75 E. OTHER SPECIES OF CONCERN IN THE AREA COVERED BY THE HCP

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E. Other Species of Concern in the Area Covered by the HCP

For the purposes of this HCP, species of concern are defined as those wildlife species that are (a) listed by the federal government as threatened or endangered, (b) listed by the state as threatened, endangered, or sensitive, or (c) proposed as candidates for listing by the federal or (d) state government. Previous sections of this chapter discuss habitat needs of the federally listed species and of anadromous salmonids and bull trout. This section provides information on habitat needs of other federal candidate species and state-listed and state candidate species that have no federal status. The species are organized in the following taxonomic groups: mollusks, arthropods, fish, amphibians, reptiles, birds, and mammals. The section starts with Table III.14, which lists for each species its federal and state status and in which HCP planning unit each could potentially occur.

At the time of writing the draft HCP and the draft EIS, the U.S. Fish and Wildlife Service used a system of classifying species that were candidates for listing as threatened or endangered into separate categories. Category 1 species were those for which the Service had sufficient information to issue a proposal for listing. Category 2 species were those for which existing information indicated that listing was possibly appropriate but sufficient data did not exist on the biological status of the species or threats to that species to warrant the issuance of a proposed rule. Both category 1 and category 2 species were considered as species of concern in the draft HCP and Draft EIS. On February 28, 1996, the U.S. Fish and Wildlife Service published an updated list of candidate species using a revised categorization system (Federal Register v. 61, no. 40, p. 7596). Former category 1 species are now referred to simply as candidates for listing. Former category 2 species are no longer considered candidates for listing, though most of them have been retained on a list of federal species of concern (Federal Register v. 61, no. 40, p. 7596). There are now two species in the HCP Planning Area that are candidate species - the spotted frog and bull trout. This section reflects the change in federal candidate status of unlisted species of concern as of the date of HCP approval and issuance of the Incidental Take Permit. Descriptions of former category 2 taxa are retained and still considered species of concern for the purposes of this HCP. Additionally, there are six species that were formerly listed as federal category 2 that are considered sensitive but have no official state or federal status.

Table III.14: Other species of concern by federal and state status and their potential occurrences in the HCP planning units

Federal candidate - Substantial data support listing the species as endangered or threatened; listing proposals are either under way or delayed.

Federal species of concern - Data point to listing species but not conclusively; additional data are being collected.

Other sensitive species - formerly listed as federal category 2.

Under state status, S = state; E = endangered; T = threatened; C = candidate; M = monitor; G = game; Sen = sensitive.
OESF = Olympic Experimental State Forest.

		Planning Unit								
Species	**State status**	**Klickitat**	**Columbia**	**South Coast**	**South Puget**	**Yakima**	**Chelan**	**North Puget**	**Straits**	**OESF**
Federal candidate										
spotted frog	SC	X	X		X	X	X	X		
Federal species of concern										
Newcomb's littorine snail	SM			X						
California floater	—	X	X			X	X			
great Columbia River spire snail	SC	X	X							
Beller's ground beetle	SC				X			X		
Hatch's click beetle	SC				X			X		
Fender's soliperlan stonefly	—		X		X					
river lamprey	—		X	X	X			X	X	X
Pacific lamprey	—	X	X	X	X			X	X	X
Larch Mountain salamander	SSen	X	X							
tailed frog	SM	X	X	X	X	X	X	X	X	X
Cascades frog	—	X	X		X	X		X	X	X
northwestern pond turtle	SE	X	X		X			X		
northern goshawk	SC	X	X	X	X	X	X	X	X	X
olive-sided flycatcher	—	X	X	X	X	X	X	X	X	X
long-eared myotis	SM	X	X	X	X	X	X	X	X	X

Table III.14: Other species of concern by federal and state status and their potential occurrences in the HCP planning units *(continued)*

Species	State status	Planning Unit: Klickitat	Columbia	South Coast	South Puget	Yakima	Chelan	North Puget	Straits	OESF
Federal species of concern *(continued)*										
fringed myotis	SM	X	X			X				
long-legged myotis	SM	X	X	X	X	X	X	X	X	X
small-footed myotis	SM	X	X			X				
Townsend's big-eared bat	SC	X	X	X	X	X	X	X	X	X
Pacific fisher	SC		X	X	X	X	X	X	X	X
California wolverine	SM		X		X	X	X	X		
lynx	ST						X			
California bighorn sheep	SG					X	X			
State-listed, no federal status										
sandhill crane	SE	X	X							
western gray squirrel	ST	X			X	X	X			
State candidate, no federal status										
Olympic mudminnow	SC		X	X	X				X	
long-horned leaf beetle	SC							X		
Dunn's salamander	SC			X						
Van Dyke's salamander	SC		X	X	X				X	X
California mountain kingsnake	SC	X	X							
common loon	SC			X	X		X	X	X	X
golden eagle	SC	X	X	X	X	X	X	X	X	X
Vaux's swift	SC	X	X	X	X	X	X	X	X	X
Lewis' woodpecker	SC	X	X	X	X	X	X	X	X	

Table III.14: Other species of concern by federal and state status and their potential occurrences in the HCP planning units *(continued)*

Species	State status	Planning Unit: Klickitat	Columbia	South Coast	South Puget	Yakima	Chelan	North Puget	Straits	OESF
State candidate, no federal status *(continued)*										
pileated woodpecker	SC	X	X	X	X	X	X	X	X	X
purple martin	SC	X	X	X	X			X	X	
western bluebird	SC	X	X	X	X	X	X	X	X	
Other sensitive species										
Lynn's clubtail	—	X				X				
green sturgeon	—		X	X						
northern red-legged frog	—		X	X	X			X	X	X
Harlequin duck	SG	X	X	X	X	X	X	X	X	X
black tern	SM	X				X	X			
little willow flycatcher	—	X	X	X	X	X	X	X	X	X
Yuma myotis	—	X	X	X	X	X	X	X	X	X

Federal Candidate Species, Federal Species of Concern, State-listed Species, State Candidate Species, and Other Sensitive Species

MOLLUSKS

At least 120 species of mollusks occur in Washington. However, many species have yet to be described, and the distribution and habitat requirements of those that have been described are still not well understood (Frest 1993; Frest and Johannes 1993; Neitzel and Frest 1993). None of the 120 species are currently listed by either the federal or state government. Three are federal species of concern (Federal Register v. 61, no. 40, p. 7569) and numerous others are species of special concern.

This section is a summary of information obtained primarily from three mollusk experts: T. Burke (Washington Department of Wildlife), T. Frest (Deixis Consultants, Seattle), and A. Stock (Washington Natural Heritage Program). It addresses only the three federal species of concern that may occur in the area covered by the HCP. These are Newcomb's littorine snail (*Algamorda newcombiana,* a.k.a. *Littorina subrotunda*), an estuarine snail; the California floater (*Anodonta californiensis*), a freshwater clam; and the great Columbia River spire snail (*Fluminicola columbianus*), a freshwater snail (WDW 1993a).

Newcomb's Littorine Snail

Newcomb's littorine snail is also a state monitor species (WDW 1993a). This is an estuarine species that is known to occur near the high-tide mark in *Salicornia* salt marshes near Grays Harbor in the South Coast Planning Unit.

California Floater

The California floater is a freshwater clam that inhabits fairly large streams, lakes, and slow rivers including the Columbia, Wenatchee, and Okanogan rivers. Its original geographic distribution included Cowlitz, Clark, Skamania, and Klickitat counties.

Great Columbia River Spire Snail

The great Columbia River spire snail (a.k.a. Columbia pebblesnail), also a candidate for state listing (WDFW 1993a), is a freshwater species restricted to rivers and large streams with ample oxygen. Historically, the species inhabited the lower Columbia River and its major tributaries (Neitzel and Frest 1993). It now occurs in the Methow and Okanogan rivers in the Columbia, Klickitat, and possibly Chelan planning units, as well as in other rivers in eastern Washington, Oregon, and Idaho. The Methow River is the smallest stream the Great Columbia River spire snail is known to inhabit.

ARTHROPODS

From 85 to 90 percent of the total biota found in forests of the Pacific Northwest is composed of species of arthropods (Lattin 1993). This diverse group occupies a variety of habitats including, forests, streams, lakes, wetlands, lichen and moss habitats in arboreal and terrestrial situations, tree canopies, and riparian communities. In forests, arthropods play an important role in preparing litter, soil, and decaying logs for processing by fungi and bacteria (Shaw et al. 1991). Because many arthropods found in soil, litter, and decayed wood in old-growth conifer forests are wingless or flightless, habitat fragmentation is a severe obstacle to maintaining

biological diversity (Lattin 1990; Olson 1992). In addition, McIver et al. (1990) reported that arachnid communities are altered significantly when forests are clearcut.

