Department of the Army

Joint Base Lewis-McChord, Washington

Final Biological Assessment

Northwest Aviation Operations
160th Special Operations Aviation Regiment
Joint Base Lewis-McChord, Washington

July 2011

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Joint Base Lewis-McChord, Washington

Prepared for

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EXECUTIVE SUMMARY

The 160th Special Operations Aviation Regiment (SOAR), based out of Joint Base Lewis-McChord (JBLM), Washington, proposes to establish three new helicopter aerial refueling routes, extend one existing aerial refueling route, establish a new low-level flight training area, and establish a new multi-mode radar training route. The routes and the training area would support the training operations of the 160th SOAR, a unit that provides aviation support to Army special operations forces. The proposed refueling routes, flight route, and training area would be located in central and western Washington and northwestern Oregon.

Aerial refueling, the process of transferring fuel from one aircraft to another to extend flight times, is an important component of military operations. Aerial refueling capability and proficiency are critical to the long-range mission capability of the 160th SOAR, and regular post-qualification training is needed to remain proficient in aerial refueling operations. The 160th SOAR currently lacks a sufficient number of published training routes to accomplish its training requirements. Available published refueling routes are currently limited to two existing routes over the Pacific Ocean and two existing routes over land in Oregon. The 160th SOAR would like to extend one of the routes over land in Oregon so that it is more suitable for meeting training requirements. In addition, the 160th SOAR is proposing to publish three new routes, which would allow for increased flexibility in planning and conducting training missions, particularly in regards to avoiding scheduling conflicts, providing a sufficient number of training opportunities, and allowing other options if one or more routes are closed because of adverse weather conditions.

Currently, there is not a suitable published instrument rules (IR) route available to the 160th SOAR for conducting training that involves use of radar to maintain a fixed altitude above the ground (Terrain-Following Flight utilizing Multi Mode Radar; TF/MMR). Because proficiency in this technique is a combat need for the 160th SOAR, a suitable approved IR route is needed. Furthermore, there is no IR route connecting JBLM to Yakima Training Center (JBLM-YTC). In the absence of such a route, the 160th SOAR could be required to cancel missions involving flight to JBLM-YTC under certain weather conditions. The new TF/MMR route would allow aircraft to fly to and from JBLM-YTC in inclement weather.

Opportunities for low-level training by the 160th SOAR are limited by available space on JBLM. This type of training conflicts with training activities by other units, which are given priority of usage. The 160th SOAR proposes to establish an off-post low-level training area, which would eliminate training land use conflicts between the 160th SOAR and other units training at JBLM.

Section 7 of the Endangered Species Act (ESA) requires that federal agencies take the necessary steps to ensure that actions authorized, funded, or carried out by them do not jeopardize the continued existence of federally listed species or species proposed for federal listing, or result in the destruction or adverse modification of critical habitat of such species. As part of this process, federal agencies are required to consult with the U.S. Fish and Wildlife Service (USFWS) and National Oceanographic and Atmospheric Administration (NOAA) National Marine Fisheries Service (NMFS) to determine if a federal action is likely to affect a listed endangered or threatened species. The purpose of this Biological Assessment (BA) is to evaluate the potential impacts to federally-listed species that would result from the establishment/extension and use of five aerial refueling routes

(three new, one extended, and one existing), a TF/MMR route, and a low-level training area. This BA will also be used in informal consultation with the USFWS and NMFS.

The proposed action would occur in western and central Washington and northwestern Oregon. The project location would include the airspace along the aerial refueling routes, including route buffers extending out 2 to 6 nautical miles on each side of the route center line (depending on the route), the 496,500-acre (200,900-ha) low-level training area, and the airspace used when flying to and from the routes and training area. Combined, the airspace overlies an area of land and water of approximately 5,000,000 acres (2,000,000 ha), not counting flight paths to the routes, which are variable and therefore cannot be precisely identified. The project area would include portions of Clark, Cowlitz, Grays Harbor, Jefferson, Klickitat, Lewis, Mason, Pacific, Pierce, Skamania, Thurston, and Yakima counties in Washington, and portions of Clackamas, Columbia, Deschutes, Hood River, Jefferson, Lane, Linn, Marion, Multnomah, Wasco, Washington, and Yamhill counties in Oregon.

According to the USFWS, 21 listed species or species proposed for listing under USFWS jurisdiction may occur within the project area. This list includes: eight plant species (Bradshaw's desert-parsley, golden paintbrush, Kincaid's lupine, marsh sandwort, Nelson's checker-mallow, Ute ladies'-tresses, water howellia, and Willamette daisy); two invertebrate species (Fender's blue butterfly and Oregon silverspot butterfly); three fish species (bull trout, Dolly Varden, and Oregon chub); four bird species (marbled murrelet, northern spotted owl, short-tailed albatross, and western snowy plover); and four terrestrial mammals (Canada lynx, Columbian white-tailed deer, gray wolf, and grizzly bear).

According to NMFS, the project area contains habitat potentially occupied by 20 marine/anadromous species under NMFS jurisdiction. This list includes three rockfish: bocaccio (Georgia Basin Distinct Population Segment [DPS]), canary rockfish (Georgia Basin DPS), and yelloweye rockfish (Georgia Basin DPS); eulachon (Southern DPS); five salmonids: chinook salmon (Upper Columbia River Spring-Run, Snake River Spring/Summer-Run, Snake River Fall-Run, Puget Sound, Lower Columbia River, and Upper Willamette River Evolutionarily Significant Units [ESUs]); chum salmon (Hood Canal Summer-Run and Columbia River ESUs); coho salmon (Lower Columbia River ESU); sockeye salmon (Snake River and Ozette Lake ESUs); and steelhead (Upper Columbia River, Snake River Basin, Lower Columbia River, Upper Willamette River, Middle Columbia River, and Puget Sound DPSs); four reptile species (green sea turtle, leatherback sea turtle, loggerhead sea turtle, and olive ridley sea turtle); and seven marine mammals (blue whale, finback whale, humpback whale, Southern Resident killer whale, sei whale, sperm whale, and Steller sea lion).

Plants in the project area could be affected by physical damage from helicopter landings, and by toxicity from fuel spills. However, none of the eight listed plant species are likely to occur near helicopter landing sites, and risks of adverse effects from fuel spills during refueling are extremely low. Therefore, the proposed project **may affect, is not likely to adversely affect** federally listed plant species or their critical habitat. Furthermore, the proposed project would have **no effect** on marsh sandwort and Ute ladies'-tresses, which are not known or likely to occur in the project area.

Populations of the Fender's blue butterfly occur in the project area, beneath and near one of the proposed refueling routes. Oregon silverspot butterfly populations have not been documented in the project area, but have

historically occurred in portions of coastal Washington beneath proposed Routes 1 and 2. Because habitat for these species does not occur in areas where aircraft would land, effects would be limited to potential impacts associated with noise and releases of fuel. Given that an in-air release of fuel during training is extremely unlikely, and any noise-related effects are likely to be infrequent and minor, the proposed project **may affect, is not likely to adversely affect** the Fender's blue butterfly or Oregon silverspot butterfly or their critical habitat.

Various federally listed fish species (bocaccio, canary rockfish, yelloweye rockfish, bull trout, Dolly Varden, chinook salmon, chum salmon, coho salmon, sockeye salmon, steelhead, eulachon, and Oregon chub) occur in aquatic habitats beneath all routes and training areas, including marine habitats and freshwater lake and stream habitats. The nearest fish-bearing streams and critical habitat to the proposed landing zones are two stretches of the Cispus River, located a minimum of 500 feet (152 meters) away. Given the densely forested buffers between the landing zones and streams, effects associated with rotor wash should be minimal. Shadow response behavioral effects are unknown but could be minimized by avoiding repeated passes over fish-bearing water bodies. Accidental releases of fuel are unlikely to occur and unlikely to be large enough to have lasting effects on fish or critical habitat. Therefore, the project **may affect, is not likely to adversely affect** listed fish or their critical habitat in the project area.

The green sea turtle, leatherback sea turtle, loggerhead sea turtle, and olive ridley sea turtle are potential inhabitants of the marine habitats of the project area, including both shallow coastal and deep offshore waters. In general, they are uncommon in the project area, although they have been sighted in marine waters off the coasts of Washington and Oregon. These turtles do not nest or breed in the project area, and are only found in the water. Aircraft flying above turtle habitat would be at sufficiently high altitudes to avoid disturbing turtles, and the risk of an accidental release of fuel is extremely low, thus the project **may affect, is not likely to adversely affect** listed sea turtles.

The blue whale, finback whale, humpback whale, Southern Resident killer whale, sei whale, and sperm whale are rare inhabitants of the project area, but have been documented off the coasts of Washington and Oregon and in the Puget Sound. Habitats utilized by these species range from deep, offshore waters to shallow coastal waters, and many are migratory species that travel through or reside in the project area only during specific seasons. Along refueling routes over marine habitats, aircraft would fly high enough above whales to avoid disturbing them, and the risk of an accidental release of fuel is extremely low. Therefore, the project **may affect, is not likely to adversely affect** listed whales.

The marbled murrelet is a small seabird that forages in nearshore marine waters and nests up to 55 miles (89 kilometers) inland in older forest stands in Washington and Oregon. Critical habitat for murrelets occurs in the project area beneath proposed refueling Routes 1 and 3. Aircraft are also likely to fly over marbled murrelet critical habitat on their way to/from refuel Routes 2 and AR305. There is no critical habitat beneath the TF/MMR route or within the proposed low-level training area, but critical habitat is adjacent to both. Marbled murrelets have been detected within the northwestern portion of the proposed low-level training area. Risks from bird strikes and releases of fuel would be low. The noise threshold for harassment due to noise disturbance during the breeding season is 92 a-weighted decibels (dBA). Adverse disturbance-related effects to murrelets could occur during use of portions of the TF/MMR route and the low-level training area during the breeding

season. Provided restrictions on aircraft operation during the breeding season are put in place to avoid exceeding noise levels of 92 dBA within presumed breeding marbled murrelet breeding habitat, the proposed action **may affect, is not likely to adversely affect** the marbled murrelet or its designated critical habitat.

Northern spotted owls are found in low and mid-elevation forests on both sides of the Cascade and Olympic mountains, including portions of the project area. Critical habitat occurs within the proposed low-level training area, beneath the proposed TF/MMR route, beneath Route AR305, adjacent to Route 1, and adjacent to and beneath Route AR304. Risks to the species from bird strikes and accidental releases of fuel are expected to be low. Spotted owls could potentially be disturbed by helicopter noise, particularly low-flying helicopters traveling along the TF/MMR route and within the low-level training area. Nest sites are found throughout portions of the low-level training area and TF/MMR route, generally only a few miles apart. Minimum flight altitudes for SOAR aircraft are required during the spotted owl breeding period to prevent adverse effects to northern spotted owls. Provided the recommended flight restrictions are followed, the proposed training **may affect, is not likely to adversely affect** northern spotted owl or designated critical habitat.

The short-tailed albatross is a seabird that is rarely seen as far south as the project area. There have been two sightings of the species off the coast of Oregon in the past 20 years, and none off the coast of Washington. Because the short-tailed albatross has no breeding habitat within the project area, and is extremely unlikely to be present, the project would have **no effect** on the short-tailed albatross.

Western snowy plovers are small shorebirds that are known to breed in the project area along the Pacific coast, and critical habitat lies beneath proposed Route 2. Breeding plovers can be disturbed by noise from aircraft overflights, but SOAR aircraft flying over coastal plover habitat would be at sufficiently high altitude to avoid disturbing western snowy plovers. Bird strikes and accidental releases of fuel are possible but unlikely. Therefore, the proposed action **may affect, is not likely to adversely affect** western snowy plovers or designated critical habitat.

The Canada lynx, gray wolf, and grizzly bear are species thought to be limited in distribution to the northern and northeastern portions of Washington State. Critical habitat for these species does not occur within the project area, and no breeding by these species is believed to occur in the project area. Grizzly bear are not believed to be present within the project area, but based on past observations, Canada lynx and gray wolves may be present. Any animals of these three species that might be present in the project area would be capable of relocating in response to disturbance from aircraft. Risks from accidental releases of fuel would be negligible. The proposed action **may affect, is not likely to adversely affect** Canada lynx and gray wolves, and would have **no effect** on critical habitat for these species. Because they are not believed to be present within the project area, the proposed action would have **no effect** on grizzly bears.

Columbian white-tailed deer have not been documented in the project area, but a large population inhabits the designated critical habitat of the Julia Butler Hansen National Wildlife Refuge, approximately 15 miles (24 kilometers) from Route AR304. Aircraft flying along refueling routes would be sufficiently high to avoid disturbing any deer that happen to be in the area, and pilots would avoid National Wildlife Refuges when flying

between JBLM and the training routes. Accidental releases of fuel are possible but unlikely. Therefore, the project **may affect, is not likely to adversely affect** Columbian white-tailed deer.

Steller sea lions reside year-round along the outer coast of Washington and Oregon, including beneath coastal portions of Routes 1 and 2, although no rookeries (breeding grounds) have been identified in the project area. Flights along these routes would occur at altitudes high enough to avoid major disturbance to sea lions, and accidental releases of fuel during training are unlikely. The proposed action **may affect, is not likely to adversely** affect Steller sea lions.

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1.0 INTRODUCTION

1.1 Introduction

The 160th Special Operations Aviation Regiment (SOAR) proposes to establish three new helicopter aerial refueling routes; extend one existing aerial refueling route; establish a new low-level flight training area; and establish a new multi-mode radar training route. The routes and the training area would support training operations based out of Joint Base Lewis-McChord (JBLM[1]), Washington, but would be located off-post, primarily in western Washington and northwestern Oregon. Training operations would be conducted by the 160th SOAR, with MH-60 Blackhawk helicopters and MH-47 Chinook helicopters. Aerial refueling operations would also involve C-130 Hercules tankers. The 4th Battalion of the 160th SOAR (4/160th SOAR) is expected to begin off-post training as soon as the appropriate approvals are granted. Additionally, 160th SOAR units from other installations would use the training routes/area. The proposed routes would range from 30 to 143 nautical miles (nm)[2] in length, and each route would include an area of airspace extending out 2 to 6 nm from each side of the center line (route buffer), depending on the route. The proposed low-level training area would cover approximately 496,500 acres (776 square miles; 200,900 hectares [ha]). The routes and training area would be available for use 24 hours a day, 365 days a year, with some restrictions on weekend and holiday use during the summer.

1.2 Purpose and Need for the Proposed Project

1.2.1 New and Extended Refueling Routes

Aerial refueling, the process of transferring fuel from one aircraft to another to extend flight times, is an important component of military operations. Aerial refueling capability and proficiency are critical to the long-range mission capability of the 160th SOAR. After completion of initial qualification training, aircrews require regular post-qualification training to remain proficient in aerial refueling operations. The 160th SOAR currently lacks a sufficient number of published training routes (routes published in the Department of Defense Flight Information Publication AP/1B) to accomplish its training requirements. The Army does not have its own tankers, and consequently must rely on the U.S. Marine Corps and U.S. Air Force to supply fuel and tankers for training exercises. The U.S. Marine Corps, which is the 160th SOAR's primary aerial refueling asset, has recently adopted a policy of only supplying fuel to published corridors. Available published refueling routes in the region are currently limited to two routes over the Pacific Ocean and two routes over land in Oregon. To meet training requirements, the 160th SOAR would need to use all four routes. However, because of their distance from JBLM, the two routes over the Pacific Ocean are too costly to use in terms of fuel consumed per training mission. In addition, the existing routes over land in Oregon require an excessive number of turns to complete all of the tasks required for training evaluations (link-up, hook-up, transfer of fuel, and disconnect). The 160th SOAR would like to extend one of these routes so that it is more suitable for meeting training requirements.

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[1] Note: This document contains references to Fort Lewis, which was a previous name for Joint Base Lewis-McChord. In the case of legacy references, the identification of Fort Lewis will not change over time. Other references are temporary and will change to Joint Base Lewis-McChord when a revision or update to the reference occurs.

[2] 100 nautical miles equals 115.1 miles.

The objective of publishing three new routes and extending one existing published route is to provide the 160th SOAR with the airspace and route dynamics necessary to accomplish training requirements and maintain mission readiness, thus enabling the regiment to accomplish its peace time and war time missions in a timely and safe manner. Additional routes would afford the 160th SOAR increased flexibility in planning and conducting training missions, particularly in regards to avoiding scheduling conflicts, providing a sufficient number of training opportunities, and allowing other options if one or more routes are closed because of adverse weather conditions.

1.2.2 New Terrain-Following/Multi-Mode Radar Route Leg

There is not a suitable published instrument rules (IR) route available to the 160th SOAR for conducting training that involves use of radar to maintain a fixed altitude above the ground (Terrain-Following Flight utilizing Multi-Mode Radar; TF/MMR). Because proficiency in this technique is a combat need for the 160th SOAR, a suitable approved IR route is needed. Furthermore, there is no IR route connecting JBLM to Yakima Training Center (JBLM-YTC). In the absence of such a route, the 160th SOAR could be required to cancel missions involving flight to JBLM-YTC under certain weather conditions. The new training route would allow aircraft to fly to and from JBLM-YTC in inclement weather.

1.2.3 Off-Post Low-Level Training Area

Opportunities for low-level training by the 160th SOAR are limited by available space on JBLM. This type of training conflicts with training activities by other units (including ground-based activities by Brigade Combat Teams), which are given priority of usage. An approved low-level training area off JBLM would eliminate training land use conflicts between the 160th SOAR and other units training at JBLM.

1.3 Purpose and Need for a Biological Assessment

In accordance with Section 7 of the federal Endangered Species Act (ESA) of 1973, as amended (19 United States Code [U.S.C.] 1536 [c], 50 Code of Federal Regulations [CFR] 402.14[c]), federal agencies must "insure that any action authorized, funded, or carried out by such agency is not likely to jeopardize the continued existence of any listed species or result in the destruction or adverse modification of critical habitat of such species." The purpose of the ESA is to provide a means for conserving the ecosystems upon which endangered species and threatened species depend, and to provide a program for protecting these species. Under Section 7 of the ESA, federal agencies are required to consult with the U.S. Fish and Wildlife Service (USFWS) and/or National Oceanic and Atmospheric Administration National Marine Fisheries Service (NMFS; collectively the Services) to: 1) determine what species and critical habitats could be affected by the action; 2) determine what effect the action may have on these species or critical habitats; 3) explore ways to modify the action to reduce or remove adverse effects to the species or critical habitats; 4) determine the need to enter into formal consultation for listed species or designated critical habitats, or conference for species proposed for listing or proposed critical habitats; and 5) explore the design or modification of an action to benefit the species.

As part of this process, federal agencies are required to prepare a Biological Assessment (BA) for major federal actions that modify the physical environment. Because the proposed aviation training activities have the

potential to modify the physical environment, this BA was prepared to analyze the potential effects of these activities on federally listed threatened and endangered species, and species proposed for listing, and their critical habitats. This BA will be used by the Services to facilitate compliance with the requirements of Section 7(c) of the ESA.

The ESA defines an endangered species as a species that is in danger of extinction throughout all or a significant portion of its range. A threatened species is defined as any species that is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range. This BA also addresses species that have been proposed for listing as either threatened or endangered, but for which a final determination has not been made. Critical habitat is a specific area or type of area that is considered to be essential for the survival of a species, as designated by the USFWS or NMFS under the ESA.

This BA also complies with other rules and regulations that govern listed species:

- The Fish and Wildlife Conservation Act of 1980 encourages federal agencies to conserve and promote the conservation of non-game fish and wildlife species and their habitats.
- Executive Order 13186, Responsibilities of Federal Agencies to Protect Migratory Birds, requires that federal agencies that have, or are likely to have, a measurable negative effect on migratory birds develop a Memorandum of Understanding (MOU) with the USFWS that will promote the conservation of migratory bird populations. If it is determined that migratory birds could be harmed by the proposed aviation operations, the Army and USFWS would develop appropriate mitigation.
- The Marine Mammal Protection Act of 1972 established a policy to prevent marine mammal stocks from declining beyond the point where they cease to be significant functioning elements of their ecosystems. This act prohibits the take of marine mammals in U.S. waters.
- The 2003 National Defense Authorization Act exempts the military from the incidental taking of migratory birds during military readiness activities authorized by the Secretary of Defense or the Secretary of the military department concerned. The Armed Forces must confer and cooperate with the USFWS if a proposed or ongoing military readiness activity may result in significant adverse effects on a population of a migratory bird species.
- Army guidance on implementing the requirements of the ESA is provided in Army Regulation 200-1 (*Environmental Quality – Environmental Protection and Enhancement*). This regulation discusses the Army's primary ESA requirements, including conserving listed species, not jeopardizing listed species, not taking listed species, consulting with the Services, and conducting BAs for major activities.
- Procedures for the protection of state and federally listed species, candidate species, species of concern, and designated critical habitat is provided in Fort Lewis Regulation 420-5 (*Federally Listed Endangered, Threatened, and Candidate Species*). This regulation covers compliance with the ESA.

The purpose of this BA is to:

- Evaluate the effects of the proposed off-post aviation training on listed species, species proposed for listing, and/or their critical habitat that are known to be, our could be present within the project area.
- Determine the need for consultation and conference with the Services.
- Meet the requirements of the ESA.

- As applicable, outline conservation measures to minimize or eliminate effects to listed species associated with the proposed action.

1.4 Consultation and Selection of Species

The consultation process is designed to assist federal agencies in complying with the ESA. Authority of consultation has been delegated by the Secretaries of the Interior or Commerce to the Directors of the USFWS and NMFS. The consultation process involves several phases. During informal consultation, the Army (or its consultant) obtains a list of endangered and threatened species, species proposed for listing, and critical habitat that could potentially be affected by the proposed action from the appropriate regional USFWS and NMFS websites.

The Army then prepares a BA, which identifies the project, describes the biology of listed species, and analyzes the potential effects of the proposed project on these species. The BA also determines whether there is likely to be an effect (either beneficial or adverse) on any listed or proposed species or critical habitat. If the BA determines that the proposed action may affect, but is not likely to adversely affect these species or critical habitat, the Army will request concurrence from the Services. Consultation is complete if a concurrence letter is obtained from the Services.

If modifications to the project cannot be made and the proposed action is likely to affect listed or proposed species or critical habitat, if there are undetermined effects, or if the Army's determination of not likely to adversely affect does not have written concurrence from the Services, the Army will initiate formal Section 7 consultation. Formal consultations determine whether a proposed agency action is likely to jeopardize the continued existence of a listed or proposed species (jeopardy), or destroy or adversely modify critical habitat (adverse modification). They also determine the amount and extent of anticipated incidental take in an incidental take statement.

When formal consultation is requested by the agency, the Services prepare and issue a Biological Opinion (BO), which completes the consultation. Using information provided in the BA, the Services present an opinion in the BO: 1) "likely to jeopardize the continued existence of a listed species or result in the destruction or adverse modification of critical habitat" (a jeopardy biological opinion), or 2) "not likely to jeopardize the continued existence of a listed species or result in the destruction or adverse modification of critical habitat" (a no jeopardy biological opinion). A jeopardy opinion must include any reasonable and prudent alternatives to the project that would avoid jeopardy. A no jeopardy opinion may include discretionary conservation recommendations, which are steps the respective agency believes could be taken to further minimize potential effects to listed or proposed species and critical habitat.

The Department of the Army and its consultant have corresponded with the USFWS since December 2007 (Appendix A). Requests were made to the Oregon Fish and Wildlife Office, the Upper Columbia Fish and Wildlife Office, and the Western Washington Fish and Wildlife Office for lists of endangered and threatened species, and species proposed for listing, that potentially occur, or for which critical habitat occurs, within the project area. Responses from these offices entailed county-wide lists of species (or links to these lists on the internet) for inclusion in the BA. For marine fish and mammals, lists of threatened and endangered species,

species proposed for listing, and critical habitat were obtained from the NMFS Northwest Regional Office web page. Updated information on listed species, species proposed for listing, and designated critical habitat was obtained from the appropriate USFWS and NMFS web sites in December 2010. Additionally, the Army obtained more detailed digital data for the proposed low-level training area and TF/MMR route from the Gifford Pinchot National Forest and from the Washington Department of Fish and Wildlife (WDFW) Priority Habitats and Species (PHS) program. As a result of the information obtained, 41 species and their habitats are being considered in this BA (Table 1).

TABLE 1
Species Considered in this Biological Assessment

Species	Scientific Name	Status	Critical Habitat
PLANTS			
Bradshaw's desert-parsley	*Lomatium bradshawii*	E	No
Golden paintbrush	*Castilleja levisecta*	T	No
Kincaid's lupine	*Lupinus sulphureus* (=*oreganus*) ssp. *kincaidii* (=var. *kincaidii*)	T	Yes[1]
Marsh sandwort	*Arenaria paludicola*	E	No
Nelson's checker-mallow	*Sidalcea nelsoniana*	T	No
Ute ladies'-tresses	*Spiranthes diluvialis*	T	No
Water howellia	*Howellia aquatilis*	T	No
Willamette daisy	*Erigeron decumbens* var. *decumbens*	E	Yes
INVERTEBRATES			
Fender's blue butterfly	*Icaricia icarioides fenderi*	E	Yes
Oregon silverspot butterfly	*Speyeria zerene hippolyta*	T	Yes[1]
FISH			
Bocaccio	*Sebastes paucispinis*		
Georgia Basin DPS		E	No
Bull trout	*Salvelinus confluentus*		
Coastal-Puget Sound DPS		T	Yes
Columbia River DPS		T	Yes
Canary rockfish	*Sebastes pinniger*		
Georgia Basin DPS		T	No
Chinook salmon	*Oncorhyncus tshawytscha*		
Upper Columbia River Spring-Run ESU		E	Yes
Snake River Spring/Summer-Run ESU		T	Yes
Snake River Fall-Run ESU		T	Yes
Puget Sound ESU		T	Yes
Lower Columbia River ESU		T	Yes
Upper Willamette River ESU		T	Yes
Chum salmon	*Oncorhyncus keta*		
Hood Canal Summer-Run ESU		T	Yes
Columbia River ESU		T	Yes
Coho salmon	*Oncorhyncus kisutch*		
Lower Columbia River ESU		T	No
Dolly Varden	*Salvelinus malma*	PSAT	No
Eulachon	*Thaleichthys pacificus*		
Southern DPS		T	Proposed
Oregon chub	*Oregonichthys crameri*	T	Yes

TABLE 1 (Cont.)
Species Considered in this Biological Assessment

Species	Scientific Name	Status	Critical Habitat
FISH (Cont.)			
Sockeye salmon	*Oncorhyncus nerka*		
Snake River ESU		E	Yes
Ozette Lake ESU		T	Yes[1]
Steelhead	*Oncorhyncus mykiss*		
Upper Columbia River DPS		T	Yes
Snake River Basin DPS		T	Yes
Lower Columbia River DPS		T	Yes
Upper Willamette River DPS		T	Yes
Middle Columbia River DPS		T	Yes
Puget Sound DPS		T	No
Yelloweye rockfish	*Oncorhyncus mykiss*		
Georgia Basin DPS		T	No
REPTILES AND AMPHIBIANS			
Green sea turtle	*Chelonia mylas*	T	Yes
Leatherback sea turtle	*Dermochelys coriacea*	E	Yes
Loggerhead sea turtle	*Caretta caretta*	E	No
Olive (=Pacific) ridley sea turtle	*Lepidochelys olivacea*	T	No
BIRDS			
Marbled murrelet	*Brachyramphus marmoratus*	T	Yes
Northern spotted owl	*Strix occidentalis caurina*	T	Yes
Short-tailed albatross	*Phoebastria (=Diomedea) albatrus*	E	No
Western snowy plover (coastal population)	*Charadrius alexandrinus nivosus*	T	Yes
MAMMALS			
Blue whale	*Balaenoptera musculus*	E	No
Canada lynx	*Lynx canadensis*	T	Yes[1]
Columbian white-tailed deer	*Odocoileus virginianus leucurus*	E	No
Finback whale	*Balaenoptera physalus*	E	No
Gray wolf	*Canis lupus*	E	Yes[1]
Grizzly bear	*Ursus arctos horribilis*)	T	No
Humpback whale	*Megaptera novaeangliae*	E	No
Southern Resident killer whale	*Orcinus orca*	E	Yes
Sei whale	*Balaenoptera borealis*	E	No
Sperm whale	*Physeter catodon (=macrocephalus)*	E	No
Steller (=northern) sea lion	*Eumetopias jubatas*	E	Yes

Note: species names follow the USFWS Endangered Species Program naming conventions (http://www.fws.gov/endangered/).
E = Endangered; T = Threatened; DPS = Distinct Population Segment; ESU = Evolutionary Significant Unit; and PSAT = Proposed Similarity of Appearance to a Threatened Taxon.
[1] Critical habitat has been designated for the species, but does not occur within the project area.
Sources:

2.0 PROJECT LOCATION AND DESCRIPTION

The Army's proposed action is to conduct off-post aviation training along five aerial fueling routes (three new routes, one extended route, and one existing route), along one new TF/MMR route, and in one low-level training area. The routes and training area would support aviation operations by the 160th SOAR. These operations are discussed in more detail in the sections that follow.

The proposed action would occur in western and central Washington and northwestern Oregon (Figure 1)[1]. The project location would include the airspace along the routes, including route buffers extending out 2 to 6 nm on each side of the route centerline and the 496,500-acre (200,900-ha) low-level training area, as well as the airspace used when flying to and from the routes and training area.

Table 2 summarizes the locations, by county, of the proposed routes and low-level training area that the 160th SOAR would utilize under the Proposed Action. Routes include a 2- to 6-nm buffer on each side of the center line to allow aircraft room to maneuver in response to situations such as weather issues, aircraft deconfliction, turns, and course reversal. These buffers do not apply to the low-level training area. Counties that aircraft could potentially pass through on their way to the identified routes from JBLM are also listed.

2.1 Refueling Operations

Refueling operations would occur along three new published routes (Routes 1, 2, and 3; Figure 2), one extended route (Route AR304), and one existing route (Route AR305; Figure 3). All three new routes would originate over land west of JBLM, and two of them would end over the Pacific Ocean. The existing route and the extended route would begin and end over land in Oregon. Table 3 lists the specifications for the proposed refueling routes. All five aerial refueling routes would have a route buffer of 6 nm on either side of the center line.

Refuel Route 1 (AR307V) would begin northwest of Olympia, Washington and head west, turning to the northwest when it reaches Highway 101 north of Aberdeen, Washington, and eventually ending over the Pacific Ocean. The length of the route would be 91 nm. Aircraft flying over this route would maintain elevations of 2,500 to 5,000 feet (762 to 1,524 meters) above mean sea level (MSL). This route is located approximately 24 nm west of JBLM.

Refuel Route 2 (ARX371V) would begin in Grays Harbor County, east of Highway 101 and southeast of Aberdeen, Washington and head west, ending over the Pacific Ocean. The length of the route would be 143 nm. Aircraft flying along this route would maintain elevations of 2,300 to 5,000 feet (701 to 1,524 meters) MSL. This route is approximately 41 nm southwest of JBLM.

Refuel Route 3 (ARX372V) would begin northwest of Olympia, Washington and head southwest into Pacific County for a distance of 42 nm. Aircraft flying along this route would maintain elevations of 4,000 to 6,000 feet (1,219 to 1,829 meters) MSL. This route is approximately 24 nm west of JBLM.

[1] Figures are provided at the end of each chapter.

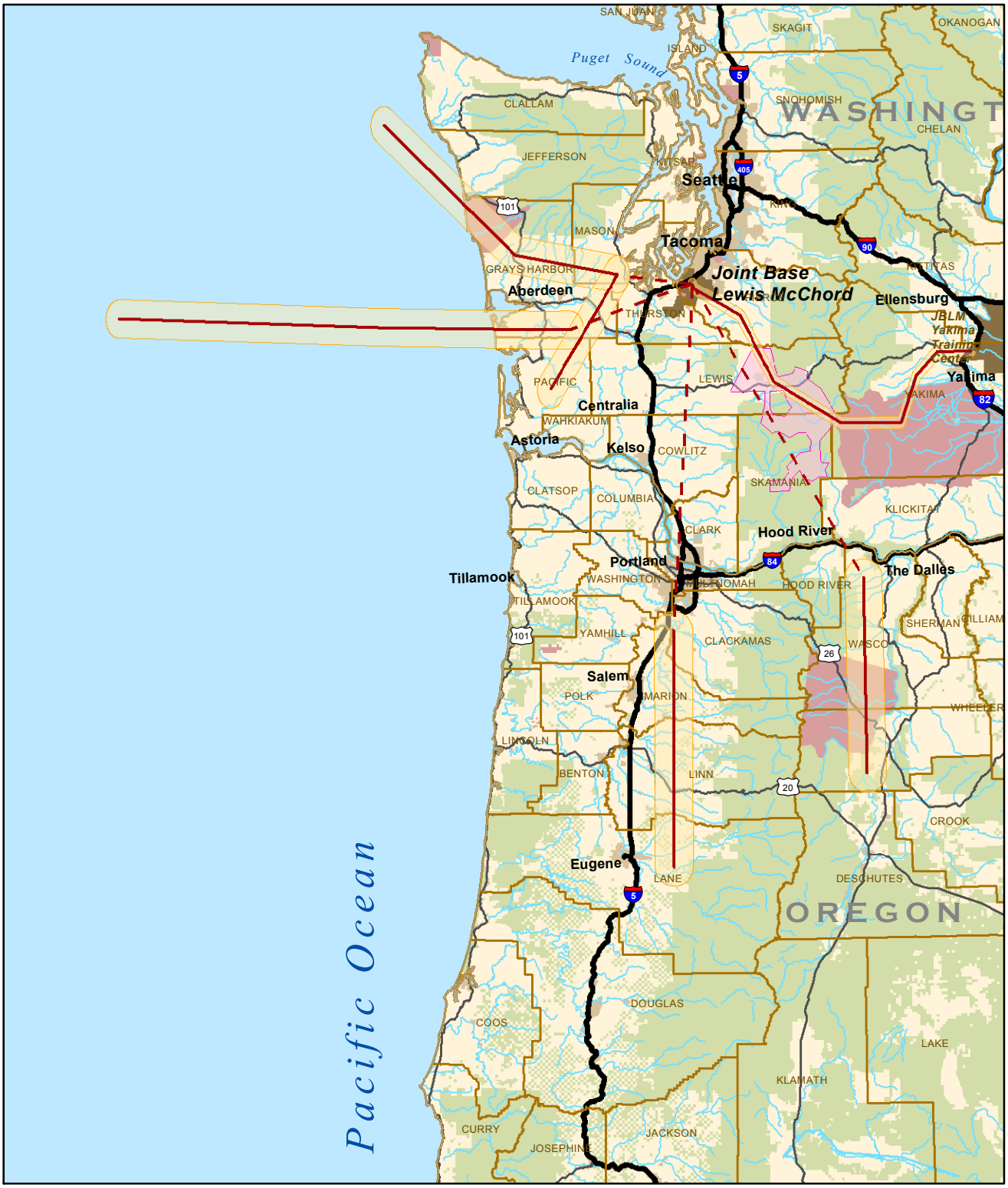

Figure 1. Project Location

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- Possible Route Approaches
- Existing and Proposed Training Routes
- Route Buffers/Airspace
- Proposed Low-Level Training Area
- Counties
- Populated Areas
- Public Lands
- Tribal Lands
- Interstate Highways
- U.S. Highways
- Rivers & Streams

0 20 40 60 80 Kilometers

0 20 40 60 Miles

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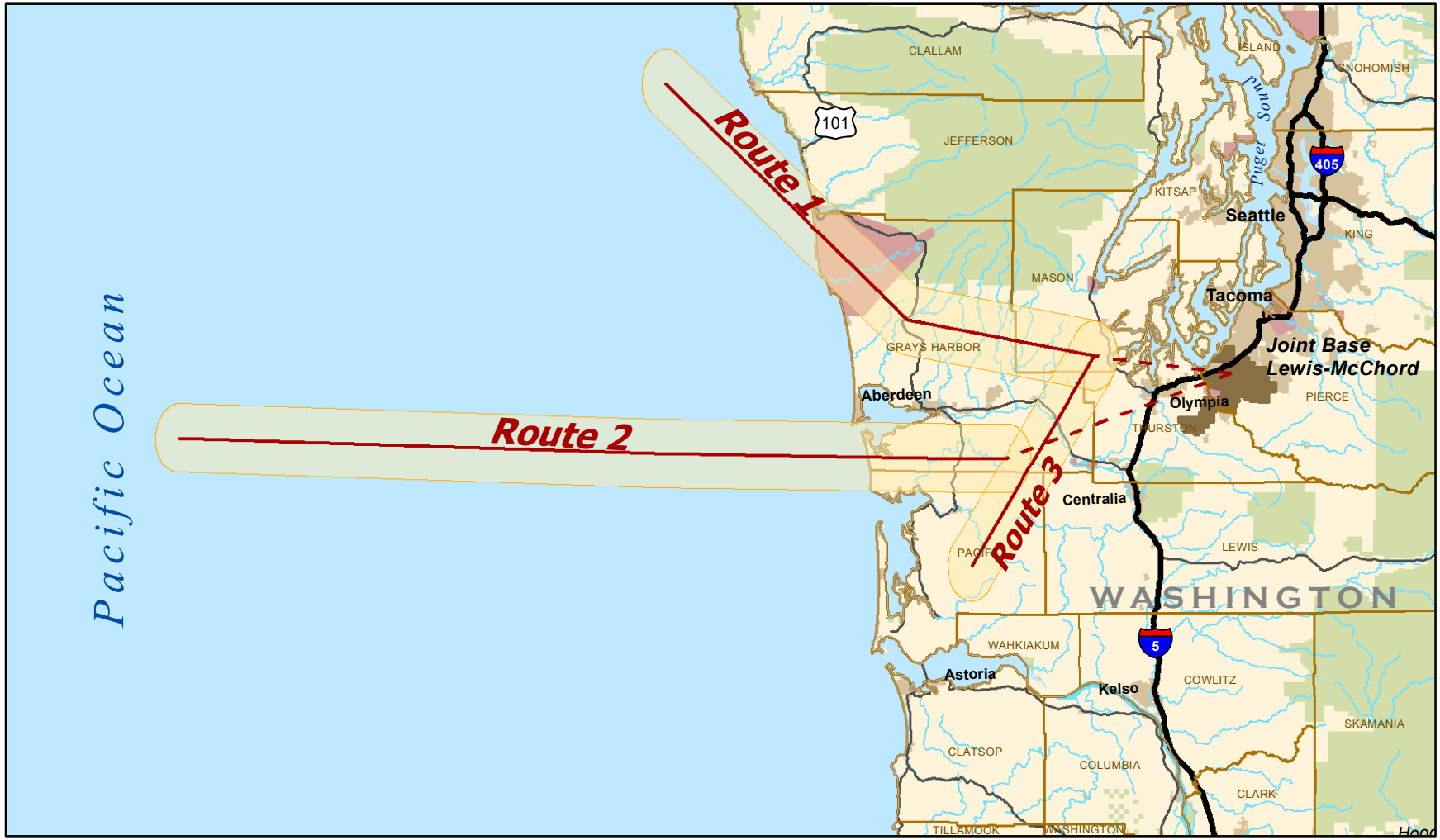

Figure 2. Proposed Aerial Refueling Routes 1, 2, and 3

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- Possible Route Approaches
- Proposed Aerial Refueling Routes
- Route Buffers
- Counties
- Populated Areas
- Public Lands
- Tribal Lands
- Interstate Highways
- U.S. Highways
- Rivers & Streams

0 10 20 30 40 Kilometers

Miles 0 10 20 30

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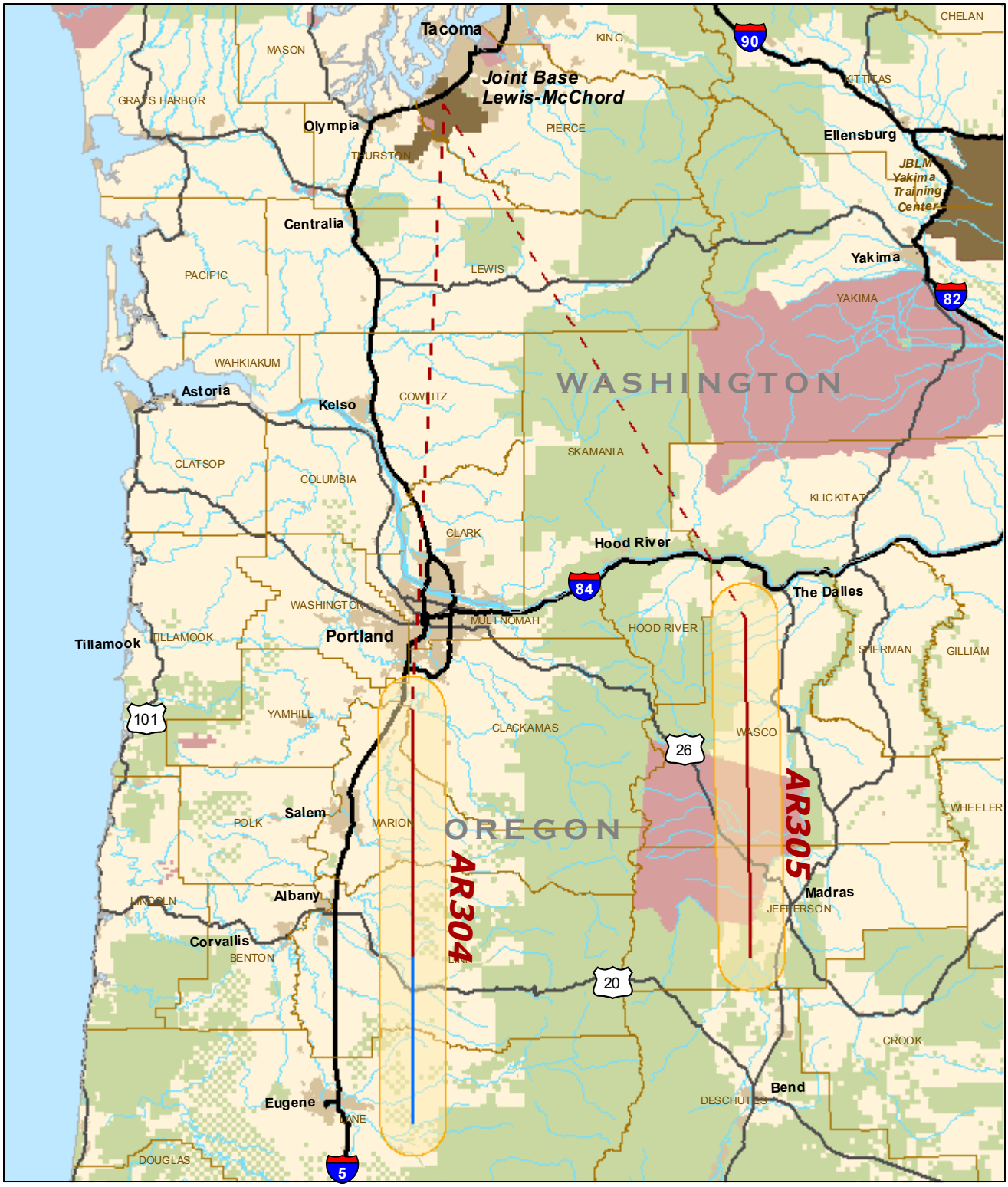

Figure 3. Proposed Aerial Refueling Routes AR304 and AR305

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- Possible Route Approaches
- Existing Refueling Routes
- Proposed Refuel Routes
- Route Buffers
- Counties
- Populated Areas
- Public Lands
- Tribal Lands
- Interstate Highways
- U.S. Highways
- Rivers & Streams

0 10 20 30 40 Kilometers

0 10 20 30 Miles

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TABLE 2
Counties[1] Underlying the Proposed Routes and Low-Level Training Area

	Washington	Oregon
Proposed Refuel Route 1	Grays Harbor, Jefferson, Mason, (Pierce, Thurston)	--
Proposed Refuel Route 2	Grays Harbor, Pacific, (Pierce, Thurston)	--
Proposed Refuel Route 3	Grays Harbor, Lewis, Mason, Pacific, Thurston, (Pierce, Thurston)	--
Refuel Route AR304	(Clark, Cowlitz, Lewis, Pierce, Thurston)	Clackamas, Lane, Linn, Marion, Washington, Yamhill, (Columbia, Multnomah)
Refuel Route AR305	(Klickitat, Lewis, Pierce, Skamania, Thurston)	Deschutes, Jefferson, Wasco, (Hood River, Wasco)
TF/MMR Route	Lewis, Pierce, Skamania, Yakima	--
Low-Level Training Area[2]	Lewis, Skamania, Yakima (Cowlitz, Klickitat, Pierce, Thurston, Yakima)	--

[1] Counties underlying the approach from JBLM to the route are shown in parentheses.
[2] Since there is no committed approach to this area, all counties that aircraft might realistically pass through on their way to the low-level training area have been included in parentheses.

Proposed Refuel Route AR304, an extension of a current published route, would begin south of Portland, Oregon and head south, ending east of Eugene, Oregon. This route would be 75 nm in length, which 30 nm longer than the current AR304 that ends southeast of Albany, Oregon. Aircraft flying along this route would maintain elevations of 3,100 to 5,000 feet (945 to 1,524 meters) MSL. This route is approximately 110 nm south of JBLM.

Proposed Refuel Route AR305, a current published route, begins south of Madras, Oregon, and heads north to The Dalles, Oregon. This route is 62 nm long. Aircraft flying along this route would maintain elevations of 1,500 to 6,000 feet (457 to 1,829 meters) MSL. This route is approximately 108 nm southeast of JBLM. Aircraft would typically enter the route at its ending point, which is the closest point to JBLM.

The proposed frequency of use is 50 times per year for each refueling route, with each training period lasting a maximum of 3 hours. Fuel transfer would take place during a 30-minute time frame within the training period, and the remainder of the time would be used for dry contacts and disconnects to gain proficiency. A typical training mission would involve completion of four tasks while flying along a refueling route: link-up, hook-up, transfer of fuel, and disconnect.

Aircraft taking part in training missions would consist of MH-60 Blackhawk and MH-47 Chinook helicopters, along with one C-130 tanker. During each training mission, from two to ten aircraft would be utilized. Helicopters could be all of one type or varying combinations of aircraft. Aircraft would typically operate at speeds ranging from 105 to 115 knots (121 to 132 miles per hour). During one training session, aircraft may use the entire route or just portions of it, and could complete one or more runs down the route and back up. Typical exercises for the proposed routes would entail six passes along Routes 1 and 2, twelve passes along Route 3, and five passes along Routes AR304 and AR305.

TABLE 3
Proposed Aerial Refueling Route and TF/MMR Route Specifications

Coordinates	Description	Elevation (feet MSL)	Fix/Rad/Distance	A/R Altitude	Track Heading	Length (nm)
Route 1 (AR307V)						
N 47° 07.89' / W 123° 09.54'	ARIP	718	OLM 293/14	2,500 - 5,000 Feet MSL	263°/296°	91
N 47° 08.86' / W 123° 16.91'	ARCP	597	OLM 287/19			
N 47° 13.76' / W 123° 58.46'	ARTP	200	HQM 004/18			
N 47° 53.88' / W 124° 59.88'	AREP	0	TOU 190/28			
Route 2 (ARX371V)						
N 46° 50.06' / W 123° 31.35'	ARIP	400	HQM 086/27	2,300 - 5,000 Feet MSL	253°	143
N 46° 49.98' / W 123° 40.23'	ARCP	400	HQM 090/21			
N 46° 49.90' / W 125° 00.20'	ARTP	0	HQM 240/36			
N 46° 49.49' / W 126° 59.61'	AREP	0	HQM 248/117			
Route 3 (ARX372V)						
N 47° 07.89' / W 123° 09.54'	ARIP	718	OLM 293/14	4,000 - 6,000 Feet MSL	193°	42
N 47° 02.63' / W 123° 13.87'	ARCP	581	OLM 270/14			
N 46° 31.29' / W 123° 40.07'	AREP	1,332	HQM 123/32			
AR305 (Current Published Route)						
N 44° 29.18' / W 121° 18.15'	ARCP	2,430	DSD 344/14	1,500 - 6,000 Feet MSL	0°	62
N 45° 31.13' / W 121° 18.15'	AREP	2,197	DSD 344/76			
AR304 (Extension of Current Published Route)						
N 45° 15.00' / W 122° 44.00'	ARCP	98	EUG 357/71	3,100 - 5,000 Feet MSL	0°	75
N 44° 30.00' / W 122° 44.00'	OLD AREP	505	EUG 026/31			
N 44° 00.00' / W 122° 44.00'	NEW AREP	1748	EUG 089/22			
TF/MMR Route						
N 47º 04.75' / W 122º 34.85'	GAAF	308	TCM 209/06	300 - 500 Feet AGL	varies	122
N 47º 03.28' / W 122º 34.11'	Point A	318	TCM 192/7			
N 46º 54.61' / W 122º 12.93'	Point B	1,856	TCM 121/18			
N 46º 33.64' / W121º 57.53'	Point C	3,113	TCM 127/41			
N 46º 20.01' / W 121º 26.90'	Point D	4,497	YKM 230/44			
N 46º 19.61' / W 120º 58.99'	Point E	3,926	YKM 216/27			
N 46º 34.47' / W 120º 51.92'	Point F	3,175	YKM 250/17			
N 46º 41.78' / W 120º 42.42'	Point G	1,797	YKM 284/13			
N 46º 41.98' / W 120º 26.45'	Exit	1,401	YKM 340/8			

A/R = Air Refueling; AGL = Above Ground Level; MSL = Mean Sea Level; GAAF = Gray Army Airfield.
Description Codes: ARIP = Air Refueling Initial Point (the entry point); ARCP = Air Refueling Control Point (the location where the tanker and the receiver rendezvous prior to refueling, and the point where tankers orbit); ARTP = Air Refueling Turning Point; AREP = Air Refueling Exit Point (the point at which the refueling track terminates).

Aircraft traveling to and from the proposed routes would not follow a set flight path. The dashed lines shown on Figures 2 and 3 represent the most direct approach to the various routes from JBLM. Actual flight paths to these routes could vary depending on weather and other factors. Aircraft would fly to and from the proposed routes at elevations of 500 feet (152 meters) above ground level (AGL) and higher, avoiding bad weather and populated areas. Under the Fly Friendly Program, pilots flying to and from military training routes (MTRs) maintain this minimum elevation and avoid areas of the landscape that might produce noise complaints. Therefore, during "friendly flying" homes and other noise-sensitive receptors are avoided.

Routes would be available for activation 24 hours a day, 7 days a week, 365 days a year. It is expected that 75 percent of training would occur at night, and that use of routes would be well-spaced throughout the year, rather than clustered together.

2.2 Low Level Training Operations

A low-level training area would be located in Washington, southeast of JBLM, mostly above the Gifford Pinchot National Forest (Figure 4). The area would be an irregularly-shaped polygon with a total area of approximately 496,500 acres (776 square miles). Helicopters could approach this area from any direction, under the guidelines of the Fly Friendly Program.

Within the area, helicopters would perform various mission-essential tasks that involve flying at low altitudes, from the ground surface to a height of 500 feet (152 meters) above treetop level. Tasks could include following the contours of the earth as low as 50 feet (15 meters) above the highest obstacle (nap-of-the-earth flying), formation flight, confined area approaches, hovering, low-level navigation, sling load operation (carrying cargo externally in a sling), and other flight and maneuvering of helicopters. Pilots would also land at various locations within the training area to practice tasks such as confined area landings. The training activities would be used to simulate mission activities. However, no refueling, expending of live ordnance, or actual movement of troops and/or equipment between the helicopter and the ground would occur within the low-level training area.

It is estimated that 10 to 20 landings would occur during each training session. Landings would take place at one or more of 10 identified landing zones, shown in Figure 4 and summarized in Table 4. Pilots would land helicopters and then take off again. In some cases, only a portion of the helicopter, such as one wheel, would touch down on the ground. All of these landing zones are located within the Gifford Pinchot National Forest. They are all relatively open areas that have been identified by the 160th SOAR as suitable for their training needs. They include abandoned quarry locations, rocky peaks, and roads. Although represented by dots on the figure, the proposed landing zones vary in size, ranging from approximately 10,000 square feet (0.5 square meters) for the smaller sites to 5 acres (2 ha) for the largest sites. All of the identified landing zones are presently cleared of vegetation and it is assumed that they would not require any alterations or ongoing maintenance to make them usable for training purposes.

Each training period would be approximately 3 hours in duration, and would involve no more than two helicopters (any combination of MH60 Blackhawks and MH47 Chinooks). Training events would occur approximately 60 times per year. The low-level training area and landing zones would be available for use 24

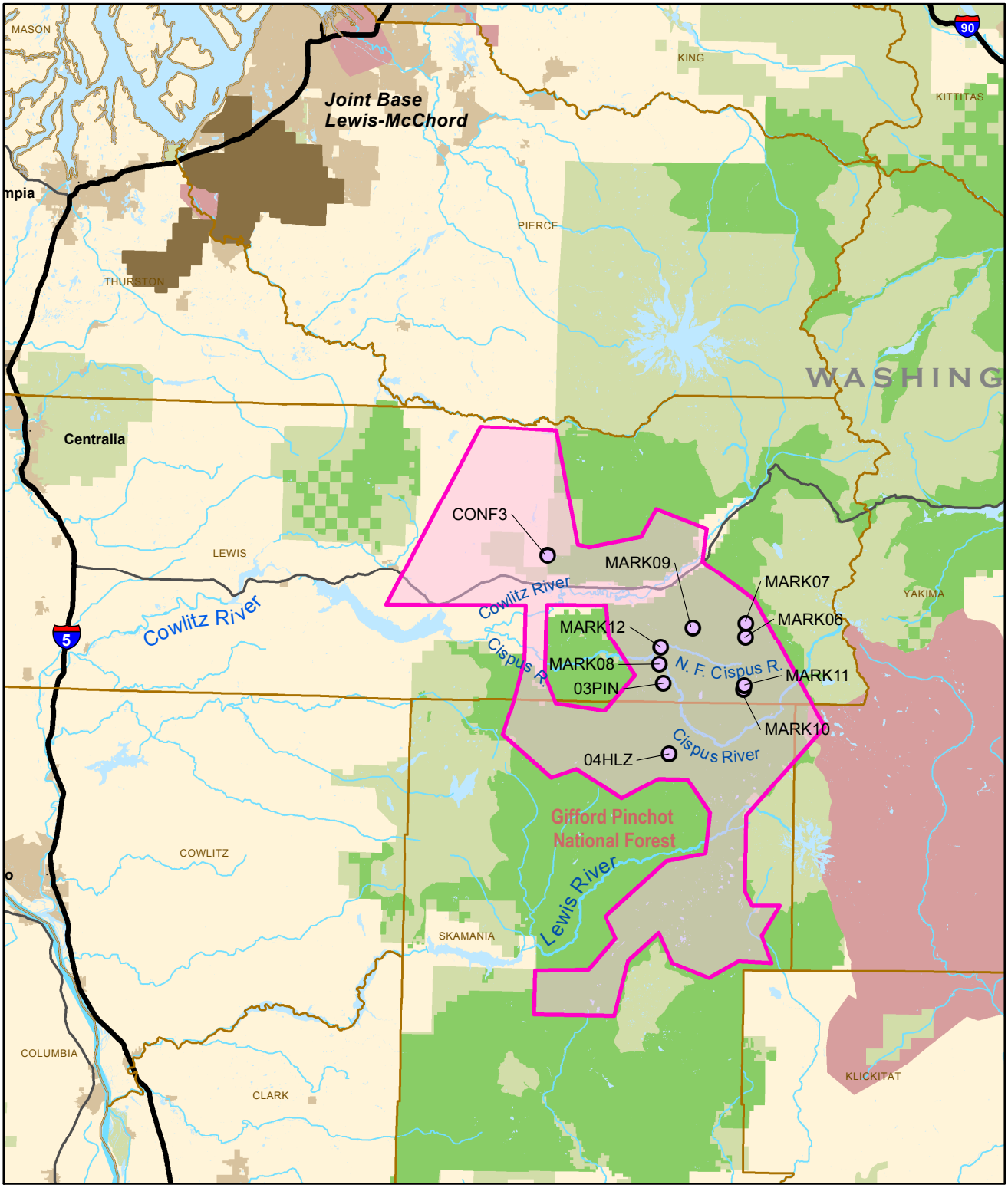

Figure 4. Proposed Low-Level Training Area

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Proposed Low-Level Training Area
Helicopter Landing Zones
Counties
Populated Areas
Public Lands
National Forests
Tribal Lands
Interstate Highways
U.S. Highways
Rivers & Streams

0 6 12 18 24 Kilometers
0 7 14 21 Miles

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hours a day, 7 days a week, 365 days a year, with the exception of weekends and federal holidays from Memorial Day through Labor Day. Use of the low-level training area and landing zones would occur throughout the year, as weather permits.

TABLE 4
Proposed Helicopter Landing Zones

Landing Zone	Location		Elevation (feet)	Use
	Township/Range/ Section	Latitude/ Longitude		
MARK06	T11N R10E S6	46.473167/ -121.617233	5,531	MH-47 Chinook: 1-wheel landing MH-60 Blackhawk: Landing
MARK07	T12N R9E S36	46.490883/ -121.617183	5,733	MH-47 Chinook: 3-Door rope, no landing MH-60: 1-wheel, no landing
MARK08	T11N R8E S14	46.436833/ -121.778167	1,481	MH-47 Chinook: Confined area 4-wheel landing MH-60 Blackhawk: Landing
MARK09	T12N R9E S32	46.484217/ -121.716517	5,136	MH-47 Chinook: 2-wheel, no landing MH-60 Blackhawk: landing (sloping)
MARK10	T11N R10E S30	46.405333/ -121.61975	5,345	MH-47 Chinook: Aft wheel extract training, no landing MH-60 Blackhawk: 2-wheel, no landing
MARK11	T11N R10E S30	46.410667/ -121.618267	5,219	MH-47 Chinook: Aft wheel extract training, no landing MH-60 Blackhawk: 2-wheel, no landing
MARK12	T11N R10E S11	46.458583/ -121.775767	1,713	MH-47 Chinook: Confined 4-wheel landing MH-60 Blackhawk: Landing
03PIN	T11N R8E S26	46.41205/ -121.76985	4,685	MH-47 Chinook: Aft wheel, no landing MH-60 Blackhawk: landing
04HLZ	T10N R8E S25	46.321083/ -121.757317	5,203	MH-47 Chinook: Landing MH-60 Blackhawk: Landing
CONF3	T13N R6E S36 T 13N R7E S31	46.574333/ -121.9904	4,600	MH-47 Chinook: Confined Area 4-Wheel Landing MH-60 Blackhawk: Landing

2.3 Terrain-Following/Multi-Mode Radar Operations

The proposed TF/MMR route is a new IR route (routes flown using instrument flight rules) between JBLM and JBLM-YTC (Figure 5). The route heads roughly southeast from JBLM and over the Cascade Range and Gifford Pinchot National Forest, making two bends before it heads east in Yakima County and then turns to the northeast toward JBLM-YTC. The total length of the route is 122 nm.

Uses of this route would include flying to JBLM-YTC during inclement weather, and proficiency/qualification training in terrain-following using multi-mode radar. During terrain-following training, pilots would use on-board radar that sweeps the terrain to maintain a fixed distance above the ground under conditions of limited visibility. During terrain-following exercises, aircraft would fly at altitudes of 300 to 500 feet (91 to 152 feet) above treetop level.

