important foraging sites (Goggans 1986).

The owls nest in natural cavities or cavities excavated by other birds. Nest sites are located 2m-12m (7 to 40') high in dead wood of live trees or snags at least 30 cm (12") in diameter (Jones and Stokes 1980, Thomas et al. 1979). Breeding occurs in middle and late seral stages of coniferous forests from late April through early October. The peak nesting period is from mid-June to mid-July (Bent 1961). There are only a few reports of this owl using nest boxes (Bloom 1983).

Flammulated owls may form loose breeding colonies. Up to 10 territorial male owls have been recorded in areas ranging from 1.2ha to 97ha (3-240 acres) in size (Marcot and Hill 1980, Jones and Stokes Assn. 1980). In Oregon, individual home ranges averaged about 10ha (25 acres) in size (Goggans 1986). Territories are typically found in core areas of mature timber with two canopy layers present. The uppermost canopy layer is formed by trees at least 200 years old. Core areas are near, or adjacent to,

clearings of 10 - 80% brush cover (Marcot and Hill 1980, Bull and Anderson 1978).

Day roosts are located in mature mixed confier stands with dense, multi-layered canopies (Goggans 1986, Bull and Anderson 1978). Dense stands presumably provide cover from weather and predators for resting owls, and may form core portions of the owls' territories.

Flammulated owls are presumed to be migratory in the northern part of their range (Balda et al. 1975). In Oregon they arrive at the breeding sites in early May and begin nesting in early June; young fledge in July and August (Goggans 1986; Bull, pers. comm.). In Colorado, the owlets dispersed in late August and the adults in early October (Reynolds and Linkhart 1987).

LIMITING FACTORS:

Availability of suitable nest cavities and/or arthropod prey in ponderosa pine or mixed-conifer forests.

MANAGEMENT RECOMMENDATIONS:

Creation of large areas of even-aged timber is detrimental to flammulated owls. Uneven stands of dense, mature timber located near brushy clearings should be maintained for flammulated owls.

All conifers and hardwoods having natural or excavated cavities in and adjacent to flammulated owl territories should be left undisturbed (Marcot and Hill 1980). At least 8 snags per 40ha (100 acres) should be left to support maximum densities of flammulated owls in ponderosa pine forests (Balda 1975 in Jones and Stokes Assn. 1980). Bull (pers. comm.) recommends leaving more than 8 snags because of competition from other secondary cavity nesters. Snags should be greater than 30cm (12") dbh and greater than 1.8m (6') tall (Thomas 1979).

Future nest snags should be recruited by continually retaining large, over-mature trees in, or adjacent to, suitable flammulated owl habitat (Marcot and Hill 1980). Where snags are lacking, large trees can be topped to promote woodpecker use and cavity formation. Fuelwood collection should be limited where flammulated owls occur because these practices eliminate nest snags.

Brushy areas may provide insect prey and feeding cover when flammulated owls forage near the ground. Therefore, forest practices (e.g. application of herbicide) which remove brush from clearings adjacent to flammulated owl territories should be avoided. Application of insecticides that could reduce insect prey abundance should not occur in flammulated owl home range areas, approximately 305m (1000') from the nest.

Winter (1979) and Marcot and Hill (1980) noted the potential importance of old black oak trees to flammulated owls becuase of their numerous natural cavities. Washington's white oak-conifer forests should be surveyed for these owls.

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KEY POINTS: Habitat Requirements:

- Associated with high-elevation coniferous forest.
- Nest and roost in mature, multi-storied stands.
- Nest in cavities.
- Can be semi-colonial.
- Insectivorous, forage in open areas.
- Migratory.

Management Recommendations:

- Maintain stands of dense, mature trees near brushy clearings.
- Maintain at least 8 snags > 30 cm dbh and > 1.8m tall per 40 ha; maintain all trees with cavities.
- Ensure snag recruitment.
- Leave brush in clearings near owl territories.
- Do not apply insecticides in areas used by owls.

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Aquila chrysaetos

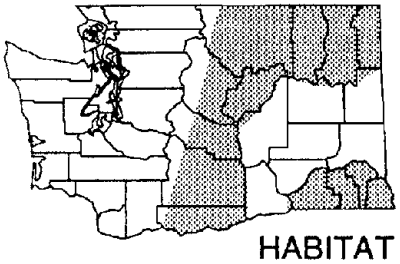
Washington Department of Wildlife

Management Recommendations for Priority Species

Golden Eagle

RANGE: Northern hemisphere (temperate and arctic).

WASHINGTON DISTRIBUTION: Found throughout Washington mainly in the upper Columbia River Basin. Breeds in most counties, but is absent from the lower Columbia Basin and parts of the Puget Trough. The 1990 population estimate is 80 breeding pair, a small population compared to the rest of the golden eagle's range (WDW 1991).



HABITAT REQUIREMENTS: Golden eagles require large, open areas for feeding. Nests generally are located on cliffs or in large trees (Anderson and Bruce 1980, Snow 1973). East of the Cascade Range, the birds commonly are associated with open, arid sagebrush, ponderosa pine and grassland habitats near cliff and plateau topography.

Western Washington nest sites primarily are in large trees in mature to old-growth forests near the edges of clearcuts (Anderson and Bruce 1980). Bruce et al. (1982) found that golden eagle tree nests generally were smaller than bald eagle nests and were placed at or below canopy height and were located no more than 500m (1500') from large clearcuts (<10 years old) or open fields. Whereas, bald eagle nests were located at or above the canopy on the interior of a stand and were closer to water than golden eagle nests.

Densities of golden eagles in the western states range from one pair per 34 sq km to one pair per 250 sq km (13-96 sq mi). Prime habitat in Wyoming (highest population density) has a mixture of cliffs and trees suitable for nesting and open rangelands with abundant and diverse prey (Phillips et al. 1984). Home range size depends on the amount of prey habitat available. Golden eagles use the same territory annually but use alternate nests in different years. The number of alternate nests range from one to 14 with two to three being average (Snow 1973).

Hares, rabbits, ground squirrels, and marmots are the most important prey for golden eagles (Snow 1973, McGahan 1967). Mountain beaver are important west of the Cascade Mountains (Bruce et al. 1982). Golden eagles may have difficulty capturing these medium-sized mammals in older clearcuts because the vegetative cover obscures them or decreases hunting efficiency.

LIMITING FACTORS: Availability of secluded nest sites, adequate prey populations (large rodents or lagomorphs) located within foraging range of the nest, and minimum nesting territory size (Beecham and Roberts 1975) are among the factors thought to be limiting to golden eagles.

MANAGEMENT RECOMMENDATIONS:

Golden eagles declined over portions of their range during the twentieth century because of widescale killing attributed to livestock depredation. Golden eagle depredation on livestock does not appear to be a problem in Washington. Currently, lead poisoning and conversion of rangeland to agricultural, industrial, or residential uses are the main threats to golden eagles (Harlow and Bloom 1989, Phillips 1986).

Human disturbance is thought to be a major factor in golden eagle nest failure. Golden eagles, especially adults, may abandon nests when disturbed during the egg-laying period. Flushing adults from the nest can cause overheating and death of eggs or eaglets (Boeker and Ray 1971, Camenzind 1969, Kochert 1972). Golden eagles seem to tolerate regular (as opposed to erratic) activities such as roads, highways, and ranches in open country. However, new development such as rock quarries, construction of roads, houses, and other structures, should be avoided near nest sites. For cliff nests, access to the cliff rim should be restricted. Camping below active eyries should be avoided. Climbing on nest cliffs should be discouraged. Avoiding these activities is critical during the nesting period of January 15 to July 15 (Beebe 1974, Hickman, Friesz pers. comm.).

Golden eagles should persist in an intensively managed forest where timber harvest plans are designed to maintain a distribution of different seral stages within drainage basins. Golden eagle habitat could be provided by leaving some long-rotation stands with clearcuts temporally-spaced around these mature nesting stands. Structural objectives include accessable open-branched trees for alternate nesting platforms.

In arid regions, golden eagles require large expanses of native habitat for foraging. Large-scale conversion of eagle habitat to agriculture should be avoided because it reduces prey abundance and availability. Also, rodent control should not occur within eagle foraging areas since it reduces the prey base (Young 1989, Phillips 1986, Eaton 1976).

In Idaho, fewer golden eagles were found on overgrazed range than on range in better condition. Prey species decrease with reduced herbaceous cover and foliage height diversity. To mitigate the effects of grazing on upland habitat, reduce grazing, use deferred rotation or rest rotation grazing systems, and space water developments to disperse livestock. On severely damaged range with high shrub density, controlled burning or chaining followed by reseeding with native vegetation can restore habitat (Kochert 1989). In general, manage range to improve or maintain prey species habitat.

Power lines and power poles in any nesting or feeding area should be constructed so the bird cannot make contact with any two points that would result in electrocution. Leaving natural perches and modifying powerlines to eliminate the possibility of electrocution are the best longterm solutions (Nelson and Nelson 1977, 1976).

Golden eagle nests that conflict with development have been relocated successfully in areas with abundant quality habitat (Phillips 1984). This technique should be used on a limited basis in Washington, since the population is small and there is less suitable habitat.

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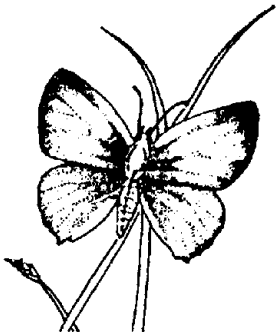
Habitat Requirements

- Large, open areas for feeding (sagebrush/grassland or clearcuts).
- Cliffs or mature trees for nesting.
- Adequate prey (large rodents or rabbits) within foraging range of nest.
- Freedom from disturbance near nests.

Management Recommendations:

- Develop site-specific management plans.
- Avoid development near nests, e.g. rock quarries, roads, houses, etc.
- Avoid disturbing activities from February 15 to July 15.
- Retain some long-rotation forest stands or manage younger sawtimber stands to produce open-limbed trees for platform nests.
- Space clearcuts through time around nesting areas.
- Retain forest buffers around nest trees.
- Avoid large-scale conversion of rangeland near golden eagle territories.
- Maintain rangeland in good condition.
- Do not control rodents within eagle foraging areas.
- Modify powerlines and poles to prevent electrocution.



Washington Department of Wildlife

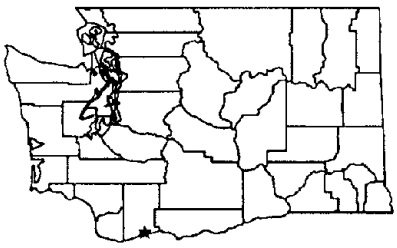
Management Recommendations for Priority Species

Habrodais grunus herri

Golden Hairstreak Butterfly

RANGE: Southern Washington, western Oregon, and northern California.

WASHINGTON DISTRIBUTION: The existance of golden hairstreak butterflys in Washington is currently confirmed in a single grove of golden chinquapin trees located in southern Skamania County (Pyle 1989).



HABITAT REQUIREMENTS: Golden hairstreak larvae are specialists that feed exclusively on the host plant golden chinquapin, *Castanopsis chrysophylla*. Golden chinquapin is an evergreen member of the oak family and Washington is the northernmost extension of its range (Kruckeberg 1980). Historical records of golden chinquapin are from at least four locations in Skamania County and a few sites near Hood Canal.

Adult golden hairstreaks feed on nectar during August (Neill and Hepburn 1976). Typical forage plants include herbaceous plants such as goldenrod (*Solidage* sp.), ox-eyed daisy (*Chrysanthemum leucanthemum*), and pearly everlasting (*Anaphalis margaritacea*) (Pyle, pers. comm.). Adults are always found in close proximity to golden chinquapin stands, and generally forage within 30m (100') of the trees (Pyle 1989).

LIMITING FACTORS: Availability of golden chinquapin.

MANAGEMENT RECOMMENDATIONS: Maintaining populations of this species depends upon protecting the larval food plant, golden chinquapin, and avoiding the use of insecticides near these trees.

Golden chinquapin is apparently shade intolerant and is generally found where conifer stands are either open or young (Kruckeberg 1980). However, some populations in the Hood Canal area appear to be intermediate in tolerance (Lesher, pers. comm.). Forest management practices should be conducted to allow for natural regeneration of golden chinquapins.

This species will stump sprout, thus stumps should not be removed. Cutting or yarding of other tree species in the vicinity of these groves should be done in a way that avoids damaging the chinquapins. Careful selective cutting and pre-commercial thinning of conifers may benefit golden chinquapins by reducing shade. However, clearcut logging and fire could destroy the trees

and should not occur where golden chinquapin is found. If clearcut logging is proposed near chinquapin stands, buffer areas should be established on a site specific basis. To prevent golden chinquapins from being damaged by blowdown from buffer trees, buffer design should consider the topography, history of blowdown and amount of root and butt rot present in the area.

Insecticides and herbicides should not be applied within 152m (500') of chinquapin groves (Pyle 1989). Aerial applications of herbicides and insecticides should not occur near golden chinquapins, so that accidental contamination from overspray can be minimized. Herbaceous forage plants used by adult butterflies should not be removed in or around golden chinquapin stands.

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KEY POINTS:

Habitat Requirements:

- Larvae feed only on the golden chinquapin tree, *Castanopsis chrysophylla*.
- Adults feed on nectar of other plants, but are always found close to golden chinquapin stands.

Management Recommendations:

- Do not cut or damage stands of golden chinquapin during timber harvesting; allow natural regeneration of chinquapins.
- Thin and selectively cut conifers around golden chinquapin stands to reduce shade and create openings.
- Establish buffer areas if clearcut logging occurs near chinquapin stands.
- Do not apply insecticides or herbicides within 152m (500') of golden chinquapin stands.

Ardea herodias

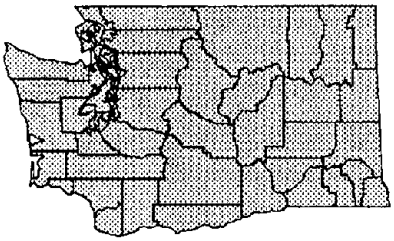
Washington Department of Wildlife

Management Recommendations for Priority Species

Great Blue Heron

RANGE: Found throughout most of North America south of 55° north latitude and extends into much of Central and South America. Breeding pairs on the Pacific coast occur only to about 52°N.

WASHINGTON DISTRIBUTION: Statewide.



HABITAT REQUIREMENTS: Great blue herons occur near all types of fresh and saltwater wetlands including seashores, rivers, swamps, marshes, and ditches. They are found at most elevations, but are more common in the lowlands. These herons are colonial breeders, generally nesting in tall deciduous or coniferous trees near wetlands. Although occasionally smaller trees, bushes, and artificial structures have been used (Bruce 1986, Blus et al. 1980), nests are usually constructed in the largest trees available. For example, a study in British Columbia found that most heronries occurred in trees over 14m (50') tall and no nests were found in trees under 10m (30') high (Mark 1976). In an Oregon study, the birds nested in trees averaging seven to 25m height (23' to 82') (Werschkul et al. 1976).

Great blue herons feed on aquatic and marine animals found in shallow water. Feeding in upland fields upon mice and voles also occurs (Calambokidis, et al. 1985) and may be important in winter, especially for herons in coastal areas (Simpson, pers. comm.). Although documented distances from an active heronry to a foraging area range from four to 29km (2.5 to 18 mi.), most are located within a radius of about four to five km (2.5 to 3 mi.) from the heronry (Short and Cooper 1985). Feeding territories may vary from year to year with respect to size or location (Hoover and Wills 1987). Birds from Pacific coastal colonies may depend on specific nearby shallow water areas which provide consistent, abundant food during the critical nesting and young rearing periods (Kelsall, pers. comm.).

Alternative nesting and feeding habitat is probably critical to great blue herons. Colonies usually exist at the same location for many years, but some herons may naturally relocate their colonies in response to increased predation on eggs and young by mammals or other birds, or declines in food availability (Simpson et al. 1987). Heronries built in spruce or Douglas-fir trees may damage the host trees over time, which may also influence natural colony relocation (Julin 1986).

Great blue herons are shy birds, generally sensitive to human disturbance and frequently the target of vandalism (Parker 1980, English 1978). Herons have abandoned heronries because of housing and industrial development, highway construction, logging, actively used roads, and repeated human intrusions into colonies (Leonard 1985, Parker 1980, Kelsall and Simpson 1979, Werschkul et al. 1976). Herons that have experienced few past disturbances are unlikely to tolerate human activities near their colonies (Bowman and Siderius 1984).

Other studies suggest that some herons, which are frequently or consistently exposed to disturbance, may habituate to human activities (Webb and Forbes 1982, Vos et al. 1985, Calambokidis et al. 1985, Shipe and Scott 1981). Thus, herons nesting in different locales may have different tolerance levels to humans, with colonies located close to human activities responding less to disturbance than those in remote areas (Simpson 1984). Certain colonies may tolerate disturbance because nests are built in coniferous trees, whose foliage naturally buffers the effects of human activity, or they may be influenced by proximity to heavily used foraging areas (Webb and Forbes 1982).

LIMITING FACTORS:

Availability of suitable habitat which provides adequate nest sites and feeding areas located in the vicinity of breeding colonies.

MANAGEMENT RECOMMENDATIONS:

Site specific management plans should be developed for individual heronries whenever activities that might affect herons are proposed. Factors to consider include, but are not limited to:

1) The heronry's relative isolation (Henny and Kurtz 1978). Some evidence suggests that colonies located in close proximity to existing human activities can tolerate more disturbance compared to colonies located in undisturbed areas (Simpson 1984, Webb & Forbes 1982, Bowman and Siderius 1984).

2) The timing of a proposed activity relative to the heron's nesting cycle. Herons are most vulnerable to disturbance early in the breeding cycle. It is generally agreed that herons are less tolerant of disturbance during the prenesting courtship period and egg laying, becoming progressively less likely to abandon nests after the young have hatched (Kelsall 1989, Bowman and Siderius 1984).

3) Topographic features surrounding the heronry and type of habitat surrounding the colony.

4) Proximity of a heron colony to likely feeding grounds (Simpson 1984, Gibbs et al. 1987).

5) Proximity to, and availability of, forest stands which might be used as alternative nest sites (Simpson 1984, Julin 1986, Gibbs et al. 1987).

6) The numbers of potential predators, such as bald eagles or crows, in the area (Simpson et al. 1986, Kelsall and Simpson 1979).

7) Degree of habituation to disturbance (Bowman and Siderius 1984).

All authors on heronry management recommend buffer zones around the periphery of nesting sites (Kelsall 1989). Recommended buffer distances vary from 1,000m (3280') during the nesting season (Bowman and Siderius 1984) to a year-round "no activity" buffer of 25m (75') encompassed by a 0.25km (0.4 mi.) zone off limits from March through mid-May (Parker 1980).

Establishment of buffer distances should be determined by the factors discussed above, and by any other factors that may pertain to a specific heron colony. Whenever possible, a minimum buffer zone within a range of 250 to 300m (820' - 980') from the peripheries of a colony should be established (Bowman and Siderius 1984, Quebec 1986 in Kelsall 1989, Vos et al. 1985, Buckley and Buckley 1976, Pullin 1988, Short and Cooper 1985, Parker 1980). All human activities should be restricted in this zone during the early nesting period, from February 15 to July 31 unless site specific nesting chronology is known (Kelsall, pers. comm.). If dates of courtship through incubation are known to differ from these prescribed dates for a specific heronry, then timing of restrictions should reflect this local knowledge. Activities, such as logging, mechanized agriculture, road building, and housing construction, should be avoided within this zone, in order to protect the structural integrity of the buffer area (Short and Cooper 1985, Bowman and Siderius 1984).

Nesting tree loss, either naturally or through disturbance, may represent a serious problem if availability of suitable alternative great blue heron habitat becomes limited. Therefore, stands of large trees at least 17m (50') high and at least 4 ha (10 acres) in extent which can be buffered from disturbance, should be left in the vicinity of heron breeding colonies and feeding areas (Parker 1980). Large colonies would likely require more alternative habitat. Kelsall (pers. comm.) suggests leaving large nesting trees in the center of an area having 300m or more of isolation during the breeding season.

Surrounding feeding areas, especially wetlands, should be protected within a minimum radius of 4km (2.5 mi.) of existing colonies. This is especially critical where herons coexist in areas with high human activity (Hoover and Wills 1987).

Efforts to increase awareness of great blue heron nesting colonies should concentrate on inventories, information exchange, and education. Nest sites occupied currently or in the past should be inventoried regularly, and local and state agencies should be made aware of their existence.

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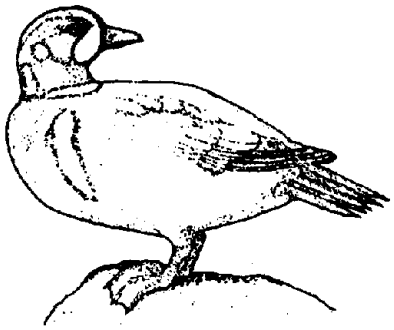
KEY POINTS:

Habitat Requirements:

- Colonial breeders, generally nest in tall trees near wetlands.
- Usually forage within four-five km of colony.
- Alternate nesting and feeding habitat important.
- Sensitive to human disturbance.

Management Recommendations:

- Maintain habitat within 250-350m buffer zone around colony.
- No human instrusion in buffer zone between February 15 and July 31.
- Maintain alternate nesting habitat nearby.
- Protect wetlands and other feeding areas within four km of colony.
- Develop a site-specific management plan for each heronry (see text).



Histrionicus histrionicus

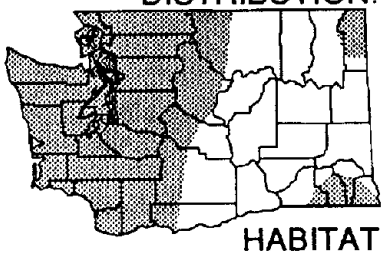
Washington Department of Wildlife

Management Recommendations for Priority Species

Harlequin Duck

RANGE: Harlequin ducks winter along the Pacific Coast from the Aleutian Islands to northern California and along the Atlantic Coast. Harlequins summer/breed from coastal mountains of Alaska to California, along the northern Rocky Mountains to Yellowstone, and along the Atlantic Coast.

WASHINGTON DISTRIBUTION: Harlequins breed in the Olympic Mountains, the Cascades, and the Blue and Selkirk Mountains. Wintering areas include northern Puget Sound, northern Hood Canal, Strait of Juan de Fuca, San Juan Islands, and the outer coast.



HABITAT REQUIREMENTS: During the nesting season (April-June) adult harlequin ducks require fast-flowing water with one or more loafing sites nearby, dense shrub or timber/ shrub mosaic vegetation on the banks, and an absence of human disturbance (Cassirer and Groves 1989). Harlequins nest on the ground (Bergston 1972). Midstream loafing sites are very important (Cassirer and Groves 1990). Since adult harlequins show fidelity to nest sites, it is unlikely that they will relocate to new nesting areas once they are disturbed (Wallen and Groves 1989).

Broods remain near nesting areas for the first few weeks after hatching then move downstream during the summer (Kuchel 1977, Wallen 1987, Cassirer and Groves 1989). Broods prefer low-gradient streams with adequate macroinvertebrate fauna (Bengton and Ulfstrand 1971). Preferred prey include crustaceans, molluscs, and aquatic insects (Cottam 1939). In general, there is a direct relationship between aquatic plant biomass and macroinvertebrate biomass (Krull 1970). In one study, ninety percent of all brood observations occurred near mature or old growth stands (Cassirer and Groves 1990).

During winter, harlequins forage and loaf along boulder- strewn shores, points, and gravel substrates and in kelp beds. Seventy percent of their prey species occur chiefly on rock substrate and twenty-two percent on gravel substrate (Vermeer 1983). Most wintering harlequins occur within 50 meters of shore in saltwater areas (Gaines and Fitzner 1987).

LIMITING FACTORS: Low benthic macroinvertebrate biomass limits the number of harlequin ducks and productivity. Human disturbance discourages nesting at traditional sites and thereby decreases productivity.

MANAGEMENT RECOMMENDATIONS: Maintain woody debris and riparian vegetation in and adjacent to streams. A 30 meter (100') buffer along nesting streams is necessary to recruit suitable LOD for loafing sites (Murphy and Koski 1989). A larger buffer may be necessary on second growth stands. Logging activity in the riparian corridor should be avoided (Cassirer and Groves 1989). Stream alterations that would cause greater surface runoff, changing water levels, or lower macroinvertebrate levels should be avoided (Kuchel 1977).

To limit disturbance, trails or roads should be farther than 50 meters (165 feet) from streams used by harlequin ducks, and should not be visible from the stream (Cassirer and Groves 1989). Fishing activity should be limited on streams used by nesting harlequins (Wallen 1987). The May through August nesting and brood rearing period are the critical months to reduce disturbance.

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KEY POINTS: Habitat Requirements:

- Adults — fast-flowing streams, loafing sites, dense bank vegetation, absence of human disturbance. Broods — low gradient streams with adequate macroinvertebrates. Winter — rocky marine shoreline areas.

Management Recommendations:

- Maintain woody debris, riparian vegetation next to streams,

macroinvertebrates. Locate roads and trails further than 165 feet from streams. Manage human disturbance during breeding/brood-rearing season (May-August). Protect rocky shoreline areas used during winter.

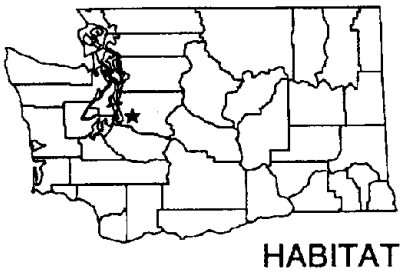
Eanus hatchi

Washington Department of Wildlife
Management Recommendations for Priority Species

Hatch's Click Beetle

RANGE: Lowland sphagnum bogs of northwest Washington (Johnson 1979).

