Department of the Army

Fort Lewis, Washington

Draft Biological and Essential Fish Habitat Assessment

Army Growth and Force Structure Realignment (Grow-the-Army or GTA) at Fort Lewis and Yakima Training Center, Washington

August 2009

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EXECUTIVE SUMMARY

This Biological Assessment (BA) analyzes the potential effects to federally listed threatened and endangered species, species proposed for listing, and a candidate species, and their critical habitats, as a result of the Army's proposal to implement those actions from Fiscal Year 2010 through 2015 needed to support the Army's decisions on growth and realignment at Fort Lewis and Yakima Training Center (YTC), Washington. These actions would allow the Army to achieve a size and composition that is better able to meet national security and defense requirements, modify the force in accordance with Army Transformation, sustain unit equipment and training readiness, and preserve quality of life for the soldiers and their families. Fort Lewis and YTC must take actions to support the strategic deployment and mobilization requirements of the nation's combatant commanders to ensure they will have the forces necessary to support regional contingency operational requirements.

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 listed or proposed species, or result in the destruction or 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) to determine if a federal action is likely to affect a listed endangered or threatened species. The National Oceanic and Atmospheric Administration National Marine Fisheries Service (NMFS) is consulted when marine or anadromous fish or mammal species may be affected by the federal action. This BA has been prepared as part of the consultation process. In addition, an Essential Fish Habitat (EFH) assessment was prepared to comply with the requirements of the Magnuson-Stevens Fishery Conservation and Management Act. All federal agencies are required to consult with NMFS on current or proposed actions that could impact EFH.

Although the effects of military training by units currently stationed at Fort Lewis and YTC have been addressed under previous BAs, this BA analyzes actions associated with the Army's proposal to implement those actions from Fiscal Year 2010 through 2015 needed to support the Army's decisions on growth and realignment at Fort Lewis and YTC. This BA will address the effects of all types of training that could potentially be conducted on Fort Lewis and YTC, and will consider land use designations, Fort Lewis and YTC regulations, and ongoing management for listed and a candidate species as described in Endangered Species Management Plans developed by installation personnel.

Specifically, the proposed action includes:

- stationing the new units and accommodating the augmented units identified in the Fort Lewis portions of the Record of Decision for the 2007 Grow-the-Army Programmatic Environmental Impact Statement,
- training of three Stryker Brigade Combat Teams simultaneously with other currently stationed major subordinate units at Fort Lewis and YTC,
- updating the Fort Lewis and YTC Area Development Plans to accommodate these defined and potential stationing actions,
- potentially stationing Combat Support Service units at Fort Lewis and YTC with up to 1,000 soldiers, and
- potentially stationing a medium Combat Aviation Brigade at Fort Lewis and YTC with up to 2,800 soldiers.

The proposed action would result in:

- **Troop-level Increase –** increase the number of soldiers that train at Fort Lewis by 5,800 from new GTA, CSS, and CAB units. This would be accomplished over 6 years. It is possible, however, that CSS and/or CAB units would not be stationed at Fort Lewis, reducing the number of troops that would train at Fort Lewis and YTC. In addition, a third SBCT would be stationed at Fort Lewis and would consist of approximately 4,100 soldiers.

- **Facility Construction, Renovation, and Demolition –** Remove facilities and infrastructure that are no longer needed, relocate facilities to support new construction, construct new facilities and infrastructure, and renovate existing facilities and infrastructure to support the new population and training activities. These activities would occur at Fort Lewis and YTC. These activities would be done in phases contingent upon funding availability and priorities.

- **Live-fire Training and Maneuvers –** Provide for training for units stationed at Fort Lewis while balancing the need for maneuver training and live-fire training, and environmental management to meet the Army's goals for maintaining military training readiness while sustaining lands for continued use.

This BA identifies conservation measures for future Army training actions that, if met, would ensure that training actions taken by the Army would result in a "no effect" or "not likely to adversely affect species or critical habitat" determination by the USFWS and NMFS.

Future training activities would occur on Fort Lewis in Pierce and Thurston counties, and on YTC in Kittitas and Yakima counties. Fort Lewis is an 86,176-acre (34,874-hectare; ha) military reservation located in western Washington. Yakima Training Center is a subinstallation of Fort Lewis located in south central Washington. It covers approximately 327,242 acres (132,433 ha).

The following species have been addressed in this BA:

Fort Lewis
Golden paintbrush (*Castilleja levisecta*, threatened)
Marsh sandwort (*Arenaria paludicola*, endangered)
Water howellia (*Howellia aquatilis*, threatened)
Leatherback turtle (*Dermochelys coriaceaI*, endangered)
Loggerhead turtle (*Caretta caretta*, threatened)
Green turtle (*Chelonia mydas*, endangered)
Olive ridley turtle (*Lepidochelys olivacea*, endangered)
Coastal/Puget Sound bull trout Distinct Population Segment (*Salvelinus confluentus*, threatened)
Puget Sound Chinook salmon Evolutionary Significant Unit (ESU; *Oncorhynchus tshawytscha*, threatened)
Puget Sound steelhead salmon ESU (*Oncorhyncus mykiss;* threatened)
Marbled murrelet (*Brachyramphus marmoratus*, threatened)
Northern spotted owl (*Strix occidentalis caurina*, threatened)
Canada lynx (*Lynx canadensis*, threatened)
Grizzly bear (*Ursus arctos horribilis*, threatened)
Gray wolf (*Canis lupus*, endangered)
Humpback whale (*Megaptera novaeangliae*, endangered)
Southern resident killer whale (*Orcinus orca*, endangered)
Steller sea lion (*Eumetopias jubatus*, threatened)

Yakima Training Center
Ute ladies'-tresses (*Spiranthes diluvialis*, threatened)
Columbia River bull trout Distinct Population Segment (threatened)
Upper Columbia River spring-run Chinook salmon ESU (endangered)
Upper Columbia River steelhead ESU (endangered)
Mid-Columbia River steelhead ESU (threatened)
Greater sage-grouse (*Centrocercus urophasianus phaios*; a candidate for federal listing that receives special consideration by YTC)
Marbled murrelet
Northern spotted owl
Canada lynx
Grizzly bear
Gray wolf

Although Fort Lewis has been surveyed for the golden paintbrush and marsh sandwort, these species are not known to occur on Fort Lewis. Therefore, future military training actions would have **no effect** on them.

Water howellia has been found in 22 wetlands on Fort Lewis. The species receives protection from Army Regulation (AR Reg) 200-1 and Fort Lewis Regulations (FL Reg) 420-5, which prohibit digging, bivouacking, assembly areas, and off-road vehicle activities within 165 feet (50 meters [m]) of wetlands and streams. Because of this wetland buffer, training activities should not impact wetlands on Fort Lewis or associated water howellia populations. Future military training actions **may effect, but are not likely to adversely affect** water howellia on Fort Lewis. No critical habitat has been designated for water howellia on Fort Lewis.

The Ute ladies'-tresses is unlikely to be found on YTC or near where training activities would occur. Thus, proposed actions on YTC would have **no effect** on this species.

The leatherback turtle, loggerhead turtle, green turtle, and olive ridley turtle are unlikely to be found on or near Fort Lewis or near where training activities would occur. Thus, proposed actions on Fort Lewis would have **no effect** on these species.

Bull trout do not occur on YTC. The nearest resident bull trout population is found in the Yakima River, about 4 miles (6 km) west of the installation. Bull trout travel through Fort Lewis in the Nisqually River but do not spawn in streams on the installation. On both installations, stream restoration projects and protective stream buffers will continue to help improve stream habitat and minimize sediment loads entering both the mainstem rivers and their tributaries. Both installations have regulations prohibiting military training activities within and adjacent to wetlands and streams, except at established locations. Assuming that the Army will continue to comply with FL Reg 200-1 and implement measures to control erosion, future military training actions **may affect, but are not likely to adversely affect** bull trout on or near Fort Lewis or YTC. No critical habitat has been designated for bull trout on Fort Lewis or YTC.

The Puget Sound Chinook salmon ESU is found in several streams on Fort Lewis. Most spawning occurs in the mainstem of the Nisqually River upstream of Fort Lewis, except for hatchery fish spawned in the Clear Creek hatchery. The Puget Sound steelhead ESU is found in the Nisqually River. The Upper Columbia River Spring-run Chinook salmon ESU may occur in the vicinity of YTC and the Upper Columbia and Mid-Columbia River steelhead ESUs may occur in the vicinity of YTC (along either the Yakima or Columbia rivers). No fish associated with these ESUs have been observed in streams on YTC. Protection measures for Chinook salmon and steelhead are similar to those for bull trout. Assuming that the Army will continue to comply with Army Reg 200-1 and implement measures to control erosion, future military training actions

may affect, but are not likely to adversely affect Chinook salmon or steelhead on or near Fort Lewis or YTC. No critical habitat has been designated for Chinook salmon or steelhead salmon on Fort Lewis or YTC. The Canada lynx, gray wolf, grizzly bear, humpback whale, southern resident killer whale, and Steller sea lion are unlikely to be found on or near Fort Lewis or YTC or near where training activities would occur. Thus, proposed actions on Fort Lewis or YTC would have **no effect** on these species.

Marbled murrelets are uncommon near Fort Lewis, but are found in Puget Sound and on the Nisqually River. The majority of ground training activities would occur several miles from areas used by murrelets, although aerial training activities would occur along the Nisqually River and over Puget Sound. The amount of amphibious training at Solo Point and other marine environments used by murrelets would be expected to remain near current levels. The marbled murrelet would not use the shrub-steppe habitats of YTC. Therefore, future military training actions **may affect, but are not likely to adversely affect** marbled murrelets. No critical habitat has been designated for marbled murrelets on Fort Lewis or YTC.

Northern spotted owls have not been observed on Fort Lewis (surveys began in 1991). Forests on the installation are managed with the assumption that they could potentially support spotted owls in the future. The majority of destructive training activities would occur outside of forest habitats, and impacts to forest habitat should be minimal. Fort Lewis conducts regular surveys for northern spotted owl and has implemented a forest management program to increase the acreage of late successional forests in the future. Northern spotted owl would not use the shrub-steppe habitats of YTC. Future military training actions **may affect, but are not likely to adversely affect** the northern spotted owl. Suitable habitat for the species on Fort Lewis was identified and mapped by the USFWS, and in 1992, 62,000 acres of Fort Lewis were designated as critical habitat for northern spotted owl. Based on a recent ruling by the USFWS, however, the areas previously designated as critical habitat for the northern spotted owl on the installation have been removed as part of the overall critical habitat revision for this species. No northern spotted owl critical habitat is on YTC.

Greater-sage grouse form leks and nest in training areas in which future training activities could occur. Training activities can affect sage-grouse by disturbing them during the breeding season and by altering habitat. All Army activities would be required to follow guidelines established in FL Reg 420-5 for the protection of greater sage-grouse on YTC. Activities that would help protect habitat include fire management programs, use of training areas on a rotational basis, close monitoring of vehicle maneuvers in sage-grouse habitat, habitat protection and restoration actions, and other management actions detailed in the sage-grouse Endangered Species Management Plan. Given the Army's need to use shrub-steppe habitat on YTC for increased levels of training, adverse effects to sage-grouse habitat cannot be avoided, despite ongoing management activities. Therefore, ongoing and future training activities **would likely to jeopardize the continued existence of greater sage-grouse and would result in the destruction or adverse modification of sage-grouse habitat**. Should the greater sage-grouse become listed as threatened or endangered, the determination could be **likely to adversely affect** the greater sage-grouse. Should the species become listed, the current ESMP would be revised, and monitoring and corrective actions would be updated, so that the ultimate determination would likely be **may affect, but not likely to adversely affect** the greater sage-grouse.

The conservation measures conducted on Fort Lewis and YTC will continue to prevent or minimize adverse effects from training to aquatic habitats on and near Fort Lewis and YTC. Therefore, proposed training activities would not result in a loss of freshwater, estuarine, or nearshore habitats valuable as EFH to salmonid and flatfish populations.

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1.0 INTRODUCTION

1.1 Background

The Army proposes to implement those actions needed to support the Army's decisions on growth and realignment at Fort Lewis and Yakima Training Center (YTC), Washington. These actions would be implemented from Fiscal Year (FY) 2010 through 2015 and would allow the Army to achieve a size and composition that is better able to meet national security and defense requirements, modify the force in accordance with Army Transformation, sustain unit equipment and training readiness, and preserve quality of life for the soldiers and their families. Fort Lewis and YTC must take actions to support the strategic deployment and mobilization requirements of the nation's combatant commanders to ensure they will have the forces necessary to support regional contingency operational requirements.

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 listed or proposed species, or result in the destruction or 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) to determine if a federal action is likely to affect a listed endangered or threatened species. The National Oceanic and Atmospheric Administration National Marine Fisheries Service (NMFS) is consulted when marine or anadromous fish or mammal species may be affected by the federal action. This Biological Assessment (BA) has been prepared as part of the consultation process. In addition, an Essential Fish Habitat (EFH) assessment has been prepared to comply with the requirements of the Magnuson-Stevens Fishery Conservation and Management Act. All federal agencies are required to consult with NMFS on current or proposed actions that could impact EFH.

1.2 Purpose and Need for the Proposed Action

The purpose of the proposed action is to implement the decisions made in the Record of Decision (ROD) for the 2007 Army Growth and Force Structure Realignment (Grow-the-Army or GTA) Programmatic Environmental Impact Statement (EIS). Fort Lewis must provide for the training readiness, deployments, administrative functions, and soldier and family quality of life elements for those soldiers stationed at or slated for stationing at Fort Lewis. The Army has established effective dates between FY 2008 and FY 2011 for standing up the new units at Fort Lewis. These dates reflect the urgent need to balance training readiness with mission requirements while allowing the Army to improve soldier and family quality of life and meet other goals defined in the ROD for the GTA Programmatic EIS.

The ROD for the GTA EIS directs the stationing at Fort Lewis of the following primary units:

- 1st Corps Headquarters
- 1st Joint Mobilization Brigade
- 555th Engineer Brigade
- 62nd Medical Brigade
- 17th Fires Brigade
- 4–6 Cavalry Squadron
- 51st Signal Battalion
- 6th Military Police Group
- 23rd Chemical Battalion
- 22nd Expeditionary Sustainment Command
- 4th Battalion 160th Special Operations Aviation Regiment (Airborne)
- 3rd Brigade 2nd Infantry Division SBCT
- 5th Brigade 2nd Infantry Division SBCT
- 42nd Military Police Brigade
- 593rd Sustainment Brigade
- 201st Battlefield Surveillance Brigade
- 1st Special Forces Group (Airborne)
- 3rd Explosive Ordnance Disposal Battalion
- 110th Chemical Battalion
- 404th Army Field Support Brigade
- 191st Infantry Brigade
- 4th Brigade 2nd Infantry Division Stryker Brigade Combat Team (SBCT)

- 81st Infantry Brigade Combat Team, Heavy (Washington Army National Guard)
- 41st Infantry Brigade Combat Team (Oregon Army National Guard)
- 66th Combat Aviation Brigade (Washington Army National Guard)

In addition, the growth of the installation may include the stationing of Combat Service Support (CSS) units and a medium Combat Aviation Brigade (CAB). The CSS units would include as many as 1,000 soldiers, and they would support operations at Fort Lewis and YTC. The CSS units perform logistic (sustainment) functions, and could consist of transportation, quartermaster, medical, and headquarters units.