Terrain-following exercises would take place approximately 60 times per year. A typical exercise would be conducted by two helicopters (any combination of Blackhawks or Chinooks) leaving Gray Army Airfield 10 or 15 minutes apart. Helicopters would fly to JBLM-YTC and back, for a total time in the air of approximately 2

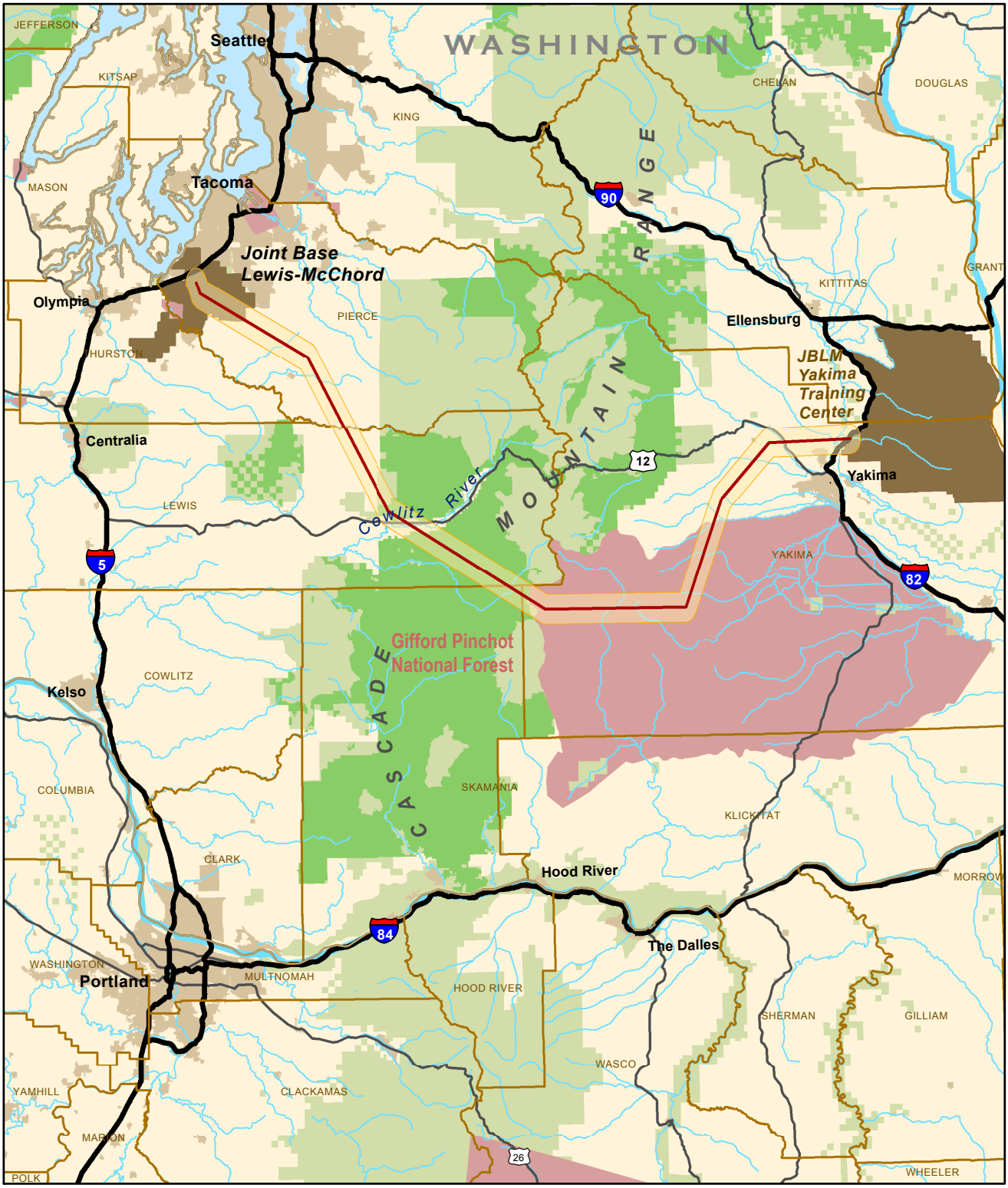

Figure 5. Proposed Terrain-Following/Multi-ModeRadar Route

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Proposed Terrain-Following/MMR Route
Route Buffer
Counties
Populated Areas
Public Lands
National Forests
Tribal Lands
Interstate Highways
U.S. Highways
Rivers & Streams

0 10 20 30 40 Kilometers
0 10 20 30 Miles

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DATE: 6/30/2011

hours. Once exiting the route, helicopters would fly friendly to Yakima Air Terminal–McAllister Field, located in Yakima, Washington, using visual flight rules outside of an established MTR. Aircraft could then return along the route to JBLM or continue on to JBLM-YTC.

The TF/MMR route would be available for use 24 hours a day, 7 days a week, 365 days a year, with the exception of weekends and federal holidays from Memorial Day through Labor Day. Use of the TF/MMR route would occur throughout the year, as weather permits.

2.4 Use of Routes by Other Military Units

The action addressed by this BA involves use of the identified training routes and training area, up to the given annual frequency. It is expected that the 160th SOAR would, for the most part, use these routes and training area exclusively. However, it is conceivable that other military units could request to use them for training. The 160th SOAR is the scheduling unit for the routes, and could approve use of the routes by other units, provided the annual training frequencies are not exceeded. In the case of the low-level training area and TF/MMR route, the Forest Service would also need to approve use of the training space by other military units, and each unit would need to acquire its own operating plan with the Forest Service prior to using National Forest lands for training. The conservation measures listed in this BA would apply to training activities by all military units using the training routes and area. Use of the routes and training area more than the annual frequencies provided for this action would require further assessment of impacts to listed species and associated Section 7 ESA consultation. However, because establishing the routes and training area could eventually result in their use by other units in the future, it is included in this BA analysis as a possible interrelated action.

3.0 BIOLOGICAL ASSESSMENT METHODOLOGY

The procedures used to develop this BA were based on the *Consultation Handbook: Procedures for Conducting Consultation and Conference Activities under Section 7 of the Endangered Species Act*, developed by the USFWS and NMFS for conducting consultation and conference activities under Section 7 of the ESA (USFWS and NMFS 1998).

3.1 Background Review

Background review for information on federally listed species and their critical habitat within the project area entailed accessing maps, databases, and other sources of information maintained by WDFW, Washington Natural Heritage Program, Oregon Biodiversity Information Center, NMFS, and USFWS. These sources and other available literature (e.g., species recovery plans and status reports) were consulted for information on species occurrence, range, and habitat requirements. The literature was reviewed for sources of information on noise-related effects to sensitive wildlife species. For species likely to be present in areas where the proposed Army activities would occur, agencies and individuals with knowledge of listed species and their habitat use near the project area were contacted for additional information on likely effects, and for suitable conservation measures to minimize/prevent effects to these species. Given the vast acreage of the project area, field studies to confirm species presence were not feasible. Therefore, based on range maps, it was assumed that all listed species on NMFS and USFWS lists that could possibly occur in the project area would be found there, unless there was compelling evidence to the contrary.

3.2 Status of the Species/Critical Habitat

This section provides information on the species' life history, their habitats and distributions, population dynamics, and other data on factors necessary for survival. This analysis documents the effects of past human and natural activities that have led to the current status of the species. If critical habitat is designated, appropriate information is provided.

3.3 Environmental Baseline

This section is an analysis of the effects of past and ongoing human and natural factors leading to the current status of the species, its habitat (including designated critical habitat), and ecosystem, within the action area. It does not include the effects of the action under review in the consultation. In this document, the baseline section and the status of the species/critical habitat section are combined.

3.4 Effects of the Action

Effects of the proposed action have been analyzed for listed species or critical habitat that are likely to occur in the study area. The effects assessment considers beneficial, direct, indirect, interdependent, interrelated, and cumulative effects on listed species or critical habitat as a result of the proposed action, and is based on the following factors:

- The dependency of the species on specific habitat components, including critical habitat;

- Proximity of the proposed action to the species or critical habitat;
- Timing, frequency, and duration of the action;
- Disturbance intensity and severity;
- Population levels of the species and its distribution;
- Habitat abundance;
- The degree of habitat impact (including designated critical habitat); and
- The potential to mitigate for the adverse effect.

The effects assessment considers the size, density, vigor, and location of species population(s), habitat requirements, and the timing and location of the project in relation to life requirements of the listed species. Types of effects are defined as follows:

- Beneficial – Effects of an action that are wholly positive, without any adverse effects, on a species or critical habitat. Determination that an action will have beneficial effects is a "may effect" situation.
- Direct – The direct or immediate effects of the project on the species or its habitat. Direct effects result from the agency action including the effects of interrelated actions and interdependent actions.
- Indirect – Effects caused by or resulting from the proposed action that occur later in time and are reasonably certain to occur. Indirect effects may occur outside of the area directly affected by the action.
- Interrelated and Interdependent – Effects of the action under consultation are analyzed together with the effects of other activities that are interrelated to, or interdependent with, that action. An **interrelated** activity is an activity that is part of the proposed action and depends on the proposed action for its justification. An **interdependent** activity is an activity that has no independent utility apart from the action under consultation.
- Cumulative – The effects of future actions that are reasonably certain to occur within the project area. Cumulative effects include the effects of future state, local, or private actions. Future federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to Section 7 of the ESA.

4.0 ANALYSIS AND DETERMINATION OF EFFECTS

This section provides background information on federally listed species, species proposed for listing, and designated critical habitat that are likely to occur within the study area. This information was used to analyze likely effects to these species and designated critical habitat from the proposed action. For the purposes of effects analysis, three groupings have been made for species that would be affected similarly by the proposed training: fish, marine turtles, and whales. All other species are discussed separately, with the effects analysis presented after the background information.

4.1 Bradshaw's Desert-Parsley

The primary reference for the baseline discussion in this section is:
USFWS. 2010a. Recovery Plan for the Prairie Species of Western Oregon and Southwestern Washington. Portland, Oregon.

References cited in this section are internal to the above-referenced document. They are included in the Bibliography.

4.1.1 Status of the Species/Critical Habitat and Baseline Information

Bradshaw's desert-parsley (*Lomatium bradshawii*), also known as Bradshaw's lomatium, occurs in a few populations in Clark County, Washington, as well as numerous populations in Benton, Lane, Linn, and Marion counties in Oregon. The majority of the populations are located within a 10-mile (16-kilometer [km]) radius of Eugene, Oregon. Most populations are small (10 to 1,000 plants), but the two largest each have more than 100,000 plants (Oregon Natural Heritage Information Center 2007). The total area of occupied habitat is approximately 742 acres (300 ha). Within the project area, populations of Bradshaw's desert-parsley occur beneath Route AR304 (the existing route and the proposed extension) in Marion and Lane counties. Numerous populations of the species also occur to the west and southwest of Route AR304.

Bradshaw's desert-parsley occurs in wet prairie habitats with heavy, sticky clay soils or a dense clay layer below the surface that results in seasonal hydric soils. Most populations occur in the southern Willamette Valley in seasonally saturated or flooded prairies near creeks and small rivers (Kagan 1980). More rarely, populations occur in the shallow, stream-covered basalt areas found in Marion and Linn counties near the Santiam River. At these sites, the plants occur in areas with almost no soil, usually in vernal wetlands or along stream channels. The relic wetland prairie inhabited by Bradshaw's desert-parsley has been described as the tufted hairgrass valley prairie, which ranges from fairly wet areas with high sedge and rush cover, to drier bunchgrass prairie. In the wet areas, Bradshaw's desert-parsley occurs on the edges of tufted-hairgrass or sedge bunches, in patches of bare or open soil (USFWS 1993a). In the drier areas, it is found in low areas, such as small depressions, trails, or seasonal channels, also with open, exposed soils. Populations of Bradshaw's desert-parsley generally respond positively to disturbance such as low-intensity fire and periodic mowing.

Bradshaw's desert-parsley reproduces entirely by seeds, which are produced on umbels. Flowers are visited by numerous pollinators, and require insects for pollination. The species does not form a seed bank; therefore,

insect pollinators are a very important component of reproduction (Kaye and Kirkland 1994). The species blooms fairly early in the spring, usually in April or early May. A typical population of Bradshaw's desert-parsley is composed of many more vegetative plants than reproductive plants.

Bradshaw's desert-parsley was federally listed as endangered, without critical habitat, on September 30, 1988 (USFWS 1988). Threats to the remaining populations of the species include expanding urban development (particularly the City of Eugene), pesticides, encroachment of woody and invasive species, herbivory, and grazing.

4.1.2 Analysis of Direct and Indirect Effects

Although Bradshaw's desert-parsley could potentially occur beneath proposed training routes in the project area, and is known to occur beneath Route AR304, it is not known or likely to occur in areas where aircraft would land during the proposed training operations. Therefore, there would be no direct, on-the-ground impacts to this species associated with the proposed project.

Because aerial refueling would occur in the air above potential habitat for this species, there is a small risk that plants could be affected by an in-air accident such as a broken hose during refueling. To prevent a loss of fuel, aircraft are equipped with shut-off valves that automatically stop the flow of fuel in the event that a refueling hose breaks. Therefore, the amount of fuel released during such an event would be limited to the amount of fuel present in the hose at the time of breakage, which would be approximately 34 gallons. The amount of fuel reaching the ground would vary depending on numerous factors, such as the altitude and speed of the tanker, as well as atmospheric conditions, but under a worst-case scenario the amount reaching the ground would range from 16 gallons (61 liters) under average conditions to 25 gallons (95 liters) on a cold day (ENSR 2008). This quantity of fuel would be dispersed over a wide area, given the height of aerial refueling (1,000 feet [305 meters] AGL and higher). In a similar study for aerial refueling operations at 2,000 feet (610 meters), it was predicted that the spilled fuel would be spread out over an area of 31 acres (13 ha; Dial Cordy and Associates Inc. 2006 a, b), or about 0.75 milliliter of fuel per square meter of land. At 1,000 feet (305 meters), the area would presumably be smaller, depending on the conditions. In order for an adverse effect to Bradshaw's desert parsley to occur, spilled fuel would have to land directly on one or more plants and be taken up by the tissues, or infiltrate the soil and subsequently be taken up by the plant, at a quantity sufficient to cause mortality or affect growth or reproduction. The 160th SOAR very rarely experiences fuel spills during refueling training. Since 1972, the 160th SOAR has experienced damage to refueling equipment that likely resulted in fuel releases on only three occasions on all of its refueling routes worldwide. These three incidents correspond to a rate of less than 1 event per 13,000 hours flown (Cuthbert 2011). Given the low likelihood of a fuel spill, and the low likelihood of fuel from a spill reaching Bradshaw's desert populations in a sufficient quantity to kill plants or reduce reproductive success, adverse effects to the species are discountable.

4.1.3 Interrelated and Interdependent Effects

Publication of the proposed aerial refueling routes would make them available for refueling operations by other military units. Use of these routes by additional aircraft would not impact populations of Bradshaw's desert-parsley, although risks of fuel spills could potentially increase with usage.

4.1.4 Cumulative Effects

Future actions that could adversely affect Bradshaw's desert-parsley involve factors that have led to the listing of the species and loss of habitat, including invasion of prairie vegetation by trees and shrubs; changes in flooding patterns and water movement (which may be critical to seedling establishment); urban development; agricultural or rural development; disease caused by a fungal parasite, and insect predation of plants and fruit; and, natural factors such as inbreeding or limited pollinator availability that may reduce fecundity, and therefore reproductive capacity of the species. These factors will continue to threaten populations of Bradshaw's desert-parsley. Because there would be no effects to Bradshaw's desert-parsley associated with the proposed training, beyond discountable fuel spill effects, there would be no additional cumulative effects to the species from the proposed action.

4.1.5 Conservation Measures

To prevent damage to the refueling hose during fuel transfer, and other accidents, the 160th SOAR would follow the procedures outlined in Army Regulation 385-95, *Army Aviation Accident Prevention*. This regulation outlines numerous required steps and processes to identify training hazards and prevent them from occurring during training. Included is a systematic risk assessment process. For more information on accident prevention measures, see Appendix B.

4.1.6 Determination of Effects

Bradshaw's desert-parsley is known to occur in the project area, and additional undocumented populations could be present. In-air activities would not affect this species, and all landing would take place outside its known range. Effects associated with fuel spills would be discountable because they are extremely unlikely to occur. Therefore, the proposed project **may affect, is not likely to adversely affect** Bradshaw's desert-parsley.

4.2 Golden Paintbrush

The primary reference for the baseline discussion in this section is:
USFWS. 2000a. Recovery Plan for the Golden Paintbrush (*Castilleja levisecta*). Portland, Oregon.

References cited in this section are internal to the above-referenced document. They are included in the Bibliography.

4.2.1 Status of the Species/Critical Habitat and Baseline Information

Golden paintbrush inhabits grasslands within the Puget Sound lowlands (including the southern tip of Vancouver Island, British Columbia) at elevations from sea level to about 330 feet (101 meters). It also historically occurred in the Willamette Valley of Oregon, but has not been observed in the state for more than 50 years. Golden paintbrush once occurred at more than 30 sites (Hitchcock et al. 1959, Sheehan and Sprague 1984, Gamon 1995), but has become restricted to a small number of sites because much of its historical habitat has been converted and/or developed for commercial, residential, or agricultural use. It is now known from 11 extant populations, nine in Washington and two in British Columbia. The nine populations in Washington

consist of one population south of Olympia in Thurston County, five populations on Whidbey Island, and three in the San Juan Islands. The closest population to the proposed routes is the population in Thurston County, which aircraft could potentially fly over when traveling between JBLM and Routes AR304 and 2. Based on the species' range and historic populations, it is assumed that the species could be present within the project area, particularly on prairies in the south Puget Sound region and the Willamette Valley.

Golden paintbrush occurs on generally flat grasslands, including some characterized by mounded topography, and on steep coastal bluffs with a west or southwest aspect that are grass-dominated. Low deciduous shrubs are commonly present as small to large thickets. In the absence of fire, some of the sites have been colonized by trees, primarily Douglas-fir (*Pseudotsuga menziesii*), and shrubs including Scotch broom (*Cytisus scoparius*) and wild rose (*Rosa nutkana*). All of the extant populations occur on soils derived from glacial origins, although historic populations occurred on near-bedrock soils and clayey alluvial soils.

Golden paintbrush is a short-lived perennial herb; individuals generally do not survive longer than 5 or 6 years. Since vegetative spread has never been reported, biologists think this species reproduces exclusively by seed. Plants emerge in early March, flower from late April through early June, and fruit from June to mid-July. Roots of plants are capable of forming parasitic connections to roots of other plants, although plants do not necessarily require a host to survive. The breeding system in the species has not been thoroughly documented. Bumblebees are thought to be pollinators, although reproduction has been observed in the absence of pollinator visitation (Wentworth 1994). It is thought that seeds are dispersed only a short distance from the parent plant, as they are shaken from capsules and likely dispersed by wind.

Golden paintbrush was federally listed as threatened, without critical habitat, on June 11, 1997 (USFWS 1997). Threats to the species include encroachment of shrub and forest lands on prairies; development of property; low potential for expansion because existing habitat is constricted; and recreational picking and herbivory. Because there are relatively few individuals in the remaining populations, golden paintbrush is vulnerable to random events.

4.2.2 Analysis of Direct and Indirect Effects

Golden paintbrush occurs in the project area, but is not known or likely to occur in areas where aircraft would land during the proposed training operations. Therefore, there would be no direct, on-the-ground impacts to this species.

Aerial refueling would not be conducted over or near known populations of golden paintbrush, although Route AR304 passes over potentially suitable habitat for this species in the Willamette Valley. Should populations of golden paintbrush occur beneath this refuel route, they could potentially be affected by a release of fuel, should one occur during training. As discussed in Section 4.1.2, associated impacts to plants would depend on the amount of fuel taken up by plant tissues. Since golden paintbrush is not known to occur beneath refueling routes and the risk of a fuel spill is very low, adverse effects are extremely unlikely to occur.

4.2.3 Interrelated and Interdependent Effects

Publication of the proposed aerial refueling routes would make them available for refueling operations by other military units. Use of these routes by additional aircraft would not impact populations of golden paintbrush, although risks of fuel spills could potentially increase with usage.

4.2.4 Cumulative Effects

Future actions that could adversely affect the species include ongoing encroachment of shrub and forest lands on prairies with the continued suppression of fire; development within suitable habitat; and recreational picking and herbivory. Because there are relatively few individuals in the remaining populations, golden paintbrush is vulnerable to random events. Because there would be no effects to golden paintbrush associated with the proposed project, beyond discountable fuel spill effects, cumulative effects to the species would not occur.

4.2.5 Conservation Measures

To prevent damage to the refueling hose during fuel transfer, and other accidents, the 160th SOAR would follow procedures discussed in Section 4.1.5.

4.2.6 Determination of Effects

Golden paintbrush occurs in the project area, but is not known to occur beneath aerial refueling routes or at sites where aircraft would land under the proposed project. Although unlikely, undocumented populations could be present in the Willamette Valley near or beneath proposed Route AR304. In-air activities would not affect this species. Effects associated with fuel spills would be discountable because they are extremely unlikely to occur. Therefore, the proposed project **may affect, is not likely to adversely affect** golden paintbrush.

4.3 Kincaid's Lupine

The primary references for the baseline discussion in this section are:
USFWS. 2006a. Recovery Outline for *Lupinus sulphureus* ssp. *kincaidii* (Kincaid's lupine). Oregon Fish and Wildlife Office. Portland, Oregon.

and

USFWS. 2010a. Recovery Plan for the Prairie Species of Western Oregon and Southwestern Washington. Portland, Oregon.

References cited in this section are internal to the above-referenced documents. They are included in the Bibliography.

4.3.1 Status of the Species/Critical Habitat and Baseline Information

Kincaid's lupine (*Lupinus sulphureus* ssp. *kincaidii*) occurs in dry upland prairies from Lewis County, Washington, south to the foothills of Douglas County, Oregon, with most populations found in the Willamette

Valley. The species probably was once well-distributed throughout the prairies of western Oregon and southwest Washington, but extant populations are now widely separated by unsuitable habitat. Within the project area, extant populations in Lane and Linn counties (Oregon) occur west and south of Route AR304. Populations in western Lewis County, Washington do not occur beneath any of the proposed routes or within the proposed low-level training area, but aircraft could potentially fly over these populations on their way to the refueling routes. Within the project area, designated critical habitat occurs in Lewis County, Washington, and in Yamhill, Polk, Benton, and Lane counties in western Oregon. Critical habitat does not occur beneath any of the training routes or within the proposed low-level training area.

In the Willamette Valley and southwest Washington, Kincaid's lupine occurs in small populations on upland prairie remnants with well-drained soils. Populations in Douglas County tolerate more shaded conditions (Barnes 2004), and tree and shrub species (e.g., Douglas-fir, California black oak (*Quercus kelloggii* Newberry) and Pacific madrone (*Arbutus menziesii*) are site dominants. Invasive species are also a significant component of the site species composition (Wilson et al. 2003).

Kincaid's lupine is a long-lived perennial species that flowers from April through June. Plants become dormant at the start of the dry season and die back by mid-August (Wilson et al. 2003). Insect pollination appears to be critical for successful seed production, and is carried out by bees. Individual plants are capable of spreading extensively underground by rhizomes. Reproduction by seed is common in large populations, but reduced in small populations (Severns 2003). Seeds are dispersed from fruits that open explosively upon drying. Kincaid's lupine is the larval host plant of the federally endangered Fender's blue butterfly (*Icaricia icarioides fenderi*).

Kincaid's lupine was federally listed as threatened on January 25, 2000 (USFWS 2000b). On October 6, 2006, the USFWS designated 585 acres as critical habitat for the species in Benton, Lane, Polk, and Yamhill Counties, Oregon, and Lewis County, Washington (USFWS 2006b). Kincaid's lupine likely once occurred over a large distribution throughout the historic native prairie. However, native prairie was decimated by the rapid expansion of agriculture from the 1850s to the present. In addition, fire suppression allowed shrub and tree species to overtake grasslands, while agricultural practices hastened the decline of native prairie species through habitat loss and increased grazing (Johannessen et al. 1971, Franklin and Dyrness 1973). Presently, the primary threats to Kincaid's lupine include habitat loss, competition from non-native plants, and elimination of historical disturbance regimes (Wilson et al. 2003). Additionally, habitat fragmentation and isolation of small populations may be causing inbreeding depression in the species.

4.3.2 Analysis of Direct and Indirect Effects

Known populations of Kincaid's lupine, as well as critical habitat, occur in western Washington and Oregon, although generally outside of the project area. However, for the purposes of this analysis, it is assumed that suitable habitat for this species occurs within the project area. The species could potentially occur beneath refueling routes, but are unlikely to be found in the low-level training area, which is substantially east of the range of this species. Therefore, there would be no direct, on-the-ground impacts to Kincaid's lupine.

Should populations of Kincaid's occur beneath proposed refueling routes, they could potentially be affected by an accidental release of fuel in the event of a broken hose or other mishap during fuel transfer. As discussed in

Section 4.1.2, associated impacts to plants would depend on the amount of fuel taken up by plant tissues. Since Kincaid's lupine is not known to occur beneath refueling routes and the risk of a fuel spill is very low, adverse effects are extremely unlikely to occur and therefore discountable.

4.3.3 Interrelated and Interdependent Effects

Publication of the proposed aerial refueling routes would make them available for refueling operations by other military units. Use of these routes by additional aircraft would not impact populations of Kincaid's lupine, although risks of fuel spills could potentially increase with usage.

4.3.4 Cumulative Effects

Ongoing development of suitable habitat, timber harvest, recreation, and encroachment of native shrublands and forests onto habitat as a result of continued fire suppression are all factors that could adversely affect Kincaid's lupine in the future. Because there would be no effects to Kincaid's lupine associated with the proposed project, beyond discountable fuel spill effects, cumulative effects to the species would not occur.

4.3.5 Conservation Measures

To prevent damage to the refueling hose during fuel transfer, and other accidents, the 160th SOAR would follow procedures discussed in Section 4.1.5.

4.3.6 Determination of Effects

Kincaid's lupine occurs near the project area, and could potentially occur beneath aerial refueling routes, but is not likely to occur or at sites where aircraft would land under the proposed project. Undocumented populations could be present in western Washington and Oregon, particularly near or beneath Route AR304. In-air activities would not affect this species. Effects associated with fuel spills would be discountable because they are extremely unlikely to occur. Therefore, the proposed project **may effect, is not likely to adversely affect** Kincaid's lupine or its critical habitat.

4.4 Marsh Sandwort

The primary reference for the baseline discussion in this section is:
USFWS. 1998a. Recovery Plan for Marsh Sandwort (*Arenaria paludicola*) and Gambel's Watercress (*Rorippa gambelii*). Portland, Oregon.

References cited in this section are internal to the above-referenced document. Full citations have been included in the Bibliography.

4.4.1 Status of the Species/Critical Habitat and Baseline Information

The marsh sandwort (*Arenaria paludicola*) was historically found in scattered locations near the Pacific coast in Washington and southern and central California. The species occurs in freshwater marshes at elevations from sea level to 1,480 feet. Soils in these habitats are saturated, acidic bog soils that are predominantly sandy and

have a high organic content. Presently, there is only one known extant population of this species, which is located in San Luis Obispo County, California. The Marsh sandwort has been listed by the Washington Natural Heritage Program as "possibly extirpated" in Washington State. Nonetheless, it is thought that suitable habitat for the species remains in Washington State, and that populations could exist there now or in the future. Because there are so few individuals remaining, studying the life history of this species has been difficult. Although plants have been observed flowering and fruiting minimally, and a viable seed bank has been identified, information about pollinators, seed germination and dispersal, and seedling recruitment is lacking.

The marsh sandwort was federally listed as endangered, without critical habitat, on August 3, 1993 (USFWS 1993b). Threats to the species include encroaching vegetation (both native and non-native) associated with lowered water tables, agricultural and residential development, and use of off-highway vehicles (OHVs). In addition, the very low number of individuals in the remaining populations puts this species at a great risk of extinction as a result of random, naturally occurring events.

4.4.2 Analysis of Direct and Indirect Effects

Marsh sandwort has not been documented in Oregon and is thought to be extirpated from Washington. However, because suitable habitat may occur in Washington, it is possible that this species may occur in the state now or in the future. In-flight training activities would not affect plant populations, and aircraft would only land within the proposed low-level training area. Habitat that is suitable for this species (i.e., freshwater marsh) is not suitable for landing of aircraft (dry, open areas with firm hard-packed soil are preferred) and does not occur in any of the proposed landing zones. Therefore, direct, on-the ground impacts to this species should not occur.

Should one or more population of marsh sandwort occur beneath proposed refueling routes, the species could potentially be affected if an accidental release of fuel were to occur during in-air fuel transfer. As discussed in Section 4.1.2, associated impacts to plants would depend on the amount of fuel taken up by plant tissues. Since marsh sandwort is not known to occur beneath refueling routes or elsewhere in the project area and the risk of a fuel spill is very low, adverse effects are extremely unlikely to occur and therefore discountable.

4.4.3 Interrelated and Interdependent Effects

Publication of the proposed aerial refueling routes would make them available for refueling operations by other military units. Use of these routes by additional aircraft would not impact populations of marsh sandwort, although risks of fuel spills could potentially increase with usage.

4.4.4 Cumulative Effects

Given the lack of evidence of populations of marsh sandwort in the project area (or in Washington or Oregon), it is unlikely that future actions within the project area would impact this species, although agriculture and residential development could continue to reduce the amount of suitable habitat for the species. Because there would be no effects to marsh sandwort associated with the proposed training, beyond discountable effects associated with accidental releases of fuel, cumulative effects would not occur.

4.4.5 Conservation Measures

To prevent damage to the refueling hose during fuel transfer, and other accidents, the 160th SOAR would follow procedures discussed in Section 4.1.5.

4.4.6 Determination of Effects

Marsh sandwort is not known to occur in or near the project area. Although it is possible that undocumented populations of this species occur in the project area, they are not likely to occur or at sites where aircraft would land under the proposed project. The only potential effects to plants that might happen to be beneath the proposed routes would be associated with an accidental release of fuel. These effects are discountable, given the lack of evidence of populations of marsh sandwort in the project area and the small likelihood of a fuel spill. Therefore, the proposed project would have **no effect** on marsh sandwort.

4.5 Nelson's Checker-Mallow

The primary references for the baseline discussion in this section are:
USFWS. 1998b. Recovery Plan for the Threatened Nelson's Checker-mallow (*Sidalcea nelsoniana*). Portland, Oregon.

and

USFWS. 2010a. Recovery Plan for the Prairie Species of Western Oregon and Southwestern Washington. Portland, Oregon.

References cited in this section are internal to the above-referenced documents. They are included in the Bibliography.

4.5.1 Status of the Species/Critical Habitat and Baseline Information

Nelson's checker-mallow (*Sidalcea nelsoniana*) occurs as scattered populations in the northern Oregon Coast Range, the Willamette Valley, and the Puget Trough of Washington, with the majority of sites in the Willamette Valley of Oregon. In the Willamette Valley, populations of the species occur at low elevations within a mosaic of urban and agricultural areas, with concentrations around the cities of Corvallis and Salem. Some of these populations occur under or near Route AR304. The Puget Trough populations occur in Lewis and Cowlitz counties. None of the project training routes pass over or near these populations, but aircraft could potentially pass over them when traveling between JBLM and the training routes. The Coast Range populations are outside the project area.

Coast Nelson's checker-mallow occurs in diverse habitats, occupying a broad range of soils that vary in texture, drainage, and disturbance regimes (CH2M Hill 1986). Plants appear to favor primary drainages, or those that receive mostly ground flow of stormwater runoff, rather than drainages fed by stream sources. Although occasionally occurring in the understory of woodlands or among woody shrubs, populations of Nelson's checker-mallow in the Willamette Valley usually occupy open habitats that support early successional species.

These habitats are frequently represented by margins of sloughs, ditches, and streams, roadsides, fence rows, drainage swales, native prairie remnants, and fallow fields. Most sites have been densely colonized by invasive weeds, especially introduced forage grasses. Coast Range populations typically occur in open, wet to dry meadows, intermittent stream channels, and along the margins of coniferous forests (Glad et al. 1987).

Nelson's checker-mallow is an herbaceous perennial species. In the Willamette Valley, flowering begins as early as mid-May, and continues through August to early September, depending on the moisture and climatic conditions of each site. Sexual reproduction appears to be accomplished entirely by insect pollinators.

Nelson's checker-mallow was federally listed as threatened, without critical habitat, on February 12, 1993 (USFWS 1993c). Prior to European settlement, Nelson's checker-mallow habitats were likely maintained by natural wildfires, fires set by Native Americans (Johannessen et al. 1971, Franklin and Dyrness 1973, Boyd 1986), and sporadic flooding. Disturbance regimes have been dramatically altered since the onset of European settlement. Today, no natural prairie remains in the Willamette Valley without evidence of livestock grazing, agriculture, and fire suppression (Moir and Mika 1972). Urbanization and conversion of the native prairies into intensively managed croplands and pastures have eliminated and fragmented grasslands to the extent that Nelson's checker-mallow is now restricted to sparsely distributed patches within narrow highway and country road rights-of-way, undeveloped tracts, ditches, fence rows, abandoned fields, parks, and wildlife refuges. Existing populations of Nelson's checker-mallow are threatened by urban and agricultural development, ecological succession (shrub and tree encroachment onto open prairie habitats, and competition with invasive weeds (USFWS 1993c).

4.5.2 Analysis of Direct and Indirect Effects

Nelson's checker-mallow is unlikely to be found in the proposed low-level training area, which is substantially east of the range of this species. Therefore, there would be no direct, on-the-ground impacts to this species.

Populations of Nelson's checker-mallow that occur beneath or near Route AR304 could potentially be impacted by an accidental release of fuel during proposed aerial refueling activities. As discussed in Section 4.1.2, impacts to plants would depend on the amount of fuel taken up by the plant tissues. Because the risk of a fuel spill is very low and the risk of fuel reaching populations of this species in sufficient quantities to cause mortality or reproductive effects is even lower, adverse effects to Nelson's checker-mallow are extremely unlikely to occur and therefore discountable.

4.5.3 Interrelated and Interdependent Effects

Publication of the proposed aerial refueling routes would make them available for refueling operations by other military units. Use of these routes by additional aircraft would not impact populations of Nelson's checker-mallow, although risks of fuel spills could potentially increase with usage.

4.5.4 Cumulative Effects

Nelson's checker-mallow is now restricted to sparsely distributed patches within narrow highway and country road rights-of-way, undeveloped tracts, ditches, fence rows, abandoned fields, parks, and wildlife refuges.

Roadside maintenance, herbicide application and mowing, soil cultivation, ditching, and other habitat modifications could occur within the project area and have the potential to adversely impact Nelson's checker-mallow. Because there would be no effects to Nelson's checker-mallow associated with the proposed project, beyond discountable fuel spill effects, cumulative effects would not occur.

4.5.5 Conservation Measures

To prevent damage to the refueling hose during fuel transfer, and other accidents, the 160th SOAR would follow procedures discussed in Section 4.1.5.

4.5.6 Determination of Effects

Nelson's checker-mallow occurs in the project area beneath one of the aerial refueling routes, but not in proposed landing zones. In-air activities would not affect this species, but effects from an accidental fuel release would be possible but of extremely low probability. Therefore, the proposed project **may affect, is not likely to adversely affect** Nelson's checker-mallow.

4.6 Ute Ladies'-tresses

The primary reference for the baseline discussion in this section is:
Fertig, W, R. Black, and P. Wolken. 2005. Rangewide Status Review of Ute Ladies'-Tresses. Prepared for the U.S. Fish and Wildlife Service and Central Utah Water Conservancy District. Lakewood, Colorado.

References cited in this section are internal to the above-referenced document. They are included in the Bibliography.

4.6.1 Status of the Species/Critical Habitat and Baseline Information

Ute ladies'-tresses (*Spiranthes diluvalis*) is a perennial, terrestrial orchid that occurs in riparian, spring, and lakeside wetland meadows in eight states (Colorado, Nevada, Utah, Idaho, Montana, Nebraska, Washington, and Wyoming) and 38 watersheds in the western United States. In Washington, there are two known occurrences of the species, one at a lake in Okanogan County and one along a reservoir bordering the Columbia River in Chelan County. Ute ladies'-tresses is not known to occur in the project area, although suitable habitat for the species does occur in Klickitat and Yakima counties.

Ute ladies'-tresses occurs in a variety of wet and regularly flooded habitats. Over one-third of all known populations are found on alluvial banks, point bars, floodplains, or oxbows associated with perennial streams (Jennings 1989, Riedel 2002). These habitats typically have short vegetative cover maintained by grazing, periodic flooding, or mowing. Plants also occur in river floodplain habitats that experience regular spring flooding and frequent large-scale floods. Both occurrences in Washington are associated with lakes or reservoirs, in habitats that are exposed as the lake level fluctuates, or that experience frequent flooding. Other habitats include groundwater-fed springs and subirrigated meadows that occur in depressions, valley bottoms, and swampy lowlands; and human-influenced riparian habitats. In Washington, Ute ladies'-tresses occurs at elevations of 720 to 1,830 feet (220 to 558 meters).

Ute ladies'-tresses is a long-lived perennial forb that probably reproduces exclusively by seed. There are four main stages to the life cycle: seedling, dormant, vegetative, and reproductive (modified from Arft 1995). Fruits are produced in late August or early September, followed by seed dispersal by wind or water (Jennings 1990). Seeds are believed to be short-lived in the soil. New germinants remain dormant underground, until they are large enough to develop aboveground leafy shoots. New shoots are produced in October and persist through the winter as small rosettes (Arft 1995). Rosettes resume growth in the spring, developing into short-stemmed leafy plants. Reproductive individuals bloom from early July to late October. Bees are the primary pollinators.

Ute ladies'-tresses was federally listed as threatened on January 17, 1992 (USFWS 1992a). Critical habitat has not been designated. The primary threats to the species include habitat loss and modification (through urbanization and road and infrastructure construction), recreation, grazing by livestock, modification of hydrology, competition from invasive species, vegetative succession, herbivory, loss of pollinators, and drought.

4.6.2 Determination of Effects

Ute ladies'-tresses is not known to occur in the project area, although it could potentially occur in Yakima and/or Kittitas counties in Washington, where suitable habitat for the species occurs. Proposed activities occurring in these two counties would include flying along the TF/MMR route, landing at McAllister Field in the city of Yakima, and conducting various training activities in a small portion of the low-level training area. None of the proposed landing zones are located in Yakima or Kittitas counties. In-air activities would not affect Ute ladies'-tresses or its habitat. Additionally, landing of helicopters at designated facilities at McAllister Field would not affect this species or its habitat. Therefore, the proposed training will have **no effect** on Ute ladies'-tresses.

4.7 Water Howellia

The primary reference for the baseline discussion in this section is:
Mincemoyer, S. 2005. Range-wide Status Assessment of *Howellia aquatilis* (Water Howellia). Prepared for U.S. Fish and Wildlife Service. Montana Natural Heritage Program. Helena, Montana.

References cited in this section are internal to the above-referenced document. They are included in the Bibliography.

4.7.1 Status of the Species/Critical Habitat and Baseline Information

Water howellia (*Howellia aquatilis*) is an annual aquatic plant that is endemic to the Pacific Northwest. Its current known distribution includes Washington, Oregon, Idaho, Montana, and California. The majority of the occurrences are concentrated in three metapopulations in western Washington, Spokane County, Washington, and west-central Montana. In western Washington there are numerous populations on JBLM and JBLM-McChord, as well as one population in Clark County, across the Columbia River from the location of the first known collection of the species in Multnomah County, Oregon. In Oregon, the species was long presumed extirpated until a population was found in 2002 on the William Finley National Wildlife Refuge in Benton County. Within the project area, extant populations of water howellia occur in Pierce and Thurston counties,

primarily on JBLM. The Thurston county population occurs south of the likely access route to proposed Route 2. The TF/MMR route passes over populations of water howellia on JBLM in Pierce County. In addition, because all helicopters would take off from and land at Gray Army Airfield on JBLM, it is assumed that they would fly over or near populations of water howellia on JBLM.

The dominant habitat for water howellia is small, vernal, freshwater wetlands and ponds that annually fill up with water in the fall and then dry up by the end of the growing season. Depending on annual patterns of temperature and precipitation, the drying of the pond may be complete or partial by the fall. A few populations occur in oxbow sloughs and surrounding marshy areas. Ponds inhabited by water howellia are typically surrounded by some forest vegetation. Bottom surfaces of the ponds and wetlands typically consist of organic sediments underlain by consolidated clay (USFWS 1996a).

Water howellia is a winter annual, reproducing entirely by seed. Germination takes place in the fall, and seedlings over-winter and resume growth in the spring. Germination occurs only when ponds dry out and seeds are exposed to air (Lesica 1990, 1992). Population size varies widely from year to year, depending on the extent to which the pond dries out at the end of the previous year. Plants begin growth in the spring, and emergent flowers bloom soon after the stems reach the water surface, from June into August. In addition to emergent flowers, plants produce submerged flowers that do not open and are self pollinated.

Water howellia was federally listed as a threatened species, without critical habitat, on July 14, 1994 (USFWS 1994a). Potential threats to the species include invasion of occupied sites by non-native species, and activities related to timber harvesting, land development, recreation, military training, and grazing. On JBLM, populations are protected from destructive forms of training by wetland buffers. However, trampling of the drawdown zone has been observed.

4.7.2 Analysis of Direct and Indirect Effects

Water howellia is known to occur within the project area in Pierce and Thurston counties, primarily on JBLM. The species could also potentially occur in other portions of the project area in western Washington and Oregon, but is unlikely to occur in the proposed low-level training area or landing zones. Other take-offs and landings would occur at Gray Army Airfield at JBLM and McAllister Field in Yakima, which do not support populations of water howellia or suitable habitat for the species. Therefore, direct, on-the-ground impacts to water howellia should not occur.

Although populations of water howellia are not known to occur beneath the refueling routes, undocumented populations of this species could potentially be present, and could potentially be affected in the event of an accidental release of fuel during in-air fuel transfer along these routes. As discussed in Section 4.1.2, impacts to plants from a fuel spill would depend on the amount of fuel taken up by plant tissues. Since there are no documented occurrences of water howellia beneath the refueling routes and the risk of a fuel spill is very low, adverse effects are extremely unlikely to occur and therefore discountable.

4.7.3 Interrelated and Interdependent Effects

Publication of the proposed aerial refueling routes would make them available for refueling operations by other military units. Use of these routes by additional aircraft would not impact populations of water howellia, although risks of fuel spills could potentially increase with usage.

4.7.4 Cumulative Effects

Ongoing timber harvesting, land development, recreation, and grazing within the project area will continue to impact water howellia and suitable habitat for this species within the project area. On JBLM, populations are protected from destructive forms of training by wetland buffers and would not be adversely impacted by non-federal actions. Because there would be no effects to water howellia associated with the proposed training, beyond discountable fuel spill effects, cumulative effects to the species would not occur.

4.7.5 Conservation Measures

To prevent damage to the refueling hose during fuel transfer, and other accidents, the 160th SOAR would follow procedures discussed in Section 4.1.5.

4.7.6 Determination of Effects

Water howellia occurs in the project area, but is unlikely to occur in the proposed landing zones, and is not known to occur beneath refueling routes. It is possible that undocumented populations occur beneath refueling routes, where they would have an extremely low probability of being impacted by an accidental release of fuel in the event of a mishap during refueling activities (see Section 4.1.2). Given this low probability of harm and that there are no documented populations beneath the routes, the proposed project **may affect, is not likely to adversely affect** water howellia.

4.8 Willamette Daisy

The primary references for the baseline discussion in this section are:
USFWS. 2006b. Designation of Critical Habitat for the Fender's Blue Butterfly (*Icaricia icarioides fenderi*), *Lupinus sulphureus* ssp. *kincaidii* (Kincaid's Lupine), and *Erigeron decumbens* var. *decumbens* (Willamette Daisy); Final Rule. Federal Register 71(210):63861-63977.

and

USFWS. 2010a. Recovery Plan for the Prairie Species of Western Oregon and Southwestern Washington. Portland, Oregon.

References cited in this section are internal to the above-referenced documents. A complete list of these references is available from the USFWS Oregon State Office, Portland, Oregon.

4.8.1 Status of the Species/Critical Habitat and Baseline Information

The Willamette daisy (*Erigeron decumbens* var. *decumbens*) is endemic to the Willamette Valley of Oregon and is restricted primarily to native grasslands in this region. The vast majority of these grasslands require natural or human-induced disturbance for their maintenance (Franklin and Dyrness 1973), and would likely be forested if left undisturbed (Johannessen et al. 1971). Although presumed to be extinct before 1980, the species has been rediscovered and is now known to occur at more than 30 sites in Benton, Lane, Linn, Marion, and Polk counties, Oregon. Known extant sites include locations beneath and west of Route AR304. In addition, portions of designated critical habitat for this species occur under Route AR304, in Marion and Linn counties.

The Willamette daisy occurs in native wetland prairie and drier upland prairie sites where woody cover is nearly absent. The wet prairie habitat is characterized by the seasonally wet tufted hairgrass community that occurs in low, flat regions of the Willamette Valley where flooding creates anaerobic and strongly reducing soil conditions. This wet prairie community includes rushes and California oatgrass as co-dominant native species, as well as the introduced species tall fescue, Japanese brome, and sweet vernal grass. On upland prairie sites, associated species include Hall's aster (*Symphyotrichum hallii*), Roemer's fescue (*Festuca idahoensis* ssp. *roemeri*), and Pacific poison oak (*Toxicodendron diversilobum*) (Meinke 1982, Clark et al. 1993).

The Willamette daisy is an herbacious perennial herb that blooms in June and early July and produces seeds in late summer. As with many species in the Aster family, the Willamette daisy produces large quantities of wind-dispersed seeds. Pollination is potentially carried out by flies, bees, and butterflies. Seeds are released in July and August. Although the seeds are wind-dispersed, the short stature of this species likely prevents the long-distance travel of many of these seeds. The Willamette daisy is capable of vegetative spreading and is commonly found in large clumps scattered throughout a site (Clark et al. 1993).

The Willamette daisy was federally listed as endangered on January 25, 2000 (USFWS 2000b). On October 31, 2006, 718 acres (291 ha) in the Willamette Valley were designated as critical habitat for the species in Benton, Lane, Polk, and Yamhill counties, Oregon (USFWS 2006b). The Willamette daisy likely once occurred over a large distribution throughout the historic native prairie. However, native prairie vegetation in the Willamette Valley was decimated by the rapid expansion of agriculture from the 1850s to the present. In addition, fire suppression allowed shrub and tree species to overtake grasslands, while agricultural practices hastened the decline of native prairie species through habitat loss and increased grazing (Johannessen et al. 1971, Franklin and Dyrness 1973). Currently, the species is threatened by habitat loss due to urban and agricultural development, successional encroachment into its habitat by trees and shrubs, competition with non-native weeds, and small population sizes (Kagan and Yamamoto 1987, Clark et al. 1993, Gisler 2004). The majority of the populations are on private lands, which are the most vulnerable to threats of development.

4.8.2 Analysis of Direct and Indirect Effects

The Willamette daisy and critical habitat for the species occur in the project area beneath proposed Route AR304. All take-offs and landings would occur in Washington, where this species does not occur. Therefore, direct, on-the-ground impacts to the Willamette daisy should not occur.

Populations of the Willamette daisy beneath Route AR304 could potentially be exposed to fuel released during an in-air release of fuel, should a hose mishap occur during fuel transfer. As discussed in Section 4.1.2, associated impacts to plants would depend on the amount of fuel taken up by plant tissues. The risk of a release of fuel is very low, but should fuel be released the risk of it reaching populations of Willamette daisy in sufficient quantities to do harm is extremely unlikely. Therefore, adverse effects would be discountable.

4.8.3 Interrelated and Interdependent Effects

Publication of the proposed aerial refueling routes would make them available for refueling operations by other military units. Use of these routes by additional aircraft would not lead to effects to populations of water Willamette daisy, although risks of in-air mishaps and associated fuel releases could potentially increase with usage.

4.8.4 Cumulative Effects

Willlamette daisy populations are afforded protection within designated critical habitat, but the species still is threatened by ongoing commercial and residential development, agriculture, silvicultural practices, road improvement, collection, and herbicide use. Since the majority of populations are on private lands, future development will likely be an important factor affecting this species. Because there would be no effects to Willamette daisy associated with the proposed training, beyond discountable effects associated with an accidental fuel release, cumulative effects to the species would not occur.

4.8.5 Conservation Measures

To prevent damage to the refueling hose during fuel transfer, and other accidents, the 160th SOAR would follow procedures discussed in Section 4.1.5.

4.8.6 Determination of Effects

Populations of the Willamette daisy, as well as designated critical habitat for the species, occur in the project area beneath Route AR304. Because the species does not occur in areas where aircraft would land, effects would be limited to unlikely impacts associated with an accidental release of fuel during training. Given the small likelihood of such an occurence, the proposed project **may affect, is not likely to adversely affect** the Willamette daisy or its designated critical habitat.

4.9 Fender's Blue Butterfly

The primary references for the baseline discussion in this section are:
USFWS. 2000b. Endangered Status for *Erigeron decumbens* var. *decumbens* (Willamette Daisy) and *Icaricia icarioides fenderi* (Fender's Blue Butterfly) and Threatened Status for *Lupinus sulphureus* ssp. *kincaidii* (Kincaid's Lupine). Federal Register 65(16):3875-3890.

and

USFWS. 2010a. Recovery Plan for the Prairie Species of Western Oregon and Southwestern Washington. Portland, Oregon.

References cited in this section are internal to the above referenced documents. A complete list of these references is available from the USFWS Oregon State Office, Portland, Oregon.

4.9.1 Status of the Species/Critical Habitat and Baseline Information

The Fender's blue butterfly (*Icaricia icarioides fenderi*) is endemic to upland prairies of the Willamette Valley in Oregon. Although its precise historic distribution is unknown, recent surveys indicate that the insect is confined to the Willamette Valley and currently persists in approximately 17 populations on remnant prairies in Yamhill, Polk, Benton, and Lane counties (Hammond and Wilson 1993, Schultz et al. 2003, USFWS unpublished data). Sites occupied by the species are predominantly upland prairies historically characterized by native bunchgrasses located on the western side of the Willamette Valley, within 21 miles (33 km) of the Willamette River. Within the project area, populations of Fender's blue butterfly are located under and near Route AR304. Designated critical habitat does not occur beneath any of the training routes or within the proposed low-level training area.

The primary habitat requirement for the Fender's blue butterfly is its host plant, Kincaid's lupine. Kincaid's lupine is the preferred larval host plant and food source at most known Fender's blue butterfly populations. Spurred lupine and sickle keeled lupine may be secondary food plants used by the insect (Hammond and Wilson 1993). Several native wildflowers act as adult nectar food sources, as do non-native vetches. The population size of Fender's blue butterfly has been found to correlate directly with the abundance of native nectar sources (Schultz et al 2003).

The Fender's blue butterfly was federally listed as endangered on January 25, 2000 (USFWS 2000b). On October 31, 2006, 3,010 acres were designated as critical habitat for the species in Benton, Lane, Polk, and Yamhill counties, Oregon (USFWS 2006b). The primary threats are habitat loss from agriculture and urban development, the invasion of non-native plant species into prairie habitat, fragmentation and the small size of the remaining populations, invasion by non-native plants, and elimination of natural disturbance regimes. Use of pesticides is also a concern (Oregon Department of Human Services 2003, Oregon Department of Agriculture 2006).

4.9.2 Analysis of Direct and Indirect Effects

The Fender's blue butterfly occurs within the project area, with documented populations beneath Route AR304, and designated critical habitat within approximately 6 miles of this route. Populations do not occur at proposed landing sites (Gray Army Airfield, McAllister Field, or within the proposed low-level training area), all of which are outside the range of this species and its host plant, Kincaid's lupine (see Section 4.3 for more information on this species). Within the species' range, proposed activities would be limited to in-air aviation operations at a minimum of 500 feet (152 meters) AGL, well above butterfly habitats. Therefore, there would be no direct injury to butterflies or physical disturbance of their habitat associated with normal training operations.

Aerial refueling along Route AR304 would generate noise in excess of 85 a-weighted decibels (dBA), which would be experienced five times in a 3-hour period, approximately 50 times per year. There is little available literature on the effects of noise on insects, particularly on butterflies. The U.S. Environmental Protection Agency (1980) and Manci et al. (1988) conducted literature reviews of the effects of noise, including aircraft noise on wildlife, which briefly discuss studies on insects. The findings of these reviews suggest that insects have differing responses to noise, which vary based on the frequency of the noise and the duration of the exposure. Effects ranged from none to flying or freezing (cessation of movement) responses. Therefore, it is possible that aircraft overflights could cause temporary behavioral changes in Fender's blue butterflies. It is unlikely, however, that infrequent passes overhead would lead to increased mortality or decrease the vigor or reproduction of existing populations.

Butterfly populations, as well as host and nectar plant populations beneath and near Route AR304 could be exposed to fuel in the event of hose damage or other mishap during in-air fuel transfer. As discussed in Section 4.1.2, the amount of fuel reaching the ground in such a scenario would depend on numerous factors, but could range from 16 to 25 gallons (61 to 95 liters), spread out over an area of less than 30 acres (12 ha), under worst-case scenarios. In order for the Fender's blue butterfly to be directly impacted by a spill, fuel would have to land directly on a butterfly (or larva or pupa). Indirect impacts could occur if fuel landed on host or nectar plants, or infiltrated the soil and was taken up by plants. Impacts to plants would depend on the amount of fuel taken up by plant tissues. Since the risk of an in-air release of fuel is very low (only three incidents by the 160th SOAR since 1972 over all routes worldwide) and the amount of fuel reaching any given point on the ground would be minimal, adverse effects associated with refueling would be very unlikely.

4.9.3 Interrelated and Interdependent Effects

Publication of the proposed aerial refueling routes would make them available for refueling operations by other military units. Use of these routes by additional aircraft could increase the frequency of noise reaching the ground beneath the routes, and could potentially increase the risk of fuel spills.

4.9.4 Cumulative Effects

The primary threats to Fender's blue butterfly are habitat loss from agriculture and urban development, the invasion of non-native plant species into prairie habitat, and the small size of the remaining populations. Some protection from these threats is afforded to populations found within designated critical habitat. Noise from aviation training would be added to noise from other aircraft in the region, as well as other sources of noise, which may or may not affect the behavior of Fender's blue butterflies. Noise is not a documented threat to butterflies, and it is not known whether cumulative increases in noise exposure would ever amount to reduced reproductive success or vigor of Fender's blue butterfly populations. Since the risk of an in-air release of fuel is very low, adverse effects associated with refueling would be very unlikely. Thus, there are no or only minor additional cumulative effects associated with the proposed action.

4.9.5 Conservation Measures

To prevent damage to the refueling hose during fuel transfer, and other accidents, the 160th SOAR would follow procedures discussed in Section 4.1.5.

4.9.6 Determination of Effects

Populations of the Fender's blue butterfly occur in the project area, beneath and near one of the refueling routes. Because habitat does not occur in areas where aircraft would land, effects would be limited to potential impacts associated with noise and accidental releases of fuel. Given that an in-air release of fuel during training is extremely unlikely, and any noise-related effects are likely to be infrequent and minor, the proposed project **may affect, is not likely to adversely affect** the Fender's blue butterfly or its critical habitat.

4.10 Oregon Silverspot Butterfly

The primary reference for the baseline discussion in this section is:
USFWS. 2001a. Oregon Silverspot Butterfly (*Speyeria zerene hippolyta*) Revised Recovery Plan. Portland, Oregon.

References cited in this section are internal to the above-referenced document. Full citations have been included in the Bibliography.

4.10.1 Status of the Species/Critical Habitat and Baseline Information

The Oregon silverspot butterfly (*Speyeria zerene hippolyta*) occurs at disjunct sites near the Pacific coast, with a historic range from northern California to southwestern Washington. As of 2001, populations of the subspecies were known to occur at only six sites, five in Oregon and one in California. In addition, historic habitats for the species in Washington and Oregon can potentially be restored and made suitable for the species in the future. In Oregon, two populations occur in Lane County, two occur in Tillamook County, and one occurs in Clatsop County, although this population has declined in recent surveys, with only one butterfly documented in 1998 (VanBuskirk 1993, 1998). No documented populations occur within the project area, however, coastal Washington as far north as Grays Harbor County is within the butterfly's historic range. Therefore, it is assumed that undocumented populations could potentially occur within the project area beneath proposed Routes 1 and 2. Critical habitat for the Oregon silverspot butterfly is not found within the project area.

The Oregon silverspot butterfly occupies three types of grassland habitat: marine terrace and coastal "salt spray" meadows, stabilized dunes, and montane grasslands. The first two habitats are strongly influenced by proximity to the ocean, with mild temperatures, high rainfall, and persistent fog. Of the two, the dune habitat tends to have lower relief, highly porous soils, and less exposure to winds. Conditions at the montane sites include colder temperatures, frequent cloud cover, substantial snow accumulations, less coastal fog, and no salt spray. Each type of habitat must provide the Oregon silverspot with host plants, nectar sources, and other suitable environmental conditions.

Caterpillars feed primarily on early blue violets (*Viola palmata*). Stands large enough to provide enough food for larval butterflies on the Oregon coast occur only in relatively open and low-growing grasslands, where early blue violets may be an abundant component of the plant community (Hammond and McCorkle 1984). Oregon silverspot caterpillars are also known to feed on a few other violet species. The most frequently used nectar plants are members of the Aster family, including several native species and two common introduced species. The Oregon silverspot butterfly goes through six larval instars and a pupal stage before metamorphosing into an

adult. Adult emergence starts in July and extends into September, with mating usually taking place in relatively sheltered areas.

The Oregon silverspot butterfly was federally listed as threatened on July 2, 1980, with critical habitat designated in approximately 273 acres (110 ha) in coastal Lane County, Oregon (USFWS 1980). Invasion by exotic species, natural succession, fire suppression, and land development have resulted in the loss and modification of the species' habitat. Land use practices have altered disturbance regimes needed to maintain existing habitats and create new habitats for species expansion. Other threats to the subspecies include OHVs, grazing, erosion, road kill, and pesticides. The Oregon silverspot butterfly is also sought by collectors.

4.10.2 Analysis of Direct and Indirect Effects

The Oregon silverspot butterfly potentially occurs beneath proposed Routes 1 and 2, although no documented populations or designated critical habitat occur in the project area. All proposed aircraft landing sites are outside the historic range of the subspecies. In coastal areas along Routes 1 and 2, activities would be limited to refueling at altitudes of 1,000 feet AGL and higher. Therefore, there would be no direct injury to butterflies or alteration of habitat associated with normal training operations.

Noise associated with aerial refueling along proposed Routes 1 and 2 could be in excess of 85 dBA at the ground level, depending on the altitude of the aircraft. Aerial refueling aircraft noise would be experienced six times in a 3-hour period, approximately 50 times per year. As discussed in Section 4.9.1, there is little information on the effects of noise on butterflies, but based on studies on other insects, some noise-related effects are possible. A worst-case scenario would include temporary flying or freezing responses. These infrequent behavioral changes, should they occur, would be unlikely to lead to mortality of the Oregon silverspot butterfly, or decrease the vigor or reproductive output of any undocumented populations that may be present beneath these routes.

Should undocumented Oregon silverspot populations occur beneath Routes 1 and 2, these butterflies and their host and nectar plants could be exposed to fuel in the event of hose damage or other mishap during in-air fuel transfer. As discussed in Section 4.1.2, the amount of fuel reaching the ground in such a scenario could range from 16 to 25 gallons (61 to 95 liters), spread out over an area of less than 30 acres (12 ha), under a worst-case scenario. In order for butterflies to be directly impacted, fuel would have to land directly on the insect. Indirect impacts could occur if fuel landed on host or nectar plants, or infiltrated the soil and was taken up by plants. Impacts to plants would depend on the amount of fuel taken up by plant tissues. Since the risk of a fuel spill is very low, and Oregon silverspot populations are not known to occur beneath the refueling routes, adverse effects associated with refueling would be very unlikely and are therefore discountable.

4.10.3 Interrelated and Interdependent Effects

Publication of the proposed aerial refueling routes would make them available for refueling operations by other military units. Use of these routes by additional aircraft could increase the frequency of noise reaching the ground beneath the routes, and could potentially increase the risk of fuel spills.

4.10.4 Cumulative Effects

Invasion by exotic species, natural succession, fire suppression, and land development are activities that are reasonably certain to occur with the proposed action area and that could lead to the loss and modification of the species' habitat. Land use practices have altered disturbance regimes needed to maintain existing habitats and create new habitats for species expansion. Other threats to the subspecies include OHVs, grazing, erosion, road kill, and pesticides. The Oregon silverspot butterfly is also sought by collectors. Noise from aviation training would be added to noise from other aircraft in the region, as well as other sources of noise, which may or may not affect the behavior of Oregon silverspot butterflies. Noise is not a documented threat to butterflies, and it is not known whether cumulative increases in noise exposure would ever amount to reduced reproductive success or vigor of Oregon silverspot butterfly populations. Since the risk of an in-air release of fuel is very low, adverse effects associated with refueling would be very unlikely and are therefore discountable. Thus, there are no or only minor additional cumulative effects associated with the proposed action.

4.10.5 Conservation Measures

To prevent damage to the refueling hose during fuel transfer, and other accidents, the 160th SOAR would follow procedures discussed in Section 4.1.5.

4.10.6 Determination of Effects

No designated critical habitat or documented populations of the Oregon silverspot butterfly occur in the project area, although the coastal areas in Washington beneath Routes 1 and 2 are within the subspecies' historic range. Because landing areas are outside the species range, effects would be limited to potential impacts associated with noise and fuel spills. Given that release of fuel during training is unlikely, that Oregon silverspot butterflies are not known to occur beneath refueling routes presently, and that any noise-related effects are likely to be infrequent and minor, the proposed project **may affect, is not likely to adversely affect** the Oregon silverspot butterfly or its critical habitat.

4.11 Fish

4.11.1 Status of the Species/Critical Habitat and Baseline Information

4.11.1.1 Rockfish (Bocaccio, Canary Rockfish, and Yelloweye Rockfish)

Based on recent status reviews, NMFS has determined that three species of rockfish occurring in the Puget Sound area are in danger of extinction, or are likely to become endangered within the foreseeable future. In April 2010 NMFS listed the Georgia Basin Distinct Population Segment (DPS) of bocaccio as endangered, and listed the Puget Sound/Georgia Basin DPSs of yelloweye rockfish and canary rockfish as threatened (NMFS 2010a). Critical habitat has not been designated. Most of the background information presented in this section is taken from the Federal Register notice of proposed listing of these species (NMFS 2009). None of the training routes pass over the Puget Sound or Straight of Georgia, although SOAR helicopters could potentially pass over the Puget Sound on their way to and from the routes, particularly Routes 1, 2, and 3.