WASHINGTON DISTRIBUTION: Historically known from Snohomish County and King County. Currently confirmed only in King County(Johnson 1984).



HABITAT REQUIREMENTS: Hatch's click beetles inhabit eutrophic sphagnum bogs in or near lakes below 1,000m (3280'). They have been collected in very low, floating mats of vegetation in pure sphagnum bogs (Lane 1938). Larvae have been found near the bog margins, above the water line (Lane 1971). Adults probably feed on honey dew, pollen, nectar, and small soft insects. Larvae probably are plant and small insect predators (Johnson, pers. comm.).

LIMITING FACTORS: Unknown.

MANAGEMENT RECOMMENDATIONS: Prevent all activities that might alter the condition of sphagnum bogs where Hatch's click beetles occur. These include peat mining, filling, draining, construction within the bogs, and other activities. Changing the natural water level or flow rate within the bogs should also be prevented.

Insecticides, and herbicides that could damage wetland vegetation, should not be applied in sphagnum bogs. Persons wanting to apply chemicals to adjoining lands should not apply them if stormwater runoff or wind drift will carry the chemicals into the bog. Stormwater runoff should not be diverted into sphagnum bogs. Decisions about chemical applications should be made on a site specific basis and should consider type of chemical used, season, topography and other relevant features.

Exotic fish could potentially prey upon beetle larvae and should not be introduced into wetlands occupied by Hatch's click beetles.

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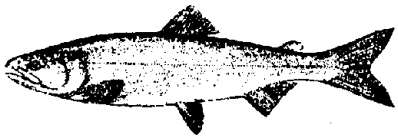
KEY POINTS: Habitat Requirements:

- Inhabit sphagnum bogs associated with lakes below 1000 m (3300') elevation.

Management Recommendations:

- Avoid activities that may alter the condition of sphagnum bogs (e.g., peat mining, filling, draining, construction).
- Avoid altering the natural water level or flow rate within sphagnum bogs.
- Avoid applying insecticides or herbicides in or near sphagnum bogs.
- Avoid diverting stormwater runoff into sphagnum bogs.
- Do not introduce exotic fish into lakes or wetlands associated with sphagnum bogs.



Washington Department of Wildlife
Management Recommendations for Priority Species

Oncorhynchus nerka

Kokanee

RANGE: In North America, kokanee occur from the Klamath River, California to Point Hope, Alaska. Kokanee occur naturally outside North America in Japan and the USSR.

WASHINGTON DISTRIBUTION: Kokanee occur in many lakes throughout Washington. Some of the larger populations occur in Banks Lake and Loon Lake in eastern Washington and Lake Whatcom in Western Washington (Wydoski and Whitney 1979).

HABITAT REQUIREMENTS: Kokanee inhabit deep, cool lakes and reservoirs. They inhabit the upper third of the lake's water column and feed primarily on zooplankton and aquatic insect larvae (Scott and Crossman 1973, Wydoski and Whitney 1979). Adult kokanee migrate to tributaries where spawning occurs in redds dug in fine gravel located in clean riffles (Scott and Crossman 1973). Some spawning also occurs along gravel lake shores. Newly emergent fry migrate to the lake where they will live until adults.

LIMITING FACTORS: The presence or absence of deep cool lakes and associated tributaries are the primary factors which limit the distribution of kokanee. Because spawning occurs in tributaries, high stream temperatures or high sedimentation during spawning, a lack of spawning habitat, and/or a lack of zooplankton in the lake will limit the population and range of kokanee.

MANAGEMENT RECOMMENDATIONS: The maintenance of riparian vegetation is essential for controlling stream temperature, providing cover, and protecting against lateral erosion. Removal of streamside vegetation lowers canopy density (shading), and increases sedimentation and stream scouring. Increases in solar radiation raises stream temperatures thereby negatively impacting spawning, hatching, and rearing survival. Increased sedimentation contributes to the loss of spawning habitat and decreases the diversity of aquatic invertebrates and other food items (Newbold et al. 1980, Noss 1983, Heede 1985). Buffer zones along stream and lake banks should be at least the width of the height of the tallest tree or 15.2 m (50 ft) whichever is wider. The vegetative buffer will provide erosion control, and maintain natural stream temperatures and diversity of aquatic invertebrates (Meehan et al. 1977, Newbold et al. 1980). In Washington, this can range up to 60 m (200 ft.). This "zone of influence" (Meehan et al. 1977) should be maintained along stream banks which provide kokanee habitat, and any other stream and lake which directly or indirectly influences kokanee. Road construction and maintenance activities should be avoided adjacent to streams with kokanee. In-stream structures such as bridges, piers, boat ramps, or culverts must not impede the natural movements of kokanee.

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Meehan, W.R., F.J. Swanson, and J.R. Sedell. 1977. Influences of riparian vegetation on aquatic ecosystems with particular reference to salmonid fishes and their food supply. P. 137-145 in Proceed. Symp. on the Importance, Preservation, and Management of the Riparian Habitat, July 9, 1977, Tucson, AZ.

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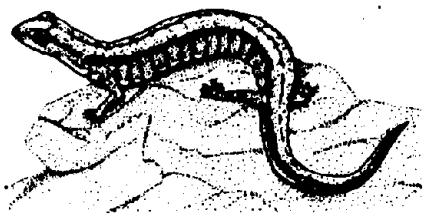
KEY POINTS:

Habitat Requirements:

- Kokanee require a lake environment for most of their lives.
- Tributaries are used for spawning habitat and for newly emerged fry.
- Spawning occurs in redds dug in fine gravel located in clean riffles.
- Newly emergent fry migrate to the lake where they will live until adults.

Management Recommendations:

- Buffer zones of at least the width of the height of the tallest tree (or 15.2 m (50 ft) whichever is wider) should be maintained along stream banks which provide kokanee habitat, and any other stream which directly or indirectly influences kokanee habitat.
- Road construction and maintenance activities should be avoided adjacent to streams which provide kokanee habitat.
- In-stream structures such as bridges, piers, boat ramps, or culverts must not impede the natural movements of kokanee.



Washington Department of Wildlife
Management Recommendations for Priority Species

Plethodon larselli

Larch Mountain Salamander

RANGE: Both sides of the lower Columbia River Gorge between Hood River and Troutdale, Oregon, and in the central Cascade Range of Washington (Nussbaum et al. 1983; Aubry et al. 1987).

WASHINGTON DISTRIBUTION: Washougal River to near the Klickitat River, isolated populations as far north as Lewis County. A disjunct population occurs inside a lava tube cave located within the Mount St. Helens National Volcanic Monument (Aubry et al. 1987).

HABITAT REQUIREMENTS: Nearly all populations of Larch Mountain salamanders have been found in talus slopes. The talus generally consists of rocks measuring 2.5cm - 5cm (1 in. - 2 in.) in diameter. Most of these talus slopes are covered with mixed stands of bigleaf maple and Douglas-fir (Larsen and Schaub 1982). Ground cover is often minimal and generally there is little soil in the spaces between the rocks. Larch Mountain salamanders are more abundant in areas with a dense overstory and depend on a moist, but not saturated environment.

LIMITING FACTORS: Availability of adequate, undisturbed, shaded, moist talus slopes.

MANAGEMENT RECOMMENDATIONS: Logging should be avoided in Larch Mountain salamander habitat (Bury et al. 1980). If logging does occur, a 27.4m to 45.7m (90' to 150') border of trees should be retained along the periphery of the talus fields (Herrington and Larsen 1985). Leaving an uncut zone is critical to maintaining populations of these salamanders in logged areas. Beyond this zone, at least 50% vegetation and as much slash as possible should be left in place.

If logging occurs in areas surrounding Larch Mountain salamander habitat, talus slopes should not be disturbed. Logs should not be dragged across talus, and heavy machinery should be kept off talus.

Talus slopes should be maintained with sufficient overstory to keep ground temperatures cool for much of the year and to conserve adequate moisture for survival of these salamanders and their prey. Gravel required for road construction and maintenance or other uses should be acquired from sources other than the talus supporting populations of Larch Mountain salamanders. Building and development should be designed and executed in a manner that will not interfere with salamander population sites (Herrington and Larsen 1985).

Human access to caves where Larch Mountain salamanders occur should be restricted to avoid disturbing these animals and their habitat.

Destructive collecting methods, such as tearing apart logs or removing moss, should be avoided (Larsen and Schaub 1982).

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KEY POINTS:

Habitat Requirements:

- Inhabit moist talus slopes, usually with a dense mixed Douglas-fir/big leaf maple overstory.

Management Recommendations:

- Maintain a 27m to 46m buffer along the periphery of talus slopes.
- Avoid dragging logs or heavy machinery across talus areas.
- Leave sufficient overstory to assure talus slopes remain cool and moist.
- Building, development and gravel extractions should be avoided in sites occupied by Larch Mountain salamanders.
- Restrict human access in caves occupied by Larch Mountain salamanders.
- Avoid destructive collecting methods.

Asyndesmus lewis

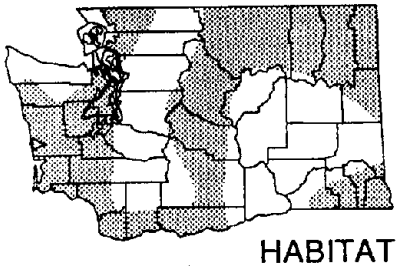
Washington Department of Wildlife

Management Recommendations for Priority Species

Lewis' Woodpecker

RANGE: Breeds from British Columbia and southern Alberta to New Mexico, and from South Dakota west to the Pacific. Winters from Oregon south to Baja California east to western Texas and southern Nebraska (Jackman and Scott 1975).

WASHINGTON DISTRIBUTION: Western Whatcom and Skagit Counties, Olympic Peninsula and southwest Washington, through the Columbia Gorge, up the east slopes of the Cascade Mountains to the Okanogan Highlands, northeast Washington and the Blue Mountains.



The Lewis' Woodpecker is principally a resident of the Transition Zone associated with ponderosa pine and cottonwood riparian areas. It is locally distributed, often in colonies, and frequently in burned forests (Jewett et al. 1953, Larrison and Sonnenberg 1968).

HABITAT REQUIREMENTS: **Nesting** - Open or parklike ponderosa pine forest is probably the major breeding habitat of the Lewis' woodpecker, although they also nest in burned-over stands of Douglas fir, mixed conifer, riparian and oak woodlands (Bock 1970). Openness is the common characteristic in all breeding habitats used by Lewis' woodpeckers. This requirement is related to their foraging methods of hawking and gleaning in brush. Some trees are needed for hawking perches and for nesting (Bock 1970, Jackman and Scott 1975).

An important component of their preferred breeding habitat is brushy undergrowth consisting of such species as sagebrush, golden current, bitterbrush and rabbitbrush that supports insects on which Lewis' woodpeckers feed. Bock (1970) stated that the critical features of their habitat were the openness, the composition of the understory and the insect fauna.

Other desirable habitats are selectively logged or burned coniferous forest, habitats structurally similar to open ponderosa pine. In the normal cycle of reforestation, a burn may become suitable Lewis' woodpecker habitat between the 10th and 30th years when a shrub understory develops and insects are prevalent (Bock 1970, Jackman and Scott 1975).

Riparian habitat is the main breeding area for Lewis' woodpeckers at lower elevations. Groves of cottonwood trees are especially suitable since they are open and usually have dead trees which offer nest and roost sites. Insects are abundant due to the lush vegetation of riparian areas (Bock 1970, Jackman and Scott 1975).

Oak woodlands are also utilized as breeding areas if sufficient openings and large, decayed trees are available. A colony of 22 birds is known from an old oak grove on a year-round creek canyon in the Columbia River Gorge (Kavanaugh 1991).

These woodpeckers also may nest in agricultural lands if adequate nest trees are present.

The Lewis' woodpecker will excavate its own nest cavity, but also uses natural cavities or holes excavated by other woodpeckers. They nest in conifers and hardwoods with a preference for snags over live trees. Nest heights range from 1.5 to 52 m (5-170'). Scanning perches are important year-round (Bock 1970).

Bock (1970) noted that during the breeding season these woodpeckers protect only their immediate nest site, but in winter defend a feeding area. Thomas et al. (1979) reported a larger territory size of 6 ha (15 ac) per pair in the Blue Mountains. These woodpeckers have high nest site fidelity and often use the same cavity in consecutive years (Bock 1970). Kavanaugh (1991) described colonial nesting with up to 22 birds in a five acre oak grove. Some trees had two nest cavities. There was an abundant food supply of insects and acorns.

Wintering and Migration - Lewis' woodpeckers that nest in Klickitat County, Washington arrive in mid March. Most leave by early winter, but a few are observed throughout the winter (Kavanaugh 1991).They may migrate as far south as California and winter in oak woodlands and commercial orchards where emergent insects and mast are available (Bock 1970). During migration these woodpeckers can be seen in groups of six to 50 birds from sea level to 2000 m (6500') elevation (Jewett et al. 1953).

Feeding - The Lewis' woodpecker is an opportunistic feeder that breeds where insects are locally abundant and winters where mast crops are readily available.

The primary food of Lewis' woodpeckers during the spring and summer consists of insects such as flies, ladybird beetle larvae, tent caterpillars, ants and mayflies. Fruits and berries were the most frequently used food in late summer and fall, while winter food consisted of acorns and commercial nuts or corn.

Feeding behavior of Lewis' woodpeckers is atypical among woodpeckers. Bock (1970) noted that in summer, they spent approximately 60 percent of their foraging time flycatching, 30 percent ground-brush foraging and 10 percent gleaning insects from trees. During winter, Lewis' woodpeckers feed mostly on cached acorns and insects and spend some time flycatching and gleaning insects (Bock 1970).

LIMITING FACTORS:

Availability of snags, nest holes excavated by other woodpeckers, and abundant insects and mast are the predominant factors that limit distribution and abundance of Lewis' woodpeckers (Jackman 1975).

MANAGEMENT RECOMMENDATIONS:

This woodpecker has shown a recent decline in the western states possibly due to competition for snags and nest cavities and loss of riparian habitat (USFWS 1985).

The Lewis' woodpecker is only locally abundant as a breeding bird in Washington. The selection of one specific area probably depends on insect abundance. Certain habitats are only temporarily suitable such as logged or burned forests prior to regeneration of second growth timber.

Logged or burned coniferous forest is an integral part of the Lewis' woodpecker's habitat, but it is suitable only in the shrub stage. However, the

brushy stage is undesirable to the timber manager and efforts are made to eliminate it. Management practices that remove snags and damaged or diseased trees limit the availability of nest sites.

For managed stands, Neitro et al. (1985) recommend leaving 118 soft snags/ 100 ha (48/100 ac) > 43 cm (17") dbh and > 9 m (30') tall. In addition to the snag requirement, optimum habitat suitability is defined by the following factors (Sousa 1983):

1. tree canopy closure < 30%
2. shrub crown cover > 50%
3. crown cover of mast producing shrubs > 70%
4. % canopy of hard mast trees > 70%
5. corn crop left standing throughout winter
6. distance to potential mast storage sites 0.8 km (0.5 mi).

During thinning and cutting, leave as many dead and damaged trees as possible. Leave sections of logged or burned forest to regenerate naturally to brush (Jackman and Scott 1975). Retain groves of large oaks, maples, and cottonwoods.

Woodpeckers, along with other insectivores, play an important role in reducing insect populations at endemic levels. Biological control of forest insects is preferred over use of insecticides. It has a longer term effect to regulate future insect outbreaks and is less costly and nontoxic. Management to increase woodpecker populations should have the secondary benefits of increasing other insectivorous birds and controlling insect outbreaks (Takekawa et al. 1982).

Heavy livestock grazing often destroys native understory vegetation and may conflict with the Lewis' woodpeckers need for brush (Jackman and Scott 1975).

Lewis woodpeckers become agitated by continued disturbance at the nest site, occasionally deserting the nest (Bock 1970).

Large flocks may damage nut or fruit orchards (Jackman 1975).

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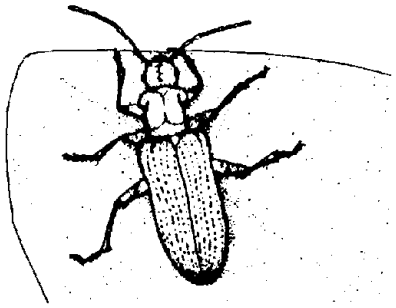
KEY POINTS:

Habitat Requirements:

- Mainly inhabits park like ponderosa pine forests with brushy under story. Also uses Douglas fir, mixed conifer, riparian and oak woodlands.
- Also uses logged or burned areas 10-30 yrs old.
- Excavates cavity or uses other nest holes in short snags.
- Feeds mainly on insects and mast crops. Uses scanning perches to flycatch insects.
- Winters in southwestern U.S.

Management Recommendations:

- Leave 48 soft snags/100 ac > 17" dbh and > 30' tall. Leave damaged trees for snag recruitment.
- Manage forest stands for open canopy with brushy understory.
- Encourage mast-producing trees and shrubs. Leave corn crops standing through winter.
- Leave sections of burned and logged forest to regenerate naturally.
- Avoid insecticides, use biological control of insects.



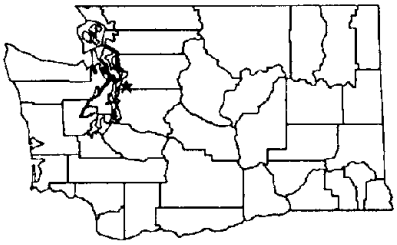
Donacia idola

Washington Department of Wildlife
Management Recommendations for Priority Species

Long-horned Leaf Beetle

RANGE: Lowland sphagnum bogs of Washington (Johnson 1979) and southwest British Columbia (Hatch 1971, Leech 1943).

WASHINGTON DISTRIBUTION: Historically known only from Snohomish County.



HABITAT REQUIREMENTS: The Long-horned leaf beetle inhabits eutrophic sphagnum bogs in or near lakes below 1000m (3280'). Long-horned leaf beetle larvae feed on submerged portions of aquatic plants. Adults feed on exposed portions of aquatic plants (White 1983), especially lilies and potamogeton.

LIMITING FACTORS: Unknown.

MANAGEMENT RECOMMENDATIONS: Activities that might alter the condition of sphagnum bogs should not occur where long-horned leaf beetles reside. These include peat mining, filling, draining, construction within the bogs, and other activities. Changing the natural water level or flow rate within the bogs should also be prevented.

Insecticides, and herbicides that could damage wetland vegetation, should not be applied in or near sphagnum bogs. Persons wanting to apply chemicals to adjoining lands should not apply them if stormwater runoff or wind drift will carry the chemicals into the bog. Decisions about chemical applications should be made on a site specific basis and should consider type of chemical used, season, topography and other relevant features.

Urban runoff waters may contain pesticides and other pollutants that could be harmful to adult or larval beetles. Therefore, stormwater runoff from surrounding developments should not be diverted into sphagnum bogs.

Exotic fish could potentially prey on beetle larvae and should not be introduced into wetlands occupied by long-horned leaf beetles.

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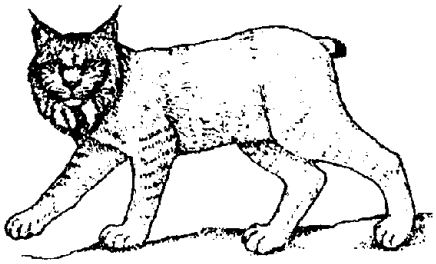
KEY POINTS: Habitat Requirements:

- Inhabit sphagnum bogs below 914m (3000') elevation.

Management Recommendations:

- Prevent activites that may alter the condition of sphagnum bogs (e.g., peat mining, filling, draining, construction).
- Avoid altering the natural water level or flow rate within sphagnum bogs.
- Avoid applying insecticides or herbicides in or near sphagnum bogs.
- Avoid diverting stormwater runoff into sphagnum bogs.
- Do not introduce exotic fish into lakes or wetlands associated with sphagnum bogs.



Washington Department of Wildlife
Management Recommendations for Priority Species

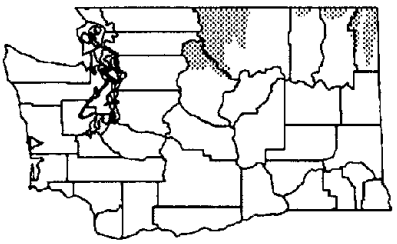
Lynx canadensis

Lynx

RANGE: Lynx occupy the boreal forests of North America and the spruce, subalpine fir and lodgepole pine forests in the West. They occur from Newfoundland, Labrador, and Quebec on the east to Alaska and British Columbia on the west; from the Arctic treeline south into portions of the United States.

Never a common animal in the contiguous United States, lynx may be found in northern New England (Godin 1977), the northern portions of the Lake States (Gunderson 1978, Mech 1973), parts of the Pacific Northwest (Ingles 1965, Hoffman et al. 1969, Nellis 1971) and the Rocky Mountains south to Utah (Durrant 1952) and Colorado (Miller 1980).

WASHINGTON DISTRIBUTION: In Washington, they occur in favorable habitats above 1,000 m (4.500') elevation in Chelan, Okanogan, Ferry, Stevens, and Pend Oreille counties (Brittell et al. 1989).



HABITAT REQUIREMENTS: The lynx is a specialized carnivore and its survival depends on a small number of prey species, particularly the snowshoe hare (Van Zyll de Jong 1966). This dependency significantly influences lynx population dynamics. During times of hare abundance, lynx reproduction is high, mortality is low and densities are high; during times of low hare abundance, lynx reproduction is low, mortality is high, and densities are low (Berrie 1973, Brand and Keith 1979, Parker et al. 1983, O'Connor 1984). Dependency of lynx on hare also influences lynx home range size as lynx must increase movement when hare densities are low. Lynx are territorial with the mean home range size in Washington of 60 sq km and a range of 20 to 300 sq km (24 sq mi, range 8 to 120 sq mi) (Brittell et al. 1989).

Habitat conditions which are good for snowshoe hare benefit lynx. Snowshoe hare prefer dense, early successional habitats with high habitat interspersion (Bittner and Rongstad 1982). The general trend in the seasonal food habits of hares is from woody browse, bark and needles during winter to more succulent herbaceous vegetation in the summer (Wolff 1980, Bittner and Rongstad 1982). Of critical importance during winter are small diameter twigs and new growth (less than 1 cm or 0.4" in diameter); larger stems may be eaten when conditions become harsh and vegetation is covered by snow (Wolff 1980). Hardwoods are preferred but when not readily available hares feed on conifers (Conroy et al. 1979, Peitz and Tester 1983). In Northeastern Washington, hares concentrate on tips of lodgepole pine seedlings and bark from

lodgepole pine trees. Trees must be 2 to 3 m (6 to 8') tall to provide browse when snows are 1 m (3 to 4' deep) (Wolff 1980).

Dense thickets used by hares provide protective cover from mammalian and avian predators and shelter from the elements (Keith 1963, Wolff 1980, Pietz and Tester 1983). Dense stands with 4,700 to 13,490 stems/acre provide these needs (Brocke 1975, Wolff 1980, Litvaitus et al. 1985, Monthey 1986, Koehler 1990). Thickets also provide stalking conditions for lynx.

On the other end of the forest successional spectrum, lynx need mature forests for denning. In Washington, denning sites are typically in lodgepole pine, spruce, and subalpine fir forests older than 200 years, with north and northeast aspects, mesic habitat associations, and a high density of down-fall logs (Koehler 1990). Denning areas must be connected by corridors of vegetative cover to prey habitat because lynx often avoid open areas (Brittell et al. 1989).

LIMITING FACTORS:

The major limiting factor is snowshoe hare abundance, which, in turn, is limited by availability of winter habitat. Excessive trapping and hunting can depress populations and may have been detrimental to local Washington lynx populations.

MANAGEMENT RECOMMENDATIONS:

Converting mature timber stands to early stages of plant succession will benefit lynx by creating conditions favorable to hare. However, clearcutting has the potential to eliminate cover over large areas. Management practices should provide a mosaic of forest age classes distributed over time and space. An even balance of forest age classes must be maintained. This would be represented by an equal amount of grass-forb-seedling, sapling, and pole-small saw timber cover types. Natural openings should be considered as part of the grass-forb-seedling type. Forest management may include timber harvesting, thinning or fire management (Brittell et al. 1989).

Mature lodgepole pine and old-growth (150-250 years) subalpine fir and Engelmann spruce stands in north or northeast aspects must be provided for denning cover. They should be 0.4 to 2 ha (1 to 5 acres) in size, interspersed among other cover types, contain high density of down-fall logs within 5.5 km (3.5 mi) of prey habitat, and located away from areas of significant human disturbance. The density of logs should be greater than 40 logs/45 m (150') lying 0.3 to 1.2 m (1 to 4') above ground (Brittell et al. 1989, Koehler and Brittell 1990).

All habitat components must be contiguous via travel corridors, as lynx avoid openings greater than 90 m (300'). Tree density should be more than 70 stems/ha (180 stems per acre) and the height must be at least 2 m (6') in height to satisfy cover requirements (Brittell et al. 1989, Koehler and Brittell 1990).

Managed units should be 8 to 16 ha (20-40 acres) in size with irregular shapes. During reforestation, site preparation should encourage regrowth of lodgepole pine and other native vegetation. Trees on units should reach at least 2 m (6') in height before harvesting or thinning adjacent areas (Brittell et al. 1989, Koehler and Brittell 1990).