The medium CAB is the standard design for Army aviation brigades under the Army Modular Force (AMF) plan. Formerly called the multi-functional aviation brigade, the medium CAB is part of Army Transformation. The CAB would support the SBCTs and other units stationed at Fort Lewis and would support and enhance integrated training at Fort Lewis and YTC. The Army is considering Fort Lewis and several other locations for stationing of a medium CAB during FY 2010 to FY 2013. The CAB consists of about 2,800 personnel.

Implementing these requirements would involve constructing new facilities to support additional soldiers and their families, upgrading existing training ranges, and constructing new training ranges. Facilities for training, garrison operations, and housing are critical for supporting the operations of the new units that would be stationed at Fort Lewis and those units already at Fort Lewis that are undergoing troop strength increases from GTA-directed augmentations. Adequate facilities do not currently exist at Fort Lewis or YTC to accommodate the new units. Therefore, construction of facilities would be required.

1.2.1 Army Training Strategy and Doctrine

Current training needs have been shaped by the AMF and Army Transformation, operational experience in Afghanistan and Iraq, and the capabilities of new equipment. Training in the current operational environment requires large maneuver or training areas of varying characteristics with complex terrain. The Army also has an increased need to conduct urban training operations. Trends toward greater urbanization in operational theaters across the globe require the Army to provide security, stability, and counterinsurgency operations in populated urban environments. The military's experiences from Iraq and Afghanistan have demonstrated that Special Forces operations, intelligence gathering, and the use of joint multi-service and multinational (sister service and coalition) assets are also critical to mission success and defeat of a dispersed and poorly defined enemy force.

Training that prepares soldiers for the operational environment is essential to ensuring the success of the nation's strategic defense objectives, national security, and the safety of soldiers. Home stations, such as Fort Lewis, must prepare soldiers for operational deployments and missions. This preparation includes live-fire mission support and maneuver training.

1.2.2 Installation Sustainability

On October 1, 2004, the Secretary of the Army and the Army Chief of Staff issued the *Strategy for the Environment*, which focuses on the interrelationships of mission, environment, and community. A sustainable installation simultaneously meets current and future mission requirements, safeguards human health, improves quality of life, and enhances the natural environment (Department of the Army 2004a). A sustained natural environment is necessary to allow the Army to train and maintain military readiness.

The Army's *Strategy for the Environment* is implemented by Army Regulation (AR) 200-1, *Environmental Protection and Enhancement*. AR 200-1 reinforces the Army's commitment to applying sustainable policies and practices to safeguard the environment.

The Army recognizes that a unit executing training for its current mission, or to doctrinal standards to maintain its overall readiness, affects training lands. To manage training lands in a sustainable manner, the Army has instituted land and environmental management programs to support sound natural resource management practices and provide stewardship of its training lands.

Fort Lewis has developed eight 25-year sustainability goals. These goals are related to air quality, energy, sustainable community, products and materials, sustainable training lands, and water resources at Fort Lewis. Fort Lewis has committed to achieving a higher level of environmental performance through continued progress toward its sustainability goals. Yakima Training Center has five goals that are consistent with those of Fort Lewis and are measureable, but are specific to YTC's different location and environment. The five goals are related to air quality, energy, products and materials, sustainable training lands, and water resources at YTC. Progress toward implementation of these goals is voluntary at both installations and depends on available funding.

The impacts to land from military training are a focus of Fort Lewis' and YTC's sustainability efforts. The Integrated Training Area Management program at each installation establishes a uniform land management program, elements of which include inventorying and monitoring land condition, integrating training requirements with land carrying capacity while training to standard, educating land users to minimize adverse impacts, and prioritizing and implementing rehabilitation and maintenance projects. Other important resource management programs and procedures are provided in the installations Integrated Natural Resource Management Plan (INRMP; Fort Lewis; Department of the Army 2007), and Integrated Cultural and Natural Resource Management Plan (ICRMP; YTC; Yakima Training Center Environment and Natural Resources Division [ENRD] 2002). These programs seek to optimize training while providing sustainable land management that will ensure that training lands continue to be available to support the Army's mission.

1.3 Purpose and Need for a Biological Assessment

In accordance with Section 7 of the federal 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 USFWS and/or 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 BA for major federal actions that modify the physical environment. Because the proposed 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 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 Services 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 with the USFWS that will promote the conservation of migratory bird populations. If the USFWS determines that migratory birds could be harmed by the proposed off-post aviation operations, the Army and USFWS would develop appropriate mitigation.
- The 2003 National Defense Authorization Act that 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 a significant adverse effect on a population of a migratory bird species (Federal Register 2007).
- The Bald Eagle Protection Act, passed by Congress in 1940, prohibits the take, possession, sale, purchase, barter, or offer to sell, purchase, or barter, export or import of the bald eagle at any time or in any manner. In 1962, Congress amended the Eagle Act to cover golden eagles.
- The Sikes Act authorizes the U.S. Department of Interior to plan, develop, maintain, and coordinate programs with state agencies for the conservation and rehabilitation of wildlife, fish, and game on public lands.
- Army guidance on implementing the requirements of the ESA is provided in AR 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 (FL Reg) 420-5 (*Federally Listed Endangered, Threatened, and Candidate Species*; see Appendix A). This regulation covers compliance with the ESA.

The intent of this BA is to:

- Evaluate the effects of the proposed training on listed species, species proposed for listing, a candidate species, and/or their critical habitat that are known to be, or could be present within the project area.
- Determine the need for consultation and conference with the Services.
- Meet the requirements of the ESA and the National Environmental Policy Act (NEPA).
- As applicable, outline conservation measures to minimize or eliminate effects to listed species associated with the proposed action.

1.3.1 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 threatened, endangered, and proposed species 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 and proposed 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.

Lists of endangered and threatened species, candidate species, and species proposed for listing that potentially occur within Thurston and Pierce counties (in which Fort Lewis is located) and within Yakima and Kittitas counties (in which YTC is located), were retrieved from the USFWS website (updated versions of these lists are provided in Appendix B; USFWS 2009a, b). 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 (see Appendix B; NMFS 2009).

According to the USFWS, nine listed species may occur on Fort Lewis: golden paintbrush (*Castilleja levisecta*; threatened); marsh sandwort (*Arenaria paludicola*, endangered); water howellia (*Howellia aquatilis*, threatened); marbled murrelet (*Brachyramphus marmoratus*, threatened); northern spotted owl (*Strix occidentalis caurina*, threatened); Canada lynx (*Lynx canadensis*; threatened); gray wolf (*Canis lupus*, endangered); grizzly bear (*Ursus arctos horribilis*, threatened); and the Coastal/Puget Sound Distinct Population Segment (DPS) of bull trout (*Salvelinus confluentus*, threatened). The USFWS uses the DPS system for the purposes of listing, delisting, and reclassifying vertebrates. This system is based on the Evolutionary Significant Unit (ESU) system established by NMFS for salmonid populations. It is unlikely that golden paintbrush, marsh sandwort, Canada lynx, gray wolf, or grizzly bear would be found on Fort Lewis.

According to the USFWS, seven listed species may occur within the vicinity of YTC: Ute ladies'-tresses (*Spiranthes diluvialis*, threatened); marbled murrelet (threatened); northern spotted owl (threatened); Columbia River DPS of bull trout (threatened); Canada lynx (threatened); gray wolf (endangered); and grizzly bear (threatened). Although Ute ladies'-tresses, bull trout, grizzly bear, Canada lynx, gray wolf, marbled murrelet, and northern spotted owl are listed by USFWS as potentially occurring in either Kittitas or Yakima counties, it is unlikely that these species would be found on YTC. The greater sage-grouse, a federal candidate species afforded special protection on YTC, is discussed in this BA. However, since discussion of candidate species is not required under ESA, no other candidate species are considered.

TABLE 1
Species Evaluated in this Biological Assessment

Species	Scientific Name	Federal Status	Critical Habitat	Occurrence on Installation
PLANTS				
Golden paintbrush	*Castilleja levisecta*	T	No	No
Marsh sandwort	*Arenaria paludicola*	E	No	No
Ute ladies'-tresses	*Spiranthes diluvialis*	T	No	No
Water howellia	*Howellia aquatilis*	T	No	Fort Lewis
FISH				
Bull trout	*Salvelinus confluentus*			
Coastal-Puget Sound DPS		T	Yes[1]	No
Columbia River DPS		T	Yes[1]	No
Chinook salmon	*Oncorhyncus tshawytscha*			
Puget Sound ESU		T	Yes[1]	Fort Lewis
Upper Columbia River Spring-Run ESU		E	Yes[1]	No
Steelhead	*Oncorhyncus mykiss*			
Puget Sound ESU		T	No	No
Upper Columbia River ESU		E	Yes[1]	No
Middle Columbia River ESU		T	Yes[1]	No
REPTILES AND AMPHIBIANS				
Leatherback turtle	*Dermochelys coriacea*	E	Yes[1]	No
Loggerhead turtle	*Caretta caretta*	T	No	No
Green turtle	*Chelonia mydas*	E	Yes[1]	No
Olive ridley turtle	*Lepidochelys olivacea*	E	No	No
BIRDS				
Marbled murrelet	*Brachyramphus marmoratus*	T	Yes[1]	No
Northern spotted owl	*Strix occidentalis caurina*	T	Yes[1]	No
Greater sage-grouse	*Centrocercus urophasianus*	C	No	YTC
MAMMALS				
Canada lynx	*Lynx canadensis*	T	Yes[1]	No
Gray wolf	*Canis lupus*	E	Yes[1]	No
Grizzly bear	*Ursus arctos horribilis*	T	No	No
Killer whale	*Orcinus orca*	E	Yes[1]	No
Humpback whale	*Megaptera novaeangliae*	E	No	No
Steller (=northern) sea lion	*Eumetopias jubatas*	T	Yes[1]	No

E = Endangered; T = Threatened; and C = Candidate.
[1] Critical habitat has been designated for the species, but does not occur within the project area.

A list of endangered and threatened marine species (including anadromous fish species), and species proposed for listing that may potentially occur within the project area, was obtained from the NMFS website (Appendix

B; NMFS 2009a). According to the website, the BA must address the potential effects of the proposed action on the Puget Sound Chinook salmon (*Oncorhynchus tshawytscha*; threatened) ESU and Puget Sound steelhead (*O. mykiss*; threatened) on Fort Lewis; and the Upper Columbia River spring-run Chinook salmon (endangered), Upper Columbia River steelhead (endangered), and Mid-Columbia River steelhead (threatened) ESUs on YTC. The term 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. Leatherback turtle (*Dermochelys coriacea*; endangered), loggerhead turtle (*Caretta caretta*; threatened), green turtle (*Chelonia mydas*; endangered), olive ridley turtle (*Lepidochelys olivacea*; endangered), Steller sea lion (*Eumetopias jubatus*; threatened), southern resident killer whale (*Orcinus orca*; endangered), and humpback whale (*Megaptera novaeangliae*; endangered) are listed by NMFS and could be found near Fort Lewis, but are rare in the South Puget Sound and encounter with one during ongoing or proposed military training activities is unlikely.

1.4 Purpose and Need for the Essential Fish Habitat Assessment

Information on EFH is provided in Chapter 5. In 1976, Congress passed into law what is currently known as the Magnuson-Stevens Fishery Conservation and Management Act (MSA). This law authorized the U.S. to manage its fishery resources to a distance of 200 miles (322 kilometers; km) off the coast. Under this law, all federal agencies are required to consult with NMFS on all actions or proposed actions that are permitted, funded, or undertaken by the agency and that may adversely affect EFH. Essential fish habitat is defined by Congress as "waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity." For the purpose of interpreting the definition of EFH, "waters" include aquatic areas and their associated physical, chemical, and biological properties; "substrate" includes sediment underlying the waters; "necessary" refers to the habitat required to support a sustainable fishery and to manage the species' contribution to a healthy ecosystem; and "spawning, breeding, feeding, or growth to maturity" covers all habitat types utilized by a species throughout its life cycle.

There are four components of an EFH consultation:

1. **Notification** – the federal agency (in this case, the Army) provides notification of an activity that "may adversely affect" EFH to NMFS;

2. **EFH Assessment** – the federal agency provides a description of the proposed action, an analysis, and effects determination to NMFS;

3. **Conservation Recommendations** – Under section 305(b)(4) of the MSA, NMFS is required to provide EFH conservation and enhancement recommendations to the federal agency for actions that may adversely affect EFH. In turn, NMFS will discuss EFH conservation recommendations with the federal agency and provide these recommendations to the federal agency, pursuant to section 305(b)(4)(A) of the MSA; and

4. **Federal Agency Response** – the federal agency provides written responses to NMFS and the appropriate Council within 30 days after receiving the conservation recommendations.

The objective of the EFH assessment is to describe potential adverse effects of ongoing and future military training activities on areas designated as EFH for the federally managed fisheries of the Pacific Coast. In addition, this assessment will include conservation measures proposed to avoid, minimize, or otherwise offset potential adverse effects resulting from the proposed action in the designated EFH. The EFH assessment is provided in Chapter 5.

The scope and requirements of EFH and ESA consultations differ in that an EFH consultation is required for listed and non-listed, federally managed fishery species, while an ESA consultation only addresses federally listed species, and species proposed for listing, within the action area.

For the Pacific Coast (excluding Alaska), the Pacific Fishery Management Council (Pacific Council) manages federal fisheries for Washington, Oregon, Idaho, and California under three Fishery Management Plans (FMPs). These FMPs are the Pacific Coast Groundfish Management Plan (82 species), the Coastal Pelagic Species Fishery Management Plan (5 species), and the Pacific Coast Salmon Plan (3 species: Chinook, coho (*Oncorhynchus kisutch*), and Puget Sound pink salmon (*Oncorhynchus gorbuscha*).

All three salmon species overseen by the Pacific Council are reviewed in the EFH assessment. For the Pacific Coast salmon fishery, EFH includes those waters and substrates that are necessary for salmon production, and that are capable of supporting a long-term, sustainable salmon fishery and salmon contributions to a healthy ecosystem. To achieve this level of production, EFH includes all streams, lakes, ponds, wetlands, and other viable water bodies that are accessible to salmon, as well as most of the habitat that was historically accessible (excluding areas upstream of longstanding naturally impassable barriers) in Washington, Oregon, Idaho, and California. In estuarine and marine areas, salmon EFH extends out from the nearshore and tidal submerged environments within state territorial waters, to the full extent of the Exclusive Economic Zone offshore of Washington, Oregon, and California, north of Point Conception (Pacific Fishery Management Council 1999).

A total of four flatfish, of the 82 managed groundfish species that may occur within the area surrounding the Nisqually Reach, are reviewed in the EFH assessment. According to the composite EFHs of these four flatfish species, at least one stage of each species' life history utilizes the upriver extent of saltwater intrusion in rivers such as the Nisqually River (Pacific Fishery Management Council 1998).

Pelagic species occupy deeper ocean waters and are not included in this EFH.

1.5 Document Organization

Chapter 2 of this BA provides a description of the action area and the proposed project. Chapter 3 provides the methodology used to develop this BA. Chapter 4 includes background information and an analysis of the effects of the proposed action on the species addressed by this BA. Chapter 5 includes the EFH assessment. Appendix A includes Fort Lewis Regulation 420-5. Appendix B includes correspondence from USFWS and NMFS.

2.0 PROJECT LOCATION AND DESCRIPTION

2.1 Project Location

2.1.1 Fort Lewis

Fort Lewis is an 86,176-acre (34,874-hectare; ha) military reservation located in western Washington, in Pierce and Thurston counties, approximately 35 miles (56 km) south of Seattle and 7 miles (11 km) northeast of Olympia (Figure 2-1). It is bordered on the north by McChord Air Force Base (AFB) and suburban and commercial development; on the east and south by rural areas, forested land, and several small communities; and on the west by Puget Sound, the Nisqually Indian Reservation, and rural areas that surround Olympia (CH2M HILL 1994).