Although several arthropod species are reported to be vulnerable to extinction due to their rarity or threatened state, few have been formally listed, primarily because of inadequate information or oversight. Lattin and Moldenke (1992) list a number of arthropods that could serve as indicator species for ecosystem health. Pyle (1989) presents a list of more than 200 Washington butterfly (Lepidoptera) species, their distribution, habitats, and potential threats.

Six species of arthropods that are known to occur or may occur in the HCP planning units are considered species of concern. One is federally listed (see Section C of this chapter titled Other Federally Listed Species), three are federal species of concern, one is a sensitive species, and one is a candidate only for state listing.

Beller's Ground Beetle

The Beller's ground beetle (*Agonum belleri*) is a federal species of concern and candidate for state listing (WDW 1993a). It occurs exclusively in eutrophic sphagnum bogs of Washington, Oregon, and southwestern British Columbia (Johnson 1986; WDW 1991) that are associated with lakes below 3,280 feet in elevation, where it likely scavenges plant and animal material (Dawson 1965; WDW 1991). In Washington, Beller's ground beetle is known to occur only in two DNR Natural Area Preserves — Snoqualmie Bog, located along the North Fork of the Snoqualmie River, and in Kings Lake Bog in King County.

Long-horned Leaf Beetle

The long-horned leaf beetle (*Donacia idola*) is a candidate only for state listing (WDW 1993a). It occurs specifically in lowland sphagnum bogs of Washington and southwestern British Columbia (WDW 1991). In Washington, this species has been documented historically only in Snohomish County and is currently known only at Chase Lake, near Edmonds. Long-horned leaf beetle larvae forage on submerged plants, while adults forage on the exposed portions of aquatic plants (White 1983).

Hatch's Click Beetle

Hatch's click beetle (*Eanus hatchi*) is a federal species of concern and a candidate for state listing (WDW 1993a). Like Beller's ground beetle, Hatch's click beetle inhabits eutrophic sphagnum bogs in or near lakes at less than 3,280 feetin elevation (WDW 1991). Adult beetles feed on honey, dew, pollen, nectar, and small soft insects (WDW 1991). This species occurred historically in Snohomish and King counties, but is now known to occur at only three bog sites located in central King County, including Kings Lake Bog Natural Area Preserve.

Fender's Soliperlan Stonefly

Fender's soliperlan stonefly (*Soliperla fenderi*) is a federal species of concern. One specimen was collected from St. Andrews Creek in Mount Rainier National Park. On the basis of the biology of other stonefly species the habitat requirements of Fender's soliperlan are met in and adjacent to water, preferably which is clean and well-oxygenated.

Lynn's Clubtail

Lynn's clubtail (*Gomphus lynnae*) is a sensitive species. This species of dragonfly is known to prefer large rivers, but it has also been recorded at mountain lakes. Lynn's clubtail breeds in silty water and tends to occur along low-elevation streams or rivers with a fair amount of siltation. All habitat requirements are assumed to occur within and adjacent to aquatic habitats (i.e., Types 1 through 5 waters).

FISH

Four species of fish considered species of concern (Federal Register v. 61, no. 40, p. 7596), not including anadromous salmonids and bull trout, are known to occur in the HCP planning units; two are federal species of concern, one is a candidate for state listing, and one is a sensitive species. Anadromous salmonids and bull trout are discussed in Section D of this chapter titled Salmonids and the Riparian Ecosystem.

River Lamprey

The river lamprey (*Lampetra ayresi*) is a federal species of concern . The main threats to its continued existence are thought to be dams on mainstream rivers and habitat degradation. A parasite of herring and salmon (Beamish and Youson 1987), the river lamphrey's range is along the Pacific coast from northern California to south-eastern Alaska (Wydoski and Whitney 1979). In Washington, the species probably occurs in most large coastal rivers (Wydoski and Whitney 1979). There are no records of its being caught for food (Scott and Crossman 1973).

Little is known about the river lamprey. It is anadromous. Adults enter fresh water from mid-September to late winter, and spawning occurs from April to June (Beamish 1980). Both sexes work to dig a single shallow nest in the gravel of stream riffles. Adults die after spawning. Eggs need clean cold water and clean gravel to survive. Ammocoetes (larvae) are filter feeders that consume plankton and remain in the fine sediments of streams for three to five years until they metamorphose into adults. They migrate to the sea from May to July (Beamish 1980). Adults remain at sea until mid-September (Beamish and Youson 1987).

Pacific Lamprey

The Pacific lamprey (*Lampetra tridentata*) is a federal species of concern. The main threats to its continued existence are thought to be dams on mainstream rivers and habitat degradation. Its range is along the Pacific coast from southern California to the Gulf of Alaska (Wydoski and Whitney 1979). The species is a parasite of salmon, and its freshwater range once matched that of its host. In Washington, the species occurs in most large coastal river systems, and it has been known to ascend the Snake River into Idaho (Wydoski and Whitney 1979). Historically, Native Americans harvested Pacific lampreys for food. Today, the species is commercially harvested to be used as bait.

The Pacific lamprey is anadromous. Adults enter fresh water in late spring and early summer. Spawning occurs from April to July of the following year (Beamish 1980). Both sexes work to dig a single shallow nest in the gravel of stream riffles. Adults die after spawning. Eggs need clean cold water and clean gravel to survive. Ammocoetes (larvae) are filter feeders that consume plankton and remain in the fine sediments of streams for approximately five years until they metamorphose into adults (Beamish and Levings 1991). They migrate to the ocean from March to July (Wydoski and Whitney 1979). Adults remain at sea for one year (Beamish and Levings 1991).

Olympic Mudminnow

The Olympic mudminnow (*Novumbra hubbsi*), a candidate for state listing in Washington, is jeopardized by its limited distribution and population isolation in drainages along the west coast of Washington, the Chehalis River, and the lower Deschutes River (Meldrim 1968; Harris 1974; Wydoski and Whitney 1979).

This mudminnow tolerates a wide range of water-quality conditions but is found most often in turbid water. However, it does not occur in newly silted areas containing only inorganic sediment. Although the mudminnow prefers cooler waters, it is found in water temperatures ranging from 32° to 70°F (Wydoski and Whitney 1979). Elevation restrictions are not reported in the literature, but on the basis of its preferred habitat, this species is not expected to occur in high-gradient streams at higher elevations.

Spawning and rearing habitats for the Olympic mudminnow are limited to ponds and marshy streams in coastal lowlands (WDW 1991) with the following characteristics: (1) at least several inches deep, (2) slow-flowing or still water, (3) choked with aquatic vegetation, and (4) soft mud bottom containing organic matter (Hagen et al. 1972; Harris 1974; Wydoski and Whitney 1979). The female lays eggs in the vegetation within a male's territory; the eggs are adhesive and stick to the vegetation. After the eggs hatch, the fry remain in the vegetation for seven days before dispersing from the hatching site (Wydoski and Whitney 1979).

GREEN STURGEON

The green sturgeon (*Acipenser medirostris*) is a sensitive species. The main threat to its continued existence is thought to be dams on mainstream rivers. Also, because the species lives up to 60 years (Emmett et al. 1991) and is a bottom feeder, it may bioaccumulate pollutants (Emmett et al. 1991). Its range is along the Pacific coast from Ensenada, Mexico, to southeast Alaska, and extends to parts of Asia (Emmett et al. 1991). In Washington, the species is known to occur in Willapa Bay and Grays Harbor (Wyd-oski and Whitney 1979: Emmett et al. 1991) and has been reported 140 miles upstream in the Columbia river. The commercial and sport green sturgeon fisheries in Washington are negligible (Wydoski and Whitney 1979).

The green sturgeon is anadromous. Little is known about its life cycle, but it is commonly assumed to be similar to that of the white sturgeon (*Acipenser transmontanus*) (Emmet et al. 1991; Wydoski and Whitney 1979; Scott and Crossman 1973). Eggs, larvae, and young juveniles of white sturgeon live in rivers. As juveniles mature, they move into deeper and more saline habitat (Emmett et al. 1991). White sturgeon mature late in life (Emmett et al. 1991); males are sexually mature at nine years of age and females at 13 to 16 years (Wydoski and Whitney 1979). Females carry from 60,000 to 140,000 eggs, but they do not breed every year (Emmett et al. 1991.) Adults move into fresh water in the fall and winter to spawn. The green sturgeon, like other sturgeons, probably uses large cobble as a spawning substrate (Emmett et al. 1991) they breed in the lower reaches of rivers in depths greater than 10 feet (Emmett et al. 1991).