Cattle grazing should be monitored to minimize impacts to hare habitats since cattle may compete with hare use of deciduous brush or trees, such as along riparian areas. Minimum human access and disturbance can be contolled by road management, including: minimize road miles; construct dead-end roads,

rather than loop; build roads to minimum standards to allow regeneration after timber sale; close unused mainstems with gates or traps; and rip or replant spurs (Brittell et al. 1989).

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KEY POINTS:

Habitat Requirements:

- Habitat conditions which are good for snowshoe hare benefit lynx.
- Snowshoe hare prefer dense, early successional habitats with high habitat interspersion.
- Vegetation must be 6 to 8' tall to provide browse when snows are deep.
- Thickets provide stalking conditions for lynx.
- Lynx need mature forests for denning.
- Denning areas must be connected by corridors of vegetation cover to prey since lynx avoid open areas.

Management Requirements:

- Management practices should provide a mosaic of forest age classes distributed over time and space.
- Converting mature timber stands to early stages of plant succession must not occur too rapidly. Clearcutting has the potential to eliminate cover over large areas.
- Overmature timber stands must be provided for denning cover. They should be 5 acres in size, contain high density of downfall logs, and interspersed amongst other cover types.
- Managed units should be 20 to 40 acres in size.
- During reforestation, lodgepole pine and other native vegetation should be encouraged in dense, solid stands. Stands must reach a height of 6 to 8' before adjacent stands are cut.
- Cattle grazing should be regulated to minimize negative impacts to snowshoe hare habitats.
- Minimize human access.

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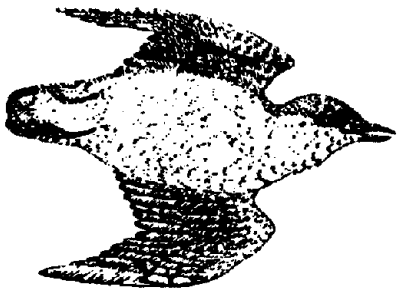


Washington Department of Wildlife

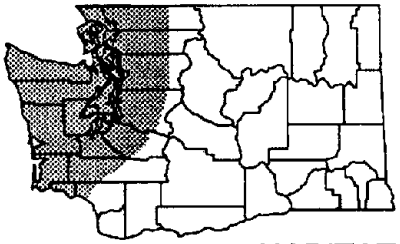
Management Recommendations for Priority Species

Brachyrhamphus marmoratus

Marbled Murrelet

RANGE: Aleutian Islands, Kodiak Island, and Kenai Peninsula of Alaska, south to central California. Individual birds winter as far south as southern California (Marshall 1988).

WASHINGTON DISTRIBUTION: Resident all year on coastal waters. Nests and roosts in mature and old-growth forest areas of western Washington. The breeding population is estimated to be 1900-3500 pairs (Speich et al., in press).



HABITAT REQUIREMENTS: The marbled murrelet feeds on inland saltwaters and the ocean within 2km (1.2 mi) of shore. They select feeding areas which are closer inshore than other alcid seabirds that forage in Washington waters. Primary prey are small fish and crustaceans, which are captured below the water's surface (Marshall 1988).

Little is known about the nesting habits of the marbled murrelet. The nesting period extends from April 1 to September 15. Marbled murrelets, unlike many other seabird species, do not nest in island colonies. However, when nesting areas are located in relatively large forest stands, murrelets may nest in aggregations of two or more pairs (Marshall 1988). As of 1990, only 24 nests have been found (Leschner, pers. comm.). Nearly all of these nests were in conifers that were 150+ years of age, located in mature or old-growth forests or residual old-growth trees > 88 cm (35") dbh (Binford et al. 1975, Carter and Sealy 1986, Carter and Sealy 1987, Marshall 1988, Hamer 1990). Most nests have been found on large flat conifer branches, which are thickly covered with moss (Marshall 1988, Hamer 1990, Nelson pers. comm 1990. The three known Washington nests are all in mature to old-growth forest stands. One of the nests is in an old-growth Douglas fir in a stand of mixed residual old-growth components and younger fire influenced forest (Hamer 1990, Holtrup pers. comm.). The mean size of potential and occupied nesting stands is 193 ha (478 ac) (IMMC 1991).

In Washington, a survey for marbled murrelets at randomly located observation stations found that murrelet abundance increased dramatically when the percentage of old-growth/mature forest was > 30% of the landscape and decreased substantially when the percentage of clear-cut meadow cover type was > 25%. Murrelets were detected up to 68 km (43 mi) inland, however they were most abundant in a belt of old growth along the North Fork of the Stillaguamish River between 32-60 km (18 and 36 mi) inland (Hamer 1990).

Grounded downy chicks and fledglings have been found up to 53 km (33 mi) inland from saltwater (Leschner and Cummins 1990). Murrelets also occur on freshwater lakes up to 75 km (47 mi) inland (Brooks 1928). The largest concentration on freshwater was 42 marbled murrelets at Lake Quinault (Leschner and Cummins 1990). Lakes may provide feeding and resting areas (Carter and Sealy 1986).

Old-growth or mature forest stands appear to be important to marbled murrelets year-round. The birds have been observed visiting freshwater lakes and inland forests in non-breeding months, from October to March. Such visits may be important in forming or maintaining pair bonds, and for selecting nest sites (Marshall 1988).

LIMITING FACTORS:

Marbled murrelets require mature and old-growth forest stands for nesting and roosting.

MANAGEMENT RECOMMENDATIONS:

Although more research on all aspects of their biology is needed, three major threats to marbled murrelets have been identified: loss of old-growth forests, saltwater oil spills, and entanglement in gill-nets (Marshall 1988, Leschner and Cummins 1990). Aquaculture may also impact subpopulations in some areas (Leschner and Cummins 1990). Because this species appears to use old-growth habitat all year, old-growth forests which are known to support murrelets should be preserved to provide habitat for these birds. Potential nesting habitat occurs in proposed Spotted Owl Habitat Conservation Areas.

An Interagency Team recommends the following *Interim Management Guidelines* for marbled murrelet conservation in Washington, Oregon, and California (IMMC 1991). A murrelet management area should be designated wherever murrelets occupy suitable habitat during the breeding season. For any such area with 200 ha (500 ac) or less of contiguous suitable habitat, all the habitat should be included within the management area. Additional pole size or larger forest stands should be included to buffer the core area. If more contiguous habitat is available, at least 200 ha (500 ac) should be included in the management area. To reduce edge effect and windthrow, the buffer should be at least 90 m (300') wide for stands > 40 ha (100 ac) and 180 m (600') wide for stands < 40 ha (100 ac).

The designated Murrelet Management Area should be managed as follows:

1. For activities that would modify habitat:
- No timber harvest should take place within suitable habitat.
- Management activities within currently unsuitable habitat, or habitats which become unsuitable through catastrophic occurrences such as blowdown and wildfire, should be designed to accelerate the development of suitable habitat. Plans for such activities should be reviewed by qualified wildlife biologists.

2. For activities that could disturb nesting birds:
- Management activities that could disturb breeding birds should not occur within 0.5 miles of occupied sites during the breeding season, April 1 - September 15.
- Departures from this guideline may be allowed when qualified biologists agree that a particular activity presents a low risk of disturbance (IMMC 1991).

"Suitable habitat" includes old-growth forests and mature forests with an old-growth component, trees > 46 cm (32") in diameter with large moss covered

branches. Such trees only develop after 175 years of age. The effective size of stands is unknown, but in surveys, murrelet detections increase linearly with stand size. Being social birds, murrelets may need large areas to breed successfully (IMMC 1991).

The following habitat alterations may adversely affect nesting and roosting murrelets: timber harvest, timber salvage or thinning, road construction, recreation site construction, mineral mining, blowdown, and wildfire. Disturbing activities include mineral exploration, and use of explosives, heavy machinery, and off-road vehicles (IMMC 1991).

The Interagency Team stresses that the above interim guidelines should be applied on a site specific basis and do not constitute a long-term conservation strategy. They will be updated as needed.

Gill-net fishing and oil development or transport should be restricted in marine areas where large concentrations of marbled murrelets occur. Response to net-pen aquaculture sites should be monitored if the facilities area built in waters where murrelets feed.

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KEY POINTS:

Habitat Requirements:

- Inhabit mature and old-growth forests within 50 mi of saltwater.
- Nest on thick mossy branches in trees > 35" dbh.
- Feed mainly in nearshore marine waters on small fish and crustaceans.

Management Recommendations:

- For areas with documented breeding use: designate murrelet management areas of 500 ac (+ or -) contiguous suitable habitat with pole-plus-size forested buffers 300'-600' wide.
- For designated areas:
  - Harvest no timber within suitable habitat.
  - Management activities within unsuitable habitat should promote development of suitable habitat.
  - Avoid disturbing management activities within 0.5 mi of occupied sites during the breeding season April 1 - September 15.
  - Restrict gill-net fishing and oil development or transport in marine areas where large murrelet concentrations occur.

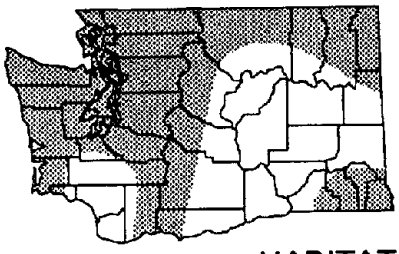
Washington Department of Wildlife
Management Recommendations for Priority Species

Martes americana

Marten

RANGE: The marten is currently found throughout the coniferous forests of Canada, Alaska, and the 11 western states except Arizona. To the east its range includes the northeastern United States from Northern Michigan along the Great Lakes states into the New England states then north to Maine. It was extirpated from the southeastern portion of its range between 1850 and 1875 and from adjacent areas by the early 1900's (Hagmeier 1956).

WASHINGTON DISTRIBUTION: Marten occur in many parts of Washington: the Olympic, Cascade, Selkirk, and Blue Mountains, the Okanogan Highlands, as well as the coastal mountains. Trapping records indicate their greatest numbers are in the Cascades, Selkirks, and the Okanogan Highlands.



HABITAT REQUIREMENTS: Marten use a variety of forest communities, although the greatest density of martens occurs in mesic spruce subalpine fir communities older than 100 years with a canopy cover greater than 30 percent (Koehler et al. 1975). Mixed age forests provide hunting sites and protective cover in a variety of snow conditions and they support a more diverse number of prey species (Allen 1982; Hargis and McCullough 1984; Strickland et al. 1987). Allen (1982) prepared a habitat suitability index for the western states that indicated several important habitat requirements. The requirements include: greater than 30 percent canopy coverage of pole size or larger trees, greater than 25 percent coniferous trees, and 20 to 50 percent fallen trees and stumps as ground cover. Fallen trees and stumps are important because they provide marten with access to prey under the snow, and large, old trees and logs provide denning sites (Strickland et al. 1987). Martens also require snags, logs, or talus for resting purposes. A recent study in western Washington, indicates that marten prefer larger trees, snags and fallen trees for resting than studies conducted in other areas. This study also found that preferred canopy closure averaged 71%, which is much higher than other areas (Jones and Raphael 1990).

Marten are opportunistic feeders. They eat a variety of small mammals and plants. Studies in Alaska, Alberta, British Columbia, Idaho, Montana, and Wyoming have shown a high reliance on red-backed and meadow voles (Koehler et al. 1975). Microtine rodents make up a high percentage of the marten's diet as do snowshoe hares. Ruffed grouse, squirrels, birds and their eggs, reptiles, insects, fruits, nuts, and berries may all constitute an important part of the marten's diet (Strickland et al. 1982).

Preferred winter feeding sites include mesic spruce-fir areas and areas near riparian zones and lakeshores. These areas tend to have high prey populations (Buskirk et al. 1989; Koehler et al. 1990). Jones and Raphael (1990) found that marten used riparian areas throughout the year in western Washington.

Home ranges vary widely, but are generally 1 to 16 square kilometers (0.5 to 6 square miles). Females tend to have small home ranges from 1 - 2.5 sq km (0.5 - 1 sq mi). Male home ranges are up to three times larger and may overlap with female marten. (Strickland and Douglas 1987)

LIMITING FACTORS:

Extensive clearcutting of timber stands and major fires seriously reduce a forest's habitat value for marten. Clearcutting eliminates resting sites, hunting sites, and overhead cover for marten and also reduces their preferred prey species.

Grazing by domestic livestock has caused serious depletion of marten habitat in some areas by impacting native vegetation thus reducing prey species. In addition, excessive harvest has resulted in near extirpation of these easily trapped animals in many settled and accessible areas (Strickland et al. 1987).

MANAGEMENT RECOMMENDATIONS:

Maintaining forest diversity is particularly important. Large blocks of mature forest should be left undisturbed, and smaller blocks connected with forested corridors. High canopy closure can be maintained by selective cutting rather than clearcutting. Road closures following logging, or logging by aerial means, may also be needed (Koehler et al. 1975). In addition, trapping should be limited and fires controlled (Canadian Wildlife Service, 1977; Strickland and Douglas 1987).

Marten seldom use large clearcuts and severely burned areas. These sites may be useless for 15 years or longer depending on the regenerating abilities of the site (Steventon and Major 1982; Hargis and McCullough 1984; Clark et al. 1987; Strickland and Douglas 1987). Small burns and clearcuts however, may increase habitat values for marten because they provide habitat for prey species and good denning sites. For the long term, they may also help prevent catastrophic fires and habitat loss (Koehler et al. 1975).

Timber harvest criteria should include the use of small clearcuts, leaving timbered strips along waterways and connecting blocks of uncut timber. In addition, slash piles, large snags, and large downed logs should be left for resting and foraging areas.

The clearcuts should be less than 100 m (330') across with scattered clumps of trees left to become future snags and downed logs. Slashpiles should be within 10 m (30') of forest canopy and should contain logs as large as 30 cm (12") (Spencer 1981)

In Newfoundland, Snyder (1984) found that blocks of mature timber should be at least 15 hectares (37 acres) and within 250 mm (800') of each other. Strips at least 100 m (330') wide should be left along waterways. Soutiere's (1979) research in Maine indicated that at least 25 percent of the area should be left in mature timber with an accumulative basal area of at least 25 square meters of pole size or larger trees per hectare (100 sq ft per acre).

Road building, skidding, and other logging operations should be kept 60 m (200') from riparian areas (Spencer 1981). Road closures following logging operations may be needed to reduce concentrated trapping pressure or human disturbance (Koehler et al. 1975).

Livestock grazing should be controlled to maintain rodent populations. Forage of at least 1,500 kg dry weight per hectare (1300 lb. per acre) should remain after grazing. In addition, livestock should not be allowed to denude streambanks and should be excluded from fragile riparian areas. (Spencer 1981)

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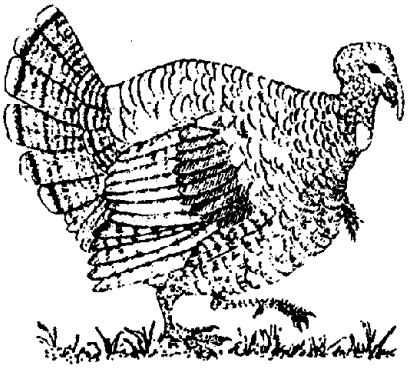
KEY POINTS:

Habitat Requirements:

- Old growth or mature forest on mesic sites with greater than 30 percent canopy cover.
- Large snags, numerous down logs, and small openings.
- High numbers of red-backed and meadow voles and other microtine rodents.
- Riparian zones and lakeshores remaining in mature forest.

Management Recommendations:

- Maintain at least 25 percent of a geographic area (e.g. drainage) in mature forest.
- Maintain mixed-age stands containing saplings, pole sized trees and mature timber in order to provide suitable cover over a wide range of snow depths and conditions.
- Use selective harvest techniques wherever possible to minimize large, unused clearings.
- Clearcuts should be less than 330' wide with clusters of trees spaced no farther than 160' apart to allow marten travel through these areas.
- Leave large snags and live trees, logs, and slash piles for foraging and denning sites within 30' of forest cover.
- Strips of timber should be left along waterways, including headwater streams, and strips should connect timbered blocks.
- Roads should be closed after logging to minimize human impacts.



Meleagris gallopavo

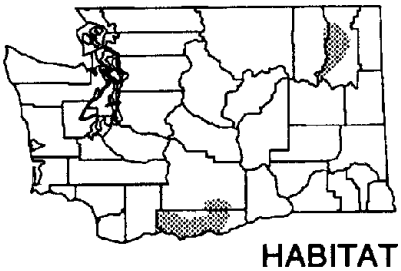
Washington Department of Wildlife

Management Recommendations for Priority Species

Merriam's Turkey

RANGE: Merriam's turkeys are found only in North America; native populations occur in western Texas, New Mexico, Arizona, and Colorado.

WASHINGTON DISTRIBUTION: Merriam's turkeys were first introduced into Washington in the early 1960s. Populations from introduced sources has since become established in Skamania, Klickitat, Yakima, Ferry and Stevens Counties (Wash. Dept. Wildlife, unpublished data).



HABITAT REQUIREMENTS: Merriam's turkeys in Klickitat County are associated with ponderosa pine - Oregon White Oak, Oregon White, oak, and Douglas-fir habitats (Mackey 1982). They feed on green vegetation and seeds and fruits of grasses and forbes year-round. Oak acorns and beetles are important spring food items, while grasshoppers are important in late summer and early fall, and ponderosa pine seeds are important in winter (Mackey 1982).

Turkeys rely on the presence of large trees for roosting. Single large trees are apparently not used as roosts unless they are associated with other trees (Phillips 1980, Mackey 1984).

In Washington, Mackey (1984) found that roosting habitat consisted of several roost trees surrounded by forest cover. Douglas-fir habitats were especially important to Merriam's turkeys in winter because they contained the largest trees with the highest canopy cover, which is probably important as thermal cover. Fir trees were used most commonly as roosts from February through August.

Turkeys in Klickitat County spent more time roosting in ponderosa pine and oak trees in summer. Pine/oak habitat, which commonly occurs along drainages in Klickitat County may be important during the driest parts of the year due to increased water availability (Mackey 1982).

Lutz and Crawford (1987a) found roosts located in multi-layered, mature, mixed-conifer cover types in Oregon. As in Washington, species and sizes of roost trees differed seasonally. Smaller, sawlog sized trees were used in summer, probably because of low tree limbs found on trees of this size, which aided young birds in moving into the canopy. Larger ponderosa pine and Douglas-fir trees were important in winter and spring.

Merriam's turkeys form flocks in winter. These flocks break into courtship groups during early spring, with males establishing strutting grounds during March and April. Nesting may begin as early as the first part of April, with hatching taking place in late May or early June (Mace 1965).

Mixed pine/oak and oak forests are important for nesting and brood rearing in Klickitat County (Mackey 1982). These habitats offer a high diversity of grasses and forbes during the nesting period, and an abundant supply of grasshoppers by early summer.

LIMITING FACTORS:

Scarcity of roost trees may limit Merriam's turkey distribution (Boeker and Scott 1969, Mackey 1984).

MANAGEMENT RECOMMENDATIONS:

Mackey (1982) found that pine/oak habitat was the most preferred type for diurnal use by Merriam's turkeys during all seasons, and oak habitat was particularly important to broods. Cutting of trees in these habitats should be done selectively and clearcutting should be avoided.

Roost sites are a required component of Merriam's turkey habitat. Logging should be avoided within known roost sites and in mature Douglas-fir stands where turkeys occur. If logging must occur in mature Douglas-fir stands, a tree basal area (measured in tree density and/or large dbh) of at least 20.0 sq. m/ha should be maintained (Mackey 1984). Sufficient forest cover should also be left to provide travel lanes to roost sites (Mackey 1984).

Merriam's turkeys may use small clearings within forested areas as feeding sites. Construction of houses within Merriam's turkey habitat should be restricted to non-forested areas which are larger than 2 ha in size (Mackey 1982).

The importance of grasses as food for turkeys cannot be overemphasized (Mace 1965). Heavy grazing by livestock should not occur in areas where turkeys are likely to feed.

Turkey hens are sensitive to disturbance at their nest sites (Lutz and Crawford 1987b). Therefore, major land management activities in nesting habitats should be minimized during April, May, and early June.

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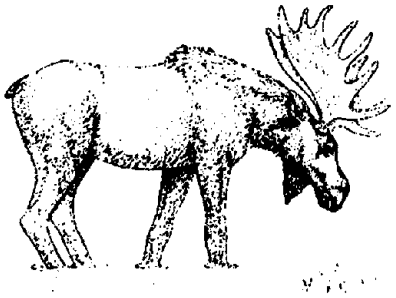
KEY POINTS:

Habitat Requirements

- Associated with pine/oak, oak, and Douglas-fir habitats.
- Roost in clumps of large trees surrounded by forest cover; Douglas-fir roosts especially important in winter.

Management Recommendations

- Avoid clearcutting oak or mature Douglas-fir habitats.
- Do not log known turkey roost sites; maintain forested travel lanes to roost sites.
- Build homes only in large (>2 ha), non-forested areas.
- Carefully manage livestock grazing to maintain grasses.
- Minimize activities that impact nesting habitat during spring.



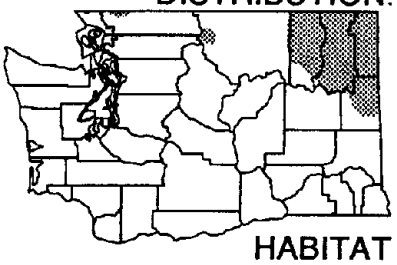
Washington Department of Wildlife
Management Recommendations for Priority Species

Alces alces

Moose

RANGE: Moose are holarctic in distribution. In North America, three subspecies occupy Alaska, Canada, Maine, the Selkirk Range into northern Washington, and the Rocky Mountains south to northern Utah.

WASHINGTON DISTRIBUTION:



The Shiras moose has been expanding its range from the Kalispell Basin to much of the Selkirk Range in northeast Washington. In the Selkirk's, moose are now distributed as far west as Colville and southward to Spokane. In addition, a few moose from Canada wander south in the Cascades. A couple of moose are occasionally seen on the outskirts of Bellingham, while others are seen near Winthrop.

HABITAT REQUIREMENTS:

Calving sites are characterized by roadless blocks of mature timber of 32+ ha (80+ acres) which provide hiding cover and contain or are adjacent to good forage. Human disturbance is minimal. Several such sites are found within any one drainage (Costain 1989).

Aquatic feeding sites are found in areas of slow flowing water, ponds, swamps, and potholes of at least 9 square meters (100 square feet) in size, 0.3 - 2 m (1-6 feet) deep which contain abundant submergent and emergent aquatic vegetation. Larger aquatic areas are preferred. These sites are characterized by a broad zone of hiding cover around the perimeter of the feeding site (Costain 1989).

Summer range includes both clearcut and forested areas. Timber harvest in Washington has precipitated the moose population increase over the last 30 years. We need to protect some forested areas but moose are generally not dependent on old-growth. Forested summer range includes stream bottoms and other moist areas inside mature timber stands of 40 ha (100 acres) or more with 70 percent canopy closure. These areas should contain a narrow but productive zone of understory forage (Costain 1989). Forage consists of willow, boxwood, maple, evergreen ceanothus and serviceberry. Clearcuts and seedtree cuts 5-35 years old, and natural openings which are dominated by saplings and brush are utilized both summer and winter. They must have little disturbance and have escape cover islands of leave-trees and brush to create internal edge. Broadcast burning and prescribed burning can increase forage (Irwin 1976).

Winter range is determined by snow depth and aspect (Costain 1989, Pierce, 1984). When snow depth exceeds 75 cm (30 inches), moose depend on closed canopy areas. They use multi-storied stands of mature and old growth timber with >70 percent canopy closure with abundant understory and arboreal lichens which are 20 - 80 ha (50-200 acres) in size. Sapling/shrub

dominated openings created by clearcut logging are heavily used. When snow depth is not a factor, moose prefer areas in 15-30 year old successional stages. These can be burned or clearcut areas.

LIMITING FACTORS:

The amount of quality winter range at middle elevations (about 3,000 feet) limits moose numbers. Calf production is linked to effective snow depth based on accessibility to sapling/shrub dominated openings with sufficient thermal cover nearby (Costain 1989, Pierce 1984).

MANAGEMENT RECOMMENDATIONS:

Limit access of motorized vehicles by road closures to help reduce poaching and disturbance. Studies by Pierce (1984) in Idaho show unregulated moose harvest may equal or exceed legal harvest. In Washington, poaching of moose is also a problem.

Maintain several calving sites per large drainage (Costain, 1989). Provide for hiding cover buffers, wide enough to hide adult moose, around one-half or more of the perimeter of aquatic feeding sites.

An overall timber rotation on summer and winter range should be 100 years with 10 percent removal per decade except for south and western exposures and forest reserves (Jageman 1986, Telfer, 1974).

Maintain a sufficient number of 40 ha (100 acre) mature or old growth timber patches interspersed with openings on summer range to support the moose population. Openings should be irregular, 90 - 360 m (300-1,200') wide, and contain hiding cover patches. Blast potholes, and broadcast burn and prescribe burn to maintain forage areas.

On winter range, maintain forage openings that are less than 8 ha (20 acres) and 240 m (800') wide and surrounded by at least 90 m (300') of cover. Reserve multi-storied stands of mature and old growth timber on south and west exposures with >70 percent canopy closure that are 20 - 80 ha (50-200 acres) in size (Costain 1989).

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KEY POINTS:

Habitat Requirements:

- Old growth timber or slopes with snow depth less than 30" on south and west exposures.
- Small openings adjacent to thermal cover patches containing shrubs on winter range.
- Openings adjacent to or containing escape cover patches as well as thermal cover patches on summer range.
- Relatively undisturbed large acreages of suitable calving habitat.
- Aquatic vegetation surrounded by hiding cover on summer ranges.