Fort Lewis lies in an upland glacial plain at the southern end of the Puget Sound lowland, and is typified by flat, gently rolling terrain. The elevation throughout most of the installation ranges between 250 and 400 feet (76 to 122 m) above sea level. However, topography varies from sea level at Puget Sound, to 567 feet (173 m) in the extreme southwest portion of Fort Lewis at the Rainier Training Area.

The surface water resources at Fort Lewis include rivers, streams, lakes, wetlands, and marine areas. There are four major source water drainage basins: the Nisqually River, Sequalitchew Creek (including American Lake), Deschutes River, and Chambers Creek basins (by means of Clover Creek, which drains into it). Approximately 56 percent of Fort Lewis (48,500 acres [19,628 ha]) falls within the Nisqually River Basin. Because of the gentle topography and generally permeable soils, surface water runoff is very low, with few perennial streams, and poorly defined surface water sub-basins. Approximately 5 percent (4,500 acres [1,821 ha]) of Fort Lewis can be classified as wetlands, including emergent marshes, scrub-shrub swamps, and forested wetlands.

Soils on Fort Lewis are predominantly composed of excessively drained, gravelly, sandy loams that are up to 2 feet (61 centimeters [cm]) thick. A soil survey of the Puget Sound lowlands, including Fort Lewis, identifies a predominance of glacial deposits, such as till and outwash (Zulauf 1979, Pringle 1990). Soils on the installation have been formed from these parent materials since they were deposited around 13,500 years ago, through physical disintegration and chemical decomposition of material exposed to the weather. Because soil fertility is low to moderate within the area, the agricultural potential is very limited.

2.1.2 Yakima Training Center

The YTC, a subinstallation of Fort Lewis, is located in south central Washington, in Kittitas and Yakima counties (Figure 2-2). The installation, which covers approximately 327,242 acres (132,433 ha), is 3 miles (5 km) northeast of the city of Yakima, 13 miles (21 km) southeast of the city of Ellensburg, and adjacent to and west of the Columbia River. Yakima Training Center is bounded on the north by Interstate 90 and Badger Pocket and on the east by the Columbia River. The southern boundary is south of Yakima Ridge, and most of the western boundary follows Interstate 82.

Yakima Training Center is located in the rain shadow of the Cascade Range and can be described as open country with shrub-steppe-covered rolling hills and flats. Thin bands of trees and shrubs occur in the bottoms of canyons and along creeks. Rock outcrops, talus slopes, and cliffs are visible along the ridge tops, canyon walls, steep hills, and drainages. Land uses adjacent to YTC include rangeland, agriculture, urban uses, and state and federal wildlife and recreation areas.

All watersheds on YTC drain into one of two major basins: the Columbia River basin to the east, or the Yakima River basin to the west. The surface water resources at YTC include streams, seeps, springs, and ponds. Five of approximately 19 man-made ponds on YTC are artificially maintained, four to support fire fighting activities and wildlife habitat, and one for recreation. Major streams flowing into the Columbia River include Alkali, Corral Canyon, Hanson, Sourdough, and Johnson creeks. Many of the tributaries to the Columbia River discharge via subsurface flow when stream flows are low, particularly during the summer. Lmumma Creek flows year-round into the Yakima River. While several other streams have perennial flow in their upper reaches within YTC, they become intermittent or dry in their lower reaches on the installation. These include Selah, Middle Canyon, and Cold creeks. The remaining surface water drainages on YTC are intermittent and do not flow in the summer.

The dry environment of YTC limits wetland areas to the immediate vicinity of perennial streams, seeps, and springs. A total of 204 seeps and springs are known to occur within YTC, many associated with wetlands or riparian areas. Wetland vegetation primarily consists of cattails (*Typha* spp.), rushes (*Juncus* spp.), and sedges (*Carex* spp.), with occasional patches of scrub-shrub vegetation such as willows (*Salix* spp.). Many wetland and riparian areas have been disturbed by past land use practices including grazing.

The U.S. Department of Agriculture Natural Resources Conservation Service (USDANRCS) completed a soil survey of YTC in cooperation with the U.S. Department of the Army (USDANRCS 2006). A total of four major groupings of soils, comprised of 215 soil types, have been found within the installation. Soils at YTC formed in a variety of parent materials, including glacial outwash, loess, residuum, alluvium, and basaltic colluvium, and are found at several landscape positions, such as ridgetops, benches, and hill slopes. Soils are mostly shallow, light, silt loams. They are characteristic of arid to semiarid climates and are fragile and easily eroded. There are some major areas of bottomland or alluvial soils, primarily along the eastern boundary near the Columbia River and in the cantonment area.

2.2 Military Mission

The military mission is to operate a state-of-the-art power projection and sustainment platform for warfighters by providing them with superior training support and infrastructure; support the transformation of 1st Corps and Fort Lewis; support the well-being of its soldiers, civilians, retirees, and their families; and demonstrate leadership and innovation in environmental stewardship.

Fort Lewis is the home of 1st Corps, whose primary focus is the Pacific Rim. As a result, 1st Corps has a close, ongoing relationship with Pacific Command. The principal Fort Lewis maneuver units are SBCTs.

Fort Lewis is adjacent to McChord AFB, which is scheduled to be the home of the new C-17 transport fleet. Fort Lewis has abundant, high-quality, close-in training areas, including numerous live fire ranges. Yakima Training Center provides additional training space, including maneuver areas and additional live fire ranges.

The Army is currently involved in a worldwide reorganization to meet the needs of combatant commanders, and to make the Army more strategically responsive and dominant at every point along the spectrum of military operations. This restructuring will support the global war on terrorism and ongoing military needs. As a result of Army restructuring, which began in 2002, Fort Lewis and YTC have been tasked with supporting the training needs of several units that have, or are in the process of, relocating to Fort Lewis.

2.3 Project Description

Recently, the Army identified the need to increase its overall size while continuing to restructure its forces in accordance with modular Transformation decisions:

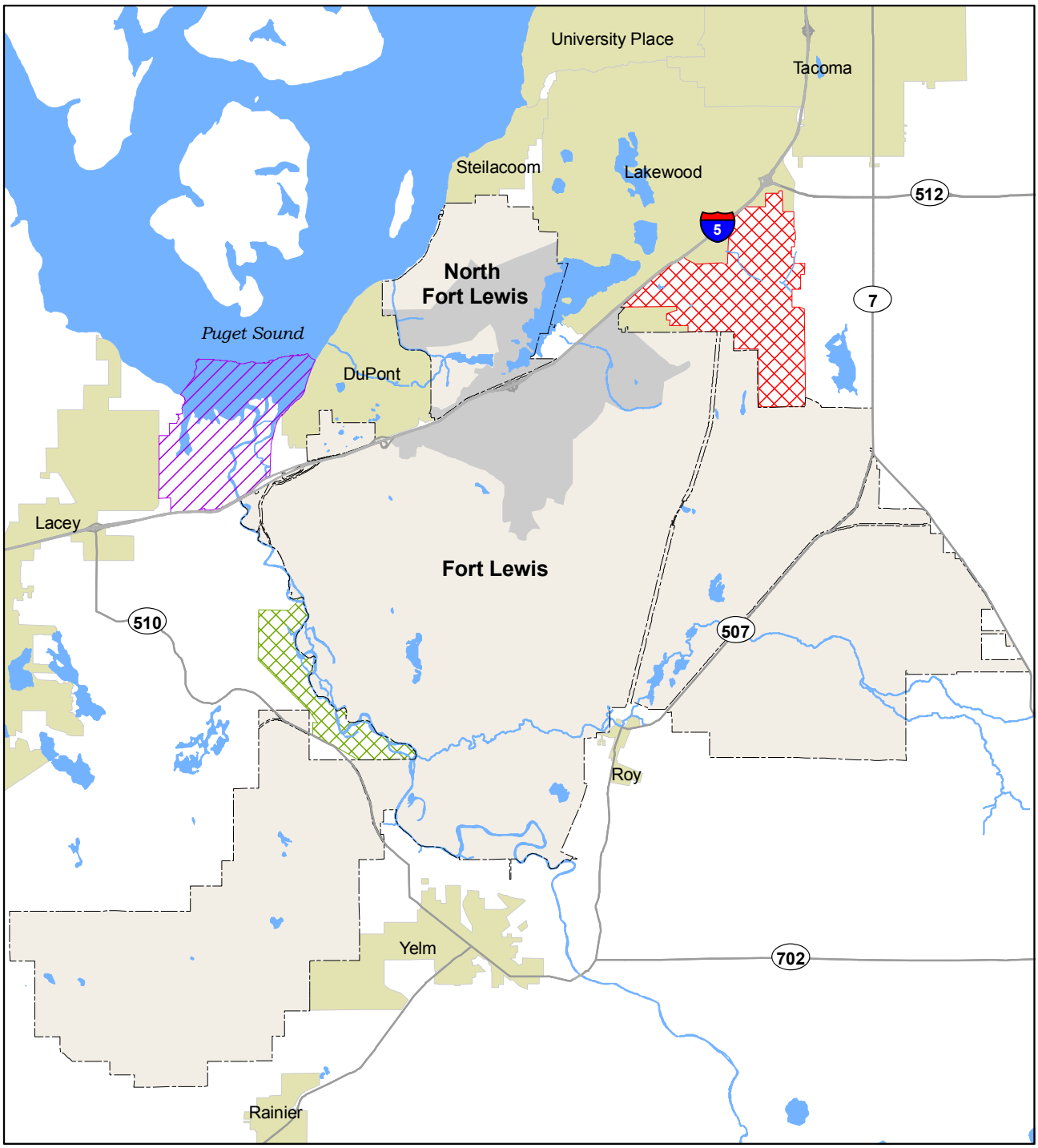

Figure 2-1. Fort Lewis Vicinity Map

Fort Lewis Boundary
Cantonment Area
City Boundary
McChord Air Force Base
Nisqually Indian Reservation
Nisqually National Wildlife Refuge

N

0 1 2 3 4 Miles
0 1 2 3 4 Kilometers

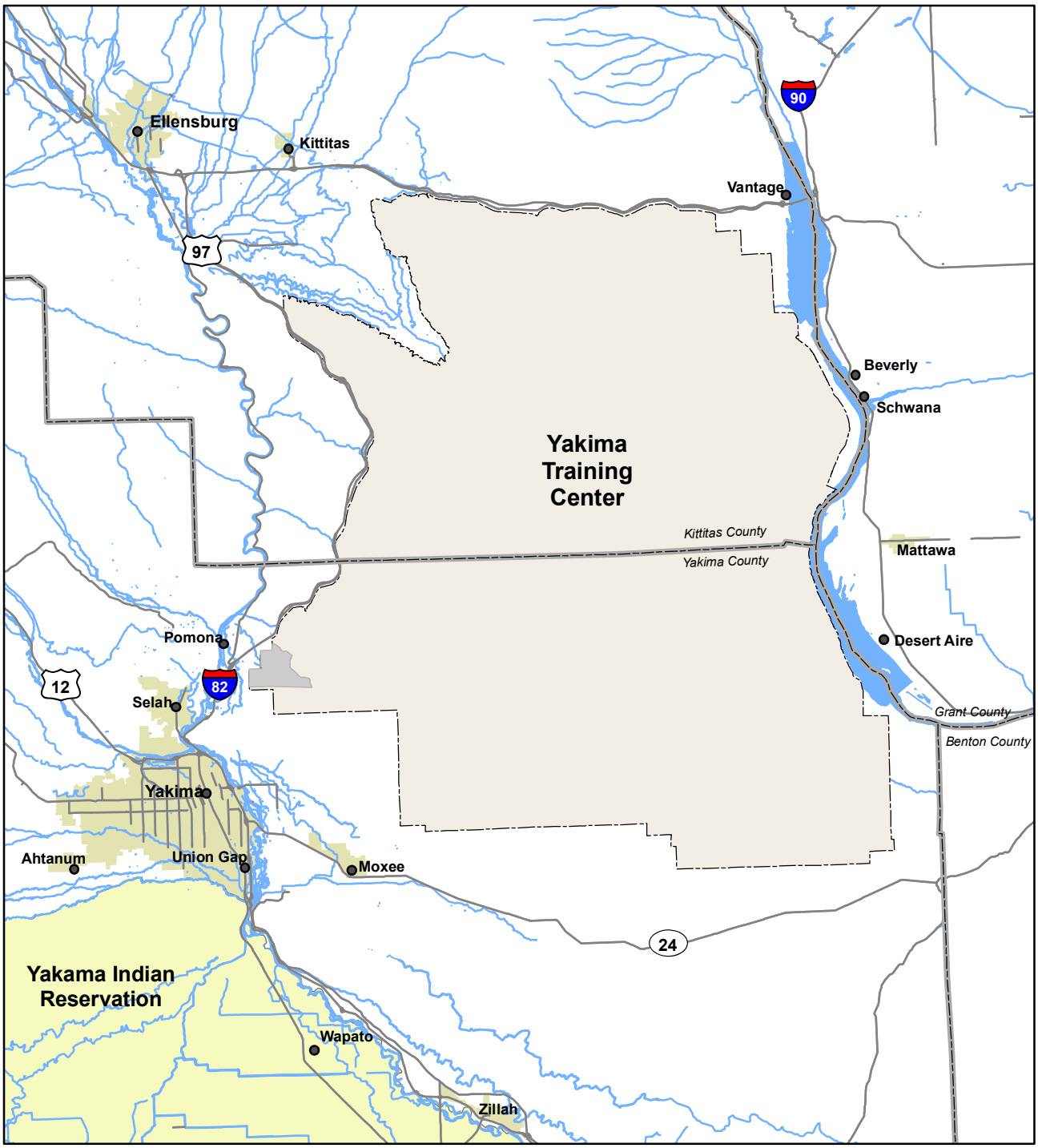

Figure 2-2. Yakima Training Center Vicinity Map

County Boundary

City Boundary

Yakima Training Center Boundary

Rivers

0 1.5 3 6 9 12 Miles

0 3 6 12 18 24 Kilometers

N

- to further Army Transformation,
- to meet the 21st Century's requirements for increased national security and defense,
- to maintain training and operational readiness levels of the force, and
- to preserve a high quality of life for soldiers and their families.

This increase in the numbers and configurations of units will enhance operational readiness by allowing soldiers more time to train and maintain their equipment. It also will afford soldiers and families more time together at home station while providing the nation with greater capability to respond to the increased challenges to national defense and security.

In 2007, the Army analyzed the environmental effects of an addition of units (Army Modularity and Global Defense Posture Realignment, and growth of new units by up to six active component SBCTs). These effects were documented in the GTA Programmatic EIS. This growth is intended to mitigate shortages in units, soldiers, and time to train that would otherwise inhibit the Army from meeting readiness goals and supporting strategic requirements. In December, the GTA ROD was signed by the Deputy Chief of Staff of the Army, G–3/5/7 (Operations, Plans, and Training).