AMPHIBIANS

Seven species of amphibians that occur in the area covered by the HCP are considered species of concern. One is a candidate for federal listing (Federal Register v. 59, no. 219, p. 58982-9028), three are federal species of concern, and one is a sensitive species. One of these is already listed by the state. Two additional species are candidates for listing by the state (WDFW 1995b).

Dunn's Salamander

Dunn's salamander (*Plethodon dunni*) is a candidate for state listing (WDFW 1995b) found in southwestern Washington, western Oregon, and the extreme northwestern corner of California. In Washington, the species is found only in the Willapa Hills (Leonard et al. 1993).

Dunn's salamanders are considered to be a highly aquatic species of woodland salamander (Leonard et al. 1993). They are commonly associated with seeps or streams located in heavily shaded areas (WDW 1991). The species inhabits the splash zone of creeks, typically under rocks and occasionally under woody debris (Leonard et al. 1993). It has also been found in talus where there is high humidity (Leonard et al. 1993). The principal management recommendation of WDW (1991) is the maintenance of riparian corridors along all stream types, but especially Types 4 and 5 streams. Additional recommendations exist for wet talus where the species is known to occur.

Larch Mountain Salamander

The Larch Mountain salamander (*Plethodon larselli*) is a federal species of concern; it is already listed by the state as sensitive (WDW 1993a). It was first described as a subspecies of the Van Dyke's salamander (*Plethodon vandykei*) (Burns 1954).

The Larch Mountain salamander's range (Herrington and Larsen 1985) is along about 40 miles of the Columbia River Gorge in Washington and Oregon. Most habitat for the Larch Mountain salamander is protected in the Columbia Gorge National Scenic Area (Leonard et al. 1993). Aubry et al. (1988) recently extended the range into two areas of the central Cascades of Washington. Larch Mountain salamanders have been found at a minimum of 35 sites in Washington (WDW 1993c). The Washington Department of Fish and Wildlife identifies the main Washington distribution as extending from the Washougal River to near the Klickitat River, with isolated populations occurring as far north as Lewis and King Counties (WDW 1991, 1993c). A disjunct population occurs inside a lava tube cave in the Mount St. Helens National Volcanic Monument. Larch Mountain salamander sites also occur at Archer Falls and along the Washougal River in the HCP's Columbia Planning Unit; however, surveys of potential habitat are needed to confirm actual presence.

The Larch Mountain salamander occurs at elevations between 165 and 4,100 feet (WDW 1993c) and appears to have fairly restricted habitat requirements, including stabilized talus ranging in length between 0.4 and 2.3 inches with soil deposits in the interstices. Larch Mountain salamanders are more common in areas where dense overstories of coniferous or deciduous trees help maintain higher moisture levels (WDW 1993c). Herrington and Larsen (1985) make a solid case for a direct, dependent relationship between this salamander and Pacific Northwest old-growth forests. In their study, one site (along Mabee Mines Road in Skamania County, Washington) consisted of two talus slopes separated by a creek. One talus slope had been clearcut 10 years before their study began, and no Larch Mountain salamanders were found in the cut-over area; however, the other talus slope, directly across the creek from the cut slope, was covered with mature forest and contained Larch Mountain salamanders.

No data exist regarding the population dynamics of the Larch Mountain salamander. Individuals of this species behave like most other Pacific Northwest plethodontid salamanders; they are active at or near the surface whenever temperature and moisture regimes permit, which could be any

day of the year in the Columbia River Gorge (Herrington and Larson 1985; Herrington 1987). Courtship behavior has not been observed, but mating occurs primarily in the fall and occasionally in the spring (Herrington and Larsen 1987). No clutches of eggs have been found for this species.

Any land-use practice that impacts moisture regimes in suitable stabilized talus slopes probably will eliminate populations of the Larch Mountain salamander. Herrington and Larson (1985) point out that the Columbia River Gorge is an area with numerous potential uses by humans, many of which could be detrimental to populations of these salamanders. Logging, harvesting talus for road building, and housing developments could all adversely affect the status of this species. The Washington Department of Fish and Wildlife (as WDW1991) recommends that a buffer of up to 150 feet of uncut forest be maintained around any occupied talus slope to protect populations of this salamander.

Lehmkuhl and Ruggiero (1991) compiled a list of species associated with late successional Douglas fir forests in the Pacific Northwest and modeled the risk of local extinction for each species from habitat loss or fragmentation. This model was based on frequency of occurrence, abundance, body size, and mobility of the various species. They determined that the Larch Mountain salamander is a species at high risk (score of 9, where 1 is low and 10 is high). Thomas et al. (1990) considered populations of this species to be at a medium to high viability risk.

Van Dyke's Salamander

Van Dyke's Salamander (*Plethodon vandykei*) is a candidate for state listing (WDFW 1995b) and is endemic to western Washington (Leonard et al. 1993). Approximately half of its known geographical distribution is on the Olympic Peninsula. It is considered at risk due to its limited distribution and the isolation of its disjunct populations.

Van Dyke's salamanders are considered to be the most aquatic species of woodland salamanders (Leonard et al. 1993). They are commonly associated with seeps or streams located in mature and old-growth coniferous forests (WDW 1991) and are typically located in the splash zone of creeks under rocks, logs, and woody debris (Leonard et al. 1993). The species has also been found in wet talus and forest litter (WDW 1991). The principal management recommendation of the Washington Department of Fish and Wildlife (as WDW 1991) is the maintenance of riparian corridors along all stream types, but especially along Types 4 and 5 streams. Additional recommendations exist for wet talus where the species is known to occur.

Tailed Frog

The tailed frog (*Ascaphus truei*) is a federal species of concern. Its range lies between the Cascades and the Pacific coast from southwestern British Columbia to northwestern California, with a disjunct area in southeast Washington, northeast Oregon, and central Idaho (Leonard et al. 1993). Tailed frogs are found throughout most of the HCP planning units. They are known to occur from elevations near sea level to 5,250 feet (Leonard et al. 1993). The principal threat to their continued existence is the degradation of riparian areas through intensive timber harvesting.

Tailed frogs are the only genus of anurans in North America adapted for life in cold fast-flowing mountain streams (Nussbaum et al. 1983). The "tail" of the species appears on males and is an erectile copulatory organ that enables internal fertilization of eggs (Welsh 1990). Internal fertilization is rare among amphibians and is probably an adaptation for successful breed-

ing in fast-flowing streams. Tadpoles have a unique oral disc that enables them to adhere to rocks in swift currents (Nussbaum et al. 1983). The species prefers cold water and tolerates a narrow range of temperatures. Summer temperatures of a stream in the Oregon Cascades inhabited by tailed frogs ranged from 51.8° to 53.6° F (Nussbaum et al. 1983). The upper limit for egg development is 65.3° F (Brown 1975).

The species shows a preference for older forests. Welsh (1990) found that at elevations less than 3,280 feet, tailed frog density is correlated with forest age, and Carey (1989) found that tailed frogs are closely associated with old-growth forests. Tailed frogs sometimes disappear from streams within logged areas (Nussbuam et al. 1983); high water temperatures and increased siltation are the probable causes.

Lehmkuhl and Ruggiero (1991) included the tailed frog in a list of species associated with late successional Douglas fir forests in the Pacific Northwest. The risk of local extinction from habitat loss or fragmentation for each species was modeled, based on the frequency of occurrence, abundance, body size, and mobility of the species. Populations of the tailed frog were considered to be at moderately high risk.

Northern Red-legged Frog

The northern red-legged frog (*Rana aurora aurora*) is a sensitive species. Northern red-legged frogs inhabit moist and riparian forests, typically below 2,790 feet in elevation in the Pacific Northwest (Nussbaum et al. 1983; Stebbins 1985). This species is generally found near permanent water, including small ponds, quiet pools along streams, reservoirs, springs, lakes, and marshes (Gordon 1939; Stebbins 1954, 1985; Nussbaum et al. 1983). Although Stebbins (1954) describes northern red-legged frogs as being "highly aquatic", individuals have been found in forests at considerable distances from water (Gordon 1939; Stebbins 1954; Nussbaum et al. 1983). Nussbaum et al. (1983) reported finding individuals up to 984 feet from standing water and frequently along roads during rainy nights. Although not restricted to old-growth habitat, the northern red-legged frog is frequently found in old-growth stands (Bury and Corn 1988). In southern Washington, Aubry and Hall (1991) found that this species was most abundant in mature stands and least abundant in young stands. Bury et al. (1991) found that northern red-legged frogs were most abundant at lower elevations with flatter slopes in Oregon and Washington. Breeding areas for this species vary greatly and include small temporary ponds, relatively large lakes, potholes, overflows of lakes and rivers, or slow reaches of rivers (Storm 1960; Licht 1969, 1971; Calef 1973; Brown 1975; Nussbaum et al. 1983).