Management Recommendations:

- Reserve some mature and old growth timber on appropriate sites.
- Manage non-reserved timber on 100 year rotation at 10 percent per decade.
- Intersperse small to moderate-sized openings with moderate to large-sized cover areas.
- Use prescribed and broadcast burning to stimulate forage.
- Blast potholes in summer range.
- Cut willow patches every few years to provide forage for moose.

Rangifer tarandus caribou

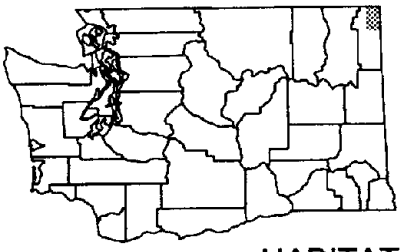
Washington Department of Wildlife

Management Recommendations for Priority Species

Mountain Caribou

RANGE: Occupies the international border area of northern Idaho,Washington and southern British Columbia (USFWS 1985).

WASHINGTON DISTRIBUTION: Small numbers inhabit the Selkirk Mountains of northeastern Washington (Pend Oreille County).



HABITAT REQUIREMENTS: Mountain caribou are found on moderate slopes above 1300m (4300') (Layser 1974, Freddy 1974). Caribou use streams,bogs, basins, and other areas that are no more than 35% slope and are composed of mature or old-growth timber are used by caribou (Freddy 1974, Simpson and Woods 1987). Simpson and Woods (1987) observed that caribou avoided immature forests (20-100 yrs.), but they will use low elevation mature forests where they still exist in British Columbia.Calving areas are on high elevation rocky ridge tops with 20 - 40%canopy cover (Compton, pers. comm.).

The caribou move through elevation zones seasonally to feed on lichens, new herbaceous vegetation, mushrooms, shrub leaves, grasses,sedges, and soft shrubs (USFWS 1985). Arboreal lichens of the genera Alectoria and Bryoria are consumed almost exclusively in winter and are eaten from October into May (Freddy 1974, Simpson and Woods 1987).Old-growth and spruce-fir stands apparently provide the most productive and available lichens for caribou. Lichens are consumed from 1.5 to 6.1m (5'- 20') above the ground on shaded trees (USFWS1985); wind thrown lichens from tree tops are important in early winter(Stevenson 1979, Simpson et al. 1987, Rominger and Oldemeyer 1989).

Mountain caribou exhibit traditional, seasonal, and elevational migration between habitats (Freddy 1974, USFWS 1986, Simpson et al. 1987) and annual fidelity to small areas of habitat (Rominger and Oldemeyer 1989). Summer and early winter are critical times in which habitat quality and availability may be limiting to caribou population (Simpson et al.1988). Servheen and Lyon (1989) found certain habitat characteristics to be constant for most seasonal habitats in the Selkirk Mountains: 1)a high abundance of lichens, 2) 30% of stands had tree crown canopy >50%, and 3) stem diameters were > 20 cm (8"), except at high elevations. The following habitat descriptions from the Colville National Forest Plan (1988) are based Scott and Servheen (1985):

Early Winter (November 1 - December 31) - Habitat consists of dense,closed canopy, mature cedar-hemlock adjacent to more open stands including the subalpine fir ecotone. Moderate slopes (< 40%) with north and east aspects are preferred.

Late Winter (January 1 - April 30) **and Calving** (June 1 - July 15) -Caribou use high elevation old-growth and mature Englemann spruce - subalpine fir stands with low basal area and moderate canopies during the late winter and summer calving season. The ridge tops and upper slopes(< 30%) on all aspects and areas with high-density windthrow of lichen-bearing trees are preferred (Rominger and Oldemeyer 1989).

Spring (May 1 - July 15) - The lower slopes (< 35%) with south and west aspects and valley bottoms are preferred during spring. In this low elevation cedar-hemlock zone, the caribou use a mixture of mature,dense-canopied stands and immature, open-canopied stands adjacent to openings and clearcuts with new green forage.

Summer (July 15 - August 30) - During this season caribou seek lush forage at high elevations on shallow slopes (20% +) with all aspects in mature spruce - subalpine fir stands.

Fall (September 1 - November 1) - The fall rutting season marks a shift to lower elevation to dense-canopied, spruce-fir stands with abundant snags and lichens. Lower slopes (< 20%) with all aspects,benches, valley bottoms, seeps, basins and riparian areas are preferred.

LIMITING FACTORS:

Habitat loss, natural and human predation, habitat fragmentation, and the availability of early winter habitat and lichen forage limit this small population (USFWS 1985, Compton, pers. comm.)

MANAGEMENT RECOMMENDATIONS:

Natural predation, poaching, accidental shooting, and highway accidents may seriously impact the remaining population of mountain caribou. Efforts to reduce this source of mortality should include hunter education, posting signs, and enforcement programs. Curtailing vehicular access into caribou habitat during hunting seasons may reduce poaching, accidental shooting, and road kills (Freddy 1984, Scott 1985).

Intensive use of snowmobiles in caribou wintering areas may cause the animals to abandon the site. Cross country skiers may also cause caribou to avoid an area (Simpson 1987). Prohibiting or limiting snowmobile and skier access in areas used by caribou could reduce poaching as well as disturbance to caribou (Freddy 1974, Scott 1985,Simpson 1987).

The main challenge for land managers is to maintain a balance among all seasonal habitats, with emphasis on the critical spring and early-winter habitats. Large blocks of the seasonal habitats should be connected by migration corridors (Servheen and Lyon 1989).

The Colville National Forest Land and Resource Management Plan (1988)includes the following management prescriptions to recover the mountain caribou in the five seasonal use areas:

Early Winter Habitat - Maintain 60% of cedar-hemlock zone in old-growth cover types with a spruce-fir component at the ecotone. The major goal is an uneven-age stand structure that minimizes early winter snow depths, > 70% crown closure with trees > 10 m (30') tall and > 53 cm (21") dbh.

Late Winter Habitat - Timber management is not anticipated for most of these sites which are outside of commercial production areas. The target is for mature to over-mature spruce-fir stands with 30 - 50%canopy closure and trees > 6 m (20') tall and > 20 cm (8" dbh.

Spring Habitat - Manage 40% of the cedar-hemlock zone as caribou spring range with priority given to south and west aspects. Use even-age management to create early successional stages with < 45% canopy closure.

Summer Habitat - A minimum of 25% of sites capable of providing summer habitat in each Caribou Management Area will be maintained. The target stand condition is mature spruce-fir with 40 - 70% crown closure and trees > 35 cm (14") dbh.

Fall Habitat - Maintain spruce-fir stands using uneven-age management with 40 - 100% crown closure and trees > 10m (30') tall and 53 cm (21")dbh.

Where less than 60% of potential winter range has suitable mature forest, immature forests should be allowed to mature (Simpson et al.1988).

Clearcut logging of mature, low elevation forest and road construction have removed critical early winter range and security cover for caribou. Avoid clearcut logging within caribou range. Avalanche slopes should be logged on one side only. Slash should be cleared by spring to provide new forage, and replanting should occur within one year (Simpson et al. 1988).

Selective logging may stimulate arboreal lichen production. Areas with high windthrow vary annually. Caribou travel extensively during early winter to find lichen-bearing windthrow. Therefore, it is important to maintain travel corridors between patches of early winter habitat (Rominger and Oldemeyer 1989).

No harvest or road construction should occur within 400 m (1/4 mile)of lakes, bogs, or fens over 0.1 ha (1/4 acre) in size (USFWS 1985). Control fires in, or adjacent to, known and potential caribou habitat.

Prevent surface developments, such as mining, roads, and power lines,from eliminating the mature spruce-fir forest in known and potential caribou winter habitat (Freddy 1974).

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Washington Department of Wildlife
Management Recommendations for Priority Species

Oreamnos americanus

Mountain Goat

RANGE: Found in many of the mountainous areas of western North America, from southeastern Alaska to south central Washington in the coastal ranges, and in the interior as far south as central Idaho and western Montana in the Rocky Mountains (Johnson 1983).

WASHINGTON DISTRIBUTION: Found in the Cascade, Selkirk, and Olympic Mountains (Johnson 1983). Most goats in Washington are found in the Cascades from the Canadian border south to Mount Adams.

HABITAT REQUIREMENTS: Mountain goats occupy diverse habitats but nearly all are appropriately described by physiographic criteria. These features include steep, rocky cliffs, projecting pinnacles, ledges, and talus slides. Goats tend to spend much of their life in small, localized, highly preferred niches with these habitats. Mountain goats tend to prefer the narrow band of habitat near treeline in both the very wet forested areas of western Washington, and the dry open areas of eastern Washington. Migration patterns and distances vary considerably; some migrations are very short, while in other areas goats may migrate from 16-24km (10 to 15 mi.) or more to find suitable summer and winter habitat (Johnson 1983).

Winter range is characterized by steep, rocky sites with slopes more than 40 degrees close to diverse forage and cover. The most preferred areas do not accumulate more than 0.6m (2') of snow because of the steep slopes, low elevation, and aspect. East and southwest slopes are preferred, with dense conifer stands utilized for thermal cover (Johnson 1983). Summer ranges occupy large areas, and are usually not a limiting factor. Escape terrain is a critical component of both winter and summer ranges. Mountain goats are dependent on rock-cliff habitats to escape from predators, especially when offspring are young (Johnson 1983).

LIMITING FACTORS: Human disturbance tends to push goats into the more remote areas. Goats avoid areas with heavily used trails (Sachet 1988).

Goats need early plant successional communities near steep, rocky cliffs, projecting pinnacles, ledges, and an occasional talus slide. Winter ranges are steep, rocky sites with slopes of 40 degrees or more close to diverse forage and cover (Johnson 1983).

Goats prefer the narrow band of habitat near treeline and seek the thermal cover of conifer stands or caves during periods of inclement weather. Mosses

and lichens as well as evergreen needles provide some forage during extended storm periods (Johnson 1983). These are starvation forage items, however, and goats cannot survive for extended periods on these foods.

MANAGEMENT RECOMMENDATIONS:

Retain 30 to 50 percent of goat summer ranges in escape cover patches of 4-8 ha (10 to 20 acres). Retain more than 50 percent of goat winter range in thermal cover areas of more than 14 ha (36 acres) each. Discourage human use and vehicle traffic on and off roads and trails November 1 to June 30 within 1.6km (1 mi.) of winter range. Retain conifers in an unmanaged condition 90m (300') directly above and below cliffs used by mountain goats. Retain cover in travel corridor between cliffs used by mountain goats. Maintain goat forage areas in vigorous conditions through burning or seeding native herbs. Restrict livestock grazing in goat habitat.

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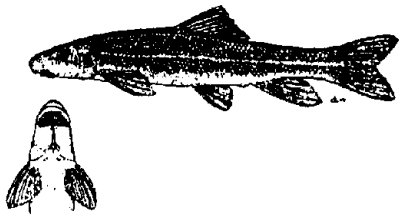
KEY POINTS:

Habitat Requirements:

- Early plant successional communities.
- Adjacent or nearby precipitous escape terrain.
- Thermal cover on winter ranges and escape cover on summer ranges.
- Freedom from disturbance one-quarter mile from escape terrain year-round and minimize disturbance within one mile during November through the end of June.

Management Recommendations:

- Retain escape and thermal cover patches in goat range.
- Maintain native forage in openings.
- Restrict livestock grazing.
- Minimize disturbance within one mile seasonally.



Washington Department of Wildlife

Management Recommendations for Priority Species

Catostomus platyrhynchus

Mountain Sucker

RANGE: The mountain sucker is distributed in the Great Basin, upper Missouri, upper Colorado, Fraser, and Columbia River systems, from California east to western South Dakota and Nebraska, and north to British Columbia and Saskatchewan (Wydoski and Whitney 1979).

WASHINGTON DISTRIBUTION: Mountain suckers are found only in the upper Columbia River and its tributaries east of the Cascade Mountains. Washington populations are less abundant compared to those of other states and provinces of occurrence (Scott and Crossman 1973).

HABITAT REQUIREMENTS: The mountain sucker lives in mountain streams with clear cold water with sand, gravel, or boulder bottoms (Wydoski and Whitney 1979). Spawning occurs in riffles below pools in June and July when water temperature is between 10.5 - 18.88 degrees C (51 - 66 F) (Smith 1966, Hauser 1969). After spawning, adults are found in habitats associated with bank cover in deep pools (Hauser 1969). Fingerling habitat consists of shallow areas with moderate current and abundant vegetation, usually behind obstructions (Wydoski and Whitney 1979). Fingerlings can also occur in deep pools. Older juveniles are usually found near cover in shallow water of moderate (0.5 m/sec) current (Hauser 1969). Preferred food consists almost entirely of algae scraped from the rocky substrate, however mountain suckerswill also eat insect larvae (Wydoski and Whitney 1979).

LIMITING FACTORS: Stream temperatures which exceed the normal spawning range, a lack of spawning habitat, high sedimentation in spawning areas, and/or a lack of preferred food items will limit the population and range of mountain suckers.

MANAGEMENT RECOMMENDATIONS: The maintenance of riparian vegetation is essential for controlling stream temperature, providing cover, and protecting against lateral erosion. Removal of streamside vegetation lowers canopy density (shading) and increases sedimentation. Increases in solar radiation raises stream temperatures thereby negatively impacting spawning, hatching, and rearing survival. Increased sedimentation contributes to the loss of spawning habitat and decreases the diversity of aquatic invertebrates and other food items (Newbold et al. 1980, Noss 1983, Heede 1985). Buffer zones along stream banks should be at least the width of the height of the tallest tree or 15.2 m (50 ft), whichever is wider. The vegetative buffer will provide erosion control, and maintain natural stream temperatures and diversity of aquatic invertebrates (Meehan et al. 1977, Newbold et al. 1980). In Washington, this can range up to 60 m (200 ft.). This "zone of influence" (Meehan et al. 1977) should be maintained along stream banks which provide mountain sucker habitat, and any other stream which directly or indirectly influences mountain suckers. Road construction and maintenance activities should be avoided adjacent to streams with mountain suckers. In-stream structures such as

bridges, piers, boat ramps, or culverts must not impede the natural movements of mountain suckers.

REFERENCES:

Heede, B.H. 1985. Interactions between streamside vegetation and stream dynamics. in Proceed. Symp. of Riparian Ecosystems and their Management: Reconciling Conflicting Uses, April 16-18, 1985, Tucson, AZ.

Meehan, W.R., F.J. Swanson, and J.R. Sedell. 1977. Influences of riparian vegetation on aquatic ecosystems with particular reference to salmonid fishes and their food supply. P. 137-145 in Proceed. Symp. on the Importance, Preservation, and Management of the Riparian Habitat, July 9, 1977, Tucson, AZ.

Newbold, J.D., D.C. Erman, and K.B. Roby. 1977. Effect of logging on macroinvertebrates in streams with and without buffer strips. J. Fish. Aquat. Sci. 37:1076-1085.

Noss, R.F. 1983. A regional landscape approach to maintain diversity. BioS. 33(1):700-706.

Scott, W.B. and E.J. Crossman. 1973. Freshwater fishes of Canada. Fish. Res. Bd. Canada. Bull. 14.

Wydoski, R.S. and R.R. Whitney. 1979. Inland fishes of Washington. Univ. of Wash. Press, Seattle, WA.

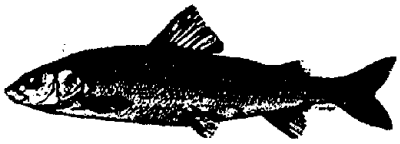
KEY POINTS:

Habitat Requirements:

- Inhabits mountain streams with clear cold water with sand, gravel, or boulder bottoms.
- Preferred temperatures range between 10.5 - 18.8 degrees C for spawning.
- Spawning occurs in riffles below pools in June and July.
- Fingerling habitat consists of shallow areas with moderate current and abundant vegetation, usually behind obstructions, and deep pools.
- Older juveniles are usually found adjacent to pools where the current is about 0.5 m per second.
- Algae scraped from the rocky substrate is the preferred food.

Management Recommendations:

- Buffer zones of at least the width of the height of the tallest tree (or 15.2 m (50 ft), whichever is wider) should be maintained along stream banks which provide mountain sucker habitat, and any other stream which directly or indirectly influences mountain sucker habitat.
- Road construction and maintenance activities should be avoided adjacent to streams which provide mountain sucker habitat.
- In-stream structures such as bridges, piers, boat ramps, or culverts must not impede the natural movements of mountain suckers.



Washington Department of Wildlife
Management Recommendations for Priority Species

Prosopium williamsoni

Mountain Whitefish

RANGE: Occurs only in the lakes and streams of western North America from the Lahontan basin in Nevada, north to the Yukon-British Columbia border (Scott and Crossman 1973).

WASHINGTON DISTRIBUTION: Found throughout Washington's lakes, rivers, and streams.

HABITAT REQUIREMENTS: In streams, juvenile and adult mountain whitefish are found primarily in pools and riffles in summer, and in large pools in winter. Spawning generally occurs in late October and early November in gravel of stream riffles and on gravel shoals along lake shores. Newly hatched fry are found in stream and lake shallows for a few weeks after hatching in the early spring before migrating offshore (Scott and Crossman 1973). Adult mountain whitefish feed primarily on immature forms of bottom dwelling aquatic insects, including mayflies, caddisflies, stoneflies, and midges (Wydoski and Whitney 1979).

LIMITING FACTORS: Stream temperatures which exceed the normal spawning range, a lack of spawning habitat, high sedimentation in spawning areas, and/or a lack of preferred food items will also limit the population and range of mountain whitefish.

MANAGEMENT RECOMMENDATIONS: The maintenance of riparian vegetation is essential for controlling stream temperature, providing cover, and protecting against lateral erosion. Removal of streamside vegetation lowers canopy density (shading) and increases sedimentation. Increases in solar radiation raises stream temperatures thereby negatively impacting spawning, hatching, and rearing survival. Increased sedimentation contributes to the loss of spawning habitat and decreases the diversity of aquatic invertebrates and other food items (Newbold et al. 1980, Noss 1983, Heede 1985). Buffer zones along stream banks should be the width of the height of the tallest tree or 15.2 m (50 ft), whichever is wider. The vegetative buffer will provide erosion control, and maintain natural stream temperatures and diversity of aquatic invertebrates (Meehan et al. 1977, Newbold et al. 1980). In Washington, this can range up to 60 m (200 ft.). This "zone of influence" (Meehan et al. 1977) should be maintained along stream banks which provide mountain whitefish habitat, and any other stream which directly or indirectly influences mountain whitefish. Road construction and maintenance activities should be avoided adjacent to streams with mountain whitefish. In-stream structures such as bridges, piers, boat ramps, or culverts must not impede the natural movements of mountain whitefish.

REFERENCES:

Heede, B.H. 1985. Interactions between streamside vegetation and stream dynamics. in Proceed. Symp. of Riparian Ecosystems and their Management: Reconciling Conflicting Uses, April 16-18, 1985, Tucson, AZ.

Meehan, W.R., F.J. Swanson, and J.R. Sedell. 1977. Influences of riparian vegetation on aquatic ecosystems with particular reference to salmonid fishes and their food supply. P. 137-145 in Proceed. Symp. on the Importance, Preservation, and Management of the Riparian Habitat, July 9, 1977, Tucson, AZ.

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Noss, R.F. 1983. A regional landscape approach to maintain diversity. BioSci. 33(1):700-706.

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Wydoski, R.S. and R.R. Whitney. 1979. Inland fishes of Washington. Univ. of Wash. Press, Seattle, WA.

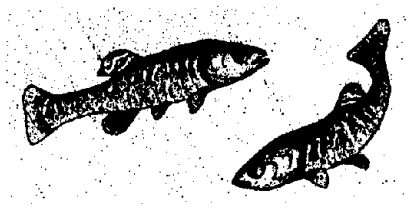
KEY POINTS:

Habitat Requirements:

- Juvenile and adults inhabit stream pools and riffles in summer, and large pools in winter.
- Spawning habitat consists of gravel in stream riffles, and gravel shoals along lake shores.
- Newly hatched fry inhabit stream and lake shallows for a few weeks before migrating offshore.

Management Recommendations:

- Buffer zones of at least the width of the height of the tallest tree (or 15.2 m (50 ft), whichever is wider) should be maintained along stream and lake banks which provide mountain whitefish habitat, and any other stream which directly or indirectly influences mountain whitefish habitat.
- Road construction and maintenance activities should be avoided adjacent to streams which provide mountain whitefish habitat.
- In-stream structures such as bridges, piers, boat ramps, or culverts must not impede the natural movements of mountain whitefish.



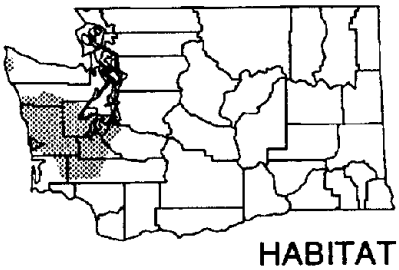
Washington Department of Wildlife
Management Recommendations for Priority Species

Novumbra hubbsi

Olympic Mudminnow

RANGE: Found entirely within portions of the Olympic Peninsula and central western Washington.

WASHINGTON DISTRIBUTION: Distributed in rivers of the Chehalis River drainage, Deschutes River drainage, Olympic coastal drainages as far north as the Queets River, Lake Ozette, Puyallup Creek and Skookum Creek.



HABITAT REQUIREMENTS: Olympic mudminnows inhabit lotic (pertaining to running water), pond and marsh habitats in the coastal lowlands. They occur in standing or gently flowing water with a current of less than three cm per second, with dense aquatic vegetation, and at least several centimeters of soft mud bottom substrate (Hagen et al. 1972, Harris 1974, Wydoski and Whitney 1979). The type of bottom substrate is especially important to these fish and must be composed of fine silt with a high organic content. Mudminnows are not found in swampy habitats created by recent siltation, or where water flow has been restricted by logging debris (Harris 1974).

Olympic mudminnows breed from early March to mid-June. Male fish defend territories in clumps of vegetation, including seasonally flooded reed-canary grass, or over carpets of moss; females lay their eggs on the bottom substrate (Hagen et al. 1972; Beecher, pers. comm.). They feed on a variety of aquatic invertebrates and molluscs.

LIMITING FACTORS: The presence of introduced predatory fish probably limits Olympic mudminnows (Beecher and Fernan 1983).

MANAGEMENT RECOMMENDATIONS: Olympic mudminnows are most threatened by reduction or deleterious changes to the habitat within their limited range. Alterations to wetlands where these fish occur should not take place. Such alterations include draining, filling or channelizing a wetland, clearing vegetation and connecting stagnant or slow moving waters with fast moving streams. Where Olympic mudminnows are found on agricultural lands, fences should be constructed so that livestock does not denude the vegetation.

Indirect, detrimental effects to Olympic mudminnows should be considered during logging operations. Practices which change the flow patterns of feeder streams or contribute debris to swampy habitats should be avoided. Logging in swampy portions of the Olympic Peninsula should not occur.

Olympic mudminnows may be excluded from some areas by non-native fishes (Beecher and Fernan 1983). Bass, catfish and other non-native fishes should not be introduced where mudminnows occur. Rotonone and other chemical agents that adversely affect fish should not be applied to waters occupied by mudminnows.

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Beecher, H.A. and R.F. Fernan. 1983. Fishes of oxbow lakes of Washington. Northwest Sci. 57(2):125-131.

Harris, C.K. 1974. The geographical distribution and habitat of the Olympic mudminnow, *Novumbra hubbsi* (Schultz). Unpublished report, College of Fisheries, Univ. of Wash., Seattle.

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Wydoski, R.S. and R.R. Whitney. 1979. Inland fishes of Washington. Univ. of Wash. Press, Seattle. 220pp.

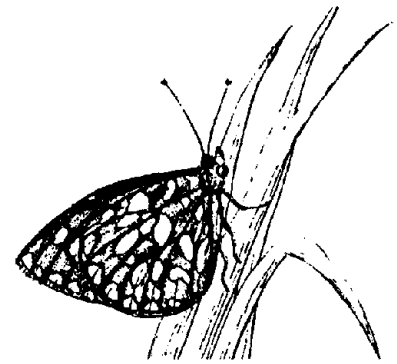
KEY POINTS:

Habitat Requirements:

- Inhabit lake, pond and marsh habitats of coastal lowlands.
- Require currents of less than 3cm/second in wetlands with dense aquatic vegetation and deep, soft mud bottoms.

Management Recommendations:

- Avoid altering streams and wetlands where mudminnows occur.
- Keep livestock out of wetlands occupied by mudminnows.
- Avoid altering the flow of feeder streams.
- Avoid logging in swampy portions of the Olympic Peninsula.
- Do not introduce exotic fish into mudminnow habitat.
- Do not use rotonone where mudminnows occur.



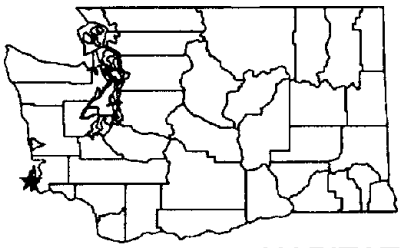
Speyeria zerene hippolyta

Washington Department of Wildlife
Management Recommendations for Priority Species

Oregon Silverspot Butterfly

RANGE: Historically found along the coastal zone of southern Washington and central and northern Oregon. The Oregon silverspot butterfly is classified as a federally threatened subspecies.

WASHINGTON DISTRIBUTION: Currently one small population is known from the Long Beach Peninsula (Pacific County).