Under the ROD, each installation affected by GTA actions was to prepare an EIS analyzing the effects of actions authorized by the GTA ROD. Fort Lewis is preparing a GTA EIS that is analyzing the effects of stationing about 560 additional active duty soldiers at Fort Lewis and augmenting Fort Lewis' existing units with approximately 1,320 soldiers. In addition, it analyzes the potential stationing at Fort Lewis of additional CSS units (consisting of up to 1,000 soldiers) and a medium CAB (consisting of approximately 2,800 soldiers) to support the SBCTs. The EIS also documents the analysis of effects from pertinent, past, present, and reasonably foreseeable future actions interconnected to the GTA actions. Reasonably foreseeable future actions include updating the Fort Lewis and Yakima Training Center YTC Area Development Plans. These actions also include the stationing and training of three SBCTs simultaneously at Fort Lewis and YTC with the GTA-directed new units being stationed and the other units already training at Fort Lewis and YTC. The analysis also considers construction of the facilities necessary to support these units.

Specifically, the proposed action includes:

- stationing the new units and accommodating the augmented units identified in the Fort Lewis portions of the ROD for the 2007 GTA Programmatic EIS,
- training of three SBCTs simultaneously with other currently stationed major subordinate units at Fort Lewis and YTC,
- updating the Fort Lewis and YTC Area Development Plans to accommodate these defined and potential stationing actions,
- potentially stationing CSS units at Fort Lewis and YTC with up to 1,000 soldiers, and
- potentially stationing a medium CAB at Fort Lewis and YTC with up to 2,800 soldiers.

The proposed action would result in:

- **Troop-level Increase –** increase the number of soldiers that train at Fort Lewis by 5,800 from new GTA, CSS, and CAB units. This would be accomplished over 6 years. It is possible, however, that CSS and/or CAB units would not be stationed at Fort Lewis, reducing the number of troops that would train at Fort Lewis and YTC. In addition, a third SBCT would be stationed at Fort Lewis and would consist of approximately 4,105 soldiers.

- **Facility Construction, Renovation, and Demolition –** Remove facilities and infrastructure that are no longer needed, relocate facilities to support new construction, construct new facilities and infrastructure, and renovate existing facilities and infrastructure to support the new population and training activities. These activities would occur at Fort Lewis and YTC. These activities would be done in phases contingent upon funding availability and priorities.

- **Live-fire Training and Maneuvers –** Provide for training for units stationed at Fort Lewis while balancing the need for maneuver training and live-fire training, and environmental management to meet the Army's goals for maintaining military training readiness while sustaining lands for continued use.

2.3.1 Actions under the GTA ROD

The 2007 ROD for GTA identifies several new units for stationing at Fort Lewis and YTC. The Expeditionary Sustainment Command (ESC) is the largest new unit. The ESC is the single logistics command Headquarters for a designated area of operations. It plans, controls, and synchronizes all support operations for the Army or Joint Force Commander. It is capable of commanding and controlling the full range of logistics capabilities through multiple phases of operations simultaneously. The ESC is the single provider for Army distribution operations and it advises and provides logistics planning assistance to the supported command.

2.3.2 Stationing of a Third Stryker Brigade Combat Team at Fort Lewis

Under the proposed action, the Army would station a third SBCT at Fort Lewis. Each SBCT has approximately 4,105 soldiers, 317 Stryker combat vehicles, 588 wheeled support vehicles, 18 155-mm howitzers, and numerous trailers and other pieces of equipment. The SBCT is a rapidly deployable force that can fight in smaller-scale contingencies, serve in stability and support operations, and if need be, fight as part of the division in major theatre wars. The SBCT is most effective if its capabilities are embedded within the unit's organization, rather than employing the traditional division-slice approach. Thus, the SBCT design includes embedded unit-based capabilities—military intelligence, signal, engineer, antitank, artillery, and combat service support elements—that have been tailored specifically to the unique requirements of the unit's mission set. Force effectiveness is best enhanced through internetted combined arms capabilities to company team level, rather than to the traditional battalion level and higher. The SBCT's major fighting components are its motorized infantry battalions. The SBCT also has a unique Reconnaissance, Surveillance, and Target Acquisition (RSTA) squadron to enhance situational understanding.

Major components of the SBCT include:

- Three motorized, combined arms infantry battalions, which are the primary maneuver elements within the SBCT. Within the battalions, snipers, mobile gun systems, mortars, Stryker-equipped fire support teams, and reconnaissance elements provide support for dismounted operations by squads, platoons, and companies. The battalions are equipped with technology to allow unit leaders and individual soldiers to designate targets for engagement by higher supporting weapons, and to allow units to receive continuously updated information on the location of friendly and enemy forces, battlefield obstacles, and vehicle locations. Each infantry battalion has 81 Stryker vehicles and about 40 assorted trucks.

- A RSTA squadron, which provides the SBCT with reconnaissance and surveillance information. Each RSTA squadron is made up of four troops: three reconnaissance troops and one surveillance troop. The surveillance troop is comprised of an unmanned aerial vehicle platoon, a ground sensor platoon, and a nuclear, biological, and chemical reconnaissance platoon. The squadron can continuously and simultaneously reconnoiter nine routes or conduct surveillance of 18 designated areas. The squadron must

inspect and classify bridges, locate mines, obstacles, and barriers, and locate bypasses around built-up areas. The squadron also is responsible for interviewing civilians to gather intelligence. The squadron is supported by 54 Stryker vehicles along with 79 trucks.

- An antitank company that comprises the SBCT's primary stand-off antitank capability. The company consists of three platoons, each with three long-range, tube-launched, optically-guided, wire-guided 2B systems mounted on Stryker vehicles. The company uses terrain analysis to identify enemy mounted avenues of approach, targets enemy armored vehicles, fortifications, and dug-in positions, and protects the maneuver force against any enemy mounted counterattack. The company has 13 Stryker vehicles and four support trucks.

- A field artillery battalion that provides direct support, responsive counter-fire support, and reinforcing and shaping fire support to the SBCT. The battalion is composed of 18 trucks and 12, 155-mm towed howitzers.

- An engineer company, comprised of nine Stryker vehicles and 27 trucks, which provides mobility support.

- A signal company, which provides the strong command, control, communication, computer, intelligence, surveillance, and reconnaissance network needed to provide communication among individual units. The company is comprised of 5 Stryker vehicles and 35 trucks.

- A military intelligence company, which coordinates all intelligence, surveillance, and reconnaissance efforts in supporting the SBCT's battlefield strategy. The company operates out of 35 trucks.

- A brigade support battalion that provides resource support to the SBCT. The battalion operates out of 174 trucks.

- The brigade headquarters and headquarters company, which provides information management and administrative support to headquarters and commands the SBCT's from 3 Stryker vehicles and 34 trucks.

2.3.3 Stationing of Combat Service Support Units at Fort Lewis

Combat Service Support Logistics (Sustainment) units are responsible for transporting fuel, munitions, parts, food, medical supplies, and battlefield casualties during training and operational scenarios. In addition, these units maintain vehicles, recover destroyed or damaged vehicles, and provide medical care to injured soldiers. Combat Service Support units primarily consist of transportation, quartermaster, medical, and headquarters units and functions. The number of soldiers in the CSS units varies with the function and mission of each unit. As many as 1,000 soldiers spread across these units may be stationed at Fort Lewis in the future. Combat Service Support units use a wide variety of vehicles. Vehicles assigned to each unit are based in part on the types of units they are supporting and the missions they need to accomplish. Wheeled vehicles are capable of on-road and off road maneuver, but will more often travel on-road. The following describes the mission, numbers of soldiers, and primary equipment for each of the four types of CSS units likely to train at Fort Lewis and YTC.

2.3.3.1 Transportation Units

Mission. The mission of the Transportation component is to transport, distribute, and issue general military supplies and equipment. Military supplies and equipment include ammunition; fortification and construction materials; water, subsistence, and water purification equipment; petroleum products; repair parts and end items; and medical supplies.

Soldiers. Transportation units typically consist of company-sized organizations of 100 to 200 soldiers.

Primary Equipment. Transportation units primarily use High Mobility Multi-wheeled Vehicles (HMMWVs), other light trucks, cargo trucks with 5-ton or larger capacity, and fuel trucks (5,000 gallon). In addition, they may have Heavy Equipment Transport trucks, which they use for transporting armored combat vehicles.

2.3.3.2 Quartermaster Units

Mission. The mission of the Quartermaster component is to receive, store, and issue general military supplies and equipment. These supplies and equipment include fortification and construction material, water, subsistence, repair parts, and medical supplies.

Soldiers. Quartermaster units typically consist of platoon- to company-sized organizations of 30 to 120 soldiers.

Primary Equipment. Quartermaster units use HMMWVs and cargo trucks with 5-ton capacity.

2.3.3.3 Medical Units

Mission. The mission of the Medical component is to provide health care support during training and operational deployments.

Soldiers. Medical units vary in size with the type of medical unit and function.

Primary Equipment. High Mobility Multi-wheeled Vehicles, some configured as medical evacuation vehicles, and cargo trucks with 5-ton capacities.

2.3.3.4 Headquarters Units

Mission. The mission of Headquarters units includes collecting information, conducting planning and staffing, disseminating guidance to subordinate units, and overseeing operations. Headquarters units are responsible for the command and control of units in Garrison and during training and operational deployments. These units are typically collocated with combat maneuver units during maneuver rotations.

Soldiers. Headquarters units vary in size with the mission and function of the headquarters. Typically, they range from 50 to 400 soldiers, depending on the span of operational control and number of subordinate units.

Primary Equipment. Headquarters units use HMMWVs, other light trucks, and cargo trucks with 5-ton or larger capacities.

2.3.4 Stationing of a Medium Combat Aviation Brigade at Fort Lewis

The Army is considering Fort Lewis and other locations for the restationing of a medium CAB in the FY 2010 to 2013 time frame. Restationing a medium CAB at Fort Lewis and YTC would support the three SBCTs and other units already stationed at Fort Lewis and YTC by supporting and enhancing integrated training. A decision to restation a medium CAB to Fort Lewis would result in an increase of approximately 2,800 soldiers.

A medium CAB plans, prepares, executes, and assesses aviation and combined arms operations to support division and maneuver brigades to find, fix, and destroy enemy forces at a decisive time and place. The structure of the medium CAB is tailored to the types of BCTs it supports. Each medium CAB can support up

to five BCTs. They are organized into two attack/reconnaissance battalions, an assault battalion, a general support battalion, an aviation support battalion (medium), and an air traffic service company. Typical mission essential tasks of a medium CAB include the following:

- Conduct air assault operations
- Conduct air defense operations
- Conduct air movement operations
- Conduct air volcano (scatterable mine dispensing system) operations
- Conduct command, control, communications, computers, and intelligence operations
- Conduct combat service support operations
- Conduct combat support operations
- Conduct deployment/redeployment operations
- Conduct fast rope insertion and extraction system/special patrol infiltration/exfiltration system operation
- Conduct mission planning/preparation
- Conduct mobility, counter mobility and survivability operations
- Conduct reconnaissance and surveillance operations
- Conduct stability operations and support operations
- Conduct casualty evacuation

Medium CABs use a variety of equipment and are authorized about 110 helicopters. Each attack battalion has 24 attack helicopters (AHs). The assault battalion has 30 utility helicopters (UHs). In addition to eight UHs, the general support battalion has 30 OH-58D Kiowa Warrior helicopters, 12 cargo helicopters (CHs) and, 12 medivac helicopters (UHs). Finally, a CAB is accompanied by approximately 700 tactical vehicles, including light trucks, fuelers, and transport vehicles.

2.3.5 Fort Lewis Facilities

Training Areas (TAs). Training areas on Fort Lewis include forest, wetland, prairie, brush, and marine environments. Training areas are delineated into maneuver, impact, range, and other training areas. Dense forest covering much of the installation is ideal for light infantry maneuvers, which are primarily conducted on foot. Open areas in prairies provide adequate space for vehicle maneuver training. Other training areas include ammunition storage areas, urban combat areas, and amphibious sites.

Cantonment Area. The cantonment area is the developed portion of the installation. It serves as the center for most activities on Fort Lewis apart from field training. Land uses in the cantonment area include family and troop housing, administrative uses, commercial uses (e.g., shops and medical services), industrial uses (maintenance, logistics, and transportation), and open space maintained as green belts and recreational use areas. Gray Army Airfield (GAAF) supports rotary- and fixed-wing aircraft operations. The airfield consists of a 6,125-foot (1,867-m) runway, aircraft hangers, airfield operations facilities, and a simulator facility.

2.3.6 Yakima Training Center Facilities

Yakima Training Center provides training facilities, logistical support, and operational live-fire training, primarily for units stationed out of Fort Lewis. The terrain at YTC is well suited for desert and hill/submountainous area training. The types of military training activities at YTC, as well as the sizes of training units involved, are diverse. Activities include dismounted (on foot), motorized, mechanized, and armored infantry maneuvers at the platoon, company, battalion, and brigade levels, and live-fire gunnery training. A Multi-Purpose Range Complex (MPRC) provides state-of-the-art live-fire training for infantry, tanks, aircraft, and helicopters (ENSR 1998c).

2.4 Military Training

The major types of training are discussed in the sections that follow. The Army proposes to continue these types of military training activities, which have already been addressed in previous ESA consultations. It is anticipated that during the next 5 years the number of troops would increase from 30,000 to near 40,000. Training by new units is expected to be similar to what is described below, and would be covered by all applicable regulations. Any new types of training not addressed below would require additional consultation.

2.4.1 Maneuver Training

Field training exercises emphasize maneuver training using Stryker vehicles; however, other wheeled and tracked vehicles are used during the exercises as well. During maneuver training, vehicles travel on improved and unimproved roads, as well as off-road. Road systems are classified on a five-point scale that describes their level of development (Table 2-1).

TABLE 2-1
Road Classifications at Fort Lewis and YTC

Road Classification	Description
MIL-CLASS 1 and 2	All-weather, hardened, or improved surfaces; range from state highways to gravel roads.
MIL-CLASS 3	Secondary roads within range areas that have been upgraded to a width of 14 feet (4 m), with a minimum 10 inches (25 centimeters) of crushed rock.
MIL-CLASS 4	Secondary roads that are seasonally accessible; width varies from single-lane to multiple-lane.
MIL-CLASS 5	Faint trails in the landscape where a few vehicles pass, or similar to MIL-CLASS 4 roads but found on steep slopes; road surfaces consist of natural soil and vegetation.

Drainage features, such as culverts, fords, drainage ditches, and water turnouts are associated with MIL-CLASS 1 through 3 roads. Use of MIL-CLASS 4 and 5 roads can lead to rutting and erosion during wet weather.

Vehicle maneuvers typically occur in large open areas. On YTC, most of the available training lands are suitable for vehicle maneuvers. On Fort Lewis, primary maneuver areas are located on prairies. Based on the land use designations described in Section 2.5, and shown in Figures 2-3 and 2-4, off-road maneuver training is not authorized in certain areas on the installations. Fort Lewis Regulation 420-5 restricts vehicle travel on Fort Lewis to established roads within 164-foot (50-m) buffers around all wetlands on the installation, and restricts water crossings by vehicles to authorized fords. On YTC, vehicles are not authorized in riparian buffers along streams, depicted in Figure 2-4.

At present, the maximum amount of SBCT off-road vehicle training that occurs annually is approximately 37,500 off-road miles (60,340 kilometers [km]) on Fort Lewis and 111,750 miles (179,805 km) on YTC (Tables 2-2 and 2-3). It is assumed that off-road mileage during training would not exceed these levels, regardless of the projected increases in training associated with new units. If additional off-road driving was deemed necessary, the Army would consult with the Services to assess the effects of an increase in vehicle training mileage.