Rockfishes are bottom and mid-water dwelling fish that occur in various coastal habitats. Rockfish larvae are found in surface water, and larvae and small juveniles may remain in open waters for several months. Juveniles and subadults are associated with shallow water habitats, such as rocky reefs, kelp canopies, and artificial structures. Adults generally move into deeper water as they age. Larval rockfish feed on diatoms, dinoflagellates, tintinnids, and cladocerans; juveniles feed on copepods and euphasiids; and adults eat bottom and mid-water dwelling invertebrates and small fishes.

Bocaccio

Bocaccio are very rare in the Puget Sound, and have declined substantially since 1965, particularly relative to other rockfish species in the Puget Sound. The occurrence of large adult bocaccio in the Georgia Basin appears to be limited to certain areas. In past years, they were most commonly caught in the areas around Point Defiance and the Tacoma Narrows in the South Puget Sound. Based on limited information, they are frequently found in areas lacking hard substrates. Copulation and fertilization typically occur between August and November. Larvae are planktivores, pelagic juveniles are opportunistic feeders, and larger juveniles and adults are primarily piscivores. The main predators of adult bocaccio are marine mammals.

Threats to the Georgia Basin DPS of bocaccio include low dissolved oxygen within their range, bycatch in recreational and commercial harvest, and a reduction in kelp habitat necessary for juvenile recruitment.

Yelloweye Rockfish

Yelloweye rockfish occur from Baja California to Alaska. They are distributed throughout the Strait of Georgia in the northern Georgia Basin, but are less frequently observed in South Puget Sound. They typically occur in waters 80 to 1,560 feet (25 to 475 meters) deep, and often occur in areas with high relief and complex rocky habitats. Juveniles settle in shallow, high relief zones, crevices, and sponge gardens, and then move to deeper waters as they grow. Fertilization may occur throughout the year, but is most common between September and April. Yelloweye rockfish are opportunistic feeders. Early life stages eat foods similar to those described for bocaccio. Adult yelloweye rockfish are larger than adult bocaccio, and tend to eat sand lance, gadids, flatfishes, shrimps, crabs, and gastropods. Predators include salmon and orcas. Threats to the species include low intrinsic productivity, bycatch in recreational and commercial harvest, loss of near shore habitat, chemical contamination, and areas of low dissolved oxygen.

Canary Rockfish

Within their range (from Baja California to the Western Gulf of Alaska), canary rockfish are most common off the coast of central Oregon. They were once considered fairly common in the greater Puget Sound area. They inhabit waters 160 to 820 feet (50 to 250 meters) deep, and are associated with the various rocky and coarse habitats throughout the basins of the Puget Sound. Fertilization peaks in December, and spawning occurs once per year. Larvae are planktivores, juveniles are zooplanktivores, and adults are planktivores/carnivores. Predators include yelloweye rockfish, lingcod (*Ophiodon elongatus*), salmon, sharks, dolphins, seals, and possibly river otters (*Lutra canadensis*). Threats to the species include low intrinsic productivity, bycatch in recreation and commercial harvest, loss of near shore habitat, chemical contamination, and areas of low dissolved oxygen.

4.11.1.2 Bull Trout

The primary reference for the baseline discussion in this section is:
USFWS. 1999a. Determination of Threatened Status for Bull Trout in the Coterminous United States Final Rule. Federal Register 64(210):58909-58933.

References cited in this section are internal to the above-referenced document. A complete list of these references is available from the USFWS Snake River Basin Field Office, Boise, Idaho.

Bull trout (*Salvelinus confluentus*) are native to the Pacific Northwest and western Canada. They historically occurred in major river drainages in the Pacific Northwest, from northern California and Nevada to the Northwest Territories, Canada (Cavender 1978, Bond 1992). To the west, the range of the bull trout includes the Puget Sound, and various coastal rivers of Washington, British Columbia, Canada, and southeast Alaska (Bond 1992, Leary and Allendorf 1997). Bull trout occur throughout the project area. Counties in the project area with critical habitat include: Deschutes, Hood River, Jefferson, Lane, and Wasco counties in Oregon; and Clallam, Clark, Cowlitz, Grays Harbor, Jefferson, Klickitat, Mason, Pierce, Skamania, Thurston, and Yakima counties in Washington.

Bull trout exhibit both resident and migratory life-history strategies through much of their current range (Rieman and McIntyre 1993). Resident bull trout complete their life cycles in the tributary streams in which they spawn and rear. Migratory bull trout spawn in tributary streams, and juvenile fish rear from 1 to 4 years before migrating to lake, river, or saltwater habitats to mature (Fraley and Shepard 1989, Goetz 1989).

Bull trout have very specific habitat requirements that appear to influence their distribution and abundance (Rieman and McIntyre 1993). Critical parameters include water temperature, cover, channel form and stability, valley form, spawning and rearing substrates, and migratory corridors (Oliver 1979; Pratt 1984, 1992; Fraley and Shepard 1989; Goetz 1989; Hoelscher and Bjornn 1989; Sedell and Everest 1991; Howell and Buchanan 1992; Rieman and McIntyre 1993, 1995; Rich 1996; Watson and Hillman 1997). Watersheds must have specific physical characteristics to provide the necessary habitat requirements for spawning and rearing, although these characteristics are not necessarily ubiquitous throughout watersheds in which bull trout occur.

Bull trout are typically associated with the colder streams in a river system, although fish can occur throughout larger river systems (Fraley and Shepard 1989; Rieman and McIntyre 1993, 1995; Buchanan and Gregory 1997; Rieman et al. 1997). Spawning areas are often associated with cold-water springs, groundwater infiltration, and the coldest streams in a given watershed (Pratt 1992, Rieman and McIntyre 1993, Rieman et al. 1997). All life history stages of bull trout are associated with complex forms of cover, including large woody debris, undercut banks, boulders, and pools (Oliver 1979, Fraley and Shepard 1989, Goetz 1989, Hoelscher and Bjornn 1989, Sedell and Everest 1991, Pratt 1992, Thomas 1992, Rich 1996, Sexauer and James 1997, Watson and Hillman 1997). Maintaining bull trout populations requires stream channel and flow stability (Rieman and McIntyre 1993). Juvenile and adult bull trout frequently inhabit side channels, stream margins, and pools with suitable cover (Sexauer and James 1997). These areas are sensitive to activities that directly or indirectly affect stream channel stability and alter natural flow patterns.

Preferred spawning habitat generally consists of low gradient stream reaches, which are often found in high gradient streams that have loose, clean gravel (Fraley and Shepard 1989) and water temperatures of 41 to 48 °F in late summer to early fall (Goetz 1989). Bull trout typically spawn from August to November during periods of decreasing water temperatures. However, migratory bull trout may begin spawning migrations as early as April, and move upstream as far as 155 miles to spawning grounds in some areas of their range (Fraley and Shepard 1989, Swanberg 1997). Fry normally emerge from early April through May, depending on water temperatures and increasing stream flows (Pratt 1992, Ratliff and Howell 1992).

Bull trout are opportunistic feeders, with food habits primarily a function of size and life-history strategy. Resident and juvenile bull trout prey on terrestrial and aquatic insects, macro-zooplankton, amphipods, mysids, crayfish, and small fish (Wyman 1975, Rieman and Lukens 1979 *cited in* Rieman and McIntyre 1993, Boag 1987, Goetz 1989, Donald and Alger 1993). Adult migratory bull trout are primarily piscivorous, (Fraley and Shepard 1989, Donald and Alger 1993).

The bull trout was federally listed as threatened throughout its entire range in the coterminous United States on November 1, 1999 (USFWS 1999a). Critical habitat was designated in October 2004 (USFWS 2004a), and revised in October 2010 to include 19,729 miles (31,751 km) of streams and marine shoreline and 488,252 acres (197,589 ha) of lakes and reservoirs in Washington, Oregon, Nevada, Idaho, and Montana (USFWS 2010b). The decline of bull trout is primarily attributable to habitat degradation and fragmentation, blockage of migratory corridors, poor water quality, past fisheries management practices, and the introduction of non-native species.

4.11.1.3 Dolly Varden

The primary reference for the baseline discussion in this section is:
USFWS. 2001b. Proposed Rule to List the Dolly Varden as Threatened in Washington Due to Similarity of Appearance to Bull Trout. Federal Register 66(6):1628-1632.

References cited in this section are internal to the above-referenced document. A complete list of these references is available from the USFWS Western Washington Office, Lacey, Washington.

The Dolly Varden is an anadromous char and a member of the family Salmonidae that occurs in several river drainages within the Coastal-Puget Sound DPS of the bull trout (*Salvelinus confluentus*), which is listed as a threatened species under the ESA. The area of overlap between Dolly Varden and bull trout includes western Washington (west of the Cascades) and the Olympic Peninsula. Although these two species of native char were previously considered a single species, the bull trout and the Dolly Varden are now formally recognized as two separate species (Cavender 1978, Robins et al. 1980, Bond 1992). Specific distinctions between bull trout and Dolly Varden are based on morphometrics (measurements), meristic variation (variation in characters that can be counted), osteological characteristics (bone structure), and distributional evidence (Cavender 1978). Genetic analyses can distinguish between the two species (Crane et al. 1994, Baxter et al. 1997, Leary and Allendorf 1997). Bull trout and Dolly Varden, however, are virtually impossible to differentiate visually, and misidentifications occur even using an established morphometric field identification procedure.

On January 9, 2001, the USFWS proposed to list the Dolly Varden as threatened under the ‘‘Similarity of Appearance’’ provisions of the ESA (USFWS 2001b). The determination of threatened status due to similarity of appearance for Dolly Varden would extend to this species the prohibitions against take that apply to bull trout, and would substantially facilitate law enforcement actions to protect bull trout.

4.11.1.4 Salmonids

The primary references for the background discussions in this section are:
National Marine Fisheries Service. No Date. Endangered Species Act Status Reviews and Listing Information. Available at: www.nwr.noaa.gov.

and

Washington State Joint Natural Resources Cabinet. 1999. Statewide Strategy to Recover Salmon. Olympia, Washington.

All salmonid species have similar habitat requirements. Freshwater habitat consists of four major components: habitat for spawning and incubation, juvenile rearing habitat, juvenile and adult migration corridors, and adult holding habitat. Estuarine and marine nearshore areas provide habitats for estuarine and ocean rearing, and for juvenile and adult migration.

Two of the most important features of freshwater habitat for spawning, rearing, and migration are a sufficient quantity of water, and good quality water. Salmon require cool, clean water that is of sufficient depth and velocity to allow passage, migration, and spawning, where floods do not scour channels. In addition, they seek out slow velocity areas adjacent to faster water for feeding, resting, and growing. Temperature affects growth rates and the timing of life history events, and turbidity and sediments can affect the abundance of food, as well as impact spawning and incubation habitats. Salmon also require a high level of dissolved oxygen, and are affected by other chemical aspects of the water.

Salmon life cycles are very sensitive to changes in stream flow, and have adapted over thousands of years to the natural flow regime in their individual watersheds. Natural low flows are important for the establishment of vegetation along stream banks. High flows add gravel, flush sediments from gravel, create new rearing channels, and perform other important functions.

Within the stream channel, salmon require sufficient clean and appropriately sized cobbles and gravel for spawning and incubation. Riffles, rapids, pools, and floodplain connectivity are important for production, rearing, cover, and aeration. Riparian vegetation provides shade, moderates the temperature of the stream, stabilizes banks, and controls soil erosion and sedimentation. It also provides nutrients to the stream and contributes large woody debris, which increases channel complexity, creates backwater habitats, and increases the water depth of pools. Aquatic plants and organic litter provide food for salmon, and can be influenced by riparian vegetation, temperature, streamflow, and substrate. Finally, salmon require unobstructed access both downstream and upstream for migration and feeding. Factors that obstruct passage include physical structures, inadequate streamflow, and high temperatures.

Nearshore marine habitats (e.g., marine tidal marshes, tidal channels, eelgrass beds, and kelp beds) provide salmon with spawning, rearing, and feeding grounds and shelter. They also protect the shoreline from erosion, filter pollutants, and reduce flooding by retaining stormwater during high-flow periods. Estuaries are important habitats for anadromous salmon transitioning from juvenile to adult, and from fresh to salt water and back again. Salmon pass through estuaries as juveniles on their downstream migration to the ocean, and as adults on their upstream migration to spawn. Some species are also dependent on estuaries as rearing areas. There are several important features of estuarine and marine habitats: water quality, especially temperature; adequate food and cover; a saltwater/fresh water transition zone; marine vegetation and algae; adequate river or stream discharge; and migration pathways.

The term Evolutionary Significant Unit (ESU) is used by NMFS to refer to any distinct group of salmon populations, and to further clarify the meaning of subspecies under the ESA. Each salmonid species under the jurisdiction of NMFS is divided into several ESUs for the purposes of management, protection, and listing under the ESA.

Chinook Salmon

Chinook salmon (*Oncorhynchus tshawtscha*) are found from the Bering Strait south to Southern California, with 17 ESUs in the United States. In the project area, there are six listed ESUs: Snake River Fall-run; Snake River Spring/Summer-run; Lower Columbia River; Upper Willamette River; Upper Columbia River Spring-run; and Puget Sound. The different seasonal runs correspond to the timing of migration from ocean to freshwater.

Chinook salmon are the largest of any salmon, with adults often exceeding 40 pounds (18 kilograms). Chinook salmon stocks exhibit considerable variability in size and age of maturation, at least some of which is genetically determined. Body size, which is correlated with age, may be an important factor in migration and the successful construction of redds (spawning beds).

Chinook salmon migrate from a marine environment into the freshwater streams and rivers of their birth. Fish spawn only once, and then die. The various chinook runs differ based on when adults enter freshwater to begin their spawning migration, the degree of maturation at the time of river entry, the thermal regime and flow characteristics of their spawning site, and their actual time of spawning.

There are two distinct races of chinook salmon: stream-type and ocean-type. Stream-type chinook have a longer freshwater residency and perform extensive offshore migrations before returning to their natal streams in the spring and summer months. Ocean-type chinook, which are commonly found in coastal streams, typically migrate to sea within the first 3 months of emergence, but may spend up to a year in fresh water prior to emigration. They also spend their ocean life in coastal waters, utilizing estuaries and coastal areas more extensively for juvenile rearing.

Adult female chinook prepare spawning beds in stream areas with suitable gravel composition, water depth, and velocity. The female then lays eggs, which she guards for a brief period before dying. Eggs hatch between 90 and 150 days after deposition, depending on water temperatures. The following spring, young salmon fry emerge, and may spend from 3 months to 2 years in freshwater before migrating to estuarine areas as smolts,

and then into the ocean to feed and mature. Chinook salmon remain at sea for 1 to 6 years, with the exception of a small number of yearling males that mature in freshwater, or return after 2 to 3 months in salt water.

Upper Columbia River Spring Run

The Upper Columbia River Spring-run ESU was federally listed as threatened on March 24, 1999 (NMFS 1999a), and this status was reaffirmed in June 2005 (NMFS 2005a). Included in this ESU are all naturally-spawned populations occurring in all accessible river reaches in Columbia River tributaries upstream of the Rock Island Dam and downstream of Chief Joseph Dam in Washington, excluding the Okanogan River. Chinook salmon (and their progeny) from six hatchery stocks are considered part of the listed ESU.

On August 15, 2005, approximately 974 stream miles and 4 square miles of lake habitat were designated as critical habitat for this ESU (NMFS 2005b). Major river basins containing spawning and rearing habitat for this ESU comprise approximately 7,003 square miles (18,168 km^2) in Oregon and Washington. Critical habitat for this ESU is found in the following counties in the project area: Oregon—Clatsop, Columbia, Hood River, Multnomah, and Wasco; and Washington—Clark, Cowlitz, Klickitat, Pacific, Skamania, Wahkiakum, and Yakima.

Snake River Spring/Summer Run

The Snake River Spring/Summer-run ESU was federally listed as a threatened species on April 22, 1992 (NMFS 1992), and this status was reaffirmed in June 2005 (NMFS 2005a). Included in this ESU are all natural populations occurring in the mainstem Snake River and in the subbasins of the Tucannon River, Grande Ronde River, Imnaha River, and Salmon River.

Critical habitat (designated in December 1993 [NMFS 1993a] and revised in October 1999 [NMFS 1999b]) is similar to that for the Snake Fall-run ESU, except that stretches of the Palouse River, Clearwater River, and the North Fork Clearwater are not included. A total of 22,390 square miles (58,000 km^2) of major river basins contain spawning and rearing habitat for this ESU in Idaho, Oregon, and Washington. Counties in the project area with critical habitat are: Oregon—Clatsop, Columbia, Hood River, Multnomah, and Wasco; and Washington—Clark, Cowlitz, Klickitat, Pacific, Skamania, and Wahkiakum.

Snake River Fall Run

The Snake River Fall-run ESU was federally listed as a threatened species in April, 1992 (NMFS 1992), and this status was reaffirmed in June 2005 (NMFS 2005a). This ESU includes all natural populations occurring in the mainstem Snake River and any of the following subbasins: Tucannon River, Grande Ronde River, Imnaha River, Salmon River, and Clearwater River.

Critical habitat (designated on December 28 [NMFS 1993a]) includes all river reaches presently or historically accessible (except reaches above impassable natural falls, and Dworshak and Hells Canyon dams) in the Columbia River, from a straight line connecting the west end of the Clatsop jetty (south jetty, Oregon side) and the west end of the Peacock jetty (north jetty, Washington side). Critical habitat also includes all Columbia River estuarine areas and river reaches proceeding upstream to the confluence of the Columbia and Snake rivers. On the Snake River, all reaches from the confluence of the Columbia River, upstream to Hells Canyon Dam are

included. Also included are the Palouse River from its confluence with the Snake River upstream to Palouse Falls; the Clearwater River from its confluence with the Snake River upstream to its confluence with Lolo Creek; and the North Fork Clearwater River from its confluence with the Clearwater River upstream to Dworshak Dam. Major river basins containing spawning and rearing habitat for this ESU comprise approximately 13,679 square miles in Idaho, Oregon, and Washington. Counties in the project area with critical habitat are: Oregon—Clatsop, Columbia, Hood River, Multnomah, and Wasco; and Washington—Clark, Cowlitz, Klickitat, Pacific, Skamania, and Wahkiakum.

Puget Sound

The Puget Sound ESU was federally listed as threatened on March 24, 1999 (NMFS 1999a), with threatened status reaffirmed on June 28, 2005 (NMFS 2005a). This ESU includes all naturally spawned populations of chinook salmon from rivers and streams flowing into Puget Sound, including the Straits of Juan De Fuca from the Elwha River eastward, including rivers and streams flowing into Hood Canal, South Sound, North Sound, and the Strait of Georgia in Washington. This ESU also includes populations from 26 artificial propagation programs. Critical habitat (designated on September 2, 2005 [NMFS 2005b]) includes 1,670 miles of stream and 2,182 miles of nearshore marine habitat. Washington counties in the project area with critical habitat are: Clallam, Jefferson, Mason, Pierce, and Thurston.

Lower Columbia River

The Lower Columbia River ESU was federally listed as threatened on March 24, 1999 (NMFS 1999a), and this status was reaffirmed in June 2005 (NMFS 2005a). Included in this ESU are all naturally-spawned populations occurring in the Columbia River and its tributaries, from its mouth at the Pacific Ocean upstream to a transitional point between Washington and Oregon east of the Hood River and the White Salmon River. This ESU also includes populations in the Willamette River to Willamette Falls, Oregon, exclusive of spring-run chinook salmon in the Clackamas River.

On August 15, 2005, NMFS filed the final critical habitat designation for this species in Clackamas, Clatsop, Columbia, Hood River, Multnomah, Wasco counties in Oregon; and Clark, Cowlitz, Klickitat, Lewis, Pacific, Pierce, Skamania, Wahkiakum, and Yakima counties in Washington (NMFS 2005b). Major river basins that contain spawning and rearing habitat for this ESU comprise approximately 6,338 square miles in Oregon and Washington. Approximately 1,311 stream miles (2,110 stream km) and 33 square miles (53 km^2) of lake habitat within this ESU are designated as critical habitat. Critical habitat is found in the following counties in the project area: Oregon—Clackamas, Clatsop, Columbia, Hood River, and Multnomah; and Washington—Clark, Cowlitz, Klickitat, Lewis, Pacific, Skamania, and Wahkiakum.

Upper Willamette River

The Upper Willamette River chinook salmon ESU was federally listed as threatened on March 24, 1999 (NMFS 1999a), and this status was reaffirmed in June 2005 (NMFS 2005a). This ESU includes all naturally-spawned populations occurring in the Clackamas River and in the Willamette River, and its tributaries, above Willamette Falls, Oregon.

NMFS filed final critical habitat designation for this species on August 15, 2005 (NMFS 2005b). Approximately 1,472 stream miles (2,369 stream km) and 18 square miles (47 km^2) of lake habitat have been designated as critical habitat in this ESU. Major river basins containing spawning and rearing habitat for this ESU comprise approximately 8,575 square miles (22,209 km^2). Counties in the project area with critical habitat are: Oregon—Clackamas, Clatsop, Columbia, Lane, Linn, Marion, Multnomah, Polk, and Yamhill; and Washington—Clark, Cowlitz, and Wahkiakum.

Chum Salmon

Chum salmon (*Oncorhynchus keta*) have the widest natural geographic and spawning distribution of any Pacific salmonid, with a range that extends farther along the shores of the Arctic Ocean than other Pacific salmon. Historically, chum salmon were distributed as far south as Monterey, California. Presently, however, major spawning populations are found only as far south as Tillamook Bay on the northern Oregon coast. Four ESUs of chum salmon occur along the west coast of the United States, two of which are found in the project area: the Hood Canal Summer Run ESU and the Columbia River ESU.

Like chinook salmon, chum salmon are anadromous and spawn only once before dying, primarily in fresh water. They spawn in the lowermost reaches of rivers and streams, typically within about 60 miles of the ocean. Unlike most other salmonids, they migrate almost immediately after hatching to estuarine and ocean waters. Therefore, the survival and growth of juveniles depends less on freshwater conditions than on favorable estuarine and marine conditions. Another behavioral difference between chum salmon and most species that rear extensively in fresh water is that chum salmon form schools, presumably to reduce predation. Most chum salmon mature at between 3 and 5 years of age. The species has only a single form (sea-run) and does not reside in fresh water.

Hood Canal Summer Run

The Hood Canal summer-run ESU was federally listed as threatened on March 25, 1999 (NMFS 1999c), and this status was reaffirmed on June 28, 2005 (NMFS 2005a). This ESU includes all naturally spawned populations in Hood Canal and its tributaries, and populations in Olympic Peninsula Rivers between Hood Canal and Dungeness Bay, Washington, as well as eight artificial propagation programs: the Quilcene National Fish Hatchery, Hamma Hamma Fish Hatchery, Lilliwaup Creek Fish Hatchery, Union River/Tahuya, Big Beef Creek Fish Hatchery, Salmon Creek Fish Hatchery, Chimacum Creek Fish Hatchery, and the Jimmycomelately Creek Fish Hatchery summer-run chum hatchery programs. Critical habitat was designated on September 2, 2005, and includes 79 miles (127 km) of stream and 377 miles (607 km) of nearshore marine areas (NMFS 2005b). Washington counties in the project area with critical habitat are: Clallam, Jefferson, and Mason.

Columbia River

The Columbia River ESU was federally listed as threatened on March 25, 1999 (NMFS 1999c). This ESU includes all naturally spawned populations occurring in the Columbia River and its tributaries in Washington and Oregon.

NMFS filed final critical habitat designation for this species on September 2, 2005 (NMFS 2005b). Approximately 708 stream miles (1,139 stream km) have been designated as critical habitat. Major river basins containing spawning and rearing habitat for this ESU comprise approximately 4,426 square miles (11,463 km^2)

in Oregon and Washington. Critical habitat is found in the following counties in the project area: Oregon—Clatsop, Columbia, Hood River, and Multnomah; and Washington—Clark, Cowlitz, Klickitat, Lewis, Pacific, Skamania, and Wahkiakum.

Coho Salmon

Historically, coho salmon (*Oncorhyncus kisutch*) were distributed throughout the North Pacific Ocean, from Central California to Point Hope, Alaska, through the Aleutian Islands, and from the Anadyr River, Russia south to Hokkaido, Japan. The species probably once inhabited most coastal streams in Washington, Oregon, and northern California. Some populations, now considered extinct, are believed to have migrated hundreds of miles inland to spawn in tributaries of the upper Columbia River in Washington and the Snake River in Idaho. There are six distinct ESUs of coho salmon along the West Coast of the United States, of which only one, the Lower Columbia River ESU, is listed and occurs in the project area.

Like chinook and chum salmon, coho salmon are anadromous and spawn only once before dying. Coho spend approximately the first half of their life cycle rearing in streams and small freshwater tributaries. The remainder of their life cycle is spent foraging in estuarine and marine waters of the Pacific Ocean, prior to returning to their stream of origin to spawn and die. Most fish return to spawn at 3 years old, although some precocious males may do so at 2 years of age.

Lower Columbia River

The Lower Columbia River ESU was federally listed as threatened on June 28, 2005 (NMFS 2005a). This ESU includes all naturally spawned populations occurring in the Columbia River and its tributaries in Washington and Oregon, from the mouth of the Columbia River up to and including the Big White Salmon and Hood Rivers. This ESU also includes the Willamette River to Willamette Falls, Oregon, as well as 25 artificial propagation programs. Critical habitat for this ESU is currently under development, and has not yet been proposed for designation.

Sockeye Salmon

Sockeye salmon (*Oncorhyncus nerka*) on the Pacific coast inhabit riverine, marine, and lake environments, from the Columbia River and its tributaries north and west to the Kuskokwim River in western Alaska. Seven ESUs of sockeye salmon occur along the west coast of the United States, two of which are federally listed. The endangered Snake River ESU and the threatened Ozette Lake ESU are both found within the project area.

Like other salmon species, sockeye are anadromous; however, there are non-anadromous life forms of this species. Sockeye salmon exhibit a wide variety of life history patterns that reflect varying dependency on the freshwater environment. With the exception of certain river-type and sea-type populations, the vast majority of sockeye salmon spawn in or near lakes, where the juveniles rear for 1 to 3 years prior to migrating to sea. For this reason, the major distribution and abundance of large sockeye salmon stocks are closely related to the location of rivers that have accessible lakes in their watersheds for juvenile rearing. Occasionally, a proportion of the juveniles in an anadromous sockeye salmon population will remain in their rearing lake environment throughout life, and will be observed on the spawning grounds together with their anadromous siblings.

Snake River

The Snake River ESU of sockeye salmon was federally listed as endangered on November 20, 1991 (NMFS 1991a). This ESU includes populations of sockeye salmon from the Snake River Basin, Idaho (extant populations occur in the Stanley River subbasin).

Critical habitat (designated on December 28, 1993; NMFS 1993a) includes presently or historically accessible river reaches (except reaches above impassable natural falls, and Dworshak and Hells Canyon dams) in the Columbia River, from a straight line connecting the west end of the Clatsop jetty (south jetty, Oregon side) and the west end of the Peacock jetty (north jetty, Washington side) and including all Columbia River estuarine areas and river reaches upstream to the confluence of the Columbia and Snake Rivers. Also included are all Snake River reaches from the confluence of the Columbia River upstream to the confluence of the Salmon River; all Salmon River reaches from the confluence of the Snake River upstream to Alturas Lake Creek; Stanley, Redfish, Yellow Belly, Pettit, and Alturas lakes (including their inlet and outlet creeks); Alturas Lake Creek, and the portion of Valley Creek between Stanley Lake Creek and the Salmon River. Watersheds containing spawning and rearing habitat for this ESU comprise approximately 510 square miles (1,321 km^2) in Idaho. Critical habitat has been designated in the following counties in the project area: Oregon—Clatsop, Columbia, Hood River, Multnomah, and Wasco; and Washington—Clark, Cowlitz, Klickitat, Pacific, Skamania, and Wahkiakum.

Ozette Lake

The Ozette Lake ESU of sockeye salmon was federally listed as threatened on March 25, 1999 (NMFS 1999d), and threatened status was reaffirmed on June 28, 2005 (NMFS 2005a). The ESU includes all naturally spawned populations of sockeye salmon in Ozette Lake and streams and tributaries flowing into Ozette Lake, Washington, as well as two artificial propagation programs: the Umbrella Creek and Big River sockeye hatchery programs.

Critical habitat was designated on September 2, 2005, and includes 42 miles (68 km) of streams and 12 square miles (31 km^2) of lakes in Washington (NMFS 2005b). All critical habitat is located outside of the project area in the Hoh/Quillayute subbasin of the Ozette Lake watershed in Clallam County.

Steelhead

Along the west coast, steelhead trout (*Oncorhynchus mykiss*) are distributed across about 15 degrees of latitude from the U.S. Canada border south to the mouth of Malibu Creek, California. In some years, steelhead may be found as far south as San Diego County, California. There are ten listed steelhead DPSs, six of which are found in the project area: Upper Columbia River, Snake River Basin, Lower Columbia River, Upper Willamette, Middle Columbia River, and Puget Sound.

Steelhead have the greatest diversity of life history patterns of any Pacific salmonid species, including varying degrees of anadromy, differences in reproductive biology, and plasticity of life history between generations. Within the range of West Coast steelhead, spawning migrations occur throughout the year, with seasonal peaks of activity. In any given river basin there may be one or more peaks of migration activity; some rivers may have multiple runs, and fish are divided into either winter, spring, summer, or fall run steelhead. North American

steelhead commonly spend 2 years in the ocean before entering fresh water to spawn. Summer steelhead enter fresh water up to a year prior to spawning. Steelhead may spawn more than once. In some cases, the separation between anadromous steelhead and rainbow or redband trout is obscured.

Upper Columbia River

The Upper Columbia River DPS was federally listed as endangered on August 18, 1997 (NMFS 1997a). This DPS occurs in streams in the Columbia River Basin upstream from the Yakima River, Washington, to the U.S.-Canada border. Wells Hatchery stock steelhead are also part of the listed DPS. NMFS filed final critical habitat designation for this species on September 2, 2005 (NMFS 2005b). Approximately 1,262 stream miles (2,031 stream km) and 7 square miles (18 km^2) of lake habitat have been designated as critical habitat. Major river basins containing spawning and rearing habitat for this DPS comprise approximately 9,545 square miles (24,721 km^2) in Oregon and Washington. Critical habitat is found in the following counties in the project area: Oregon—Clatsop, Columbia, Hood River, Multnomah, and Wasco; and Washington— Clark, Cowlitz, Klickitat, Skamania, Wahkiakum, and Yakima.

Snake River

The Snake River DPS of steelhead was federally listed as threatened on August 18, 1997 (NMFS 1997a). This DPS occurs in streams in the Snake River Basin of southeast Washington, northeast Oregon, and Idaho. NMFS filed final critical habitat designation for this species on September 2, 2005 (NMFS 2005b). Approximately 8,049 stream miles (12,954 stream km) and 4 square miles (10 km^2) of lake habitat have been designated as critical habitat. Major river basins containing spawning and rearing habitat for this DPS comprise approximately 29,282 square miles (75,840 km^2) in Idaho, Oregon, and Washington. Critical habitat is found in the following counties in the project area: Oregon—Clatsop, Columbia, Hood River, Multnomah, and Wasco; and Washington—Clark, Cowlitz, Klickitat, Skamania, and Wahkiakum.

Lower Columbia River

The Lower Columbia River DPS was federally listed as threatened on March 19, 1988 (NMFS 1988). This DPS occurs in streams and tributaries to the Columbia River between the Cowlitz and Wind rivers, Washington (inclusive) and the Willamette and Hood rivers, Oregon (inclusive). Excluded are steelhead in the upper Willamette River Basin above Willamette Falls and steelhead from the Little and Big White Salmon rivers in Washington. NMFS filed final critical habitat designation for this species on September 2, 2005 (NMFS 2005b). Approximately 2,324 stream miles (3,740 stream km) and 27 square miles (70 km^2) of lake habitat have been designated as critical habitat. Major river basins containing spawning and rearing habitat for this DPS comprise approximately 5,017 square miles (12,994 km^2) in Oregon and Washington. Critical habitat is found in the following counties in the project area: Oregon—Clackamas, Clatsop, Columbia, Hood River, Marion, and Multnomah; and Washington—Clark, Cowlitz, Klickitat, Lewis, Skamania, and Wahkiakum.

Upper Willamette

The Upper Willamette DPS of steelhead was federally listed as threatened on March 25, 1999 (NMFS 1999e). This DPS includes all naturally-spawned populations of winter-run steelhead in the Willamette River, Oregon, and its tributaries upstream from Willamette Falls to the Calapooia River, inclusive. NMFS filed final critical habitat designation for this species on September 2, 2005 (NMFS 2005b). Approximately 1,276 stream miles

(2,054 stream km) and 2 square miles (5 km^2) of lake habitat have been designated as critical habitat. Major river basins containing spawning and rearing habitat for this DPS comprise approximately 4,872 square miles (12,618 km^2) in Oregon and Washington. Critical habitat is found in the following counties in the project area: Oregon—Clackamas, Clatsop, Columbia, Linn, Marion, Multnomah, Polk, Tillamook, Washington, and Yamhill; and Washington—Clark, Cowlitz, and Wahkiakum.

Middle Columbia River

The Middle Columbia River DPS was federally listed as threatened on March 25, 1999 (NMFS 1999e). This DPS occurs in streams from above the Wind River, Washington, and the Hood River, Oregon (exclusive), upstream to, and including, the Yakima River, Washington. Excluded are steelhead from the Snake River Basin. NMFS filed final critical habitat designation for this species on September 2, 2005 (NMFS 2005b). Approximately 5,815 stream miles (9,363 stream km) have been designated as critical habitat. Major river basins containing spawning and rearing habitat for this DPS comprise approximately 26,739 square miles (69,254 km^2) in Oregon and Washington. Critical habitat is found in the following counties in the project area: Oregon—Clatsop, Columbia, Hood River, Jefferson, Multnomah, and Wasco; and Washington—Clark, Cowlitz, Klickitat, Skamania, Wahkiakum, and Yakima.

Puget Sound

The Puget Sound DPS was federally listed as threatened on May 11, 2007 (NMFS 2007c). Critical habitat has not been designated to date, but is currently under development. This DPS includes all naturally spawned anadromous winter-run and summer-run populations in streams in the river basins of the Strait of Juan de Fuca, Puget Sound, and Hood Canal, Washington, bounded to the west by the Elwha River (inclusive) and to the north by the Nooksack River and Dakota Creek (inclusive). This DPS also includes the Green River natural and Hamma Hamma winter-run steelhead hatchery stocks. Critical habitat for this DPS has not been proposed thus far.

Threats to Pacific Salmon

Salmonid species on the West Coast of the United States have experienced dramatic declines in abundance during the past several decades as a result of human-induced and natural factors. Water storage, withdrawal, conveyance, and diversions for agriculture, flood control, domestic, and hydropower purposes have greatly reduced or eliminated historically accessible habitat and/or resulted in direct entrainment mortality of juvenile salmonids. Modification of natural flow regimes has resulted in increased water temperatures; changes in fish community structures; and a depletion of the flows necessary for migration, spawning, rearing, flushing of sediments from spawning gravels, gravel recruitment, and transport of large woody debris. Physical features of dams, such as turbines and sluiceways, have resulted in increased mortality of both adults and juvenile salmonids. Attempts to mitigate negative impacts of these structures have, to date, met with limited success.

Natural resource use and extraction leading to habitat modification can have substantial direct and indirect impacts to salmon populations. Land use activities associated with logging, road construction, urban development, mining, agriculture, and recreation have significantly altered fish habitat quantity and quality. Impacts associated with these activities include: alteration of streambanks and channel morphology; alteration of ambient stream water temperatures; degradation of water quality; reduction in available food supply; elimination

of spawning and rearing habitat; fragmentation of available habitats; elimination of downstream recruitment of spawning gravels and large woody debris; removal of riparian vegetation resulting in increased stream bank erosion; and increased sedimentation input into spawning and rearing areas, resulting in the loss of channel complexity, pool habitat, suitable gravel substrate, and large woody debris. In most western states, about 80 to 90 percent of the historic riparian habitat has been eliminated. It has also been estimated that Washington and Oregon's wetlands have been diminished by one third, and that California has experienced a 91precent loss of its wetland habitat.

Other factors that have led to the decline of salmon and continue to threaten remaining populations include loss of spatial and temporal connectivity and complexity, recreational and commercial fishing, introduction of non-native species, and natural environmental conditions (e.g., floods, drought, climatic shifts) that exacerbate the problems associated with degraded and altered riverine and estuarine habitats.

4.11.1.5 Eulachon

The primary reference for the baseline information in this section is:
NMFS. 2008a. Listing Endangered and Threatened Species: Notification of Finding on a Petition to List Pacific Eulachon as an Endangered or Threatened Species under the Endangered Species Act. Federal Register 73(49): 13185-13189.

References cited in this section are internal to the above-referenced document. A complete list of these references is available from the NMFS Office of Protected Resources.

Pacific eulachon are endemic to the eastern Pacific Ocean, with a range from northern California to Southwestern Alaska and into the Bering Sea. South of the U.S./Canada border, most eulachon production originates in the Columbia River Basin. Within the project area, eulachon have also been documented in the Rogue and Umpqua rivers in Oregon (which are south of the project area) and, infrequently, in coastal rivers and tributaries to Puget Sound in Washington (Emmett et al. 1991, Musick et al. 2000). Proposed critical habitat for this species includes a portion of the Quinault River beneath proposed Route 1. Additionally, helicopters traveling between JBLM and Route AR304 are likely to pass over critical habitat in the Columbia, Cowlitz, and Kalama rivers.

Eulachon generally occur in nearshore ocean waters, to 1,000 feet (300 meters) in depth, but make brief spawning runs into their birth streams. Spawning occurs in the lower sections of snowmelt-fed rivers at temperatures from 39 to 50 degrees Fahrenheit (°F; 4 to 10 degrees Celsius [°C]; Washington 2001), over sand or coarse gravel substrates. Eggs are fertilized in the water column, sink, and adhere to the river bottom typically in areas of gravel and coarse sand. Eulachon eggs hatch in 20 to 40 days. The larvae are carried downstream and are dispersed by estuarine and ocean currents shortly after hatching. Juvenile eulachon move from shallow nearshore areas to mid-depth midshore areas. Typically, eulachon spend 3 to 5 years in saltwater before returning to freshwater to spawn. Spawning takes place from late winter through mid-spring. Spawning grounds are typically in the lower reaches of larger snowmelt fed rivers (Hay and McCarter 2000), and most eulachon adults die after spawning.

The southern DPS of eulachon was federally listed as threatened on March 18, 2010 (NMFS 2010b). In January 2011, NMFS proposed designating 12 areas of critical habitat in California, Oregon, and Washington, totaling approximately 292 miles (479 km) of freshwater creeks and rivers and their associated estuaries (NMFS 2011). Critical habitat has not been designated for the species. Current threats to the species include continued habitat alteration; overutilization for commercial, recreational, scientific or educational purposes; disease; predation; bycatch of eulachon in commercial fisheries; and high sediment loads.

4.11.1.6 Oregon Chub

The primary reference for the baseline discussion in this section is:
USFWS. 1998c. Oregon Chub (*Oregonichthys crameri*) Recovery Plan. Portland, Oregon.

References cited in this section are internal to the above-referenced document. Full citations have been included in the Bibliography.

The Oregon chub (*Oregonichthys crameri*) is a small minnow that is endemic to the Willamette River Basin in western Oregon (Markle et al. 1991). The species was formerly distributed throughout the Willamette River Valley in off-channel habitats such as beaver ponds, oxbows, side channels, backwater sloughs, low gradient tributaries, and flooded marshes (Snyder 1908). The current distribution of the Oregon chub is limited to 25 naturally occurring populations and 11 reintroduced populations scattered throughout the Willamette Valley (Scheerer et al. 2007). Naturally occurring populations occur in the Santiam River, Middle Fork Willamette River, Coast Fork Willamette River, and several tributaries to the Mainstem Willamette River. Within the project area, the species occurs in water bodies beneath proposed Route AR304, as well as in areas that SOAR aircraft could potentially pass over on their way to/from JBLM. Additionally, nine units of critical habitat in Lane, Line, and Marion counties Oregon occur beneath proposed Route AR304.

Oregon chub are found in off-channel habitats with little or no water flow, silty and organic substrate, and considerable aquatic vegetation as cover for hiding and spawning (Pearsons 1989; Markle et al. 1991). The average depth of Oregon chub habitats is typically less than 6 feet (2 meters), and the summer temperatures typically exceed 61 °F (16 °C). Adult Oregon chub seek dense vegetation for cover and frequently travel in the mid-water column in beaver channels or along the margins of aquatic plant beds. Larval chub congregate in nearshore areas in the upper layers of the water column in shallow areas (Pearsons 1989). Juveniles venture farther from shore into deeper areas of the water column. In the winter months, chub can be found buried in the detritus or concealed in aquatic vegetation. Fish of similar size classes school and feed together. In the early spring, Oregon chub are most active in the warmer, shallow areas of the ponds.

Oregon chub are obligatory sight feeders. They feed throughout the day and stop feeding after dusk (Pearsons 1989). Chub feed mostly on water column fauna, primarily minute crustaceans such as copepods, cladocerans, and chironomid larvae (Markle et al. 1991).

Oregon chub spawn from April through September. Before and after spawning season, chub are social and non-aggressive. Spawning behavior begins with the male establishing a territory in or near dense aquatic vegetation (Pearsons 1989). Behaviors associated with reproduction and courtship include territorial behavior between

males, head rubbing, directing of females by males, and twirling of both fish during the release of egg and sperm. Spawning activity has only been observed at temperatures exceeding 61 °F (16 °C).

The Oregon chub was federally listed as endangered on October 18, 1993 (USFWS 1993d). In March 2010, the USFWS designated approximately 132 acres (53 ha) in Benton, Lane, Linn, and Marion counties, Oregon as critical habitat for the species (USFWS 2010c). The species evolved in a dynamic network of slack water habitats in the floodplain of the Willamette River. Major alteration of the Willamette River for flood control and navigation improvements has eliminated most of the river's historic floodplain. This alteration has also impaired or eliminated the environmental conditions in which the Oregon chub evolved. Remaining suitable habitats have been invaded by non-native fish predators and competitors. Current threats to the species include continued habitat alteration; the proliferation of non-native fish and amphibians; accidental chemical spills; runoff from herbicide or pesticide application on farms or along roadways, railways, and powerline ROW; desiccation of habitats; unauthorized water withdrawals, diversions, or fill and removal activities; and siltation resulting from timber harvesting in the watershed.

4.11.2 Analysis of Direct and Indirect Effects

Fish species are present in a variety of stream, lake, and marine habitats beneath proposed refuel and training routes and their approaches. Potential impacts to fish and their designated critical habitat in the project area include noise disturbance, shadow effects from aircraft passing over streams, siltation of aquatic habitat due to rotor wash, and accidental releases of fuel. In general, the greatest impacts to fish would occur within the low-level training area, where low-altitude helicopter flights and landings would occur, and helicopters would be closest to fish-bearing water bodies. Several streams within the low-level training area support listed fish species and critical habitat. According to WDFW PHS data (WDFW 2010a), the Cowlitz and Cispus rivers and other stream stretches within the proposed low-level training area support populations of winter steelhead, fall chinook salmon, and coastal cutthroat trout. Summer steelhead are also found in small creek stretches in the southern portion of the low-level training area. PHS data also indicate that bull trout may be present in the White Salmon River and a tributary creek within the proposed low-level training area. However, according to data from the Forest Service, all mapped river stretches with bull trout are located west of the proposed low-level training area. Portions of the Cowlitz and Cispus rivers and some of their tributaries within the low-level training area have been designated as critical habitat for chinook salmon and steelhead (Figure 6). Of the proposed landing zones, MARK08 and MARK 12 are both located within 600 feet (183 meters) of the Cispus River, which is designated critical habitat for listed salmonids. Activities occurring in and around these landing zones would be of special concern.

The effects of aircraft overflights on fish have not been well researched. Studies of the effects of other noise sources on fish do exist; responses of fish to sonic booms (Rucker 1973), fishing fleet sounds (Schwarz and Greer 1984), and underwater dredging sounds (Konagaya 1980) have shown that fish exhibit varying degrees of avoidance behavior and startle responses when encountering loud noise. Because noise transmits poorly from air to water, noise impacts to fish would be negligible throughout the majority of the project area, where aircraft would fly at altitudes of at least 500 feet (152 meters) above fish habitat. In the low-level training area, however, where helicopters would practice landing and low-altitude maneuvers, noise levels would likely be greater. Helicopters could potentially fly over aquatic habitats at very low altitudes (ground level to 500 feet [152

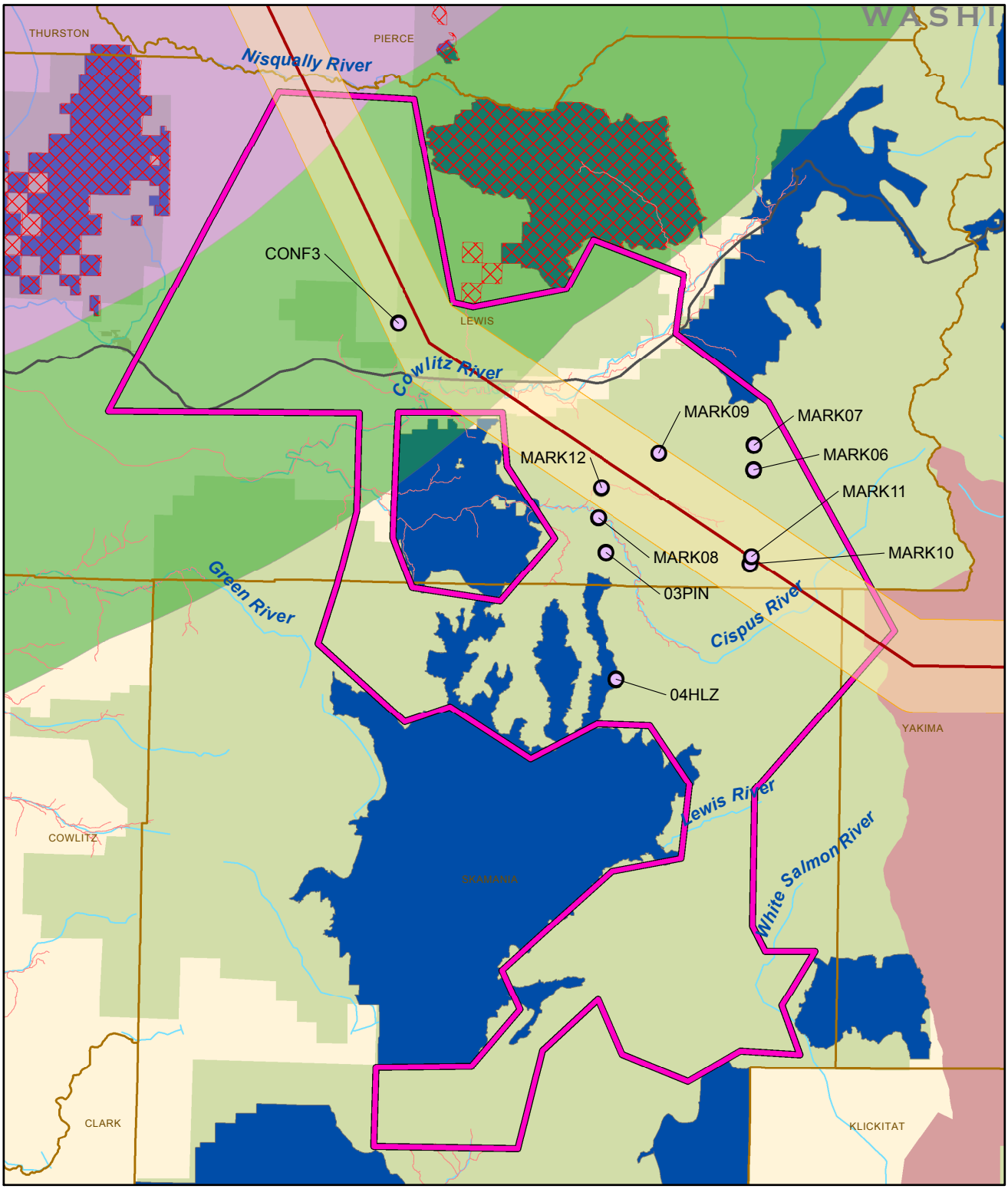

Figure 6. Designated Critical Habitat in the Proposed Low-Level Training Area

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- Proposed Low-Level Training Area
- Helicopter Landing Zones
- Northern Spotted Owl Designated Critical Habitat***
- Marbled Murrelet Designated Critical Habitat*

Marbled Murrelet Zone of Occurrence**

- Zone 1
- Zone 2

Data Sources: USFWS
*1996, **2004, ***2008c

- Listed Salmonid Designated Critical Habitat
- Proposed Terrain-Following/MMR Route
- Counties
- Populated Areas
- Public Lands
- Tribal Lands
- Interstate Highways
- U.S. Highways
- Rivers & Streams

0 3 6 9 12 Kilometers

0 4 8 12 Miles

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DATE: 6/30/2011

meters] AGL), possibly generating enough noise to disturb fish during each 3-hour training period. Any effects would be infrequent and of short duration.

Aircraft flying over streams could produce shadows that might be interpreted by fish as predators, potentially causing fish to seek cover, which could have energetic costs if it occurs frequently. This phenomenon is largely unstudied, and it is unknown how much helicopters passing over streams would alter the behavior of listed salmonids. Over most of the project area, aircraft would fly high enough that shadow effects would be unlikely. In the low-level training area, however, helicopters flying at low altitudes over streams and lakes could potentially create shadows over these habitats. Fish-bearing water bodies do not occur within any of the proposed landing zones. As helicopters would not hover directly over water bodies, shadows would be associated with passing over these habitats. Although the potential impacts to listed salmonids from shadow responses are unknown, they could be minimized by avoiding making repeated passes over fish-bearing streams during low-altitude training activities.

Helicopter training activities in the proposed low-level training area could potentially stir up soil through rotor wash and cause sedimentation into streams that support listed fish species. Dust that settles on the stream bed can affect the reproductive success of fish by reducing the permeability of gravel redds, which cuts off the flow of oxygenated water to eggs in the redd (Greig et al. 2005). The increase in water turbidity resulting from dust can also be harmful to fish, as increased turbidity makes it more difficult for fish to see prey, and entrained dust particles can abrade the gills of fish. Sedimentation would be most likely to occur if helicopters were to take off, land, or hover just above the ground close to a stream that provides habitat for listed species. The greatest risk for effects would be in portions of the training area with highly erodible soil. Based on 2010 aerial photos of the two proposed landing zones near salmonid habitat (MARK08 and MARK12), dense forest exists between the landing zones and the closest stretch of the Cispus River. Additionally, at distances of approximately 600 feet (183 meters) and 500 feet (152 meters), respectively, any dust produced by rotor wash would be unlikely to be transported to aquatic habitats that support listed fish species.

In the event of hose damage during refueling, the resulting release of fuel could potentially affect nearby aquatic habitats that support listed fish species or provide critical habitat. In a worst-case scenario, the amount of fuel reaching the ground would be an estimated 16 to 25 gallons (61 to 95 liters) of fuel (depending on weather conditions), distributed over many acres (see Section 4.1.2 for more information). Any fuel reaching aquatic habitats would do so in very small quantities. Polycyclic aromatic hydrocarbons (PAHs) in fuel are toxic to salmon at high concentrations, particularly during early life stages, but chronic exposures can cause lethal and sublethal effects (e.g., increased embryo mortality and reduced marine growth), and can accumulate in salmon tissues (NMFS 2003b). One study of PAHs in the Pacific Northwest found that these compounds can cause cardiovascular effects in fish embryos (Northwest Fisheries Science Center 2007). It is unlikely that the small amount of fuel released during a refueling mishap would be large enough to kill any fish present in exposed aquatic habitats. Chronic effects are also unlikely, given the very low rates of fuel spills by the 160th SOAR (3 times since 1972; 1 event per 13,000 hours flown). The risk of an accidental release of fuel occurring more than once in the same location would be exponentially lower. Given the low risks involved, effects to listed fish species from fuel releases would be discountable.

4.11.3 Interrelated and Interdependent Effects

The publication of the proposed routes would make them available for use by other military units. Use of routes by additional aircraft could result in increased impacts to fish in the project area.

4.11.4 Cumulative Effects

Because the project area is large in geographic extent, future activities with the likelihood to impact listed fish species in the area are numerous. These activities include, but are not limited to, development/urbanization and associated habitat degradation and pollution, agriculture and pesticides in agricultural runoff, use of vessels and other activities in fish-bearing aquatic habitats, and fish harvest. Noise from project aircraft would be cumulative to noise from all other aircraft use in the region, as well as other noise sources that could potentially disturb fish. Any accidental fuel releases during training activities, though small, would be cumulative to pollution from other sources in the region. PAHs are pervasive contaminants in aquatic habitats within the project area, particularly in urban streams (Northwest Fisheries Science Center 2007). Within the proposed low-level training area, activities with the potential to impact listed fish species primarily include recreation (including boating on fish-bearing streams and lakes) and timber harvest. Conservation efforts, including regulatory protection and restoration of passage in blocked streams, continue to offset some of the adverse impacts to listed fish habitats in the region.

4.11.5 Conservation Measures

To prevent damage to the refueling hose during fuel transfer, and other accidents, the 160th SOAR would follow procedures discussed in Section 4.1.5.

Additionally, in order to avoid adverse effects to listed salmonids in the low-level training area, the following conservation measure is recommended:

- Avoid making repeated low-level passes over fish-bearing streams in the low-level training area.

4.11.6 Determination of Effects

Fish are not likely to be disturbed by aircraft in the majority of the project area, where aircraft would fly at 500 ft (152 meters) AGL or higher. At this altitude, noise, shadows, and rotor wash from aircraft would have negligible effects on fish at the ground level. In the low-level training area, however, aircraft would fly below 500 feet (152 meters) AGL and land at ten landing zones, and could potentially disturb nearby aquatic habitats and listed fish species. The nearest fish-bearing streams and critical habitat to the proposed landing zones are two stretches of the Cispus River, located a minimum of 500 feet (152 meters) away. Given the densely forested buffers between the landing zones and streams, effects associated with rotor wash should be minimal. Shadow response behavioral effects are unknown but could be minimized by avoiding repeated passes over fish-bearing water bodies. Accidental releases of fuel are unlikely to occur and unlikely to be large enough to have lasting effects on fish or critical habitat. Therefore, the project **may affect, is not likely to adversely affect** listed fish or their critical habitat in the project area.

4.12 Sea Turtles

The primary references for the baseline discussion in this section are the applicable recovery plans for sea turtles: NMFS and USFWS 1991, 1998a, 1998b, and 1998c. References cited in this section are internal to these recovery plans. Full citations have been included in the Bibliography.

4.12.1 Status of the Species/Critical Habitat and Baseline Information

Four species of sea turtle are found in marine waters in the project area: the green sea turtle, leatherback sea turtle, loggerhead sea turtle, and olive ridley sea turtle. In general, these species are uncommon in the project area, although they have been sighted in marine waters off the coasts of Washington and Oregon. Historically, these turtles have not nested or bred in the project area, and have only been found in the water.

4.12.1.1 Green Sea Turtle

The green sea turtle (*Chelonia mydas*) is a highly migratory species found in subtropical and tropical ocean waters along continental coasts and islands worldwide. Along the west coast of the U.S., turtles have been sighted from southern Alaska to Baja California, but are most common from San Diego south (NMFS 2007a). There are an estimated 150 nesting colonies worldwide, but none along the west coast of the continental U.S.

Green sea turtles utilize oceanic beaches as nesting grounds, open ocean as hatchling and juvenile foraging grounds, and benthic coastal areas as adult feeding grounds (NMFS 2007a). Juveniles, which live in pelagic environments, appear to be entirely carnivorous and feed on invertebrates and fish eggs. Adults that are large enough to live in near-shore benthic environments are almost exclusively herbivorous, feeding on macroalgae and sea grasses. Females migrate to breeding grounds every 2 to 3 years, or sometimes less frequently, while males migrate to breeding grounds annually.

The green sea turtle was listed as threatened on July 28, 1978 (USFWS and NMFS 1978). Breeding populations in Florida and the Pacific coast of Mexico are listed as endangered. The only designated critical habitat for the green sea turtle is the coastal waters around Culebra Island, Puerto Rico. Harvest by humans is the largest threat faced by green sea turtles, which have historically been used for food. Other threats include habitat loss, and incidental take in commercial fisheries.

4.12.1.2 Leatherback Sea Turtle

The leatherback sea turtle (*Dermochelys coriacea*) is the most migratory and wide-ranging of the sea turtle species, and the most common sea turtle in U.S. waters north of Mexico (Stinson 1984). Leatherback sea turtles have been sighted along the Pacific coast as far north as Alaska, including along the Washington and Oregon coasts (Brueggeman 1991). They forage for food in the project area in summer and fall (Dohl et al. 1983, Brueggeman 1991), and are found primarily along the continental slope and occasionally further inland along the continental shelf. Within these areas, leatherback sea turtles feed at the surface and at depth.

Leatherback sea turtles are primarily associated with open ocean habitats, where they feed on prey in the water column and near the surface, but they are also known to forage in coastal waters. Jellyfish are the most common

prey items. Females breed seasonally and migrate long distances from foraging grounds to nesting grounds every two to three years. Leatherback sea turtles are not known to nest within the project area.

The leatherback sea turtle was listed as endangered on June 2, 1970 (USFWS 1970). In 1979, NMFS designated critical habitat for the species in the U.S. Virgin Islands (NMFS 1979). Worldwide, the most significant threat to leatherback sea turtles is the harvest of eggs and adults along beaches and in coastal feeding grounds. Along the west coast of the U.S., incidental take in fisheries and entanglement or ingestion of marine debris are the largest threats.

4.12.1.3 Loggerhead Sea Turtle

The loggerhead sea turtle (*Caretta caretta*) is distributed throughout the temperate, tropical, and subtropical waters of the Pacific, Atlantic, and Indian Oceans. No known nesting colonies exist along the western U.S. coast; in the Pacific basin, nesting grounds are limited to Japan and Australia. Most sightings of this species in the western U.S. have been in southern California (Guess 1981a, b; Stinson 1984). However, loggerhead sea turtles have been spotted in or near the project area off the Washington coast near Grays Harbor and Ilwaco (Washington Department of Game, unpublished data; Hodge 1982), and are occasionally sighted off the coasts of Washington and Oregon.

Loggerhead sea turtles occupy different habitats at different stages of their lives. As post-hatchlings, they may linger for several months in waters just offshore of their natal beaches, but are eventually transported to open ocean habitats by ocean currents. Juveniles spend up to 12 years in these open ocean environments, typically remaining within 15 feet (5 meters) of the surface. Finally, juveniles migrate to near-shore and estuarine waters along the continental margin. Subadults and adults spend the majority of their lives in these coastal habitats. The diet of adult loggerheads includes a variety of invertebrates, with benthic invertebrates such as mollusks and crustaceans the preferred food items (Dodd 1988). Post-hatchling loggerheads feed on macroplankton. Females migrate at multiple year intervals from foraging grounds to nesting grounds, typically between May and August.

The loggerhead sea turtle was listed as threatened on July 28, 1978 (USFWS and NMFS 1978). Critical habitat for the species has not been designated.

4.12.1.4 Olive Ridley Sea Turtle

The olive ridley sea turtle (*Lepidochelys olivacea*) is widely regarded as the most abundant sea turtle in the world (Carr 1972; Zwinenberg 1976), occurring worldwide in tropical and warm temperate ocean waters. In the eastern Pacific, the largest nesting concentrations occur in southern Mexico and northern Costa Rica, with stragglers nesting as far north as southern Baja California (Fritts et al. 1982) and as far south as Peru (Brown and Brown 1982). Olive ridley sea turtles are typically not found along the western U.S. coast north of California, but boat collisions and incidental takes in commercial fishing nets have been reported in both Washington and Oregon.

Olive ridley sea turtles are typically found in pelagic environments, although they are occasionally found in coastal areas such as bays and estuaries, particularly near the breeding season. They feed on a wide variety of

food items, including algae, lobster, crabs, tunicates, mollusks, shrimp, and fish. Olive ridley sea turtles reach sexual maturity at around 15 years, and females nest every year, once or twice a season.

The olive ridley sea turtle was listed as threatened on July 28, 1978 (USFWS and NMFS 1978). No critical habitat has been designated for the species. The primary threats to the species along the western U.S. coast and throughout its range are collisions with boats and incidental take in commercial fishing gear.

4.12.2 Analysis of Direct and Indirect Effects

Helicopters conducting refueling operations along proposed Routes 1 and 2 would pass over the Pacific Ocean adjacent to Washington, where these listed species of sea turtles occasionally occur. There is little data on the response of sea turtles to aircraft overflights. A recent Environmental Impact Statement for the Navy's Northwest Training Range Complex (Department of the Navy 2010), which includes facilities along the coast of Washington and Oregon, compiled data on the potential impacts of aircraft overflights on sea turtles. According to information provided in the Environmental Impact Statement, data support the idea that sea turtles at or near the surface of the water can hear sound from low-flying aircraft, but that behavioral reactions by sea turtles are based more on visual cues than auditory cues. At the proposed training at refueling altitudes of 2,300 to 5,000 feet (701 to 1,524 meters) MSL, it is expected that there would be no visual disturbances to sea turtles, and noise disturbance would be minimal. Any effects associated with behavioral avoidance reactions would be minor, and the reactions would last only as long as the helicopter can be heard. Since sea turtles are uncommon in the project area, and are often found in much deeper waters where aircraft noise would not be heard, the frequency of such responses would be very low.