HABITAT REQUIREMENTS: Oregon silverspot butterflies are found in coastal salt-spray meadows and open field habitats that support the larval host plant, western blue violet (*Viola adunca*). Moderate grass cover found in these open habitats provides shelter for the larvae from wind, rain, and sun (Stine 1982).

Adult butterflies feed in the meadows on nectar producing herbaceous plants such as aster, tansy ragwort, goldenrod, thistle, and pearly everlasting (Pyle, pers. comm.). Open areas used by the butterflies are typically surrounded by a fringe of brush or conifer trees, which provide necessary shelter for adults (Stine 1982).

In Washington, the butterflies breed in stabilized sand dune communities where violets persist. Adults presumably rest and feed in nearby open forest glades (Pyle 1985).

LIMITING FACTORS: Availability of salt-spray meadow habitat that supports the western blue violet and nearby forest fringe shelter belts.

MANAGEMENT RECOMMENDATIONS: Maintaining populations of Oregon silverspot butterflies depends upon protecting and restoring the habitat of the larval foodplant, western blue violet, and protecting the forest glade habitat used by adults. Western blue violets grow best in open, exposed areas that are free of surrounding vegetation. However, mature violets apparently can survive for long periods of time in heavily shaded areas (Hammond 1987). Butterfly habitat in Oregon is recovering after six years of habitat restoration efforts (Hammon 1989).

In Washington, virtually all of the habitat where the butterflies and violets have been found are threatened by the presence of heavy grass thatch or woody plant invasion, which deter violet growth. These sites are also threatened by residential, commercial, and recreational development (Pyle 1985).

Development should not occur in areas that may support the silverspot butterfly. These areas include both the forest stands that offer shelter to adult butterflies and the dune communities where larvae feed. Shore pine succession should be reduced in meadow violet habitat, by removing young trees and other woody vegetation. Selected older hind dune areas on the Long Beach Peninsula should be mowed two or three times a year for at least three years in succession. The timing of mowing should be April and June to remove bracken fern, and November. Once violets are reestablished, mowing may only need to be done on a three year rotation, once in early spring and once in late fall. The mowing regime should also be staggered, so all habitat areas are not mowed in the same year (Hammond pers. comm.). These treatment areas should be monitored to avoid erosion.

Landowners can promote violet growth by leaving their lawns and vacant lots natural (no fertilizers or herbicides) and mowing only a few times a year (Sayce pers. comm.). Small openings or strips, 9m-12m (30-40') wide, should be created in forest shelter areas to promote nectar plants (Hammond pers. comm.). Camping, ORV use, and other recreational activities that damage violet habitat should be restricted in dune areas (Stine 1982). Insecticides should not be applied in open areas or adjacent forested areas where butterflies occur (Stine 1982). Herbicides should not be applied to areas where western blue violets grow. Oregon silverspot butterflies should not be collected in Washington.

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KEY POINTS:

Habitat Requirements:

- Larval habitat—dune meadows with violets.
- Adult habitat—spruce-shorepine with grassy openings.

Management Recommendations:

- To restore dune meadows, mow two to three times per year for three years.
- To maintain dune meadows, mow on a three year cycle.
- Leave lawns and vacant lots natural and mow.
- Create openings or strips, 30-40 feet wide in forest shelter areas.
- Avoid insecticides, herbicides and fertilizers.

Washington Department of Wildlife
Management Recommendations for Priority Species

Pandion haliaetus

Osprey

RANGE: Breeds along sea coasts, rivers and lakes of coastal North America. Winters in the West Indies and in Central and South America.

WASHINGTON DISTRIBUTION: A summer resident along waterways east and west of the Cascade Mountains. Ospreys are found in western Washington from Bellingham to the Columbia River, and in forested portions of eastern Washington.

HABITAT REQUIREMENTS: Ospreys feed almost exclusively on live fish captured at or near the water's surface. Although nests are generally built near productive bodies of water, estimates of osprey hunting ranges may extend to distances of 10 to 15 km (16-24mi.) from the nest (Henny 1986, Poole 1987, Sidle and Suring 1986). Ospreys usually construct large stick nests in live trees or dead snags with flat, broken tops. These trees are typically as tall or taller than surrounding structures. Sites that offer accessory perches within view of the nest are preferred (Zarn 1974).

This species exhibits strong nest-site fidelity; breeding pairs usually return to the same site year after year to breed (Vana-Miller 1987). Nesting pairs defend the area around their nest and raise one brood per year (Sidle and Suring 1986, Vana-Miller 1986, Poole 1987). Males use the same perch site located within view of the nest (Hickman, pers. comm.).

Individual osprey pairs apparently vary in their ability to tolerate human disturbance (Van Daele and Van Daele 1982). Several studies (in Vana-Miller 1987) indicate that tolerance to human activities depends upon the timing and frequency of the activities and on the degree of habituation that individual pairs develop to them. Ospreys initiating nesting in or near an area frequented by humans may be more tolerant of subsequent human activities than those unaccustomed to humans (Swenson 1979, Van Daele and Van Daele 1982). Human activities that are initiated during incubation and early nesting are probably most disturbing to ospreys. Disturbance during this critical period (April 1-June 30) can cause adults to leave the nest frequently or for extended periods of time, which can be fatal to embryos and nestlings (Van Daele and Van Daele 1982, Levenson and Koplin 1984).

LIMITING FACTORS: Availability of snags, suitable live trees, or other suitable nest structures near large bodies of water that produce adequate fish supplies.

MANAGEMENT RECOMMENDATIONS: Land managers should observe the following guidelines around osprey nests: 1) Restrict all human activities within 201m (660') of any active osprey nest, from April 1 to October 1; 2) Do not cut trees within a 61m (200') radius of each individual nest. This radius can be reduced to 40m (130') when topography dictates; 2) Beyond the 61m "no cut" zone, retain 3-5 live or dead dominant trees currently suitable for nesting or roosting, and some healthy

young trees suitable for future roosting or nesting within a 201m radius of the nest tree (Zarn 1974, Westall 1986). At least one snag or perch site for each pair member is recommended (Hickman, pers. comm.); 3) Where vandalism is unlikely, mark nest trees with metal signs to prevent destruction by uninformed individuals (Zarn 1974, Westall 1986).

When osprey nests are located along a shoreline, the following additional guidelines should be observed:
1) Retain a 61m buffer around water bodies where ospreys nest in which timber and snags are not cut (Zarn 1974, Westall 1986); 2) Beyond the 61m "no cut" zone, maintain at least two dominant live trees and two desirable snags per acre within an additional, "restricted cutting" zone of 335m (1,100') (Zarn 1974, Westall 1986); 3) Preserve all broken-top snags and live trees suitable for osprey nesting for a distance of 3.2km (2 mi.) beyond the "restricted cutting" zone.

Ospreys which are unaccustomed to human activities should be protected from disturbance. Roads should be closed between April 1 and September 15 if they are located within 201m of a sensitive pair. In remote areas, campsites should not be located within 1km (0.7 mi.) of occupied nests, and hiking trails should not come within 91m (300') of the nest tree.

Some chemicals applied to water systems could contaminate or reduce the amount of prey available to ospreys. Pesticides, especially organochlorines, should not be used in any watershed used by ospreys. Fish control projects, including rotonone applications, should not be undertaken in waters where the birds hunt unless temporary alternative food sources are available.

Artificial platforms may be useful if mitigation for loss of a naturally occurring nest site is required.

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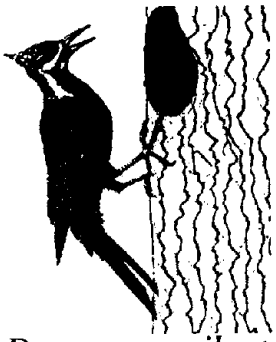
KEYPOINTS:

Habitat Requirements:

- Feed exclusively on fish.
- Construct large stick nests in the largest snags or live trees with flat, broken tops, usually located near water.
- Individual pairs show variation in their ability to tolerate human disturbance.

Management Recommendations:

- Restrict all human activities within 201m of any active osprey nest between April 1 and October 1.
- Establish a "no cut" zone within 61m of each nest.
- Retain 3-5 live or dead dominant trees and young recruitment trees with 201m of the nest tree.
- Do not cut trees within 61m around bodies of water associated within osprey nests.
- Maintain two dominant live trees and two snags per acre within 335m of the "no cut" zone around bodies of water associated with osprey nests.
- Preserve snags and live trees suitable for nesting for 3.2km beyond the "restricted cutting" zone around water bodies associated with osprey nests.
- Close roads between April 1 and October 1 if birds are unused to disturbance.
- Do not apply chemicals to any watershed used by ospreys.



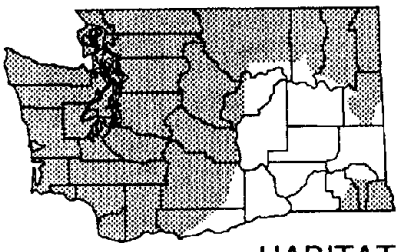
Dryocopus pileatus

Washington Department of Wildlife
Management Recommendations for Priority Species

Pileated Woodpecker

RANGE: Resident from northern British Columbia, and southern Canada east to Nova Scotia; south to northern California, Idaho, Montana, eastern Kansas, and south to the Gulf Coast and Florida.

WASHINGTON DISTRIBUTION: Forested areas of the state.



HABITAT REQUIREMENTS: Pileated woodpeckers inhabit mature and old growth forests and second growth forests with significant numbers of large snags and fallen trees. The best habitat is conifer stands with two or more canopy layers, the uppermost being 25-30 m (80-100') high (Bull 1987).

Nesting - Breeding season is from mid-March to mid-July. Pileateds spend most of their time in stands older than 70 years. They excavate nest cavities in snags or live trees with dead wood, generally excavating through hard outer wood into rotten heartwood. Pileateds excavate large nest holes (3/yr/pair) and may excavate winter roost cavities in the fall or use previous nests (Mannan 1984, Bull 1987, Mellen 1987).

Five studies in Oregon and Washington report similar nest tree characteristics for pileateds: mean dbh > 68 cm (27") and mean height > 27 m (87') (Mannan 1984, Madsen, 1985, Mellen 1987, Bull 1987, Nelson, 1988). The preferred tree species are western larch, pondersoa pine, and black cottonwood east of the Cascade Mountains (Madsen 1985, Bull 1987) and Douglas fir and grand fir west of the Cascades (Mellen 1987, Nelson 1988). Most nest trees were hard snags with bark and broken tops.

Feeding - Pileated woodpeckers forage primarily within forests 40 years or older. They seldom use clearcuts, but do forage in shelterwood cuts if logging debris is left (Mannan 1984, Irwin 1987, Mellen 1987). Pileateds forage on large snags (>50 cm or 20" dbh), logs (>18 cm or 7" dbh), and stumps (especially naturally formed versus cut). They feed mainly on carpenter ants, beetle larvae, and other insects. Snags take on special importance in winter for roosting and foraging when logs and stumps may be covered with snow (McClelland 1979). They may excavate large rectangular holes during foraging that may be used by smaller birds for nesting and roosting.

Roosting - Fall and winter roosts generally are in the same nest tree and cavity that was previously excavated. Consequently, the roost tree characteristics are similar to those of nest trees (McClelland 1977, Bull 1987).

Home range varies from an average of 480 ha (1200 ac) in western Oregon (Mannan 1984, Mellen 1987) to 220 ha (540 ac) in northeast Oregon (Bull 1987). In western Oregon home ranges, the amount of nesting and roosting habitat averaged 200 ha (500 ac) and the foraging habitat averaged 306 ha (750 ac) (Mellen 1987). Several studies found that the density of pileateds increased with the abundance of large conifers and snags.

MANAGEMENT RECOMMENDATIONS:

For areas that must be harvested, leave at least 32 snags > 50 cm dbh/100 ha (14> 20"/100 ac) to maintain nesting habitat for pileated woodpeckers (Neitro et al. 1985).

In addition, to provide foraging habitat, large stumps and numerous large logs should be left in various stages of decay. During thinning and cutting the following types of trees should be left standing where it is safe to do so: dying trees, trees with heartwood rot, insect-infested trees, and trees with distorted shape or wind breakage. Trees with greatest potential for immediate use by pileated woodpeckers have old pileated cavities, broken tops, about 33% of limbs and bark remaining, and some decay (Bull 1987). Trees with broken tops (both live and dead) are the most heavily used for foraging.

Retention of nest snags can be accomplished in two ways: 1) clustering potential nest trees in small areas, or 2) dispersing the trees throughout each territory. The second method may be preferable because it reduces loss to wind, fire, and woodcutters. Safe logging techniques for snag retention are outlined in Neitro et al. (1985) and a U.S. Forest Service publication (1986). In areas where snags are lacking, they can be created by topping live trees or inoculating them with heartrot fungus at nest height (> 12 m or 40') (Bull 1986).

The U.S. Forest Service (1986) has a mandate to maintain viable populations of wildlife on public lands. They developed Minimum Management Recommendations based on this legal requirement. The pileated woodpecker was selected as a management indicator species for old growth conifer forests because its highest densities occur in old growth. The MMRs for the pileated woodpecker apply to a 400 ha (1000 ac) unit. Within the unit, 240 ha (600 ac) are managed for one pair of pileated woodpeckers: a 120 ha (300 ac) old growth or mature nesting area and an additional 300 ac for feeding. One such habitat area is retained for every 4850 ha (12,000 ac) dispersal area. Specific requirements for the 300 ac nesting area include maintaining at least two hard snags/ac > 30 cm (12") dbh and of these 600 snags, 45 should be > 50 cm (20") (15 snags/100 ac). A minimum of two hard snags/ac > 25 cm (10") dbh should be maintained in the additional 300 ac feeding area.

The MMRs were based on data from northeast Oregon where there are high densities of pileateds with small home ranges (Bull 1987). Recent studies for western Oregon show lower densities and a mean home range that is twice the size found in northeast Oregon (Mannan 1984, Mellen 1987). The MMRs should be adjusted to reflect these regional differences. Mellen (1987) recommends a 50% increase in the size of the nesting and feeding areas for each breeding pair in western Oregon and Washington.

Also, Conner (1979) notes that managing for the minimum habitat components may cause gradual population declines. Instead, he suggests that average values for habitat elements be used in forest management. The average dbh for pileated nest trees in the Northwest is 76 cm (30"). Since Douglas fir in Washington will not reach this size until after 100 years, nesting areas should be managed for long rotations. Perhaps the MMRs should be revised using mean values of habitat components rather than minimum values.

Mannan (1984) and Mellen (1987) question the suitability of the pileated woodpecker as an indicator species for other snag-dependent species that may need higher snag densities, and for the old growth community since pileateds also use riparian hardwoods and forage in immature stands. The pileated may be a better indicator species for mature forests west of the Cascade Range.

Irwin (1987) also questions several assumptions about the pileated woodpecker as an indicator species and the MMRs. He contends that pileated woodpeckers may be more adaptable than indicated by the MMRs based on available research in fragmented forests. He suggests a hypothesis for testing: that pileated woodpecker populations can be maintained or enhanced in managed forests by maintaining a minimal total amount of habitat components distributed through time and space. This would occur by using existing forest reserves and riparian zones along major streams and retaining or creating standing dead and down woody debris. Such a test could be conducted through monitoring programs.

Bull et al. (1990) discuss techniques for monitoring pileated woodpecker populations including: 1) density of breeding pairs, 2) reproduction, and 3) presence or absence of birds. Pileated nests can be located by using vocal or recorded calls and locating nests and roost trees or foraging signs. The monitoring method will depend on the size of the area, the work resources and time available, and the amount of information desired.

Woodpeckers, along with other insectivores, play an important role in reducing insect populations at endemic levels. Biological control of forest insects is preferred over use of insecticides. It has a longer term effect to regulate future insect outbreaks and is less costly and nontoxic. Management to increase woodpecker populations should have the secondary benefits of increasing other insectivorous birds and controlling insect outbreaks (Takekawa et al. 1982).

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KEY POINTS

Habitat Requirements:

- Pileateds inhabit mature and old growth forests and second growth forests with numerous large snags and fallen trees.
- Nest trees are mostly snags > 27" dbh and taller than 87'.
- They forage on large snags, logs, and stumps for ants, beetle larvae, and other insects.
- Home range west of Cascade Crest is 1200 ac, east of Cascades 540 ac.

Management Recommendations:

- Pileateds are sensitive to forest management that removes large standing and down woody material.
- U. S. Forest Service Minimum Management Recommendations:
  Maintain one 600 ac habitat area for one pair every 12,000 ac.
  Nesting area - 300 ac with two hard snags/ac > 12" dbh, 45 of which are > 20" dbh (15/100 ac).
  Foraging area - 300 ac with two hard snags/ac > 10" dbh (200/100 ac).
- During logging, retain 14 snags > 20"/100 ac and green trees in clusters

or dispersed throughout a habitat area. Where snags are lacking, top live trees or inoculate them with fungus above nest height.

- Leave large logs and stumps in various stages of decay. During thinning and harvesting, leave deformed or dying trees and green replacement trees of sufficient size such that they will replace existing snags when they fall.
- Limit insecticide use and promote biological insect control.

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Washington Department of Wildlife

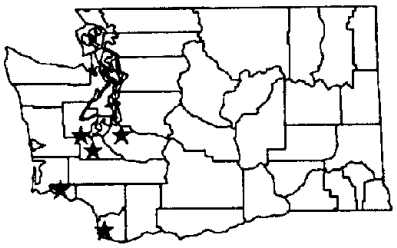
Management Recommendations for Priority Species

Thomomys mazama
Thomomys talpoides douglasi

Pocket Gophers

RANGE: Two species of pocket gopher occur in the genus *Thomomys*. The western pocket gopher (*Thomomys mazama*) is found from western Washington south to northern California. The northern pocket gopher (*Thomomys talpoides*) ranges from southwestern Canada to Nevada, Colorado and South Dakota. In western Washington, several populations that were isolated in patchily-distributed prairies have evolved into separate subspecies. Some of these subspecies populations have disappeared and at least five have become rare as a result of alteration of their habitats.

WASHINGTON DISTRIBUTION: The status of several pocket gopher subspecies in Washington is poorly known. However, rare pocket gophers of Washington include five subspecies of the two species (which may be further separated with future research), distributed as follows:



1) Western pocket gopher (*Thomomys mazama*)
   - a) *T. m. couchi* - one population near Shelton (Mason County)
   - b) *T. m. glacialis* - Roy Prairie (Pierce County)
   - c) *T. m. louiei* - Cathlamet area (Wakiakum County)
   - d) *T. m. tumuli* - one population north of Tenino (Thurston County)

2) Northern pocket gopher (*Thomomys talpoides douglasi*) - Clark County near Vancouver

HABITAT REQUIREMENTS: Pocket gophers inhabit a wide variety of habitats usually characterized by open vegetation types that range from lowland prairies to mountain meadows. Key elements within these habitats are a substantial growth of herbs, and relatively dry soil that is loose enough to burrow through.

LIMITING FACTORS: Open, undisturbed tracts of prairie.

MANAGEMENT RECOMMENDATIONS: Eliminate conifer encroachment on lands inhabited by these subspecies. Restrict development in open areas with uncompacted, dry soils where pocket gophers may occur.

Avoid frequent plowing of fields used by, or enhanced for, rare gopher populations. Plowing every two to three years is detrimental to the population, while plowing every 10 years may renew the supply of non-woody plants favored by gophers. When plowing, only a portion of the habitat should be plowed in any given year. Planting alfalfa in unused adjacent areas will provide new habitat if left unplowed (Scheffer 1931). Herbicides such as 2,4D are detrimental to gopher populations (Barnes 1973), and should be avoided where rare gopher populations survive.

If pocket gophers become a nuisance to a landowner, the Washington Department of Wildlife should be contacted to develop a plan to manage for the species at that specific site.

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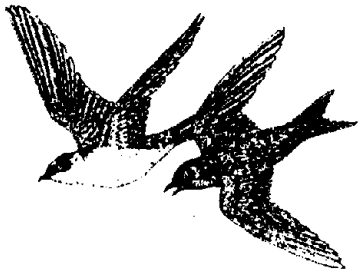
KEY POINTS:

Habitat Requirements:

- Inhabit a wide variety of open habitats with abundant herbaceous vegetation and loose soil.

Management Recommendations:

- Curtail conifer encroachment into open areas.
- Restrict development of open areas where gophers may occur.
- Plow infrequently fields used by gophers; plow only part of a field in any given year.
- Plant alfalfa in adjacent open areas not used by gophers; don't plow these planted areas.
- Avoid using herbicides in areas used by gophers.
- Consult with the Department of Wildlife if gophers cause problems.



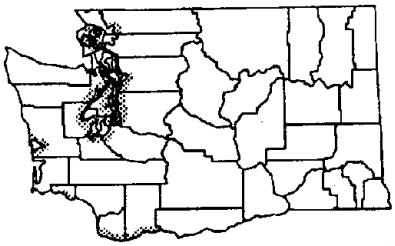
Washington Department of Wildlife
Management Recommendations for Priority Species

Progne subis

Purple Martin

RANGE: Breeds locally from southern Canada to northern Mexico. Winters in South America.

WASHINGTON DISTRIBUTION: Breeds primarily near water around Puget Sound and the Columbia River. Breeding pairs have been confirmed in San Juan, King, Pierce, Thurston, Mason, Clark, Skamania, and Gray's Harbor counties.



HABITAT REQUIREMENTS: Purple martins are insectivorous swallows that nest in cavities. In Washington, most of the birds have been reported nesting in manmade structures near cities and towns in the lowlands of western Washington. Historically, they probably bred in old woodpecker cavities in large dead trees. Only a few such nests are known today. Nesting is more common now in bird boxes.

Purple martins feed in flight on insects. Favorable martin foraging habitat includes open areas, often located near moist to wet sites where flying insects are abundant.

LIMITING FACTORS: Availability of nesting cavities, which are not usurped by starlings and house sparrows.

MANAGEMENT RECOMMENDATIONS: Purple martins are known to nest in cavities located in old pilings and occasionally in snags with clear air space and easy access. These pilings and snags (especially snags near water) should be protected and left standing. Snags should be retained during timber harvesting operations, including salvage operations after burns, blow-downs, and insect infestations. Prescribed burns can be used as a tool to create favorable martin foraging habitat. Create snags in forest openings, or at forest edges (e.g., by topping) where nesting cavities are lacking, especially within 10 miles of an existing purple martin colony. Insecticides should not be applied within at least seven and a half miles of martin nesting colonies in order to maintain a food base and avoid chemical contamination.

If natural sites are lacking and cannot be provided by manipulating habitat, artificial nesting sites can be provided according to the following specifications:

1) Construct nest boxes according to the designs such as that shown in

Figure 1. Box dimensions should be at least 7" x 7" x 7", and preferably at least 10" deep. It is important to make the entrance exactly 1 1/4" high, without a threshold (i.e. continuous with the porch floor). The top of the opening should be sanded smooth. The porch is a necessary feature, and the floor board should be rough to provide traction. These features will aid in dissuading starlings from taking over the nest boxes.

2) Protect boxes from wet weather by sealing edges with caulking material, painting or varnishing wood, using cedar for construction or protecting the roof with galvanized tin. Provide drainage holes in the box floor and ventilation holes near the top.

3) Locate boxes in existing colonies first. Locate additional boxes within 10 miles of existing colonies.

4) Locate boxes near water or wetlands with minimum clear air space of 15' (preferably 100') for circling and foraging about the nest. Erect houses 10' or more above the ground or water.

5) It is not necessary to remove martin nests from previous years. If you clean out old nesting material, do so in the spring and place the contents in a dry place beneath the nest. This is to allow for the emergence of chalcid wasps, which help to control Protocalliphora, a nestling parasite. The wasp larvae live in nest materials and will return to the martin boxes if old nests are left nearby.

6) Where starlings and house sparrows are a problem, plug the box entrances from October to mid-April. If starlings establish themselves in a box, remove their nests, eggs, and young on a routine basis (they will renest several times in a breeding season).

The same measures can be taken with house sparrows early in the breeding season, however removal of sparrow nests later in the cycle may cause sparrows to wander into martin nests and destroy their young. Adult sparrows may be controlled. If this is impossible, remove eggs and young, but leave sparrow nests in later months to prevent sparrows from taking over martin nests.

Starlings and house sparrows are not classified as a protected species. Their numbers may be controlled by trapping or shooting them around a martin colony.

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Adapted from:

Milner, R.L. 1988. Guidelines for establishing and maintaining a purple martin nest box colony. Unpublished report for the Washington Department of Wildlife.