Although no long-term studies of northern red-legged frogs have been conducted, observations from several biologists suggest that populations of this species are dwindling. For example, Nussbaum et al. (1983) stated that the northern red-legged frog is less common than it once was in the Willamette Valley of Oregon. The species has also declined greatly in California, presumably due to habitat exploitation by humans and introduced bullfrogs (Jennings and Hayes 1985; Hayes and Jennings 1986). Depletion of old-growth forests that provide habitat for northern red-legged frogs is likely to have detrimental effects on their populations.

Lemkuhl and Ruggiero (1991) included the northern red-legged frog in a list of species associated with late successional Douglas fir forests in the Pacific Northwest. The risk of local extinction from habitat loss or fragmentation for each species was modeled, based on the frequency of occurrence,

abundance, body size, and mobility of the species. Populations of the northern red-legged frog were considered to be at moderately high risk.

Cascades Frog

The Cascades frog (*Rana cascadae*) is a federal species of concern. It is found in the Olympic Mountains and in the Cascade Range of Oregon, Washington, and northern California, typically above 2,625 feet and in small bodies of water rather than in large lakes (Sype 1975; O'Hara 1981; Nussbaum et al. 1983). Frequently used habitats include small, unvegetated potholes and marsh-like areas that are overflows of larger lakes. (See O'Hara 1981.) On occasion, Cascades frogs are found in forests away from water (Nussbaum et al. 1983).

Adults use the same sites for breeding from year to year (O'Hara 1981). Breeding sites in the central Cascades of Oregon are shallow, gently sloping margins of the lake shore or overflow areas, generally over soft substrates and protected from severe wave action (O'Hara 1981). The Cascades frog tends to lay eggs in microhabitats that produce maximal embryonic growth (Sype 1975; O'Hara 1981; Wollmuth et al. 1987). Tadpoles do not move much farther than several yards from where they hatched (O'Hara 1981); various features of the habitat (e.g., substrate type, cold water) bar their dispersal (O'Hara 1981). In the larger ponds where they are found, Cascades frog tadpoles prefer fairly warm, shallow water close to the shoreline with abundant vegetation (O'Hara 1981).

Relatively little is known about the population dynamics of adult Cascades frogs. (See Briggs and Storm 1970; Briggs 1978; Nussbaum et al. 1983; Olson 1988, and references therein.) Declines in populations of this species seem to have begun in the mid-1970s (Blaustein and Wake 1990; Wake 1991). One estimate is that 80 percent of the 30 populations that have been monitored since the mid-1970s have disappeared at least temporarily (Blaustein and Wake 1990). These declines, however, may reflect natural population fluctuations.

Lemkuhl and Ruggiero (1991) included the Cascades frog in a list of species associated with late successional Douglas fir forests in the Pacific Northwest. The risk of local extinction from habitat loss or fragmentation for each species was modeled based on the frequency of occurrence, abundance, body size, and mobility of the species. Populations of the Cascades frog were considered to be at moderately high risk.

Spotted Frog

The spotted frog (*Rana pretiosa*) is currently a candidate for both federal and state listing (WDW 1993a; Federal Register v. 61, no. 40, p. 7596). Historically, spotted frogs ranged north to extreme southeastern Alaska, south to central Nevada and central Utah, and east to western Montana and northwestern Wyoming. However, spotted frogs have become extremely rare in the western portion of their range (Nussbaum et al. 1983; Stebbins 1985; McCallister and Leonard 1990, 1991). Although occurring historically throughout the western Cascades and Puget Sound trough, spotted frogs are now very rare west of the Cascade mountains in Washington. One spotted frog population was documented in Trout Lake on DNR-managed land in the HCP's Columbia Planning Unit. The last published observation west of the Cascades in Oregon was in 1971 (Nussbaum et al. 1983; McCallister and Leonard 1990, 1991). The status of the spotted frog in eastern Oregon and Washington is unknown (McCallister and Leonard 1990, 1991). Causes for the decline of this species are unknown, although

Nussbaum et al. (1983) and Stebbins (1985) suggest that introduced bullfrogs (*R. catesbeiana*) may have contributed to their decline. Kirk (1988) noted DDT poisoning killed adult spotted frogs in Oregon. Because the frogs are dependent on shoreline and marsh vegetation, alteration caused by grazing and timber harvest can have serious negative effects on the species.

Spotted frogs are highly aquatic, using marshy ponds, streams, and lakes as high as 9,842 feet in parts of their range (Stebbins 1954, 1985; Nussbaum et al. 1983). They are found in numerous habitat types, including those dominated by Douglas fir and ponderosa pine as well as semi-arid to arid sites dominated by sagebrush (Stebbins 1954, 1985). In Oregon, spotted frogs may be sympatric with northern spotted owls in parts of their range. Stebbins (1985) suggests that this species is more common in fairly cool waters; however, in Wyoming, stagnant pools are used for mating (Turner 1958), and most ovulation sites are found in the shallow and warm portions of a pond (Morris and Tanner 1969). In Wyoming and British Columbia, eggs are laid in the open in clear water and are not attached to vegetation (Licht 1969; Morris and Tanner 1969). In Washington, the state Department of Fish and Wildlife (1991) reports that courtship and breeding occurs in the warm, shallow margins of ponds or rivers and in temporary ponds. Eggs are laid in water that is only a few inches deep and are usually half-exposed to air. In the lowlands, spotted frogs are active from February through October and hibernate in muddy pond or river bottoms in winter (WDW 1991). The maximum movement recorded from a breeding site is 4,225 feet.

The diet of the spotted frog varies with age and size of the frog and includes algae, vascular plants, numerous insect species, arachnids, and mollusks (Morris and Tanner 1969; Miller 1978; Whitaker et al. 1983; Licht 1986). Whitaker et al. (1983) suggested that management practices in Oregon may have altered the food items available for spotted frogs. Frogs from variously managed sites ate different foods than frogs at non-managed sites. For example, more grasshoppers were consumed at sites where soil was compacted, presumably by grazing livestock.

REPTILES

Two species of reptiles that occur in the area covered by the HCP are considered species of concern. One is a federal species of concern (Federal Register v. 61, no. 40, p.7596) and is already listed by the state; the other is a candidate only for state listing.

Northwestern Pond Turtle

The northwestern pond turtle (*Clemmys marmorata marmorata)* is currently a federal species of concern and is listed by the state as endangered (WDW 1993a). This species occurs at elevations from sea level to 6,000 feet from extreme southwestern British Columbia to the Sacramento Valley in California, principally west of the Sierra-Cascade crest (Bury 1970; Stebbins 1985). However, all sightings of the turtle north of the Willamette Basin in Oregon occurred below 2,400 feet (WDW 1993d). Recorded sightings in Washington seem to be clustered around the southeastern edge of Puget Sound and along a small portion of the Columbia River (Nussbaum et al. 1983; WDW 1993d). The distance between these populations is the largest known disjunction in the range of the northwestern pond turtle (WDW 1993d). Populations are confirmed only in Klickitat and Skamania counties, and individuals have been seen in Pierce and King counties (WDW 1993d). Historical records also exist for Clark and Thurston counties. Sixty-nine turtles were recorded at 15 sites in Washington in 1992 (Nordby 1992).

Northwestern pond turtles inhabit marshes, sloughs, moderately deep ponds, and slow reaches of creeks and rivers. They need basking sites, such as partially submerged logs, vegetation mats, rocks, and mud banks (Nussbaum et al. 1983). Evenden (1948) reported two records of northwestern pond turtles in rapid-flowing, clear, cold, rock and gravel streams in the Cascade foothills. The pond turtle has also been sighted in brackish coastal waters (Ernst and Barbour 1972). Northwestern pond turtles hibernate in the bottom mud of streams or ponds, or on land as far as 1,640 feet from water (Ernst and Barbour 1972). Northwestern pond turtles feed on aquatic vegetation, invertebrates, small fish, frogs, and carrion (WDW 1993d); however, they apparently prefer live or dead animal tissue to plant material.