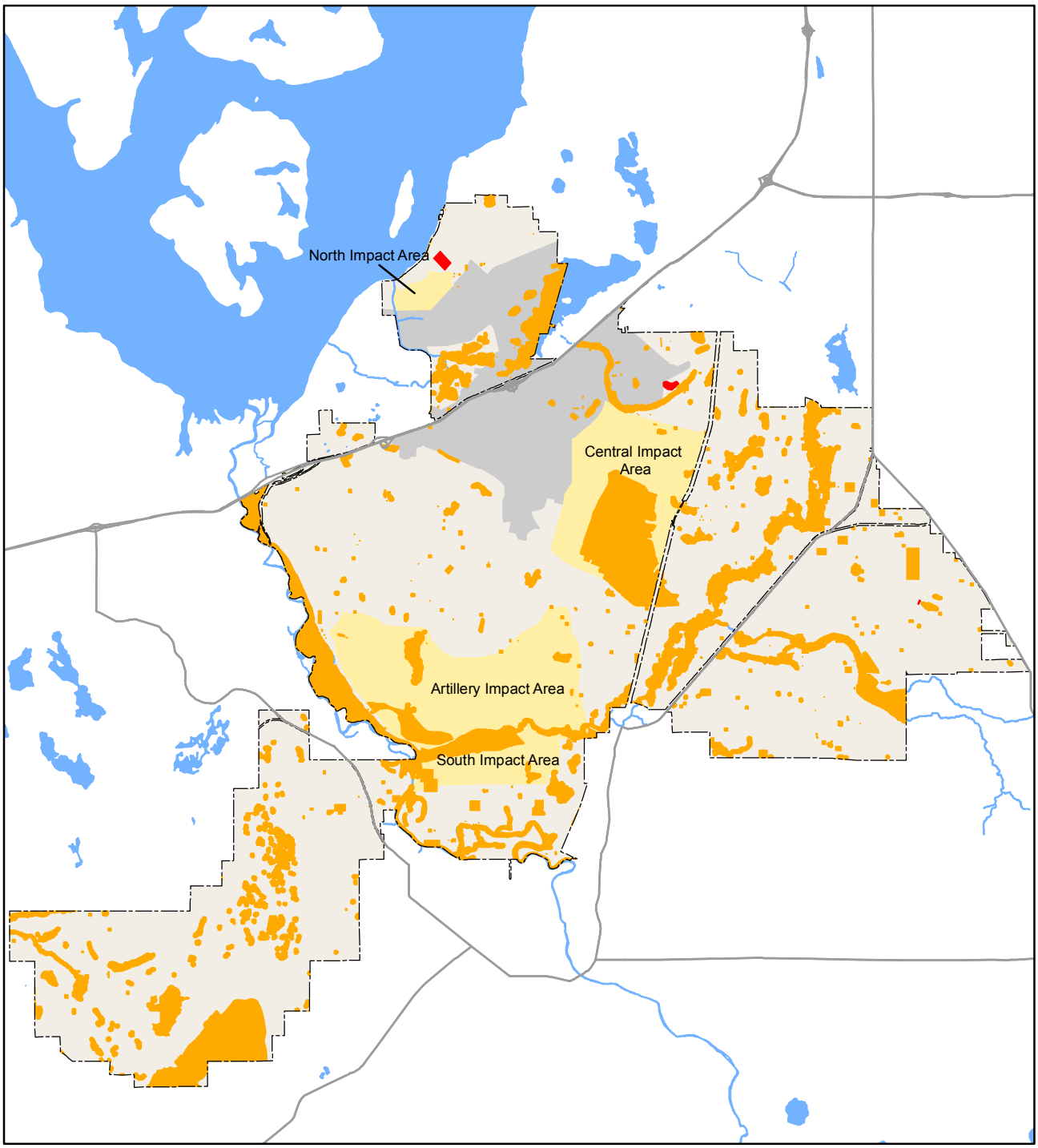

Figure 2-3. Controlled Use Areas on Fort Lewis

Cantonment Area

Impact Areas

Fort Lewis Boundary

Digging, bivouacking, assembly areas, and/or off-road vehicle activities are not authorized

Access is prohibited; a safety and/or human health risk is present

N

0 1 2 3 4 Miles

0 1 2 3 4 Kilometers

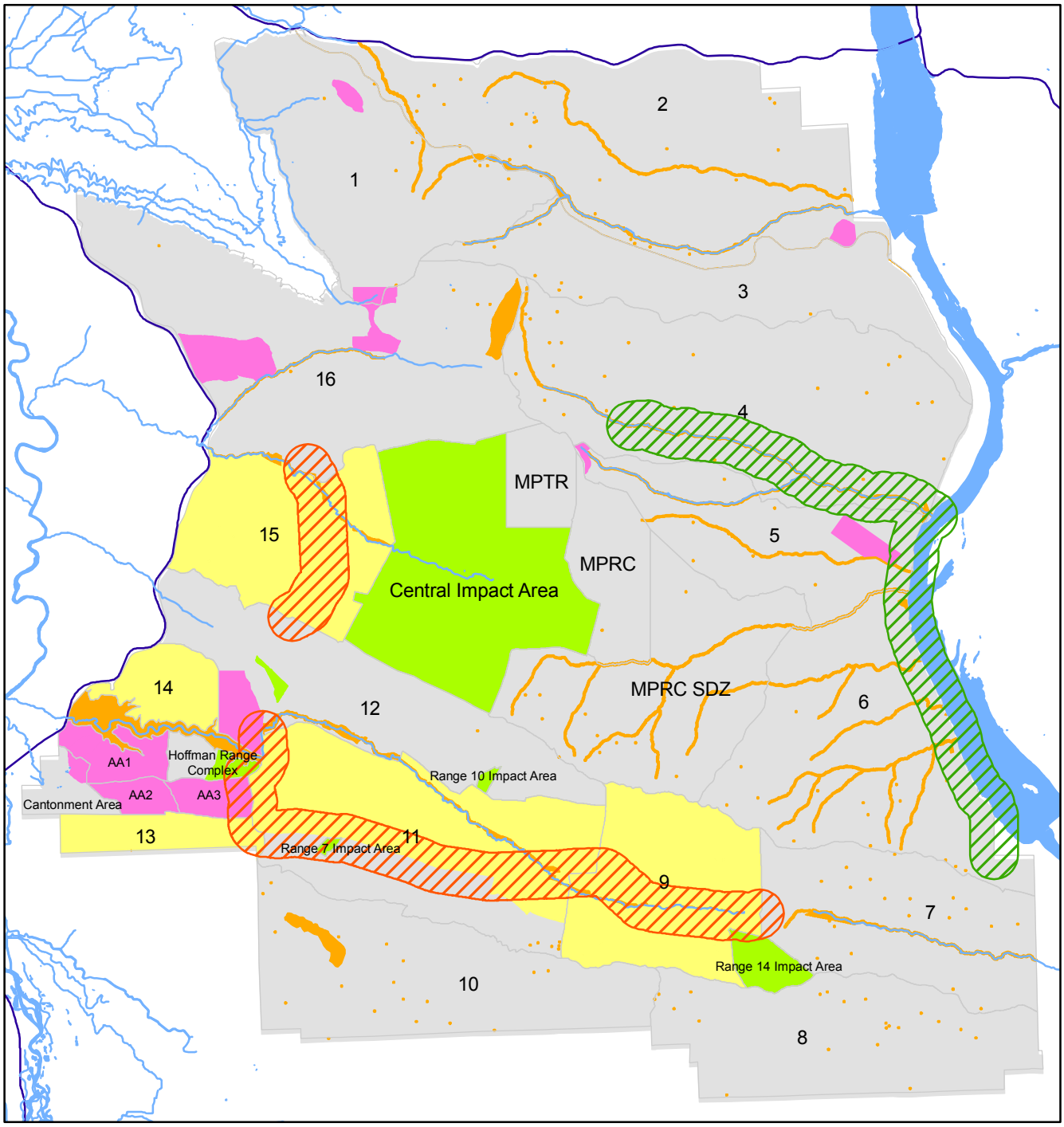

Figure 2-4. Land Use Zones and Flight Restriction Areas on Yakima Training Center

Zone 1 - No Vehicles or Digging
Zone 2 - Sage Grouse Protection Area
Zone 3 - General Use Area
Zone 4 - Bivouac Locations (BSA)
Zone 5 - Off Limits Area

Sage Grouse No Fly Zone
Bald Eagle Restrictions

N

0 1 2 4 6 8 Miles

0 2 4 8 12 16 Kilometers

TABLE 2-2
Annual MIL-CLASS 4 and 5 and Off-Road Vehicle Miles for SBCT, GTA, CSS, and CAB Unit Vehicles on Fort Lewis

	Miles on MIL-CLASS 4 and 5 Roads	Off-Road Miles	Total Miles
Current Condition	51,000	35,250	86,250
SBCT Stryker Vehicles[1]	126,000	99,000	225,000
SBCT Support Vehicles[1]	168,750	135,000	303,750
GTA Vehicles[1]	6,875	1,100	7,975
CSS Vehicles[1]	25,000	4,000	29,000
CAB Vehicles[1]	21,090	14,060	35,150
1 – Number of miles for SBCT, GTA, CSS, and CAB vehicles under proposed action.			

TABLE 2-3
Annual MIL-CLASS 4 and 5 and Off-Road Vehicle Miles for SBCT, GTA, CSS, and CAB Unit Vehicles on Yakima Training Center

	Miles on MIL-CLASS 4 and 5 Roads	Off-Road Miles	Total Miles
Current Condition	167,500	105,000	272,500
SBCT Stryker Vehicles[1]	297,000	234,000	531,000
SBCT Support Vehicles[1]	405,000	310,500	715,500
GTA Vehicles[1]	16,500	2,750	19,250
CSS Vehicles[1]	28,000	5,000	33,000
CAB Vehicles[1]	21,090	17,575	38,665
1 – Number of miles for SBCT, GTA, CSS, and CAB vehicles under proposed action.			

2.4.2 Weapons Qualification and Gunnery Training

All live fire military training occurs at established firing ranges. On Fort Lewis, the effects of ammunition are concentrated at four impact areas (Figure 2-3): the North Impact Area (small arms only, with 14 firing ranges), the Central Impact Area (small arms only, with 48 separately scheduled ranges), the Artillery Impact Area (AIA; with 13 separately scheduled small arms and live fire maneuver/combined arms live fire exercise ranges; also serves 37 artillery firing points), and the South Impact Area (with eight separately scheduled small arms and live fire maneuver/combined arms live fire exercise ranges and one mortar firing point).

Seasonal fire hazards restrict use of tracers and other potentially incendiary ammunition on Fort Lewis, except at the AIA. Daily, fire hazard levels are posted, with the following associated restrictions:

- Level I – Tracers and pyrotechnics authorized.
- Level II and III – Tracers outside the AIA and any pyrotechnics use prohibited.

On YTC, firing ranges are located in the MPRC, adjacent to ground maneuver corridors, in the Multi-Purpose Training Range (MPTR), in and other portions of the installation (Figure 2-4). The effects of ammunition are concentrated at the Central Impact Area, Range 7 Impact Area, Range 10 Impact Area, and the Range 14 Impact Area.

Range Control and Fire Department personnel on YTC set a daily fire danger rating (low, medium, high, or extreme) based on ambient weather data. When the fire risks associated with live-fire training or use of pyrotechnic devices are unreasonable, these activities are postponed or curtailed.

2.4.3 Aviation Training

On Fort Lewis, aviation training involves predominantly rotary-wing aircraft (helicopters), but some fixed-wing aircraft and unmanned aerial vehicles (UAVs) as well. Most rotary-wing operations, including the CAB, operate out of GAAF, and most fixed-wing operations operate out of McChord AFB, located adjacent to Fort Lewis.

Aviation training activities that utilize the Fort Lewis airspace include artillery and mortar firing from helicopters, close air support, joint anti-armor training, aircraft reconnaissance, parachute drops and low altitude parachute extraction system operations, field and assault airstrip operations, helicopter air-to-air combat training, aviation unit field training exercises from a ground base in a training area, and UAV operations. Helicopter training occurs during daytime and nighttime hours, and includes low level flying.

The majority of fixed-wing aircraft support activities conducted at Fort Lewis involve troop transport missions, transport of very important persons, operational support airlift, or low-level flights over the various drop zones for airborne training.

On YTC, aviation training involves predominantly rotary-wing aircraft (helicopters), fixed-wing aircraft, and UAVs. The UAVs operate within the installation boundaries, and must remain at least 2.4 miles (3.9 km) from the boundary of YTC. They have a preferred flight altitude of 10,000 to 13,000 feet (3,050 to 3,960 km), and are especially quiet to avoid detection.

Aviation training activities that utilize the YTC airspace include close air support, joint anti-armor training, aircraft reconnaissance, field and assault airstrip operations, helicopter air-to-air combat training, aviation unit field training exercises from a ground base in a training area, and UAV operations. Helicopter training occurs during daytime and nighttime hours, and includes low level flying.

There are seasonal flight restrictions in place to protect bald eagles on Fort Lewis, and to protect bald eagles and sage-grouse on YTC (Figure 2-4). Restrictions, which are listed in detail in FL Reg 420-5, pertain to flying over/near sage-grouse leks, and bald eagle nesting and wintering sites.

2.4.4 Mechanical Digging

Various excavation activities take place during training exercises. Earth moving is required for excavation of vehicle positions; berming for fire bases, tactical operation centers, and hasty one-man, two-man, and crew-served weapons systems; and construction of integrated trenches for laying pipeline. At Fort Lewis, excavations are refilled and reseeded, with the exception of individual fighting positions, which are refilled but not reseeded. At YTC, individual fighting positions are refilled, and if multiple excavations occur in the same location they are reseeded.

On both Fort Lewis and YTC, digging activities are not authorized in certain areas to protect natural and cultural resources, as discussed in Sections 2.5.1 and 2.5.2. In addition, units are encouraged to excavate in areas where ground-disturbance has occurred previously. The dig permit process requires trainers to obtain a permit prior to conducting digging activities. This process helps prevent excavations from occurring in environmentally sensitive areas.

2.4.5 Bivouacking and Assembly Areas

Some aspects of training require soldiers, vehicles, and equipment to gather in one area. For example, training exercises may require tactical assembly areas, temporary arming and refueling facilities, or bivouac sites for establishing command and control areas. Because of the concentrated activity, bivouacking is not authorized in certain locations, as indicated in Sections 2.5.1 and 2.5.2.

2.4.6 Urban Combat Training

During urban combat training, units take part in exercises that mimic conflict scenarios in urban settings and Forward Operating Bases, including urban unrest and operations other than war. Urban combat training occurs in special training facilities on Fort Lewis and YTC that mimic urban settings. On Fort Lewis, these facilities include the Leschi Town Combined Arms Collective Training Facility, the Regenburg/Al-Regen site, and temporary shanty towns emplaced in maneuver areas. At YTC, urban combat training takes place at a Shoot House and Urban Assault Course (SHUAC). The Shoot House is located at Range 24 and the Urban Assault Course is located at Range 25. Training activities that take place at the SHUAC include use of small arms, pyrotechnics such as flares and smoke devices, explosives for live breaches, tactical and non-tactical vehicles, and occasionally helicopters.

2.4.7 Pyrotechnics and Tracers

Use of these incendiary devices would be minimal. Some use of tracers would be required for nighttime firing. Pyrotechnics may occasionally be used for scenarios involving perimeter defense during battery and battalion training.

2.5 Land Use Designations

Fort Lewis and YTC have training land designations that indicate the types of activities that are authorized in various locations. These land use designations would be applicable to training by any new units stationed at Fort Lewis/YTC in the next 5 years.