In the event of an accidental release of fuel during refueling, a maximum of 16 to 25 gallons (61 to 95 liters) of fuel could potentially reach the ocean surface (see Section 4.1.2). This fuel would be spread out over many acres, and at this quantity would rapidly be dissipated in the ocean by wind and current. Additionally, the risk of such a spill is very low, having occurred only three times since 1972.

4.12.3 Interrelated and Interdependent Effects

The publication of the proposed routes would make them available for use by other military units. Use of Routes 1 and 2 by additional aircraft could result in an increase in the number of aircraft overflights and risk of fuel releases in the project area, but risk levels would remain very low.

4.12.4 Cumulative Effects

Future activities in the project area with the potential to impact sea turtles include increased operation of marine vessels, habitat loss through development, and commercial fishing. Because the proposed action does not include any in-water activities, cumulative effects associated with these activities would not occur. The proposed action would result in an increase in aircraft overflights, and potentially an increased risk in pollution of marine habitats through accidental fuel release. These effects would be additive to other sources of noise and fuel leaks and spills in the project area, which primarily include boats, aircraft, and coastline development. The effects associated with the proposed in-air activities are negligible when viewed in relation to those associated with in-water activities.

4.12.5 Conservation Measures

The following conservation measure would be followed to avoid effects to sea turtles in the project area.

- To prevent damage to the refueling hose during fuel transfer, and other accidents, the 160th SOAR would follow procedures discussed in Section 4.1.5.

4.12.6 Determination of Effects

Listed sea turtles are uncommon in the project area, and do not breed along the Washington or Oregon coasts. Given that the proposed training activities occur at minimum altitudes of 2,300 feet (701 meters) MSL, they should not disturb or harm sea turtles in the project area. Releases of fuel during refueling are possible but discountable, and effects in ocean habitats would be negligible. Therefore, the proposed action **may affect, is not likely to adversely affect** listed sea turtles or their designated critical habitat.

4.13 Whales

The primary references for the baseline discussions in this section are the applicable recovery plans, status reviews, and stock assessment reports for whales (NMFS 1991b, 1998, 2003a, 2006a, 2008, 2010c). References cited in this section are internal to these documents. Full citations have been included in the Bibliography.

4.13.1 Status of the Species/Critical Habitat and Baseline Information

Six listed species of whale are potentially found in marine waters in the project area: the blue whale (*Balaenoptera musculus*), finback whale (*Balaenoptera physalus*), humpback whale (*Megaptera novaengliae*), Southern Resident killer whale (*Orcinus orca*), sei whale (*Balaenoptera borealis*), and sperm whale (*Physeter macrocephalus*). In general, these species are uncommon in the project area, although they have been sighted off the coasts of Washington and Oregon and in the Puget Sound. Habitats utilized by these species range from deep, offshore waters to shallow coastal waters, and many are migratory species that travel through or reside in the project area only during specific seasons.

4.13.1.1 Blue Whale

The range of the blue whale is known to encompass much of the North Pacific Ocean, from Kamchatka to southern Japan in the west, and from the Gulf of Alaska and California south to at least Costa Rica in the east. The species is found primarily south of the Aleutian Islands and the Bering Sea (Nishiwaki 1966, Reeves et al. 1985). Blue whales are very rare in the project area and elsewhere off the coast of Washington and Oregon, but are often seen off the coast of California from Monterey Bay southward.

Blue whales are migratory and their distribution is largely determined by food resources. Populations typically move poleward in spring to reach areas of high zooplankton productivity, and toward the tropics in winter to breed and avoid ice entrapment. They inhabit and feed in both coastal and pelagic environments, including the relatively shallow coastal waters of the continental shelf and also deep offshore waters. Blue whales feed almost

exclusively on euphausiids (krill), although they may also incidentally ingest copepods and amphipods (Nemoto 1957, Nemoto and Kawamura 1977).

Blue whales reach sexual maturity between 5 and 15 years of age (Mizroch et al. 1984, Yochem and Leatherwood 1985), and females give birth to calves every 2 to 3 years. Breeding occurs during the winter months, and the gestation period is 10 to 12 months. Calves nurse for 6 to 7 months and are weaned during summer migration.

The blue whale was listed as endangered on December 2, 1970 (USFWS 1970). It is also listed as depleted under the Marine Mammal Protection Act. Critical habitat has not been designated for this species. Threats to the blue whale include collisions with vessels, entanglement in fishing gear, reduced zooplankton production due to habitat degradation, and disturbance from low-frequency noise from boats.

4.13.1.2 Finback Whale

Finback whales (also known as fin whales) are widely distributed throughout the world's oceans. At present, there are two named subspecies, *Balaenoptera physalus physalus* in the North Atlantic and *Balaenoptera physalus quoyi* in the southern oceans. Most experts consider the North Pacific finback whales a separate unnamed subspecies. Finbacks are known to congregate off the coast of Oregon during the summer (Green et al. 1992), and acoustic signals of finbacks are detected year-round off both the Washington and Oregon coasts. Shipboard sighting surveys in the summer and autumn of 1991, 1993, 1996, and 2001 estimated 1,600 to 3,200 finback whales off California and 280 to 380 finback whales off Oregon and Washington (Barlow 2003).

The species is typically associated with mixing zones between coastal and oceanic waters, which occur at the edge of the continental shelf. Finback whales in the North Pacific feed primarily on euphasiids and copepods, but are also known to consume schooling fish such as herring (*Clupea* spp.), walleye pollock (*Theragra chalcogramma*), and capelin (*Mallotus villosus*) (Nemoto 1970, Kawamura 1982).

On average, finback whales in the North Pacific reach sexual maturity at age 6 for females and age 4 for males (Ohsumi 1986). Mating typically takes place during the winter months (Haug 1981, Mitchell 1974). The gestation period is less than a year, and calves nurse for 6 to 7 months (Haug 1981, Gambell 1985). Females give birth to calves every 2 years on average (Christensen et al. 1992).

The finback whale was listed as endangered on December 2, 1970 (USFWS 1970). It is also listed as depleted under the Marine Mammal Protection Act. No critical habitat has been designated for this species. Current threats include collisions with vessels, entanglement in fishing gear, reduced prey abundance due to overfishing, habitat degradation, disturbance from low-frequency noise and the possibility that illegal whaling or resumed legal whaling will cause removals at biologically unsustainable rates.

4.13.1.3 Humpback Whale

The humpback whale occurs worldwide in all ocean basins, typically at higher latitudes in the summer and lower latitudes in the winter. There are no resident populations of humpback whales in Washington or Oregon

waters, but migrating humpback whales can be seen feeding off the coasts of these states during fall and spring. The current estimate for the North Pacific humpback whale population is approximately 20,000 whales (NOAA Fisheries Office of Protected Resources no date).

The main habitat for the humpback whale is coastal waters above and along the edge of the continental shelf, and around some oceanic islands. In summer, North Pacific humpback whales feed on krill and schooling fish such as mackerel, herring, and cod (*Gadus* spp.) in southern Alaskan waters and the Bering Sea. The majority of the North Pacific population migrates in the fall to the warmer waters near the Hawaiian Islands, where breeding occurs and calves are born and raised (Pacific Biodiversity Institute 2007).

Humpback whales reach sexual maturity between 4 and 6 years of age, and mature females typically give birth every 2 or 3 years. Groups of mature male humpbacks compete for access to females at breeding grounds. Gestation period is approximately 1 year, and calves nurse for a year after birth.

The humpback whale was listed as endangered on December 2, 1970 (USFWS 1970). It is also listed as depleted under the Marine Mammal Protection Act. No critical habitat has been designated for the species. The major threats to humpback whales in the Northern Pacific are collisions with boats, entrapment in fishing gear, and subsistence hunting.

4.13.1.4 Killer Whale

The killer whale is the most widely distributed cetacean in the world, occurring in all parts of the ocean and in most seas from the Arctic to the Antarctic. In the eastern North Pacific, three distinct forms of killer whale are recognized: resident whales, transient whales, and offshore whales. These forms are morphologically, genetically, and behaviorally different and typically do not intermix despite having overlapping ranges. The Southern Resident DPS of killer whales, the only population listed as endangered, consists of three pods that reside in the inland waterways of Washington and British Columbia, including the Strait of Juan de Fuca, Strait of Georgia, and Puget Sound, from spring to fall (Bigg 1982, Ford et al. 2000, Krahn et al. 2002). Designated critical habitat for this population includes the portions of the Puget Sound within the project area. Between 1996 and 2001, the Southern Resident population declined by nearly 20 percent, prompting a petition for listing under the ESA, and since 2001 there has been a small increase in population size. The current population estimate is 88 whales (NOAA Fisheries Office of Protected Resources no date).

Killer whales exist in various marine waters that have adequate prey resources, and are unconstrained by water temperature, depth, or salinity (Baird 2000). The species occurs widely as an inhabitant of the open ocean, but many populations, including the Southern Resident population, are found in shallower coastal and inland marine waters. The distribution of resident killer whales is strongly associated with areas of high salmon abundance, including areas of high-relief underwater topography that concentrate prey (Heimlich-Boran 1988, Felleman et al. 1991). Diet differs among populations of whales in the eastern North Pacific. Resident whales prey heavily on salmonids such as chum and chinook salmon, while transient whales feed primarily on marine mammals such as Dall's porpoise (*Phocoenoides dalli*), Pacific white-sided dolphin (*Lagenorhynchus obliquidens*), California sea lion (*Zalophus californianus*), Steller sea lion (*Eumetopias jubatus*), harbor seal (*Phoca vitulina*), and sea otter (*Enhydra lutris*).

Female killer whales become reproductively mature between age 12 and 17 (Olesiuk et al. 1990, 2005; Matkin et al. 2003), and males between ages 11 and 15 (Olesiuk et al. 2005). Killer whales have a polygamous mating system, and most mating in the North Pacific is believed to occur from April to October (Nishiwaki 1972, Olesiuk et al. 1990, 2005; Matkin et al. 1997). The gestation period averages 17 months (Asper et al. 1988, Walker et al. 1988, Duffield et al. 1995), and calves are weaned after 1 to 2 years (Haenel 1986, Asper et al. 1988, Kastelein et al. 2003). Estimates of the calving interval for resident killer whales range from 4.9 to 7.7 years (Olesiuk et al. 1990, 2005; Krahn et al. 2002, 2004; Matkin et al. 2003).

The Southern Resident killer whale DPS was listed as endangered on November 18, 2005 (NMFS 2005c). The Southern Resident population is also listed as depleted under the Marine Mammal Protection Act (NOAA Fisheries Office of Protected Resources no date). Critical habitat for the Southern Resident killer whale, designated in 2006, includes the waters of the Puget Sound, Strait of Juan de Fuca, and an area around the San Juan Islands (NMFS 2006b). Threats to the killer whale include contaminants, ship strikes, habitat degradation, oil spills, prey depletion due to overfishing, and boat noise disturbance.

4.13.1.5 Sei Whale

The sei whale occurs worldwide from subtropical to subpolar waters, but is most frequently found in temperate latitudes. Only two confirmed sightings of sei whales and five possible sightings (identified as sei or Bryde's whales) were made in California, Oregon, and Washington waters during extensive ship and aerial surveys in 1991, 1992, 1993, 1996, and 2001 (Hill and Barlow 1992, Carretta and Forney 1993, Mangels and Gerrodette 1994, VonSaunder and Barlow 1999, Barlow 2003). Green et al. (1992) did not report any sightings of sei whales in aerial surveys of Oregon and Washington.

The preferred habitat for sei whales is deep water in the open ocean, over the continental slope, and along the edge of the continental shelf. Sei whales do not appear to be associated with coastal features (Carretta et al. 2004). Distribution of sei whales may be influenced by the location of oceanic mixing zones and eddies, where food density is high (Committee on the Status of Endangered Wildlife in Canada 2003). Prey items include krill, copepods, squid, and schooling fish such as northern anchovy (*Engraulis mordax*) and Pacific sardine (*Sardinops sagax*).

Sei whales reach sexual maturity at approximately age 10, and breeding occurs during the winter months. The gestation period is approximately 1 year, and females give birth to a single calf, which is weaned after approximately 9 months. Females typically give birth to a calf every 2 to 3 years (Rice 1977).

The sei whale was listed as endangered on December 2, 1970 (USFWS 1970). It is also listed as depleted under the Marine Mammal Protection Act. No critical habitat has been designated for this species. Threats to the sei whale include ship strikes, entanglement in fishing gear, acoustic disturbance, and pollution.

4.13.1.6 Sperm Whale

The sperm whale is the most abundant of the large whale species despite being extensively hunted by commercial whalers during the past two centuries. The species can be found throughout the world's oceans

between 60 degrees north and 60 degrees south latitude. An estimated 152,000 to 226,000 sperm whales inhabit the Pacific Ocean. The most recent population estimate for the California-Oregon-Washington coastal population is 1,200 individuals. Sperm whales are present during all months of the year off California (Dohl et al. 1983, Barlow 1995, Forney et al. 1995), and during all seasons except mid-winter (Dec.-Feb.) off Oregon and Washington (Green et al. 1992).

The sperm whale occupies deep water habitats far from land. It prefers waters deeper than 2,000 feet (610 meters), and is uncommon in waters less than 1,000 feet (305 meters) deep (NMFS 2007a). Sperm whales feed primarily on large- and medium-sized squid near the bottom of the water column, but a variety of other prey species are known to be consumed by sperm whales, including octopuses, rays, sharks, and teleost fishes (Berzin 1972; Clarke 1977, 1980; Rice 1989).

The maximum reproductive rate of sperm whales is very low, a factor that makes recovery of the species difficult. Females begin ovulating between ages 7 and 13, but males may not become fully mature until they are in their twenties. Spring is the peak breeding season, and estimates of gestation period length range from 15 months to more than 18 months. Calves nurse for more than 2 years, and the inter-birth interval for females is 4 to 6 years.

The sperm whale was designated as endangered, without critical habitat, on December 2, 1970 (USFWS 1970). It is also listed as depleted under the Marine Mammal Protection Act. Threats to sperm whales include ship strikes, entanglement in fishing gear, and pollution. Because of their preference for deep water offshore habitats, however, sperm whales face fewer threats than many other marine mammals.

4.13.2 Analysis of Direct and Indirect Effects

Helicopters conducting refueling operations along proposed Routes 1 and 2 would pass over the Pacific Ocean adjacent to Washington, where listed whales occasionally occur. The proposed training along these routes would occur at a minimum of 2,300 and 5,000 feet (701 and 1,524 meters) MSL. While whales may exhibit a behavioral response to noise, it is unknown whether flights of this altitude would impact listed whales that may be present beneath the proposed refueling routes. Studied responses by whales to helicopter overflights have ranged from no response to diving, breaching and changing direction, with reactions less frequent at altitudes greater than 492 feet (150 meters; Department of the Navy 2010). Guidance for whale watching typically requires aircraft to be at a minimum altitude of 1,000 feet (305 meters) to avoid disturbing whales. Given the high altitudes of SOAR helicopters during the proposed refueling activities over the ocean, and the limited frequency of the activity (six passes along each route, 50 times per year), it is expected that disturbance to listed whales, if any, would be minimal.

In the event of an accidental release of fuel while refueling, small amounts of fuel could reach ocean habitats utilized by listed whales. An estimated maximum of 16 to 25 gallons (61 to 95 liters) of fuel could reach the ocean in the event of a spill (see Section 4.1.2). At these amounts, fuel would be quickly diluted and impacts to whales are not anticipated. Additionally, the risk of a fuel release is very low, and has occurred at a rate of less than 1 event per 13,000 hours flown, worldwide.

4.13.3 Interrelated and Interdependent Effects

The publication of the proposed routes would make them available for use by other military units. Use of Routes 1 and 2 by additional aircraft could result in increased noise over the Pacific Ocean and increased risks of in-air mishaps during refueling.

4.13.4 Cumulative Effects

Risks to whales that are reasonably foreseeable include noise disturbance associated with aircraft and vessels, particularly low frequency noise, which continue to become more prevalent in ocean habitats. The potential effects of the proposed action are noise disturbance and releases of fuel, which would potentially be additive to other sources of noise and fuel spills/leaks, which primarily include boats, aircraft, and coastline development. The effects associated with the proposed in-air activities are negligible when viewed in relation to those associated with existing and future in-water activities.

4.13.5 Conservation Measures

The following conservation measure would be implemented to avoid effects to whales in the project area.

- To prevent damage to the refueling hose during fuel transfer, and other accidents, the 160th SOAR would follow procedures discussed in Section 4.1.5.

4.13.6 Determination of Effects

Listed whales are generally uncommon in the project area. Given that proposed training activities over the ocean would occur at minimum flight altitudes of 2,300 feet (701 meters) MSL, any disturbance to whales in the project area should be negligible. Fuel spills during refueling are possible but very unlikely, and the amount of fuel released would not be large enough to have lasting impacts on whales or their habitats. Critical habitat for the Southern Resident killer whale does not occur beneath proposed refueling routes. Therefore, the proposed action **may affect, is not likely to adversely affect** listed whales or their critical habitat.

4.14 Marbled Murrelet

A primary reference for the baseline discussion in this section is:
USFWS. 1992b. Determination of Threatened Status for the Washington, Oregon, and California Population of the Marbled Murrelet. Federal Register 57(191):45328-45337.

Many references cited in this section are internal to the above-referenced documents. A complete list of these references is available from the USFWS Portland Field Office, Portland, Oregon.

4.14.1 Status of the Species/Critical Habitat and Baseline Information

The North American subspecies of marbled murrelet (*Brachyramphus marmoratus marmoratus*) is a small seabird found on the Pacific Coast of North America. Marbled murrelets are generally found in nearshore waters (within about 3 miles of shore) near their nesting sites. They nest in a narrow range along the Pacific, from the

Aleutian Islands of Alaska south through British Columbia, Washington, and Oregon, to central California. The 2009 population estimate was 364,700 birds, with 270,000 birds in Alaska, 77,000 birds in British Columbia, and 17,700 birds in Washington, Oregon, and California (USFWS 2009a).

The species generally occupies nesting areas on a year-round basis, although in certain places in Alaska and British Columbia, birds move to more protected waters during the winter (U.S. Geological Survey 2006a). This species can also be found wintering south of its breeding range, along the coast of southern California to extreme northwestern Baja California. The states of California, Oregon, and Washington encompass roughly one-third of the geographic area occupied by this subspecies, comprising an important portion of its range. The amount of nesting habitat has undergone a tremendous decline since the late 1800s (most of which has taken place during the last 30 to 40 years), especially in the coastal areas of all three states. Therefore, the marbled murrelet is listed only in these three states, which together constitute a DPS of the eastern Pacific subspecies. Population decline estimates for the continental U.S. for the period 2000 to 2008 range from 19 to 34 percent over the 7 years, or an annual decline of 2.4 to 4.3 percent (USFWS 2009a). Marbled murrelets occur within the project area, with critical habitat present beneath proposed Routes 1 and 3. Aircraft are also likely to fly over marbled murrelet critical habitat on their way to refuel Routes 2 and AR305 (Figure 7). There is no marbled murrelet critical habitat beneath the TF/MMR route or within the proposed low-level training area, but critical habitat is present adjacent to both the route and the training area. Additionally, marbled murrelets have been detected within the northwestern portion of the proposed low-level training area.

Marbled murrelets feed primarily on fish and invertebrates in nearshore marine waters. During the summer, major food items include Pacific sand lance, northern anchovy, Pacific herring, and other small schooling fish, while during the winter, krill, amphipods, and herring are major prey items. Marbled murrelets usually forage alone, or in pairs, and are active in search of food both day and night. Although the majority of birds are found within or adjacent to the marine environment, there have been detections of marbled murrelets on rivers and inland lakes (Carter and Sealy 1986). Marbled murrelets spend the majority of their lives on the ocean, and come inland to nest, although they visit some inland stands during all months of the year. In Washington, Oregon, and northern California, most nests occur within 37 miles (60 km) of the coast, although marbled murrelets range up to 55 miles (89 km) inland (Nelson et al. 2006). However, nearness to the coast is an important predictor of potential nesting habitat (Huff et al. 2006).

Marbled murrelets do not reach sexual maturity until their second year, and adults have a variable reproductive rate (i.e., not all adults may nest every year). They are solitary nesters, and produce one egg per nest, which the female lays on the limb of an old-growth conifer tree. Nesting occurs over an extended period from mid-April to late September (Carter and Sealy 1987). Incubation lasts about 30 days, and fledging takes another 28 days (Simons 1980, Hirsch et al. 1981). Both sexes incubate the egg in alternating 24-hour shifts (Simons 1980, Singer et al. 1991). Flights from ocean feeding areas to the often remote inland nest sites occur most often at dusk and dawn (Hamer and Cummins 1991). The adults feed the chick at least once per day, carrying one fish at a time (Carter and Sealy 1987, Hamer and Cummins 1991, Nelson 1992, Singer et al. 1992). Before leaving the nest, the young molt into a distinctive juvenile plumage. Fledglings appear to fly directly from the nest to the sea, rather than exploring the forest environment first (Hamer and Cummins 1991). Nesting and fledging

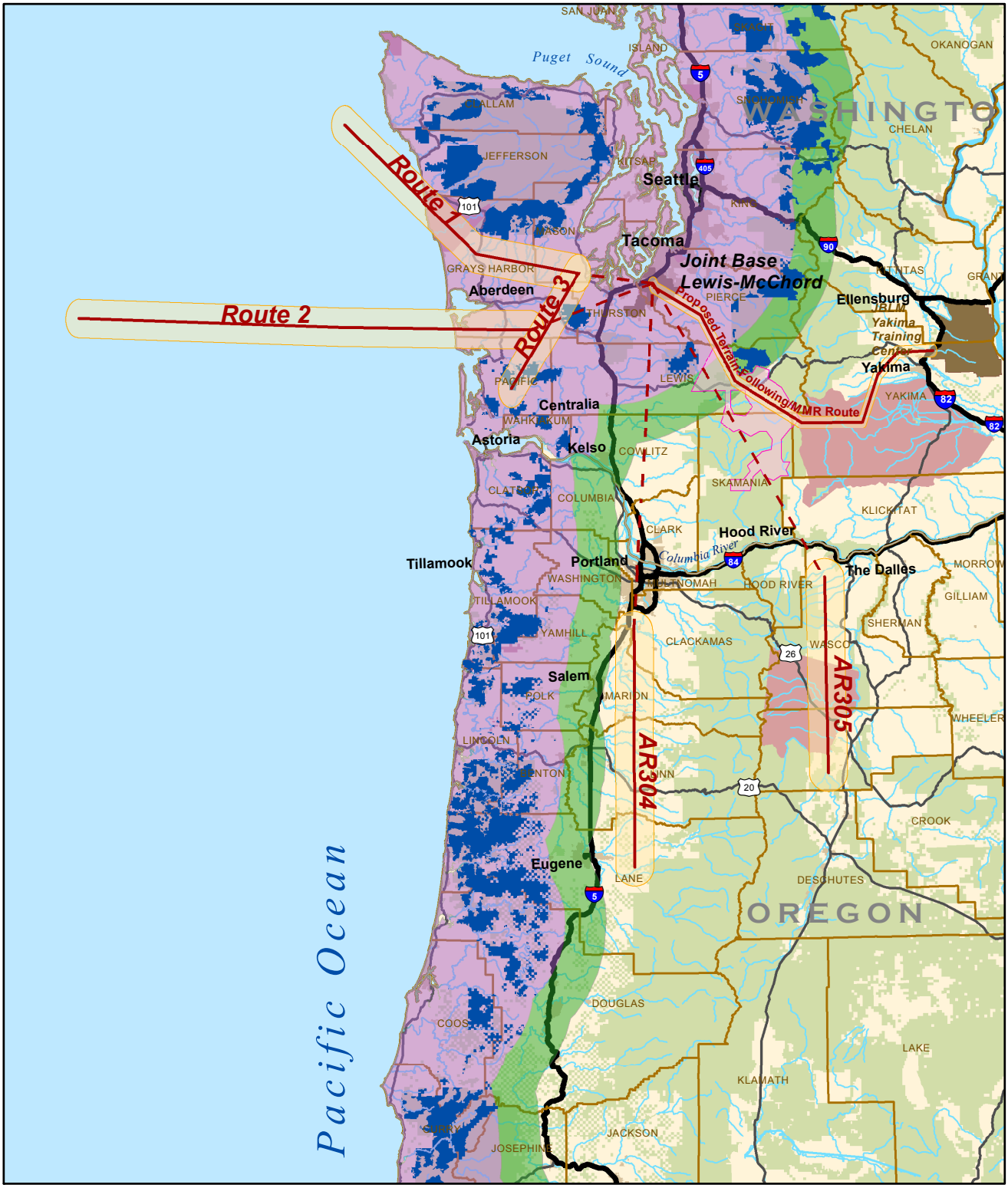

Figure 7. Marbled Murrelet Designated Critical Habitat

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- Marbled Murrelet Designated Critical Habitat*
- Marbled Murrelet Zone of Occurrence**
  - Zone 1
  - Zone 2
- Possible Route Approaches
- Existing and Proposed Training Routes
- Route Buffers/Airspace
- Proposed Low-Level Training Area
- Counties
- Populated Areas
- Public Lands
- Tribal Lands
- Interstate Highways
- U.S. Highways
- Rivers & Streams

Data Sources:
*USFWS 1996
**USFWS 2004

0 20 40 60 80 Kilometers

0 20 40 60 Miles

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DATE: 6/30/2011

success rate is extremely low (3 to 5 percent) in Washington and California (USFWS 2009a). A decrease in forage quality (size and species of forage fish) is believed to be a factor in the low success (USFWS 2009a).

In Oregon and Washington, marbled murrelets use older forest stands near the coastline for nesting. These forests are generally characterized by large trees (32 inches [81 cm] diameter at breast height or larger), a multistoried stand, and a moderate to high canopy closure. In certain parts of the range, marbled murrelets are also known to use mature forests with an old-growth component. In order to provide suitable nest platforms, trees must have large branches or deformities (Binford et al. 1975; Carter and Sealy 1987; Hamer and Cummins 1990, 1991; Singer et al. 1991, 1992). Marbled murrelets tend to nest in the oldest trees in the stand. Observations of nests indicate that they tend to be located high above ground, usually with good overhead protection, in locations that allow easy access to the exterior of the forest. In Oregon and Washington, nests are located in stands dominated by Douglas-fir. Marbled murrelets have been found at elevations up to 5,020 feet (1,530 meters), with nesting behavior exhibited as high as 4,400 feet (1,341 meters) in Washington State. (USFWS 2009a).

The marbled murrelet was federally listed as threatened in California, Oregon, and Washington on October 1, 1992 (USFWS 1992b). On May 24, 1996, 32 critical habitat units in Washington, Oregon, and California, encompassing approximately 3,887,800 acres (1,573,340 ha) of land, were designated for the species (USFWS 1996b). In July, 2008, USFWS proposed revising critical habitat for the species to remove some land in northern California (USFWS 2008a), but has not yet made a decision on this proposal. Critical habitat areas focused on two primary constituent elements: individual trees with potential nesting platforms, and forested areas within 0.5 miles (0.8 km) of these trees with a canopy height of at least one-half the site-potential tree height. At present, designated critical habitat is found directly adjacent to the proposed low-level training area (Figure 6).

The principal factor affecting the marbled murrelet in the project area, and the main cause of population decline, has been the loss of older forests and associated nest sites. Older forests have declined throughout the range of the marbled murrelet as a result of commercial timber harvest, with additional losses from natural causes such as fire and windthrow. Most suitable nesting habitat on private lands within the range of the subspecies in Washington, Oregon, and California has been eliminated by timber harvest (Green 1985, Norse 1988, Thomas et al. 1990). Remaining tracts of potentially suitable habitat on private lands throughout the range are subject to continuing timber harvest operations. In addition to outright loss of forest, fragmentation of remaining stands contributes to population decline via displacement, localized extinctions, fewer and less successful nesting attempts, crowding, and increased predation and parasitization. Mortality associated with oil spills and gill-net fisheries (in Washington) are lesser threats. Climate change is predicted to contribute to wetter winters and drier summers, leading to an increased risk of forest fire in nesting habitat. Overfishing and increasing ocean temperatures contribute to significant declines in forage fish populations (USFWS 2009a).

4.14.2 Analysis of Direct and Indirect Effects

Potential effects from the proposed training include disturbance from helicopter noise, and bird strikes. Additionally, accidental releases of fuel could potentially affect habitat. Information about noise disturbance on marbled murrelets indicates that responses to noise by marbled murrelets vary, and in some cases may affect reproductive success (Raphael et al. 2008, USFWS 2009a). However, nestlings appear unaffected by

disturbances near nests, and adults at nests in general do not appear to be affected by vehicular traffic or most loud noises (Raphael et al. 2008). Past studies have observed little to no response by murrelets to vehicles on nearby logging roads (Chinnici, unpublished data *in* Long and Ralph 1998). There is also evidence that marbled murrelets have minimal response to long and prolonged noises without visual cues, including logging activities at as close as 0.5 miles (0.8 km; Long and Ralph 1998). Responses by marbled murrelets to aircraft predominantly have been observed at low altitudes, including chicks lying flat in their nest (Kerns 1994 *in* Long and Ralph 1998). The USFWS has established a threshold of 92 dBA as the point at which marbled murrelets are likely to show signs of disturbance such as flushing (Harke, personal comm.). Noise modeling data for similar aircraft (Table 5) indicate that MH-47 Chinook helicopters would exceed this noise threshold at an altitude of approximately 400 feet (123 meters) above marbled murrelets, MH-60 Blackhawk helicopters would exceed this threshold at an altitude of approximately 200 feet (61 meters) above marbled murrelets, and C-130 tankers would exceed this threshold at an altitude of approximately 500 feet (152 meters) above marbled murrelets.

TABLE 5
Maximum Noise Levels of Aircraft

Altitude AGL (feet)	Maximum Level, dBA		
	C-130	CH-47D	UH-60
200	100	98	91
500	92	89	83
1,000	85	83	76
2,000	77	77	69
5,000	66	67	58
10,000	57	59	48
Source: U.S. Army Center for Health Promotion and Preventive Medicine (2007).			

Along aerial refueling routes, aircraft would fly at a minimum altitude of 1,000 feet (305 meters) AGL. At these heights, all aircraft would produce noise levels below the USFWS thresholds for adverse effects to marbled murrelets associated with noise disturbance. Nesting murrelets may show little to no response to aircraft passing overhead at these altitudes, but it is assumed that behavioral responses would be minor and would not affect reproductive success or the ability to forage or feed. Additionally, aircraft would pass through the area quickly, and the frequency of passes over a given area would be low. Helicopters traveling between JBLM and the training routes/area would fly at minimum altitudes of 500 feet AGL (152 meters) which is the height above treetop level). At these altitudes, noise levels would be below 92 dBA, and adverse effects to marbled murrelets should not occur.

Noise levels associated with the proposed training activities would have the potential to exceed the threshold level of 92 dBA along the proposed TF/MMR route and within the proposed low-level training area, where helicopters would fly below 500 feet (152 meters) AGL. Since marbled murrelet nests are difficult to find and observe, it is not well known what types of behavioral responses nesting murrelets might make to noise levels of 92 dBA or greater. However it is assumed that during the breeding period, responses could include behaviors that would reduce productivity or survival of marbled murrelets, which would constitute harassment-level

effects. As noted in Section 4.14.1, nestlings appear unaffected by noise disturbances near nests, and adults at nests in general do not appear to be affected by vehicular traffic or most loud noises (Raphael et al. 2008). Thus, although adult murrelets could abandon nests in response to low-altitude helicopter flights, they would likely return to nests after training ceased. However, eggs, hatchlings, and younger murrelet chicks may not be able to survive exposure to weather during periods of parental abandonment.

As stated in section 4.14.1, marbled murrelets can nest up to 55 miles (89 km) inland in Washington. As shown in Figure 7, the area of potential murrelet habitat includes approximately half of the proposed TF/MMR route, and the northwest third of the proposed low-level training area. This area is divided into two zones: Zone 1 extends approximately 40 miles (64 km) from the coast, and Zone 2 extends approximately 55 miles (89 km) from the coast. Most of the proposed low-level training area is within Zone 2, which is believed to be marginal for marbled murrelet nesting (Huff et al. 2006). According to data from WDFW (2010a), four marbled murrelet detections have been made within the proposed low-level training area, including two within Zone 2. Additionally, according to data provided by the Forest Service, some suitable marbled murrelet nesting habitat does occur within the northwest portion of the proposed low-level training area. Therefore, it should be assumed that marbled murrelets nest, or could potentially nest, in this area, and would be adversely affected by low-level training within the area of potential murrelet habitat shown on Figures 6 and 7. Restrictions on the flight level of aircraft within the proposed low-level training area and along the proposed TF/MMR route are necessary during the breeding season to avoid adverse impacts to marbled murrelets.

Only one of the proposed landing zones (CONF3) is located within 55 miles (89 km) of the coast, within the area that could potentially be used by marbled murrelets. The remaining proposed landing zones are located in the middle and southern portions of the training area, with the closest one more than 7 miles (11 km) from the potential murrelet habitat area. At these distances, use of the landing zones would not adversely affect marbled murrelets, although flight paths to and from landing zones would need to follow flight-level restrictions within the potential murrelet habitat area during the breeding season.

Bird strikes involving murrelets are possible within the project area, and would be most likely to occur by helicopters flying at low altitudes within the northwest portion of the low-level training area, along part of the TF/MMR route, and when flying between JBLM and the proposed routes/training area at altitudes close to 500 feet (152 meters) AGL. Maneuvers within the northwestern portion of the low-level training area could occur in close proximity to marbled murrelet nesting sites. Murrelets could potentially collide with aircraft, and nests could be physically damaged by helicopter-generated winds. It is not known whether murrelets nest within the proposed low-level training area; if they do, nesting density is likely low because of the distance from the closest marine habitat. Elsewhere in the project area, aircraft would fly above canopy level, typically at 500 feet (152 meters) above treetop level or higher. It is possible that murrelets could fly at this altitude while transiting between coastal feeding grounds and inland nesting sites, but the rarity of the marbled murrelet makes bird strikes unlikely (Harke, personal comm.). Federal Aviation Administration (FAA) bird strike records for civilian aircraft do not show any recorded marbled murrelet strikes in Washington or Oregon between 1990 and the beginning of 2011 (FAA 2011). Because reporting strikes is voluntary and some birds are not identified, it is not known whether this information provides an accurate assessment of risk to marbled murrelets. According to data from the U.S. Air Force, murrelets are not on the list of the top 50 wildlife strikes by count (less than 149

strikes) through 2008 (Air Force Safety Center 2011). However, it is not expected that a rare species would be found on this list.

In the event of an accidental release of fuel along refueling routes, habitat utilized by marbled murrelets could be affected by fuel reaching the forest canopy and floor, and marine habitats that support murrelet prey items. Under a worst-case spill scenario, the amount of fuel reaching the ground or water would be approximately 16 to 25 gallons (61 to 95 liters), spread out over a large area (see Section 4.1.2). The amount reaching the treetop level could potentially be slightly lower. Given the small amount of fuel reaching murrelet habitat and the dispersion across the landscape, lasting effects to murrelets and their food sources are not anticipated. While there is a low risk of a spill (the current rate is less than 1 event per 13,000 hours flown, worldwide), the risk of fuel reaching a nest with murrelet eggs or chicks would be discountable.

4.14.3 Interrelated and Interdependent Effects

The publication of the proposed routes would make them available for use by other military units. Use of these routes by additional aircraft could result in increased frequency of noise disturbance to marbled murrelets in the project area, and a slightly increased risk of fuel releases.

4.14.4 Cumulative Effects

The principal factor affecting the marbled murrelet within the project area, and the main cause of population decline, has been the loss and fragmentation of older forests and associated nest sites. Older forests have declined throughout the range of the marbled murrelet as a result of commercial timber harvest, with additional losses from natural causes such as fire and windthrow. Most suitable nesting habitat on private lands within the range of the subspecies in Washington, Oregon, and California has been eliminated by timber harvest. Since the marbled murrelet's federal listing in 1992, habitat loss has been greatly reduced on federal lands (which encompass 91 percent of murrelet habitat), as well as private and state land in Washington and California, where Habitat Conservation Plans have been adopted (Raphael et al. 2008). It is expected that loss of habitat within the project area will continue in the future as a result of timber harvest and other activities on private lands.

Because predation threats are greatest in areas with human disturbance, increases in population throughout the marbled murrelet's range have contributed to increased predation of murrelets, which is a primary cause of nest failure (Raphael 2006). As human population levels increase, and if the proposed action is implemented, it is likely that human disturbance will increase in areas near or with nesting marbled murrelets.

The proposed training would contribute to increased air traffic in the region. A large number of aircraft fly into and out of the two major airports in the vicinity of the project area, Seattle-Tacoma International Airport (Sea-Tac) and Portland International Airport (PDX), as well as a variety of smaller regional airports. However, data from Sea-Tac and PDX indicate that total flight operations out of these airports have decreased slightly in recent years. At Sea-Tac, flight operations have decreased by approximately 9 percent compared to 1992 levels (Port of Seattle 2010), and at PDX, flight operations have decreased by approximately 3 percent compared to 1997 levels (Port of Portland 2010). Together, these airports currently support more than 540,000 annual aircraft operations,

with thousands of additional operations occurring at smaller regional airports. The number of aircraft operations associated with proposed project activities would be very small in comparison.

Noise disturbances from SOAR helicopters would be cumulative to other noises and disturbances to marbled murrelets within the project area, including commercial, military, and other aircraft flying overhead, and Forest Service helicopter use associated with timber sales and other activities. Cumulative noise disturbances would continue to be minimized by following guidance to not exceed critical noise levels of 92 dBA during the breeding period.

4.14.5 Conservation Measures

The following Best Management Practices would be implemented to avoid effects to marbled murrelets in the project area.

- One pilot would stay focused outside the aircraft when in flight to help avoid bird strikes.
- Where feasible, SOAR pilots would follow guidance in FAA Advisory Circular 91-36D, which recommends that pilots maintain a minimum altitude of 2,000 feet (610 meters) AGL when flying over noise sensitive areas, such as National Parks, National Wildlife Refuges, Wilderness Areas, and other areas where a quiet setting is a generally recognized feature or attribute of the land.
- To prevent damage to the refueling hose during fuel transfer, and other accidents, the 160th SOAR would follow the procedures discussed in Section 4.1.5.

Additionally, the following conservation measure is recommended to avoid adverse effects to marbled murrelets in the project area.

- Between April 5th and August 5th, SOAR helicopters would fly at a minimum altitude of 400 feet (122 meters) above treetop level within the area of potential marbled murrelet presence (through Zone 2 on Figure 7, within 55 miles [89 kilometers] of the nearest marine habitat). These restrictions apply to the applicable portions of the TF/MMR route and low-level training area, including landing zone CONF3.

4.14.6 Determination of Effects

Risks to marbled murrelets associated with bird strikes and releases of fuel are expected to be low. Additionally, throughout the majority of the project area, aircraft would travel at altitudes of 500 feet (152 meters) AGL and higher, and therefore would minimally disturb any breeding murrelets nearby. Along the proposed TF/MMR route, and within the proposed low-level training area, helicopters would fly at altitudes low enough to exceed noise thresholds of 92 dBA at any nests that may be present within these areas, potentially causing behavioral responses that lead to reduced productivity or survival. These potential effects would be prevented by the recommended conservation measure, presented above, limiting operations along portions of the TF/MMR route and within portions of the low-level training area during the marbled murrelet breeding period. Without this conservation measure in place, the proposed project **may affect, is likely to adversely affect** the marbled murrelet, but is **not likely to adversely affect** designated critical habitat. Provided this conservation measure is

enacted and enforced, the proposed training **may affect, is not likely to adversely affect** the marbled murrelet or designated critical habitat.

4.15 Northern Spotted Owl

The primary reference for this section is:
U.S. Fish and Wildlife Service. 2010d. 2010 Draft Revised Recovery Plan for the Northern Spotted Owl (*Strix occidentalis caurina*). Region 1 U.S. Fish and Wildlife Service. Portland, Oregon.

References cited in this section are internal to the above-referenced documents. They are included in the Bibliography.

4.15.1 Status of the Species/Critical Habitat and Baseline Information

The northern spotted owl (*Strix occidentalis caurina*) is one of three subspecies of the spotted owl, a nocturnal bird of forest habitats. The species occupies complex forested habitats from southwest British Columbia through the Cascade Mountains, coastal ranges, and intervening forested lands in Washington, Oregon, and California. The range of the spotted owl is partitioned into 12 physiographic provinces. Within the project area, these provinces include the Olympic Peninsula, Western Washington Lowlands, Western Washington Cascades, Eastern Washington Cascades, Oregon Coast Range, Willamette Valley, Western Oregon Cascades, and Eastern Oregon Cascades. The actual number of currently occupied spotted owl locations across the species' range is unknown because many areas remain unsurveyed (USFWS 1992c, Thomas et al. 1993). Based on a recent model of population change, there is evidence that populations are declining in 7 of 11 study areas, and stationary in the others (Forsman et al. in press). Within the project area, the most suitable habitat for spotted owls is located beneath Route AR305, along the proposed TF/MMR route, and within the proposed low-level training area. Aircraft traveling between JBLM and the proposed routes/training area could also potentially pass over suitable spotted owl habitat, depending on the route taken. Portions of designated critical habitat occur within the proposed low-level training area, beneath the proposed TF/MMR route, and beneath Route AR305 (Figure 8). Additionally, a very small piece of critical habitat occurs at the southern tip of proposed Route AR304, and critical habitat occurs immediately adjacent to Route 1. The most direct flight paths between JBLM and the TF/MMR route and Route AR305 also pass over designated critical habitat for the northern spotted owl.

The northern spotted owl is known from most of the major types of coniferous forests in the Pacific Northwest (Forsman et al. 1984). Extensive studies of spotted owls during the last 20 years have shown the species to be strongly associated with late-successional forests throughout much of its range. However, landscape-level analyses suggest that a mosaic of late-successional habitat interspersed with other seral conditions may benefit the species more than large, homogeneous expanses of older forests (Meyer et al. 1998, Franklin et al. 2000, Zabel et al. 2003).

Older forests contain the structures and characteristics required for northern spotted owl nesting, roosting, and foraging. Features that support nesting and roosting include moderate to high canopy closure (60 to 90 percent); a multi-layered, multi-species canopy dominated by large (> 30 inches [76 cm] diameter at breast height) overstory trees; a high incidence of large trees with various deformities (e.g., large cavities, broken tops,

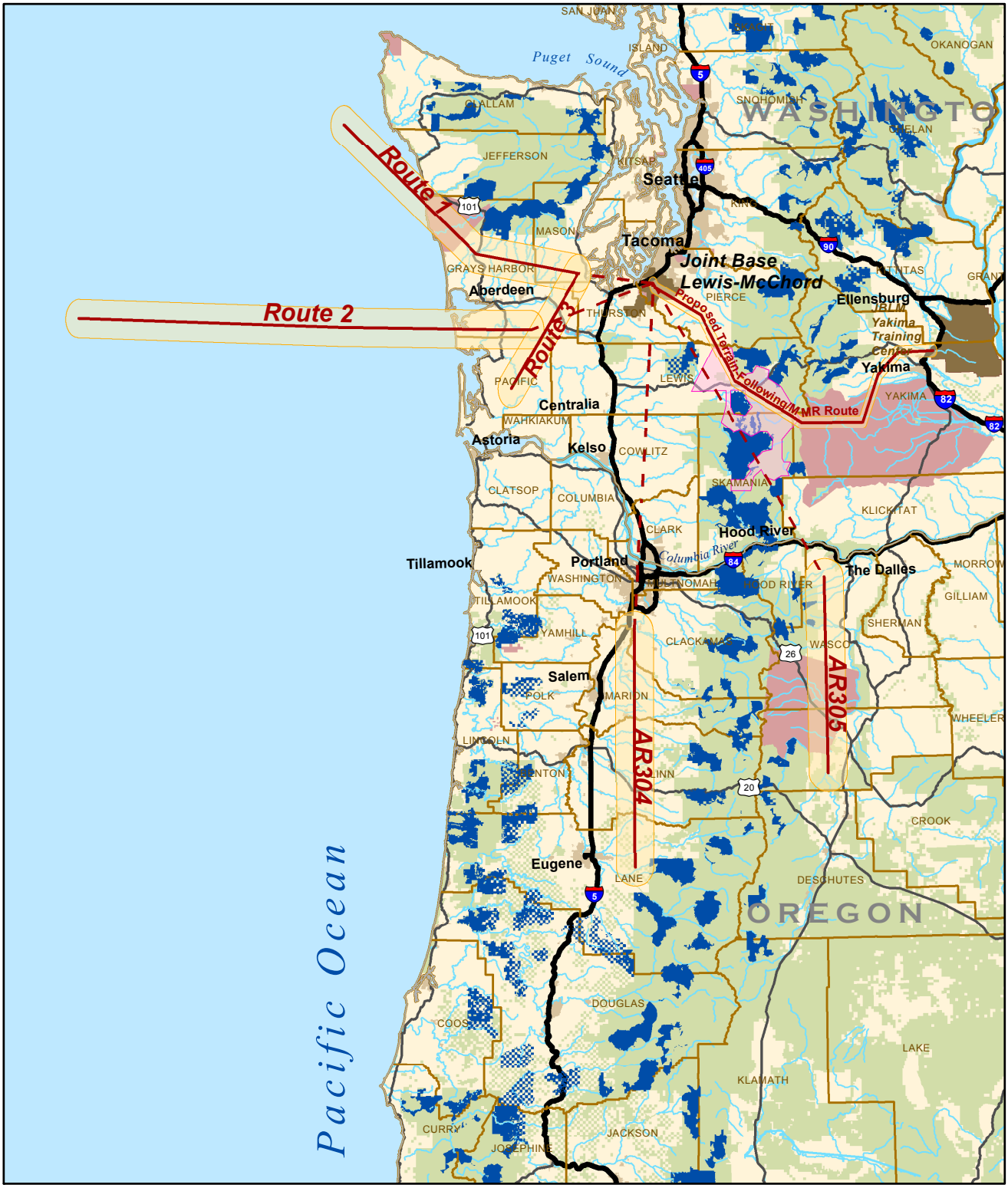

Figure 8. Northern Spotted Owl Designated Critical Habitat

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- Northern Spotted Owl Designated Critical Habitat*
- Possible Route Approaches
- Existing and Proposed Training Routes
- Route Buffers/Airspace
- Proposed Low-Level Training Area
- Counties
- Populated Areas
- Public Lands
- Tribal Lands
- Interstate Highways
- U.S. Highways
- Rivers & Streams

Data Source: *USFWS 2008c

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mistletoe infections, and other evidence of decadence); numerous large snags; large accumulations of fallen trees and other woody debris on the ground; and sufficient open space below the canopy for owls to fly (Thomas et al. 1990). Usually, the features characteristic of owl habitat are most commonly associated with old-growth forests or mixed stands of old-growth and mature trees, which do not assimilate these attributes until 150 to 200 years of age. Dispersal habitat consists of stands that have large enough trees and enough canopy closure to provide protection from avian predators and some foraging opportunities (USFWS 1992c).

Although a secretive and mostly nocturnal bird, the northern spotted owl is relatively unafraid of human beings (Forsman et al. 1984). The adult spotted owl maintains a territory year-round; however, individuals may shift their home ranges between the breeding and nonbreeding season. Northern spotted owls are perch-and-dive predators; more than 50 percent of their prey items are arboreal or semi-arboreal species. They subsist on a variety of mammals, birds, reptiles, and insects, with small mammals (e.g., flying squirrels, red tree voles [*Arborimus longicaudus*], and dusky-footed woodrats [*Neotoma fuscipes*]) making up the bulk of the food items throughout the range of the species (Forsman et al. 1984, Barrows 1985).

Spotted owls are territorial and monogamous, with home ranges with median sizes that vary from approximately 3,000 to 14,000 acres (1,214 to 5,666 ha; Thomas et al. 1990, USFWS 1994b). Most spotted owl pairs usually do not nest every year, and nesting pairs are not successful every year (Forsman et al. 1984, USFWS 1990, Anthony et al. 2006). Nesting behavior begins in February to March, with nesting occurring from March to June. The timing of nesting and fledging varies with latitude and elevation (Forsman et al. 1984). The number of eggs in a clutch ranges from one to four, with two eggs being most common. Fledging occurs from mid-May to late June, with parental care continuing into September. Females are capable of breeding in their second year, but it is likely that most do not breed until their third year (Barrows 1985, Miller and Meslow 1985, Franklin et al. 1986). Males do most of the foraging during incubation, and assist with foraging during the fledging period.

The northern spotted owl was federally listed as a threatened species on June 26, 1990 (USFWS 1990), and critical habitat was designated in Washington, Oregon, and California in January 1992 (USFWS 1992d). This designation was revised in August 2008 to include a reduced acreage (5.3 million acres [2.1 million ha]; USFWS 2008b). Throughout its range, the northern spotted owl is threatened by competition from the barred owl (*Strix varia*) and the loss and modification of suitable habitat as a result of timber harvesting. These threats are exacerbated by risks of catastrophic events such as fire, volcanic eruption, and wind storms.

4.15.2 Analysis of Direct and Indirect Effects

Potential effects from the proposed training include disturbance from helicopter noise, and bird strikes. Additionally, accidental releases of fuel could potentially affect habitat. The USFWS has established a threshold of 92 dBA as the point at which spotted owls are likely to show signs of disturbance such as flushing (Harke, personal comm.). Noise modeling data for similar aircraft (Table 5) indicate that MH-47 Chinook helicopters would exceed this noise threshold at an altitude of approximately 400 feet (122 meters) above spotted owls, MH-60 Blackhawk helicopters would exceed this threshold at an altitude of approximately 200 feet (61 meters) above spotted owls, and C-130 tankers would exceed this threshold at an altitude of approximately 500 feet (152 meters) above spotted owls.

Along aerial refueling routes, aircraft would fly at a minimum altitude of 1,000 feet (305 meters) AGL. At these heights, all aircraft would produce noise levels below the thresholds for adverse effects to spotted owl associated with noise disturbance. Although spotted owls could be disturbed by noise, behavioral responses would be minor, such as avoiding the sound by hiding or delaying a feeding. Additionally, aircraft would pass through the area quickly, and the frequency of passes over a given area would be low. Helicopters traveling between JBLM and the training routes/area would fly at minimum altitudes of 500 feet (152 meters) AGL (which is the height above treetop level). At these altitudes, noise levels would be below 92 dBA, and adverse effects to spotted owls should not occur.

Noise levels associated with proposed training activities would have the potential to exceed 92 dBA along the proposed TF/MMR route and within the proposed low-level training area, where helicopters would fly below 500 feet (152 meters) AGL. At these levels, aircraft could cause birds to flush from nests or abort feeding visits, leading to reduced productivity or survival (USFWS 2006c). These harassment-level effects would only occur during the breeding period. Suitable habitat for northern spotted owl is found throughout the Cascade Range forests crossed by the TF/MMR route and within the proposed low-level training area. Critical habitat intersects the route and training area as well, and numerous documented, mapped spotted owl nest sites (centers) occur along the TF/MMR route and within the proposed training area. Along the TF/MMR route, nesting spotted owls potentially occur along the majority of the route, for a 72-mile (63-nm) stretch from the southern portion of Pierce County through the bend in Yakima County where the route shifts north. Restrictions on the flight level of helicopters within this area are necessary during the breeding season to avoid adverse impacts to northern spotted owls.

Mapped northern spotted owl centers occur in relatively high densities throughout most of the proposed low-level training area. General use of this area at flight altitudes from 0 to 500 feet (152 meters) above treetop level during the breeding season could potentially disturb northern spotted owls enough to cause harassment-level effects. Restrictions on the use of this area during the breeding season are necessary to avoid adverse impacts to northern spotted owls. Proposed landing zones were selected to avoid mapped locations of northern spotted owl centers, based on digital data provided by the Gifford Pinchot National Forest. The closest distance between a proposed landing zone and the nearest spotted owl center is approximately 1.1 miles (1.7 km). Based on the noise level threshold of 92 dBA, MH-47 Chinook helicopters could come within 400 feet (122 meters; horizontally or vertically) of northern spotted owl centers, and MH-60 Blackhawks could come within 200 feet (61 meters), without exceeding noise disturbance thresholds during the breeding season. However, flight paths of helicopters to and from landing zones would also need to avoid northern spotted owl centers.

Bird strikes involving spotted owls are possible within the project area. However, spotted owls typically remain at canopy level or lower when flying, so the risk of a bird strike anywhere outside of the low-level training area is extremely low (Harke, personal comm.). Maneuvers within the low-level training area could place helicopters in close proximity to spotted owl nesting sites. Owls could potentially collide with aircraft, and nests could be physically damaged by helicopter-generated winds. Based on data from the Gifford Pinchot National Forest and WDFW, spotted owl centers are common within the low-level training area. However, the closest distance between a proposed landing zone and the nearest spotted owl center is approximately 1.1 miles (1.7 km). According to FAA data, there were 51 recorded owl strikes by civilian aircraft in Washington from 1990

through 2010, and 132 recorded owl strikes in Oregon during the same time period (FAA 2011). No spotted owl strikes were recorded during this time period. According to data from the U.S. Air Force, no owls are on the list of top 50 wildlife strikes by count, as of January, 2009 (Air Force Safety Center 2011), which means that the total number of recorded owl strikes (all species) from 1985 through 2008 was less than 149. It is not known whether these data provide an accurate picture of the risk to northern spotted owls from aircraft strikes within the proposed low-level training area.

In the event of an accidental release of fuel along refueling routes, habitat utilized by spotted owls could be affected by fuel reaching the forest canopy and floor. Under a worst-case spill scenario, the amount of fuel reaching the ground would be approximately 16 to 25 gallons (61 to 95 liters), spread out over a large area (see Section 4.1.2). The amount reaching the treetop level could potentially be slightly lower. Given the small amount of fuel reaching owl habitat and the dispersion across the landscape, lasting effects to spotted owl habitat are not anticipated. While there is a low risk of a spill (the current rate is less than 1 event per 13,000 hours flown, worldwide), the risk of fuel reaching a nest with spotted owl eggs or chicks would be discountable.

4.15.3 Interrelated and Interdependent Effects

The publication of the proposed routes would make them available for use by other military units. Use of these routes by additional aircraft could result in increased frequency of noise disturbance to northern spotted owls in the project area, particularly along the proposed TF/MMR route.

4.15.4 Cumulative Effects

The northern spotted owl is primarily threatened by the loss and modification of suitable habitat and by competition from barred owls (USFWS 2010d). Although the rate has slowed since the species was listed in 1990, loss of suitable habitat continues to occur, predominantly on non-federal lands. Noise disturbances from SOAR helicopters would be cumulative to other noises and disturbances to spotted owls within the project area, including commercial, military, and other aircraft flying overhead, and Forest Service helicopter use associated with timber sales and other activities. Cumulative noise disturbances would continue to be minimized by following guidance to not exceed critical noise levels of 92 dBA during the breeding period.

4.15.5 Conservation Measures

The following conservation measures are Best Management Practices that would help avoid effects to northern spotted owls in the project area.

- One pilot would stay focused outside the aircraft when in flight to help avoid bird strikes.
- Where feasible, SOAR pilots would follow guidance in FAA Advisory Circular 91-36D, which recommends that pilots maintain a minimum altitude of 2,000 feet (610 meters) AGL when flying over noise sensitive areas, such as National Parks, National Wildlife Refuges, Wilderness Areas, and other areas where a quiet setting is a generally recognized feature or attribute of the land.
- To prevent damage to the refueling hose during fuel transfer, and other accidents, the 160th SOAR would follow the procedures discussed in Section 4.1.5.

Additionally, the following conservation measure is necessary to avoid adverse effects to northern spotted owls in the project area:

- Between March 1st and July 31st, MH-47 SOAR helicopters would fly at a minimum altitude of 400 feet (122 meters) above treetop level in the vicinity of northern spotted owl nests. These restrictions apply to the TF/MMR route and much of the low-level training area, including travel to and from the proposed landing zones. Northern spotted owl centers would be clearly labeled on pilots' maps to ensure that these areas are avoided.

4.15.6 Determination of Effects

Over the majority of the project area, effects to northern spotted owls would be minimal, since SOAR aircraft would fly at altitudes of 500 feet (152 meters) AGL and higher. Along the proposed TF/MMR route and within the proposed low-level training area, where numerous spotted owl nests are present, spotted owls could be harassed by low-altitude helicopter flight. Noise levels could potentially exceed 92 dBA and cause behavioral responses that lead to reduced productivity or survival. These potential effects would be prevented by the required conservation measure, presented above, limiting operations along the TF/MMR route and within the low-level training area during the northern spotted owl breeding period. Without this conservation measure in place, the proposed project **may affect, is likely to adversely affect** the northern spotted owl, but is **not likely to adversely affect** designated critical habitat. Provided this conservation measure is enacted and enforced, the proposed training **may affect, is not likely to adversely affect** the northern spotted owl or designated critical habitat.

4.16 Short-tailed Albatross

The primary reference for the baseline discussion in this section is:
U.S. Fish and Wildlife Service. 2005b. Short-tailed Albatross Draft Recovery Plan. Anchorage, AK.

References cited in this section are internal to the above-referenced document. Full citations have been included in the Bibliography.

4.16.1 Status of the Species/Critical Habitat and Baseline Information

The short-tailed albatross (*Phoebastria albatrus*) was historically the most abundant of the three North Pacific albatross species. Today, the species is known to breed on only two islands in the Western Pacific near Japan, and the worldwide population is estimated to be less than 2,000 birds. Outside of the breeding season, albatrosses range across much of the northern Pacific, but are most commonly sighted along the continental shelves of the Gulf of Alaska, Bering Sea, and Aleutian Islands. They are rarely seen as far south as the project area. No short-tailed albatross have been observed in Washington, but there have been four confirmed sightings of the species off the coast of Oregon in the past 20 years (Pacific Biodiversity Institute 2007).

Breeding habitat for the short-tailed albatross is windswept, isolated offshore islands with minimal human disturbance. Nesting takes place in open, treeless areas with little or no vegetative cover. The preferred marine

environment used for feeding is along the northern edge of the Gulf of Alaska, along the Aleutian Chain, and along the Bering Sea shelf break from the Alaska Peninsula out towards St. Matthew Island (USFWS unpublished data 2003). The diet of the short-tailed albatross is poorly understood, but is known to include squid, shrimp, miscellaneous fish, flying fish eggs, and other crustaceans (Hasegawa unpblished data in Austin 1949).

Birds arrive at breeding colonies and begin nest construction in October. Each female lays a single egg between late October and late November, and the incubation period lasts approximately 65 days. During this period, males and females take turns foraging for 2 to 3 weeks at a time. Eggs hatch in late December or January, and chicks are almost fully grown by May or early June, when adults begin leaving the breeding colony (Hasegawa and DeGange 1982). Chicks fledge soon after adults leave the colony. Short-tailed albatrosses are monogamous for life and typically return to the same nesting location every year.

The short-tailed albatross was listed as endangered throughout its range on July 31, 2000 (USFWS 2000c). No critical habitat has been designated for this species. Hunting of the short-tailed albatross, the activity that nearly led to the extinction of the species, no longer occurs, but existing threats to short-tailed albatrosses include incidental catch in commercial fishing, air strikes, contaminants, invasive species, disease and parasites, and global climate change.

4.16.2 Analysis of Direct and Indirect Effects

Short-tailed albatrosses could potentially be impacted by noise, bird strikes, and accidental releases of fuel from aircraft within the project area. However, short-tailed albatrosses are extremely rare, with only four confirmed sightings in the project area in the past 20 years and no known breeding sites in the U.S. Given this rarity, it is very unlikely that short-tailed albatrosses would be disturbed by aircraft noise or collide with aircraft. The only aircraft that might potentially collide with albatrosses would be those engaged in refueling activities along proposed Routes 1 and 2. However, the minimum altitude of these routes, 2,300 feet (701 meters) MSL, is much higher than that of foraging albatrosses. In the event of an accidental release of fuel, habitat and prey items utilized by short-tailed albatrosses could be affected by fuel in the air and on the ground. An estimated maximum of 16 to 25 gallons (61 to 95 liters) of fuel would reach the ground/water surface in the event of a spill, spread out over many acres (see Section 4.1.2). Such a spill is unlikely to occur, and only three such spills have occurred since 1972 on all 160th SOAR refueling routes worldwide.

4.16.3 Interrelated and Interdependent Effects

The publication of the proposed routes would make them available for use by other military units. Use of Routes 1 and 2 by additional aircraft could result in a slightly increased risk of collisions with albatrosses or fuel spills.

4.16.4 Cumulative Effects

Short-tailed albatrosses are extremely rare, with only four sightings in the project area in the past 20 years and no known breeding sites in the U.S. Commercial fishing and flying of aircraft within the project area would have the potential to impact short-tailed albatrosses. A large number of aircraft fly into and out of the two major airports in the vicinity of the project area (Sea-Tac and PDX), as well as a variety of smaller regional airports.