Bury (1972) conducted a four-summer study of northwestern pond turtles in a 2.17-mile stretch of Hayfork Creek in Trinity County, California. The study site included woods (oak, ponderosa pine, and scattered Douglas fir), chaparral, and open grassy areas at 2,000 feet above sea level. Estimates of the northwestern pond turtle's home-range size were: for adult males, 2.41 acres; for adult females, 0.61 acre; and for juveniles, 0.90 acre.

Throughout their range, northwestern pond turtles nest from late April through August, but in Oregon, the peak breeding period is thought to be June to mid-July. Eggs are deposited in an earthen nest in soft soil on upland sites (Stebbins 1954; Nussbaum et al. 1983) and generally excavated in the morning. The nest is most often located near the margin of a pond or stream, but pond turtle nests have been found hundreds of yards from water.

Because Washington populations of northwestern pond turtles are extremely low, the continued presence of this species must be confirmed where they have been documented previously. Records in Washington are few and scattered, indicating the possibility of rarity or an ongoing decline. The literature is devoid of information on the possible association of northwestern pond turtles with truly forested areas. In view of the need for lengthy periods of direct sunshine for the successful hatching of buried eggs, the use of ponds or streams in older forests appears unlikely. The possibility of their use of cut-over areas, given proper aquatic habitats, has not been investigated.

Bullfrogs and non-native fish species present a risk to populations of northwestern pond turtles through predation and resource competition. Other risks include predation by carnivorous mammals, degradation of shoreline vegetation, and alteration of upland habitat within a quarter-mile of watercourses (WDW 1993d).

California Mountain Kingsnake

The California mountain kingsnake (*Lampropeltis zonata*) is currently a candidate for state listing (WDFW 1995b). Specimens have been collected in Skamania and western Klickitat counties from sites near the Columbia River Gorge (Nussbaum et al. 1983). California mountain kingsnakes occur in oak and pine forests and on chaparral up to 9,000 feet in elevation (Nussbaum et al. 1983). Their breeding, foraging, and resting habitat is primarily in early to mid-seral stage forests (Brown 1985). They have been found under and inside rotting logs and under rocks (Nussbaum et al. 1983). This species consumes lizards, snakes, mice, and nestling birds (Nussbaum et al. 1983).

BIRDS

In addition to the northern spotted owl and marbled murrelet, 16 bird species that occur in the area covered by the HCP are considered species of concern. Three of these species are federally listed and are discussed in Section C of this chapter titled Other Federally Listed Species. Two bird species are federal species of concern (Federal Register v. 61, no. 40, p. 7596), three are sensitive species, and seven are candidates for listing by the state. One more is already listed by the state.

Common Loon

The common loon (*Gavia immer*) is a candidate for state listing (WDFW 1995b). The species is known to breed at only a few locations in western Washington (WDW 1991), and it winters along the Pacific coast. Declines in common loon populations have been attributed the loss of nesting habitat (Erhlich et al. 1988).

Common loons breed on large wooded lakes with dense populations of fish (WDW 1991). Nests are built on the ground within 5 feet of the water's edge (WDW 1991). Nest sites can be reused in successive years. The breeding season occurs between April 1 and September (WDW 1991).

The species is very susceptible to human disturbance during nesting. A study of lake shore development in Canada found that the breeding success of common loons declined as the number of cottages increased within 500 feet of the nest.

Harlequin Duck

The harlequin duck (*Histrionicus histrionicus*) is a sensitive species and is also a state game animal (WDFW 1995b). Harlequin nesting success is highly sensitive to human disturbance. Its range covers the Pacific coast from northern California to Alaska and extends inland to the northern Rocky Mountains. In the east, its range includes areas of Labrador, Greenland, and the Atlantic coast north of Virginia. In Washington, it breeds throughout the Olympic, Cascade, and Selkirk mountains (WDW 1991).

Potential habitat for the harlequin duck is rivers, streams, creeks, and adjacent conifer forests (closed sap-pole, large sawtimber, and old growth per Brown 1985). Typical population densities are one pair per 2 to 4 river miles (Brown 1985). In Washington, breeding habitat for this species has been documented along the Soleduck, Hamma Hamma, North Fork of the Nooksack, Stillaguamish, Suiattle, Elwha, Methow, Nisqually, and Stehekin rivers as well as Morse Creek. Nests are typically located on rocky shores adjacent to rapids in turbulent mountain streams. Nests are built on the ground, under bushes, or between rocks (Bellrose 1976). This species feeds on mollusks, crustaceans, insects, fish, and echinoderms (Bellrose 1976). Wintering areas are saltwater habitats within 164 feet of the coast and most of the Puget Sound (Wahl and Paulson 1991; WDW 1991).

To create loafing sites, riparian corridors should be managed for stream recruitment of large woody debris. The Washington Department of Fish and Wildlife recommends that trails or roads should be at least 165 feet from streams and should not be visible from the stream (WDW 1991).

Northern Goshawk

The northern goshawk (*Accipiter gentilis*) is a state (WDW 1993a) candidate for listing as a threatened species and a federal species of concern. Habitat loss resulting from intensive timber harvest is believed to be the principal reason for its decline. Goshawks are circumpolar in the boreal, temperate,

and highland subtropical northern hemisphere. They have been observed using a variety of forest types, but Austin (1994) demonstrated through statistical analysis that goshawks prefer closed-canopy mature and old-growth forests. In the Pacific Northwest, goshawks are associated with late successional coniferous forests and are most abundant in old growth (Thomas et al. 1993). The species occurs throughout Washington, primarily in both wet and dry conifer forest habitats (Wahl and Paulson 1991).

Breeding goshawks use large tracts of mature and old-growth forest where they can maneuver in and below the canopy to forage, and where trees are large enough to provide a foundation for nest construction (Bartlet 1977; Hennessy 1978; Reynolds and Wight 1982; Crocker-Bedford 1990a,b; Marshall 1992; Reynolds et al. 1992). In northwestern California, nest sites were found in trees with an average of 23 inches dbh (Hall 1984). On the Olympic Peninsula, nest trees averaged 28.2 inches dbh per breeding territory (n = 7) and ranged from 8.1 to 57.5 inches dbh. There are apparently some similarities in the nesting habitat of northern goshawks and northern spotted owls. Spotted owl nests and goshawk nests have been located less than 100 yards from each other (Marshall 1992). In mixed conifer forests on the east slope of the Cascades, 47 of 85 spotted owl nests were on stick nests built by goshawks (Buchanan 1992 as discussed in Marshall 1992).

Goshawks prey on a variety of small- to medium-size animals such as the American robin, Steller's jay, grouse, vole, Douglas squirrel, mountain beaver, and snowshoe hare. These prey species live in a variety of forest types and seral stages and along forest edges.

Where nest sites are readily available, the primary determinant of home range size is prey density (Reynolds et al. 1992). Using radiotelemetry, Titus et al. (1994) found that, in the temperate coniferous forests of southeast Alaska, the total area traversed by adults (n = 27) ranged from 1,899 to 348,863 acres; a mean home range area was not calculated due to the extreme variability in data. Applying minimum convex polygons methods to radio-telemetry data, Austin (1994) calculated a mean home range of 7,657 acres for adults (n = 10) in the southern Cascades.

There are no reported studies of dispersing juvenile goshawks, but theoretically, habitat traversed by dispersing juveniles must provide foraging and roosting opportunities in amounts adequate to promote their survival. It is likely that snags, downed logs, and a developed understory will enhance the density of goshawk prey (Reynolds et al. 1992). Roosting opportunities should provide cover from predators (horned owls) and adverse weather.

Goshawks may be highly sensitive to human disturbance. Timber harvesting within a 0.25-mile radius (the nearest 125 acres) of goshawk nest sites in Idaho resulted in a 75 to 80 percent reduction in occupancy of their nesting territories (Patla 1990).