2.5.1 Fort Lewis

Portions of Fort Lewis have been designated as Controlled Use Areas (CUAs), in which certain land use activities are restricted either seasonally or year-round. Most CUAs are environmentally sensitive areas in which land use restrictions are necessary to protect natural resources. In some cases, restrictions are associated with regulatory compliance (e.g., bald eagle nest and roost site buffers), and in other cases, restrictions have been put in place to prevent additional future restrictions on training (e.g., areas of high quality prairie that provide habitat for candidate species). Figure 2-3 shows the locations of CUAs on Fort Lewis. Areas designated as CUAs include wetlands and streams and their associated buffers, cultural sites, areas previously designated as Research Natural Areas, buffers for listed species, and environmental hazards such as landfills. Because identification of cultural sites is a violation of federal law, these CUAs are not shown in Figure 2-3.

There are four restriction levels for CUAs, each of which corresponds to a different color on the map:

1. Red – Access is prohibited; a safety and/or human health risk is present.
2. Orange – Digging, bivouacking, assembly areas, and/or off-road vehicle activities are not authorized. Dismounted activities are allowed.
3. Yellow – No digging or bivouacking authorized. (Currently, there are no yellow CUAs on Fort Lewis)

4. Blue – No digging authorized. (Currently, there are no blue CUAs on Fort Lewis)

2.5.2 Yakima Training Center

Yakima Training Center is divided into five land use zones that identify allowable military training activities and acceptable levels of impact to resources (Figure 2-4). These land use designations maximize military training opportunities while simultaneously safeguarding resources.

Zone 1 (Land Bank). This zone, covering approximately 10,000 acres (4,050 ha), is managed for significant and sensitive natural and/or cultural resources (e.g., wetlands, riparian areas, archeological sites). Most forms of training, including all tracked and wheeled vehicle use, digging, and bivouacking, are prohibited. Protection and restoration of these sites are primary objectives.

Zone 2 (Conservation). This zone, covering approximately 44,320 acres (17,935 ha), is the Sage-grouse Protection Area. Most forms of training are permitted within areas in this zone, but are highly controlled. The Sage-Grouse Management Plan provides a detailed description of protection and management measures that apply to these areas (Livingston 1998). Digging and bivouacking activities are not permitted within this zone. Army rest/rotation training regimes and restoration or rehabilitation activities are designed to maintain or enhance these areas.

Zone 3 (General Use). This zone, covering approximately 245,915 acres (99,520 ha), includes the MPRC, MPTR, cantonment area, and all the primary training and vehicle maneuver areas. With the exception of the cantonment area and portions of the MPRC and MPTR, all forms of training are permitted, including bivouacking and digging, as long as surface water quality, soil stabilization, and potential long-term habitat reservoirs are maintained.

Zone 4 (High Use). This zone, covering approximately 7,740 acres (3,130 ha), accommodates heavy use and high-impact activities, such as Brigade Support Areas and gravel pits. Reclamation or remediation activities are used to ensure protection of soil and water resources.

Zone 5 (Impact Areas). This zone, covering approximately 19,125 acres (7,740 ha), includes impact and dud areas and the Selah Airstrip. Due to unexploded ordnance in impact and dud areas, these sites are off limits. Given the hazardous nature of these areas, on-the-ground management of these sites is not feasible beyond protection of soil and water resources. However, these sites are included in remotely sensed data collection efforts, including satellite imagery and aerial photographs.

2.6 Regulations and Management Pertaining to Listed Species

Regardless of the number of units stationed at Fort Lewis, Army regulations that involve restrictions on training for the protection of listed species will continue to be in effect (Tables 2-4 and 2-5). Additionally, the Army will continue to implement other management practices for these species, as appropriate.

2.6.1 Fort Lewis Regulation 420-5

Fort Lewis Regulation 420-5 (Appendix A) prescribes procedures to protect endangered, threatened, and candidate species, species of concern, and the habitat components necessary to support them.

Protection measures for water howellia involve analyzing proposed construction, management, and recreation activities for their potential to impact populations, and restricting or avoiding certain activities, as appropriate. Protection measures for Chinook salmon and bull trout include restrictions associated with Nisqually River crossings and Solo Point amphibious operations.

TABLE 2-4
Summary of Protection and Conservation Measures on Fort Lewis

Species	Measures
Water howellia	• No digging, bivouacking, assembly areas, or off-road vehicle activities authorized within 164 feet (50 m) of wetlands (Wetland CUA designation, FL Reg 420-5 and 200-1). • Locate assembly areas at least 328 feet (100 m) away from wetlands (FL Reg 200-1). • Locate hazardous material storage areas at least 328 feet (100 m) from wetlands (FL Reg 200-1). • Conduct refueling activities only at established refueling sites at least 328 feet (100 m) away from water bodies (FL Reg 200-1). • Prepare spill contingency plans for field training events; have the plan available and appropriate spill response supplies, tools, and equipment on site (FL Reg 200-1). • Locate smoke generators (point of smoke generation) at least 656 feet (200 m) from wetlands (FL Reg 350-30).
Bald eagle	1. The following measures apply to primary and secondary zones around active nests during the nesting period (December 1 to August 31) (primary zone = within 1,312 feet [400 m] of nests; secondary zone = within 2,624 feet [800 m] of nests; FL Reg 420-5): • Do not bivouac within the primary zone (an exception is the Halverson Marsh nest site where bivouacking can occur within the primary zone east of the railroad tracks). • Avoid training activities within the primary zone. • Avoid blasting and use of firearms. • Do not use pyrotechnics from June 1 to October 31. • Do not fly aircraft lower than 1,200 feet (365 m) MSL within primary zone. Exceptions: Nisqually Bluff: maintain overflight scenario in place at time of initial nest establishment (flights no lower than 300 feet [91 m] above ground level within the primary zone). Spanaway Marsh: any changes in the approach zone to McChord AFB within the primary nesting zone require consultation with USFWS. 2. Additional nest protective measures (FL Reg 420-5): • Adhere to no wake zones on American Lake. • Do not land boats on Picnic Point (American Lake). 3. The following measures apply to primary and secondary zones around communal night roosts during the wintering period (December 1 to March 31) (primary zone = within 1,312 feet [400 m] of roosts; secondary zone = within 2,624 feet [800 m] of roosts where eagles have line-of-sight vision; FL Reg 420-5): • Do not engage in blasting, demolition or use of firearms (an exception is the Muck Creek roost located within the Artillery and South Impact Areas). • Do not bivouac. 4. The following measures apply to primary foraging areas during the primary foraging period (December 1 to March 31; FL Reg 420-5): • From December 15 to March 31, prohibit aircraft flights lower than 1,300 feet (396 m) MSL within a 3,281-ft (1,000-m) corridor along Muck Creek from the mouth of the creek to the east slope of Harden Hill (protection zone 2). • Require review and approval by ENRD for all activities occurring within primary foraging areas that have a permanent effect on the environment.

TABLE 2-4 (Cont.)
Summary of Protection and Conservation Measures on Fort Lewis

Species	Measures
Salmonids	• No digging, bivouacking, assembly areas, or off-road vehicle activities authorized within 165 feet (50 m) of streams (CUA designation, FL Reg 420-5, and 200-1). • Vehicles must cross streams only at approved designated hardened crossing sites (FL Reg 200-1). • Locate smoke generators at least 656 feet (200 m) from water bodies (FL Reg 350-30). • Locate assembly areas at least 328 feet (100 m) away from all water bodies; select areas that do not drain into water bodies (FL Reg 200-1). • Conduct refueling activities only at established refueling sites at least 328 feet (100 m) away from water bodies; avoid drainage into water bodies (FL Reg 200-1). • Locate hazardous materials storage areas at least 328 feet (100 m) from water bodies (FL Reg 200-1). • Prepare spill contingency plans for field training events; have the plan available and appropriate spill response supplies, tools, and equipment on site (FL Reg 200-1). • Time river crossings at the Nisqually River crossing site to avoid spawning activities within the river; ENRD must review and approve proposed river crossing activities (FL Reg 420-5). • Limit off-loading and deployment of floating bridge bays and support vessels at Solo Point between March 1 and June 30 to the existing boat ramp (FL Reg 420-5). • Do not deploy from the native beach or alter the native beach material at Solo Point between March 1 and June 30 (FL Reg 420-5). • During the eight days of launch training activity scheduled between March and July of each year, limit nearshore activity to three hours each day (FL Reg 420-5).
Sources: Fort Lewis Regulation 420-5 (Department of the Army 2004b), Fort Lewis Regulation 200-1 (Department of the Army 2004c), and Fort Lewis Regulation 350-30 (Department of the Army 2004d).	

The regulation includes protection measures within primary (1,312 feet [400 m]) and secondary (2,624 feet [800 m]) zones around nests and communal night roosts on Fort Lewis to avoid impacts to eagles. There are specific protection measures for each nest, as detailed in FL Reg 420-5. In primary foraging areas along Muck Creek, aircraft must fly no lower than 1,300 feet (396 m) mean sea level (MSL) within a 3,280-foot (1,000-m) corridor along Muck Creek from its mouth to the east slope of Harden Hill from December 1 to March 31.

There are currently no flight restrictions for foraging areas along the Nisqually River. On American Lake, parachute training may be scheduled outside the nesting season (February 1 to August 31), when human activity has the highest potential to disturb nesting eagles.

To protect bald eagle populations that winter at YTC, Fort Lewis Regulation 420-5 places seasonal restrictions on certain aviation, vehicle, and river crossing activities near roost sites (Figure 2-4). These restrictions include limiting vehicular activity along Hanson Creek Road from December 8th to March 24th between 1500 and 0900 hours, and maintaining aircraft activity to a minimum of 0.6 miles (1 km) north and south of Hanson Creek at a minimum altitude of 300 feet (91 m). In addition, there are a series of restrictions associated with training activities in/near sage-grouse leks, and in sage-grouse protection areas (Figure 2-4).

2.6.2 Additional Management for Listed Species

Endangered Species Management Plans (ESMPs) have been prepared for Chinook salmon, steelhead trout, bull trout, water howellia, and greater sage-grouse.. The management objectives of these ESMPs are focused on the protection and enhancement of these listed species. Management prescriptions would be implemented to ensure that Fort Lewis and YTC are in compliance with the ESA and Army guidelines.

TABLE 2-5
Summary of Protection and Conservation Measures on Yakima Training Center

Species	Measures
Bald eagle	• During aircraft flights along the Hanson Creek Route (between coordinates GG190875 and GG280842) between December 8 and March 24, maintain a minimum flight level of 300 feet (91 m) above ground level (FL Reg 420-5). • During aircraft flights along the Hanson Creek Route (between coordinates GG190875 and GG280842) between December 8 and March 24, maintain a 0.6-mile (1-km) buffer to the north and south of Hanson Creek Road, with traffic moving west remaining 0.6 mile (1 km) north of Hanson Creek road (FL Reg 420-5). • During aircraft flights along the Columbia River Route (coordinates KB830 and KB690) maintain one-way traffic, with a minimum 0.6-mile (1-km) buffer to the west of the railroad rights-of-way along the Columbia River (FL Reg 420-5). • Do not engage in river crossing exercises at the Priest Rapids Reservoir between December 8 and March 24 (FL Reg 420-5). • Install and maintain tree protectors on roost trees to prevent beaver damage (Department of the Army 1997). • Continue implementing YTC Wildland Fire Management Plan (Department of the Army 1997). • Do not travel off-of established roads in the Hanson Creek riparian zones (FL Reg 420-5). • Prohibit military vehicle traffic within 164 feet (50 m) of Hanson Creek riparian zones (Department of the Army 1997). • Do not operate vehicles within the enclosed Siber-staked area around roost trees (FL Reg 420-5). • During December 8 through March 24, significantly curtail traffic along Hanson Creek Road between 1500 and 0900 hours (between coordinates GG180875 and GG280842); use of this road during this time period requires prior approval by ENRD and Range Control (FL Reg 420-5).
Greater sage-grouse	• Follow restrictions on training between March 1 and May 15, between 2400 and 0900 hours daily, within a 0.6-mile (1-km) radius of each designated lek and Sage Grouse Protection Area. If surveys reveal sage-grouse are attending leks prior to March 1, the restriction date is changed accordingly. During this period, access to ranges is restricted to Main Supply Routes and designated roads to ranges (FL Reg 420-5). • Do not fly aircraft within a 0.6-mile (1-km) radius of leks lower than 300 feet (91 m) above ground level between 2400-0900 hours during the lek protection period (FL Reg 420-5). • Do not bivouac in the sage-grouse protection areas (FL Reg 420-5, Figure 2-4). • Within the sage-grouse protection areas, dig only on existing firebreaks (all excavations must be coordinated through ENRD and carried out in accordance with the dig permit process) (FL Reg 420-5). • Do not drive off established roads within the sage-grouse protection areas between March 1 and June 15. Exceptions include Firing Ranges 4, 5, 10, 10Z, 16, 26, and 55 (vehicle travel is limited to Main Supply Routes and/or designated roads to these ranges) (FL Reg 420-5).
Salmonids	• Do not drive off-road, dig, or bivouacking within Zone 1 areas along water bodies (Figure 2-4). • Vehicle movement parallel to riparian drainages must remain 197 feet (60 m) from drainages that have not been Siber staked (FL Reg 200-1). • Vehicles must cross streams where roads cross streams, at concrete fords, or where marked by Siber stakes (FL Reg 200-1). • Locate assembly areas at least 328 feet (100 m) away from all water bodies; select areas that do not drain into water bodies (FL Reg 200-1). • Conduct refueling activities only at established refuel sites at least 328 feet (100 m) away from water bodies, and avoid drainage into water bodies (refueling must occur at least 656 feet [200 m] from any drainage, and bivouacking of refuelers must occur at least 328 feet [100 m] from any drainage) (FL Reg 200-1). • Locate hazardous materials storage areas at least 328 feet (100 m) from water bodies (FL Reg 200-1). • Prepare spill contingency plans for field training events; have the plan available and appropriate spill response supplies, tools, and equipment on site (FL Reg 200-1).

Source: Fort Lewis Regulation 420-5 (Department of the Army 2004b) and Fort Lewis Regulation 200-1 (Department of the Army 2004c).

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), and the *National Marine Fisheries Service Consultation Initiation Checklist* (NMFS 2002).

3.1 Pre-Field Review

To obtain information about federally listed species and greater sage-grouse on Fort Lewis and YTC, installation surveys and reports, agency reports, Washington Department of Fish and Wildlife (WDFW) Priority Species Habitat maps and databases (WDFW 2008), and Washington Natural Heritage Program databases were reviewed. Agencies and individuals with knowledge of listed species and their habitat use near the project area were contacted for information, and have been listed in Section 8 (Agencies and Persons Consulted). The literature was reviewed for information on the occurrence, range, and habitat requirements of federally listed species and greater sage-grouse. In addition, species habitat requirements were compared to habitat features found in the project area to determine whether suitable habitats were present.

3.2 Field Studies

If no evidence of species occurrence or suitable habitat exists for a listed threatened or endangered species within the project area, a "no effect" determination can be made and the BA analysis is complete for the species. If a "no effect" determination cannot be made based on background information, field reconnaissance must be conducted to determine whether listed species or suitable habitats are present. Numerous field studies have been conducted on species reviewed in this BA by the Army and its consultants.