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KEY POINTS:

Habitat Requirements:

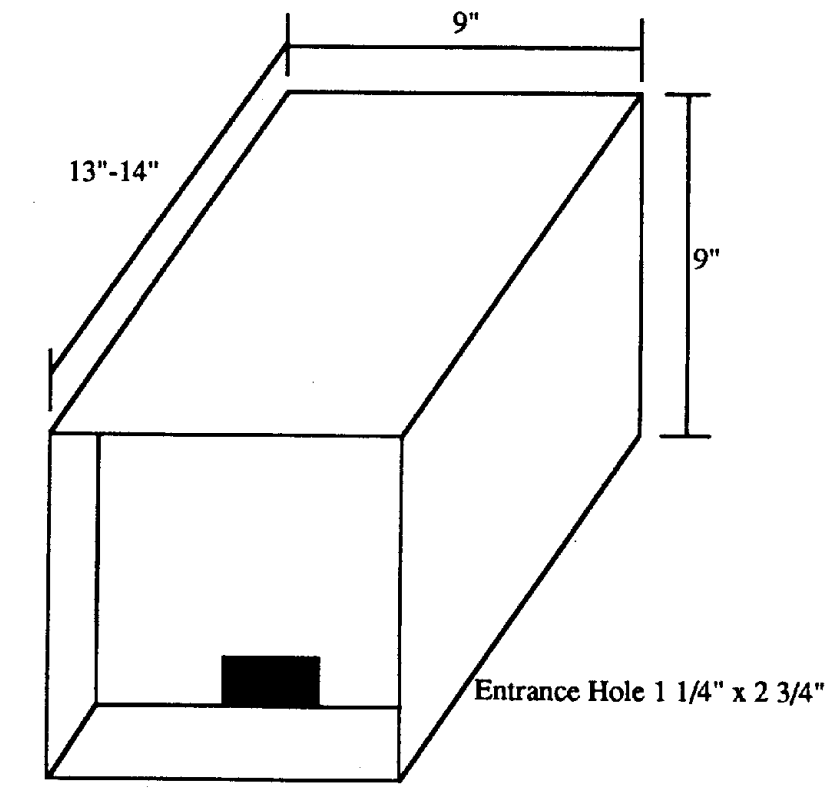
- Nest in natural and man-made cavities.
- Readily nest in bird boxes in areas where the species is already established.
- Usually nest in colonies.
- Feed on flying insects.

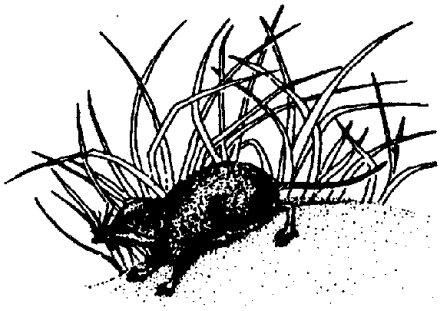
Management Recommendations:

- Retain snags during timber harvesting.
- Retain old pilings.
- Use fires in favorable martin foraging habitat, where appropriate.
- Create snags in forest openings and along forest edges if snags are lacking or limited.
- Avoid applying insecticides within 12 km (7.5 miles) of martin nesting colonies.
- Place nest boxes if cavities are lacking or limited and cannot be created (see text for details).

Figure 1
(Courtesy of Tom Lund, USFWS, 1985)

Purple Martin Nest Box Plan





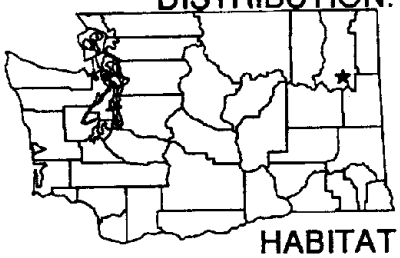
Sorex hoyi

Washington Department of Wildlife
Management Recommendations for Priority Species

Pygmy Shrew

RANGE: Found throughout most of Canada to Alaska and south into the continental United States (Long 1972).

WASHINGTON DISTRIBUTION: Presently confirmed only in Stevens County (Stinson and Reichel 1985).



HABITAT REQUIREMENTS: Pygmy shrews are considered to be among the rarest of North American small mammals (Ryan 1986). Consequently, little is known about their habitat requirements. Pygmy shrews are insectivores and have been reported to feed upon crickets, millipedes (Stinson, pers. comm.), adult beetles, spiders and various insect larvae (Ryan 1986, Whitaker and French 1984).

Long (1972, 1974) found pygmy shrews in conifer stands associated with dense ground vegetation; he stated that the shrews preferred seral and boreal habitats where wet and dry soils occurred in close proximity. They were found in swamps and marshes in spring and apparently preferred dry soils in late summer.

Pygmy shrews may also be associated with disturbed, seral habitats such as sandy blowouts, cutover forests, flooded areas, and cultivated lands (Long 1974). In Washington, pygmy shrews were captured in upland, uneven-aged, second-growth coniferous forests (Stinson and Reichel 1985).

LIMITING FACTORS: Unknown.

MANAGEMENT RECOMMENDATIONS: Destruction of ground vegetation should be avoided in areas where pygmy shrews are found. Insecticides and herbicides, which could reduce insect prey abundance or herbaceous cover, should not be applied where pygmy shrews occur.

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Ryan, J.M. 1986. Dietary overlap in sympatric populations of pygmy shrews *Sorex hoyi* and masked shrews *Sorex cinereus*, in Michigan. Can. Field. Nat. 100(2):225-228.

Stinson, D.W. and J.D. Reichel. 1985. Rediscovery of the pygmy shrew in Washington. Murrelet 66(2):59-60.

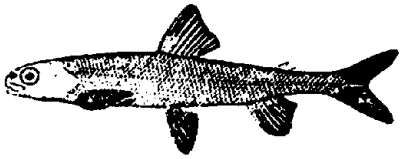
Whitaker, J.O., Jr. and T.W. French. 1984. Foods of six species of sympatric shrews from New Brunswick. Can. J. Zoo. 62:622-626.

KEY POINTS: Habitat Requirements:

- Habitat requirements poorly known; dense ground vegetation and interspersion of wet and dry soils may be important habitat elements.

Management Recommendations:

- Maintatin ground vegetation in areas where pygmy shrews occur.
- Do not apply herbicides or insecticides in areas where pygmy shrews occur.



Washington Department of Wildlife

Management Recommendations for Priority Species

Prosopium coulteri

Pygmy Whitefish

RANGE: The pygmy whitefish has a disjunct or discontinuous distribution in North America. It occurs in the Columbia River system in western Montana and Washington, in British Columbia, Yukon Territory, and in the Bristol Bay and Alaska Peninsula region of southwestern Alaska (Scott and Crossman 1973).

WASHINGTON DISTRIBUTION: Relict populations are found in lakes and cold streams associated with the Columbia River system and have been reported in Diamond Lake near Spokane, Crescent Lake on the Olympic Peninsula, and Lake Chester Morse near Seattle.

HABITAT REQUIREMENTS: Pygmy whitefish inhabit lakes at depths greater than 7 m (20 ft), stream reaches with swift currents, and cold water. Spawning occurs in riffles of streams or near lake shores during the fall and winter months. Fry generally emerge during the following spring. The diet consists primarily of benthic invertebrates, including aquatic insect larvae, crustaceans, and small mollusks. In lakes, they feed primarily on zooplankton (Wydoski and Whitney 1979).

LIMITING FACTORS: Stream temperatures which exceed the normal spawning range, a lack of spawning habitat, high sedimentation in spawning areas, and/or a lack of preferred food items will also limit the population and range of pygmy whitefish.

MANAGEMENT RECOMMENDATIONS: The maintenance of riparian vegetation is essential for controlling stream temperature, providing cover, and protecting against lateral erosion. Removal of streamside vegetation lowers canopy density (shading) and increases sedimentation. Increases in solar radiation raises stream temperatures thereby negatively impacting spawning, hatching, and rearing survival. Increased sedimentation contributes to the loss of spawning habitat and decreases the diversity of aquatic invertebrates and other food items (Newbold et al. 1980, Noss 1983, Heede 1985). Buffer zones along stream banks should be at least the width of the height of the tallest tree or 15.2 m (50 ft) whichever is wider. The vegetative buffer will provide erosion control, and maintain natural stream temperatures and diversity of aquatic invertebrates (Meehan et al. 1977, Newbold et al. 1980). In Washington, this can range up to 60 m (200 ft.). This "zone of influence" (Meehan et al. 1977) should be maintained along stream banks which provide pygmy whitefish habitat, and any other stream which directly or indirectly influences pygmy whitefish. Road construction and maintenance activities should be avoided adjacent to streams with pygmy whitefish. In-stream structures such as bridges, piers, boat ramps, or culverts must not impede the natural movements of pygmy whitefish.

REFERENCES:

Heede, B.H. 1985. Interactions between streamside vegetation and stream dynamics. in Proceed. Symp. of Riparian Ecosystems and their Management: Reconciling Conflicting Uses, April 16-18, 1985, Tucson, AZ.

Meehan, W.R., F.J. Swanson, and J.R. Sedell. 1977. Influences of riparian vegetation on aquatic ecosystems with particular reference to salmonid fishes and their food supply. P. 137-145 in Proceed. Symp. on the Importance, Preservation, and Management of the Riparian Habitat, July 9, 1977, Tucson, AZ.

Newbold, J.D., D.C. Erman, and K.B. Roby. 1977. Effect of logging on macroinvertebrates in streams with and without buffer strips. J. Fish. Aquat. Sci. 37:1076-1085.

Noss, R.F. 1983. A regional landscape approach to maintain diversity. BioSci. 33(1):700-706.

Scott, W.B. and E.J. Crossman. 1973. Freshwater Fishes of Canada. Fish. Res. Bd. Canada. Bull. 14.

Wydoski, R.S. and R.R. Whitney. 1979. Inland fishes of Washington. Univ. of Wash. Press, Seattle, WA.

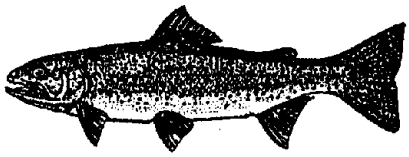
KEY POINTS:

Habitat Requirements:

- Inhabit lakes at depths greater than 7 m (20 ft), stream reaches with swift currents, and cold water.
- Spawning occurs in riffles of streams or near lake shores during the fall and winter months.
- Fry emerge the following spring.
- Primary diet consists of benthic invertebrates in rivers and zooplankton in lakes.

Management Recommendations:

- Buffer zones of at least the width of the height of the tallest tree (or 15.2 m (50 ft) whichever is wider) should be maintained along stream banks which provide pygmy whitefish habitat, and any other stream which directly or indirectly influences pygmy whitefish habitat.
- Road construction and maintenance activities should be avoided adjacent to streams which provide pygmy whitefish habitat.
- In-stream structures such as bridges, piers, boat ramps, or culverts must not impede the natural movements of pygmy whitefish.



Washington Department of Wildlife

Management Recommendations for Priority Species

Oncorhynchus mykiss

Rainbow Trout and Steelhead

RANGE: The native range of rainbow trout was from the eastern Pacific Ocean and the fresh water, mainly west of the Rocky Mountains, from northwest Mexico, to the Kuskokwim River, Alaska. Following its widespread introduction outside its normal range, it now occurs throughout the United States in all suitable localities (Scott and Crossman 1973).

WASHINGTON DISTRIBUTION: In western Washington, resident and anadromous (steelhead) rainbow trout are present in most drainages of Puget Sound, coastal streams, and the lower Columbia River. East of the Cascade Mountains they are found in tributaries of the Columbia drainage and tributaries of the Snake River (Scott and Crossman 1973, Wydoski and Whitney 1979).

HABITAT REQUIREMENTS: Rainbow trout and steelhead (when in freshwater) inhabit river bottoms in riffle and pool areas in summer and pools during other seasons. They both prefer cool water and plenty of oxygen. If the water temperature in lakes exceeds 21 degrees C (70 degrees F), rainbow trout will move to deeper and cooler water. Both rainbow trout and steelhead are tolerant of a wide range of salinities (Scott and Crossman 1973, Wydoski and Whitney 1979).

Rainbow trout and steelhead deposit their eggs in redds on bottoms consisting of fine gravel, and larger (12 cm or 5") rocks, respectively, in well oxygenated running water. Lake populations of rainbow trout move into tributaries to spawn. Newly hatched fry are found in the peripheral waters of pools until they become large enough to maintain themselves in the current riffles. Steelhead will migrate to saltwater at one to three years of age (Scott and Crossman 1973, Wydoski and Whitney 1979).

Preferred food of rainbow trout and juvenile steelhead consists of organisms associated with the bottom such as aquatic insects including diptera, mayflies, stoneflies, and beetle larvae, amphipods, aquatic worms, and fish eggs (Scott and Crossman 1973, Wydoski and Whitney 1979).

LIMITING FACTORS: Stream temperatures which exceed the normal spawning range, a lack of spawning habitat, high sedimentation in spawning areas, and/or a lack of preferred food items will also limit the population and range of rainbow trout and steelhead. Exposure to heavy metals and other pollutants can inhibit migratory behavior.

MANAGEMENT RECOMMENDATIONS: The maintenance of riparian vegetation is essential for controlling stream temperature, providing cover, and protecting against lateral erosion. Removal of streamside vegetation lowers canopy density (shading) and increases sedimentation. Increases in solar radiation raises stream temperatures thereby negatively impacting spawning, hatching, and rearing survival. Increased sedimentation contributes to the loss of spawning habitat and decreases the

diversity of aquatic invertebrates and other food items (Newbold et al. 1980, Noss 1983, Heede 1985). Buffer zones along stream banks should be at least the width of the height of the tallest tree or 15.2 m (50 ft), whichever is wider. The vegetative buffer will provide erosion control, and maintain natural stream temperatures and diversity of aquatic invertebrates (Meehan et al. 1977, Newbold et al. 1980). In Washington, this can range up to 60 m (200 ft.). This "zone of influence" (Meehan et al. 1977) should be maintained along stream banks which provide rainbow trout and steelhead habitat, and any other stream which directly or indirectly influences rainbow trout and steelhead. Road construction and maintenance activities should be avoided adjacent to streams with rainbow trout and steelhead. In-stream structures such as bridges, piers, boat ramps, or culverts must not impede the natural movements of rainbow trout and steelhead.

REFERENCES:

Heede, B.H. 1985. Interactions between streamside vegetation and stream dynamics. in Proceed. Symp. of Riparian Ecosystems and their Management: Reconciling Conflicting Uses, April 16-18, 1985, Tucson, AZ.

Meehan, W.R., F.J. Swanson, and J.R. Sedell. 1977. Influences of riparian vegetation on aquatic ecosystems with particular reference to salmonid fishes and their food supply. P. 137-145 in Proceed. Symp. on the Importance, Preservation, and Management of the Riparian Habitat, July 9, 1977, Tucson, AZ.

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Scott, W.B. and E.J. Crossman. 1973. Freshwater fishes of Canada. Fish. Res. Bd. Canada. Bull. 14.

Wydoski, R.S. and R.R. Whitney. 1979. Inland fishes of Washington. Univ. of Wash. Press, Seattle, WA.

KEY POINTS:

Habitat Requirements:

- Rainbow trout and steelhead inhabit river bottoms in riffles and pools in summer and pools during the other seasons.
- Rainbow trout and steelhead spawn in redds on bottoms consisting of fine gravel, and larger (4-5") rocks, respectively, in well oxygenated running water.
- Newly hatched fry are found in peripheral waters of pools.
- Preferred food consists of bottom dwelling organisms.

Management Recommendations:

- Buffer zones of at least the width of the height of the tallest tree should be maintained along stream banks which provide rainbow trout and steelhead habitat, and any other stream which directly or indirectly influences rainbow trout and steelhead habitat.
- Road construction and maintenance activities should be avoided adjacent to streams which provide rainbow trout and steelhead habitat.
- In-stream structures such as bridges, piers, boat ramps, or culverts must not impede the natural movements of rainbow trout and steelhead.
- Waters inhabited by steelhead parr should not be treated with metal based herbicides during the period March 1 - June 15.

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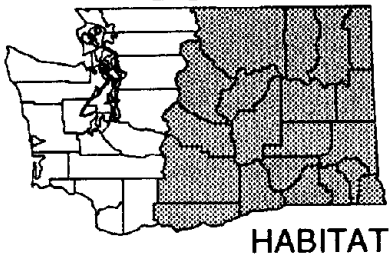
Odocoileus hemionus hemionus

Washington Department of Wildlife
Management Recommendations for Priority Species

Rocky Mountain Mule Deer

RANGE: The Rocky Mountain mule deer represents one subspecies of the mule deer/ black-tailed deer group. It occurs in southern portions of the Yukon Territory, throughout British Columbia except in the upper, coastal strip, in Alberta, southwestern Saskatchewan, and south to the Missouri River in the Dakotas, in most of Nebraska, western Kansas, the northwest corner of Texas, all of Colorado, New Mexico, Arizona, Nevada, California, and east of the Cascade Crest in Oregon and Washington (Wallmo 1981).

WASHINGTON DISTRIBUTION: Mule deer occur in many, varied habitats throughout Washington east of the Cascade Crest.



HABITAT REQUIREMENTS: Mule deer require the juxtaposition of food, cover, and water like other cervids. Areas without water available within 1.6km (1 mi.) show decreased use (Mackie 1970). Cover is used by deer for both hiding and thermal regulation. Browse is the primary vegetation used by mule deer except in spring when herbaceous materials are preferred. Summer and winter ranges are most often geographically separate areas (Wallmo 1981).

Mule deer on summer ranges are widely distributed, and studies by Myers (1990) in north central Washington indicate summer range of about 880 ha (3.4 sq. mi). Patches of deciduous trees and shrubs, dense shrub patches, or timbered stands which are 240-500m (800-1,600') across provide optimal cover (Thomas 1979). Forage is provided by interspersed openings of early successional stages containing shrubs and forbs. Shrubs increase from 38 percent of the diet in summer to 75 percent or more during winter (Schneegas and Bumstead 1977).

Winter ranges are more restrictive and may be only half the size of summer ranges. Studies by Myers (1990) show mule deer winter range in north central Washington are about 540 ha (2.1 sq. mi.).

Winter range in southeast Washington occurs up to 1070m (3,500') in elevation. Winter range in northeast Washington extends from Canada along the Sherman divide down to the timberline/grassland zone in Spokane County below 760-1100m (2,500- 3,700'), depending on the severity of the winter, except west of the Kettle Crest where it may extend to 1400m (4,500'). On the Columbia Basin Grassland/Brushlands, winter range includes areas from 180-1200m (600 to 4,000') on slopes less than 65 percent and

where annual precipitation is less than 50cm (20") and lands are dominated by shrub and grass cover. North central Washington winter range occurs below 2000m (6,500"). In the Methow area deer winter on south and south-east aspects below 1800m (6,000') in mild winters. Elsewhere in upper central Washington, winter range occurs below 1100m (3,700'). In the Klickitat area, winter ranges are located below 600m (2,000') in mild winters, but confined to areas below 300m (1,000') in severe winters.

Winter habitat is characterized by interspersed patches of timber/shrubs that are 240-500m (800-1,600') across (Thomas 1979) and openings with about 30 percent of the ground covered with vegetation, of which about 60 percent is composed of important browse species (USFWS 1982). Cover and forage is considered optimal when at a 50:50 ratio (Loveless 1963).

Mule deer fawning habitat consists of low shrubs and small trees 0.6-1.8m (2-6') tall on benches or slopes less than 15 percent within 180m (600') of water (Thomas 1976). Forage is found within 1/3 of a mile and openings are used only to the extent that cover is available within 50m (160'). Tree canopy closure of cover patches on fawning areas is optimal at 50 percent (Leckenby 1982). Human disturbance within 1.6km (1 mi.) of occupied fawning habitat may eliminate use during the May 1-June 30 season (Sachet 1988).

Extensive open road densities, particularly arterial roads, reduce deer use of habitat up to 1/2 mile from the road (Perry and Overly 1977). Research in the Blue Mountains (Perry and Overly op.cit.) indicates habitat effectiveness declines as density of roads increase. Road densities exceeding 1/2 mile of road per square mile reduces habitat effectiveness nearly 20 percent.

LIMITING FACTORS:

The abundance and availability of winter browse interspersed with cover is the primary mule deer limiting factor. Forests and rangelands should be in a variety of successional stages. Climax grasslands, sagebrush stands, or timber climax reduces or may eliminate use (USFWS 1982).

Snow depths greater than 46cm (18") eliminates all but transient use of winter range, and reduced use is noted where snow depths are greater than 30cm (12")(USFWS 1982).

MANAGEMENT RECOMMENDATIONS:

Manage mule deer summer range to include patches of deciduous or coniferous trees and dense shrubs or areas containing 1-2.4m (3-8') tall shrubs for use as hiding and thermal cover. Forage areas should contain a variety of young successional stages with a large component of preferred shrubs. Prescribed fire, rangeland treatment with seeding or fertilizing, or moderate, correctly timed livestock grazing may be beneficial tools to enhance mule deer forage, depending on the shrub species present.

Manage winter habitat to retain cover patches over about 50 percent of the area which are 240-500m (800-1,600') across and composed of small evergreen trees and tall shrubs or of fairly dense coniferous stands, depending on habitat type. Enhance the shrub component on winter range using techniques described above to increase mule deer populations. Winter range condition will gradually worsen, and deer populations decline if succession is halted for significant periods of time.

Fawning habitat should be maintained as described under habitat requirements. In some areas of Washington, low shrubs and small trees are the only fawning cover available and should be retained within 180m (600') of a stream where slopes are gentle. Elsewhere, taller stands of conifers with a 50

percent canopy should be maintained where available in 2 ha (five acre) patches well-distributed along stream corridors in each 2.6 sq. km (one-square-mile) area. Human use and all motorized vehicle use within known fawning areas should be precluded between May 1 and June 30. Disturbance should be minimized within 1.6 km (1 mi.) of fawning areas.

Roads should be closed to public use where densities exceed 1.5 miles per square mile on summer range or 0.5 mile per square mile on winter range. Road construction standards should be the minimum feasible and screening vegetation retained. Spring developments or cisterns in arid summer ranges will permit use of additional habitat.

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Mackie, R.J. 1970. Range ecology and relations of mule deer, elk, and cattle in the Missouri River Breaks, Montana. Wildl. Monogr. 20. 79 pp.

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Sachet, G.A. 1988. Wildlife evaluation processes for ORV, hiking, and horse back-country recreation use in Washington forests. Wash. Dept. of Wildl., Olympia, Wash. 87 pp.

Schneegas, E.R. and R.S. Bumstead. 1977. Decline of western mule deer populations: probable cause and tentative solution. Proc. Annu. Conf. West. Asso. State Game and Fish Comm. 57:218-237.

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Thomas, J.W. , Ed. 1979. Wildlife Habitats in Managed Forests - The Blue Mountains of Oregon and Washington. USDA For. Serv. Agric. Handbook No. 553. 512 pp.

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Wallmo, O.C. 1981. Mule and Black-tailed deer of North America. O.C. Wallmo, Ed. Univ. of Neb. Press. 605 pp.

KEY POINTS:

Habitat Requirements:

- Need food, water, and cover in close proximity within each square mile area.
- Browse on winter range is the most limiting factor for mule deer.

- Fawning habitat occurs near water on gentle terrain.
- Disturbance and open roads reduce use of winter range and fawning habitat.

Management Recommendations:

- Rejuvenate browse when needed on winter range.
- Retain about 50 percent of winter range in cover.
- Maintain quality, disturbance-free fawning areas and reduce disturbance during winter.
- Maintain minimum feasible road construction standards and maintain open road densities below 0.5 mile per mile of habitat on winter range.

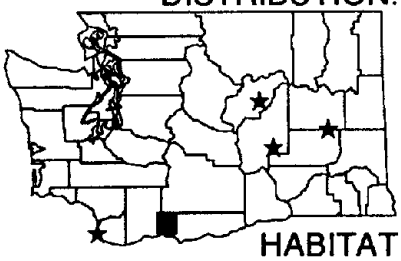
Grus canadensis

Washington Department of Wildlife
Management Recommendations for Priority Species

Sandhill Crane

RANGE: Sandhill cranes breed from Hudson Bay to northeast Siberia and south through parts of northcentral, northwestern and southeastern United States.

WASHINGTON DISTRIBUTION: A single pair of sandhill cranes has bred in Klickitat County in recent years (indicated by box). Migrants occur throughout the state, especially in spring; the largest concentrations are found in the central Columbia Basin (indicated by star).



HABITAT REQUIREMENTS: Sandhill cranes use only large tracts of open habitat where visibility is good from all vantage points. Grain fields, meadows, large marshes and shallow ponds are all favored. Nesting usually takes place in extensive shallow-water marshes with dense emergent plant cover, especially bull rushes (Littlefield and Ryder 1968). Nearby feeding grounds are composed of extensive meadows or grasslands, which may be used for nesting when emergent plants are unavailable (USDI 1978). Grainfields are also important (Littlefield and Ryder 1968).

LIMITING FACTORS: Availability of large tracts of undisturbed marshes or meadows for feeding and nesting.

MANAGEMENT RECOMMENDATIONS: **Breeding Sites** - Sandhill cranes are extremely wary, requiring isolated sites with good cover for nesting. Road and foot travel should be avoided within .4km (1/4 mi) of nests. Meadows should be mowed no earlier than mid-August to prevent mortality of young cranes.

Logging operations within .8km (1/2 mi) of the crane nest should be curtailed during the breeding season, from March through August.

Powerline corridors should be located away from crane migration and breeding sites. Install line markers or other devices on transmission lines where they pose hazards to cranes. Remove all unnecessary fences near areas used by sandhill cranes to prevent the birds from becoming entangled in fence wires (USDI 1978).

Avoid changing water levels in habitats that are important to cranes. Breeding sites should not be grazed (Brown et al. 1975). Protect additional breeding habitat.

Migration Sites -Mowing, with hay removal, conducted after August 15 may benefit cranes by providing feeding areas. All hay should be removed and

residual hay cleaned up immediately after mowing to prevent mold development. "Moldy" hay provides favorable conditions for aspergillosus, which is known to infect young cranes (USDI 1978).

Avoid new construction or traffic increases within .8km (1/2 mi) of feeding areas. Avoid fall plowing of crane feeding habitat. Waste grain is more useful if knocked over rather than left standing (Johnson and Stewart 1972). Maintain ponds within 3.2km (2 mi) of grain sites to provide roost sites for cranes (USDI 1978).

REFERENCES:

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Littlefield, C.D., and R.A. Ryder. 1968. Breeding biology of the greater sandhill crane on Malheur National Wildlife Refuge, Oregon. Trans. Thirty-third North Am. Wildlife and Nat. Resources Conf.