The most intensive research on goshawks in North America has been conducted in the southwestern United States. On the basis of this research, Reynolds et al. (1992) made a set of specific management recommendations. (1) Three suitable nest areas and three replacement nest areas, each a minimum of 30 acres, should be maintained per home range. In the southwest, home ranges are about 6,000 acres. Nest areas should be 100 percent mature and old-growth forest, and no adverse activities should occur at any time within nest areas. (2) A post-fledgling family area (PFA) of 420 acres should be maintained around the nest areas. PFAs should contain 40 percent mature and old-growth forest. Management activities should be

prohibited from March through September within the PFA. (3) A 5,400-acre foraging area should be maintained around the PFA, in which forest conditions are very similar to those of the PFA. Larger openings are preferred in the foraging area to provide habitat for certain species of goshawk prey. Reynolds et al. (1992) state that because the habitat needs of the goshawk are not adequately understood, they used the largest areas reported in the literature for establishing the size of nest sites and home ranges. It is uncertain how these recommendations would be extrapolated to the forests of western Washington.

Golden Eagle

The golden eagle (*Aquila chrysaetos*) is a candidate only for state listing (WDFW 1995b). Golden eagles declined over portions of their range because they were considered a threat to livestock and therefore killed. The destruction of rangeland is the principal threat to the species in Washington. Prior to 1982, nesting of the golden eagle west of the Cascade mountains in Washington state was considered rare (Bare et al. 1982). The species is more commonly associated with open rangeland. Clearcut logging creates forest conditions highly favorable to golden eagles (Bare et al. 1982), and therefore, recent forest practices appear to have expanded the amount of suitable golden eagle habitat.

Golden eagles use the same territory annually but may change nests from year to year (WDW 1991). The nests are in large trees or on cliffs. Nesting occurs between February 15 and July 15 (WDW 1991). In western Washington, nest sites are primarily in very large trees in mature or old-growth forests near clearcuts (WDW 1991). Golden eagles hunt mammals (snowshoe hares, squirrels, mountain beaver) in large open areas. The species can survive in intensively managed forests where timber harvests create a variety of seral stages within drainage basins.

Human disturbance is thought to be a factor in the failure of golden eagle nests (WDW 1991). A buffer distance of 1,500 to 1,600 feet during the nesting season is a general guideline to minimize the adverse impacts of human disturbance (WDW 1991).

Sandhill Crane

The sandhill crane (*Grus canadensis*) is a state endangered species (WDFW 1995b) that has no federal status. Sandhill cranes migrate throughout the state, and breeding has been documented in both eastern and western Washington. Sandhill cranes are extremely wary and therefore use only large tracts of open habitat with good visibility (WDW 1991). Habitat for this species includes grain fields, wet meadows, nonforested wetlands, and shallow ponds (Types 2 and 3 waters) (Brown 1985; WDW 1991). Nesting habitat is extensive shallow marshes with dense emergent plant cover (Littlefield and Ryder 1968). Wet meadows and grasslands are used for foraging and resting habitat (Brown 1985; WDW 1991). The sandhill crane may potentially occur in the HCP's Columbia Planning Unit.

Black Tern

The black tern (*Chlidonias niger*), a sensitive species, is a common summer resident in eastern Washington and a migrant in western Washington (Wahl and Paulson 1991). It appears to migrate primarily along the coast (Haley 1984), but probably uses the Columbia River as a route from breeding areas in eastern Washington and British Columbia.

Habitat for this bird is considered to be inland lakes, ponds, reservoirs, freshwater marshes, and wet meadows. The black tern typically nests in inland areas on pond and lake shorelines, marshes, swamps, bogs, and wet meadows (Brown 1985; National Geographic Society 1987). In Iowa, black terns nest only in marshes larger than 12.5 acres (Brown and Dinsmore 1986). Nests are loosely constructed of reeds and built on muskrat houses, fallen canes, or almost any other marsh substrate. Most black tern nests are built only a few inches above water in the same nesting habitats as Forster's terns, which typically use higher, drier locations. Nest success for this species is often low because of predation or weather (Haley 1984). During the nesting season, black terns feed on insects and small fish (Haley 1984).

Vaux's Swift

Vaux's swift (*Chaetura vauxi*) is a candidate only for state listing (WDFW 1995). It resides in the Pacific Northwest during the breeding season, and it winters from central Mexico to northern South America (Erhlich et al. 1988).

Vaux's swift nests in late successional coniferous forests (Bull and Collins 1993). There are indications that it depends on old-growth forests for survival (Carey 1989). The species requires large hollow snags or live trees for nesting and night roosting. Hundreds of Vaux's swifts may use a single large hollow tree for night roosting. There is typically one nest per tree. In 20 trees containing Vaux's swift nests, Bull and Cooper (1991) found only one tree that had two nests. In northeastern Oregon, the mean diameter of trees used for nesting was 26.6 inches dbh (n = 21); diameters ranged from 18 to 38 inches (Bull and Cooper 1991). Vaux's swifts are sometimes commensal with pileated woodpeckers, gaining access to hollow trees through holes excavated by pileated woodpeckers (Bull and Cooper 1991).

Vaux's swift preys on flying insects and spiders. They exploit all seral stages while foraging (Brown 1985) but show a strong preference for spaces over water (Bull and Beckwith 1993).

Lewis' Woodpecker

Lewis' woodpecker (*Melanerpes lewis*) is a candidate only for state listing (WDFW 1995b). The species breeds throughout most of Washington (WDW 1991) but is very rare in coniferous forests west of the Cascade crest. It winters in southern Oregon, northern California, and the southwestern United States (NGS 1987; WDW 1991). Declines in Lewis' woodpecker populations have been attributed to the loss of riparian habitat and competition for cavities and snags (WDW 1991).

Lewis' woodpecker is associated with open ponderosa pine forests and cottonwood riparian areas (WDW 1991; Erhlich et al. 1988). It also uses selectively logged or burned coniferous forest and oak woodlands (WDW 1991). The species excavates nest cavities but also occupies natural cavities or cavities excavated by other woodpeckers. Lewis' woodpecker catches insects in flight and prefers riparian deciduous forest and early-seral coniferous forest as foraging habitat (Brown 1985).

Pileated Woodpecker

The pileated woodpecker (*Dryocopus pileatus*) is a candidate only for state listing (WDFW 1995b). The pileated woodpecker occurs throughout Washington in mature and old-growth forests with large snags and fallen trees. The best habitat appears to be conifer stands with two or more canopy layers, with the uppermost being 80 to 100 feet high (WDW 1991). Pileated woodpeckers excavate nest cavities in snags or live trees with dead wood.

On the Olympic Peninsula, the mean diameter of trees used for nesting was 37.6 inches dbh (n = 13) and ranged from 25 to 45 inches dbh (Aubry and Raley 1992). Thirty-six nest trees in northeastern Oregon averaged 31 inches dbh (Bull et al. 1992). Roost tree characteristics are similar to those of nest trees (WDW 1991).

In managed forests of western Oregon, pileated woodpeckers had an average home range of 1,180 acres (n = 11) (Mellen et al. 1992). Forty-seven percent of these home ranges were covered by vegetation classes older than 70 years. Within their home range, these woodpeckers show a preference for foraging in forests 40 years or older and in riparian areas (Mellen et al. 1992), where they search for insects on large snags, logs, and stumps.

Olive-sided Flycatcher

The olive-sided flycatcher (*Contopus borealis*) is a federal species of concern. There may be evidence of a decline in the number of olive-sided flycatchers in the western United States, although data is weak and the causes of this decline are uncertain (Hejl 1994; DeSante and George 1994). The likely cause is destruction of forest habitat in both the olive-sided flycatcher's summer breeding range and wintering range. Its breeding range includes nearly all the boreal forests of North America and extends into the montane forests of the southern Sierra Nevada and Rocky Mountains (NGS 1992). The species winters in South America, from Columbia and Venezuela to southeastern Peru (Erhlich et al. 1988).

The preferred habitat of the olive-sided flycatcher is mature coniferous forest, in particular open coniferous forest with tall standing dead trees (Bent 1963). The species is often found along forest edges, where it perches on tall, exposed snags. On the western Olympic Peninsula, the bird is usually detected where late successional forest is bordered by a clearcut (Sharpe 1994). Nests are typically constructed on a horizontal branch between 15 and 50 feet above the ground (USDA 1991) in a variety of tree species — cedars, firs, spruces, or alders (Bent 1963). Bees and wasps are the main components of the flycatcher's diet (Bent 1963).

There are no established management recommendations for the olive-sided flycatcher. The creation of forest edges through clearcutting probably benefits the species, but extensive clearcutting with short harvest rotations would eliminate the mature forests and tall snags which this species requires.