3.3 Determination of Effects

Chapter 4 includes background information and an analysis of the effects of the proposed action on the species covered by this BA. In the first part of each section, background information on species abundance and distribution, habitat requirements, reproductive biology and life history, and current status and presence/absence of designated critical habitat is provided. Potential beneficial, direct, indirect, interdependent, and interrelated threats to the species that are unrelated to the proposed actions, and that may result in cumulative effect as a result of the proposed action, are presented (for a more detailed discussion of types of effects, see USFWS and NMFS 1998). These effects are defined as follows:

- Beneficial – Effects of an action that are wholly positive, without any adverse effects, on a listed species or designated 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, are later in time, and are reasonably certain to occur. Indirect effects may occur outside of the area directly affected by the action.
- Interdependent – Effects that result from an activity that has no independent utility apart from the action under consideration.
- Interrelated – Effects that result from an activity that is part of the proposed action and depends on the proposed action for its justification.

- Cumulative – Include the effects of future state, tribal, local, or private actions that are reasonably certain to occur in the action area considered in this BA. 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.

The effects assessment is based on the following factors:

- the dependency of the species on specific habitat components;
- habitat abundance;
- population levels of the species;
- the degree of habitat impact; and
- the potential to mitigate for an adverse effect.

After evaluating the potential for effect, one of the following determinations is provided:

No effect – the proposed action will not affect listed species or critical habitat;

Is not likely to adversely affect – effects on listed species are expected to be discountable, or insignificant, or completely beneficial. Beneficial effects are contemporaneous positive effects without any adverse effects to the species. Insignificant effects relate to the size of the impact and should never reach the scale where a take occurs. A take includes harassing, harming, pursuing, shooting, wounding, killing trapping, capturing, collecting, or attempting to engage in such conduct. Discountable effects are those extremely unlikely to occur. Based on best judgment, a person would not: 1) be able to meaningfully measure, detect, or evaluate insignificant effects; or 2) expect discountable effects to occur; or

Is likely to adversely affect – if any adverse effect to listed species may occur as a direct or indirect result of the proposed action or its interrelated or interdependent actions, and the effects is not discountable, insignificant, or beneficial.

4.0 ANALYSIS AND DETERMINATION OF EFFECTS

This section contains background information on federally listed, endangered and threatened species, and a candidate species that are likely to occur on Fort Lewis and YTC. This information was used to determine the effects of the proposed action on federally listed species, and on the greater sage-grouse (a federal candidate species), which is afforded special protection on YTC. In addition, conservation measures are recommended to reduce effects to species.

Additional discussion on the impacts of various types of training can be found in the following BAs: *Final BA for the Fielding of M56 and M58 Smoke Generators at Fort Lewis and Yakima Training Center* (ENSR 1999; addresses smoke generators); *Final Biological Assessment of Military Operations at Solo Point, Fort Lewis, Washington* (ENSR 1998a; addresses amphibious training); *Final BA for Training with Smoke Munitions at Fort Lewis and Yakima Training Center, Washington* (ENSR 2001a; addresses smoke-producing munitions); *Biological Assessment Interim Brigade Combat Team Transformation at Fort Lewis, Washington* (CH2M HILL 2001b; addresses SBCT training); *Final Biological Assessment and Essential Fish Habitat Assessment for the Army Transformation and Resource Sustainability* ENSR 2004a; addresses various types of training); *Biological Assessment for Construction and Maintenance Activities within the Southern Cantonment Area, Gray Army Airfield, and the Central Impact Area at Fort Lewis, Washington* (ENSR 2004b; addresses construction activities); *Biological and Essential Fish Habitat Assessment Fiscal Year 2005 Stationing Actions at Fort Lewis, Washington* (ENSR 2005a; addresses various types of training); *Final BA and Essential Fish Habitat Assessment for Float Bridge Training and Amphibious River Training Exercises at Yakima Training Center* (Department of the Army 2005; addresses amphibious training), *Final BA for Stationing Regimental Aviation Assets at Fort Lewis and Yakima Training Center and Special Forces Paratrooper Training at Fort Lewis* (ENSR 2005b; addresses aviation and paratrooper training), *Final Programmatic Biological Assessment and Essential Fish Habitat Assessment for Additional Military Units at Fort Lewis and Yakima Training Center, Washington* (ENSR 2006; addresses various types of training), and *Biological Assessment and Essential Fish Habitat Assessment Firing High Mobility Artillery Rocket System (HIMARS) at Fort Lewis and Yakima Training Center, Washington* (Department of the Army 2008; addresses High-Mobility Artillery Rocket System training).

4.1 Fort Lewis

4.1.1 Golden Paintbrush

The golden paintbrush is a perennial herb that occurs in open grasslands at elevations below 328 feet (100 m) around the periphery of the Puget Trough. Most populations occur on glacially-derived soils. Associated species include Roemer's fescue (*Festuca roemeri*), red fescue (*F. rubra*), camas (*Camassia* spp.), common velvetgrass (*Holcus lanatus*), yarrow (*Achillea millefolium*), bracken fern *(Pteridium aquilinum*), vetch (*Vicia* spp.), and brome (*Bromus* spp.; Gamon 1995). Many populations of this species have been extirpated by conversion of habitat to agricultural, residential, and commercial development. In Oregon, the golden paintbrush historically occurred in the grasslands and prairie of the Willamette Valley, but has since been extirpated from all of these sites.

The golden paintbrush was federally listed as threatened on June 11, 1997. Critical habitat has not been designated. The species is threatened by habitat modification through succession of grassland to shrub and forest habitat. In addition, the potential for expansion and persistence of refugia (suitable habitat) is low due to reduction of habitat. Because the current distribution of the species has been greatly fragmented and reduced from the historic distribution, the species is vulnerable to other threats such as interspecific competition with native and non-native woody species, and reduced vigor and reproductive potential caused

by trampling or collecting during public recreational use of sites. Sites zoned for residential development or commercial uses are particularly vulnerable.

The golden paintbrush was listed by the USFWS as a species that may occur on Fort Lewis. Fort Lewis contains suitable habitat for this species, but several surveys have failed to find it (CH2M HILL 2001a, b). Since golden paintbrush is not known to exist on Fort Lewis, the proposed project would have **no effect** on this species.

4.1.2 Marsh Sandwort

Marsh sandwort is a perennial herb that occurs in wetlands and freshwater marshes in Washington, Oregon, and California from sea level to over 1,400 feet (425 m; Federal Register 1993). However, as of May 14, 2001, the only remaining populations were located in California (USFWS 2006). Populations occur in saturated acidic bog soils, predominantly sandy with a high organic content.

The marsh sandwort was federally listed as endangered on August 3, 1993. Critical habitat has not been designated. Many populations of this species have been extirpated by the elimination of wetlands in which the species grows and/or degraded through urban development, conversion of the habitat for agriculture and ranching activities, and off-road vehicle recreational use.

The marsh sandwort was listed by USFWS as a species that may occur on Fort Lewis. Fort Lewis contains suitable habitat for this species, but several surveys have failed to find it (CH2M HILL 2001a, b). The Washington Natural Heritage Program lists this species as possibly extinct or extirpated from Washington, and it does not list it as present in Thurston or Pierce counties (Washington Natural Heritage Program 2008). Since marsh sandwort is not known to exist on Fort Lewis, the proposed project would have **no effect** on this species.

4.1.3 Water Howellia

4.1.3.1 Background Information

Water howellia is a self-pollinated, annual aquatic plant that was federally listed as a threatened species on July 14, 1994 (Federal Register 1994). Its historical range consisted of five states in the northwestern United States: California, Idaho, Montana, Oregon, and Washington. In Washington, it has been reported in Clark, Spokane, Pierce, and Thurston counties. The population has declined due to competition with introduced plants, loss of wetland habitat, and changes in habitat caused by timber harvesting, livestock grazing, and residential development.

Water howellia was first discovered on Fort Lewis in 1994. During surveys in 2003 and 2004, 22 wetlands were identified as occupied by water howellia on the Main Post of Fort Lewis (Figure 4-1; Lynch 2005). The wetlands on Fort Lewis that have populations of water howellia range from less than 1 acre to 40 acres (0.4 to 16 ha) in size, contain substrate of either Tanwax peat or Semiahmoo muck, and undergo significant annual fluctuations in water level (Gamon 1998). No water howellia sightings have been reported on North Fort Lewis. Water howellia grows in firm, consolidated clay and organic sediments, in freshwater wetlands that are filled by spring rains and snowmelt runoff, and that exhibit some drying during the growing season. The species' microhabitat consists of shallow water and the edges of deep ponds that are partially surrounded by broadleaf deciduous trees. One of the key habitat features necessary for water howellia survival is drying of wetlands during the autumn to allow seed germination, followed by submergence in the spring to permit growth and flowering. Water howellia is often found in relatively open wetlands with little surrounding deciduous forest (Kerschke 1997).

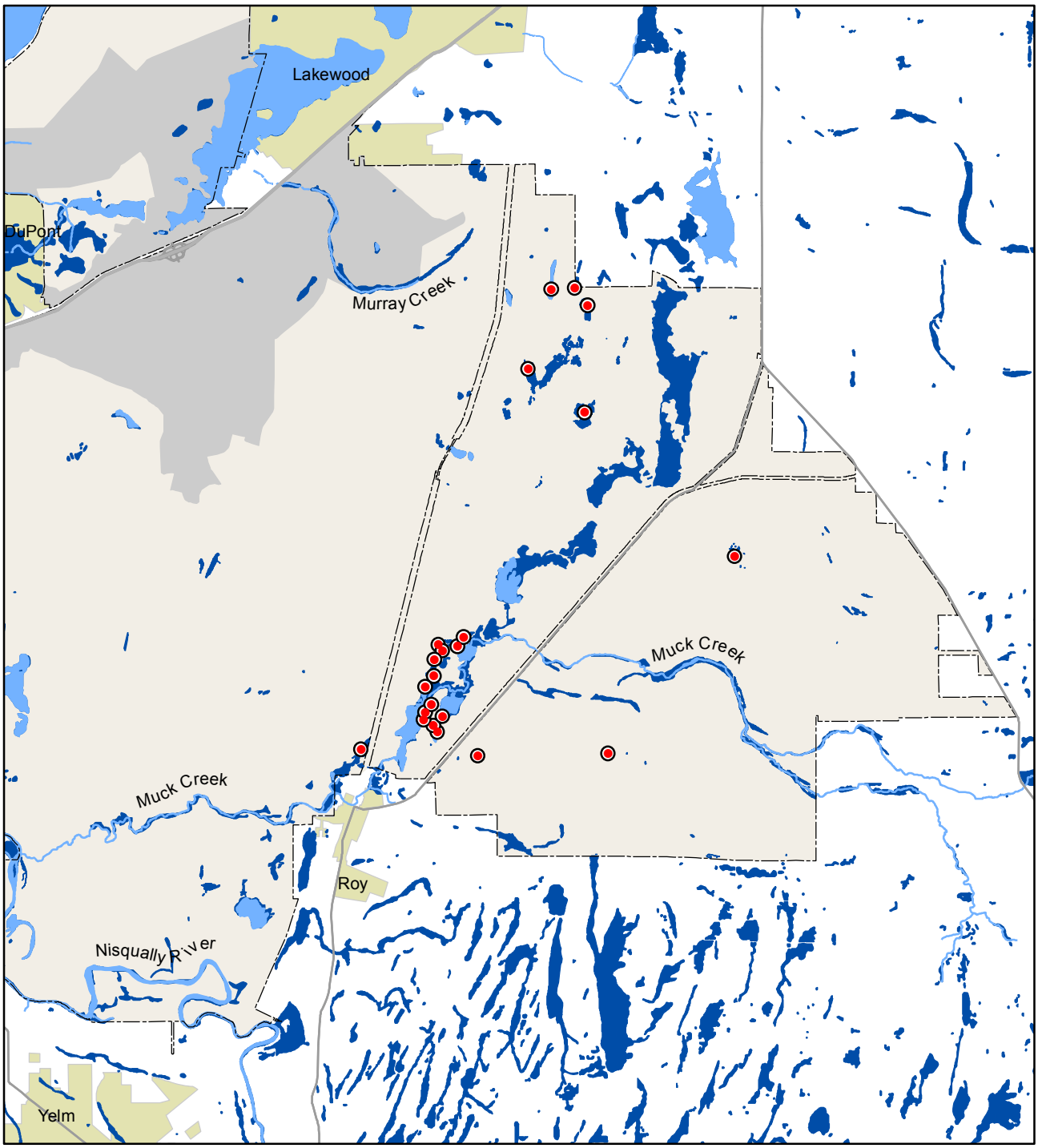

Figure 4-1. Water Howellia Locations on Fort Lewis

Fort Lewis Boundary
Cantonment Area
City Boundary
Water Howellia Locations
Lakes and Streams
Wetlands

0 1 2 3 4 Miles
0 1 2 3 4 Kilometers

N

The primary threats to water howellia include encroachment of invasive plant species into wetlands, unauthorized use of wetlands by humans, altered hydrology, and plant succession (Gamon 1997). It is thought that water howellia on Fort Lewis represents a metapopulation, which must grow in several areas to maintain a viable population over time because of the potential for frequent local extinction (Shelly and Gamon 1996).

4.1.3.2 Analysis of Direct and Indirect Effects

Construction
Most ongoing and proposed construction activities would occur in the North Fort and Main Post cantonment areas or near GAAF. The closest construction sites to a water howellia population would be over 1.5 miles (2.4 km) away. Therefore, impacts to the species from construction are unlikely.

Ground Training
Populations of water howellia are located in CUAs within which digging, bivouacking, and off-road vehicle activities are not authorized. In addition, there are no vehicle fording sites located in the vicinity of known water howellia populations. Therefore, direct effects to water howellia populations and habitat from these activities should not occur.

Because most of the wetlands in which water howellia is found are within training areas, the proposed increase in training levels associated with the proposed maneuver training could potentially indirectly expose water howellia habitat to increased sedimentation. Vehicular traffic not traveling on established roads in the vicinity of wetlands could cause higher levels of siltation of wetlands, resulting in adverse impacts to existing populations of water howellia or adverse modifications to potential habitat. After disturbance, bare land would likely be invaded by non-native species. Propagules could potentially be blown in, or transported in by troops, equipment, or vehicles. Off-road maneuver training and other ground-disturbing activities are not authorized within 164 feet (50 m) of wetlands, so adverse effects to water howellia should be minimal or not occur.

There are fire risks associated with gunnery training and other activities that use fire or incendiary devices (such as flares and camp fires). Since most fires attributable to training are contained in impact areas and other locations away from water howellia habitat, risks are minimal. Installation fire management activities (including placing restrictions on where tracers, pyrotechnics, and troop fires are authorized during high fire risk conditions), should be adequate to protect water howellia populations.

Fuel spills and leaks from vehicles present some risk to water howellia, primarily through contamination and modification of habitat. These risks would be minimal, however, since all vehicle activity within wetland CUAs would occur on established roads. Refueling sites and assembly areas would be located at least 328 feet (100 m) away from wetlands. In addition, spill contingency plans for training events would require immediate action in the field if a large spill were to occur. Actions would place emphasis on keeping the spill from entering or draining into water bodies. Water howellia populations and habitat should not be affected by ground training.

Aviation Training
Aviation training activities could contribute to sedimentation if rotor wash were to occur near water howellia populations. Rotor wash is a phenomenon in which the wind produced by helicopter rotors dislodges and moves soil from the ground, kicking up dust created during take off, landing, and hovering. Since helicopter training would not involve extended hovering, and take off and landing activities would occur in areas with very little exposed soil, it is expected that minimal, if any, sedimentation into water howellia habitat would occur.

Some aviation units could utilize chaff, a decoy for radar seeking missiles that is made of glass and silicate fibers with an aluminum coating. In significant quantities, chaff could have the potential to impact water howellia populations by altering habitat or interfering with germination. However, use of chaff during training would be very rare, and chaff would be dispersed over a wide area, so that the concentration of fibers reaching any one location would remain low. No effects to water howellia populations would be expected.