USDI Fish and Wildlife Service. 1978. Guidelines for management of the Central Valley population of greater sandhill cranes. USDI Fish and Wildlife Service, Portland, OR.

KEY POINTS

Habitat Requirements:

- Nest and feed in open areas with good visibility.
- Nest in extensive shallow-water marshes with dense emergent vegetation.
- Feed in meadows, grasslands and grainfields.

Management Recommendations:

- Avoid vehicle and foot traffic within 400m (1/4 mi) of nesting areas during the breeding period (March-October).
- Avoid logging within 800m (1/2 mi) of nests during the breeding period.
- Remove all unnecessary wire fences in areas used by cranes.
- Do not alter water levels in wetlands used by cranes.
- Exclude cattle from crane nesting areas.
- Mow meadows after 15 August; remove all hay soon after mowing.
- Prevent construction and road building within 800m (1/2 mi) of feeding areas.
- Maintain wetlands within 3 km (2 mi) of upland feeding areas.
- Do not fall-plow grainfields; knock down waste grain.

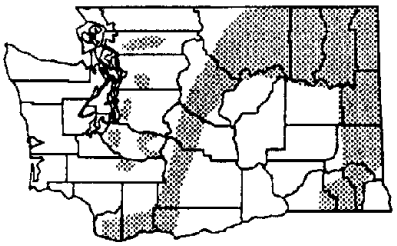
Rana pretiosa

Washington Department of Wildlife Management Recommendations for Priority Species

Spotted Frog

RANGE: Extreme southeastern Alaska to western Alberta, northwestern Wyoming, northern Utah, central Nevada, west to Oregon and Washington (Stebbins 1985).

WASHINGTON DISTRIBUTION: Widespread east of the Cascade Mountains. Isolated populations west of the Cascades are currently unconfirmed and could be extirpated; the last verified collection was near Vancouver in 1968 (Nussbaum et al. 1983).



HABITAT REQUIREMENTS: Spotted frogs are highly aquatic, inhabiting marshy edges of ponds, streams, and lakes (Nussbaum et al. 1983). Critical aspects of the habitat are not precisely identified, however suitable oviposition and tadpole rearing sites, and refuges for post-metamorphic frogs, especially hibernating adults, are probably critical (Nussbaum et al. 1983, Wells 1977 in Hayes and Jennings 1986).

Adult spotted frogs feed on invertebrates, generally within one-half meter of shore on dry days. During and after rain, they may move away from permanent water to feed in wet vegetation or ephemeral puddles (Licht 1986). Larval frogs feed on aquatic algae and vascular plants, and scavenged plant and animal materials (Morris and Tanner 1969).

Spotted frogs are active in lowland habitats from February through October, and hibernate in muddy bottoms near their breeding sites in winter (Licht 1969, 1975; Svihla 1935). Courtship and breeding takes place in warm, shallow margins of ponds or rivers, or in temporary pools. The same breeding sites may be used over successive years (Nussbaum et al. 1983, Licht 1969).

Female spotted frogs tend to deposit their eggs on top of, or immediately adjacent to, other spotted frog egg masses in an area less than six-tenths meter square. Eggs are laid in water that is only a few centimeters deep, and are usually half-exposed to direct air. Thermal tolerance of embryos ranges between 7° - 28° C (Licht 1971). In marshes near Vancouver B.C., egg laying began in March and was completed by 1 April; metamorphosis into frogs was completed by 15 August (Licht 1969).

LIMITING FACTORS: Reasons for the decline of the spotted frog in Washington are unclear. However, introduced bullfrogs (*Rana catesbeiana*) have presumably negatively impacted this species (and, to a lesser extent, other native frogs)

through direct competition or predation. Other contributing factors may include habitat alteration, predation from introduced fishes, and susceptibility to toxic chemicals (Hayes and Jennings 1986).

MANAGEMENT RECOMMENDATIONS:

Riparian areas and wetlands that support spotted frogs should not be flooded, drained, dredged or otherwise altered. Water levels should not be lowered to avoid desiccating spotted frog embryos and tadpoles by stranding them out of water (Licht 1974). Embryos may also fail to develop if water levels are raised or temperatures are lowered to less than 7° C. Altering the natural flow rate of streams used by spotted frogs should also be avoided.

To maintain adequate cover in wetlands used by spotted frogs, vegetation should not be removed from stream banks or pond edges. In addition to negatively impacting conditions for spotted frogs, removing vegetative cover may raise water temperatures, enhancing conditions for competing bullfrogs.

Introduced fish, such as sunfish and catfish, may prey upon frog tadpoles and eggs. Catfish also disturb vegetation and benthic sediment. Bullfrogs may compete with spotted frogs for resources, and prey upon native frogs during all life stages (Hayes and Jennings 1986). Exotic frogs or fish should not be introduced into sites supporting spotted frogs. Exotics that have invaded spotted frog habitats should be controlled by mechanical means where possible.

Algae, which is eaten by tadpoles should not be removed or treated in wetlands where spotted frogs occur. Muddy substrates, which may be used as hibernation sites, should not be altered.

Several chemical compounds are known to have deleterious effects on Ranid frogs, especially during larval stages of development (Hayes and Jennings 1986). Therefore, pesticides and herbicides should not be applied to waters used by spotted frogs. Urban runoff waters often contain heavy metals and other pollutants that may affect frogs. Stormwater runoff from urban developments should not be diverted into spotted frog habitats.

Rotenone, which affects gill-breathing organisms, is often applied to wetlands to control unwanted fish populations. Rotenone should not be applied to wetlands occupied by spotted frogs during the typical application times of spring and fall, because the young of this species are in the gill stage in spring and do not metamorphose until fall (Bradbury 1986).

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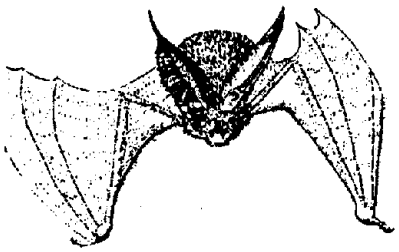
KEY POINTS: Habitat Requirements:

- Inhabit marshy edges of ponds, streams and lakes.
- Breed in warm, shallow margins of ponds or rivers, or in temporary pools; the same breeding site may be used in successive years.
- Eggs are laid in water that is only a few centimeters deep and are usually half exposed to air.
- Embryo mortality occurs if water temperature falls below 7° C (45° F) or rises above 28° C (82° F).
- Hibernate in muddy bottoms near breeding sites during winter.

Management Recommendations:

- Avoid altering wetlands (e.g., flood, drain, fill, dredge) used by spotted frogs.
- Avoid altering water levels or stream flows during the breeding period (March through August).
- Avoid causing water temperature to fall below 7° C (45° F) or rise above 28° C (82° F) during the breeding period.
- Avoid discharges of heated water or stormwater runoff into wetlands used by spotted frogs.
- Avoid removal of riparian vegetation, or removal or chemical treatment of aquatic algae.
- Avoid introducing sunfish, catfish, other exotic fish, or bullfrogs into wetlands used by spotted frogs; remove these species if they are present.
- Avoid applying pesticides and herbicides to wetlands used by spotted frogs.



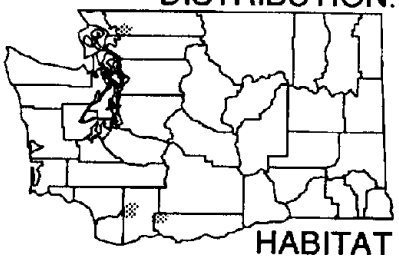
Washington Department of Wildlife
Management Recommendations for Priority Species

Plecotus townsendii

Townsend's Big-Eared Bat

RANGE: Townsend's big-eared bats occur in the western United States, central Appalachian Mountains, Ozark Mountains and northern Mexico.

WASHINGTON DISTRIBUTION: Breeding sites for Townsend's big-eared bats are confirmed near Bellingham, Mt. St. Helens, and near the Columbia Gorge (Klickitat, Skamania and Whatcom Counties).



HABITAT REQUIREMENTS: Townsend's big-eared bats are found in caves, lava tubes and abandoned buildings. Temperature is a critical factor in selection of breeding, roosting and hibernation sites by the species. Caves used for hibernation in winter are cold, generally close to freezing. Nursery colonies are warmer, generally above 10°C (50°F)(Perkins and Levesque 1987).

Townsend's big-eared bats feed on insects and arthropods, which they capture in flight or glean from foliage (Perkins and Levesque 1987).

LIMITING FACTORS: Availability of undisturbed cave sites with proper temperature conditions.

MANAGEMENT RECOMMENDATIONS: Townsend's big-eared bats are extremely sensitive to disturbance (Humphrey and Kunz 1976, Pearson et al. 1952, Graham 1966). Disturbance can simply mean visiting that portion of the cave used by the bats. Following an intrusion they will readily abandon nursery colonies, leaving with their young at night and travelling to a new site (if one is available). Thus, all visitation to nursery caves should be avoided from 1 May to 30 August (Perkins and Levesque 1987).

Portions of caves used for hibernation usually maintain a temperature close to 0°C (32°F) during winter. The bats drop their temperature to within a few degrees of that to conserve energy. Disturbance of the colony can cause bats to stir, warm themselves and become active. Such activity may cost them an excessive portion of their limited winter energy reserves. If repeated, it may cause reproductive failure, abandonment of the site or death due to starvation. Therefore, caves used for hibernation should be closed to cave explorers and other sources of disturbance from 1 November to 1 April (Perkins 1985).

Cave closure techniques could include restricting access to roads or trails leading to bat caves by erecting gates or posting signs. Placing a gate or similar barrier at the entrance of a nursery cave may be the best method of protecting nursery colonies, which are often located near cave entrances.

Gate designs are available from the American Cave Conservation Association (Hathorn 1986).

Vegetation around the openings of caves affects the microclimate of cave openings. Timber and grazing buffer areas should be established around the entrances of occupied caves to protect vegetation surrounding cave openings and maintain the temperature of the caves.

Clearcut logging should not occur around cave openings. Forest provides a thermal buffer, keeping cave entrances cooler on hot days and warmer in cold weather. This is important because of the very specific temperature requirements of the bats. They cannot tolerate wide temperature fluctuations in their hibernation and breeding sites. If selective logging occurs, trees should be felled away from cave openings and all brush should remain at the site.

Pesticides or herbicides, which could reduce the bat's food resources, should not be applied near the entrances of nursery or roost caves. Applications of pesticides and herbicides should also be avoided in areas which are likely foraging sites for bats (Perkins and Levesque 1987).

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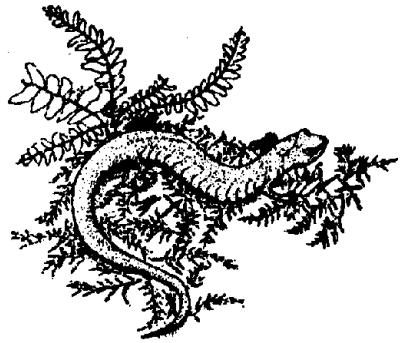
KEY POINTS:

Habitat Requirements:

- Inhabit caves, lava tubes, and abandoned buildings.
- Extremely sensitive to human disturbance.

Management Recommendations:

- Do not enter caves used by breeding bats from 1 May to 30 August or caves used by hibernating bats from 1 November to 1 April. Close cave entrances using gates or signs.
- Maintain a vegetation (forest) buffer around bat cave entrances that is sufficient to protect cave microclimate.
- Avoid applying insecticides or herbicides near caves used by bats.

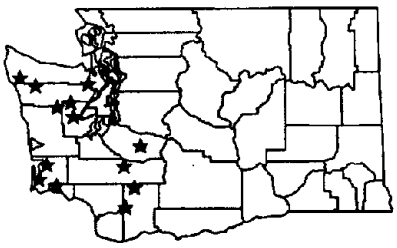


Plethodon vandykei

Washington Department of Wildlife
Management Recommendations for Priority Species

Van Dyke's Salamander

RANGE:



Western Washington, northern Idaho, northwestern Montana (Brodie and Storm 1970), and southern British Columbia (Wilson, Simon and Larsen 1989). Rocky Mountain populations are sometimes given status as a separate species (Highton and Larson 1979, Collins 1990).

WASHINGTON DISTRIBUTION:

Has been collected from Clallam, Jefferson, Mason, Grays Harbor, Pierce, Lewis, Skamania, Pacific, and Wahkiakum Counties (Nussbaum et al. 1983).

HABITAT REQUIREMENTS:

Little is known about the habitat requirements of the Van Dyke's salamander. It has been found along rocky streams, and in wet talus and forest litter from sea level to 1500m (5000')(Wilson and Larsen 1988, Nussbaum et al. 1983, Wilson and Simon, unpubl. data). Aubry et al. (1987) found Van Dyke's salamanders among loose rocks on the moist floor of a lava tube near Mount St. Helens. This species is also presumably associated with riparian habitats in mature and old-growth coniferous forests (Jones and Atkinson 1989). In these habitats, the salamanders are thought to use downed logs (Jones and Atkinson 1989, Jones 1989). Jones (1989) located a nest in a partially rotted log [=decay class 3(Maser et al. 1979)].

Van Dyke's salamanders feed mostly upon small insects including many aquatic immatures (Wilson and Larsen 1988). Predators may include birds (Wilson and Larsen 1988) and garter snakes (Wilson, pers. comm.).

LIMITING FACTORS:

Availability of moist, rocky substrate or decaying logs that are well-shaded.

MANAGEMENT RECOMMENDATIONS:

Clearcutting and removal of dead and downed material alter the moist microhabitat used by Van Dyke's salamanders. These practices should be avoided where Van Dyke's salamanders are found.

Maintain streamside management corridors adjacent to all size classes of streams with rocky or gravelly banks. Van Dyke's salamanders require both the moisture and the increased erosion protection provided by these corridors. This species' habitat likely includes many streamsides that are not used by significant numbers of resident game fish or anadromous fish (classified as Type 4 or Type 5 waters under the Washington Forest Practice Regulations). Logging activities that reduce the shade surrounding these waters should not occur when Van Dyke's salamanders are present. Yarding and heavy equipment operation should also not occur within these sites.

Understory plants and noncommercial trees should be left in gravel and rock

seepage areas during logging operations to prevent desiccation of Van Dyke's salamander habitat. Maintain at least 50% shade along stream banks and wet talus see page areas.

If logging occurs near wet talus slopes occupied by Van Dyke's salamanders, management strategies should follow those recommended for the Larch Mountain salamander (*Plethodon larselli*): 1) retain a 27.4m to 45.7m (90' to 150') border of trees along the periphery of the talus fields (Herrington and Larsen 1985); 2) external to this zone, retain at least 50% vegetation and as much slash as possible; 3) keep talus slopes clear of heavy machinery and do not drag logs across them.

Destructive collecting methods, such as tearing apart logs or removing moss, should be avoided (Larsen and Schaub 1982).

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KEY POINTS: Habitat Requirements:

- Found in wet places from sea level to 1500m.

Management Recommendation:

- Avoid clearcutting and removal of dead and downed material where Van Dyke's salamanders are found.
- Maintain riparian habitat along all size classes of streams when salamanders are present.
- Avoid reducing shade around Type 4 or Type 5 waters when salamanders are present.
- Maintain at least 50% shade along stream banks and talus areas.
- Protect talus areas used by Van Dyke's salamanders.
- Avoid destructive collecting techniques.

Chaetura vauxi

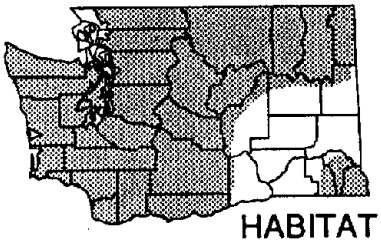
Washington Department of Wildlife

Management Guidelines for Species of Concern

Vaux's Swift

RANGE: Breeds from northern British Columbia and western Montana south to central California, west of the Cascade and Sierra Nevada Mountains. Winters in Central America and northern South America (American Ornithologists Union 1983).

WASHINGTON DISTRIBUTION: Summer resident throughout wooded areas of Washington (Paulson, pers. comm.).



HABITAT REQUIREMENTS: Vaux's swifts nest in mature and old-growth coniferous forests (Baldwin and Zaczkowski 1963, Meslow and Wight 1975, Manuwal and Huff 1987). They require cavities in large hollow snags or broken tops of live trees for nesting and night roosting. Nest snags are apparently at least 9.5m (31') tall and 51cm (20") dbh east of the Cascades (Thomas et al. 1979), and at least 12m (40') tall and 63.5cm (25") dbh west of the Cascades (Brown 1985). Suitable nest snags are often hollow and charred by fire. Nests have been found in hollow cavities close to the bottom of snags with broken tops and rotted trunks (Baldwin and Zaczkowski 1963). Vaux's swifts have also been occasionally observed nesting or roosting in chimneys and on cliffs (Jewett et al. 1953, Baldwin and Hunter 1963).

Vaux's swifts feed primarily on flying insects. All seral stages are apparently used for foraging (Brown 1985).

LIMITING FACTORS: Unknown, but likely related to the availability of hollow snags in old-growth forests.

MANAGEMENT RECOMMENDATIONS: Vaux's swifts find optimum habitat, and thus reach greatest densities, in old-growth forests in the Douglas-fir region (Meslow et al. 1981). Consequently, patches of mature (older than 100 years) or old-growth forest should be maintained where Vaux's swifts occur (Mannan et al. 1980). To preserve older forest stand conditions, these patches should be managed over long (>200-year) rotations with all snags and large defective trees retained (Cline et al. 1980, Neitro et al. 1985). Long rotation stands should be interspersed among younger, intensively managed stands (Cline et al. 1980).

Snags in younger managed stands should also be retained for use by Vaux's swifts in order to insure that large snags are available across the entire spectrum of successional stages. Leave large snags (>20cm dbh) in different

stages of deterioration in clear cuts and thinning cuts. Large defective trees, especially those showing signs of decay such as butt rot, broken tops, fungal conks, dead branch stubs, or other defects should be left (Cline et al. 1980, Neitro et al. 1985).

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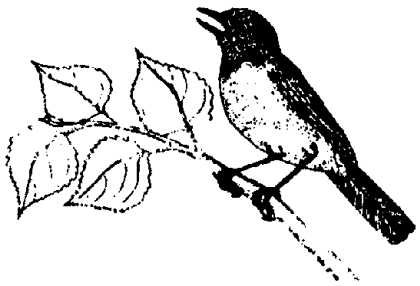
KEY POINTS:

Habitat Requirements:

- Nest in mature and old-growth coniferous forests.
- Cavity nester.

Management Recommendations:

- Retain patches of mature and old-growth forest habitat.
- Retain large snags and large "defective" trees in younger, managed stands.



Washington Department of Wildlife

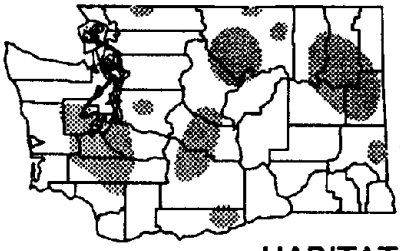
Management Guidelines for Species of Concern

Sialia mexicana

Western Bluebird

RANGE: Breeds in southern British Columbia and the western half of the United States. Generally winters in the southern portions of its breeding range (Jackman and Scott 1975).

WASHINGTON DISTRIBUTION: Throughout the lowlands and foothills of the state, but more common in eastern Washington.



HABITAT REQUIREMENTS: Western bluebirds feed on insects in clearings, old farms, fields, pastures, burned areas with snags, and other open areas with scattered trees. Insects are most commonly captured on the ground from a low perch, such as a fence post (Bent 1949). Nests are built in snags in abandoned woodpecker holes and natural tree cavities.

LIMITING FACTORS: Availability of nest cavities located in or near open feeding areas.

MANAGEMENT RECOMMENDATIONS: Western bluebirds require cavities for nesting. Snags 10' tall and 15" dbh (diameter at breast height) or greater should be left in and around the edges of clearcuts (Brown 1985). Defective trees with heartrot, distortions, or damage should also be left as potential nest sites (Jackman and Scott 1975). Clearings and snags created from forest fires should be left to succeed naturally whenever possible.

Where cavities are lacking, bird houses may be used to increase bluebird populations. Fig. 1 shows a good design for a bluebird nest box. Bluebird boxes should be deep, at least 6" from the entrance hole to the floor, and the roof should be slanted (Walter 1984). Care should be taken to place nest boxes to minimize competition from house sparrows. Locate boxes well away from houses or outbuildings where house sparrows are common.

Dimensions of the entrance hole to the nest box is critical. A 1 1/2" diameter hole is recommended to discourage starlings from entering the boxes. A rectangular hole 1 1/2" high by 1 1/4" wide will usually keep house sparrows out. Do not provide a perch below the hole; this is unnecessary and encourages house sparrows and other predators.

Bluebird boxes may face any direction other than northeast to northwest and should be put up in February and March. If predators such as cats or raccoons

are not prevalent, placing the box low, between 4-6' high, may also help to discourage sparrows. Any starlings or house sparrows which usurp a bluebird box should be removed and their nests and young destroyed.

Boxes placed in pairs have been successful in providing swallows with nest sites and keeping them from evicting bluebirds. However, no more than two boxes should be placed in any location because swallows will tolerate other swallow pairs nearby. If many swallows are nesting in the vicinity, they may mob and chase off bluebirds (Walter, pers. comm.). Nest box locations should be a minimum of 100 yards apart, whether a location has a single or paired boxes.

Western bluebirds often have two broods per season. It is advantageous to clean out boxes between broods, to encourage renesting. Cleaning out boxes between nesting seasons promotes longer nest box life, discourages overwintering nest parasites, and prevents nest material from building up. If the nest material is built up too high, starlings may be able to grab nest material or young bluebirds from the box (Walter, pers. comm.).

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KEY POINTS

Habitat Requirements:

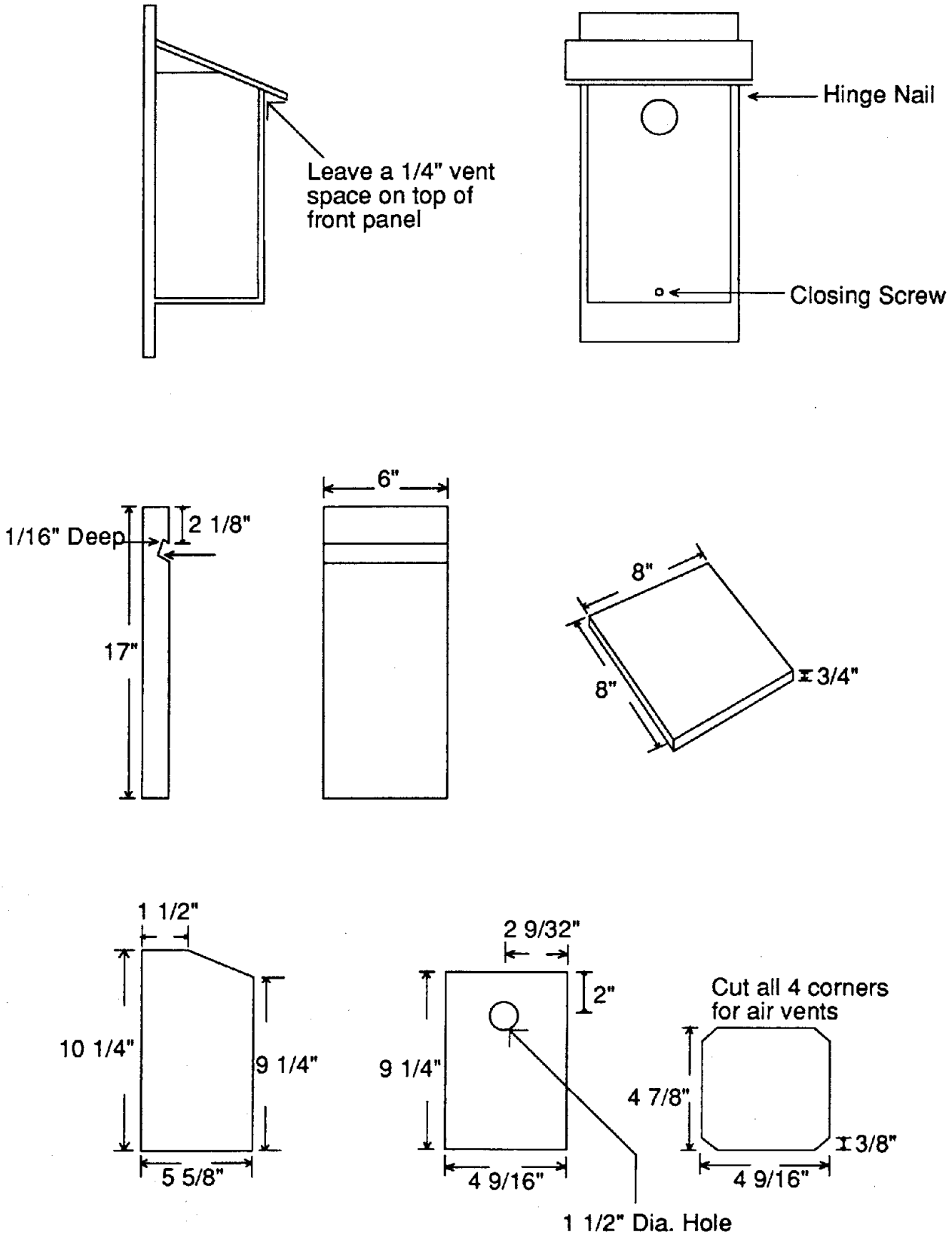
- Nest in tree cavities and in bird boxes.
- Feed on insects in open areas with scattered trees.