Little Willow Flycatcher

The little willow flycatcher (*Empidonax traillii brewsteri*) is a sensitive species. Data indicate a decline in the number of little willow flycatchers in the Pacific Northwest (Paulson 1992), although there is uncertainty about the causes. Destruction of habitat in the bird's summer breeding range and wintering range is a likely cause, as is cowbird brood parasitism. The breeding range of the flycatcher species includes most of the United States except Florida, Louisiana, and southern portions of Texas, Arizona, and California. The range extends northward into southern British Columbia (NGS 1992). The subspecies *E. t. brewsteri* inhabits the portion of this range west of the Cascade and Sierra Nevada mountains. The bird's winter range extends from southern Mexico to Panama (Erhlich et al. 1988).

The preferred habitat of the little willow flycatcher is stands of alder or willow, thickets of salmonberry or blackberry, and low dense shrubby vegetation. In drier climates, the species occurs mainly in riparian areas. In wetter climates, such as the western Olympic Peninsula, the bird has

been observed using shrubby habitats in regenerating clearcuts and in sapling stands between 10 and 20 years old. Nests are typically constructed in horizontal forks or upright crotches of shrubs or small trees between 3 and 25 feet above the ground (USDA 1991). A variety of woody plant species is used for nesting — alder, willow, or buttonbush (USDA 1991). Bees, wasps, and flies are the main components of this flycatcher's diet (Bent 1963).

There are no established management recommendations for the little willow flycatcher. Where it is strongly associated with riparian habitat, such as on the eastern Olympic Peninsula, the preservation of riparian areas would be critical for the species. On the western peninsula, even-aged forest management should provide the type of nesting habitat that the bird requires. If brood parasitism is a threat to the species, then increasing forest patch (i.e., stand) size may be recommended. Brittingham and Temple (1983) found that the density of cowbirds in the forest interior and the rate of brood parasitism decreased with distance from the forest edge. In drier climates, wider riparian buffers may reduce brood parasitism.

Purple Martin

The purple martin (*Progne subis*) is a candidate only for state listing (WDFW 1995b). The species breeds in western Washington (WDW 1991) and winters in northern South America east of the Andes Mountains (Erhlich et al. 1988). Declines in purple martin populations have been attributed to a reduction in the number of snags across its breeding range (Erhlich et al. 1988).

Purple martins require cavities for nesting. Historically, the species probably utilized cavities excavated by woodpeckers, but only a few such nests are known today (WDW 1991). Now, nesting is more common in bird boxes (WDW 1991). Its preferred breeding habitat is open areas near water (Erhlich et al. 1988).

The species is an aerial forager of insects and uses all seral stages of riparian and wetland forest as foraging habitat (Brown 1985).

Western Bluebird

The western bluebird (*Sialia mexicana*) is a candidate only for state listing (WDFW 1995b). The species breeds throughout Washington and resides year-round in western portions of the state (NGS 1987), but it is rare in coniferous forests west of the Cascade crest. Declines in western bluebird populations have been attributed to competition for nest cavities with starlings and house sparrows (Erhlich et al. 1988).

Western bluebirds require cavities for nesting and often nest in cavities excavated by woodpeckers (WDW 1991). Nests are found in open woodlands, burned areas with snags, and other open areas with scattered trees (WDW 1991; Erhlich et al 1988). In coastal Oregon, western bluebirds were found in most clearcuts where snags were present, and bluebird density was positively correlated with snag density (Schreiber and deCalesta 1992). The mean diameter of snags used for nesting was 28 inches dbh and ranged from 10 to 54 inches dbh; the snags were about 30 feet tall (Schreiber and deCalesta 1992).

The species forages on small invertebrates and berries. Prey are often captured by hawking from a low perch.

MAMMALS

Fourteen species of mammals that may occur in the area covered by the HCP are considered species of concern. Three are federally listed (discussed in Section C of this chapter titled Other Federally Listed Species), one is listed only by the state, nine are federal species of concern (Federal Register v. 61, no. 40, p. 7596; WDFW 1995a), and one is a sensitive species.

Myotis Bats

The long-eared myotis (*Myotis evotis*), fringed myotis (*M. thysanodes*), long-legged myotis (*M. volans*), and small-footed myotis (*M. ciliolabrum*), are species of concern. The Yuma myotis (*M. yumanensis*) is a sensitive species. Little is known about the ecology of these species. Thomas et al. (1993) listed 208 Pacific Northwest forest species for which information is seriously limited. Only 10 species were vertebrates, and nine of those were bats. The long-eared, fringed, long-legged, and Yuma myotis bats were among those listed.

Harvesting of old-growth forests has probably led to population declines in forest dwelling bats. In Washington, myotis species were detected 2.7 to 5.7 times more often in old-growth forests than in young and mature forests (Christy and West 1993). Feeding rates of myotis bats were found to be 10 times greater over water than in the forest interior (Christy and West 1993), implying that the species depend on old-growth forests for roost sites rather than for prey base.

Recommendations for conservation (Christy and West 1993) are preserving roost sites and foraging areas, but the dearth of knowledge about these species hinders effective conservation.

LONG-EARED MYOTIS

The long-eared myotis ranges across western North America from Baja California to central British Columbia, Alberta, and Saskatchewan (Nagorsen and Brigham 1993). It is found in a variety of habitats such as mature and immature conifer, alder/salmonberry, and arid grasslands (Maser et al. 1981; Nagorsen and Brigham 1993) at elevations from sea level to 6,725 feet (Nagorsen and Brigham 1993). The long-eared myotis uses buildings and slabs of loose bark attached to trees as day roosts (Maser et al. 1981). There are also records of the species roosting in caves and rock fissures (Nagorsen and Brigham 1993). Maternity colonies of 12 to 30 individuals have been found in buildings and hollow trees (Maser et al. 1981). The main prey of the species is moths and other flying insects.

FRINGED MYOTIS

The fringed myotis is typically found in deserts, arid grasslands, and forests (Nagorsen and Brigham 1993), but it has also been found in coniferous forests of coastal Oregon and in the western Cascades (Maser et al. 1981; Thomas and West 1991). The species prefers to forage in areas of grass-forbs and shrubs (Brown 1985). Roosting sites include buildings, mines, caves, and rock crevices (Nagorsen and Brigham 1993). Maternity colonies have been discovered in caves and buildings (Nagorsen and Brigham 1993).

LONG-LEGGED MYOTIS

The long-legged myotis ranges across western North America from Mexico to southeastern Alaska and western Canada (Nagorsen and Brigham 1993). It is found in a variety of habitats such as mature and immature conifer, alder/salmonberry, and arid range lands (Maser et al. 1981; Nagorsen and Brigham 1993) at elevations from sea level to 3,400 feet (Nagorsen and Brigham 1993). The long-legged myotis uses buildings and bark attached to

trees as day roosts and for maternity colonies (Nagorsen and Brigham 1993), which typically contain several hundred individuals (Maser et al. 1981). Seventy-five percent of the bat's diet consists of moths (Nagorsen and Brigham 1993).

SMALL-FOOTED MYOTIS

The small-footed myotis is typically found near cliffs and rock outcrops in arid valleys and badlands (Nagorsen and Brigham 1993), but it has also been found in the western Cascades (Thomas and West 1991). The species forages over rocky bluffs and seldom over water. Sites for roosting and maternity colonies include cliffs, boulders, and talus slopes (Nagorsen and Brigham 1993).

YUMA MYOTIS

The Yuma myotis ranges across western North America from Mexico to southern British Columbia (Nagorsen and Brigham 1993). It is found in a variety of habitats such as coastal forests, Douglas fir forests, and arid grasslands (Nagorsen and Brigham 1993) at elevations from sea level to 2,400 ft (Nagorsen and Brigham 1993). It is closely associated with water (Maser et al. 1981), spending 61 percent of foraging time over aquatic areas (Brigham et al. 1992). The Yuma myotis uses buildings and rock crevices as day roosts (Nagorsen and Brigham 1993). Maternity colonies of 1,500 to 2,000 individuals (Nagorsen and Brigham 1993) and as many as 5,000 individuals have been discovered (Maser et al. 1981) in buildings, mines, or caves. Its main prey is aquatic insects such as mayflies and caddisflies.

Townsend's Big-eared Bat

The Townsend's big-eared bat (*Plecotus townsendii townsendii*) is a federal species of concern and a candidate for state listing in Washington (WDW 1993a). In the winter of 1989-1990, 534 hibernating Townsend's big-eared bats were documented in Washington, in Yakima, Skamania, Klickitat, and Whatcom counties, as well as in several other counties on the east side of the Cascades (Perkins 1990).