Additionally, military aircraft utilize airspace in the region. Flights by SOAR aircraft associated with the proposed training would be cumulative to other military, commercial, and other types of air traffic in the region. However, since short-tailed albatrosses are very uncommon in the project area, cumulative effects to the species would be unlikely.

4.16.5 Conservation Measures

The following conservation measures would help avoid effects to short-tailed albatrosses, should any be present in the project area.

- One pilot would stay focused outside the aircraft when in flight to help avoid bird strikes.
- Where feasible, SOAR pilots would follow guidance in FAA Advisory Circular 91-36D, which recommends that pilots maintain a minimum altitude of 2,000 feet (610 meters) AGL when flying over noise sensitive areas, such as National Wildlife Refuges and other areas where a quiet setting is a generally recognized feature or attribute of the land.
- To prevent damage to the refueling hose during fuel transfer, and other accidents, the 160th SOAR would follow procedures discussed in Section 4.1.5.

4.16.6 Determination of Effects

The short-tailed albatross has no breeding habitat, and is extremely unlikely to occur, within the project area. Therefore, the project would have **no effect** on the short-tailed albatross.

4.17 Western Snowy Plover

The primary reference for the baseline discussion in this section is:
U.S. Fish and Wildlife Service. 2007. Recovery Plan for the Pacific Coast Population of Western Snowy Plover (*Charadrius alexandrinus nivosus*). California/Nevada Operations Office. Sacramento, California.

References cited in this section are internal to the above-referenced documents. Full citations have been included in the Bibliography.

4.17.1 Status of the Species/Critical Habitat and Baseline Information

There are two distinct populations of western snowy plover (*Charadrius alexandrinus nivosus*), only one of which is federally listed. The Pacific coast population of the western snowy plover, which is genetically isolated from interior-breeding western snowy plovers, is defined as those "individuals that nest within 50 miles of the Pacific Ocean on the mainland coast, peninsulas, offshore islands, bays, estuaries, or rivers of the United States and Baja California, Mexico" (USFWS 1993e). It is the Pacific coast population that is addressed in this document. Six current or historical western snowy plover breeding or wintering locations have been identified in Washington and 19 have been identified in Oregon. Three breeding areas along the southern Washington coast near Grays Harbor and Willapa Bay have been designated as critical habitat (Figure 9); one of these breeding areas, Midway Beach, lies beneath proposed refueling Route 2. In addition, Damont Point is located

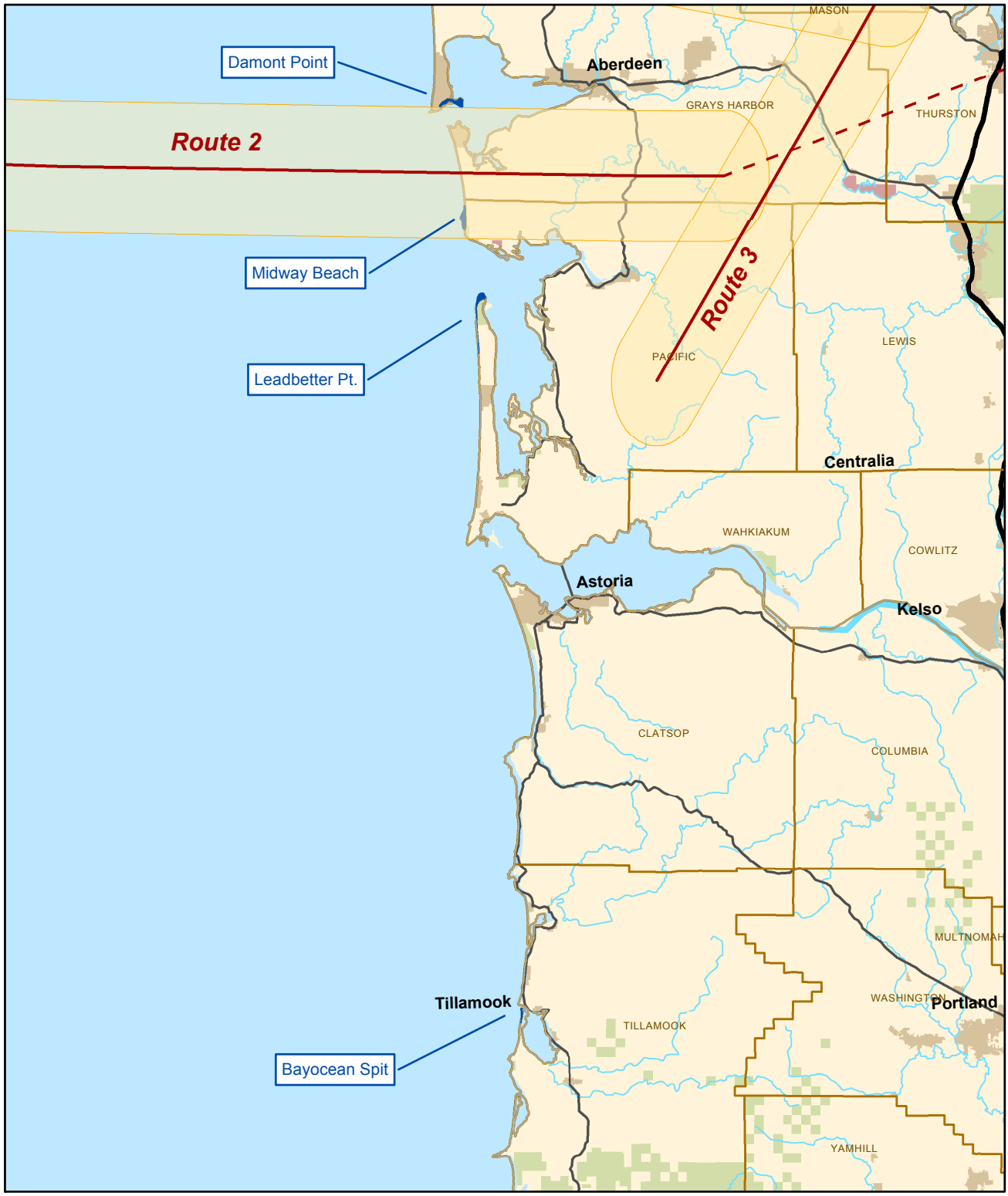

Figure 9. Western Snowy Plover Designated Critical Habitat

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- Western Snowy Plover Designated Critical Habitat*
- Possible Route Approaches
- Existing and Proposed Training Routes
- Route Buffers/Airspace
- Counties
- Populated Areas
- Public Lands
- Tribal Lands
- Interstate Highways
- U.S. Highways
- Rivers & Streams

0 4 8 12 16 Kilometers

0 5 10 15 Miles

Data Source: *USFWS 2005

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immediately north of refueling Route 2. There are also nine breeding areas along the Oregon coast with critical habitat designation.

Breeding in Pacific coast western snowy plovers occurs on coastal beaches. Nesting primarily occurs on unstable beach habitats such as sand spits, dune-backed beaches, beaches at creek and river mouths, and salt pans at lagoons and estuaries (Stenzel et al. 1981, Wilson 1980). Nests generally occur in flat, open areas with minimal to no vegetation and driftwood (Widrig 1980, Wilson 1980, Stenzel et al. 1981). The nesting season along the west coast extends from early March through late September, although breeding typically occurs later in Washington and Oregon than in more southern locations. The number of adults present at each breeding location varies by site, from 1 to 315. In Washington, western snowy plovers are known to breed in four areas (Damon Point in Grays Harbor, and Midway Beach, Ledbetter Point, and Graveyard Spit in Willapa Bay). The 2006 maximum estimated population in Washington was 70 birds. In Oregon, western snowy plovers have been observed nesting at 14 sites since 1990 (Castelein et al. 2002, Lauten et al. 2006a, 2006b), and most frequently at nine sites (Sutton, Siltcoos, Dunes Overlook, Tahkenitch, Tenmile Spits, Coos Bay North Spit, Bandon, New River, and Floras Lake). During the 2006 breeding season, nearly 180 adult birds (estimated) were observed at Oregon breeding sites.

Wintering western snowy plovers may remain at their breeding sites or move north or south to other wintering sites along the Pacific coast. Additionally, both coastal and interior populations use coastal locations during winter. Wintering habitat includes coastal areas from southern Washington to Central America (Page et al. 1995). In Washington, there are two wintering locations in Pacific County: Midway Beach and Ledbetter Point, Willapa Bay. In Oregon, at least nine locations have been used by wintering western snowy plovers between 1990 and 2005. The number of wintering birds in Washington and Oregon is relatively small, estimated as 32 birds for Washington and 97 for Oregon in 2005 (Kelly in litt. 2005).

Snowy plovers forage on invertebrates in the wet sand and among surf-cast kelp within the intertidal zone; in dry, sandy areas above the high tide; on salt pans; at spoil sites; and along the edges of salt marshes and salt ponds. Their food consists of immature and adult aquatic and terrestrial invertebrates.

The Pacific coast population of the snowy plover was federally listed as threatened on March 5, 1993 (USFWS 1993e). On December 7, 1999, the USFWS designated 28 areas along the coast of California, Oregon, and Washington (totaling approximately 18,000 acres [7,284 ha] and 180 miles [290 km] of coastline) as critical habitat for this population segment (USFWS 1999b). Critical habitat for the snowy plover was re-designated on September 29, 2005, to include 32 areas totaling 12,145 acres (4,915 ha; USFWS 2005c). Declines in snowy plover populations have been attributed to poor reproductive success resulting from human disturbance, predation, and inclement weather, combined with habitat loss resulting from urban development and the encroachment of introduced European beachgrass (*Ammophila arenaria*). These factors continue to threaten coastal populations of this species.

4.17.2 Analysis of Direct and Indirect Effects

Western snowy plovers could potentially be impacted by noise, bird strikes, and accidental releases of fuel from aircraft in the project area. Risks would be greatest in coastal breeding and wintering areas in southern

Washington, particularly beneath and near proposed Route 2. All of the identified breeding and wintering habitat in Washington is south of proposed Route 1. Damon Point in Grays Harbor provides both breeding and wintering habitat for western snowy plovers, and has been designated as critical habitat (Figure 9). This area is immediately adjacent to proposed refuel Route 2. Additionally, Midway Beach, which has also been designated as critical habitat, is located entirely beneath proposed refuel Route 2 (Figure 9). The next closest identified breeding and wintering habitat is located at Ledbetter Point in Willapa Bay, more than 5 miles (8 km) south of proposed Route 2. Helicopters would not land or come near the ground in coastal areas. Disturbances would be limited to aircraft engaged in aerial refueling activities, or returning to JBLM outside of refueling routes after completing training activities. During refueling activities along proposed Route 2, aircraft would be at altitudes of 2,300 to 5,000 feet (701 to 1,524 meters) MSL, which is well above levels that would potentially disturb western snowy plovers. Low-flying aircraft (within 500 feet [152 meters] of the ground) can disturb breeding and wintering plovers by simulating predators. At a site in California, roosting western snowy plovers were observed to increase vigilance and crouch in response to low-flying aircraft, and foraging western snowy plovers frequently took flight (Hatch 1997 *in* USFWS 2007). However, there is some evidence that plovers may become acclimated to aircraft, as they have been observed to nest repeatedly within military airfield boundaries next to busy runways at a naval air station near San Diego (S. Vissman, USFWS personal communication *in* USFWS 2007). Helicopters returning to JBLM from the refueling routes could potentially fly over western snowy plover habitat at altitudes of 500 feet (152 meters) AGL and up. Although this altitude is above the low-flying aircraft level, some noise disturbance to plovers could occur at the lowest flight levels. The return flight would occur, at a maximum, only once for every training exercise, or 50 times per year.

During migration along the Pacific coast, Western snowy plovers could collide with aircraft. According to the FAA bird strike database, there were no recorded snowy plover strikes in Washington or Oregon between 1990 and 2010 (although there was one in California; FAA 2011). However, given the very small size of western snowy plovers, it is unlikely that collisions with aircraft by this species would be easy to identify. Breeding and wintering plovers would be unlikely to fly high enough to collide with aircraft.

In the event of an accidental release of fuel during activities along proposed Routes 1 and 2, habitat utilized by western snowy plovers could be affected by fuel reaching the ground. As discussed in Section 4.1.2, an estimated maximum of 16 to 25 gallons (61 to 95 liters) of fuel could reach the ground, dispersed over many acres (see Section 4.1.2). Given the low likelihood of a fuel spill, and the low likelihood of fuel from a spill reaching western snowy plover habitat in large enough quantities to result in a loss of birds or reduced reproductive success, adverse effects would be discountable.

4.17.3 Interrelated and Interdependent Effects

The publication of the proposed routes would make them available for use by other military units. Use of Routes 1 and 2 by additional aircraft could result in increased risk of impacts to western snowy plovers in the project area.

4.17.4 Cumulative Effects

Activities in the project area that have contributed to the poor reproductive success of snowy plovers include human disturbance and habitat loss from urban development. These factors continue to threaten existing coastal populations of this species, and are likely to increase as a result of various future actions in coastal areas of Washington and Oregon. Numerous aircraft fly into and out of airports in the vicinity of the project area. Additionally, training activities by Navy and other military aircraft occur regularly in the project area, including coastal areas. The addition of SOAR aircraft flying along proposed refueling routes would increase the total number of overflights potentially impacting western snowy plovers, and therefore the total risk of collisions between aircraft and plovers. Establishment of refueling Routes 1 and 2 could also contribute to cumulative noise disturbance and fuel spill risks. However, given the limited number of additional aircraft flights expected along proposed routes over the Pacific Ocean or near coastal areas, altitude of aircraft, and very low risk of a fuel spill, it is unlikely that the project would contribute significantly to cumulative impacts to western snowy plover or its designated critical habitat.

4.17.5 Conservation Measures

The following conservation measures would be followed to avoid effects to western snowy plovers in the project area.

- One pilot would stay focused outside the aircraft when in flight to help avoid bird strikes.
- Where feasible, SOAR pilots would follow guidance in FAA Advisory Circular 91-36D, which recommends that pilots maintain a minimum altitude of 2,000 feet (610 meters) AGL when flying over noise sensitive areas, such the Grays Harbor and Willapa National Wildlife Refuges near western snowy plover breeding and wintering habitat.
- To prevent damage to the refueling hose during fuel transfer, and other accidents, the 160th SOAR would follow procedures discussed in Section 4.1.5.

4.17.6 Determination of Effects

Western snowy plovers are known to winter and breed in the project area, and critical habitat lies beneath and adjacent to proposed refueling Route 2. Studies have shown that breeding plovers can be disturbed by noise from aircraft overflights, but aircraft flying over coastal plover habitat during the proposed activities should be at a sufficiently high altitude to avoid disturbing western snowy plovers. Accidental releases of fuel and bird strikes are possible but unlikely. Therefore, the proposed action **may affect, is not likely to adversely affect** western snowy plovers or designated critical habitat.

4.18 Canada Lynx

The primary reference for the baseline discussion in this section is:
USFWS. 2000d. Determination of Threatened Status for the Contiguous U.S. Distinct Population Segment of the Canada Lynx and Related Rule. Federal Register 65(58):16051-16086.

References cited in this section are internal to the above-referenced document. A complete list of these references is available from the USFWS Montana Field Office, Helena, Montana.

4.18.1 Status of the Species/Critical Habitat and Baseline Information

Within the contiguous United States, Canada lynx (*Lynx canadensis*) historically occurred in the Cascade Range of Washington and Oregon; the Rocky Mountain Range in Montana, Wyoming, Idaho, eastern Washington, eastern Oregon, northern Utah, and Colorado; the western Great Lakes Region; and the northeastern United States region from Maine southwest to New York (McCord and Cardoza 1982, Quinn and Parker 1987). This distribution is associated with the southern boreal forest, comprising subalpine coniferous forest in the West and primarily mixed coniferous/deciduous forest in the East (Aubry et al. 1999). Lynx in Washington are concentrated in the northeast and northcentral portions of the state, specifically Okanogan, Chelan, Ferry, Stevens, and Pend Oreille counties. A very small number of lynx were reported in Yakima, Kittitas, Pierce, and Lewis counties in the 1960s and 1970s that may have been transients. More recently, a handful of possible lynx detections in Whatcom, Kittitas, eastern Skamania, eastern Lewis and southern Chelan counties that could represent transients, or small local populations (Weaver and Amato 1999), have been reported. In 2000, the size of the lynx population in Washington was estimated at less than 200 individuals, and possibly less than 100 individuals (WDFW 2000). Lynx are very rare in Oregon, and as of 2000 there had been only 12 verified sightings in the state since 1897 (McKelvey et al. 2000). Because the lynx is a secretive animal, there are no reliable population estimates for this species. However, sightings of lynx throughout the U.S. have continued to decrease over the years. Few, if any, lynx are believed to reside within the project area, although the possible detections in eastern Lewis and Skamania counties suggest that lynx could be present. There is no designated critical habitat in the project area.

Lynx are highly specialized predators whose primary prey is the snowshoe hare (*Lepus canadensis*), a species that has evolved to survive in areas that receive deep snow (Bittner and Rongstad 1982). Snowshoe hares use forests with dense understories that provide forage, cover to escape from predators, and protection during extreme weather (Wolfe et al. 1982; Monthey 1986; Hodges 1999a, 1999b). Generally, earlier successional forest stages have greater understory structure than do mature forests and therefore support higher hare densities (Hodges 1999a, 1999b). However, mature forests can also provide snowshoe hare habitat as openings develop in the canopy of mature forests when trees succumb to disease, fire, wind, ice, or insects, and the understory grows (Buskirk et al. 1999b). Lynx concentrate their hunting activities in areas where hare activity is relatively high (Koehler et al. 1979; Parker 1981; Ward and Krebs 1985; Major 1989; Murray et al. 1994; O'Donoghue et al. 1997, 1998a). Lynx also prey opportunistically on other small mammals and birds, particularly when hare populations decline (Nellis et al. 1972; O'Donoghue 1997, 1998a).

The breeding period for Canada lynx is late winter to early spring, with adult females producing one litter every 1 to 2 years. Lynx use large woody debris, such as downed logs and windfalls, to provide denning sites with security and thermal cover for kittens (McCord and Cardoza 1982, Koehler 1990, Koehler and Brittell 1990, Squires and Laurion 1999, Organ 1999). The size of lynx home ranges varies by the animal's gender, abundance of prey, season, and the density of lynx populations (Hatler 1988, Koehler 1990, Poole 1994, Slough and Mowat 1996, Aubry et al. 1999, Mowat et al. 1999). Documented home ranges vary from 3 to 300 square miles (8 to

777 km^2; Saunders 1963, Brand et al. 1976, Mech 1980, Parker et al. 1983, Koehler and Aubry 1994, Apps 1999, Mowat et al. 1999, Squires and Laurion 1999).

The population of the Canada lynx occurring in the contiguous U.S. was federally listed as threatened on March 24, 2000 (USFWS 2000c). Critical habitat, which was designated in November 2006 (USFWS 2006d) and revised in February 2009 (USFWS 2009), includes units in Maine, Minnesota, Wyoming, Idaho, and Washington totaling 39,000 square miles (101,010 acres). The critical habitat unit in Washington comprises approximately 9,500 square miles (24,605 km^2) in the North Cascades National Park (USFWS 2009b), and is located well north of the project area, in Chelan County, Washington.

According to the USFWS, the primary factor affecting lynx in the contiguous U.S. is the lack of guidance for conservation of lynx in federal land management plans. People change forests through timber harvest, fire suppression, and conversion of forest lands to agriculture. Forest fragmentation may eventually become severe enough to isolate habitat into small patches, thereby reducing the viability of lynx populations, which are dependent on larger areas of forest habitat (Litvaitis and Harrison 1989). In addition, human alteration of forests may facilitate competition by creating habitats that are more suitable to potential lynx competitors (McCord and Cardoza 1982, Quinn and Parker 1987, Buskirk et al. 1999a). Finally, lynx movements may be negatively influenced by high traffic volume on roads that bisect suitable lynx habitat.

4.18.2 Analysis of Direct and Indirect Effects

The project area does not overlap with any predicted Canada lynx breeding habitats or designated critical habitat (WDFW and University of Washington 2007), and there has been no confirmed evidence of lynx in the project area in recent years. In the unlikely event that a lynx was present in the project area during training, it is possible that the lynx could be affected by aircraft noise. Disturbance would be minimal beneath refueling routes, along which aircraft would fly a minimum of 1,000 feet (305 meters) AGL, and flight paths between JBLM and the routes/training area, along which aircraft would fly at 500 feet (152 meters) AGL or higher. The potential for disturbance, should a lynx be present, would be much greater within the low-level training area and along the TF/MMR route, where aircraft would fly at low altitudes and/or land on the ground. However, lynx are highly mobile animals that are easily capable of traveling away from refueling routes and training areas to avoid short-duration disturbance from training. Given that lynx are not believed to be present in or near the project area, it is very unlikely that they would be disturbed by the proposed training activities.

In the event of a mishap during refueling, habitat utilized by lynx could be affected by fuel reaching the ground. An estimated maximum of 16 to 25 gallons (61 to 95 liters) of fuel would reach the ground in the event of a spill (see Section 4.1.2). This small amount of fuel should not impact lynx or their habitat. Additionally, the risk of such a mishap is very low.

4.18.3 Interrelated and Interdependent Effects

The publication of the proposed routes would make them available for use by other military units. Use of these by additional aircraft could result in increased potential for disturbance of lynx, should they be present in the project area.

4.18.4 Cumulative Effects

Ongoing activities that continue to affect lynx habitat and populations in the project area include forest management, fire suppression, and development/loss of habitat. Although Lynx are relatively tolerant of human activity, noise from traffic and other sources can affect lynx movements. The proposed helicopter activities would produce noise in remote areas, which would be cumulative to other sources of noise, such as Forest Service helicopters and traffic on roads. However, since lynx are unlikely to occur within the project area, cumulative effects would be limited to making habitat less suitable for lynx that may attempt to immigrate from areas in northcentral Washington and British Columbia.

4.18.5 Conservation Measures

The following conservation measures would help avoid effects to any lynx that may be present in the project area.

- Where feasible, SOAR pilots would follow guidance in FAA Advisory Circular 91-36D, which recommends that pilots maintain a minimum altitude of 2,000 feet (610 meters) AGL when flying over noise sensitive areas, such as National Parks, Wilderness Areas, and other areas where a quiet setting is a generally recognized feature or attribute of the land.
- To prevent damage to the refueling hose during fuel transfer, and other accidents, the 160th SOAR would follow procedures discussed in Section 4.1.5.

4.18.6 Determination of Effects

Lynx are not known to reside in the project area, and the nearest critical habitat is in the North Cascades, outside the project area. However, past observations indicate that lynx could be present in the area. Lynx would be capable of moving away from the limited-duration, infrequent disturbances caused by aircraft training activities. Accidental releases of fuel are possible but unlikely. Therefore, the proposed action **may affect, is not likely to adversely affect** Canada lynx, and would have **no effect** on its designated critical habitat.

4.19 Columbian White-tailed Deer

The primary reference for the baseline discussion in this section is:

USFWS. 2002. Supplemental Proposed Rule to Remove the Douglas County Population of Columbian White-tailed Deer from the Federal List of Endangered and Threatened Wildlife. Federal Register 67(120):42217-42229.

References cited in this section are internal to the above-referenced document. A complete list of these references is available from the USFWS, Oregon Fish and Wildlife Office, Portland, Oregon.

4.19.1 Status of the Species/Critical Habitat and Baseline Information

The Columbian white-tailed deer (*Odocoileus virginianus leucurus*) is the westernmost representative of 30 subspecies of white-tailed deer in North and Central America. Two DPSs of the subspecies occur in Washington and Oregon: the delisted Douglas County DPS in Douglas County, Oregon, and the endangered Columbia River DPS along the Columbia River in Clark, Cowlitz, Pacific, Skamania, and Wahkiakum counties in Washington and Clatsop, Columbia, and Multnomah counties in Oregon. The subspecies was formerly distributed throughout the bottomlands and prairie woodlands of the lower Columbia, Willamette, and Umpqua River basins in Oregon and southern Washington (Bailey 1936, Verts and Carraway 1998), and is thought to have been locally common, particularly in riparian areas along major rivers (Gavin 1978). With the arrival and settlement of pioneers in the fertile river valleys, the decline in Columbian white-tailed deer numbers was rapid (Gavin 1978). By 1940, a population of 500 to 700 animals along the lower Columbia River in Oregon and Washington, and a disjunct population of 200 to 300 in Douglas County survived (Crews 1939, Gavin 1984, Verts and Carraway 1998). Range-wide, numbers of white-tailed deer have more than doubled since the species was first listed, although the Columbia River DPS is currently estimated at less than 1,000 individuals (Oregon Fish and Wildlife Office 2010). Populations of the Columbia River DPS do not occur beneath any of the proposed routes or within the low-level training area. However, SOAR aircraft could pass over populations of this species while traveling to/from refueling routes (particularly AR304, which begins a short distance to the south of the known populations along the Columbia River).

The Columbia River DPS occurs in wet bottomlands and dense forest swamps with little elevational relief that receive a large amount of precipitation. The diet of Columbian white-tailed deer consists of forbs, shrubs, grasses, and a variety of other foods, such as lichens, mosses, ferns, seeds, and nuts (Whitney 2001).

Like other types of deer, Columbian white-tailed deer breed in the winter, primarily in November and December. Most fawns are born between mid-May and mid-June. Columbian white-tailed deer first breed as yearlings (18 months), and young females typically give birth to a single fawn. After 2 years of age, twins are more common.

The Columbian white-tailed deer was federally listed as endangered on March 11, 1967 (USFWS 1967; the Douglas County DPS has since been delisted). Critical habitat has not been designated for the Columbian white-tailed deer. This species is primarily threatened by a lack of suitable habitat. Logging has degraded forest habitat in some areas. In addition, periodic flooding of the Columbia River and residential development along the North Umpqua River are also threats to the subspecies.

4.19.2 Analysis of Direct and Indirect Effects

Columbian white-tailed deer are present in and around the Julia Butler Hansen Refuge near the mouth of the Columbia River, and in various locations along the river as far east as Skamania County, Washington and Multnomah County Oregon. Therefore, it is likely that aircraft would pass over populations of Columbian white-tailed deer while traveling between JBLM and Route AR304, and potentially proposed Routes 2 and 3. However, Columbian white-tailed deer are not known to occur beneath any of the routes themselves. Aircraft flying to and from refueling routes would follow FAA Advisory Circular 91-36D, which directs pilots operating

helicopters to make every effort to fly at elevations of at least 2,000 feet (610 meters) AGL above noise-sensitive areas, including the Julia Butler Hanson Refuge, Lewis and Clark National Wildlife Refuge, and Ridgefield National Wildlife Refuge, all located along the Columbia River. Desert mule deer (*Odocoileus hemionus crooki*), closely related to the Columbian white-tailed deer, have been found to habituate to low flying Cessna aircraft at an average altitude of 80 meters (262 feet), significantly lower than aircraft would fly when traveling to and from the proposed routes. Additionally, the frequency of flights would be low, occurring up to twice per day, 50 days out of each year. Therefore, it is expected that noise-related disturbance to Columbian white-tailed deer would be minimal.

In the event of an accidental release of fuel during training activities, small amounts of fuel could potentially reach Columbian white-tailed deer habitats. An estimated maximum of 16 to 25 gallons (61 to 95 liters) of fuel would reach the ground in the event of a spill (see Section 4.1.2). At this quantity, impacts to deer and their habitats would be negligible. Additionally, the risk of such an occurrence is very low.

4.19.3 Interrelated and Interdependent Effects

The publication of the proposed routes would make them available for use by other military units. Use of these routes by additional aircraft could result in increased frequency of aircraft noise in areas frequented by Columbian white-tailed deer.

4.19.4 Cumulative Effects

The Columbian white-tailed deer is threatened by a lack of suitable habitat. Past and ongoing activities contributing to habitat loss and degradation include logging and residential development. Protections afforded by the Julia Butler Hansen Refuge have helped to reduce future losses to development on a portion of the Columbia River. Noise disturbance from aircraft over Columbian white-tailed deer could contribute to other human/noise disturbances within the project area.

4.19.5 Conservation Measures

The following conservation measures would be followed to avoid effects to Columbian white-tailed deer in the project area.

- Where feasible, SOAR pilots would follow guidance in FAA Advisory Circular 91-36D, which recommends that pilots maintain a minimum altitude of 2,000 feet (610 meters) AGL when flying over noise sensitive areas, such as the Julia Butler Hanson Refuge.
- To prevent damage to the refueling hose during fuel transfer, and other accidents, the 160th SOAR would follow procedures discussed in Section 4.1.5.

4.19.6 Determination of Effects

Columbian white-tailed deer are not known to be present beneath any of the training routes or in the proposed low-level training area. Aircraft traveling to and from the proposed routes would do so infrequently, and would avoid flying low above the Julia Butler Hanson Refuge and other National Wildlife Refuges along the Columbia

River. Accidental releases of fuel along refueling routes are possible but unlikely. Therefore, the project **may affect, is not likely to adversely affect** the Columbia River DPS of Columbian white-tailed deer.

4.20 Gray Wolf

The primary reference for the baseline discussion in this section is:

USFWS. 2000e. Proposal to Reclassify and Remove the Gray Wolf From the List of Endangered and Threatened Wildlife in Portions of the Coterminous United States; Proposal To Establish Three Special Regulations for Threatened Gray Wolves; Proposed Rule. Federal Register Volume 65(135):43449-43496.

References cited in this section are internal to the above-referenced document. A complete list of these references is available from the USFWS Region 3 Office, Fort Snelling, Minnesota.

4.20.1 Status of the Species/Critical Habitat and Baseline Information

Gray wolves (*Canis lupus*) are the largest wild members of the dog family. The species historically occurred across most of North America, Europe, and Asia. In North America, wolves occurred from the northern reaches of Alaska, Canada, and Greenland to the central mountains and the high interior plateau of southern Mexico. The only areas of the contiguous U.S. that apparently lacked gray wolves were much of California and the Gulf and Atlantic coastal plain south of Virginia. In addition, wolves were generally absent from the extremely arid deserts and the mountaintops of the western United States (Goldman 1944, Hall 1959, Mech 1974). The cultural attitudes of European settlers, coupled with perceived and real conflicts between wolves and human activities along the frontier, led to the widespread attempt to eradicate the species. Poisons, trapping, and shooting—spurred by federal, state, and local government bounties—resulted in extirpation of the species from more than 95% of its range in the 48 coterminous states. Since the 1930s, breeding pairs and packs have not been document in Washington State until 2008, when a pack with pups in western Okanogan and northern Chelan counties was confirmed. A second pack with pups was confirmed in Pend Oreille County in July 2009, and another pack may occur in southeastern Washington (WDFW 2010b). Wolves are dispersing into Washington from populations in adjacent areas. Wolves are also sometimes seen in Oregon, predominantly wolves traveling into the state from Idaho. There is no critical habitat for this species in the project area.

Wolves are predators of large animals. Wild prey species in North America include white-tailed deer (*Odocoileus virginianus*), mule deer (*Odocoileus hemionus*), moose (*Alces alces*), elk (*Cervus canadensis*), woodland caribou (*Rangifer tarandus caribou*), barren ground caribou (*Rangifer tarandus groenlandicus*), bison (*Bison bison*), muskox (*Ovibos moschatus*), bighorn sheep (*Ovis canadensis*), Dall sheep (*Ovis dalli*), mountain goat (*Oreamnos americanus*), beaver (*Castor canadensis*), and snowshoe hare, with small mammals, birds and large invertebrates sometimes being taken (Mech 1974, Stebler 1944, Wisconsin Department of Natural Resources 1999a). Wolves may also feed on domestic animals (Paul 1999).

Wolves are social animals, normally living in packs of two to ten members. Packs are primarily family groups consisting of a breeding pair, their pups from the current year, offspring from the previous year, and occasionally an unrelated wolf. Packs occupy, and defend from other packs and individual wolves, a territory of

20 to 214 square miles (52 to 554 km^2; though typically larger in the Rocky Mountains). Normally, only the top-ranking male and female in each pack breed and produce pups. Litters are born from early April into May; they can range from 1 to 11 pups, but generally contain 4 to 6 pups (USFWS 1992a, Michigan Department of Natural Resources 1997). Yearling wolves frequently disperse from their natal packs, although some remain with their pack. Dispersers may become nomadic and cover large areas as lone animals, or they may locate suitable unoccupied habitat and a member of the opposite sex and begin their own territorial pack. Dispersal movements of over 500 miles (805 km) have been documented (Fritts 1983).

The gray wolf was first federally listed as an endangered species in 1967 (USFWS 1967). Currently, most of the populations in the lower 48 states are still listed as endangered, including any populations in Washington and Oregon. Critical habitat occurs for the species, but not within Washington and Oregon. Human disturbance and accessibility to wolf habitats, primarily through open roads, are the main factors limiting wolf recovery, and account for the major sources of wolf mortality in most areas today (Mech et al. 1988, Mech 1989, Frederick 1991).

4.20.2 Analysis of Direct and Indirect Effects

The project area does not overlap with any predicted gray wolf breeding habitats (WDFW and University of Washington 2007), and no breeding pairs or packs are currently known to reside in Washington or Oregon. Based on data from WDFW (2010a), there have been three sightings of gray wolves within the proposed low-level training area boundary, two of which were also beneath the proposed TF/MMR route. These observations occurred in 1989, 1992, and 1993, and were determined to be of "reasonable probability." Therefore, it is likely that gray wolves are occasionally found within the project area, though occurrence is rare. If a gray wolf was present within the project area during training, it is possible that the wolf could be affected by aircraft noise. Disturbance would be minimal beneath refueling routes, along which aircraft would fly at a minimum altitude of 1,000 feet (305 meters) AGL, and flight paths to and from routes, along which aircraft would fly at minimum altitude of 500 feet (152 meters) AGL. Disturbance could be much greater within the low-level training area, where aircraft would fly at a low altitude and land on the ground at proposed landing zones. Although there is anecdotal evidence of wolves avoiding low-flying aircraft, there have also been several recorded instances of wolves tolerating noise disturbance at close range; wolves have been observed denning 0.8 km from a helicopter logging operation, as well as rendezvousing within 984 feet (0.5 km) of a military training facility and within 328 feet (0.1 km) of an active gravel pit (U.S. Geological Survey 2006b). Additionally, wolves are highly mobile animals that are easily capable of traveling away from refueling routes and training areas to avoid disturbance. Given that gray wolves are not known to breed within the project area, impacts to the species should be minimal.

In the event of an accidental release of fuel during training activities, habitat utilized by gray wolves could potentially be affected. An estimated maximum of 16 to 25 gallons (61 to 95 liters) of fuel would reach the ground in the event of a spill, spread out over many acres (see Section 4.1.2). This amount of fuel would be unlikely to impact wolves or have a lasting effect on their habitat, and such a spill is unlikely to occur.

4.20.3 Interrelated and Interdependent Effects

The publication of the proposed routes would make them available for use by other military units. Use of these routes by additional aircraft could result in increased disturbance to gray wolves, should they be present in the project area.

4.20.4 Cumulative Effects

Wolves are currently threatened by human-caused mortality, and potentially by habitat loss. Establishment of refueling routes, the TF/MMR route, and the low-level training area would likely not contribute to cumulative impacts to gray wolves, as wolves are not likely to be found in or near the project area.

4.20.5 Conservation Measures

The following conservation measures would be followed to avoid effects to gray wolves in the project area.

- Where feasible, SOAR pilots would follow guidance in FAA Advisory Circular 91-36D, which recommends that pilots maintain a minimum altitude of 2,000 feet (610 meters) AGL when flying over noise sensitive areas, such as National Parks, Wilderness Areas, and other areas where a quiet setting is a generally recognized feature or attribute of the land.
- To prevent damage to the refueling hose during fuel transfer, and other accidents, the 160th SOAR would follow procedures discussed in Section 4.1.5.

4.20.6 Determination of Effects

Gray wolves are not known to breed in the project area, have been observed there infrequently, and are capable of moving away from disturbances caused by aircraft training activities. Fuel spills during refueling are possible but unlikely, and would not affect wolves. Therefore, the proposed action **may affect, is not likely to adversely affect** gray wolves, and would have **no effect** on their designated critical habitat.

4.21 Grizzly Bear

The primary reference for the baseline discussion in this section is:
USFWS. 1993f. Grizzly Bear Recovery Plan. Missoula, Montana.

References cited in this section are internal to the above-referenced document. Full citations have been included in the Bibliography.

4.21.1 Status of the Species/Critical Habitat and Baseline Information

The grizzly bear (*Ursus arctos horriblis*) was originally distributed in various habitats throughout western North America from Central Mexico to the Arctic Ocean. Its current distribution is reduced to less than 2 percent of its former range south of Canada, in a few small populations. Four regions in the contiguous United States accommodate grizzly bear populations: the Northern Continental Divide and Cabinet/Yaak in Montana, the Selkirks of Idaho and Washington, and the North Cascades of Washington. There is also a population in the

Yellowstone ecosystem, and a possible sixth population in the Bitterroot ecosystem in Idaho. Grizzly bears are not known to occur in the project area and are believed to be limited to more remote regions of Washington to the north and northeast. The North Cascades region, which is the closest region to the project area, is estimated to contain less than 20 grizzly bears. The next closest region, the Selkirk Mountains area of northern Idaho, northeast Washington, and southeast British Columbia, contains an estimated 40 to 50 bears (USFWS No Date).

The grizzly bear has a broad range of habitat tolerance. Most areas in which the species remains are characterized by contiguous, relatively undisturbed mountainous habitat with a high level of topographic and vegetative diversity. Grizzly bears prefer areas of dense forest cover. In the winter, when there is deep snow, low ambient air temperatures, and an unavailability of food, bears hibernate in den sites. Excavation of dens starts as early as September, though it may occur just prior to entry in late November. Dens are usually dug on steep slopes where wind and topography cause an accumulation of deep snow, but where the snow is unlikely to melt during warm periods. Bears exhibit no overt defense of their dens, and several have been reported to abandon them because of human disturbance.

Seven essential characteristics of grizzly bear habitat have been defined: space, isolation, sanitation, denning, safety, vegetation types, and food (Craighead et al. 1982). Each of these characteristics contributes to the overall suitability of an area to provide habitat for grizzly bears. If one characteristic is absent from an area, or severely depleted, the ability of the entire ecosystem to sustain a grizzly bear population is much reduced.

Grizzly bears have an adaptive flexibility in food habits. Although the digestive system is essentially that of a carnivore, bears are successful omnivores, and in some areas may be almost entirely herbivorous. Bears feed on animal matter or vegetable matter that is highly digestible and high in starch, sugars, protein, and stored fat (Stebler 1972, Mealey 1975, Hamer et al. 1977). Grizzly bears must avail themselves of foods rich in protein or carbohydrates in excess of maintenance requirements in order to survive denning and post-denning periods. Herbaceous plants are eaten as they emerge from the soil, when crude protein levels are highest. Grizzly bears are opportunistic feeders and will prey or scavenge on almost any available food, including ground squirrels, ungulates, carrion, and garbage (Murie 1944, Hamer 1974). In areas where animal matter is less available, roots, bulbs, tubers, fungi, and tree cambium may be important in meeting protein requirements (Hamer 1974, Pearson 1975, Singer 1978).

The search for food has a prime influence on grizzly bear movements. Upon emergence from the den they seek the lower elevations, drainage bottoms, avalanche chutes, and ungulate winter ranges where their food requirements can be met. Throughout the late spring and early summer they follow plant phenology back to higher elevations. In late summer and fall, there is a transition to fruit and nut sources, as well as herbaceous materials. Mating in grizzly bears appears to occur from late May through mid-July, with a peak in mid-June and estrus lasting from a few days to over a month (Craighead et al. 1969, Herrero and Hamer 1977).

The grizzly bear was federally listed as threatened in 1967 (U.S. Fish and Wildlife Service 1967). Critical habitat has not been designated. The decline in numbers of this species is attributable to habitat loss and indirect human-caused mortality. Any bear-human interaction is a potential threat to either the bear or the human. The rate of grizzly bear mortality resulting from such interactions often exceeds birth rates (Craighead and Mitchell

1982). Factors that threaten the continued survival of this species include habitat alteration, loss, and fragmentation, hunting, and increased access by humans to wilderness. In addition, there has been some displacement of food sources by disease and invasive species.

4.21.2 Analysis of Direct and Indirect Effects

The project area does not overlap with any predicted grizzly bear breeding habitats (WDFW and University of Washington 2007), and no grizzly bears are currently known to reside in the project area. In the unlikely event that a grizzly bear could be present in the project area during training, it is possible that the bear could be affected by aircraft noise. Disturbance would be minimal beneath refueling routes and flight paths to and from routes, along which aircraft would fly at minimum altitudes of 1,000 feet (305 meters) AGL and 500 feet (152 meters) AGL, respectively. Within the low-level training area, where aircraft would fly at low altitude and land at the landing zones, the potential for noise-related disturbance to grizzly bears, should any be present in the area, would be greater. Grizzly bears have been observed running away from helicopters and fixed-wing aircraft and avoiding other sources of noise (McClellan and Shackleton 1989). However, bears are highly mobile animals that are easily capable of traveling away from refueling routes and training areas to avoid disturbance. Given that grizzly bears are not believed to be present in or near the project area, it is very unlikely that they would be disturbed by the proposed training activities.

In the event of an accidental release of fuel during refueling activities, habitat utilized by grizzly bears could potentially be affected by fuel reaching the ground. An estimated maximum of 16 to 25 gallons (61 to 95 liters) of fuel would reach the ground in the event of a spill, spread out over many acres (see Section 4.1.2). This amount of fuel would be unlikely to impact grizzly bears or have a lasting effect on their habitat, and such a spill would be unlikely to occur.

4.21.3 Interrelated and Interdependent Effects

The publication of the proposed routes would make them available for use by other military units. Use of these routes by additional aircraft could result in increased disturbance to grizzly bears, should they be present in the project area.

4.21.4 Cumulative Effects

Grizzly bears are not known to occur in the project area and are believed to be limited to more remote regions of Washington to the north and northeast. Establishment of refueling routes, the TF/MMR route, and the low-level training area would likely not contribute to the cumulative impacts of aircraft on grizzly bears, as grizzly bears are not found in or near the project area.

4.21.5 Conservation Measures

The following conservation measures would help minimize the potential for adverse effects to grizzly bears in the project area.

- Where feasible, SOAR pilots would follow guidance in FAA Advisory Circular 91-36D, which recommends that pilots maintain a minimum altitude of 2,000 feet (610 meters) AGL when flying over noise sensitive areas, such as National Parks, Wilderness Areas, and other areas where a quiet setting is a generally recognized feature or attribute of the land.
- To prevent damage to the refueling hose during fuel transfer, and other accidents, the 160th SOAR would follow procedures discussed in Section 4.1.5.

4.21.6 Determination of Effects

Grizzly bears are not known to reside in the project area and are capable of moving away from temporary disturbances caused by aircraft training activities. Fuel spills during refueling are possible, but unlikely, and would not affect grizzly bears. Therefore, the proposed action would have **no effect** on grizzly bears.

4.22 Steller Sea Lion

The primary reference for the baseline discussion in this section is:
National Marine Fisheries Service. 2008c. Recovery Plan for the Steller Sea Lion Eastern and Western Distinct Population Segments (*Eumetopias jubatus*), Revision. National Marine Fisheries Service, Silver Spring, MD.

References cited in this section are internal to the above-referenced document. Full citations have been included in the Bibliography.

4.22.1 Status of the Species/Critical Habitat and Baseline Information

The range of the Steller sea lion (*Eumetopias jubatus*) stretches around the Northern Pacific Ocean rim, from northern Japan, the Kuril Islands and Okhotsk Sea, through the Aleutian Islands and Bering Sea, along Alaska's southern coast, and south to California (Kenyon and Rice 1961, Loughlin et al. 1984, 1992). Two DPSs have been identified by NMFS: the eastern DPS includes sea lions born on rookeries from California north through Southeast Alaska; the western DPS includes animals born on rookeries from Prince William Sound westward (Bickham et al. 1996, Loughlin 1997). No rookeries (terrestrial areas used for breeding) have been identified in the project area, but Steller sea lions reside year-round along the outer coast of Washington and Oregon, including beneath coastal portions of Routes 1 and 2. The closest critical habitat to the project area includes three rookery sites located at Rogue Reef and Orford Reef along the southern Oregon coast. Although the worldwide population of Steller sea lions decreased by approximately 80 percent between 1950 and 1980, the eastern DPS has been increasing by more than 3 percent per year since the 1970s.

Steller sea lions are associated with a variety of terrestrial and marine habitats. Exposed rocky shorelines and wave-cut platforms are preferred habitats for rookeries and haulouts (terrestrial areas used for purposes other than breeding; Ban 2005, Call and Loughlin 2005). Gravel beaches may also be used as rookeries and haulouts. In the marine environment, sea lions are typically found near shore, although they occasionally travel out to the edge of the continental shelf and beyond.

Steller sea lions are generalist predators that eat a variety of fishes and cephalopods (Pitcher 1981, Calkins and Goodwin 1988, NMFS 2000, Sinclair and Zeppelin 2002), and occasionally other marine mammals and birds (Gentry and Johnson 1981, Pitcher and Fay 1982, Calkins 1988, Daniel and Schneeweis 1992).

Female Steller sea lions begin breeding between 3 and 6 years of age, and may produce young into their early 20s (Mathisen et al. 1962, Pitcher and Calkins 1981). Males reach sexual maturity before age seven, but usually cannot establish and defend a territory until 8 years or older. Females give birth to a single pup between May and July, then breed again approximately 11 days after giving birth. Offspring are typically weaned at approximately 1 year old, although some continue suckling for an additional year. Washington has no known rookeries, but Oregon has two rookeries south of the project area, at Rogue Reef and Orford Reef in southern Oregon.

The Steller sea lion was listed as threatened on April 5, 1990, due to population declines in the western portion of its range (NMFS 1990). It is also listed as depleted under the Marine Mammal Protection Act. Critical habitat was designated in 1993, including areas around known rookeries and haulouts and three marine foraging areas in southern Alaska and the Orford and Rogue reefs along southern Oregon (NMFS 1993b). In 1997, the species was split into two DPSs, and the western DPS was listed as endangered, while the eastern DPS (which occurs in the project area) remained threatened (NMFS 1997b). Threats to Steller sea lions include intentional killing, incidental takes in commercial fishing, reduced prey availability due to fisheries, pollution, and entanglement in marine debris.

4.22.2 Analysis of Direct and Indirect Effects

Helicopters conducting refueling operations along proposed Routes 1 and 2 would pass over the Pacific Ocean adjacent to Washington and the northern tip of Oregon, where Steller sea lions occur. Aircraft disturbances can potentially affect the behavior of Steller sea lions, and close approaches of aircraft have been observed to cause hauled out sea lions to enter the water or move to other haulout sites (Kucey 2005). Based on a review of literature in Department of the Navy (2010), the response of sea lions and related marine mammals to aircraft is variable, ranging from no reaction to abandonment of newborn pups in response to helicopter flyovers of less than 393 feet (120 meters). It is likely that the response of sea lions to disturbances by aircraft would vary depending on the season and the animals' stage in the reproductive cycle (Kucey and Trites 2006). According to NMFS, a minimum flight altitude of 1,000 feet (305 meters) above sea lion haulouts would minimize disturbance to Steller sea lions (Molenaar 2011). The Olympic Coast National Marine Sanctuary (OCNMS), located within the project area beneath proposed Route 1 and north of proposed Route 2, prohibits flying motorized aircraft less than 2,000 feet (610 meters) above the Sanctuary, within 1 nm. This prohibition is intended to minimize disturbance to Steller sea lions and other wildlife. The minimum flight altitude of proposed Routes 1 and 2 are 2,500 feet and 2,300 feet (762 meters and 701 meters) MSL, respectively. At these altitudes, disturbance to Steller sea lions would be minimized beneath both routes. It is possible that aircraft traveling between JBLM and the proposed refueling routes would pass over coastal habitats utilized by Steller sea lions. During travel to/from proposed routes, aircraft would fly a minimum of 500 feet (152 meters) AGL, but would follow FAA recommendations to maintain a minimum altitude of 2,000 feet AGL when flying over National Wildlife Refuges and other noise sensitive areas. SOAR pilots would also comply with OCNMS regulations when traveling between JBLM and the proposed refueling routes. Some disturbance of Steller sea

lions present outside of these sensitive areas could potentially occur, but would be minimal in terms of frequency of occurrence and duration.

In the event of an in-air mishap during refueling activities, a limited amount of fuel could be released from the refueling hose. An estimated maximum of 16 to 25 gallons (61 to 95 liters) of fuel could potentially reach the ground/water surface, spread out over an area of many acres (see Section 4.1.2). At these quantities, it is expected that any impacts to Steller sea lions and their habitat would be minimal. Additionally, the risk of such an occurrence is very low.

4.22.3 Interrelated and Interdependent Effects

The publication of the proposed routes would make them available for use by other military units. Use of Routes 1 and 2 by additional aircraft could result in increased disturbance to Steller sea lions, and an increased risk of fuel spills.

4.22.4 Cumulative Effects

The proposed project would potentially contribute to disturbance of Steller sea lions along the Oregon and Washington coasts, and noise from helicopters would be additive to noise from other aircraft, vessels, and other sources. Any fuel released during refueling activities, though very unlikely to occur, would be additive to toxic substances that are present in Steller sea lion habitats from other sources. Other activities in the project area with the potential to impact Steller sea lions include coastal use of boats and other vessels, which can physically harm sea lions, as well as disturb them, and fishing activities

4.22.5 Conservation Measures

The following conservation measures would be followed to avoid effects to Steller sea lions in the project area.

- Where feasible, SOAR pilots would follow guidance in FAA Advisory Circular 91-36D, which recommends that pilots maintain a minimum altitude of 2,000 feet (610 meters) AGL when flying over noise sensitive areas, such as National Parks, National Wildlife Refuges, Wilderness Areas, and other areas where a quiet setting is a generally recognized feature or attribute of the land.
- To prevent damage to the refueling hose during fuel transfer, and other accidents, the 160th SOAR would follow procedures discussed in Section 4.1.5.

SOAR pilots would also follow OCNMS regulations, which prohibit flying motorized aircraft at less than 2,000 feet (610 meters) above the sanctuary.

4.22.6 Determination of Effects

Steller sea lions are likely to occur within the project area, but given that proposed training activities occur at 1,000 feet or higher AGL and more than 2,000 feet (610 meters) MSL, they should not be disturbed by aircraft. Fuel spills during refueling are possible but unlikely. Therefore, the proposed action **may affect, is not likely to adversely affect** Steller sea lions.

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Appendix A

U.S. Fish and Wildlife Service and National Marine Fisheries Service Species Lists

LISTED AND PROPOSED ENDANGERED AND THREATENED SPECIES AND CRITICAL HABITAT; CANDIDATE SPECIES; AND SPECIES OF CONCERN IN **CLALLAM COUNTY** AS PREPARED BY THE U.S. FISH AND WILDLIFE SERVICE WASHINGTON FISH AND WILDLIFE OFFICE

(Revised August 26, 2010)

LISTED

Bull trout *(Salvelinus confluentus)* – Coastal-Puget Sound DPS
Marbled murrelet *(Brachyramphus marmoratus)*
Northern spotted owl *(Strix occidentalis caurina)*
Short-tailed albatross *(Phoebastria albatrus)* [outer coast]

Major concerns that should be addressed in your Biological Assessment of project impacts to listed animal species include:

1. Level of use of the project area by listed species.

2. Effect of the project on listed species' primary food stocks, prey species, and foraging in all areas influenced by the project.

3. Impacts from project activities and implementation (e.g., increased noise levels, increased human activity and/or access, loss or degradation of habitat) that may result in disturbance to listed species and/or their avoidance of the project area.

DESIGNATED

Critical habitat for bull trout
Critical habitat for the marbled murrelet
Critical habitat for the northern spotted owl

PROPOSED

Dolly Varden *(Salvelinus malma)* similarity of appearance
Revised critical habitat for bull trout

CANDIDATE

Fisher *(Martes pennanti)* – West Coast DPS
(Olympic) Mazama pocket gopher *(Thomomys mazama ssp. melanops)*
Taylor's checkerspot *(Euphydryas editha taylori)*

SPECIES OF CONCERN

Bald eagle *(Haliaeetus leucocephalus)*

Brown pelican *(Pelecanus occidentalis)* [outer coast]
Cascades frog *(Rana cascadae)*
Cassin's auklet *(Ptychoramphus aleuticus)*
Long-eared myotis *(Myotis evotis)*
Long-legged myotis *(Myotis volans)*
Makah's copper *(Lycaena mariposa charlottensis)*
Northern goshawk *(Accipiter gentilis)*
Northern sea otter *(Enhydra lutris kenyoni)*
Olive-sided flycatcher *(Contopus cooperi)*
Oregon vesper sparrow *(Pooecetes gramineus affinis)*
Pacific lamprey *(Lampetra tridentata)*
Pacific Townsend's big-eared bat *(Corynorhinus townsendii townsendii)*
Peregrine falcon *(Falco peregrinus)*
Olympic torrent salamander *(Rhyacotriton olympicus)*
River lamprey *(Lampetra ayresi)*
Tailed frog *(Ascaphus truei)*
Tufted puffin *(Fratercula cirrhata)*
Valley silverspot *(Speyeria zerene bremeri)*
Van Dyke's salamander *(Plethodon vandykei)*
Western toad *(Bufo boreas)*
Astragalus australis var. *olympicus* (Cotton's milk vetch)
Cimicifuga elata (tall bugbane)

LISTED AND PROPOSED ENDANGERED AND THREATENED SPECIES AND CRITICAL HABITAT; CANDIDATE SPECIES; AND SPECIES OF CONCERN IN CLARK COUNTY AS PREPARED BY THE U.S. FISH AND WILDLIFE SERVICE WASHINGTON FISH AND WILDLIFE OFFICE

(Revised December 15, 2010)

LISTED

Bull trout *(Salvelinus confluentus)* – Coastal-Puget Sound DPS
Gray wolf *(Canis lupus)*
Northern spotted owl *(Strix occidentalis caurina)*

Major concerns that should be addressed in your Biological Assessment of project impacts to listed animal species include:

1. Level of use of the project area by listed species.

2. Effect of the project on listed species' primary food stocks, prey species, and foraging areas in all areas influenced by the project.

3. Impacts from project activities and implementation (e.g., increased noise levels, increased human activity and/or access, loss or degradation of habitat) that may result in disturbance to listed species and/or their avoidance of the project area.

Castilleja levisecta (golden paintbrush) [historic]
Howellia aquatilis (water howellia)
Lomatium bradshawii (Bradshaw's lomatium)

Major concerns that should be addressed in your Biological Assessment of project impacts to listed plant species include:

1. Distribution of taxon in project vicinity.

2. Disturbance (trampling, uprooting, collecting, etc.) of individual plants and loss of habitat.

3. Changes in hydrology where taxon is found.

DESIGNATED

Critical habitat for bull trout

PROPOSED

Revised critical habitat for bull trout

CANDIDATE

(Brush Prairie) Mazama pocket gopher *(Thomomys mazama* ssp. *oregonus)*
North American wolverine *(Gulo gulo luteus)* – contiguous U.S. DPS
Oregon spotted frog *(Rana pretiosa)* [historic]

SPECIES OF CONCERN

Aleutian Canada goose (Branta canadensis leucopareia)
Bald eagle *(Haliaeetus leucocephalus)*
Cascades frog *(Rana cascadae)*
Coastal cutthroat trout *(Oncorhynchus clarki clarki)* [southwest Washington DPS]
Larch Mountain salamander *(Plethodon larselli)*
Long-eared myotis *(Myotis evotis)*
Long-legged myotis *(Myotis volans)*
Northern goshawk *(Accipiter gentilis)*
Northwestern pond turtle *(Emys (= Clemmys) marmorata marmorata)*
Olive-sided flycatcher *(Contopus cooperi)*
Pacific lamprey *(Lampetra tridentata)*
Pacific Townsend's big-eared bat *(Corynorhinus townsendii townsendii)*
Peregrine falcon *(Falco peregrinus)*
River lamprey *(Lampetra ayresi)*
Slender-billed white-breasted nuthatch *(Sitta carolinensis aculeata)*
Tailed frog *(Ascaphus truei)*
Van Dyke's salamander *(Plethodon vandykei)*
Western gray squirrel *(Sciurus griseus griseus)*
Western toad *(Bufo boreas)*
Cimicifuga elata (tall bugbane)
Corydalis aquae-gelidae (Clackamas corydalis)
Lathyrus torreyi (Torrey's peavine) [historic]

LISTED AND PROPOSED ENDANGERED AND THREATENED SPECIES AND CRITICAL HABITAT; CANDIDATE SPECIES; AND SPECIES OF CONCERN
IN COWLITZ COUNTY
AS PREPARED BY
THE U.S. FISH AND WILDLIFE SERVICE
WASHINGTON FISH AND WILDLIFE OFFICE

(Revised December 15, 2010)

LISTED

Bull trout *(Salvelinus confluentus)* – Coastal-Puget Sound DPS
Columbian white-tailed deer *(Odocoileus virginianus leucurus)*
Marbled murrelet *(Brachyramphus marmoratus)*
Northern spotted owl *(Strix occidentalis caurina)*

Major concerns that should be addressed in your Biological Assessment of project impacts to listed animal species include:

1. Level of use of the project area by listed species.

2. Effect of the project on listed species' primary food stocks, prey species, and foraging areas in all areas influenced by the project.

3. Impacts from project activities and implementation (e.g., increased noise levels, increased human activity and/or access, loss or degradation of habitat) that may result in disturbance to listed species and/or their avoidance of the project area.

Sidalcea nelsoniana (Nelson's checker-mallow)

Major concerns that should be addressed in your Biological Assessment of project impacts to listed plant species include:

1. Distribution of taxon in project vicinity.

2. Disturbance (trampling, uprooting, collecting, etc.) of individual plants and loss of habitat.

3. Changes in hydrology where taxon is found.

DESIGNATED

Critical habitat for bull trout
Critical habitat for the marbled murrelet

PROPOSED

Revised critical habitat for bull trout

CANDIDATE

North American wolverine *(Gulo gulo luteus)* – contiguous U.S. DPS

SPECIES OF CONCERN

Bald eagle *(Haliaeetus leucocephalus)*
Cascades frog *(Rana cascadae)*
Coastal cutthroat trout *(Oncorhynchus clarki clarki)*
Columbia torrent salamander *(Rhyacotriton kezeri)*
Larch Mountain salamander *(Plethodon larselli)*
Long-eared myotis *(Myotis evotis)*
Long-legged myotis *(Myotis volans)*
Northern goshawk *(Accipiter gentilis)*
Northwestern pond turtle *(Emys (= Clemmys) marmorata marmorata)*
Olive-sided flycatcher *(Contopus cooperi)*
Pacific lamprey *(Lampetra tridentata)*
Pacific Townsend's big-eared bat *(Corynorhinus townsendii townsendii)*
Peregrine falcon *(Falco peregrinus)*
River lamprey *(Lampetra ayresi)*
Tailed frog *(Ascaphus truei)*
Valley silverspot (butterfly) *(Speyeria zerene bremeri)*
Van Dyke's salamander (*Plethodon vandykei*)
Western toad *(Bufo boreas)*
Cimicifuga elata (tall bugbane)

LISTED AND PROPOSED ENDANGERED AND THREATENED SPECIES AND CRITICAL HABITAT; CANDIDATE SPECIES; AND SPECIES OF CONCERN IN GRAYS HARBOR COUNTY AS PREPARED BY THE U.S. FISH AND WILDLIFE SERVICE WASHINGTON FISH AND WILDLIFE OFFICE

(Revised August 26, 2010)

LISTED

Bull trout *(Salvelinus confluentus)* – Coastal-Puget Sound DPS
Marbled murrelet *(Brachyramphus marmoratus)*
Northern spotted owl *(Strix occidentalis caurina)*
Oregon silverspot butterfly *(Speyeria zerene hippolyta)*
Short-tailed albatross *(Phoebastria albatrus)* [outer coast]
Western snowy plover *(Charadrius alexandrinus nivosus)*

Major concerns that should be addressed in your Biological Assessment of project impacts to listed animal species include:

1. Level of use of the project area by listed species.

2. Effect of the project on listed species' primary food stocks, prey species, and foraging areas in all areas influenced by the project.

3. Impacts from project activities and implementation (e.g., increased noise levels, increased human activity and/or access, loss or degradation of habitat) that may result in disturbance to listed species and/or their avoidance of the project area.