Management Recommendations

- Retain snags and defective trees around the edges of clearings.
- Install bird boxes where snags are lacking but habitat is otherwise suitable.

Figure 1
(Courtesy of George Walter)

Bluebird Box



Washington Department of Wildlife

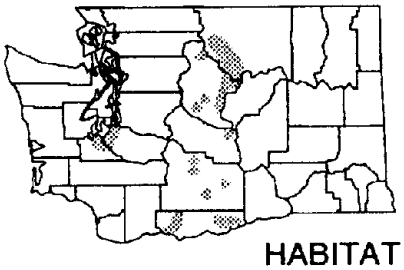
Management Recommendations for Priority Species

Sciurus griseus

Western Gray Squirrel

RANGE: Central Washington on either side of the Cascade Mountains south to northern Baja (Hall and Kelson 1959).

WASHINGTON DISTRIBUTION: Puget Trough from Pierce County south and scattered localities east of the Cascades from the Methow Valley, Okanogan County to Klickitat County.



HABITAT REQUIREMENTS: Barnum (1975) and Rodrick (1987) found western gray squirrels in three distinct habitat types: Oregon white oak/prairie association with interspersed Douglas fir; the grand fir-Douglas fir zone with planted walnuts in the Lake Chelan and Methow Valley regions; and valleys with oak-ponderosa pine woodlands in the Columbia Gorge.

Food habits studies have not been conducted for western gray squirrels in Washington. Studies from California (Cross 1969, Steinecker 1977, Steinecker and Browning 1970) show that the following plants accounted for over 90% of the squirrels' diet: truffles (hypogeous fungi), acorns, pine nuts, California bay fruit (not found in Washington), and leaf and stem fragments. Barnum (1975) found that acorns were important fall and winter foraging items, and that pine nuts were important in summer. Native hazel or filbert (*Corylus cornuta*) is thought to be an important mast item in western Washington (Rodrick 1987).

Western gray squirrels sometimes nest in cavities located in large, old, live and dead hardwoods and conifers. They also build stick nests in the crotch of these trees.

Disease was a major factor in the decline of Western grays in the 1930s (Cross 1969). This protected squirrel has been overhunted by hunters primarily seeking other types of game (Manuwal 1989).

LIMITING FACTORS: Availability of mature oak-pine and oak-fir forest with adequate water, which is undisturbed by urbanization and traffic. Availability of suitable cavities in large old oaks and conifers.

MANAGEMENT RECOMMENDATIONS: Pine-oak and fir-oak forests and oak/prairie associations should be protected from urbanization and excessive removal of mast-producing trees in order to maintain western gray squirrel food and nesting resources. In areas where

former western gray squirrel habitat has been lost due to reduction or elimination of oaks, oak and nut trees can be planted to restore habitat (Asserson 1974, Barnum 1975). Johnson (1988) provides numerous management tips for landowners living among oaks.

If significant seedling mortality or stunting of trees occurs from grazing, grazing should be reduced or protective exclosures should be provided for saplings until they grow beyond the reach of livestock (Passof et al. 1985).

Gaulke and Gaulke (1984) noted traffic as a potential problem for squirrel populations at the Oak Creek Wildlife Area in Yakima County. Road and squirrel hunting closures in important western gray squirrel habitat would help reduce mortality.

Introduced eastern gray squirrels have begun to appear in some urbanizing portions of historical western gray squirrel habitat and may compete with the western gray squirrel for resources (Rodrick 1987). Predation by domestic dogs and cats may also be a problem (Cross 1969, Asserson 1974, Barnum 1975). Development should be restricted in areas where western gray squirrel presence is documented. Competition with the Beechey's (California) ground squirrel may be occurring in Klickitat County (Rodrick 1987).

In some areas, habitat enhancement, through placement of nest boxes may benefit squirrels. Western gray squirrels in north central Oregon would use squirrel nest boxes only when they were filled with nesting material to create a 10"by 10" space (Foster, pers. comm.).

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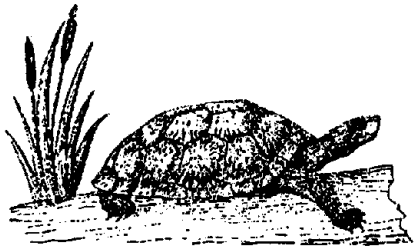
KEY POINTS: Habitat Requirements:

- Oregon white oak - prairie association/hemlock.
- Grand fir-Douglas fir zone with walnuts - Chelan County and Methow Valley.
- Oak-Ponderosa pine woodlands - Columbia Gorge.
- Diet - Acorns, pinenuts hazelnuts.
- Cavities for nesting in large old oak and conifers.

Management Recommendations:

- Protect oak forest and prairie association from development.
- Retain mast producing trees.
- Where previously removed, replant oaks and nut trees.
- Remove grazing for a period to allow oak regeneration.
- Nest boxes may be used in some circumstances.
- Road and squirrel hunting closures in priority habitat areas.



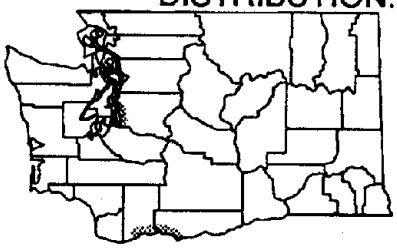
Washington Department of Wildlife
Management Recommendations for Priority Species

Clemmys marmorata

Western Pond Turtle

RANGE: Found along the Pacific coast of North America from extreme southwestern British Columbia to northwestern Baja.

WASHINGTON DISTRIBUTION:



Populations in Washington are confirmed only in Klickitat and Skamania Counties. Individual turtle sitings have recently been confirmed in Pierce and King Counties, which are part of the turtle's historical range. Historical records also exist for Clark and Thurston Counties. The western pond turtle is classified as a threatened species in Washington.

HABITAT REQUIREMENTS: Western pond turtles have been found in marshes, ponds, sloughs and small lakes in Washington (Slater 1939). Generally, they inhabit waters with abundant aquatic vegetation and protected shallow areas where the juveniles may rest and feed under cover. Adults require logs, banks or floating vegetation for basking during sunny hours. Generally, females deposit eggs in soft soil on upland sites (Storer 1930, Stebbins 1954, Nussbaum et al. 1983). In Washington, nest sites have been located in somewhat rocky soil with good sun exposure, at distances ranging from 44m to 183m (144'-600') from water (Holland, pers. comm.).

Western pond turtles are opportunistic feeders and eat a wide variety of small aquatic animals and vegetation. However, females and juveniles apparently prefer live or dead animal tissue to plant material (Bury 1986).

This species is often extremely shy and easily disturbed. Vegetation which provides enough cover to hide under when the turtles are disturbed appears to be an important habitat component.

In winter, the turtles hibernate on the pond bottoms, burying themselves in soft mud or sand.

LIMITING FACTORS: Unknown, but may be related to the availability of shallow areas with sufficient vegetative cover for juveniles, predation from introduced frogs and fish, or habitat degradation through filling or draining wetlands.

MANAGEMENT RECOMMENDATIONS: Western pond turtles bask out of water several hours each day (Bury and Wolfheim 1973). Leave any emergent logs or stumps in the water; or provide logs if basking sites are limited or unavailable. Alterations to wetlands such as draining or filling, which remove protected shallow areas or cause vegetation to become so dense that the turtles cannot maneuver through them, should be avoided.

Adult turtles may travel several hundred meters to get to nesting sites (Storer 1930), or move between ponds. In Washington, nests have been located up to 200 meters (660') away from water (Holland, unpubl. data). Avoid constructing barriers such as bulkheads, roads, ditches, or chain link fences within a radius of at least 200 meters (660') around wetlands occupied by pond turtles. Disturbing habitat in such a way as to create vegetation that is too dense for turtles to maneuver in and around wetlands should also be avoided. Protect nearby sunny slopes and other nearby open sites where eggs may be laid from trampling by people, livestock, or vehicles.

Bullfrogs and bass are not native to Washington and may prey on young turtles. Introduced carp may damage the vegetative component of the turtle's habitat. These species should not be introduced into turtle ponds or their vicinity and should be removed or controlled in ponds that support turtles. Release of pet store turtles may introduce disease into the wild population.

Removal of vegetative cover is likely to be detrimental to western pond turtles. Thus herbicides should not be applied if such action will destroy all available cover in all or part of a wetland. Applications of pesticides and other chemicals that could eliminate food sources or have a toxic effect on turtles should also be avoided near sites occupied by western pond turtles.

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Slater, J.R. 1939. *Clemmys marmorata* in the state of Washington. Occasional Papers, University of Puget Sound 4:212-233.

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KEY POINTS:

Habitat Requirements:

- Inhabit ponds, small lakes, and other wetlands with abundant aquatic vegetation and protected shallow areas.
- Require logs, banks, or floating vegetation for basking.
- Lay eggs on banks or open areas in adjacent uplands.
- Hibernate during winter in mud or sand on bottom.

Management Recommendations:

- Leave emergent logs and stumps in the water; provide logs if basking sites are lacking or limited.
- Avoid modifing wetlands so that protected shallow areas are eliminated or aquatic vegetation becomes so dense that turtles cannot maneuver through it.
- Avoid constructing barriers such as roads, ditches, and chainlink fences in or around wetlands.
- Avoid disturbance that could cause vegetation in and around wetlands

to become extremely dense.

- Protect banks and sunny slopes and other open sites on adjacent uplands from excessive trampling by livestock, people, and vehicles.
- Avoid introducing bullfrogs, non-native fish, and pet turtles into ponds used by western pond turtles; remove these species if they are present.
- Avoid applying pesticides or herbicides to water where turtles are found.

Dendrocopus albolarvatus

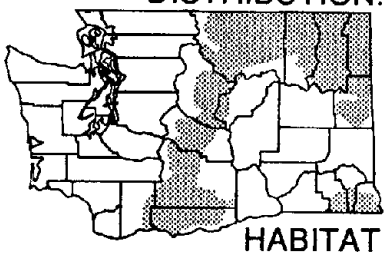
Washington Department of Wildlife

Management Recommendations for Priority Species

White-headed Woodpecker

RANGE: Southern British Columbia and Idaho to southern California.

WASHINGTON DISTRIBUTION: Ponderosa pine forests on the east slopes of the Cascade Mountains and eastern Washington. Uncommon throughout range, but locally abundant in optimal habitat.



HABITAT REQUIREMENTS: Primarily birds of mature ponderosa pine forests, white-headed woodpeckers require large, decayed snags and forage mainly on large ponderosa pine trees in the puzzlebark stage (> 60 cm or 24") (Jackman and Scott 1975, Thomas, 1979, Lang et al. 1980). White-headed woodpeckers prefer to forage for insects on the scaly bark of trees and, during winter, feed heavily on seeds from unopen pine cones (Ligon 1973). Ponderosa pine does not produce heavy seed crops until 60-100 years of age (Lang et al. 1980).

Little information is available on the nesting ecology of the white-headed woodpecker. Breeding season is from mid-April to early August. It excavates cavities in dead or dying trees with a preference for ponderosa pine.

Thomas (1979) suggests a minimum nest tree dbh of 25 cm (10"). This appears to be based on Bent (1964) which notes eight nests in tall stumps averaging 60 cm (24") at nest height, 2.5 m (8') above the ground. In northern California the diameter range of 11 nest trees was 41-97 cm (16-38") with a mean dbh of 65 cm (25") (Raphael and White 1984).

The home range for this woodpecker in northeast Oregon averages 8 ha (20 ac) (Thomas 1979). The size may vary depending on habitat quality. Also, since this species regularly drinks water, a water source may be required within its home range (Lang et al. 1980).

This species has low versatility because of its primary association in Washington with only two forest types and two stand conditions (Lang et al. 1980).

LIMITING FACTORS: Extent of mature ponderosa pine forests with adequate snags for nesting.

MANAGEMENT RECOMMENDATIONS: White-headed woodpeckers require mature (especially ponderosa pine) forests for survival. Forest management practices, which maintain mature forests or include only moderate selective cutting are necessary to maintain populations of white-headed woodpeckers. Large trees should constitute 40-70% of the forest canopy (Neitro et al. 1985).

Where cutting takes place, Neitro et al. (1985) suggest leaving 150 snags > 25 cm (10") dbh per 100 hectares (60 snags/100 ac) to keep white-headed woodpecker populations at maximum levels. Conner (1979) notes that managing for the minimum habitat components may cause gradual population declines. Instead, he suggests using average values. Thus, the mean dbh of 65 cm (25") is preferred and additional live trees should be left for feeding.

Woodpeckers, along with other insectivores, play an important role in reducing insect populations at endemic levels. Biological control of forest insects is preferred over use of insecticides. It has a longer term effect to regulate future insect outbreaks and is less costly and nontoxic. Management to increase woodpecker populations should have the secondary benefits of increasing other insectivorous, cavity-nesting birds (Takekawa et al. 1982).

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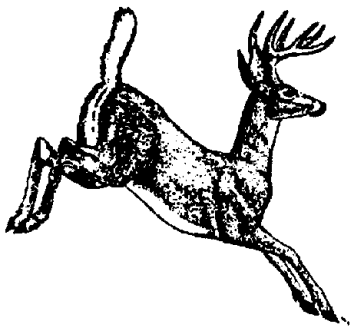
KEY POINTS

Habitat Requirements:

- Mature ponderosa pine and mixed conifer forests.
- Nests in snags averaging 25" dbh (minimum 10" dbh).
- Home range averages 20 ac and may require a water source.
- Forages on insects in large (> 24" dbh) snags and during winter on pine seeds.

Management Recommendations:

- Maintain mature ponderosa pine and mixed conifer with 40-70% canopy closure.
- Where timber harvest occurs, use moderate selective cuts and retain 60 live and dead ponderosa pine trees > 25" dbh per 100 ac.
- Limit insecticide use and promote biological insect control.



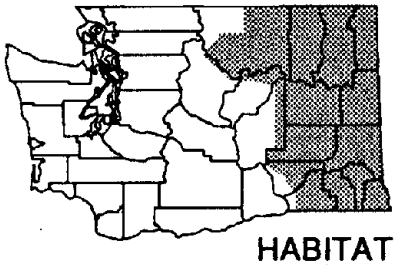
Washington Department of Wildlife Management Recommendations for Priority Species

Odocoileus virginianus Ochrourus

White-tailed Deer

RANGE: In appropriate habitats the 30 subspecies of white-tailed deer (*Odocoileus virginianus Ochrourus*) fares well from near treeline in southern Canada (60 degrees north latitude) to sub-equatorial South America (15 degrees south latitude). (Taylor 1956, Trefethem 1970, Whitehead 1972).

WASHINGTON DISTRIBUTION: White-tailed deer are native to Washington and were found in abundance in some foothills and valleys of the northwest by white explorers and trappers in the early 1800's (Pengally 1961, and Allen 1971).



White-tailed deer are currently found throughout the ten far eastern counties of Washington and in north central Washington (Okanogan). Highest deer densities are found in northeastern Washington (Stevens, Pend Oreille, and Spokane counties). The white-tailed deer is expanding its range in eastern Washington to the west and south of existing populations.

HABITAT REQUIREMENTS: White-tailed deer require a juxtaposition of food, cover, and water as do all wildlife species. The importance of edge effect to white-tailed deer has always been known and is becoming increasingly documented (Alverson 1988).

Elevations occupied by whitetails range from the lowest elevations to more than 2000m (6,500')(Peek 1984). Concentrations are highest in the lower elevations (below 1200m [4,000']). Whitetails are seldom found in the subalpine and alpine forests.

The habitat of white-tailed deer includes riparian areas, mixed species woodlands, agricultural croplands, forests with multiple successional stages, burned over shrub fields, and short diversified slopes rather than long open slopes. Fields and open slopes are used but generally thick shrub or tree cover is nearby.

Although many whitetails live their entire lives in relatively small areas (1-3 sq. miles), a high percentage of our whitetails move up to 12km (20 mi.) between summer and winter ranges. Migration for whitetails is a function of the habitat rather than of the deer species (Kramer 1972).

Winter Range - Winter range is determined by a combination of factors: elevation, slope, aspect, snow depth, browse quantity and quality, presence of closed canopy mature forests (snow intercept cover), temperatures and traditional deer movement patterns.

Closed canopies of mature forests along streams and at lower elevations are extremely important whitetail habitat. Closed canopy mature forests are needed to provide cover during severe winters or where snow depth exceeds

46cm (18")(Peek 1984). Whitetails move about more easily beneath trees where snow depths are less than in the open. They often develop trails that provide access to feeding areas adjacent to suitable winter cover.

Traditional high concentration whitetail winter ranges in northeast Washington are on southwest to southeast aspects which reduce snow accumulation due to solar energy. High use range extends to at least 850m (2,800') elevation on these aspects. Steepest slopes may extend over 900m (3,000'). On west and east slopes use is generally below 670m (2,200') and on north slopes below 600m (2,000'). Many deer winter above these elevations but are more dependent on snow intercept cover, low precipitation, or special climatic impacts such as Lake Roosevelt.

Primary winter browse includes: redstem ceanothus, evergreen ceanothus, serviceberry, rose, Oregon grape, chokecherry, willow, dogwood, snowberry, Douglas fir, and any available forb or agricultural crop (alfalfa, grain seed heads, etc.)

Spring Range - Whitetails concentrate on open slopes and fields of grasses, forbs, winter wheat, and alfalfa where it is available as soon as temperatures promote green-up. This is a time when the deer fat reserves are at the lowest so these areas may be very important to population survival and productivity. Escape and thermal cover near these areas is important.

Summer/Fall Range - High diversity in forest successional stages with brushy escape cover in close proximity to food sources high in succulence and protein is optimal. Our highest deer numbers are found where small irrigated alfalfa fields are bordered by timber and brushlands.

Fall hunting pressure, especially on bucks, can be a limiting factor in local habitats due to increased road access.

Late Fall/Early Winter Range - Snow begins to accumulate in the higher elevations in November. Snow intercept cover and travel corridors on southeast to southwest slopes from at least 1200m (4,000') down to lower winter ranges can allow many whitetails to use these areas until late December in many years. This saves browse in the lower ranges for later use. Riparian areas can be important as travel corridors but by themselves are usually not enough to ensure adequate travel corridors.

LIMITING FACTORS:

Winter snow depth severely limits distribution of whitetails. Whitetails prefer wintering areas that have snowpacks less than 30cm (12") deep for any extended period (Lustig 1972). Where movement to lower elevation habitats is possible, whitetails will generally leave areas after 25-43cm (10-17") of snow accumulation. Winter weather (snow accumulation, temperature, duration) and the quality and quantity of available winter range are the primary limiting factors for whitetail populations in Washington.

MANAGEMENT RECOMMENDATIONS:

The negative impacts of open roads on the use of adjacent habitat by big game is well documented (Perry and Overly 1977, Thomas 1979). Current road densities in white-tailed deer range generally exceed desired levels for impacts on white-tailed deer and other wildlife. The few remaining roadless areas should be maintained for wildlife benefits and to provide recreational opportunities to these limited access areas.

All new road construction should be closed to motorized public use. Existing roads should be closed to motorized public use where densities exceed 1.5

mi./sq. mi. on summer range or 0.5 mi./sq. mi. on winter range. Road construction standards should be the minimum feasible and screening vegetation retained. Roads, landings, and skid trails should be planted to grasses and especially clover. This will provide increased forage and control noxious weeds.

Logging, farming, and small wildfires have created the diversified habitats that have resulted in the increase in the white-tail populations in our best white-tailed deer areas.

Timber cuts and prescribed burns should be restricted to less than 8 ha (20 acres) in size and selection cuts that do not reduce overstories to less than 70 percent crown closure should be used if important whitetail habitat is to be logged (Mundinger 1981, Owens 1981). Distance to cover is optimum at 90m (300') and should not exceed 180m (600')(Thomas 1979). Irregular shaped cuts maximizing the amount of edge between habitat types provides improved benefits to white-tailed deer.

Manage winter habitat to retain adequate closed canopies of mature forests for snow interception (Peek 1984). This cover type should cover about 50 percent of the area in stands at least 180m (600') across.

Manage forage areas (especially on winter range) through logging and controlled burning to create a variety of young successional stages with a large component of preferred shrubs and forbs.

Prescribed burning, agricultural crops, and range fertilization are other tools that could improve winter range forage areas.

Manage summer and spring/fall transitional ranges with adequate travel corridors (with snow intercept cover). This should include not only riparian areas but also natural travel lanes often including ridges and south facing slopes. Travel corridors should provide contiguous pieces of habitat from summer to winter range.

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Whitehead, G.K. 1972. Deer of the world. London: Constable. 194 pp.

KEY POINTS:

Habitat Requirements:

- Need food, water, and cover in close proximity within each three sq. mile area.
- Optimal deer habitat is small irrigated alfalfa fields bordered by timber and brush lands.
- Disturbance and open roads reduce use of winter and fawning habitat.

Management Recommendations:

- Timber cuts and prescribed burns should be restricted to less than 20 acres in size.
- Timber harvest should not reduce overstories to less than 70 percent crown closure.
- Maintain 50 percent of habitat in mature stands of conifers at least 600 feet in diameter.
- Maintain quality, disturbance free fawning areas and reduce disturbance during winter.
- Maintain minimum feasible road construction standards and maintain road densities below 0.5 mile per mile of habitat on winter range.

Coccyzus americanus

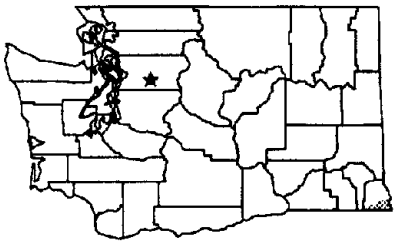
Washington Department of Wildlife

Management Recommendations for Priority Species

Yellow-billed Cuckoo

RANGE: A rare breeding species in deciduous, riparian woodlands from southern British Columbia south through California to western Mexico, and east from southern Idaho through western Colorado and western Texas. Winters throughout much of South America east of the Andes (USFWS 1985).

WASHINGTON DISTRIBUTION: Formerly Washington, but disappeared from its breeding range in the 1930's (Roberson 1980). Five sightings have been reported since 1934 from Grant, Okanogan, King, Snohomish and Benton Counties. A 1990 breeding record for the Grande Ronde River in Oregon indicates that cuckoos could be nesting along the Washington section of this river as well.



HABITAT REQUIREMENTS: Yellow-billed cuckoos generally nest in deciduous woodlands associated with riparian and wetland habitats. In California, this species has been found in dense willow-cottonwood forests and marshy bottomlands with scattered thickets of willows (Gaines and Laymon 1984), and in orchards (Laymon 1980). Nests are built on horizontal branches located 1.2m-4.5m (4 - 15') above the ground (Laymon 1980, Jewitt et al. 1953).

Dense foliage, especially within 9m (30') of the ground is a more important habitat component than tree height or dispersion. Yellow-billed cuckoos use saplings 1.8m-9m (6' - 30') in height as well as old-growth trees 9m-24m (30' - 80') tall in California (Gaines and Laymon 1984). This species apparently requires larger tracts of habitat compared to other birds of comparable size. Gaines (1974 in Gaines and Laymon 1984) found very few cuckoos in California where riparian vegetation was less than 91m (300') wide and under 10 ha (4 acres) in area.

Yellow-billed cuckoos feed exclusively on insects. In California, Laymon (1980) found cuckoos preferred large, green food items, such as katydids and sphinx moth larva; foraging was observed in riparian areas and orchards. Nolan and Thompson (1975) found that cuckoos in Indiana fed heavily on cicadas and timed their nesting around cicada eruptions in years of periodic outbreaks.

The breeding season for yellow-billed cuckoos in California is from mid-June to mid-August. Availability of food during this time may limit this species. Yellow-billed cuckoos do not establish breeding territories, a behavior which may allow birds from different nests to share in food that is locally available for a limited time period (Laymon 1980).

LIMITING FACTORS: Unknown in Washington. Availability of riparian habitat and food appear to limit yellow-billed cuckoos in California (Laymon 1980).

MANAGEMENT RECOMMENDATIONS: Suitable riparian habitat should be surveyed to determine where cuckoos nest in Washington. When these areas are identified, the following management recommendations should be applied. Do not remove riparian vegetation where yellow-billed cuckoos occur. Cuckoo habitat areas should be a minimum of 4 ha (10 acres) in size (Gaines and Laymon 1984). Within riparian habitats, this species may nest in early to mid-successional vegetation and forage in late successional vegetation. Therefore, activities such as bank stabilization and channelization projects, which alter normal plant succession in riparian woodlands should not occur in known cuckoo habitats (Laymon 1980).

Long term livestock grazing reduces the structural diversity and density of riparian vegetation, resulting in a simplified habitat incapable of supporting many bird species (USFWS 1985). Where yellow-billed cuckoos are found, riparian areas should be fenced to prevent livestock from altering the existing habitat.

Prohibit insecticide spraying in riparian corridors used by cuckoos (USFWS 1985, Gaines and Laymon 1985). To avoid accidental wind drift into riparian areas, aerial application of pesticides should not occur on adjacent lands when winds exceed 9.6 km (six miles/hour). Insecticides should not be applied between June 15 and August 15 to agricultural sites where yellow-billed cuckoos forage (Laymon 1980).

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KEY POINTS:

Habitat Requirements:

- Deciduous riparian/wetland woodlands (large tracts).
- Diet-insects.

Management Recommendations:

- Retain existing and potential habitat, > 10 acre blocks.
- Fence to exclude livestock.
- Avoid bank stabilization and channelization.
- Avoid insecticide use.

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