Townsend's big-eared bats have been documented from sea level to 10,365 feet (Pearson et al. 1952). This species can occur in nearly any forest type as long as suitable roost, nursery, and hibernaculum sites are present (Perkins and Levesque 1987; ODFW 1992). Big-eared bats use caves, buildings, mines, and the undersides of bridges with appropriate temperature and humidity for nurseries and for hibernation (ODFW 1992). Caves located within clearcuts may not be suitable because the lack of vegetation can affect the microclimate (WDW 1991). The nursery colonies, which support as many as 100 adult females, are used year after year from spring through August. Big-eared bats also use hollows in snags and tall stumps on occasion. Townsend's big eared bat forages on insects, mainly moths, in almost any habitat. This species is relatively non-migratory, with recorded annual movements generally less than 18.6 miles (Humphrey and Kunz 1976; Wackenhut 1990). Townsend's big-eared bats typically begin arriving at their hibernacula from late September to late October (Maser et al. 1981).

The Washington Department of Fish and Wildlife Nongame Program and M. Perkins, a regional bat expert at J. M. Perkins-Consultants, Portland, Oregon, each maintain databases of known bat sites in Washington. M. Perkins has provided location and big-eared bat population data for critical sites, including a minimum of 34 sites in the Columbia Planning Unit, 17 in the Klickitat, one in the Yakima, and two in the Chelan Planning Unit.

Western Gray Squirrel

The western gray squirrel (*Sciurus griseus*) is the only state-listed species of mammal with no federal status that may occur in the area covered by the HCP. It is listed by the state as a threatened species (WDW 1993a). The distribution of this squirrel in Washington is closely tied to that of Oregon white oak (WDW 1993e). Three habitats in three regions support western gray squirrels:

- white oak/Douglas fir on the edges of prairies in Pierce and Thurston counties,
- oak/ponderosa pine mixed forests along the Columbia River, and
- grand fir/Douglas fir forests in Chelan and Okanogan counties (WDW 1993e).

Mid- to late successional forests with intertwined canopies are required to allow arboreal movement of these squirrels. Nesting occurs in trees that are 8.3 to 22.8 inches dbh (WDW 1993e). The western gray squirrel may potentially occur in the Chelan, Columbia, Klickitat, and South Puget planning units of the HCP.

Pacific Fisher

The Pacific fisher (*Martes pennanti pacifica*) is a federal species of concern and a state (WDW 1993a) candidate for listing as a threatened species. As a protected species under the Wildlife Code of Washington (WAC 232-12-011), it cannot legally be trapped. Fishers occur throughout the boreal forests of North America. This species is thought to occur throughout the western Washington Cascades near the crest, in the Olympic Mountains in the Lilliwaup and Hoh-Clearwater areas, and in eastern Washington in portions of the Okanogan Highlands (Aubry and Houston 1992; WDW 1991).

Pacific fishers prefer riparian areas in mature and old-growth coniferous forests (Powell and Zielinski 1994). The species avoids nonforested areas and forest stands with low canopy closure (Powell and Zielinski 1994). Fishers are associated with low- to mid-elevation forests. West of the Cascade crest, all trapping records of this species are from locations below 5,900 feet in elevation, and 87 percent of the records are from below 3,300 feet (Aubry and Houston 1992). It is thought that fishers avoid high e levations because they are poorly adapted to deep snowpacks (USDI and USDA 1994a).

The structural complexity of older forests results in dense prey populations for Pacific fishers and provides den and rest sites (Powell and Zielinski 1994). Fishers prey on a variety of small to medium-size mammals and birds and also feed on carrion. They require habitat with large hollow snags or logs, which they use as maternity dens. Estimates of home range size vary from 4,695 to 19,521 acres for males, which have home ranges nearly three times larger than those of females (Powell and Zielinski 1994). Evidence suggests that between 148,260 and 494,200 acres of suitable contiguous habitat may be adequate for a minimum viable population of fishers (Powell and Zielinski 1994).

The Forest Ecosystem Management Assessment Team (FEMAT, as discussed in USDA and USDI 1994a) expressed concern about the geographical distribution of fishers because of:

- the lower amount of federal reserves at lower elevations,
- the low rates of recolonization by fishers after local extirpation, and
- their natural scarcity.

However, according to the rating in FEMAT (1993), of the President's Forest Plan would provide habitat of sufficient quality, distribution, and abundance to allow the Pacific fisher population to stabilize on federal land.

California Wolverine

The California wolverine (*Gulo gulo luteus*) is a federal species of concern. It is a protected species under the Wildlife Code of Washington (WAC 232-12-011), and therefore cannot legally be trapped. This sub-species of the wolverine may occur throughout the area covered by the HCP, although its distribution on the Olympic Peninsula and south coast areas appears to be very limited and may be restricted to a portion of Mason County (Butts 1992).

A large wide-ranging species, wolverines use a variety of habitats but are generally found in remote montane forest areas (Butts 1992). The habitat is probably best defined in terms of adequate year-round food supplies in large remote wilderness areas, rather than in terms of plant associations (Banci 1994). Den sites are generally in areas with an abundance of fallen logs and deep snow; however, more specific habitat associations have yet to be determined (Hatler 1989). Wolverines forage by scavenging ungulates or preying on small mammals.

Hatler (1989) indicated that the only way to manage habitat for wolverines is to use an ecosystem approach. Wolverines may use managed lands as long as the land is adjacent to a refugium such as a U.S. Forest Service Wilderness Area (Banci 1994). A primary component of suitable habitat for this species is a low level of human activity.

Lynx

The lynx (*Felis lynx canadensis*) is a federal species of concern and is listed by the state as a threatened species in Washington (WDW 1993a). Washington's lynx population is estimated to be between 96 and 191 individuals, with the population responding largely to snowshoe hare prey abundance (WDW 1991, 1993f). The lynx in Washington is found at elevations above 3,280 (Brittell et al. 1989); it ranges from Canada into northeast and north-central Washington, east of the Cascade crest and through the Okanogan Highlands into northern Idaho (McCord and Cardoza 1990; WDW 1991, 1993f). Although recent sightings have been reported throughout Washington and in Oregon, few have been confirmed, and it is uncertain if these represent breeding individuals.

Lynx are extremely wide-ranging, with home ranges between 12.4 and 186.3 square miles, depending on sex, age, season, and prey availability (Brittell et al. 1989; WDW 1991, 1993f). They are almost totally dependent upon snowshoe hares for food, although they will feed on squirrels, small mammals, and birds when hares are scarce.

The lynx occurs in remote areas, using extensive tracts of dense forests that are interspersed with rock outcrops, bogs, and thickets (McCord and Cardoza 1990). Lynx use a mosaic of forest types from early successional to mature conifer and deciduous forests, as long as snowshoe hares are present. Koehler (1990) found that lodgepole pine, Engelmann spruce,

subalpine fir, Douglas fir, western larch, open meadow, and ponderosa pine were all used in the Okanogan Highlands. Lynx foraging habitat in early successional forests typically provides good snowshoe hare habitat (Koehler 1990). Lodgepole pine stands over 20 years old provide significantly more foraging habitat than older stands or other vegetation types (Koehler 1990).

Den sites of the lynx tend to be located in mature (over 150 years old) forest stands that have abundant down woody debris and are:

- at least 5 acres in size,
- undisturbed by humans,
- within 3.4 miles of foraging areas, and
- adjacent to natural travel corridors such as ridges and riparian areas (Brittell et al. 1989; Koehler 1990; WDW 1991, 1993f).

In Washington, travel cover is defined as contiguous areas close to or encompassing foraging cover that contains coniferous or deciduous vegetation less than 6 feet high (Brittell et al. 1989). Artificially created openings should not be larger than 40 acres (WDW 1991). The habitat associations discussed here were based on observations in only one area of Washington and may not apply to other areas with different vegetation or prey resources.

California Bighorn Sheep

The California bighorn sheep (*Ovis canadensis californiana*) is a federal species of concern. This species has been reintroduced into the state over the last several decades. Based on available information, it is questionable whether the range of bighorn sheep extends into any of the HCP planning units. No sheep have been recorded on the west-side of the Cascade crest, and their elevational range varies locally. California bighorn sheep are known to occur along the Columbia River about midway between Wenatchee and Chelan, along the Yakima River between Ellensburg and Yakima, and near Chinook and White Pass. This species is restricted to semi-open, precipitous terrain with rocky slopes, ridges, and cliffs or rugged canyons. Bighorn sheep normally avoid thick forests (Lawson and Johnson 1982), although they occasionally use scattered ponderosa pine/Douglas fir stands.