DESIGNATED

Critical habitat for bull trout
Critical habitat for the marbled murrelet
Critical habitat for the northern spotted owl
Critical habitat for the western snowy plover

PROPOSED

Revised critical habitat for bull trout

CANDIDATE

Fisher *(Martes pennanti)* – West Coast DPS
Streaked horned lark *(Eremophila alpestris strigata)*
Yellow-billed cuckoo *(Coccyzus americanus)*

SPECIES OF CONCERN

Aleutian Canada goose *(Branta canadensis leucopareia)*
Bald eagle *(Haliaeetus leucocephalus)*
Brown pelican *(Pelecanus occidentalis)* [outer coast]
Cascades frog *(Rana cascadae)*
Coastal cutthroat trout *(Oncorhynchus clarki clarki)* [southwest Washington DPS]
Columbia torrent salamander *(Rhyacotriton kezeri)*
Long-eared myotis *(Myotis evotis)*
Long-legged myotis *(Myotis volans)*
Makah's copper (butterfly) *(Lycaena mariposa charlottensis)*
Newcomb's littorine snail *(Algamorda newcombiana)*
Northern goshawk *(Accipiter gentilis)*
Northern sea otter *(Enhydra lutris kenyoni)*
Olive-sided flycatcher *(Contopus cooperi)*
Olympic torrent salamander *(Rhyacotriton olympicus)*
Pacific lamprey *(Lampetra tridentata)*
Pacific Townsend's big-eared bat *(Corynorhinus townsendii townsendii)*
Peregrine falcon *(Falco peregrinus)*
River lamprey *(Lampetra ayresi)*
Tailed frog *(Ascaphus truei)*
Tufted puffin *(Fratercula cirrhata)*
Van Dyke's salamander *(Plethodon vandykei)*
Western gray squirrel *(Sciurus griseus griseus)*
Western toad *(Bufo boreas)*
Aster curtus (white-top aster)
Cimicifuga elata (tall bugbane)
Dodecatheon austrofrigidum (frigid shootingstar)
Sanicula arctopoides (footsteps of spring; bear's-foot sanicle)

LISTED AND PROPOSED ENDANGERED AND THREATENED SPECIES AND CRITICAL HABITAT; CANDIDATE SPECIES; AND SPECIES OF CONCERN IN JEFFERSON COUNTY AS PREPARED BY THE U.S. FISH AND WILDLIFE SERVICE WASHINGTON FISH AND WILDLIFE OFFICE

(Revised August 26, 2010)

LISTED

Bull trout *(Salvelinus confluentus)* – Coastal-Puget Sound DPS
Marbled murrelet *(Brachyramphus marmoratus)*
Northern spotted owl *(Strix occidentalis caurina)*
Short-tailed albatross *(Phoebastria albatrus)* [outer coast]

Major concerns that should be addressed in your Biological Assessment of project impacts to listed animal species include:

1. Level of use of the project area by listed species.

2. Effect of the project on listed species' primary food stocks, prey species, and foraging areas in all areas influenced by the project.

3. Impacts from project activities and implementation (e.g., increased noise levels, increased human activity and/or access, loss or degradation of habitat) that may result in disturbance to listed species and/or their avoidance of the project area.

DESIGNATED

Critical habitat for bull trout
Critical habitat for the marbled murrelet
Critical habitat for the northern spotted owl

PROPOSED

Dolly Varden *(Salvelinus malma)* due to similarity of appearance
Revised critical habitat for bull trout

CANDIDATE

Fisher *(Martes pennanti)* – West Coast DPS

SPECIES OF CONCERN

Aleutian Canada goose *(Branta canadensis leucopareia)*
Bald eagle *(Haliaeetus leucocephalus)*
Brown pelican *(Pelecanus occidentalis)* [outer coast]

Cascades frog *(Rana cascadae)*
Cassin's auklet *(Ptychoramphus aleuticus)*
Coastal cutthroat trout *(Oncorhynchus clarki clarki)* [southwest Washington DPS]
Destruction Island shrew *(Sorex trowbridgii destructioni)*
Long-eared myotis *(Myotis evotis)*
Long-legged myotis *(Myotis volans)*
Northern goshawk *(Accipiter gentilis)*
Northern sea otter *(Enhydra lutris kenyoni)*
Olive-sided flycatcher *(Contopus cooperi)*
Olympic torrent salamander *(Rhyacotriton olympicus)*
Pacific lamprey *(Lampetra tridentata)*
Pacific Townsend's big-eared bat *(Corynorhinus townsendii townsendii)*
Peregrine falcon *(Falco peregrinus)*
River lamprey *(Lampetra ayresi)*
Tailed frog *(Ascaphus truei)*
Tufted puffin *(Fratercula cirrhata)*
Valley silverspot *(Speyeria zerene bremeri)*
Van Dyke's salamander *(Plethodon vandykei)*
Western toad *(Bufo boreas)*

LISTED AND PROPOSED ENDANGERED AND THREATENED SPECIES AND CRITICAL HABITAT; CANDIDATE SPECIES; AND SPECIES OF CONCERN
IN KLICKITAT COUNTY
AS PREPARED BY
THE U.S. FISH AND WILDLIFE SERVICE
CENTRAL WASHINGTON FIELD OFFICE

(Revised December 15, 2010)

LISTED

Bull trout *(Salvelinus confluentus)* – Columbia River DPS
Gray wolf *(Canis lupus)*
Northern spotted owl *(Strix occidentalis caurina)*

Major concerns that should be addressed in your Biological Assessment of project impacts to listed animal species include:

1. Level of use of the project area by listed species.
2. Effect of the project on listed species' primary food stocks, prey species, and foraging areas in all areas influenced by the project.
3. Impacts from project activities and implementation (e.g., increased noise levels, increased human activity and/or access, loss or degradation of habitat) that may result in disturbance to listed species and/or their avoidance of the project area.

Spiranthes diluvialis (Ute ladies'-tresses)

Major concerns that should be addressed in your Biological Assessment of project impacts to listed plant species include:

1. Distribution of taxon in the project vicinity.
2. Disturbance (trampling, uprooting, collecting, etc.) of individual plants and loss of habitat.
3. Changes in hydrology where taxon is found.

DESIGNATED

Critical habitat for the bull trout

PROPOSED

Revised critical habitat for the bull trout

CANDIDATE

Fisher *(Martes pennanti)* - West Coast DPS
Mardon skipper *(Polites mardon)*
North American wolverine *(Gulo gulo luteus)* – contiguous U.S. DPS
Oregon spotted frog *(Rana pretiosa)*
Yellow-billed cuckoo *(Coccyzus americanus)*
Artemisia campestris ssp. *borealis* var. *wormskioldii* (northern wormwood)

SPECIES OF CONCERN

Bald eagle *(Haliaeetus leucocephalus)*
Burrowing owl *(Athene cunicularia)*
California floater *(Anodonta californiensis)*
Ferruginous hawk *(Buteo regalis)*
Giant Columbia spire snail *(Fluminicola columbiana)*
Larch Mountain salamander *(Plethodon larselli)*
Loggerhead shrike *(Lanius ludovicianus)*
Long-eared myotis *(Myotis evotis)*
Northern goshawk *(Accipiter gentilis)*
Olive-sided flycatcher *(Contopus cooperi)*
Pacific lamprey *(Lampetra tridentata)*
Pacific Townsend's big-eared bat *(Corynorhinus townsendii townsendii)*
Pallid Townsend's big-eared bat *(Corynorhinus townsendii pallescens)*
Peregrine falcon (*Falco peregrinus*)
Redband trout *(Onchrhynchus mykiss)*
River lamprey *(Lampetra ayresi)*
Sagebrush lizard *(Sceloporus graciosus)*
Sharptail snake *(Contia tenius)*
Townsend’s ground squirrel *(Spermophilis townsendii)*
Western brook lamprey *(Lampetra richardsoni)*
Western gray squirrel *(Sciurus griseus griseus)*
Western pond turtle *(Clemmys marmorata)*
Westslope cutthroat trout *(Oncorhynchus clarki lewisi)*
Astragalus pulsiferae var. *suksdorfii* (Ames’ milk-vetch)
Calochortus longebarbatus var. *longebarbatus* (long-bearded sego lily)
Cypripedium fasciculatum (clustered lady’s-slipper)
Lomatium suksdorfii (Suksdorf’s desert-parsley)
Meconella oregana (white meconella)
Mimulus jungermannioides (liverwort monkey-flower)
Penstemon barrettiae (Barrett’s beardtongue)
Pinus albicaulis (whitebark pine)
Ranunculus reconditus (obscure buttercup)
Rorippa columbiae (persistent sepal yellowcress)
Sisyrinchium sarmentosum (pale blue-eyed grass)
Texosporium sancti-jacobi (woven spore lichen)

LISTED AND PROPOSED ENDANGERED AND THREATENED SPECIES AND CRITICAL HABITAT; CANDIDATE SPECIES; AND SPECIES OF CONCERN IN LEWIS COUNTY AS PREPARED BY THE U.S. FISH AND WILDLIFE SERVICE WASHINGTON FISH AND WILDLIFE OFFICE

(Revised December 15, 2010)

LISTED

Canada lynx (*Lynx canadensis*)
Gray wolf (*Canis lupus*)
Grizzly bear (*Ursus arctos = U. a. horribilis*)
Marbled murrelet (*Brachyramphus marmoratus*)
Northern spotted owl (*Strix occidentalis caurina*)

Major concerns that should be addressed in your Biological Assessment of project impacts to listed species include:

1. Level of use of the project area by listed species.

2. Effect of the project on listed species' primary food stocks, prey species, and foraging areas in all areas influenced by the project.

3. Impacts from project activities and implementation (e.g., increased noise levels, increased human activity and/or access, loss or degradation of habitat) that may result in disturbance to listed species and/or their avoidance of the project area.

Lupinus sulphureus ssp. *kincaidii* (Kincaid’s lupine)
Sidalcea nelsoniana (Nelson's checker-mallow)

Major concerns that should be addressed in your Biological Assessment of project impacts to listed plant species include:

1. Distribution of taxon in project vicinity.

2. Disturbance (trampling, uprooting, collecting, etc.) of individual plants and loss of habitat.

3. Changes in hydrology where taxon is found.

DESIGNATED

Critical habitat for the marbled murrelet
Critical habitat for the northern spotted owl
Critical habitat for *Lupinus sulphureus* ssp. *kincaidii* (Kincaid's lupine)

PROPOSED

None

CANDIDATE

Fisher *(Martes pennanti)* – West Coast DPS
North American wolverine *(Gulo gulo luteus)* – contiguous U.S. DPS

SPECIES OF CONCERN

Bald eagle (*Haliaeetus leucocephalus*)
Cascades frog (*Rana cascadae*)
Coastal cutthroat trout (*Oncorhynchus clarki clarki*) [southwest Washington DPS]
Columbia torrent salamander (*Rhyacotriton kezeri*)
Larch Mountain salamander (*Plethodon larselli*)
Long-eared myotis (*Myotis evotis*)
Long-legged myotis (*Myotis volans*)
Northern goshawk (*Accipiter gentilis*)
Northwestern pond turtle (*Emys* (= *Clemmys*) *marmorata marmorata*)
Olive-sided flycatcher (*Contopus cooperi*)
Oregon vesper sparrow (*Pooecetes graminus affinis*)
Pacific lamprey (*Lampetra tridentata*)
Pacific Townsend's big-eared bat (*Corynorhinus townsendii townsendii*)
Peregrine falcon (*Falco peregrinus*)
River lamprey (*Lampetra ayresi*)
Tailed frog (*Ascaphus truei*)
Valley silverspot (*Speyeria zerene bremeri*)
Van Dyke's salamander (*Plethodon vandykei*)
Western gray squirrel (*Sciurus griseus griseus*)
Western toad (*Bufo boreas*)
Cimicifuga elata (tall bugbane)
Delphinium leucophaeum (pale larkspur)
Meconella oregana (white meconella)

LISTED AND PROPOSED ENDANGERED AND THREATENED SPECIES AND CRITICAL HABITAT; CANDIDATE SPECIES; AND SPECIES OF CONCERN IN MASON COUNTY AS PREPARED BY THE U.S. FISH AND WILDLIFE SERVICE WASHINGTON FISH AND WILDLIFE OFFICE

(Revised August 26, 2010)

LISTED

Bull trout (*Salvelinus confluentus*) – Coastal-Puget Sound DPS
Marbled murrelet (*Brachyramphus marmoratus*)
Northern spotted owl (*Strix occidentalis caurina*)

Major concerns that should be addressed in your Biological Assessment of project impacts to listed species include:

1. Level of use of the project area by listed species.

2. Effect of the project on listed species' primary food stocks, prey species, and foraging areas in all areas influenced by the project.

3. Impacts from project activities and implementation (e.g., increased noise levels, increased human activity and/or access, loss or degradation of habitat) that may result in disturbance to listed species and/or their avoidance of the project area.

DESIGNATED

Critical habitat for bull trout
Critical habitat for the marbled murrelet
Critical habitat for the northern spotted owl

PROPOSED

Revised critical habitat for bull trout

CANDIDATE

Fisher *(Martes pennanti)* – West Coast DPS
(Shelton) Mazama pocket gopher (*Thomomys mazama* ssp. *couchi*)
Streaked horned lark (*Eremophila alpestris strigata*)

SPECIES OF CONCERN

Bald eagle (*Haliaeetus leucocephalus*)
Cascades frog (*Rana cascadae*)
Coastal cutthroat trout (*Oncorhynchus clarki clarki*) [southwest Washington DPS]
Long-eared myotis (*Myotis evotis*)
Long-legged myotis (*Myotis volans*)
Northern goshawk (*Accipiter gentilis*)
Northern sea otter (*Enhydra lutris kenyoni*)
Olive-sided flycatcher (*Contopus cooperi*)
Olympic torrent salamander (*Rhyacotriton olympicus*)
Pacific lamprey (*Lampetra tridentata*)
Pacific Townsend’s big-eared bat (*Corynorhinus townsendii townsendii*)
Peregrine falcon (*Falco peregrinus*)
River lamprey (*Lampetra ayresi*)
Tailed frog (*Ascaphus truei*)
Van Dyke's salamander (*Plethodon vandykei*)
Western toad (*Bufo boreas*)
Botrychium ascendens (triangular-lobed moonwort)

LISTED AND PROPOSED ENDANGERED AND THREATENED SPECIES AND CRITICAL HABITAT; CANDIDATE SPECIES; AND SPECIES OF CONCERN IN PACIFIC COUNTY AS PREPARED BY THE U.S. FISH AND WILDLIFE SERVICE WASHINGTON FISH AND WILDLIFE OFFICE

(Revised August 26, 2010)

LISTED

Bull trout (*Salvelinus confluentus*) – Coastal-Puget Sound DPS
Marbled murrelet (*Brachyramphus marmoratus*)
Northern spotted owl (*Strix occidentalis caurina*)
Oregon silverspot butterfly (*Speyeria zerene hippolyta*)
Short-tailed albatross (*Phoebastria albatrus*) [outer coast]
Western snowy plover (*Charadrius alexandrinus nivosus*)

Major concerns that should be addressed in your Biological Assessment of project impacts to listed species include:

1. Level of use of the project area by listed species.

2. Effect of the project on listed species' primary food stocks, prey species, and foraging areas in all areas influenced by the project.

3. Impacts from project activities and implementation (e.g., increased noise levels, increased human activity and/or access, loss or degradation of habitat) that may result in disturbance to listed species and/or their avoidance of the project area.

DESIGNATED

Critical habitat for the marbled murrelet
Critical habitat for the western snowy plover

PROPOSED

None

CANDIDATE

Streaked horned lark (*Eremophila alpestris strigata*)

SPECIES OF CONCERN

Bald eagle (*Haliaeetus leucocephalus*)
Brown pelican (*Pelecanus occidentalis*) [outer coast]
Coastal cutthroat trout (*Oncorhynchus clarki clarki*) [southwest Washington DPS]
Columbia torrent salamander (*Rhyacotriton kezeri*)
Long-eared myotis (*Myotis evotis*)
Long-legged myotis (*Myotis volans*)
Makah's copper (butterfly) (*Lycaena mariposa charlottensis*) [historic]
Newcomb's littorine snail (*Algamorda newcombiana*)
Northern goshawk (*Accipiter gentilis*)
Northern sea otter (*Enhydra lutris kenyoni*)
Olive-sided flycatcher (*Contopus cooperi*)
Pacific lamprey (*Lampetra tridentata*)
Pacific Townsend's big-eared bat (*Corynorhinus townsendii townsendii*)
Peregrine falcon (*Falco peregrinus*)
River lamprey (*Lampetra ayresi*)
Tailed frog (*Ascaphus truei*)
Van Dyke's salamander (*Plethodon vandykei*)
Western toad (*Bufo boreas*)
Abronia umbellata ssp. *acutalata* (pink sandverbena)
Dodecatheon austrofrigidum (frigid shootingstar)
Filipendula occidentalis (queen of the forest)
Sanicula arctopoides (footsteps of spring; bear's-foot sanicle)

LISTED AND PROPOSED ENDANGERED AND THREATENED SPECIES AND CRITICAL HABITAT; CANDIDATE SPECIES; AND SPECIES OF CONCERN IN PIERCE COUNTY AS PREPARED BY THE U.S. FISH AND WILDLIFE SERVICE WASHINGTON FISH AND WILDLIFE OFFICE

(Revised December 15, 2010)

LISTED

Bull trout (*Salvelinus confluentus*) – Coastal-Puget Sound DPS
Canada lynx (*Lynx canadensis*)
Gray wolf (*Canis lupus*)
Grizzly bear (*Ursus arctos* = *U. a. horribilis*)
Marbled murrelet (*Brachyramphus marmoratus*)
Northern spotted owl (*Strix occidentalis caurina*)

Major concerns that should be addressed in your Biological Assessment of project impacts to listed species include:

1. Level of use of the project area by listed species.

2. Effect of the project on listed species' primary food stocks, prey species, and foraging areas in all areas influenced by the project.

3. Impacts from project activities and implementation (e.g., increased noise levels, increased human activity and/or access, loss or degradation of habitat) that may result in disturbance to listed species and/or their avoidance of the project area.

Arenaria paludicola (marsh sandwort) [historic]
Castilleja levisecta (golden paintbrush) [historic]
Howellia aquatilis (water howellia)

Major concerns that should be addressed in your Biological Assessment of project impacts to listed plant species include:

1. Distribution of taxon in project vicinity.

2. Disturbance (trampling, uprooting, collecting, etc.) of individual plants and loss of habitat.

3. Changes in hydrology where taxon is found.

DESIGNATED

Critical habitat for bull trout
Critical habitat for the marbled murrelet
Critical habitat for the northern spotted owl

PROPOSED

Revised critical habitat for bull trout

CANDIDATE

Fisher *(Martes pennanti)* – West Coast DPS
Mardon skipper (*Polites mardon*)
(Roy Prairie and Tacoma) Mazama pocket gopher (*Thomomys mazama* ssp. *glacialis* and *tacomensis* [historic])
North American wolverine *(Gulo gulo luteus)* – contiguous U.S. DPS
Oregon spotted frog (*Rana pretiosa*)
Streaked horned lark (*Eremophila alpestris strigata*)
Taylor's checkerspot (*Euphydryas editha taylori*)
Yellow-billed cuckoo (*Coccyzus americanus*)

SPECIES OF CONCERN

Bald eagle (*Haliaeetus leucocephalus*)
Cascades frog (*Rana cascadae*)
Fender's soliperlan stonefly (*Soliperla fenderi*)
Larch Mountain salamander (*Plethodon larselli*)
Long-eared myotis (*Myotis evotis*)
Long-legged myotis (*Myotis volans*)
Northern goshawk (*Accipiter gentilis*)
Northern sea otter (*Enhydra lutris kenyoni*)
Northwestern pond turtle (*Emys* (= *Clemmys*) *marmorata marmorata*)
Olive-sided flycatcher (*Contopus cooperi*)
Oregon vesper sparrow (*Pooectetes gramineus affinis*)
Pacific lamprey (*Lampetra tridentata*)
Pacific Townsend's big-eared bat (*Corynorhinus townsendii townsendii*)
Peregrine falcon (*Falco peregrinus*)
River lamprey (*Lampetra ayresi*)
Slender-billed white-breasted nuthatch (*Sitta carolinensis aculeata*)
Tailed frog (*Ascaphus truei*)

Valley silverspot butterfly (*Speyeria zerene bremeri*)
Western gray squirrel (*Scirius griseus griseus*)
Van Dyke’s salamander (*Plethodon vandykei*)
Aster curtus (white-top aster)
Botrychium ascendens (triangular-lobed moonwort)
Castilleja cryptantha (obscure paintbrush)
Cimicifuga elata (tall bugbane)
Cypripedium fasiculatum (clustered lady’s slipper)
Lathyrus torreyi (Torrey's peavine)

LISTED AND PROPOSED ENDANGERED AND THREATENED SPECIES AND CRITICAL HABITAT; CANDIDATE SPECIES; AND SPECIES OF CONCERN IN SKAMANIA COUNTY AS PREPARED BY THE U.S. FISH AND WILDLIFE SERVICE WASHINGTON FISH AND WILDLIFE OFFICE

(Revised December 15, 2010)

LISTED

Bull trout (*Salvelinus confluentus*) – Coastal-Puget Sound DPS
Canada lynx (*Lynx canadensis*)
Gray wolf (*Canis lupus*)
Grizzly bear (*Ursus arctos = U. a. horribilis*)
Northern spotted owl (*Strix occidentalis caurina*)

Major concerns that should be addressed in your Biological Assessment of project impacts to listed species include:

1. Level of use of the project area by listed species.

2. Effect of the project on listed species' primary food stocks, prey species, and foraging areas in all areas influenced by the project.

3. Impacts from project activities and implementation (e.g., increased noise levels, increased human activity and/or access, loss or degradation of habitat) that may result in disturbance to listed species and/or their avoidance of the project area.

DESIGNATED

Critical habitat for bull trout
Critical habitat for the northern spotted owl

PROPOSED

Revised critical habitat for bull trout

CANDIDATE

Fisher *(Martes pennanti)* – West Coast DPS
Mardon skipper (*Polites mardon*)
North American wolverine *(Gulo gulo luteus)* – contiguous U.S. DPS
Oregon spotted frog (*Rana pretiosa*)

SPECIES OF CONCERN

Bald eagle (*Haliaeetus leucocephalus*)
Cascades frog (*Rana cascadae*)
Coastal cutthroat trout (*Oncorhynchus clarki clarki*) [southwest Washington DPS]
Fender's soliperlan stonefly (*Soliperla fenderi*)
Larch Mountain salamander (*Plethodon larselli*)
Long-eared myotis (*Myotis evotis*)
Long-legged myotis (*Myotis volans*)
Northern goshawk (*Accipiter gentilis*)
Northwestern pond turtle (*Emys* (= *Clemmys*) *marmorata marmorata*)
Olive-sided flycatcher (*Contopus cooperi*)
Pacific lamprey (*Lampetra tridentata*)
Pacific Townsend's big-eared bat (*Corynorhinus townsendii townsendii*)
Peregrine falcon (*Falco peregrinus*)
River lamprey (*Lampetra ayresi*)
Tailed frog (*Ascaphus truei*)
Van Dyke's salamander (*Plethodon vandykei*)
Western gray squirrel (*Sciurus griseus griseus*)
Western toad (*Bufo boreas*)
Cimicifuga elata (tall bugbane)
Corydalis aquae-gelidae (Clackamas corydalis)
Cypripedium fasciculatum (clustered lady's slipper) [historic]
Erigeron howellii (Howell's daisy)
Erigeron oreganus (gorge daisy)
Penstemon barrettiae (Barrett's beardtongue)
Rorippa columbiae (Columbian yellowcress)
Sisyrinchium sarmentosum (pale blue-eyed grass)
Sullivantia oregana (Oregon sullivantia)

LISTED AND PROPOSED ENDANGERED AND THREATENED SPECIES AND CRITICAL HABITAT; CANDIDATE SPECIES; AND SPECIES OF CONCERN IN THURSTON COUNTY AS PREPARED BY THE U.S. FISH AND WILDLIFE SERVICE WASHINGTON FISH AND WILDLIFE OFFICE

(Revised December 15, 2010)

LISTED

Bull trout (*Salvelinus confluentus*) – Coastal-Puget Sound DPS
Marbled murrelet (*Brachyramphus marmoratus*)
Northern spotted owl (*Strix occidentalis caurina*)

Major concerns that should be addressed in your Biological Assessment of project impacts to listed species include:

1. Level of use of the project area by listed species.

2. Effect of the project on listed species' primary food stocks, prey species, and foraging areas in all areas influenced by the project.

3. Impacts from project activities and implementation (e.g., increased noise levels, increased human activity and/or access, loss or degradation of habitat) which may result in disturbance to listed species and/or their avoidance of the project area.

Castilleja levisecta (golden paintbrush)
Howellia aquatilis (water howellia)

Major concerns that should be addressed in your Biological Assessment of project impacts to listed plant species include:

1. Distribution of taxon in project vicinity.

2. Disturbance (trampling, uprooting, collecting, etc.) of individual plants and habitat loss.

3. Changes in hydrology where taxon is found.

DESIGNATED

Critical habitat for the bull trout
Critical habitat for the marbled murrelet
Critical habitat for the northern spotted owl

PROPOSED

Revised critical habitat for bull trout

CANDIDATE

Fisher *(Martes pennanti)* – West Coast DPS
Mardon skipper (*Polites mardon*)
(Olympia, Tenino, and Yelm) Mazama pocket gopher (*Thomomys mazama* ssp. *pugetensis*, *tumuli*, and *yelmensis*)
North American wolverine *(Gulo gulo luteus)* – contiguous U.S. DPS
Oregon spotted frog (*Rana pretiosa*)
Streaked horned lark (*Eremophila alpestris strigata*)
Taylor's checkerspot (*Euphydryas editha taylori*)

SPECIES OF CONCERN

Bald eagle (*Haliaeetus leucocephalus*)
Cascades frog (*Rana cascadae*)
Coastal cutthroat trout (*Oncorhynchus clarki clarki*) [southwest Washington DPS]
Long-eared myotis (*Myotis evotis*)
Long-legged myotis (*Myotis volans*)
Northern goshawk (*Accipiter gentilis*)
Northern sea otter (*Enhydra lutris kenyoni*)
Northwestern pond turtle (*Emys* (= *Clemmys*) *marmorata marmorata*)
Oregon vesper sparrow (*Pooecetes gramineus affinis*)
Olive-sided flycatcher (*Contopus cooperi*)
Pacific lamprey (*Lampetra tridentata*)
Pacific Townsend's big-eared bat *(Corynorhinus townsendii townsendii*)
River lamprey (*Lampetra ayresi*)
Slender-billed white-breasted nuthatch (*Sitta carolinensis aculeata*)
Tailed frog (*Ascaphus truei*)
Valley silverspot butterfly (*Speyeria zerene bremeri*)
Van Dyke's salamander (*Plethodon vandykei*)
Western gray squirrel (*Sciurus griseus griseus*)
Aster curtus (white-top aster)
Cimicifuga elata (tall bugbane)
Sidalcea malviflora ssp. *virgata* (rose checker-mallow)

LISTED AND PROPOSED ENDANGERED AND THREATENED SPECIES AND CRITICAL HABITAT; CANDIDATE SPECIES; AND SPECIES OF CONCERN IN WAHKIAKUM COUNTY AS PREPARED BY THE U.S. FISH AND WILDLIFE SERVICE WASHINGTON FISH AND WILDLIFE OFFICE

(Revised August 26, 2010)

LISTED

Bull trout (*Salvelinus confluentus*) – Coastal-Puget Sound DPS
Columbian white-tailed deer (*Odocoileus virginianus leucurus*)
Marbled murrelet (*Brachyramphus marmoratus*)
Northern spotted owl (*Strix occidentalis caurina*)

Major concerns that should be addressed in your Biological Assessment of project impacts to listed species include:

1. Level of use of the project area by listed species.

2. Effect of the project on listed species' primary food stocks, prey species, and foraging areas in all areas influenced by the project.

3. Impacts from project activities and implementation (e.g., increased noise levels, increased human activity and/or access, loss or degradation of habitat) that may result in disturbance to listed species and/or their avoidance of the project area.

DESIGNATED

Critical habitat for the marbled murrelet

PROPOSED

Revised critical habitat for bull trout

CANDIDATE

(Cathlamet) Mazama pocket gopher (*Thomomys mazama* ssp. *louiei*) [historic]
Streaked horned lark (*Eremophila alpestris strigata*)

SPECIES OF CONCERN

Bald eagle (*Haliaeetus leucocephalus*)
Cascades frog (*Rana cascadae*)
Coastal cutthroat trout (*Oncorhynchus clarki clarki*) [southwest Washington DPS]
Columbia torrent salamander (*Rhyacotriton kezeri*)
Long-eared myotis (*Myotis evotis*)
Long-legged myotis (*Myotis volans*)
Northern goshawk (*Accipiter gentilis*)
Olive-sided flycatcher (*Contopus borealis*)
Pacific lamprey (*Lampetra tridentata*)
Pacific Townsend's big-eared bat (*Corynorhinus townsendii townsendii*)
Peregrine falcon (*Falco peregrinus*)
River lamprey (*Lampetra ayresi*)
Tailed frog (*Ascaphus truei*)
Valley silverspot (*Speyeria zerene bremeri*)
Van Dyke's salamander (*Plethodon vandykei*)
Western toad (*Bufo boreas*)
Erigeron oreganus (gorge daisy)

LISTED AND PROPOSED ENDANGERED AND THREATENED SPECIES AND CRITICAL HABITAT; CANDIDATE SPECIES; AND SPECIES OF CONCERN
IN YAKIMA COUNTY
AS PREPARED BY
THE U.S. FISH AND WILDLIFE SERVICE
CENTRAL WASHINGTON FIELD OFFICE

(Revised December 15, 2010)

LISTED

Bull trout *(Salvelinus confluentus)* – Columbia River DPS
Gray wolf *(Canis lupus)*
Grizzly bear *(Ursus arctos horribilis)*
Marbled murrelet *(Brachyramphus marmoratus)*
Northern spotted owl *(Strix occidentalis caurina)*

Major concerns that should be addressed in your Biological Assessment of project impacts to listed animal species include:

1. Level of use of the project area by listed species.

2. Effect of the project on listed species' primary food stocks, prey species, and foraging areas in all areas influenced by the project.

3. Impacts from project activities and implementation (e.g., increased noise levels, increased human activity and/or access, loss or degradation of habitat) that may result in disturbance to listed species and/or their avoidance of the project area.

Spiranthes diluvialis (Ute ladies'-tresses)

Major concerns that should be addressed in your Biological Assessment of project impacts to listed plant species include:

1. Distribution of taxon in the project vicinity.

2. Disturbance (trampling, uprooting, collecting, etc.) of individual plants and loss of habitat.

3. Changes in hydrology where taxon is found.

DESIGNATED

Critical habitat for the bull trout
Critical habitat for the northern spotted owl

PROPOSED

Revised critical habitat for the bull trout

CANDIDATE

Fisher *(Martes pennanti)* - West Coast DPS
Greater sage grouse *(Centrocercus urophasianus)* – Columbia Basin DPS
Mardon skipper *(Polites mardon)*
North American wolverine *(Gulo gulo luteus)* – contiguous U.S. DPS
Yellow-billed cuckoo *(Coccyzus americanus)*

SPECIES OF CONCERN

Bald eagle *(Haliaeetus leucocephalus)*
Black swift *(Cypseloides niger)*
Burrowing owl *(Athene cunicularia)*
Ferruginous hawk *(Buteo regalis)*
Larch Mountain salamander *(Plethodon larselli)*
Loggerhead shrike *(Lanius ludovicianus)*
Long-eared myotis *(Myotis evotis)*
Northern goshawk *(Accipiter gentilis)*
Olive-sided flycatcher *(Contopus cooperi)*
Pacific lamprey *(Lampetra tridentata)*
Pallid Townsend's big-eared bat *(Corynorhinus townsendii pallescens)*
Peregrine falcon *(Falco peregrinus)*
Redband trout *(Oncorhynchus mykiss)*
River lamprey *(Lampetra ayresi)*
Sagebrush lizard *(Sceloporus graciosus)*
Sharptail snake *(Contia tenius)*
Townsend’s ground squirrel *(Spermophilis townsendii)*
Western brook lamprey *(Lampetra richardsoni)*
Western gray squirrel *(Sciurus griseus griseus)*
Westslope cutthroat trout *(Oncorhynchus clarki lewisi)*
Astragalus columbianus (Columbia milk-vetch)
Calochortus longebarbatus var. *longebarbatus* (long-bearded sego lily)
Castilleja cryptantha (obscure paintbrush)
Cryptantha leucophaea (gray cryptantha)
Cypripedium fasciculatum (clustered lady’s-slipper)
Erigeron basalticus (basalt daisy)
Lomatium tuberosum (Hoover’s desert-parsley)
Pinus albicaulis (whitebark pine)
Sisyrinchium sarmentosum (pale blue-eyed grass)
Tauschia hooveri (Hoover’s tauschia)

FEDERALLY LISTED, PROPOSED, CANDIDATE SPECIES
AND SPECIES OF CONCERN
UNDER THE JURISDICTION OF THE FISH AND WILDLIFE SERVICE
WHICH MAY OCCUR WITHIN BENTON COUNTY, OREGON

LISTED SPECIES

Birds

Marbled murrelet	*Brachyramphus marmoratus*	CH T
Northern spotted owl	*Strix occidentalis caurina*	CH T

Fish

Inland:

Oregon chub	*Oregonichthys crameri*	CH T

Invertebrates

Insects:

Fender's blue butterfly	*Icaricia icarioides fenderi*	CH E

Plants

Golden paintbrush	*Castilleja levisecta*	T
Willamette daisy	*Erigeron decumbens var. decumbens*	CH E
Water howellia	*Howellia aquatilis*	T
Bradshaw's desert parsley	*Lomatium bradshawii*	E
Kincaid's lupine	*Lupinus sulphureus ssp. kincaidii*	CH T
Nelson's checker-mallow	*Sidalcea nelsoniana*	T

PROPOSED SPECIES

None

No Proposed Endangered Species	PE
No Proposed Threatened Species	PT

CANDIDATE SPECIES

Birds

Streaked horned lark	*Eremophila alpestris strigata*

Invertebrates

Insects:

Taylor's checkerspot	*Euphydryas editha taylori*

SPECIES OF CONCERN

Mammals

White-footed vole	*Arborimus albipes*
Red tree vole	*Arborimus longicaudus*
Townsend's western big-eared bat	*Corynorhinus townsendii townsendii*
Silver-haired bat	*Lasionycteris noctivagans*
Long-eared myotis bat	*Myotis evotis*

Fringed myotis bat	*Myotis thysanodes*
Long-legged myotis bat	*Myotis volans*
Yuma myotis bat	*Myotis yumanensis*
Camas pocket gopher	*Thomomys bulbivorus*

Birds

Northern goshawk	*Accipiter gentilis*
Western burrowing owl	*Athene cunicularia hypugaea*
Black tern	*Chlidonias niger*
Olive-sided flycatcher	*Contopus cooperi*
Yellow-breasted chat	*Icteria virens*
Acorn woodpecker	*Melanerpes formicivorus*
Lewis' woodpecker	*Melanerpes lewis*
Mountain quail	*Oreortyx pictus*
Band-tailed pigeon	*Patagioenas fasciata*
Oregon vesper sparrow	*Pooecetes gramineus affinis*
Purple martin	*Progne subis*

Reptiles and Amphibians

Northern Pacific pond turtle	*Actinemys marmorata marmorata*
Coastal tailed frog	*Ascaphus truei*
Northern red-legged frog	*Rana aurora aurora*
Southern torrent (seep) salamander	*Rhyacotriton variegatus*

Fish

Pacific lamprey	*Lampetra tridentata*
Coastal cutthroat trout	*Oncorhynchus clarki ssp*

Invertebrates

Insects:

American acetropis grass bug	*Acetropis americana*
Siskiyou chloealtis grasshopper	*Chloaeltis aspasma*
Goeden's lepidostoman caddisfly	*Lepidostoma goedeni*
Roth's blind ground beetle	*Pterostichus rothi*
Haddock's rhyacophilan caddisfly	*Rhyacophila haddocki*

Annelid Worms:

Oregon giant earthworm	*Megascolides macelfreshi*

Plants

Peacock larkspur	*Delphinium pavonaceum*
Shaggy horkelia	*Horkelia congesta ssp. congesta*
Thin leaved peavine	*Lathyrus holochlorus*
Frye's Limbella	*Limbella fryei*
Hitchcock's blue-eyed grass	*Sisyrinchium hitchcockii*

DELISTED SPECIES

Birds

Aleutian Canada goose	*Branta canadensis leucopareia*
American Peregrine falcon	*Falco peregrinus anatum*
Bald eagle	*Haliaeetus leucocephalus*

FEDERALLY LISTED, PROPOSED, CANDIDATE SPECIES AND SPECIES OF CONCERN UNDER THE JURISDICTION OF THE FISH AND WILDLIFE SERVICE WHICH MAY OCCUR WITHIN BENTON COUNTY, OREGON

Definitions:

Listed Species: An endangered species is one that is in danger of extinction throughout all or a significant portion of its range. A threatened species is one that is likely to become endangered in the foreseeable future.

Proposed Species: Taxa for which the Fish and Wildlife Service or National Marine Fisheries Service has published a proposal to list as endangered or threatened in the Federal Register.

Candidate Species: Taxa for which the Fish and Wildlife Service has sufficient biological information to support a proposal to list as endangered or threatened.

Species of Concern: Taxa whose conservation status is of concern to the U.S. Fish and Wildlife Service (many previously known as Category 2 candidates), but for which further information is still needed. Such species receive no legal protection and use of the term does not necessarily imply that a species will eventually be proposed for listing.

Delisted Species: A species that has been removed from the Federal list of endangered and threatened wildlife and plants.

Key:

E	Endangered
T	Threatened
CH	Critical Habitat has been designated for this species
PE	Proposed Endangered
PT	Proposed Threatened
PCH	Critical Habitat has been proposed for this species

Notes:

Marine & Anadromous Species: Please consult the National Marine Fisheries Service (NMFS) (http://www.nmfs.noaa.gov/pr/species/) for marine and anadromous species. The National Marine Fisheries Service (NMFS) manages mostly marine and anadromous species, while the U.S. Fish and Wildlife Service manages the remainder of the listed species, mostly terrestrial and freshwater species.

Marine Turtle Conservation and Management: All six species of sea turtles occurring in the U.S. are protected under the Endangered Species Act of 1973. In 1977, NOAA Fisheries and the U.S. Fish and Wildlife Service signed a Memorandum of Understanding to jointly administer the Endangered Species Act with respect to marine turtles. NOAA Fisheries has the lead responsibility for the conservation and recovery of sea turtles in the marine environment and the U.S. Fish and Wildlife Service has the lead for the conservation and recovery of sea turtles on nesting beaches. For more information, see the NOAA Fisheries webpage on sea turtles http://www.nmfs.noaa.gov/pr/species/turtles/.

Gray Wolf: On February 27, 2008, the Service published a final rule that established a distinct population segment of the gray wolf (*Canis lupis*) in the northern Rocky Mountains (which includes a portion of Eastern Oregon, east of the centerline of Highway 395 and Highway 78 north of Burns Junction and that portion of Oregon east of the centerline of Highway 95 south of Burns Junction). Any wolves found west of this line in Oregon belong to the conterminous USA population [see 73 FR 10514]. Gray wolves in Oregon are State-listed as endangered, regardless of location.

FEDERALLY LISTED, PROPOSED, CANDIDATE SPECIES
AND SPECIES OF CONCERN
UNDER THE JURISDICTION OF THE FISH AND WILDLIFE SERVICE
WHICH MAY OCCUR WITHIN CLACKAMAS COUNTY, OREGON

LISTED SPECIES

Birds

Northern spotted owl	*Strix occidentalis caurina*	CH T

Plants

Willamette daisy	*Erigeron decumbens var. decumbens*	CH E
Nelson's checker-mallow	*Sidalcea nelsoniana*	T

PROPOSED SPECIES

None

No Proposed Endangered Species	PE
No Proposed Threatened Species	PT

CANDIDATE SPECIES

Birds

Streaked horned lark	*Eremophila alpestris strigata*

SPECIES OF CONCERN

Mammals

Red tree vole	*Arborimus longicaudus*
Townsend's western big-eared bat	*Corynorhinus townsendii townsendii*
Silver-haired bat	*Lasionycteris noctivagans*
Long-eared myotis bat	*Myotis evotis*
Fringed myotis bat	*Myotis thysanodes*
Long-legged myotis bat	*Myotis volans*
Yuma myotis bat	*Myotis yumanensis*
Camas pocket gopher	*Thomomys bulbivorus*

Birds

Northern goshawk	*Accipiter gentilis*
Olive-sided flycatcher	*Contopus cooperi*
Harlequin duck	*Histrionicus histrionicus*
Yellow-breasted chat	*Icteria virens*
Acorn woodpecker	*Melanerpes formicivorus*
Lewis' woodpecker	*Melanerpes lewis*
Mountain quail	*Oreortyx pictus*
Band-tailed pigeon	*Patagioenas fasciata*
Oregon vesper sparrow	*Pooecetes gramineus affinis*
Purple martin	*Progne subis*

Reptiles and Amphibians

Northern Pacific pond turtle	*Actinemys marmorata marmorata*

Coastal tailed frog	*Ascaphus truei*
Oregon slender salamander	*Batrachoseps wrighti*
Larch Mountain salamander	*Plethodon larselli*
Northern red-legged frog	*Rana aurora aurora*
Cascades frog	*Rana cascadae*

Fish

Pacific lamprey	*Lampetra tridentata*
Coastal cutthroat trout	*Oncorhynchus clarki ssp*

Invertebrates

Insects:

Beller's ground beetle	*Agonum belleri*
Scott's apatanian caddisfly	*Allomyia scotti*
Cascades apatanian caddisfly	*Apatania tavala*
Mt. Hood primitive brachycentrid caddisfly	*Eobrachycentrus gelidae*
Mt. Hood farulan caddisfly	*Farula jewetti*

Annelid Worms:

Oregon giant earthworm	*Megascolides macelfreshi*

Plants

Cliff paintbrush	*Castilleja rupicola*
Cold-water corydalis	*Corydalis aquae-gelidae*
Pale larkspur	*Delphinium leucophaeum*
Willamette Valley larkspur	*Delphinium oreganum*
Peacock larkspur	*Delphinium pavonaceum*
Howell's daisy	*Erigeron howellii*
Thin leaved peavine	*Lathyrus holochlorus*
Whitetop aster	*Sericocarpus rigidus*
Henderson's checker-mallow	*Sidalcea hendersonii*
Pale blue-eyed grass	*Sisyrinchium sarmentosum*
Oregon sullivantia	*Sullivantia oregana*

DELISTED SPECIES

Birds

American Peregrine falcon	*Falco peregrinus anatum*
Bald eagle	*Haliaeetus leucocephalus*

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FEDERALLY LISTED, PROPOSED, CANDIDATE SPECIES AND SPECIES OF CONCERN UNDER THE JURISDICTION OF THE FISH AND WILDLIFE SERVICE WHICH MAY OCCUR WITHIN CLACKAMAS COUNTY, OREGON

Species of Concern: Taxa whose conservation status is of concern to the U.S. Fish and Wildlife Service (many previously known as Category 2 candidates), but for which further information is still needed. Such species receive no legal protection and use of the term does not necessarily imply that a species will eventually be proposed for listing.

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FEDERALLY LISTED, PROPOSED, CANDIDATE SPECIES
AND SPECIES OF CONCERN
UNDER THE JURISDICTION OF THE FISH AND WILDLIFE SERVICE
WHICH MAY OCCUR WITHIN CLATSOP COUNTY, OREGON

LISTED SPECIES

Mammals

Terrestrial:

Columbian white-tailed deer (Columbia River distinct population segment)	*Odocoileus virginianus leucurus*	E

Birds

Marbled murrelet	*Brachyramphus marmoratus*	CH T
Western snowy (coastal) plover	*Charadrius alexandrinus nivosus*	CH T
Short-tailed albatross	*Phoebastria albatrus*	E
Northern spotted owl	*Strix occidentalis caurina*	CH T

Reptiles and Amphibians

Marine:

Loggerhead sea turtle	*Caretta caretta*	E
Green sea turtle	*Chelonia mydas*	T
Leatherback sea turtle	*Dermochelys coriacea*	E
Olive (=Pacific) ridley sea turtle	*Lepidochelys olivacea*	T

Invertebrates

Insects:

Oregon silverspot butterfly	*Speyeria zerene hippolyta*	CH T

Plants

Nelson's checker-mallow	*Sidalcea nelsoniana*	T

PROPOSED SPECIES

None

No Proposed Endangered Species	PE
No Proposed Threatened Species	PT

CANDIDATE SPECIES

Birds

Streaked horned lark	*Eremophila alpestris strigata*

SPECIES OF CONCERN

Mammals

White-footed vole	*Arborimus albipes*
Red tree vole	*Arborimus longicaudus*
Townsend's western big-eared bat	*Corynorhinus townsendii townsendii*
Silver-haired bat	*Lasionycteris noctivagans*

Long-eared myotis bat	*Myotis evotis*
Fringed myotis bat	*Myotis thysanodes*
Long-legged myotis bat	*Myotis volans*
Yuma myotis bat	*Myotis yumanensis*

Birds

Olive-sided flycatcher	*Contopus cooperi*
Black oystercatcher	*Haematopus bachmani*
Harlequin duck	*Histrionicus histrionicus*
Lewis' woodpecker	*Melanerpes lewis*
Mountain quail	*Oreortyx pictus*
Band-tailed pigeon	*Patagioenas fasciata*
Purple martin	*Progne subis*

Reptiles and Amphibians

Coastal tailed frog	*Ascaphus truei*
Northern red-legged frog	*Rana aurora aurora*

Fish

River lamprey	*Lampetra ayresi*
Pacific lamprey	*Lampetra tridentata*
Coastal cutthroat trout	*Oncorhynchus clarki ssp*

Invertebrates

Clams:

California floater mussel	*Anodonta californiensis*

Plants

Pink sand-verbena	*Abronia umbellata ssp. breviflora*
Saddle Mountain bittercress	*Cardamine pattersonii*
Chamber's paintbrush	*Castilleja chambersii*
Frigid shootingstar	*Dodecatheon austrofrigidum*
Queen-of-the-forest	*Filipendula occidentalis*
Frye's Limbella	*Limbella fryei*
Saddle Mountain saxifrage	*Saxifraga hitchcockiana*
Bristly-stemmed sidalcea	*Sidalcea hirtipes*

DELISTED SPECIES

Birds

American Peregrine falcon	*Falco peregrinus anatum*
Bald eagle	*Haliaeetus leucocephalus*
Brown pelican	*Pelecanus occidentalis*

Definitions:

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FEDERALLY LISTED, PROPOSED, CANDIDATE SPECIES AND SPECIES OF CONCERN UNDER THE JURISDICTION OF THE FISH AND WILDLIFE SERVICE WHICH MAY OCCUR WITHIN CLATSOP COUNTY, OREGON

Proposed Species: Taxa for which the Fish and Wildlife Service or National Marine Fisheries Service has published a proposal to list as endangered or threatened in the Federal Register.

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FEDERALLY LISTED, PROPOSED, CANDIDATE SPECIES
AND SPECIES OF CONCERN
UNDER THE JURISDICTION OF THE FISH AND WILDLIFE SERVICE
WHICH MAY OCCUR WITHIN COLUMBIA COUNTY, OREGON

LISTED SPECIES

Mammals

Terrestrial:

Columbian white-tailed deer (Columbia River distinct population segment)	*Odocoileus virginianus leucurus*	E

Birds

Northern spotted owl	*Strix occidentalis caurina*	CH T

Plants

Water howellia	*Howellia aquatilis*	T
Nelson's checker-mallow	*Sidalcea nelsoniana*	T

PROPOSED SPECIES

None

No Proposed Endangered Species	PE
No Proposed Threatened Species	PT

CANDIDATE SPECIES

Birds

Streaked horned lark	*Eremophila alpestris strigata*

SPECIES OF CONCERN

Mammals

White-footed vole	*Arborimus albipes*
Red tree vole	*Arborimus longicaudus*
Silver-haired bat	*Lasionycteris noctivagans*
Long-eared myotis bat	*Myotis evotis*
Fringed myotis bat	*Myotis thysanodes*
Long-legged myotis bat	*Myotis volans*
Yuma myotis bat	*Myotis yumanensis*
Camas pocket gopher	*Thomomys bulbivorus*

Birds

Olive-sided flycatcher	*Contopus cooperi*
Yellow-breasted chat	*Icteria virens*
Lewis' woodpecker	*Melanerpes lewis*
Mountain quail	*Oreortyx pictus*
Band-tailed pigeon	*Patagioenas fasciata*
Oregon vesper sparrow	*Pooecetes gramineus affinis*
Purple martin	*Progne subis*

FEDERALLY LISTED, PROPOSED, CANDIDATE SPECIES
AND SPECIES OF CONCERN
UNDER THE JURISDICTION OF THE FISH AND WILDLIFE SERVICE
WHICH MAY OCCUR WITHIN COLUMBIA COUNTY, OREGON

Reptiles and Amphibians

Northern Pacific pond turtle	*Actinemys marmorata marmorata*
Coastal tailed frog	*Ascaphus truei*
Northern red-legged frog	*Rana aurora aurora*

Fish

Malheur mottled sculpin	*Cottus bairdi ssp.*
River lamprey	*Lampetra ayresi*
Pacific lamprey	*Lampetra tridentata*
Coastal cutthroat trout	*Oncorhynchus clarki ssp*

Invertebrates

Clams:

California floater mussel	*Anodonta californiensis*

Plants

Oregon sullivantia	*Sullivantia oregana*

DELISTED SPECIES

Birds

Aleutian Canada goose	*Branta canadensis leucopareia*
American Peregrine falcon	*Falco peregrinus anatum*
Bald eagle	*Haliaeetus leucocephalus*

Definitions:

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Delisted Species: A species that has been removed from the Federal list of endangered and threatened wildlife and plants.

Key:

E Endangered
T Threatened
CH Critical Habitat has been designated for this species

FEDERALLY LISTED, PROPOSED, CANDIDATE SPECIES AND SPECIES OF CONCERN UNDER THE JURISDICTION OF THE FISH AND WILDLIFE SERVICE WHICH MAY OCCUR WITHIN COLUMBIA COUNTY, OREGON

PE Proposed Endangered
PT Proposed Threatened
PCH Critical Habitat has been proposed for this species

Notes:

Marine & Anadromous Species: Please consult the National Marine Fisheries Service (NMFS) (http://www.nmfs.noaa.gov/pr/species/) for marine and anadromous species. The National Marine Fisheries Service (NMFS) manages mostly marine and anadromous species, while the U.S. Fish and Wildlife Service manages the remainder of the listed species, mostly terrestrial and freshwater species.

Marine Turtle Conservation and Management: All six species of sea turtles occurring in the U.S. are protected under the Endangered Species Act of 1973. In 1977, NOAA Fisheries and the U.S. Fish and Wildlife Service signed a Memorandum of Understanding to jointly administer the Endangered Species Act with respect to marine turtles. NOAA Fisheries has the lead responsibility for the conservation and recovery of sea turtles in the marine environment and the U.S. Fish and Wildlife Service has the lead for the conservation and recovery of sea turtles on nesting beaches. For more information, see the NOAA Fisheries webpage on sea turtles http://www.nmfs.noaa.gov/pr/species/turtles/.

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FEDERALLY LISTED, PROPOSED, CANDIDATE SPECIES
AND SPECIES OF CONCERN
UNDER THE JURISDICTION OF THE FISH AND WILDLIFE SERVICE
WHICH MAY OCCUR WITHIN DESCHUTES COUNTY, OREGON

LISTED SPECIES

Birds

Northern spotted owl	*Strix occidentalis caurina*	CH T

Fish

Inland:

Bull trout	*Salvelinus confluentus*	CH T

PROPOSED SPECIES

None

No Proposed Endangered Species	PE
No Proposed Threatened Species	PT

CANDIDATE SPECIES

Birds

Greater sage-grouse	*Centrocercus urophasianus*
Yellow-billed cuckoo	*Coccyzus americanus*

Reptiles and Amphibians

Inland:

Oregon spotted frog	*Rana pretiosa*

SPECIES OF CONCERN

Mammals

Terrestrial:

Pygmy rabbit	*Brachylagus idahoensis*
Townsend's western big-eared bat	*Corynorhinus townsendii townsendii*
Spotted bat	*Euderma maculatum*
Silver-haired bat	*Lasionycteris noctivagans*
Small-footed myotis bat	*Myotis ciliolabrum*
Long-eared myotis bat	*Myotis evotis*
Long-legged myotis bat	*Myotis volans*
Yuma myotis bat	*Myotis yumanensis*
Preble's shrew	*Sorex preblei*

Birds

Northern goshawk	*Accipiter gentilis*
Western burrowing owl	*Athene cunicularia hypugaea*
Ferruginous hawk	*Buteo regalis*
Black tern	*Chlidonias niger*
Olive-sided flycatcher	*Contopus cooperi*
Willow flycatcher	*Empidonax traillii adastus*

Yellow-breasted chat	*Icteria virens*
Lewis' woodpecker	*Melanerpes lewis*
Mountain quail	*Oreortyx pictus*
White-headed woodpecker	*PIcoides albolarvatus*

Reptiles and Amphibians

Coastal tailed frog	*Ascaphus truei*
Oregon slender salamander	*Batrachoseps wrighti*
Cascades frog	*Rana cascadae*
Northern sagebrush lizard	*Sceloporus graciosus graciosus*

Invertebrates

Clams:

California floater mussel	*Anodonta californiensis*

Plants

Estes' artemisia	*Artemisia ludoviciana ssp. estesii*
Cliff paintbrush	*Castilleja rupicola*
Cusick's buckwheat	*Eriogonum cusickii*
Peck's penstemon	*Penstemon peckii*
Howell's thelypody	*Thelypodium howellii ssp. howellii*

DELISTED SPECIES

Birds

American Peregrine falcon	*Falco peregrinus anatum*
Bald eagle	*Haliaeetus leucocephalus*

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Key:

FEDERALLY LISTED, PROPOSED, CANDIDATE SPECIES AND SPECIES OF CONCERN UNDER THE JURISDICTION OF THE FISH AND WILDLIFE SERVICE WHICH MAY OCCUR WITHIN DESCHUTES COUNTY, OREGON

E	Endangered
T	Threatened
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FEDERALLY LISTED, PROPOSED, CANDIDATE SPECIES
AND SPECIES OF CONCERN
UNDER THE JURISDICTION OF THE FISH AND WILDLIFE SERVICE
WHICH MAY OCCUR WITHIN HOOD RIVER COUNTY, OREGON

LISTED SPECIES

Birds

Northern spotted owl	*Strix occidentalis caurina*	CH T

Fish

Inland:

Bull trout	*Salvelinus confluentus*	CH T

PROPOSED SPECIES

None

No Proposed Endangered Species	PE
No Proposed Threatened Species	PT

SPECIES OF CONCERN

Mammals

Red tree vole	*Arborimus longicaudus*
Silver-haired bat	*Lasionycteris noctivagans*
Small-footed myotis bat	*Myotis ciliolabrum*
Long-eared myotis bat	*Myotis evotis*
Yuma myotis bat	*Myotis yumanensis*

Birds

Northern goshawk	*Accipiter gentilis*
Olive-sided flycatcher	*Contopus cooperi*
Willow flycatcher	*Empidonax traillii adastus*
Harlequin duck	*Histrionicus histrionicus*
Yellow-breasted chat	*Icteria virens*
Lewis' woodpecker	*Melanerpes lewis*
Mountain quail	*Oreortyx pictus*
Band-tailed pigeon	*Patagioenas fasciata*
White-headed woodpecker	*PIcoides albolarvatus*
Purple martin	*Progne subis*

Reptiles and Amphibians

Northern Pacific pond turtle	*Actinemys marmorata marmorata*
Coastal tailed frog	*Ascaphus truei*
Oregon slender salamander	*Batrachoseps wrighti*
Larch Mountain salamander	*Plethodon larselli*
Northern red-legged frog	*Rana aurora aurora*
Cascades frog	*Rana cascadae*

Fish

Pacific lamprey	*Lampetra tridentata*
Coastal cutthroat trout	*Oncorhynchus clarki ssp*

Invertebrates

Insects:

Mt. Hood primitive brachycentrid caddisfly	*Eobrachycentrus gelidae*
Mt. Hood farulan caddisfly	*Farula jewetti*
Goeden's lepidostoman caddisfly	*Lepidostoma goedeni*
One-spot rhyacophilan caddisfly	*Rhyacophila unipunctata*

Plants

Howell's bentgrass	*Agrostis howellii*
Mountain grape fern	*Botrychium montanum*
Cliff paintbrush	*Castilleja rupicola*
Howell's daisy	*Erigeron howellii*
Oregon fleabane	*Erigeron oreganus*
Suksdorf's desert parsley	*Lomatium suksdorfii*
White meconella	*Meconella oregana*
Barrett's penstemon	*Penstemon barrettiae*
Oregon sullivantia	*Sullivantia oregana*

DELISTED SPECIES

Birds

American Peregrine falcon	*Falco peregrinus anatum*
Bald eagle	*Haliaeetus leucocephalus*

Definitions:

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Proposed Species: Taxa for which the Fish and Wildlife Service or National Marine Fisheries Service has published a proposal to list as endangered or threatened in the Federal Register.

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Delisted Species: A species that has been removed from the Federal list of endangered and threatened wildlife and plants.

Key:

E	Endangered
T	Threatened
CH	Critical Habitat has been designated for this species

FEDERALLY LISTED, PROPOSED, CANDIDATE SPECIES AND SPECIES OF CONCERN UNDER THE JURISDICTION OF THE FISH AND WILDLIFE SERVICE WHICH MAY OCCUR WITHIN HOOD RIVER COUNTY, OREGON

PE Proposed Endangered
PT Proposed Threatened
PCH Critical Habitat has been proposed for this species

Notes:

Marine & Anadromous Species: Please consult the National Marine Fisheries Service (NMFS) (http://www.nmfs.noaa.gov/pr/species/) for marine and anadromous species. The National Marine Fisheries Service (NMFS) manages mostly marine and anadromous species, while the U.S. Fish and Wildlife Service manages the remainder of the listed species, mostly terrestrial and freshwater species.

Marine Turtle Conservation and Management: All six species of sea turtles occurring in the U.S. are protected under the Endangered Species Act of 1973. In 1977, NOAA Fisheries and the U.S. Fish and Wildlife Service signed a Memorandum of Understanding to jointly administer the Endangered Species Act with respect to marine turtles. NOAA Fisheries has the lead responsibility for the conservation and recovery of sea turtles in the marine environment and the U.S. Fish and Wildlife Service has the lead for the conservation and recovery of sea turtles on nesting beaches. For more information, see the NOAA Fisheries webpage on sea turtles http://www.nmfs.noaa.gov/pr/species/turtles/.

Gray Wolf: On February 27, 2008, the Service published a final rule that established a distinct population segment of the gray wolf (*Canis lupis*) in the northern Rocky Mountains (which includes a portion of Eastern Oregon, east of the centerline of Highway 395 and Highway 78 north of Burns Junction and that portion of Oregon east of the centerline of Highway 95 south of Burns Junction). Any wolves found west of this line in Oregon belong to the conterminous USA population [see 73 FR 10514]. Gray wolves in Oregon are State-listed as endangered, regardless of location.

FEDERALLY LISTED, PROPOSED, CANDIDATE SPECIES
AND SPECIES OF CONCERN
UNDER THE JURISDICTION OF THE FISH AND WILDLIFE SERVICE
WHICH MAY OCCUR WITHIN JEFFERSON COUNTY, OREGON

LISTED SPECIES

Birds

Northern spotted owl	*Strix occidentalis caurina*	CH T

Fish

Inland:

Bull trout	*Salvelinus confluentus*	CH T

PROPOSED SPECIES

None

No Proposed Endangered Species	PE
No Proposed Threatened Species	PT

CANDIDATE SPECIES

Reptiles and Amphibians

Inland:

Oregon spotted frog	*Rana pretiosa*

SPECIES OF CONCERN

Mammals

Pallid bat	*Antrozous pallidus pacificus*
Townsend's western big-eared bat	*Corynorhinus townsendii townsendii*
Spotted bat	*Euderma maculatum*
Silver-haired bat	*Lasionycteris noctivagans*
Small-footed myotis bat	*Myotis ciliolabrum*
Long-eared myotis bat	*Myotis evotis*
Long-legged myotis bat	*Myotis volans*
Yuma myotis bat	*Myotis yumanensis*

Birds

Northern goshawk	*Accipiter gentilis*
Western burrowing owl	*Athene cunicularia hypugaea*
Olive-sided flycatcher	*Contopus cooperi*
Willow flycatcher	*Empidonax traillii adastus*
Yellow-breasted chat	*Icteria virens*
Lewis' woodpecker	*Melanerpes lewis*
Mountain quail	*Oreortyx pictus*
White-headed woodpecker	*PIcoides albolarvatus*

Reptiles and Amphibians

Coastal tailed frog	*Ascaphus truei*
Oregon slender salamander	*Batrachoseps wrighti*

Cascades frog	*Rana cascadae*
Northern sagebrush lizard	*Sceloporus graciosus graciosus*

Fish

Pacific lamprey	*Lampetra tridentata*

Invertebrates

Insects:

Cascades apatanian caddisfly	*Apatania tavala*

Plants

Estes' artemisia	*Artemisia ludoviciana ssp. estesii*
Sessile mousetail	*Myosurus sessilis*
Peck's penstemon	*Penstemon peckii*
Woven-spored Lichen	*Texosporium sancti-jacobi*

DELISTED SPECIES

Birds

American Peregrine falcon	*Falco peregrinus anatum*
Bald eagle	*Haliaeetus leucocephalus*

Definitions:

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FEDERALLY LISTED, PROPOSED, CANDIDATE SPECIES AND SPECIES OF CONCERN UNDER THE JURISDICTION OF THE FISH AND WILDLIFE SERVICE WHICH MAY OCCUR WITHIN JEFFERSON COUNTY, OREGON

Notes:

Marine & Anadromous Species: Please consult the National Marine Fisheries Service (NMFS) (http://www.nmfs.noaa.gov/pr/species/) for marine and anadromous species. The National Marine Fisheries Service (NMFS) manages mostly marine and anadromous species, while the U.S. Fish and Wildlife Service manages the remainder of the listed species, mostly terrestrial and freshwater species.

Marine Turtle Conservation and Management: All six species of sea turtles occurring in the U.S. are protected under the Endangered Species Act of 1973. In 1977, NOAA Fisheries and the U.S. Fish and Wildlife Service signed a Memorandum of Understanding to jointly administer the Endangered Species Act with respect to marine turtles. NOAA Fisheries has the lead responsibility for the conservation and recovery of sea turtles in the marine environment and the U.S. Fish and Wildlife Service has the lead for the conservation and recovery of sea turtles on nesting beaches. For more information, see the NOAA Fisheries webpage on sea turtles http://www.nmfs.noaa.gov/pr/species/turtles/.

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FEDERALLY LISTED, PROPOSED, CANDIDATE SPECIES
AND SPECIES OF CONCERN
UNDER THE JURISDICTION OF THE FISH AND WILDLIFE SERVICE
WHICH MAY OCCUR WITHIN LANE COUNTY, OREGON

LISTED SPECIES

Birds

Marbled murrelet	*Brachyramphus marmoratus*	CH T
Western snowy (coastal) plover	*Charadrius alexandrinus nivosus*	CH T
Short-tailed albatross	*Phoebastria albatrus*	E
Northern spotted owl	*Strix occidentalis caurina*	CH T

Reptiles and Amphibians

Marine:

Loggerhead sea turtle	*Caretta caretta*	E
Green sea turtle	*Chelonia mydas*	T
Leatherback sea turtle	*Dermochelys coriacea*	E
Olive (=Pacific) ridley sea turtle	*Lepidochelys olivacea*	T

Fish

Inland:

Oregon chub	*Oregonichthys crameri*	CH T
Bull trout	*Salvelinus confluentus*	CH T

Invertebrates

Insects:

Fender's blue butterfly	*Icaricia icarioides fenderi*	CH E
Oregon silverspot butterfly	*Speyeria zerene hippolyta*	CH T

Plants

Willamette daisy	*Erigeron decumbens var. decumbens*	CH E
Bradshaw's desert parsley	*Lomatium bradshawii*	E
Kincaid's lupine	*Lupinus sulphureus ssp. kincaidii*	CH T

PROPOSED SPECIES

None

No Proposed Endangered Species	PE
No Proposed Threatened Species	PT

CANDIDATE SPECIES

Mammals

North American wolverine	*Gulo gulo luscus*

Birds

Streaked horned lark	*Eremophila alpestris strigata*

Reptiles and Amphibians

Inland:

Oregon spotted frog	*Rana pretiosa*

SPECIES OF CONCERN

Mammals

Pallid bat	*Antrozous pallidus pacificus*
White-footed vole	*Arborimus albipes*
Red tree vole	*Arborimus longicaudus*
Townsend's western big-eared bat	*Corynorhinus townsendii townsendii*
Silver-haired bat	*Lasionycteris noctivagans*
Long-eared myotis bat	*Myotis evotis*
Fringed myotis bat	*Myotis thysanodes*
Long-legged myotis bat	*Myotis volans*
Yuma myotis bat	*Myotis yumanensis*
Camas pocket gopher	*Thomomys bulbivorus*

Birds

Northern goshawk	*Accipiter gentilis*
Western burrowing owl	*Athene cunicularia hypugaea*
Black tern	*Chlidonias niger*
Olive-sided flycatcher	*Contopus cooperi*
Black oystercatcher	*Haematopus bachmani*
Harlequin duck	*Histrionicus histrionicus*
Yellow-breasted chat	*Icteria virens*
Acorn woodpecker	*Melanerpes formicivorus*
Lewis' woodpecker	*Melanerpes lewis*
Mountain quail	*Oreortyx pictus*
Band-tailed pigeon	*Patagioenas fasciata*
Oregon vesper sparrow	*Pooecetes gramineus affinis*
Purple martin	*Progne subis*

Reptiles and Amphibians

Northern Pacific pond turtle	*Actinemys marmorata marmorata*
Coastal tailed frog	*Ascaphus truei*
Oregon slender salamander	*Batrachoseps wrighti*
Northern red-legged frog	*Rana aurora aurora*
Foothill yellow-legged frog	*Rana boylii*
Cascades frog	*Rana cascadae*
Southern torrent (seep) salamander	*Rhyacotriton variegatus*

Fish

Malheur mottled sculpin	*Cottus bairdi ssp.*
Pacific lamprey	*Lampetra tridentata*
Coastal cutthroat trout	*Oncorhynchus clarki ssp*

Invertebrates

Insects:

Tombstone Prairie farulan caddisfly	*Farula reaperi*
Tombstone Prairie oligophlebodes caddisfly	*Oligophlebodes mostbento*
Insular blue butterfly	*Plebejus saepiolus insulanus*
One-spot rhyacophilan caddisfly	*Rhyacophila unipunctata*

FEDERALLY LISTED, PROPOSED, CANDIDATE SPECIES
AND SPECIES OF CONCERN
UNDER THE JURISDICTION OF THE FISH AND WILDLIFE SERVICE
WHICH MAY OCCUR WITHIN LANE COUNTY, OREGON

Plants

Pink sand-verbena	*Abronia umbellata ssp. breviflora*
Crenulate grape fern	*Botrychium crenulatum*
Cliff paintbrush	*Castilleja rupicola*
Cold-water corydalis	*Corydalis aquae-gelidae*
Willamette Valley larkspur	*Delphinium oreganum*
Peacock larkspur	*Delphinium pavonaceum*
Wayside aster	*Eucephalus vialis*
Shaggy horkelia	*Horkelia congesta ssp. congesta*
Thin leaved peavine	*Lathyrus holochlorus*
Frye's Limbella	*Limbella fryei*
Whitetop aster	*Sericocarpus rigidus*
Henderson's checker-mallow	*Sidalcea hendersonii*
Hitchcock's blue-eyed grass	*Sisyrinchium hitchcockii*

DELISTED SPECIES

Birds

American Peregrine falcon	*Falco peregrinus anatum*
Bald eagle	*Haliaeetus leucocephalus*
Brown pelican	*Pelecanus occidentalis*

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FEDERALLY LISTED, PROPOSED, CANDIDATE SPECIES AND SPECIES OF CONCERN UNDER THE JURISDICTION OF THE FISH AND WILDLIFE SERVICE WHICH MAY OCCUR WITHIN LANE COUNTY, OREGON

PCH Critical Habitat has been proposed for this species

Notes:

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FEDERALLY LISTED, PROPOSED, CANDIDATE SPECIES
AND SPECIES OF CONCERN
UNDER THE JURISDICTION OF THE FISH AND WILDLIFE SERVICE
WHICH MAY OCCUR WITHIN LINCOLN COUNTY, OREGON

LISTED SPECIES

Birds

Marbled murrelet	*Brachyramphus marmoratus*	CH T
Western snowy (coastal) plover	*Charadrius alexandrinus nivosus*	CH T
Short-tailed albatross	*Phoebastria albatrus*	E
Northern spotted owl	*Strix occidentalis caurina*	CH T

Reptiles and Amphibians

Marine:

Loggerhead sea turtle	*Caretta caretta*	E
Green sea turtle	*Chelonia mydas*	T
Leatherback sea turtle	*Dermochelys coriacea*	E
Olive (=Pacific) ridley sea turtle	*Lepidochelys olivacea*	T

Invertebrates

Insects:

Oregon silverspot butterfly	*Speyeria zerene hippolyta*	CH T

PROPOSED SPECIES

None

No Proposed Endangered Species	PE
No Proposed Threatened Species	PT

SPECIES OF CONCERN

Mammals

White-footed vole	*Arborimus albipes*
Red tree vole	*Arborimus longicaudus*
Silver-haired bat	*Lasionycteris noctivagans*
Long-eared myotis bat	*Myotis evotis*
Fringed myotis bat	*Myotis thysanodes*
Long-legged myotis bat	*Myotis volans*
Yuma myotis bat	*Myotis yumanensis*

Birds

Northern goshawk	*Accipiter gentilis*
Olive-sided flycatcher	*Contopus cooperi*
Black oystercatcher	*Haematopus bachmani*
Harlequin duck	*Histrionicus histrionicus*
Lewis' woodpecker	*Melanerpes lewis*
Mountain quail	*Oreortyx pictus*
Band-tailed pigeon	*Patagioenas fasciata*
Purple martin	*Progne subis*

Reptiles and Amphibians

Coastal tailed frog	*Ascaphus truei*
Northern red-legged frog	*Rana aurora aurora*
Southern torrent (seep) salamander	*Rhyacotriton variegatus*

Fish

River lamprey	*Lampetra ayresi*
Pacific lamprey	*Lampetra tridentata*
Coastal cutthroat trout	*Oncorhynchus clarki ssp*

Invertebrates

Snails:

Newcomb's littorine snail	*Algamorda newcombiana*

Insects:

Goeden's lepidostoman caddisfly	*Lepidostoma goedeni*
Roth's blind ground beetle	*Pterostichus rothi*

Plants

Bog anemone	*Anemone oregana var. felix*
Pt. Reyes bird's-beak	*Cordylanthus maritimus ssp. palustris*
Coast Range fawn lily	*Erythronium elegans*
Queen-of-the-forest	*Filipendula occidentalis*
Seaside gilia	*Gilia millefoliata*
Frye's Limbella	*Limbella fryei*
San Francisco bluegrass	*Poa unilateralis*
Bristly-stemmed sidalcea	*Sidalcea hirtipes*

DELISTED SPECIES

Birds

American Peregrine falcon	*Falco peregrinus anatum*
Bald eagle	*Haliaeetus leucocephalus*
Brown pelican	*Pelecanus occidentalis*

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FEDERALLY LISTED, PROPOSED, CANDIDATE SPECIES
AND SPECIES OF CONCERN
UNDER THE JURISDICTION OF THE FISH AND WILDLIFE SERVICE
WHICH MAY OCCUR WITHIN LINN COUNTY, OREGON

LISTED SPECIES

Birds

Northern spotted owl	*Strix occidentalis caurina*	CH T

Fish

Inland:

Oregon chub	*Oregonichthys crameri*	CH T
Bull trout	*Salvelinus confluentus*	CH T

Invertebrates

Insects:

Fender's blue butterfly	*Icaricia icarioides fenderi*	CH E

Plants

Golden paintbrush	*Castilleja levisecta*	T
Willamette daisy	*Erigeron decumbens var. decumbens*	CH E
Bradshaw's desert parsley	*Lomatium bradshawii*	E
Kincaid's lupine	*Lupinus sulphureus ssp. kincaidii*	CH T
Nelson's checker-mallow	*Sidalcea nelsoniana*	T

PROPOSED SPECIES

None

No Proposed Endangered Species	PE
No Proposed Threatened Species	PT

CANDIDATE SPECIES

Birds

Streaked horned lark	*Eremophila alpestris strigata*

SPECIES OF CONCERN

Mammals

White-footed vole	*Arborimus albipes*
Red tree vole	*Arborimus longicaudus*
Silver-haired bat	*Lasionycteris noctivagans*
Long-eared myotis bat	*Myotis evotis*
Long-legged myotis bat	*Myotis volans*
Yuma myotis bat	*Myotis yumanensis*
Camas pocket gopher	*Thomomys bulbivorus*

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Northern goshawk	*Accipiter gentilis*

Western burrowing owl	*Athene cunicularia hypugaea*
Black tern	*Chlidonias niger*
Olive-sided flycatcher	*Contopus cooperi*
Harlequin duck	*Histrionicus histrionicus*
Yellow-breasted chat	*Icteria virens*
Acorn woodpecker	*Melanerpes formicivorus*
Lewis' woodpecker	*Melanerpes lewis*
Mountain quail	*Oreortyx pictus*
Band-tailed pigeon	*Patagioenas fasciata*
Oregon vesper sparrow	*Pooecetes gramineus affinis*
Purple martin	*Progne subis*

Reptiles and Amphibians

Northern Pacific pond turtle	*Actinemys marmorata marmorata*
Coastal tailed frog	*Ascaphus truei*
Oregon slender salamander	*Batrachoseps wrighti*
Northern red-legged frog	*Rana aurora aurora*
Foothill yellow-legged frog	*Rana boylii*
Cascades frog	*Rana cascadae*

Fish

Malheur mottled sculpin	*Cottus bairdi ssp.*
Pacific lamprey	*Lampetra tridentata*
Coastal cutthroat trout	*Oncorhynchus clarki ssp*

Invertebrates

Insects:

Cascades apatanian caddisfly	*Apatania tavala*
Mt. Hood primitive brachycentrid caddisfly	*Eobrachycentrus gelidae*
Tombstone Prairie farulan caddisfly	*Farula reaperi*
Tombstone Prairie oligophlebodes caddisfly	*Oligophlebodes mostbento*

Clams:

California floater mussel	*Anodonta californiensis*

Plants

Pink sand-verbena	*Abronia umbellata ssp. breviflora*
Howell's bentgrass	*Agrostis howellii*
Bog anemone	*Anemone oregana var. felix*
Hell's Canyon rock-cress	*Arabis hastatula*
Mountain grape fern	*Botrychium montanum*
Cliff paintbrush	*Castilleja rupicola*
Cold-water corydalis	*Corydalis aquae-gelidae*
Willamette Valley larkspur	*Delphinium oreganum*
Wayside aster	*Eucephalus vialis*
Shaggy horkelia	*Horkelia congesta ssp. congesta*
Thin leaved peavine	*Lathyrus holochlorus*
Whitetop aster	*Sericocarpus rigidus*

DELISTED SPECIES

Birds

FEDERALLY LISTED, PROPOSED, CANDIDATE SPECIES AND SPECIES OF CONCERN UNDER THE JURISDICTION OF THE FISH AND WILDLIFE SERVICE WHICH MAY OCCUR WITHIN LINN COUNTY, OREGON

American Peregrine falcon	*Falco peregrinus anatum*
Bald eagle	*Haliaeetus leucocephalus*

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FEDERALLY LISTED, PROPOSED, CANDIDATE SPECIES
AND SPECIES OF CONCERN
UNDER THE JURISDICTION OF THE FISH AND WILDLIFE SERVICE
WHICH MAY OCCUR WITHIN MARION COUNTY, OREGON

LISTED SPECIES

Birds

Northern spotted owl	*Strix occidentalis caurina*	CH T

Fish

Inland:

Oregon chub	*Oregonichthys crameri*	CH T

Plants

Golden paintbrush	*Castilleja levisecta*	T
Willamette daisy	*Erigeron decumbens var. decumbens*	CH E
Water howellia	*Howellia aquatilis*	T
Bradshaw's desert parsley	*Lomatium bradshawii*	E
Kincaid's lupine	*Lupinus sulphureus ssp. kincaidii*	CH T
Nelson's checker-mallow	*Sidalcea nelsoniana*	T

PROPOSED SPECIES

None

No Proposed Endangered Species	PE
No Proposed Threatened Species	PT

CANDIDATE SPECIES

Birds

Streaked horned lark	*Eremophila alpestris strigata*

SPECIES OF CONCERN

Mammals

Red tree vole	*Arborimus longicaudus*
Townsend's western big-eared bat	*Corynorhinus townsendii townsendii*
Silver-haired bat	*Lasionycteris noctivagans*
Long-eared myotis bat	*Myotis evotis*
Long-legged myotis bat	*Myotis volans*
Yuma myotis bat	*Myotis yumanensis*
Camas pocket gopher	*Thomomys bulbivorus*

Birds

Northern goshawk	*Accipiter gentilis*
Olive-sided flycatcher	*Contopus cooperi*
Harlequin duck	*Histrionicus histrionicus*
Yellow-breasted chat	*Icteria virens*
Acorn woodpecker	*Melanerpes formicivorus*
Lewis' woodpecker	*Melanerpes lewis*

Mountain quail	*Oreortyx pictus*
Band-tailed pigeon	*Patagioenas fasciata*
Oregon vesper sparrow	*Pooecetes gramineus affinis*
Purple martin	*Progne subis*

Reptiles and Amphibians

Northern Pacific pond turtle	*Actinemys marmorata marmorata*
Coastal tailed frog	*Ascaphus truei*
Oregon slender salamander	*Batrachoseps wrighti*
Northern red-legged frog	*Rana aurora aurora*
Foothill yellow-legged frog	*Rana boylii*
Cascades frog	*Rana cascadae*

Fish

Pacific lamprey	*Lampetra tridentata*
Coastal cutthroat trout	*Oncorhynchus clarki ssp*

Plants

Mountain grape fern	*Botrychium montanum*
Cold-water corydalis	*Corydalis aquae-gelidae*
Pale larkspur	*Delphinium leucophaeum*
Willamette Valley larkspur	*Delphinium oreganum*
Peacock larkspur	*Delphinium pavonaceum*
Shaggy horkelia	*Horkelia congesta ssp. congesta*
Thin leaved peavine	*Lathyrus holochlorus*
Whitetop aster	*Sericocarpus rigidus*
Pale blue-eyed grass	*Sisyrinchium sarmentosum*

DELISTED SPECIES

Birds

Aleutian Canada goose	*Branta canadensis leucopareia*
American Peregrine falcon	*Falco peregrinus anatum*
Bald eagle	*Haliaeetus leucocephalus*

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FEDERALLY LISTED, PROPOSED, CANDIDATE SPECIES AND SPECIES OF CONCERN UNDER THE JURISDICTION OF THE FISH AND WILDLIFE SERVICE WHICH MAY OCCUR WITHIN MARION COUNTY, OREGON

Delisted Species: A species that has been removed from the Federal list of endangered and threatened wildlife and plants.

Key:

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T	Threatened
CH	Critical Habitat has been designated for this species
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FEDERALLY LISTED, PROPOSED, CANDIDATE SPECIES
AND SPECIES OF CONCERN
UNDER THE JURISDICTION OF THE FISH AND WILDLIFE SERVICE
WHICH MAY OCCUR WITHIN MULTNOMAH COUNTY, OREGON

LISTED SPECIES

Mammals

Terrestrial:

Columbian white-tailed deer (Columbia River distinct population segment)	*Odocoileus virginianus leucurus*	E

Birds

Northern spotted owl	*Strix occidentalis caurina*	CH T

Fish

Inland:

Bull trout	*Salvelinus confluentus*	CH T

Plants

Willamette daisy	*Erigeron decumbens var. decumbens*	CH E
Water howellia	*Howellia aquatilis*	T
Bradshaw's desert parsley	*Lomatium bradshawii*	E
Kincaid's lupine	*Lupinus sulphureus ssp. kincaidii*	CH T
Nelson's checker-mallow	*Sidalcea nelsoniana*	T

PROPOSED SPECIES

None

No Proposed Endangered Species	PE
No Proposed Threatened Species	PT

CANDIDATE SPECIES

Mammals

North American wolverine	*Gulo gulo luscus*

Birds

Streaked horned lark	*Eremophila alpestris strigata*

Plants

Northern wormwood	*Artemisia campestris var. wormskioldii*

SPECIES OF CONCERN

Mammals

Pallid bat	*Antrozous pallidus pacificus*
Red tree vole	*Arborimus longicaudus*
Townsend's western big-eared bat	*Corynorhinus townsendii townsendii*
Silver-haired bat	*Lasionycteris noctivagans*

Long-eared myotis bat	*Myotis evotis*
Long-legged myotis bat	*Myotis volans*
Yuma myotis bat	*Myotis yumanensis*
Camas pocket gopher	*Thomomys bulbivorus*

Birds

Northern goshawk	*Accipiter gentilis*
Tricolored blackbird	*Agelaius tricolor*
Western burrowing owl	*Athene cunicularia hypugaea*
Olive-sided flycatcher	*Contopus cooperi*
Harlequin duck	*Histrionicus histrionicus*
Yellow-breasted chat	*Icteria virens*
Lewis' woodpecker	*Melanerpes lewis*
Mountain quail	*Oreortyx pictus*
Band-tailed pigeon	*Patagioenas fasciata*
Oregon vesper sparrow	*Pooecetes gramineus affinis*
Purple martin	*Progne subis*

Reptiles and Amphibians

Northern Pacific pond turtle	*Actinemys marmorata marmorata*
Coastal tailed frog	*Ascaphus truei*
Oregon slender salamander	*Batrachoseps wrighti*
Larch Mountain salamander	*Plethodon larselli*
Northern red-legged frog	*Rana aurora aurora*
Cascades frog	*Rana cascadae*

Fish

Pacific lamprey	*Lampetra tridentata*
Coastal cutthroat trout	*Oncorhynchus clarki ssp*

Invertebrates

Snails:	
Columbia pebblesnail	*Fluminicola fuscus (= columbianus)*
Insects:	
Mt. Hood primitive brachycentrid caddisfly	*Eobrachycentrus gelidae*
Mt. Hood farulan caddisfly	*Farula jewetti*
Columbia Gorge neothremman caddisfly	*Neothremma andersoni*
Wahkeena Falls flightless stonefly	*Zapada wahkeena*
Clams:	
California floater mussel	*Anodonta californiensis*

Plants

Howell's bentgrass	*Agrostis howellii*
Cliff paintbrush	*Castilleja rupicola*
Cold-water corydalis	*Corydalis aquae-gelidae*
Pale larkspur	*Delphinium leucophaeum*
Howell's daisy	*Erigeron howellii*
Oregon fleabane	*Erigeron oreganus*
Barrett's penstemon	*Penstemon barrettiae*
Whitetop aster	*Sericocarpus rigidus*
Oregon sullivantia	*Sullivantia oregana*

DELISTED SPECIES

Birds

Aleutian Canada goose	*Branta canadensis leucopareia*
American Peregrine falcon	*Falco peregrinus anatum*
Bald eagle	*Haliaeetus leucocephalus*

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FEDERALLY LISTED, PROPOSED, CANDIDATE SPECIES
AND SPECIES OF CONCERN
UNDER THE JURISDICTION OF THE FISH AND WILDLIFE SERVICE
WHICH MAY OCCUR WITHIN POLK COUNTY, OREGON

LISTED SPECIES

Birds

Marbled murrelet	*Brachyramphus marmoratus*	CH T
Northern spotted owl	*Strix occidentalis caurina*	CH T

Fish

Inland:

Oregon chub	*Oregonichthys crameri*	CH T

Invertebrates

Insects:

Fender's blue butterfly	*Icaricia icarioides fenderi*	CH E

Plants

Golden paintbrush	*Castilleja levisecta*	T
Willamette daisy	*Erigeron decumbens var. decumbens*	CH E
Water howellia	*Howellia aquatilis*	T
Bradshaw's desert parsley	*Lomatium bradshawii*	E
Kincaid's lupine	*Lupinus sulphureus ssp. kincaidii*	CH T
Nelson's checker-mallow	*Sidalcea nelsoniana*	T

PROPOSED SPECIES

None

No Proposed Endangered Species	PE
No Proposed Threatened Species	PT

CANDIDATE SPECIES

Birds

Streaked horned lark	*Eremophila alpestris strigata*

SPECIES OF CONCERN

Mammals

White-footed vole	*Arborimus albipes*
Red tree vole	*Arborimus longicaudus*
Silver-haired bat	*Lasionycteris noctivagans*
Long-eared myotis bat	*Myotis evotis*
Yuma myotis bat	*Myotis yumanensis*
Camas pocket gopher	*Thomomys bulbivorus*

Birds

Black tern	*Chlidonias niger*

Olive-sided flycatcher	*Contopus cooperi*
Yellow-breasted chat	*Icteria virens*
Acorn woodpecker	*Melanerpes formicivorus*
Lewis' woodpecker	*Melanerpes lewis*
Mountain quail	*Oreortyx pictus*
Band-tailed pigeon	*Patagioenas fasciata*
Oregon vesper sparrow	*Pooecetes gramineus affinis*
Purple martin	*Progne subis*

Reptiles and Amphibians

Northern Pacific pond turtle	*Actinemys marmorata marmorata*
Coastal tailed frog	*Ascaphus truei*
Northern red-legged frog	*Rana aurora aurora*
Southern torrent (seep) salamander	*Rhyacotriton variegatus*

Fish

Pacific lamprey	*Lampetra tridentata*
Coastal cutthroat trout	*Oncorhynchus clarki ssp*

Plants

Bog anemone	*Anemone oregana var. felix*
Willamette Valley larkspur	*Delphinium oreganum*
Peacock larkspur	*Delphinium pavonaceum*
Coast Range fawn lily	*Erythronium elegans*
Queen-of-the-forest	*Filipendula occidentalis*
Shaggy horkelia	*Horkelia congesta ssp. congesta*
Thin leaved peavine	*Lathyrus holochlorus*
Frye's Limbella	*Limbella fryei*

DELISTED SPECIES

Birds

Aleutian Canada goose	*Branta canadensis leucopareia*
American Peregrine falcon	*Falco peregrinus anatum*
Bald eagle	*Haliaeetus leucocephalus*

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AND SPECIES OF CONCERN
UNDER THE JURISDICTION OF THE FISH AND WILDLIFE SERVICE
WHICH MAY OCCUR WITHIN TILLAMOOK COUNTY, OREGON

LISTED SPECIES

Birds

Marbled murrelet	*Brachyramphus marmoratus*	CH T
Western snowy (coastal) plover	*Charadrius alexandrinus nivosus*	CH T
Short-tailed albatross	*Phoebastria albatrus*	E
Northern spotted owl	*Strix occidentalis caurina*	CH T

Reptiles and Amphibians

Marine:

Loggerhead sea turtle	*Caretta caretta*	E
Green sea turtle	*Chelonia mydas*	T
Leatherback sea turtle	*Dermochelys coriacea*	E
Olive (=Pacific) ridley sea turtle	*Lepidochelys olivacea*	T

Invertebrates

Insects:

Oregon silverspot butterfly	*Speyeria zerene hippolyta*	CH T

Plants

Nelson's checker-mallow	*Sidalcea nelsoniana*	T

PROPOSED SPECIES

None

No Proposed Endangered Species	PE
No Proposed Threatened Species	PT

SPECIES OF CONCERN

Mammals

White-footed vole	*Arborimus albipes*
Red tree vole	*Arborimus longicaudus*
Townsend's western big-eared bat	*Corynorhinus townsendii townsendii*
Silver-haired bat	*Lasionycteris noctivagans*
Long-eared myotis bat	*Myotis evotis*
Fringed myotis bat	*Myotis thysanodes*
Long-legged myotis bat	*Myotis volans*
Yuma myotis bat	*Myotis yumanensis*

Birds

Olive-sided flycatcher	*Contopus cooperi*
Black oystercatcher	*Haematopus bachmani*
Harlequin duck	*Histrionicus histrionicus*
Lewis' woodpecker	*Melanerpes lewis*
Mountain quail	*Oreortyx pictus*
Band-tailed pigeon	*Patagioenas fasciata*

Purple martin	*Progne subis*

Reptiles and Amphibians

Northern Pacific pond turtle	*Actinemys marmorata marmorata*
Coastal tailed frog	*Ascaphus truei*
Northern red-legged frog	*Rana aurora aurora*
Southern torrent (seep) salamander	*Rhyacotriton variegatus*

Fish

River lamprey	*Lampetra ayresi*
Pacific lamprey	*Lampetra tridentata*
Coastal cutthroat trout	*Oncorhynchus clarki ssp*

Plants

Pink sand-verbena	*Abronia umbellata ssp. breviflora*
Bog anemone	*Anemone oregana var. felix*
Saddle Mountain bittercress	*Cardamine pattersonii*
Pt. Reyes bird's-beak	*Cordylanthus maritimus ssp. palustris*
Frigid shootingstar	*Dodecatheon austrofrigidum*
Coast Range fawn lily	*Erythronium elegans*
Queen-of-the-forest	*Filipendula occidentalis*
Frye's Limbella	*Limbella fryei*
San Francisco bluegrass	*Poa unilateralis*
Saddle Mountain saxifrage	*Saxifraga hitchcockiana*
Henderson's checker-mallow	*Sidalcea hendersonii*
Bristly-stemmed sidalcea	*Sidalcea hirtipes*
Cascade Head catchfly	*Silene douglasii var. oraria*

DELISTED SPECIES

Birds

Aleutian Canada goose	*Branta canadensis leucopareia*
American Peregrine falcon	*Falco peregrinus anatum*
Bald eagle	*Haliaeetus leucocephalus*
Brown pelican	*Pelecanus occidentalis*

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AND SPECIES OF CONCERN
UNDER THE JURISDICTION OF THE FISH AND WILDLIFE SERVICE
WHICH MAY OCCUR WITHIN WASCO COUNTY, OREGON

LISTED SPECIES

Birds

Northern spotted owl	*Strix occidentalis caurina*	CH T

Fish

Inland:

Bull trout	*Salvelinus confluentus*	CH T

PROPOSED SPECIES

None

No Proposed Endangered Species	PE
No Proposed Threatened Species	PT

CANDIDATE SPECIES

Reptiles and Amphibians

Inland:

Oregon spotted frog	*Rana pretiosa*

Plants

Northern wormwood	*Artemisia campestris var. wormskioldii*

SPECIES OF CONCERN

Mammals

Pallid bat	*Antrozous pallidus pacificus*
Townsend's western big-eared bat	*Corynorhinus townsendii townsendii*
Spotted bat	*Euderma maculatum*
Silver-haired bat	*Lasionycteris noctivagans*
Small-footed myotis bat	*Myotis ciliolabrum*
Long-eared myotis bat	*Myotis evotis*
Long-legged myotis bat	*Myotis volans*
Yuma myotis bat	*Myotis yumanensis*

Birds

Northern goshawk	*Accipiter gentilis*
Tricolored blackbird	*Agelaius tricolor*
Western burrowing owl	*Athene cunicularia hypugaea*
Ferruginous hawk	*Buteo regalis*
Olive-sided flycatcher	*Contopus cooperi*
Willow flycatcher	*Empidonax traillii adastus*
Yellow-breasted chat	*Icteria virens*
Acorn woodpecker	*Melanerpes formicivorus*
Lewis' woodpecker	*Melanerpes lewis*

Mountain quail	*Oreortyx pictus*
Band-tailed pigeon	*Patagioenas fasciata*
White-headed woodpecker	*PIcoides albolarvatus*
Purple martin	*Progne subis*

Reptiles and Amphibians

Northern Pacific pond turtle	*Actinemys marmorata marmorata*
Coastal tailed frog	*Ascaphus truei*
Oregon slender salamander	*Batrachoseps wrighti*
Northern red-legged frog	*Rana aurora aurora*
Cascades frog	*Rana cascadae*
Northern sagebrush lizard	*Sceloporus graciosus graciosus*

Fish

Pacific lamprey	*Lampetra tridentata*
Coastal cutthroat trout	*Oncorhynchus clarki ssp*

Invertebrates

Snails:	
Columbia pebblesnail	*Fluminicola fuscus (= columbianus)*
Minor Pacific sideband snail	*Monadenia fidelis minor*
Insects:	
Beller's ground beetle	*Agonum belleri*
Clams:	
California floater mussel	*Anodonta californiensis*

Plants

Henderson ricegrass	*Achnatherum hendersonii*
Henderson's bentgrass	*Agrostis hendersonii*
Mountain grape fern	*Botrychium montanum*
Dwarf evening-primrose	*Camissonia pygmaea*
Oregon fleabane	*Erigeron oreganus*
Suksdorf's desert parsley	*Lomatium suksdorfii*
White meconella	*Meconella oregana*
Barrett's penstemon	*Penstemon barrettiae*
Dalles Mt. buttercup	*Ranunculus triternatus*

DELISTED SPECIES

Birds

American Peregrine falcon	*Falco peregrinus anatum*
Bald eagle	*Haliaeetus leucocephalus*

Definitions:

Listed Species: An endangered species is one that is in danger of extinction throughout all or a significant portion of its range. A threatened species is one that is likely to become endangered in the foreseeable future.

Proposed Species: Taxa for which the Fish and Wildlife Service or National Marine Fisheries Service has published a proposal to list as endangered or threatened in the Federal Register.

FEDERALLY LISTED, PROPOSED, CANDIDATE SPECIES AND SPECIES OF CONCERN UNDER THE JURISDICTION OF THE FISH AND WILDLIFE SERVICE WHICH MAY OCCUR WITHIN WASCO COUNTY, OREGON

Candidate Species: Taxa for which the Fish and Wildlife Service has sufficient biological information to support a proposal to list as endangered or threatened.

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Key:

E	Endangered
T	Threatened
CH	Critical Habitat has been designated for this species
PE	Proposed Endangered
PT	Proposed Threatened
PCH	Critical Habitat has been proposed for this species

Notes:

Marine & Anadromous Species: Please consult the National Marine Fisheries Service (NMFS) (http://www.nmfs.noaa.gov/pr/species/) for marine and anadromous species. The National Marine Fisheries Service (NMFS) manages mostly marine and anadromous species, while the U.S. Fish and Wildlife Service manages the remainder of the listed species, mostly terrestrial and freshwater species.

Marine Turtle Conservation and Management: All six species of sea turtles occurring in the U.S. are protected under the Endangered Species Act of 1973. In 1977, NOAA Fisheries and the U.S. Fish and Wildlife Service signed a Memorandum of Understanding to jointly administer the Endangered Species Act with respect to marine turtles. NOAA Fisheries has the lead responsibility for the conservation and recovery of sea turtles in the marine environment and the U.S. Fish and Wildlife Service has the lead for the conservation and recovery of sea turtles on nesting beaches. For more information, see the NOAA Fisheries webpage on sea turtles http://www.nmfs.noaa.gov/pr/species/turtles/.

Gray Wolf: On February 27, 2008, the Service published a final rule that established a distinct population segment of the gray wolf (*Canis lupis*) in the northern Rocky Mountains (which includes a portion of Eastern Oregon, east of the centerline of Highway 395 and Highway 78 north of Burns Junction and that portion of Oregon east of the centerline of Highway 95 south of Burns Junction). Any wolves found west of this line in Oregon belong to the conterminous USA population [see 73 FR 10514]. Gray wolves in Oregon are State-listed as endangered, regardless of location.

FEDERALLY LISTED, PROPOSED, CANDIDATE SPECIES
AND SPECIES OF CONCERN
UNDER THE JURISDICTION OF THE FISH AND WILDLIFE SERVICE
WHICH MAY OCCUR WITHIN WASHINGTON COUNTY, OREGON

LISTED SPECIES

Birds

Marbled murrelet	*Brachyramphus marmoratus*	CH T
Northern spotted owl	*Strix occidentalis caurina*	CH T

Plants

Kincaid's lupine	*Lupinus sulphureus ssp. kincaidii*	CH T
Nelson's checker-mallow	*Sidalcea nelsoniana*	T

PROPOSED SPECIES

None

No Proposed Endangered Species	PE
No Proposed Threatened Species	PT

CANDIDATE SPECIES

Birds

Streaked horned lark	*Eremophila alpestris strigata*

SPECIES OF CONCERN

Mammals

White-footed vole	*Arborimus albipes*
Red tree vole	*Arborimus longicaudus*
Townsend's western big-eared bat	*Corynorhinus townsendii townsendii*
Silver-haired bat	*Lasionycteris noctivagans*
Fringed myotis bat	*Myotis thysanodes*
Long-legged myotis bat	*Myotis volans*
Yuma myotis bat	*Myotis yumanensis*
Camas pocket gopher	*Thomomys bulbivorus*

Birds

Olive-sided flycatcher	*Contopus cooperi*
Yellow-breasted chat	*Icteria virens*
Acorn woodpecker	*Melanerpes formicivorus*
Lewis' woodpecker	*Melanerpes lewis*
Mountain quail	*Oreortyx pictus*
Band-tailed pigeon	*Patagioenas fasciata*
Oregon vesper sparrow	*Pooecetes gramineus affinis*
Purple martin	*Progne subis*

Reptiles and Amphibians

Northern Pacific pond turtle	*Actinemys marmorata marmorata*
Coastal tailed frog	*Ascaphus truei*

Northern red-legged frog	*Rana aurora aurora*

Fish

Malheur mottled sculpin	*Cottus bairdi ssp.*
Pacific lamprey	*Lampetra tridentata*
Coastal cutthroat trout	*Oncorhynchus clarki ssp*

Invertebrates

Clams:

California floater mussel	*Anodonta californiensis*

Plants

Pale larkspur	*Delphinium leucophaeum*
Shaggy horkelia	*Horkelia congesta ssp. congesta*
Thin leaved peavine	*Lathyrus holochlorus*

DELISTED SPECIES

Birds

Aleutian Canada goose	*Branta canadensis leucopareia*
American Peregrine falcon	*Falco peregrinus anatum*
Bald eagle	*Haliaeetus leucocephalus*

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FEDERALLY LISTED, PROPOSED, CANDIDATE SPECIES AND SPECIES OF CONCERN UNDER THE JURISDICTION OF THE FISH AND WILDLIFE SERVICE WHICH MAY OCCUR WITHIN WASHINGTON COUNTY, OREGON

PCH Critical Habitat has been proposed for this species

Notes:

Marine & Anadromous Species: Please consult the National Marine Fisheries Service (NMFS) (http://www.nmfs.noaa.gov/pr/species/) for marine and anadromous species. The National Marine Fisheries Service (NMFS) manages mostly marine and anadromous species, while the U.S. Fish and Wildlife Service manages the remainder of the listed species, mostly terrestrial and freshwater species.

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FEDERALLY LISTED, PROPOSED, CANDIDATE SPECIES
AND SPECIES OF CONCERN
UNDER THE JURISDICTION OF THE FISH AND WILDLIFE SERVICE
WHICH MAY OCCUR WITHIN YAMHILL COUNTY, OREGON

LISTED SPECIES

Birds

Marbled murrelet	*Brachyramphus marmoratus*	CH T
Northern spotted owl	*Strix occidentalis caurina*	CH T

Invertebrates

Insects:

Fender's blue butterfly	*Icaricia icarioides fenderi*	CH E
Oregon silverspot butterfly	*Speyeria zerene hippolyta*	CH T

Plants

Willamette daisy	*Erigeron decumbens var. decumbens*	CH E
Water howellia	*Howellia aquatilis*	T
Kincaid's lupine	*Lupinus sulphureus ssp. kincaidii*	CH T
Nelson's checker-mallow	*Sidalcea nelsoniana*	T

PROPOSED SPECIES

None

No Proposed Endangered Species	PE
No Proposed Threatened Species	PT

CANDIDATE SPECIES

Birds

Streaked horned lark	*Eremophila alpestris strigata*

SPECIES OF CONCERN

Mammals

White-footed vole	*Arborimus albipes*
Red tree vole	*Arborimus longicaudus*
Long-eared myotis bat	*Myotis evotis*
Yuma myotis bat	*Myotis yumanensis*
Camas pocket gopher	*Thomomys bulbivorus*

Birds

Olive-sided flycatcher	*Contopus cooperi*
Yellow-breasted chat	*Icteria virens*
Acorn woodpecker	*Melanerpes formicivorus*
Lewis' woodpecker	*Melanerpes lewis*
Mountain quail	*Oreortyx pictus*
Band-tailed pigeon	*Patagioenas fasciata*
Oregon vesper sparrow	*Pooecetes gramineus affinis*
Purple martin	*Progne subis*

Reptiles and Amphibians

Northern Pacific pond turtle	*Actinemys marmorata marmorata*
Coastal tailed frog	*Ascaphus truei*
Northern red-legged frog	*Rana aurora aurora*
Southern torrent (seep) salamander	*Rhyacotriton variegatus*

Fish

Pacific lamprey	*Lampetra tridentata*
Coastal cutthroat trout	*Oncorhynchus clarki ssp*

Invertebrates

Insects:

American acetropis grass bug	*Acetropis americana*

Plants

Bog anemone	*Anemone oregana var. felix*
Pale larkspur	*Delphinium leucophaeum*
Willamette Valley larkspur	*Delphinium oreganum*
Coast Range fawn lily	*Erythronium elegans*
Thin leaved peavine	*Lathyrus holochlorus*

DELISTED SPECIES

Birds

Aleutian Canada goose	*Branta canadensis leucopareia*
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FEDERALLY LISTED, PROPOSED, CANDIDATE SPECIES AND SPECIES OF CONCERN UNDER THE JURISDICTION OF THE FISH AND WILDLIFE SERVICE WHICH MAY OCCUR WITHIN YAMHILL COUNTY, OREGON

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Appendix B

Army Regulation 385-95, Army Aviation Accident Prevention

Department of the Army
Pamphlet 385–90

Safety

Army Aviation Accident Prevention Program

Headquarters
Department of the Army
Washington, DC
28 August 2007

UNCLASSIFIED

SUMMARY of CHANGE

DA PAM 385-90
Army Aviation Accident Prevention Program

This new publication, dated 28 August 2007--

- Prescribes unit and higher level aviation safety program guidelines (para 1-4).
- Applies Composite Risk Management (CRM) in each phase of training management (para 2-2).
- Clarifies safety council and meeting guidance (para 2-4).
- Establishes requirements for reporting of hazards and hazard tracking (paras 2-3, 2-7, and 2-10).
- Describes a foreign object damage (FOD) prevention program for aircraft (para 2-8).
- Establishes aviation accident prevention survey guidelines for commanders (para 2-11).
- Provides a risk management process for standing operating procedures (para 2-12).
- Defines functions for safety related programs and processes used by the safety staff (chap 3).

Headquarters
Department of the Army
Washington, DC
28 August 2007

Department of the Army Pamphlet 385–90

Safety

Army Aviation Accident Prevention Program

By Order of the Secretary of the Army:

GEORGE W. CASEY, JR.
General, United States Army
Chief of Staff

Official:

JOYCE E. MORROW
Administrative Assistant to the Secretary of the Army

History. This is a new Department of the Army Pamphlet.

Summary. This new pamphlet implements the Army Aviation Safety Program established to promote safety within the Army aviation community through education and the application of information and techniques oriented to aviation, including unmanned aerial systems. The pamphlet defines procedures to be used by the safety component of protecting the force to be an integral part of Army aviation operations and integrates Composite Risk Management (CRM) into existing command processes. This pamphlet implements the requirements of AR 385-10 and other directives.

Applicability. This pamphlet applies to all active duty Army military personnel on or off a DOD installation; to the Army National Guard/Army National Guard of the United States and the United States Army Reserve personnel while in a military duty status and to all Army civilian personnel in a duty status and on or off a DOD installation, and to all persons at any time on an Army installation. This pamphlet is applicable during full mobilization. During mobilization, the proponent may modify chapters and policies contained in this pamphlet as required to meet mobilization requirements unless otherwise stated.

Proponent and exception authority. The proponent for this pamphlet is the Chief of Staff, Army. The proponent has the authority to approve exceptions to this pamphlet that are consistent with controlling law and regulations. The proponent has delegated approval authority to Office of the Director of Army Safety, Office of the Chief of Staff, Army. The proponent may delegate this approval authority, in writing, to a division chief within the proponent agency or its direct reporting unit or field operating agency, in the grade of colonel or the civilian equivalent. Activities may request a waiver to this pamphlet by providing justification that includes a full analysis of the expected benefits and must include a formal review by the activity's senior legal officer. All waiver requested will be endorsed by the commander or senior leader of the requesting activity and forwarded through their higher headquarters to the policy proponent. Refer to AR 25–30 for specific guidance.

Suggested improvements. Users of are invited to send comments and suggested improvements on DA Form 2028 (Recommended Changes to Publications and Blank Forms) directly to the Director of Army Safety, ATTN: ODASAF, 223 23rd St., Room 980, Arlington, VA 22202.

Committee Continuance Approval. The Department of the Army Committee Management Officer concurs in the establishment and/or continuance of the committee(s) outlined herein, in accordance with AR 15-1. AR 15-1 requires the proponent to justify establishing/continuing its committee(s), coordinate draft publications, and coordinate changes in committee status with the Department of the Army Committee Management Office, ATTN: SAAA-RP, Office of the Administrative Assistant, Resources and Programs Agency, 2511 Jefferson Davis Highway, Taylor Building, 13th Floor, Arlington, VA 22202-3926. Further, if it is determined that an established "group" identified within this regulation later takes on the characteristics of a committee, the proponent will follow all AR 15-1 requirements for establishing and continuing the group as a committee.

Distribution. This publication is available in electronic media only and is intended for command levels A, B, C, D, and E for the Active Army, the Army National Guard/Army National Guard of the United States, and the United States Reserve.

UNCLASSIFIED

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Glossary

Chapter 1
General

1–1. Purpose

This pamphlet—

a. Establishes the promotion of safety within the Army aviation community through education and the application of information and techniques oriented to aviation, including unmanned aerial systems.

b. Defines procedures and process to be used by the safety component of protecting the force to be an integral part of Army aviation training and operations.

c. Provides functions, policies, and duties for the integration of safety and Composite Risk Management (CRM) into existing command processes.

1–2. References

Required and related publications and prescribed and referenced forms are listed in appendix A.

1–3. Explanation of abbreviations and terms

Abbreviations and special terms used in this regulation are explained in the glossary.

1–4. Functions

a. The Secretary of the Army. The Secretary of the Army, or authorized representative, reserves all authority and final approval for DA aviation matters and has the responsibility for operational support airlift (OSA) management.

b. The Assistant Secretary of the Army (Installations and Environment) (ASA(I&E)). The ASA(I&E) is the principal adviser and assistant to the Secretary of the Army for the Army aviation safety component of protecting the force.

c. The Assistant Secretary of the Army (Financial Management and Comptroller) (ASA(FM&C)). The ASA(FM&C) prepares and publishes Army cost comparison rates and Army aircraft reimbursement rates annually and provides cost analysis support to OSA management and other agencies on request.

d. The Chief of Staff, Army. The Office of the Chief of Staff, Army approves Armywide grounding of an entire mission, type, design, and series (MTDS) fleet of air-craft. This authority applies to safety of flight (SOF) and aviation safety action messages (ASAM).

e. The Deputy Chief of Staff, DCS, G–3. The DCS, G-3 has staff functions for Army aviation, including:

(1) Authorizing selected waivers, limited to those items referenced in AR 95–1, paragraph 1–7.

(2) Reporting Army flying hour program execution during the quarterly program performance and budget execution review.

f. The Deputy Chief of Staff G–1. The DCS, G-1 promotes aviation safety and accident prevention, and recommends aviation safety risk areas as candidates for future research and studies by the U.S. Army Research Institute (ARI) and/or by the U.S. Army Research Laboratory Human Research Engineering Directorate (HRED).

g. The Director of Army Safety. The Director of Army Safety (DASAF) manages the Army aviation accident prevention program and is responsible for Armywide aviation safety functions cited in AR 10–88, including, "U.S. Army Combat Readiness Center." The DASAF will provide the functions of developing aviation risk control options for commanders.

h. U.S. Army Headquarters. Commanders establish, in writing, policy for risk decision authority level.

(1) *The Commander, U.S. Army Training and Doctrine Command.* The U.S. Army Training and Doctrine Command (TRADOC)—

(a) Integrates the safety component of protecting the force into aviation doctrine, training, leadership development, organizational design, materiel requirements, and soldier issues (DTLOMS).

(b) Monitors the safety performance of aviation modified table of organization and equipment (MTOE) and table of distribution and allowances (TDA) units, and school products Armywide.

(c) Develops aviation safety lessons learned and countermeasures.

(2) *The Commander, U.S. Army Forces Command.* The U.S. Army Forces Command (FORSCOM) integrates the safety component of protecting the force into Army force projection plans and procedures.

(3) *The Commander, U.S. Army Materiel Command.* The U.S. Army Materiel Command (AMC)—

(a) Integrates the safety component of protecting the force into Army plans, procedures, and criteria to sustain the force.

(b) Eliminates hazards in aviation equipment, materiel systems, science and technology, and informs users of the hazards associated with equipment designs, maintenance, and operation.

(c) In conjunction with CG TRADOC, informs HQDA of the high risks associated with the systems it provides.

i. All U.S. Army Headquarter Commanders. Commanders with assigned aviation activities and/or units maintain current authorized full-time positions for qualified aviation safety officers (ASO) (CW5), or qualified aviation safety technicians (CW5), on the headquarters safety office staff. However, Army Headquarter commanders with limited

aviation assets, (12 or fewer aircraft), may assign ASO responsibilities to an ASO–qualified operations staff aviation/action officer.

j. Commanders. Commanders provide the following functions:

(1) Effectively manage risk to minimize the accidental loss of aviation personnel and equipment.

(2) Maintain current authorized full-time positions for qualified ASOs at Army Headquarters, corps, installations or facilities that support aviation activities, and aviation unit levels (regiment/brigade/group, battalion/squadron, company/troop, detachments and comparable-size activities).

(3) Appoint and rate the ASOs at regiment/brigade/group level and below.

(a) Ensure that ASOs are not assigned duties that are not related to the safety component of protecting the force.

(b) Units that do not have table of organization and equipment (TOE)/TDA-authorized ASO positions will utilize the expertise of the next higher authorized ASO in the chain of command. Additionally, commanders not authorized full-time ASOs by the TOE/TDA will appoint additional duty Safety Officers (SOs)/non-commissioned officers (NCOs).

(c) Additional-duty ASOs must be graduates of the USACRC Aviation Safety Officer Course. Safety-trained NCO or qualified individuals will be appointed by unit commanders, in writing, to assist the ASOs.

(d) Commanders will support the resourcing of adequate computer equipment to allow ASOs to perform assigned duties more efficiently.

(4) Ensure compliance with Department of Defense (DOD), Department of the Army (DA), Occupational Safety and Health Administration (OSHA), National Fire Protection Association (NFPA), and Environmental Protection Agency (EPA) requirements. Commanders will establish other requirements as necessary for protection of personnel and equipment under their control.

(5) Develop current safety goals, objectives, and priorities and include them in quarterly training guidance (annually for Reserve component).

(6) Integrate risk controls into standing operating procedures (SOP) and ensure that written SOPs exist for all functional areas and for all operations within the command (A stand alone written commander's accident prevention plan is no longer required.) SOPs will include the following:

(a) Composite risk management (CRM) procedures and responsibilities for training and operations.

(b) Risk controls for hazards most frequently experienced.

(c) Command level authority to accept each level of risk, (low, moderate, high, and extreme high).

(d) Pre-accident plans, including immediate actions, investigation procedures (See DA Pamphlet (PAM) 385–40.), reporting and records (See AR 385–10.), and corrective action responsibilities. (See app C for sample pre-accident plan.)

(e) Procedures and responsibilities for safety-related programs. (See chap 2.)

(7) Conduct risk assessment during the planning phase of training, as part of the commander's training assessment, to identify shortcomings (hazards) and to develop actions to eliminate or control them.

(8) Ensure that CRM procedures are integrated into the decision making process to identify and control hazards during the execution phase of training and during operational missions.

(9) Ensure that the unit's risk management and safety performance is systematically observed and assessed during training and operations.

(10) Ensure sufficient information is provided during after action reviews (AARs) to determine if the performance met the commander's safety guidance (goals, objectives, and priorities).

(11) Ensure that corrective actions/controls to improve performance are identified and included in the training management cycle and unit SOP.

(12) Clearly specify, in writing, protection (safety) duties for staff officers, subordinate commanders, leaders, and individuals.

(13) Designate, in writing, a Command Safety Council (CSC) and an Enlisted Safety Council (ESC) to be convened a minimum of quarterly for the purpose of reviewing risk-control options, making risk-control-option decisions, and directing implementation of risk-control options. The CSC and ESC may be combined as one council in units with a low density of officer or enlisted personnel, such as detachments, platoons, and facilities. Commanders may consolidate councils (one CSC and one ESC) at no higher than battalion/squadron level.

(14) Conduct safety meetings monthly for active component and full-time reserve component personnel and quarterly for all others.

(15) Ensure that a complete aviation accident prevention survey (AAPS) is conducted of all unit functional areas at a minimum of semiannually for active component and full-time Reserve component facilities and annually for all others.

k. Deputy Chief of Staff, G–3/S–3/operations officers. Deputy Chief of Staff, G–3/S–3/operations officers (DCS, G–3/S–3) operations officers should do the following:

(1) Gather mission, enemy, terrain and weather, troop and support available, civilian considerations (METT–TC) information and complete an aviation accident risk assessment for each course of action (COA).

(2) Include the aviation accident risk in determining the residual risk level of each COA on the decision matrix.

(3) Identify the most severe and most probable hazards for each functional area and develop controls for each hazard.

(4) Implement and monitor control measures selected by the commander.

(5) Manage the risk of new or increased-risk METT–TC hazards as they occur during mission execution.

l. Operations officers. Operations officers should do the following:

(1) Ensure that all aviators are issued appropriate, current publications for pilot-age or navigation purposes.

(2) Ensure that pilots are properly briefed on each mission prior to the planning phase of the mission and monitor aviation safety during mission planning through execution. (A risk assessment is conducted for each mission.)

(3) Monitor each pilot-in-command (PC) mission debriefs upon completion of the mission and immediately pass safety breaches, incidents, and potential hazards to the ASO for investigation.

(4) Ensure that a detailed hazard location map covering the entire unit operational area is posted and current.

(5) Monitor the crew endurance program and provide feedback as necessary to meet mission requirements.

(6) Manage the unit reading file, implementing a system that ensures new information is reviewed by crewmembers in a timely manner.

(7) Prepare and maintain the unit pre-accident plan for the commander. The expertise of the ASO and other applicable elements is used in accomplishing this task.

(8) Rehearse, review, and document the adequacy of the unit pre-accident plan. This must be a systematic review and is conducted at least quarterly. The degree of response by elements in the pre-accident plan can vary; however, an exercise requiring all elements to physically respond must be conducted at least annually.

m. Aviation safety officers. Aviation safety officers should do the following:

(1) As their primary duty, advise and assist the commander and staff on all safety matters, including—

(a) Developing safety policy.

(b) Developing safety goals, objectives, and priorities and integrating them into appropriate training guidance based upon identification of the most probable and severe types of accidents expected and the most likely reasons (hazards) for these accidents.

(c) Developing corrective actions/control options for command selection.

(2) Monitor the ability of each unit functional area (for example, war fighting functions) to protect the force against aviation accidents.

(3) Advise the commander when a below-standard status that affects safety is detected in any functional area.

(4) Advise and assist in developing the commander's training assessment based upon a safety assessment of unit functional areas using diagnostic tools and programs administered or monitored by the ASO. (See chaps 2 and 3.)

(5) Assist the commander and staff in assessing the unit's CRM effectiveness and safety performance after operations by:

(a) Collecting from each staff section, information about risk-management successes, shortcomings, and needed improvements.

(b) Assisting the commander in determining if the performance met the commander's guidance (goals, objectives, and priorities).

(c) Assisting staff officers in implementing corrective actions/controls selected by the commander to improve performance.

(6) Administer or monitor safety-related programs, including:

(a) Observing flight and ground operations to detect and correct unsafe practices.

(b) Conducting hazard analysis, prioritizing hazards in terms of accident severity and probability, and promptly advising the appropriate officials.

(c) Conducting safety meetings monthly for active component and full time Reserve components/facilities, and quarterly for all others.

(d) Reviewing aircraft accident reports and helping to implement corrective measures.

(e) Rehearsing, reviewing, and documenting the adequacy of the unit preaccident plan. This must be a systematic review to be conducted at least quarterly. The degree of response by elements in the pre-accident plan may be varied; however, an exercise requiring all elements to physically respond must be conducted at least annually.

(f) Ensuring that air-traffic-control communication equipment, navigational aids, and all other electronic aids to aircraft operations are inspected frequently and regularly.

(g) Inspecting semiannually the physical condition of airfields, heliports, helipads, and tactical landing sites for hazards; when deficiencies are noted, recommending abatements and ensuring that all known hazards are publicized.

(h) Acquiring and maintaining a current reference library of aviation literature. (See app A.)

(i) Maintaining accident-prevention and other appropriate safety literature and posters and making distribution a priority.

(j) Reviewing aviator flight records, making appropriate entries as necessary to unit training programs, and recommending corrections to any deficiencies noted.

(k) Monitoring techniques and proficiency of personnel in handling weapons; ammunition or explosives; petroleum, oil, and lubricants (POL); chemicals; hazardous and toxic materials; and lasers.

(l) Observing aviation maintenance operations, making recommendations to correct unsafe procedures and practices, and monitoring the Safety of Flight (SOF) Program.

(m) Managing the operational hazard report (OHR) program and monitoring the foreign object damage (FOD) prevention program. (See chap 2.)

(n) Reviewing results of accident-prevention surveys and other inspection results, bringing noted deficiencies to the immediate attention of the commander and Command Safety Council, and establishing follow-up procedures to correct deficiencies.

(o) Monitoring unit aviation life-support equipment (ALSE) and related survival training programs.

(p) Monitoring the hazard communication program.

(q) Managing the unit's safety award program. This should be done in consonance with the unit administration officer and according to the guidelines contained in DA Pam 385–10.

n. Army aviator. The Army aviator is the basic element in the command line of aircraft accident prevention. Minimum aviation duties, in regard to safety, are—

(1) Attaining and maintaining proficiency in all aircraft that the aviator is assigned to pilot.

(2) Maintaining appropriate physical and mental fitness according to applicable Army regulations.

(3) Complying with sound flight principles (aircrew training manuals (ATMs), ARs, FMs, Federal Aviation Regulations (FARs)) and safe practices during all flight operations.

(4) Immediately reporting hazards and unsafe conditions or acts to the proper authority. After initial verbal reporting, providing a DA Form 2696 (Operational Hazard Report) to document the condition and promote follow-up actions as appropriate.

(5) Making on-the-spot corrections of unsafe conditions when appropriate.

o. Aviation maintenance officer. The aviation maintenance officer develops and maintains an effective maintenance program. The aviation maintenance officer should—

(1) Continuously monitor quality control (QC) through coordination with QC personnel, ensuring that QC personnel complete SF 368 (Product Quality Deficiency Reports) according to established procedures (ARs, TMs, FMs, and so forth).

(2) Ensure adequate training of maintenance personnel; and ensure that a formal continuing education program is available to provide maintenance personnel with current information on techniques, procedures, and modifications.

(3) Ensure proper and timely aircraft inspections.

(4) Ensure adequate program supervision to guarantee that maintenance personnel are aware of, and comply with, all technical directives affecting aircraft operations.

(5) Ensure that discrepancies (write-ups) are properly classified as to status and that they are properly cleared.

(6) Monitor and manage the equipment improvement recommendation (EIR) program and the Army oil analysis program (AOAP).

(7) Provide maintenance personnel with lessons-to-be-learned from accident summaries that cite maintenance as the accident cause factor.

(8) Ensure that maintenance test pilots (Army and contractor) meet the requirements of AR 95–1 and Technical Manual (TM) 55–1500–328–25 to perform maintenance test flights, and ensure maintenance test flights are performed according to appropriate directives.

p. Flight surgeon. The flight surgeon assists and advises the command in all aviation medical matters. In remote areas where a flight surgeon is not assigned or readily available, local support will be provided by the servicing medical department activity (MEDDAC) to best accomplish these duties. The flight surgeon should:

(1) Maintain liaison within the command to implement the aviation medicine program.

(2) Take part in, and observe, flight operations to monitor the interactions of crewmembers, aircraft, and environment. The flight surgeon exerts maximum effort in observing the flying ability and characteristics of each assigned aviator at least annually.

(3) Serve as a member of aircraft accident investigations board, when directed.

(4) Serve as a member of flight evaluation boards, when directed.

(5) Ensure that the medical portion of the pre-accident plan is adequate.

(6) Monitor the physical and mental health of aviation personnel, including alcohol, tobacco, dietary supplements, and self-medication problems (See AR 40–8).

(7) Advise the commander on crew-endurance issues.

(8) Maintain aviation medical records on flight personnel, assist the unit in providing annual occupational health and

safety screening for non-crewmember personnel, and ensure that DA Form 4186 (Medical Recommendation for Flying Duty) prepared on flight personnel is accurate and complete prior to being sent to the unit commander for approval.

(9) Monitor the survival and physiological training of aviation crewmembers and provide medical support in accordance with applicable Army regulations.

(10) Medically clear crewmembers for further flight duty after aircraft accidents in accordance with applicable Army regulations.

(11) Make recommendations to the Commander, USACRC, for improvement of human factors compatibility, crashworthiness, aviation life-support equipment, and survival features of aircraft.

(12) Take part in aviation safety meetings to educate aviation crewmembers on the aeromedical aspects of flight.

(13) Monitor the aviation life support equipment (ALSE) program.

(14) Assist in, and advise on, the hearing and occupational vision program.

(15) Ensure command consideration of preventive and occupational medicine aspects of all plans, operations, training, and security missions.

q. Senior noncommissioned officer. The senior NCO promotes safety within the unit and acts as chairperson for the ESC.

r. Aviation safety noncommissioned officer. The aviation safety NCO assists, advises, and makes recommendations to the ASO on aviation accident-prevention matters. The aviation safety NCO should—

(1) Maintain liaison with the command sergeant major, first sergeants, and other enlisted personnel on all aviation safety matters.

(2) Observe aircraft support activities (such as POL, maintenance, operations, and enlisted crewmembers' training) to detect and report unsafe practices or procedures.

(3) Act as recorder for the ESC.

(4) Maintain liaison between the ESC and the CSC.

(5) Post reference files on aviation safety literature for the ASO, keeping the ASO informed of noted changes and new material received, and ensures that all files are current and complete.

(6) Participate in unit safety surveys and inspections.

s. Unit instructor pilot or flight standardization officer. The unit instructor pilot or flight standardization officer should:

(1) Administer the aviator standardization or training program for the commander according to AR 95–1, TC 1–210, and appropriate aircraft aviation technical manual (ATMs) and stress that sound safety principles must be adhered to during all standardization or training operations.

(2) Monitor aircrew status, annual proficiency and readiness test (APART), instrument qualification or currency, and advise the commander of deviations.

(3) Actively participate in unit safety meetings and CSC meetings.

t. Aircrew. Each aircrew member is ultimately responsible for ensuring his/her own safety and for expeditiously advising the aviator that an unsafe practice is occurring or is about to occur.

u. ALSE officer/NCO/technician. The ALSE officer/NCO/technician should:

(1) Ensure that each aircrew member is equipped with all required items of individual aviation life-support equipment and ensure that each aircraft is equipped with crew life-support equipment (kits or sets) required for the mission and environment.

(2) Ensure that all life-support equipment is maintained, inspected, and replaced in accordance with AR 95–1, paragraphs 8–16, 8–17, and 8–18.

v. Tenants. Tenants are responsible for coordinating with installation commanders concerning aviation safety responsibilities, functions, and funding. Procedures are properly described in host/tenant agreements.

w. Command Safety Director (installation and Army Headquarter level). The command safety director is the commander's direct safety representative and is responsible for the overall safety management within the command. Duties include providing for safety training, safety education and promotion, accident reporting, analysis, statistics, and recommending corrective or preventive actions to the commander. The safety director will also ensure that safety is integrated into all activities within the command.

x. Individuals.

(1) Individual unit members are directly responsible for their own safety, both on and off duty.

(2) Each individual has a moral responsibility to advise others about anyone who may, knowingly or unknowingly, be committing, or about to commit, an unsafe act.

Chapter 2
Aviation Safety Program

2–1. Introduction

Aviation operations involve inherently higher risk (higher probability of accidents and more severe consequences) than most ground operations. Historically, when deployed to combat theaters, Army aviation has suffered more losses to accidents than to enemy action. Aviation accidents in combat are typically the same type experienced in peacetime. Because of this, commanders of units involved in aviation operations must emphasize the safety component of protecting the force. Commanders, supervisors, and safety managers at all levels must comply with certain policies regarding the aviation safety component for protecting the force.

2–2. Composite Risk Management

Composite Risk Management (DA Pam 385–30) provides a structured approach to planning training and missions in a manner that will control risks and reduce the hazards in accordance with DA Pam 385–30 and FM 5–19. Aviation commanders will insure that CRM procedures are applied in each phase of the training-management cycle (see FM 7–1) to identify hazardous conditions and correct shortcomings responsible for these conditions.

a. Aircraft accidents are caused by below-standard performance of unit functions (for example, War fighting functions) due to human factors, material failure or inadequate precautions for environmental factors. Hazardous conditions are caused by shortcomings in the following areas:

(1) *Support.* Failure to provide adequate equipment, personnel, services, facilities or maintenance.

(2) *Standards.* Failure to provide practical guidance and standards of task performance.

(3) *Training.* Failure to provide awareness of, or the essential skills and knowledge to accomplish task to standard.

(4) *Leadership.* Failure to manage risk effectively or fails to enforce known standards.

(5) *Individual.* Failure of the individual to follow known standards.

b. The CRM will be used to ensure flexible risk reduction measures are available for use at the decisive point and time for successful operations. Combat power is generated by soldiers and machines performing War fighting functions in the operational environment. Hazards not identified and controlled during operations can cause accidents and unnecessarily deplete combat power. During planning and execution of aviation missions, commanders will integrate CRM procedures into the decision-making process to identify and control METT–TC hazards. Mission after action reviews (AAR) will assess the effectiveness of risk management and safe performance.

c. Integrate the requirement for protecting the force with the demand for realistic training and mission readiness. A high degree of mission effectiveness is achieved through systematic management of inherent mission risks. The concept and the systematic process of CRM must be understood, promoted, and applied by leaders at each level.

d. All commanders will integrate risk controls into SOPs (A standalone written commander's accident prevention plan is no longer required) and ensure that written SOPs exist for all functional areas and for all operations within the command. SOPs will include information in accordance with 1–4j(6).

e. Commanders will provide functions in accordance with 1–4j(7–9). Ensure that personnel are trained in CRM and risk management. Training in CRM is available on line at https://crc.army.mil/home/. Additional examples and information may be found in FM 5-19.

2–3. Commander's Safety Philosophy

Each commander will develop and state their safety philosophy in writing. The safety policy will incorporate the commander's safety goals, objectives and priorities. The safety philosophy should be included in their quarterly training guidance/planning (annually for Reserve component).

2–4. Safety councils and meetings

Safety councils and meetings provide risk management forums to assist the commander in developing and implementing an aviation accident prevention program. Safety councils are named at two levels, the CSC and the ESC.

a. Commanders should designate, in writing, safety councils to provide risk-management forums that allow leaders to review current or projected hazards, their associated risk, and to make decisions on their elimination or control. Councils will convene a minimum of quarterly regardless of unit status or location.

b. The CSC is organized by the ASO, chaired by the commander, and consists of the following unit personnel (if assigned), at a minimum:

(1) Commander.

(2) Operations officer (S–3).

(3) Instructor pilot/standardization instructor pilot (IP/SP).

(4) ASO.

(5) Aviation maintenance officer.

(6) Aviation Life Support Systems (ALSS) manager.

(7) Flight surgeon.

(8) Senior unit NCO (1SG/CSM).

(9) Aviation safety NCO (ASNCO).

(10) Other personnel designated by the commander.

c. At a minimum the agenda of each council meeting should include a review of unit hazard-tracking log and recent accidents, address the effectiveness of risk control options, and present an opportunity for decision-making on proposed risk control options for newly identified hazards. The ASO should organize the meeting to allow the commander to select the best COA and task the appropriate staff/subordinate commander with control option action. The CSC should focus on tactical and leadership issues that require command visibility and decision-making.

d. The ESC is organized by the ASNCO and chaired by the senior NCO (1SG/CSM). The function of the ESC is similar to that of the CSC except the focus is primarily toward soldier safety issues that are more efficiently resolved through NCO leadership. (Consideration should be given to including at least one junior enlisted soldier on the ESC for a "hands-on" perspective of hazards.) The ESC should convene prior to the CSC to allow unresolved issues to be forwarded for command action. The ESC and the CSC may be combined as one council in units with a low density of enlisted or officer personnel at no higher than detachment, facility, or company level. The ESC consists of the following personnel, at a minimum:

(1) Senior NCO.

(2) ASNCO.

(3) Operations NCO.

(4) Maintenance NCO.

(5) ALSS NCO.

(6) POL NCO.

(7) Other personnel designated at the commander's discretion.

e. Safety councils may be consolidated at no higher than battalion/squadron level.

f. Safety council minutes will document command decisions on risk-control options. Council minutes should be very specific in describing the risk control option, the responsible individual that is responsible for implementing the control option, and the date by which the commander expects the action to be completed. The commander will approve and sign the council minutes. Wide dissemination of safety council actions should be ensured through safety awareness meetings and by posting minutes to safety bulletin boards.

g. Unit safety training meetings will be conducted at least monthly by commanders for active component and full-time reserve component units/facilities and quarterly for all others.

(1) Safety training meetings should include training and open dialog on aviation and ground hazards affecting the unit. The commander may conduct separate ground and aviation safety meetings as long as all personnel receive training pertinent to their duty positions and off-duty activities.

(2) Safety meetings should be programmed at least twelve months out and included on the unit training schedule. Commanders will develop a "make-up" system that ensures that personnel not able to attend a safety training meeting will receive the same quality of training as those who attended. If the unit has the equipment available, videotaped meetings are an effective make-up tool.

(3) Safety training meetings may be consolidated at battalion/squadron or even brigade/group level. However, safety training and dialog is most effective when conducted at the lowest unit level.

2–5. Safety awards

Safety awards provide recognition and incentive to soldiers and civilians for improving risk control and reducing the occurrence of aviation accidents.

a. Commanders will integrate and budget safety awards into the unit awards program, in accordance with AR 385–10 and DA Pam 385–10. The unit ASO will manage the safety awards program through coordination with the unit administration officer/NCO.

b. Commanders will actively participate in higher headquarters, Army Headquarters and Department of the Army safety awards programs.

c. Commanders will implement local or unit safety awards programs that recognize individual and unit safe performance and will develop, budget for, and use "impact" awards to quickly recognize individuals or units for specific acts that advance accident prevention.

2–6. Safety continuing education

Management of an effective aviation safety program requires technical skills acquired only through qualification training and continuing education. Commanders should support a continuing education program for safety personnel. Particular emphasis should be placed on continuing education provided or endorsed by the U.S. Army, Department of Defense and/or the Department of Labor. Information on U.S. Army safety continuing education may be obtained from the USACRC, Fort Rucker, AL (Web site is https://crc.army.mil/home/).

2–7. Operational hazard reporting

An operational hazard is any condition, action or set of circumstances that compromise the safety of Army aircraft, associated personnel, airfields or equipment. Operational hazards should be corrected at the lowest level possible.

a. Operational hazards include inadequacies, deficiencies, or unsafe practices pertaining to:

(1) Air traffic control (ATC).

(2) Airways and navigational aids (NAVAIDs).

(3) Controller procedures and techniques.

(4) Near mid-air collisions (NMAC) between aircraft or near collisions between aircraft and other objects in the air or on the ground.

(5) Aircraft operations.

(6) Aircraft maintenance or inspection.

(7) Weather services.

(8) Airfields and heliports facilities or services.

(9) Flight or maintenance training and education.

(10) Regulations, directives, and publications issued by Department of Defense (DOD) agencies, the Federal Aviation Administration (FAA), the International Civil Aviation Organization and host nations.

b. The operational hazard report uses DA Form 2696 to identify and report potential hazards to Army aviation.

(1) DA Form 2696 (Operational Hazard Report (OHR)) RCS CSGPA 1633, is used to record information about hazardous acts or conditions before accidents occur. This form is available on the Army Publishing Directorate (APD) Web site (http://www.apd.army.mil). Blank copies of the report forms will be readily available to all aviation-related personnel.

(2) The OHR is used to fulfill North Atlantic Treaty Organization (NATO) Standardization Agreement (STANAG) 3750FS "Airmiss Reporting and Investigation".

(3) The OHR is issued within the DA for accident prevention purposes only. The OHR is NOT used—

(a) To report alleged flight violations for punitive action. AR 95–1 provides guidance for processing alleged flight violations.

(b) In determining the misconduct or line of duty status of Army personnel.

(c) By evaluation boards in determining pecuniary liability.

(d) As evidence for disciplinary action.

(4) The following procedures will be used to submit hazard reports.

(a) Any person (military or civilian) may submit an OHR. The signature and address of the individual submitting the OHR are desirable but not mandatory. A signature is required if the individual wishes to have a copy of the completed report returned. An OHR is not required when an aircraft accident report will be prepared in accordance with DA Pam 385–40, or when a deficiency report (DR) will be submitted according to DA Pam 738–751. Hazards observed in flight will be reported to the nearest radio contact point. An OHR will be prepared and submitted after landing. In the event of an NMAC, an immediate airborne report will be transmitted to the nearest air traffic agency, that is, flight center, flight service station or control tower. The following information will be provided when reporting an airborne operational hazard or NMAC:

1. Identification or call sign.

2. Time and location of the occurrence.

3. Altitude or flight level.

4. Description of the other aircraft.

5. An advisory to the controlling agency that a written report (DA Form 2696) will be filed.

6. The OHR will be used only to report hazards that affect aviation safety. Hazards not pertaining to aviation safety are reported on DA Form 4755 (Employee Report of Alleged Unsafe or Unhealthful Working Conditions) (AR 385–10).

7. The OHR will be processed by the following: submitting the OHR to an ASO or Army flight operations office. A report sent to an operations office will be promptly forwarded to the organization ASO; an OHR pertaining to other organizations will be transferred as soon as possible from the ASO receiving the report to the one having official control;.The OHR will be forwarded to the Commander, U.S. Army Combat Readiness Center, (CSSC–OA), Fort Rucker, AL 36362–5363, when actions pertain to:

8. The Department of Army staff, Army Headquarters or subcommands not in the chain of command.

9. Other DOD armed services, the U.S. Coast Guard or a host nation.

10. The FAA or National Transportation Safety Board (NTSB) at the national level.

11. Other subject commanders or ASOs believed to be significant.

(b) An OHR pertaining to civilian operations will be routed as follows:

1. In cases involving civil aircraft or civil air traffic control, a copy of the report will be mailed to the FAA Flight Standards District Office (FSDO) in the area of the hazard. The Department of the Army regional representative

(DARR) should be contacted for the correct FSDO point of contact (app B). For Army Headquarters outside the national airspace system, the report will be forwarded through appropriate coordinating agency.

2. When FAA ATC is involved in the hazard, the report will be mailed to the appropriate DAAR office.

3. When forwarding the correspondence, request that the results of the investigation, including corrective actions taken, be returned to the sender. The correspondence will state that OHR information is used for accident prevention and safety purposes only.

(c) The U.S. Air Force and the U.S. Navy have similar hazard-reporting systems. Army personnel should submit hazard reports directly to the base or station operations office while operating from any of these installations.

(d) A copy of each report pertaining to Army air-traffic-control personnel, services, procedures and equipment will be forwarded through the respective Army Headquarters to the Director, U.S. Army Aeronautical Services Agency, 9325 Gunston Road, Suite N319, Fort Belvoir, VA 22060–5582.

(e) A copy of the report will be returned to the originator, provided the report includes the originator's name and address.

(f) A copy of each report should remain on file for two years, in case the investigating ASO needs to refer to the information.

c. Commanders will ensure that procedures are established to manage OHR functions to insure that each report is quickly processed and appropriate corrective action taken. These management procedures will include:

(1) Emphasizing the importance of the OHR as a CRM tool.

(2) Promptly reporting and investigating hazards.

(3) Promptly correcting hazards.

(4) Emphasizing that the OHR and flight violation reports are two separate systems that may be used simultaneously to enhance safety.

(5) Forwarding the OHR to the next higher command when recommendations exceed the capabilities of the receiving unit.

(6) Reviewing, signing, and returning the completed OHR to the ASO within 10 working days of the date, the report was received.

d. ASOs are responsible for administering the commander's OHR management procedures within their organizations, including—

(1) Actively promoting the OHR procedure.

(2) Maintaining an adequate supply of DA Form 2696 and making forms readily available, normally in flight operations and the maintenance area.

(3) Receiving OHRs, analyzing hazards, and recommending control options to the commander.

(4) Completing all items in block 11, DA Form 2696.

(5) Ensuring that OHRs are promptly forwarded to the commander for action and are returned to the ASO within 10 working days of the date the report was received; ensuring that the completed action is returned to the originator within 20 working days of the date the report was received. In the event the action cannot be completed within 20 working days, ensuring that an interim report is returned to the originator with an updated written report provided every 10 working days until the action is completed.

(6) Ensuring that OHR forms are prepared for verbally reported hazards.

e. Instructions for completing DA Form 2696 (Operational Hazard Report)—

(1) *Items 1–7.* Check all applicable blocks and complete required information on the hazard being reported.

(2) *Item 8.* Describe the conditions and circumstances of the hazard and evaluate the risk.

(3) *Item 9.* The appropriate ASO conducts the investigation using the 3W investigation process, including the following information:

(a) Results of the examination and analysis of the conditions and circumstances.

(b) Reasons why the hazard occurred or was allowed to exist.

(c) Recommendations for eliminating, correcting or controlling the risk.

(4) *Item 10.* Completed by the responsible commander who will correct or control the risk. Commander's signature is required.

(5) *Item 11.* Completed by the ASO investigating the hazard.

2–8. Prevention of foreign object damage to aircraft

Foreign object damage (FOD) is damage to or malfunction of an aircraft caused by an object that is alien to an area or system or is ingested by or lodged in a mechanism of an aircraft or strikes the aircraft. Foreign object damage may cause material damage or it may cause a system or equipment to be unusable, unsafe or less efficient. Some examples of FOD are ingestion of loose hardware or grass by an engine, flight controls jammed by hardware or tools, and tires cut or propellers or tail rotors damaged by debris on the ramp or taxiway.

a. The objectives of an FOD prevention program are to find and correct potential hazards and to eliminate the causes of FOD. Training, work-site design, discipline, motivation and follow-up on FOD incidents are key factors of a

sound program. All unit personnel will take an active role in FOD prevention. An effective FOD prevention program can enhance combat readiness by saving material, manpower and money. Therefore, FOD prevention must be an essential part of each unit's aviation accident-prevention program.

b. The unit FOD prevention program will be in writing. All unit personnel will be familiar with the contents of the FOD prevention program. A sample FOD prevention SOP is in appendix C. Foreign object damage prevention countermeasures will be integrated throughout the unit SOP. However, each unit's SOP will be adapted to meet local FOD needs.

c. Each aviation unit will develop an FOD control checklist that will be used by FOD prevention officer(s), NCO(s) and unit personnel.

d. Management of the foreign object damage program will encompass the following:

(1) Unit commanders will establish an FOD prevention program tailored to the needs of the unit:

(a) Appoint an FOD prevention officer/NCO to implement the unit FOD prevention program. This may be an additional duty for any unit officer/NCO other than the ASO/aviation safety noncommissioned officer (ASNCO) or the aviation maintenance officer.

(b) Ensure FOD prevention is an integral part of the unit safety program.

(c) Ensure FOD prevention is discussed and FOD accidents are reviewed at all unit safety meetings.

(d) Ensure all unit personnel are made aware of their responsibilities for FOD prevention.

(2) The FOD prevention officer/NCO will—

(a) Administer the unit FOD prevention program.

(b) Monitor the unit tool accountability program.

(c) Delegate specific areas of responsibility (such as a hangar) to appropriate unit personnel.

(d) Conduct surveys and documents results (minimum once per month) and inspections of all unit areas to ensure the FOD prevention program is viable and working; notifies the unit ASO of hazards found during surveys for analysis and control option development.

(3) All unit personnel will implement the FOD prevention program by:

(a) Taking an active role in FOD prevention.

(b) Perform all maintenance tasks according to prescribed technical data.

(c) Use the "clean-as-you-go" approach to maintenance; make a thorough check of the area after each task is completed.

(d) Ensure all aircraft openings, ports, lines, holes, ducts and so forth, are properly protected to keep foreign objects from accidentally entering.

(e) Ensure all tools, hardware, and other equipment is properly accounted for at the end of each maintenance operation; mark tools for ease of accountability.

(f) Inspect all equipment prior to use to ensure it will not cause damage. Ensure care is taken when installing any piece of test equipment.

(g) Check engine inlet screens for loose, trapped or broken objects that may produce FOD.

(h) Immediately report FOD and potential FOD to the first-line supervisor.

(i) Place all residue and objects that may produce FOD in the proper container.

e. Foreign object prevention suggestions and publicity. All personnel are encouraged to recommend new ways to prevent FOD. Suggestions should be sent to Commander, USACRC, ATTN: CSSC–OA, Fort Rucker, AL 36362–5363. To obtain publicity material, promoting FOD control within the unit, contact Commander, USACRC, ATTN: CSSC–SM, Fort Rucker, AL 36362–5363.

2–9. Pre-accident planning

a. Commanders will ensure that—

(1) In the event of an Army aircraft accident (A through C and selected Class D), that all crewmembers, and any other personnel who may have contributed to the accident, are promptly moved by medical evacuation assets, (aeromedical or ground ambulance, whichever is fastest and safest), to facilities where physical examinations and blood and urine testing will be accomplished under the provisions of AR 40–8, AR 40–21, AR 40–501, AR 600–105, and DA Pam 385–40. Apparent absence of injury is not a factor in determining how or when to move personnel to medical facilities. The dynamics involved in an aircraft accident may produce injuries that are found only with a detailed medical examination. Post accident flight evaluations will be in accordance with AR 95–1.

(2) The development of detailed, written, pre-accident plans specifying duties, responsibilities, and immediate actions for personnel involved in accident notification procedures, search and rescue, accident investigation, and equipment recovery. The unit operations officer develops and administers the pre-accident plan with the technical assistance of the unit ASO (additional guidance on pre-accident planning may be found in DA Pam 385–10).

b. Pre-accident plans will—

(1) Interface with airfield/installation and higher headquarters plans. Units/facilities on non-Army and nonDOD

airfields will ensure plans are coordinated with appropriate local authorities and comply with applicable Army and DOD requirements.

(2) Focus on organized rescue of personnel, protection of property, preservation of the accident scene, and notification of appropriate personnel.

(3) Address both garrison and field/deployment operations.

(4) Address actions for both aviation and ground accidents.

c. Systematic rehearsal and review of pre-accident plans is as follows:

(1) Pre-accident plans will be systematically rehearsed and reviewed for adequacy quarterly (at a minimum). Rehearsal of plans will be coordinated in accordance with AR 420–90.

(2) Frequent non-tenant user flight crews will be fully knowledgeable of the host installation pre-accident plan.

(3) An example of a unit aviation pre-accident plan is in appendix C.

2–10. Hazard analysis and tracking

Chapter 1 describes the commander and staff functions involving risk management.

a. The primary process used by the ASO to manage the unit safety program is the five-step risk-management model. The ASO uses the risk-management model to assess and develop control options for hazards identified through various other processes such as surveys, job-hazard analyses, OHRs, safety quizzes, and accident reports.

b. Hazards should be analyzed with a goal of finding their root causes; hazards should be translated into risk levels or risk-assessment codes (RAC) (low, moderate, high, and extremely high) by prioritizing them in terms of probability of occurrence and severity of impact on the unit mission; tools, such as logic diagrams, matrices, or cause-and-effect diagrams, should be used and promoted to facilitate the hazard analysis.

c. This process should be used to develop and recommend to the commander control options that eliminate unnecessary hazards at their root cause or reduce their residual risk to an acceptable level consistent with successful mission accomplishment. Develop controls for those hazards that present the highest risk first. Conduct realism assessments to ensure that controls are fully applicable to the mission in combat or that they are essential for controlling risk in training or other operations. Ensure that implementation of a control measure does not create additional unnecessary risk. The ASO assists in the decision-making process by advising commanders and staff that control options best support mission success and protect unit resources.

d. The commanders and staff will assist and advise in implementing risk controls by integration into SOPs, policies, and operational plans and orders (OPLAN/OPORD). Ensure that safety is integrated as a task performance standard rather than a separate paragraph, section, or annex.

e. The commanders and staff will assist and advise on evaluating hazard controls after implementation to ensure their effectiveness and applicability.

f. The commanders and staff should maintain a file/log of hazards to track control-option implementation and effectiveness. The file/log should be maintained as a permanent reference for future hazard analysis. The file/log should contain the following elements:

(1) A reference or log number.

(2) Description of the hazard, including source or root cause.

(3) Determination of potential impact on the unit/mission RAC.

(4) Recommended control options.

(5) Command decision on control options and implementation directives, including responsible agent and suspense.

(6) A plan to verify the effectiveness of controls.

(7) Status based on verification of effectiveness.

g. Provide feedback through appropriate channels on hazards that affect other units or Army systems.

2–11. Aviation accident prevention survey

Commanders of all units should conduct Aviation accident prevention survey (AAPS) annually. This may be conducted in concert with the annual Standard Army Safety and Occupational Health Safety Inspection (SASOHSI) “Guide to Aviation Resource Management for Aircraft Mishap Prevention” or a similar guide should be used as a reference. When possible, the AAPS should be administered from the battalion/squadron level consolidating the safety staff into a survey team and using supplemental expertise from outside the unit. Surveys conducted by external sources (brigade, installation, or Army Headquarters aviation resource management surveys; standard Army safety and occupational health inspections; regional accident prevention surveys) may count toward semiannual accident-prevention surveys, provided all applicable functional areas for the organization are surveyed. An external survey may count toward the annual requirement for Reserve component units. The AAPS may be concurrent with internal command inspection programs as long as all unit functional areas are surveyed. The AAPS is a major source in the hazard identification step of the CRM process. All hazards identified during the AAPS must be thoroughly assessed for their risk level, and control options must be developed for command decision-making and implementation. Hazards found during the AAPS will be tracked through the unit hazard tracking system. Files on subordinate unit surveys may be maintained at

battalion/squadron level if the subordinate unit commander has immediate access to the files for control option follow-up and research purposes.

2–12. Standing operating procedures

Commanders should ensure that an SOP is developed for all unit functional areas and for all aviation operations executed in the command. The SOP may, where applicable, be consolidated at the battalion/squadron or regiment/brigade/group level. The systematic risk management process should be integrated in all unit operational procedures. Command approved risk-control options should be integrated into the SOP as task performance standards. At a minimum, the following subjects will be addressed in the SOP if they are applicable to the unit mission:

a. Terrain flight hazard avoidance.

b. Instrument flight and inadvertent instrument meteorological conditions (IMC) procedures.

c. Passenger- and troop-carrying operations.

d. External and internal cargo operations.

e. Gunnery operations.

f. Night operations.

g. Use and maintenance of night vision devices (NVDs).

h. Operations in a tactical environment.

i. Parachute operations.

j. Infiltration/exfiltration techniques (rappelling, first rope insertion/extraction system (FRIES), special purpose insertional extraction system (SPIES), and so forth).

k. Multi-aircraft operations.

l. Forward area refueling and rearming.

m. Aviation life-support systems (ALSS).

n. Aircraft survivability equipment (ASE) use and maintenance.

o. Foreign object damage prevention.

p. Responsibilities of aircrews when involved in an accident.

q. Aircraft maintenance procedures.

r. Maintenance shop operations.

s. Hazardous material (HAZMAT) handling.

t. Hazards communication (HAZCOM) program.

u. Aviation mission risk-management process.

v. Command-and-control procedures with the ground commander.

w. Fatigue/rest-management procedures.

x. Extreme environmental operations (blowing snow, desert, over-water, and so forth).

y. Protection of equipment from severe weather and environmental hazards.

z. Contractor flight operations.

aa. Special/unique operations not covered by existing written procedures-that is, external refuel systems, and so forth.

Chapter 3
Safety Related Programs

3–1. Introduction

Safe operation and maintenance of Army aircraft requires that all aspects of the Army safety program be implemented within the aviation unit. This chapter identifies the interface with other areas of the Army safety program.

3–2. Fire prevention and protection

Commanders will implement a unit fire prevention and protection program to ensure compliance with AR 420–90, 29 CFR 1910.106, 1910.252, and local directives.

3–3. Hazard communication

The aviation unit will develop and implement a unit hazard communication (HAZCOM) program to ensure compliance with 29 CFR 1910.1200 and DODI 6050.5 directives.

3–4. Hearing conservation

The unit will have—

a. A unit hearing conservation program to protect unit personnel from occupational noise hazards and to ensure compliance with AR 40–5 and DA Pam 40–501.

b. A designated hearing conservation officer/NCO to administer the unit program in conjunction with the local preventive medicine office.

3–5. Respiratory protection

The unit will—

a. Implement a unit respiratory protection program to protect unit personnel from the hazards of respiratory injury or illness and to ensure compliance with AR 11–34.

b. Determine if there is a need for respiratory protection in their units and, if necessary; and will designate and train an officer/NCO to administer the program in conjunction with the installation respirator specialist and in accordance with AR 11–34.

c. Have a respiratory protection program that is an integral part of the unit protective clothing and equipment (PCE) program. The unit ASO/ASNCO should not be designated as the respiratory protection officer/NCO.

3–6. Radiological protection

The unit should—

a. Develop and implement a unit radiological protection program to protect unit personnel from the hazards of radiation and to ensure compliance with TB 43–0108 and DA Pam 385–24; and for laser, AR 40–46 and TB MED 524).

b. Determine if a radiological hazard exists and, if necessary, will designate and train a unit representative to administer the program in conjunction with the installation radiological safety officer (RSO).

3–7. Protective clothing and equipment

a. Commanders will implement a unit protective clothing and equipment (PCE) program.

b. Unit ASOs will evaluate requirements for PCE during surveys of unit work sites.

c. The PCE program will be administered by unit logistical personnel and monitored by the unit ASO to ensure compliance with AR 385–10.

3–8. Hazardous materiel handling

a. Commanders will develop and implement a unit hazardous materiel (HAZMAT) handling program.

b. The HAZMAT handling program will be administered by unit logistical personnel and monitored by the unit ASO to ensure compliance with AR 700–141.

c. The plan will address procedures for handling advanced composite materiel, including precautions to be taken in the vicinity of aircraft accident sites.

3–9. Aviation maintenance

Commanders will implement aviation maintenance programs in accordance with AR 750–1, DA Pam 738–751, and TM 1–1500–328–3. Unit ASOs will perform safety inspections of maintenance areas, procedures, and records in conjunction with the AAPS, SASOHSI, and monthly safety, FOD, and fire inspection programs.

3–10. Ammunition/explosives/weapons handling

Commanders will ensure that unit ASOs monitor the unit ammunition/explosives/ weapons handling program to ensure compliance with AR 385–10 and TM 9–1300–206. The unit ASO/ASNCO should not manage the ammunition/ explosives/ weapons handling program.

3–11. Aviation life support systems

Aviation commanders will develop and implement a unit aviation life-support systems (ALSS) program to ensure aircrews are provided with adequate aviation life support equipment (ALSE) as prescribed by AR 95–1. Commanders will designate a qualified officer/NCO to manage the unit ALSS program. Unit ASO/ASNCO will monitor, but should not manage the ALSS program.

3–12. Environmental protection

a. Commanders will coordinate with installation environmental management office to develop and implement environmental protection plans for unit operations.

b. Unit ASOs will monitor the safety elements of the Commanders environmental protection program ensuring appropriate PPE, handling equipment, and safeguards are available and used by personnel involved with the program. Administration of the unit environmental protection program is a logistical staff function. The program is not a safety staff function; however, the ASO should monitor the program activities.

3–13. Endurance management

Commanders should—

a. Ensure fatigue is controlled or eliminated as a risk factor in all operations (See AR 40–8 and AR 95–1).

b. Implement programs to ensure that personnel operating/servicing military equipment, planning operations, and making critical decisions are alert and not degraded by fatigue.

Appendix A
References

Section I
Required Publications

AR 40–8
Temporary Flying Restrictions Due to Exogenous Factors. (Cited in para 2–9.)

AR 40–21
Medical Aspects of Army Aircraft Accident Investigation. (Cited in para 2–9.)

AR 40–501
Standards of Medical Fitness. (Cited in para 2–9.)

AR 95–1
Flight Regulations. (Cited in paras 2–7, 2–9, and 3–12.)

AR 200–1
Environmental Protection and Enhancement. (Cited in para 3–13.)

AR 385–10
The Army Safety Program. (Cited in paras 1–4, 3–4, 3–8, and 3–11.)

AR 420–90
Fire and Emergency Services. (Cited in paras 2–9, and 3–2.)

AR 600–55
The Army Driver and Operator Standardization Program (Selection, Training, Testing, and Licensing). (Cited in para 3–4.)

AR 600–105
Aviation Service of Rated Army Officers. (Cited in para 2–9.)

AR 700–141
Hazardous Material Information Resource System (HMIRS) (RCS DD–FM&P (A, Q & AR 1486). (Cited in para 3–9.)

AR 750–1
Army Material Maintenance Policy. (Cited in para 3–10.)

29 CFR 1910
OSHA Standards. (Cited in paras 3–2, and 3–3.)

DA Pam 385–03
Composite Risk Management. (Cited in para 2–2.)

DA Pam 385–40
Accident Reporting and Record Keeping. (Cited in paras 2–2, and 2–7.)

DA Pam 385–41
Army Accident Investigation and Reporting. (Cited in paras 2–2, 2–7, and 2–9.)

DA Pam 738–751
Functional Users Manual for the Army Maintenance Management System-Aviation (TAMMS–A). (Cited in para 2–7.)

TM 1–1500–204–23 (Books 1–10)
General Aircraft Maintenance Practices. (Cited in para 3–10.)

Section II
Related Publications

A related publication is a source of additional information. The user does not have to read it to understand this publication.

AR 11–34
The Army Respiratory Protection Program

AR 25–400–2
The Army Information Management System (ARIMS)

AR 40–5
Preventive Medicine

AR 70–62
Airworthiness Qualification of U.S. Army Aircraft Systems

AR 75–1
Malfunctions Involving Ammunition and Explosives (RCS CSGLD–1961 (MIN))

AR 95–2
Air Traffic Control, Airspace, Airfields, Flight Activities, and Navigational Aids

AR 95–27
Operational Procedures for Aircraft carrying Hazardous Materials

AR 500–1
Aircraft Piracy Emergencies

AR 600–8–22
Military Awards

DA Pam 40–501
Hearing Conservation Program

FAR part 91
General Operating and Flight Rules Air Shipment

FM 7–1
Battle Focus Training

FM 1–100
Army Aviation Operations

FM 10–67–1
Concepts and Equipment of Petroleum Operations

FM 10–67–2
Petroleum Laboratory Testing Operations

FM 100–14, change 1
Risk Management

TM 38–250
Preparing Hazardous Materials for Military Air Shipments

TM 1–1500–250–23
Aviation Unit and Aviation Intermediate Maintenance for General Tie-down and Mooring on all Series Army Models AH–64, UH–60, CH–47, UH–1, AH–1, OH–58 Helicopters

TB 43–0142
Safety Inspections and Testing of Lifting Devices

TB 385–4
Safety Requirements for Maintenance of Electrical and Electronic Equipment

TC 5–400
Unit Leaders' Handbook for Environmental Stewardship

Section III
Prescribed Forms

DA Form 2696
Operational Hazard Report (Prescribed in para 2–7.)

DA Form 4755
Employee Report of Alleged Unsafe or Unhealthful Working Conditions (Prescribed in para 2–7.)

Section IV
Referenced Forms

DA Form 4186
Medical Recommendation for Flying Duty

SF Form 368
Product Quality Deficiency Report

Appendix B
FAA/DARR Regions

See figures below.

B–1. Regions

The FAA/DARR is composed of nine regions.

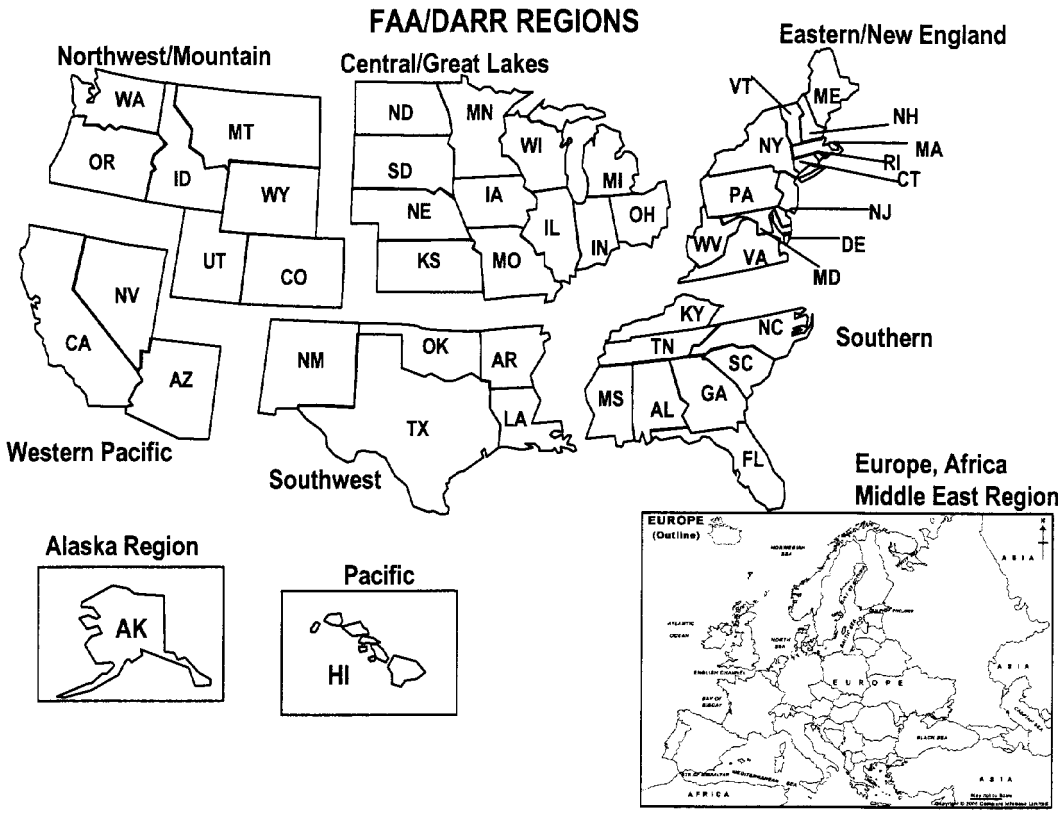

Figure B–1. FAA/DARR Regional Map

B–2. FAA/DARR addresses

Listed by region.

Table B–2
FAA/DARR Addresses

Alaskan	FAA Alaskan Region	Southern	DARR FAA Southern
	ATTN: AAL 590 (DARR)		(ASO-902)
	22 W. 7th Ave, #14		P.O. Box 20636
	Anchorage, AK 99513–7587		Atlanta, GA 30320
	COMM: (907) 271–5366		COMM: (404) 763–7245/46
	FAX: (907) 276–3998		FAX: (404) 763–7353

Central & Great Lakes	FAA Central Region	Southwest	
	ATTN: DARR/FAA		DARR Soutwest Region
	601 East 12th Street		Federal Aviation Administration

Table B–2
FAA/DARR Addresses—Continued

	Kansas City, MO 64106–9998		Fort Worth, TX 76193–0902
	COMM: (816) 426–5576		COMM: (817) 624–5902
	FAX: (816) 426–2798		FAX: (817) 624–5031
Eastern & New England	DARR, FAA/New England Region	Western Pacific	DARR FAA Western Pacific Region
	12 New England		P.O. Box 92007 (AWP-920)
	Executive Park Burlington, MA 01803–0510		Worldway Postal Center Los Angeles, CA 90009
	COMM: (617) 270–2462		COMM: (213) 297–1163
	FAX: (617) 273–7269		FAX: (213) 643–8724/9154
Northwest Mountain	DARR Northwest Mountain Region	Pacific	Commander, EUSA ATTN: EACJ–EA–ATC
	1601 Lind Avenue, SW (ANM–902) Renton, WA 98055–4056		APO SF 96301–0009 COMM: YOUNGSAN MILITARY–6115
	COMM: (206) 227–2952/55		
	FAX: (206) 431–2071		
Europe, Africa and Middle East	Commander, USAASDE APO New York Heidleberg		
MILITARY ETS 370–6426/8079	09102–3162		

Appendix C
Sample Documents

The following documents are provided as examples that are functional in existing units. There is no intent for these samples to be construed as the standard for all units. Use of these sample documents or compliance with the requirements stated within them is not mandatory unless supported by regulation.

C–1. Pre-accident plan

a. General. The operations officer should be responsible for establishing, implementing and accomplishing the pre-accident plan, including:

(1) Coordinating with all personnel.

(2) Familiarizing all unit personnel with the crash alarm system and the provisions of AR 420–90, AR 385–10, and DA Pam 385–40.

(3) Conducting regular (minimum quarterly) documented tests of the plan.

(4) Ensuring air crash search and rescue (ACSR) or local crash grid maps and/or crash grid overlays are distributed and maintained by each activity listed on the primary and secondary crash alarm systems and in all medical ambulances.

(5) Ensuring DA Pam 385–40 and AR 420–90 are used as guidance.

(6) Ensuring that plans are developed and coordinated to fulfill all Army requirements when operating as a tenant activity on a non-Army or joint use airfield.

b. Primary crash alarm system. (Use of a cover sheet should be considered to reflect the immediate actions required of an individual who is notified of an accident.) If informed of a crash, the following procedures will be followed:

(1) *Flight operations.* Flight operations personnel should:

(a) Activate the primary crash alarm system and notify all parties in the primary system.

(b) Activate the secondary alarm system by informing all parties in the system and specifying an assembly point.

(c) Control, direct, coordinate and dispatch personnel, aircraft, equipment, and convoys to locate or to service crash scene.

(d) Establish and control an adequate crash PASS SYSTEM.

(e) Monitor requests from the crash area for special or additional assistance or equipment.

(f) Serve as the control center for general direction of post-accident activities.

(2) *Air traffic control tower.* Air traffic control tower personnel should:

(a) Keep a current grid map/overlay conspicuously posted and ensure that all tower personnel are familiar with the map.

(b) Activate the primary alarm system, and report when a crash or flight emergency is observed from the tower or reported to it by radio.

(c) Radio crash location data to fire fighting and rescue crews.

(d) Alert all traffic to the emergency and grant traffic priority to rescue and search aircraft.

(e) Close field to air and ground traffic if necessary.

(3) *Fire station.* Fire station personnel should:

(a) Respond immediately to the alarm.

(b) Conduct rescue and fire suppression as necessary.

(c) Supervise crash area until fire is under control, if applicable and other hazards are stabilized or until area is safe for entry by authorized personnel.

(d) Request additional fire-fighting equipment when necessary because of location or nature.

(e) Maintain trained and equipped crash-rescue crew on alert during all flying operations.

(f) Crews are located so as to be able to provide immediate response in the event of an aircraft emergency.

(g) Train all personnel appropriately. Ensure crash-rescue personnel are trained and equipped to respond to aircraft accidents that may present a hazard due to advanced composite materials. Training should include personal protection measures and stabilization of hazardous materials.

(4) *Ambulance station.* Ambulance station personnel should:

(a) Dispatch medical personnel to the crash scene via ambulance or helicopter, whichever permits earliest arrival and evacuation of injured.

(b) Periodically train all medical personnel who may be assigned crash or rescue duties. Ensure medical personnel are trained and equipped to respond to aircraft accidents that may present a hazard due to advanced composite materials.

(c) Inform ambulance crews of best routes to reach each general area shown on ACSR or grid map/overlay sections.

(d) Request additional ambulance and medical assistance when necessary because of crash location or nature.

(e) Supervise removal and transportation of injured and provide emergency treatment.

(5) *Helicopter ambulance crew.* Helicopter ambulance crew should:

(a) Maintain helicopter ambulance for immediate departure to locate crash. Ensure crews are trained in the rescue and evacuation of aircraft accident victims. Ensure crews are trained and equipped to respond to aircraft accidents that may present a hazard due to advanced composite materials.

(b) Rescue personnel from crash and evacuate casualties to the designated medical facility.

(c) Radio preliminary report of crash scene to tower or controlling agency to aid ground rescue operation.

(d) Provide transportation for medical personnel, crash crews and medical supplies as directed by the flight surgeon.

(6) *Special crash rescue.* Special crash rescue personnel should:

(a) Dispatch rescue team when required.

(b) Radio preliminary report of crash circumstances to the tower.

(c) Rescue and transport injured persons to specific transfer point where faster transportation to hospital is available. Note: A specially equipped and trained rescue team may be required to meet search and rescue needs under unusual geographic conditions.

c. Secondary crash alarm system.

(1) *Airfield or post fire department.* Airfield or post fire department personnel should:

(a) Dispatch equipment necessary to support crash fire station.

(b) Where crash location or nature indicates need for outside fire extinguishing services, make request directly to appropriate fire departments.

(c) Determine the off-post fire stations closest to each grid map area, and post telephone numbers on the crash grid map.

(d) Supervise the crash site until fire is under control.

(e) Direct crash crew training.

(f) Advises flight operations when dangerous or hazardous cargo warrants presence of specialist (such as ordnance officer and chemical officer).

(2) *Flight surgeon or their assistant.* Flight surgeon should:

(a) Dispatch medical personnel to accident with crash crews, as directed by flight operations.

(b) Alert hospital emergency room of crash and prepare medical personnel, facilities and equipment for accident victims.

(c) Supervise and plan periodic training of all medical personnel who may be assigned crash rescue duty.

(d) Determine off-airfield medical and ambulance facilities closest to each grid map area, and post telephone numbers on the grid map.

(e) Serve on the investigation board, assist in determining causes of accident and injuries and assist in the selection of accident prevention measures.

(3) *Provost Marshal.* Provost Marshal should:

(a) Dispatch security personnel to assembly points as needed to provide adequate security and order at the crash scene and to prevent pilferage of wreckage until relieved by security personnel. Inform security personnel that cooperation with civil authorities should be in accord with The Posse Comitatus Act (18 USC 1385) or the Status of Forces Agreement (SOFA).

(b) Train security personnel on specific duties at aircraft accident scenes. This includes restraint of spectators, crash pass requirements, handling of wreckage, security of classified materials, and safeguarding Government property.

(c) Escort crash convoys to accident scene.

(d) Ensure that all security control patrols know best routes to all general areas within ACSR or grid map/overlay sections.

(e) Determine off-post police departments closest to each grid map area, and post telephone numbers (and radio control data) on the grid map.

(f) Obtain and supervise nonmilitary guards when there are insufficient security personnel or other military personnel available to guard the accident area.

(g) Maintain radio communications with security vehicles as necessary.

(4) *Aviation maintenance officer.* The aviation maintenance officer will—

(a) Ensure necessary qualified personnel are available to assist accident investigation board at accident site.

(b) Provide the board with an estimated cost of damage (ECOD) (TB 43–0002–3) to assist in determining accident classification.

(c) Help the board to recover and identify wreckage and determine the operating conditions of various parts.

(d) Provide maintenance history of accident aircraft.

(e) Help board to reconstruct aircraft from wreckage.

(5) *Aviation safety officer.* Aviation safety officer should:

(a) Be thoroughly familiar with AR 385–10 and DA Pam 385–40.

(b) Identify an alternate ASO.

(c) Assist the operations officer in reviewing this plan and ensuring that participating agencies test it at least once a quarter.

(d) Go to the scene of an aircraft accident.

(e) Classify the accident based on ECOD from the aviation maintenance officer and injury cost and classification estimates from the medical activity.

(f) Take charge of the accident site until the accident investigation board arrives. Additional details related to this responsibility are contained in DA Pam 385–40, DA Pam 385–10, and AR 385–10.

(g) Keep the ASO in the next higher chain-of-command informed.

(h) Make certain that notification in accordance with DA Pam 385–40 is completed.

(i) Act as an advisor to the investigation board and assist its members as necessary.

(j) Review aircraft accident reports for the commander before they are forwarded to the reviewing authority, giving particular attention to cause determination and preventive measures.

(6) *Motor officer.* Motor officer will provide ground transportation necessary to transport authorized personnel and equipment to and from the accident scene.

(7) *Army Communications Command element.* Army Communications Command element personnel will:

(a) Dispatch photographers to assembly point to report directly to the board president. Additional guidance is in AR 385–10 and DA Pam 385–40.

(b) Provide and maintain communication facilities to implement this plan.

(c) Provide multiple telephone hookup system for secondary alarm circuit so that all numbers are dialed simultaneously.

(d) Test multiple telephone hookups at least quarterly.

(8) *Public affairs officer.* Public affairs officer will—

(a) Dispatch personnel to accident scene to handle local media and news release.

(b) Maintain liaison with local news services.

(c) Help investigators to identify witnesses and solicit return of wreckage pieces that may have been recovered without authorization.

(9) *Staff Adjutant General.* Staff Adjutant General will—

(a) Contact chaplain when necessary.

(b) Contact claims officer when necessary.

(c) Prepare and transmit casualty report.

(d) Designate the staff duty officer responsible for these duties during non-duty hours and ensure contact at (phone number).

(e) Dispatch Technical Escort specialists (chemical or ordnance) when crashed aircraft was transporting dangerous or hazardous cargo requiring special handling.

(10) *Facility engineer.* Facility engineer will—

(a) Detail a qualified draftsman, equipped to diagram wreckage pattern and accident scene, to assembly point.

(b) Provide, upon request from aircraft accident investigation board, personnel and equipment to clear land, move earth or perform other engineering functions relating to accident investigation.

(11) *Aircraft accident investigation board members.* Aircraft accident investigation board members will—

(a) Be notified of crashes by board president or ASO.

(b) On notice report to specified assembly point.

(c) Take charge of accident site and initiate investigation upon arrival at crash scene after rescue and fire suppression tasks are completed.

(d) Conduct the investigation and send the report of the investigation as prescribed by AR 385–10, DA Pam 385–10, DA Pam 385–40.

(12) *Airfield weather officer.* Airfield weather officer will—

(a) Take and issue local weather observation.

(b) Determine if additional weather information will be required for investigation purposes. Analysis of the weather conditions occurring at the time and place of accident is essential to the accident investigation. The weather unit must be properly advised of an aircraft accident or emergency to ensure the best possible weather conditions can be determined at that time.

(13) *The aviation officer.* The aviation officer will:

(a) Not be on the secondary alarm system but will be informed promptly after the secondary alarm system is implemented.

(b) Go to the accident scene when appropriate.

(c) Arrange for appointment of a board if the organization that has the accident does not have appointing authority.

C–2. Sample foreign object damage prevention standing operating procedure

a. Unit foreign object damage prevention meetings. The foreign object damage (FOD) control officer chairs the meeting; the ASO attends the meeting. One representative from each flight section/detachment attends. Either the maintenance officer or maintenance NCO also attends the unit FOD prevention meetings. Results of the FOD prevention surveys and the unit FOD control status are discussed at the end of each scheduled safety meeting.

b. Managing the foreign object damage program. All subordinate commands and units will develop a tailored FOD prevention program. The minimum requirements to be included in subordinate programs are:

(1) Evaluating FOD trends to find areas that need managing.

(2) Reviewing accident reports to determine types of FOD and prevention measures.

(3) Setting up an active FOD exchange-of-information program and providing pertinent information to parallel and subordinate units.

(4) Ensuring that FOD prevention is made an area of interest during visits by maintenance or safety assistance teams.

(5) Ensuring that FOD prevention is stressed within the unit and personnel are adequately trained at the operating unit level.

(6) Assigning specific areas of responsibility (such as a hangar, shop, parking area, run-up area, wash rack and ramp) to appropriate unit personnel. Responsible individuals will conduct and document frequent inspections to en-sure the unit FOD program is viable and working.

(7) Related tasks for all personnel, including:

(a) Performing maintenance tasks according to technical data.

(b) Ensuring that aircraft openings, ports, lines, hoses and ducts are properly plugged or capped to keep foreign objects from entering critical air-craft openings.

(c) Ensuring that all tools, equipment and hardware are accounted for at the end of each maintenance task.

(d) Using care when placing test equipment.

(e) Inspecting equipment before use to make sure it does not cause FOD.

(f) Checking engine inlet screens for loose or trapped objects and for broken wires before and after each installation.

(g) Reporting FOD and potential FOD that cannot be promptly corrected to immediate supervisor.

(h) Keeping all working areas clean and free of debris.

(i) Thoroughly checking the work area after each task is completed.

(j) Placing all hardware residues in containers and placing stands and equipment in their assigned storage areas.

(k) Keeping areas free of litter and picking up litter when seen during task performance.

(l) Using magnetic or mechanic vacuum sweepers (when available) for aircraft parking ramps, taxiways, runways, run-up areas, and other areas vulnerable to FOD.

c. Responsibilities. Specific responsibilities in regard to the FOD prevention operating procedures.

(1) *Commander.* Commander should:

(a) Appoint an officer (other than the ASO or aviation maintenance officer), on orders, at unit level to be responsible for implementing the FOD prevention program.

(b) Ensure units, sections, and detachments check their areas of responsibility at least once a day.

(c) Periodically inspect and supervise the FOD prevention program.

(d) Establish an FOD-reporting procedure to battalion level or higher and take corrective action where FOD potentials and trends exist.

(e) Ensure all incoming personnel are briefed on their responsibility for FOD prevention.

(f) Ensure supported non-aviation personnel are briefed on the importance of FOD prevention.

(g) Provide adequate FOD containers throughout maintenance and flight line areas.

(2) *Aviation safety officer.* The aviation safety officer (ASO) should:

(a) Continuously monitor and survey the command FOD prevention effort.

(b) Ensure all safety meetings address FOD prevention.

(3) *Aviation maintenance officer.* The aviation maintenance officer functions are the following:

(a) Incorporate FOD prevention in all maintenance training.

(b) Ensure individual maintenance areas are cleaned at least once during the day. Recommend appropriate corrective measures where warranted by adverse conditions or trends, hazardous procedures, or other inadequacies of FOD prevention effort.

(c) Ensure the immediate area of an aircraft is cleaned after maintenance to ensure all debris (such as safety wire, paper and rags) is picked up.

(d) Ensure supervisors complete the following practices at the end of each workday:

1. Account for tools and inventory toolboxes after each maintenance operation.

2. Turn in special tools.

3. Cap all oil and fuel lines.

4. Dispose of used cans of lubricants.

5. Place covers or caps over those items susceptible to FOD.

(4) *Foreign object damage officer/NCO.* The FOD officer/NCOs functions are following:

(a) Check parking ramps, taxiways, and engine run-up areas and other maintenance and storage areas for cleanliness and condition of surface. Records of these checks, listing deficiencies noted and corrective action taken will be forwarded to the ASO for trend analysis and hazard tracking.

(b) With the airfield operations officer, ensure active runways and taxi areas are checked daily for debris and surface conditions.

(c) Check mechanical sweeping operation to make sure it is effective.

(d) Check ramps of paved airfields or heliports daily to ensure foreign objects are not being carried onto the flight line by vehicles.

(e) Inspect pavement cracks and expansion joints for debris the mechanical sweeper has missed. Advises commander when cleaning by hand is needed.

(f) Advise the commander when mechanical sweepers are not used.

(g) With the local facility engineer, ensure construction personnel are advised about FOD prevention when working in aircraft maintenance parking and operational areas.

(h) Check for debris pickup.

(i) Ensure there are FOD containers in the area and they are periodically emptied. FOD containers on the flight line should be marked appropriately with HI–VIS tape, secured, and have a lid.

(j) Spot-check general housekeeping in work areas.

(k) Observe people at work on FOD prevention.

(l) Spot-check to see that open aircraft, engine and fluid lines are secured with proper plugs or caps to prevent foreign objects from entering.

(m) Check engine run-up areas for cleanliness.

(n) Discuss the FOD program with supervisors.
(o) Observe personnel at work around aircraft with engines running for safe practices.
(p) Spot-check personnel during aircraft intake and exhaust inspections for proper clothing and loose personal items.
(q) Check corrections from previous FOD accident reports.
(r) Review FOD reports for trends.
(s) Review unit FOD training programs. Provide help where needed.
(t) With flight operations, ensure crews are briefed on potential and actual crew-caused FOD.
(u) Check for compliance with this SOP and local supporting plans on FOD.

Glossary

Section I
Abbreviations

AAPS
Aircraft accident prevention survey

AAR
After action reviews

ALSE
Aviation life support equipment

ALSS
Aviation life support systems

AOAP
Army Oil Analysis Program

APD
Army Publishing Directorate

AR
Army Regulation

ASAM
Army Safety Action Message

ASARC
Army Systems Acquisition Review Council

ASAT
Army Safety Action Team

ASE
Aircraft survivability equipment

ASNCO
Aviation safety noncommissioned officer

ASO
Aviation safety officer

ATC
Air traffic control

ATM
Aviation technical manual

COA
course of action

CRM
Composite Risk Management

CSC
Command Safety Council

DA
Department of the Army

DARR
Department of the Army regional representative

DOD
Department of Defense

DR
Deficiency report

ECOD
Estimated cost of damage

EIR
Equipment improvement recommendation

ESC
Enlisted Safety Council

FAA
Federal Aviation Administration

FAR
Federal Aviation Regulation

FM
field manual

FOD
foreign object damage

FRIES
first rope insertion/extraction system

FSDO
Flight Standards District Office

HAZCOM
hazardous communication

HAZMAT
hazardous material

HQDA
Headquarters, Department of the Army

IMC
Instrument meteorological conditions

IP
Instructor pilot

IP/SIP
Instructor pilot/standardization instructor pilot

MANPRINT
Manpower and Personnel Integration

METT–TC
mission, enemy, terrain and weather, troop and support available, time available, civil considerations

MTOE
modified table of organization and equipment

NATO
North Atlantic Treaty Organization

NAVAIDS
navigational aids

NCO
noncommissioned officer

NMAC
near mid-air collision

NTSB
National Transportation Safety Board

NVD
night vision devices

OCSA
Office of the Chief of Staff, Army

ODASAF
Office of the Director of Army Safety

OHR
operational hazard report

OPLAN
operations plan

OPORD
operations order

OSHA
Occupational Safety and Health Act/Administration

PCE
protective clothing and equipment

QC
quality control

RAC
risk assessment code

RPO
Radiological Safety Officer

SASOHSI
Standard Army Safety and Occupational Health Safety Inspection

SOF
Safety of Flight

SOFA
Status of Forces Agreement

SOP
standing operating procedure

SPIES
Special Purpose Insertional/Extraction System

STANAG
Standardization agreement

TM
technical manual

USACRC
United States Army Combat Readiness Center

Section II
Terms

Actual
An active theater or area of combat operations.

Aircrew training manual (ATM)
An Army publication that contains training requirements for Army flight crewmembers and programs for qualification, refresher, mission and continuation training in support of the aircrew training program.

Aviation Accident Prevention Program
Established procedures designed for commanders who control aviation assets which will safeguard and preserve human life and United States property.

Aviation life support equipment
Equipment designed to provide for the maximum functional capability of flying personnel appropriate for the mission, terrain and climatic conditions along the planned route of flight. In the event of an accident, the equipment provides a means to enhance safe and reliable escape, survival and recovery in combat and emergency situations. Use of this equipment will be in accordance with AR 95–1and FM 1–302.

Aviation safety officer
An Army officer, Department of the Army civilian or contractor with a skill qualification of safety and designated by the commander for the purpose of managing the commander's aviation accident prevention program. This officer should have no other duties not related to safety.

Commander
For this regulation, the term commander applies to the individual responsible for the per-sonnel and equipment of a military unit or facility. In some cases, this may be the facility supervisor or manager.

Composite Risk Management
A continuous process applied across the full spectrum of Army training and operations, individual and collective day-to-day activities and events, and base operations functions to identify and assess hazards, develop and implement controls, and evaluate outcomes.

Soldier endurance
Also referred to as crew rest/crew endurance/fighter management. A program designed by the unit commander and tailored to the unit mission to prevent fatigue from becoming a risk factor in aviation operations.

Flight safety technician
A Government employee (civil service) who is school trained and qualified in the skills required to manage an aviation accident prevention program.

Flight surgeon
A medical officer who has graduated from the U.S. Army Aeromedical Center (USAAC) Aviation Medicine Course.

Graduates from other military courses in aviation medicine must receive USAAC approval. References to flight surgeons include USAAC trained aeromedical physicians' assistants.

Foreign object damage
Any damage to, or malfunction of, an aircraft caused by some alien material.

Instructor pilot
An aviator with a skill qualification to conduct training and evaluation of pilots and unit trainers in designated aircraft and to promote safety among aviators. Training and evaluation include aircraft operation, qualification, unit tactical employment, visual and instrument flight, and crew performance.

Instrument flight procedures
Flight of the aircraft by sole reference to the flight instruments. This may be performed under actual or simulated instrument meteorological conditions. Instrument flight rules govern the procedure.

Mission
Flight or series of flights (sorties), conducted to accomplish a specific task or series of tasks in support of the unit's approved mission statement. Each mission is assigned to a designated pilot in command (PC) and or Air Mission Commander (AMC).

Near mid-air collision
A near midair collision has occurred when in the opinion of the pilot in command, the safety of an airborne aircraft was jeopardized by the hazardous proximity of another air-borne aircraft, not a member of the same flight. The following criteria are used to determine hazardous proximity:

a. Collision avoidance was due to chance rather than an act on the part of either pilot.
b. A collision would have resulted if no action had been taken by either pilot.
c. A situation involving an estimated distance of less than 500 feet.

Night operations
Flights that occur between the periods of sunset to sunrise. Because of reduced visual cues, flights at night require the aviator to use different techniques to determine relative position and speed, to include an increased reliance upon flight instruments. The use of night vision devices requires different flight techniques than those used during daylight operations.

Safety council
A membership of selected personnel from the unit designated, in writing, by the unit commander for the purpose of advising the commander on the status of safety within the unit and to recommend control options for improving safety. The council will meet on a regular basis as specified by AR and the commander. In aviation units safety councils are specified as Command Safety Council or Enlisted Safety Council.

Standardization instructor pilot
A qualified instructor pilot designated by the unit commander, in writing, to train and evaluate instructor pilots, unit trainers, pilots, and other standardization instructor pilots and tactical field operations

Simulated
An operational area established for training in which combat operations are simulated.

Terrain flight operations
Flight of the aircraft that is generally carried out above obstacles, but at an altitude where detection by threat forces is minimized or avoided. Flight modes include low level, contour and nap-of-the-earth.

Section III
Special Abbreviations and Terms
This section contains no entries.