Given the greater number of ignition sources utilized on Fort Lewis annually, it is likely that more fires would occur because of CAB training. These fires would not be expected to have lasting effects on the impacted areas, and would result in insignificant impacts to all water howellia.

4.1.3.3 Interrelated and Interdependent Effects

Stationing of new units at Fort Lewis would result in additional construction in the cantonment area to provide housing, administrative space, and other facilities for the additional soldiers and their families above that identified in the GTA EIS. All known populations of water howellia on Fort Lewis are located well outside of the cantonment area, and as such should not be adversely affected as a result of any construction activities. Some of the likely construction projects were addressed in the *Biological Assessment for Construction and Maintenance Activities within the Southern Cantonment Area, Gray Army Airfield, and the Central Impact Area at Fort Lewis, Washington* (ENSR 2004b). Other construction projects would require consultation under the ESA.

4.1.3.4 Cumulative Effects

No cumulative impacts to this species are expected from the proposed action because all known occurrences of water howellia within the Puget Sound lowlands are on Fort Lewis and McChord AFB. McChord AFB maintains an undeveloped area around water howellia populations on the base and restricts vehicular access to these areas (Gibbons 2006). These water howellia populations are unlikely to be impacted by future state, tribal, local, or private actions that are reasonably certain to occur within the proposed Action Area.

4.1.3.5 Conservation Measures to Reduce the Effects of the Action

Conservation measures contained in the water howellia ESMP, in Table 2-4, and Fort Lewis 420-5 would help preclude impacts to this species as a result of GTA, SBCT, CSS, and CAB training at Fort Lewis.

4.1.3.6 Determination of Effects

The conservation measures currently in place, in addition to the conservation measures listed in Section 4.1.3.5 above, would protect water howellia from impacts associated with ongoing and future military training activities at Fort Lewis. There would be few, if any, effects to water howellia. Therefore, the proposed actions **may affect, but are not likely to adversely affect** water howellia on Fort Lewis.

4.1.4 Salmonids

4.1.4.1 Background Information

Bull trout, Chinook salmon, and steelhead are three federally listed species that could be found on or near Fort Lewis. The life cycles of salmonids vary widely. However, common habitat requirements exist for all species. Freshwater salmonid 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, incubation, rearing, and migration are sufficient water quantity and good water quality. 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 require a high level of dissolved oxygen, and are affected by other chemical aspects of the water.

Salmonid 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, while 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 (which moderates the temperature of the stream), stabilizes banks, and controls soil erosion and sedimentation. It 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, chemical pollution, inadequate streamflow, and high temperatures.

Nearshore marine habitats (e.g., marine tidal marshes, tidal channels, eelgrass (*Vallisneria* spp.) beds, and kelp (*Macrocystis* spp.) forests) provide salmon with spawning (pink salmon only), rearing, and feeding grounds and shelter. There are several important features that influence the value of estuarine and marine habitats: water quality; temperature; adequate food and cover; a saltwater/freshwater transition zone; marine vegetation and algae; adequate river or stream discharge; and migration pathways. Estuaries 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 fresh to salt water during juvenile downstream migration, and back again during the spawning migration upstream. Some species are dependent on estuaries as rearing areas. Salmon migrate to the ocean and rear there for 2 to 5 years while feeding and rapidly gaining weight before returning to their natal streams.

Bull Trout

Bull trout are native to the Pacific Northwest and western Canada, and were federally listed as a threatened species on June 10, 1998 (Federal Register 1998). On September 25, 2005, the USFWS designated critical habitat for the Coastal-Puget Sound DPS of bull trout, including 1,212 miles (1,951 km) of stream and marine shoreline in the Puget Sound region (USFWS 2005a). Fort Lewis water bodies are exempt from this critical habitat designation (pursuant to the National Defense Authorization Act for Fiscal Year 2004; Public Law 108-136).

Historically, bull trout were found throughout the Pacific Northwest including Montana, Idaho, northern California, and Nevada (Knowles and Gumtow 2005). They exhibit both resident and migratory life-history strategies throughout 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 either a lake (adfluvial), river (fluvial), or, in certain coastal areas, saltwater (anadromous), to mature (Fraley and Shepard 1989, Goetz 1989). Anadromy is the least studied life-history stage in bull trout.

Spawning areas are associated with cold-water springs, areas of groundwater infiltration, and the coldest streams in a given watershed (Pratt 1992; Rieman and McIntyre 1993; Rieman et al. 1997). Cold water temperatures are especially crucial during spawning, when temperatures above 7° Celsius (C; 46° Fahrenheit [F]) can decrease egg survival by at least 75 percent (Knowles and Gumtow 2005). 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 5 to 7° C (41 to 48° F) in late summer to early fall (Goetz 1989). Growth of resident fish is generally slower than that of migratory fish; resident fish tend to be smaller at maturity and less productive (Fraley and Shepard 1989, Goetz 1989). Biologists report repeated and alternate year spawning, although repeat spawning frequency and post-spawning mortality are not well known (Leathe and Graham 1983, Fraley and Shepard 1989, Pratt 1992, Rieman and McIntyre 1993). 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 (250 km) to spawning grounds in some areas of their range (Fraley and Shepard 1989, Swanberg 1997). Depending on the water temperature, egg incubation is normally 100 to 145 days (Pratt 1992), and juveniles remain in the gravels after hatching. Fry normally emerge from the gravel from early April through May, depending on water temperatures and increasing stream flows (Pratt 1992, Ratliff and Howell 1992).

Deforestation, along with agriculture, grazing, and mining, are the major causes of habitat degradation. These practices cause higher water temperatures and sediment buildup in streams that affects both water clarity and spawning gravels. Dams and irrigation projects have caused the extinction of most of the migratory bull trout subpopulations (Brown 1992, Knowles and Gumtow 2005). Other causes of population declines include habitat fragmentation and degradation, poor water quality, poor fisheries management, and introduction of non-indigenous species.

The Coastal-Puget Sound DPS of bull trout is significant to the species as a whole because it contains the only anadromous forms of bull trout in the coterminous United States. The DPS includes the Puget Sound Management Unit, which includes all watersheds within the Puget Sound Basin and the marine nearshore areas of Puget Sound (USFWS 2004a). Bull trout have been observed in the Nisqually River, which passes through Fort Lewis (Fresh et al. 1979, Bottorff and Swanson 1993, Chan 2004). Bull trout historically were present in the Nisqually River, and there have been recent sightings in the Nisqually River, which have likely been foraging bull trout (Chan 2000, 2003; Ellings 2004). A single juvenile was collected during stream sampling in the lower reaches of the Nisqually River in the mid-1980s (WDFW 1998), and in the late 1990s a single adult was observed at Clear Creek hatchery in mid-September (USFWS 2004a). In July 2004, a bull trout was collected in the lower reaches of the Nisqually River (Zuchowski 2006). Bull trout are most likely to be found in the Nisqually River during the winter and spring months, but are unlikely to be found there later in the summer and fall when they journey upstream into glacial streams to spawn.

The Bull Trout Recovery Unit Team has decided that the Nisqually River Basin is not a core population watershed for Puget Sound bull trout. However, the team has designated it as “core habitat,” given the possibility that bull trout from other South Puget Sound watersheds may use the Nisqually River estuary for habitat. More recently, a single bull trout smolt was captured by seining at the mouth of the river (Kunz 2009, Phillips 2009). The origin of this fish is unclear and could have been another river system (Phillips 2009).

Chinook Salmon

This species is found from the Bering Strait south to southern California. The Puget Sound ESU for Chinook salmon is federally listed as threatened, although Chinook salmon populations appear stable in the Puget Sound Region. On September 2, 2005, NMFS designated critical habitat areas in Washington for Puget Sound Chinook salmon (Federal Register 2005). However, none of the streams on Fort Lewis are classified as critical habitat as Fort Lewis water bodies are exempt from this critical habitat designation (pursuant to the National Defense Authorization Act for Fiscal Year 2004; Public Law 108-136).

Chinook salmon are the largest of any salmon, with adults often exceeding 40 pounds (18 kilograms). There are different seasonal runs of Chinook salmon, which correspond to the timing of migration from ocean to freshwater. These runs have been identified on the basis of when adults enter freshwater to begin their spawning migration. However, distinct runs also differ in 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.

Though they use a variety of freshwater habitats, Chinook salmon spawn in large mainstream rivers more frequently than other salmon species (Washington State Joint Natural Resources Cabinet 1999). As adults, they migrate from a marine environment into freshwater streams and rivers. These areas are mostly in rough gravel beds of major rivers, rather than the more protected tributaries (Tibbits 1998). Physical qualities of the stream, including stream flow, gravel quality, and silt load, can significantly influence the survival of the eggs as they develop within these spawning beds. Adult females 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.

To complete the freshwater portion of their life histories, Chinook salmon require cool, clean water with a high level of dissolved oxygen and low turbidity and sediment content. For spawning and incubation, clean gravel must be available, and minimum streamflow must be of sufficient depth and velocity to allow passage, migration, and spawning (Washington State Joint Natural Resources Cabinet 1999). Dams and fishing pressure (commercial, tribal, and recreational) are the main factors preventing salmon from accessing their primary reproduction areas, and have been identified as the major causes of declines in Chinook populations.

The Puget Sound Chinook 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, and rivers and streams flowing into Hood Canal, South Puget Sound, North Puget Sound, and the Strait of Georgia in Washington. Chinook salmon (and their progeny) from the following hatchery stocks are considered part of the listed ESU: Kendall Creek (spring run); North Fork Stillaguamish River (summer run); White River (spring run); Dungeness River (spring run); and Elwha River (fall run).

The streams surrounding the Puget Sound are one of the major producers of Chinook salmon. The Puget Sound Chinook ESU includes Fort Lewis. Puget Sound borders North Fort Lewis, an area that provides habitat for outmigrating juvenile and in migrating adult anadromous salmonids using the Nisqually River to the south and Chambers Creek to the north (Walter 1998). Some experimental rearing of Chinook and coho salmon was conducted in Sequalitchew Creek on Fort Lewis. Since the survival of Chinook salmon was poor (Mills 1998), the Chinook and coho program was terminated in the early 1990s (Zuchowski 2006). Although some Chinook salmon may use the lower reaches of Sequalitchew Creek, it is unlikely that they spawn in the creek, as there is little spawning habitat within Sequalitchew Creek immediately downstream of Sequalitchew Lake (Carlson 1998, Norman 1998). Most spawning near Fort Lewis occurs in the mainstem of the Nisqually River (U.S. Army Directorate of Engineering and Housing 1984, CH2M HILL 1994, Nisqually Chinook Recovery Team 2001).

Steelhead

The Puget Sound ESU for steelhead is federally listed as threatened. No critical habitat has been designated for this species. The original range of steelhead was from northern Mexico to southeastern Alaska, and inland to the tributaries of the upper Columbia River, to Hell's Canyon Dam on the Snake River and the Clearwater and Salmon rivers in Idaho.

Of all the salmonid populations within Washington State, steelhead spend the largest amount of their lives actually within the inland boundaries of the state. This species is found in most streams in Washington during all times of the year. Winter runs are normally found in the Puget Sound region with a few populations migrating east through the Cascades via the Columbia River. The summer runs migrate much farther and are found in most major streams in Washington. In western Washington, both forms (rainbow trout and steelhead) are present in most drainages of Puget Sound, coastal streams, and the lower Columbia River (Figures 4-2 and 4-3).

In general, steelhead that enter freshwater between May and October are considered summer-run steelhead. Steelhead that enter fresh water between November and April are considered winter-run steelhead. Summer steelhead enter fresh water in a sexually immature condition and require several months to mature and spawn. Winter steelhead enter fresh water with well-developed gonads and spawns shortly thereafter.

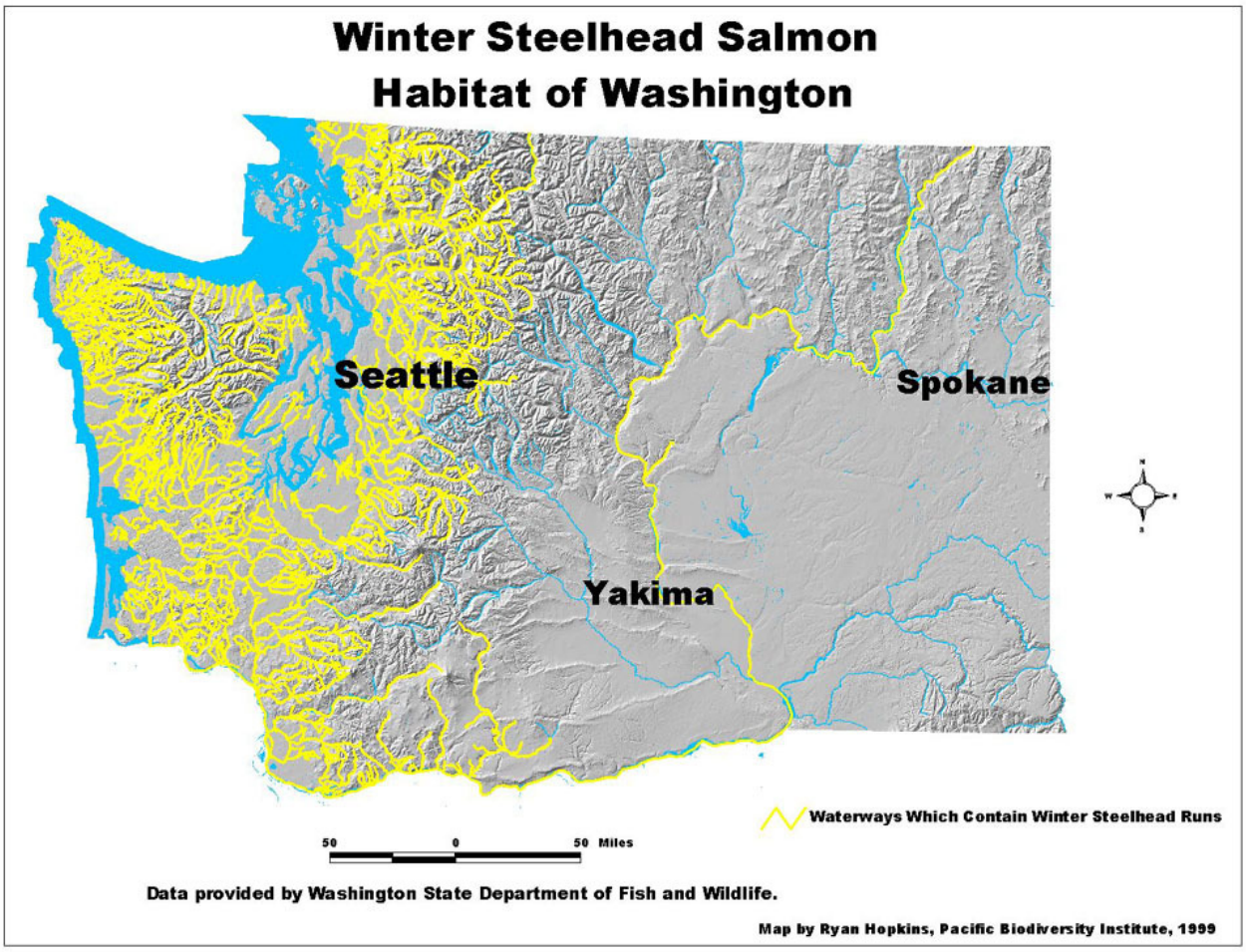

Figure 4-2. Waterways in Washington State that Contain Puget Sound Winter-run Steelhead.

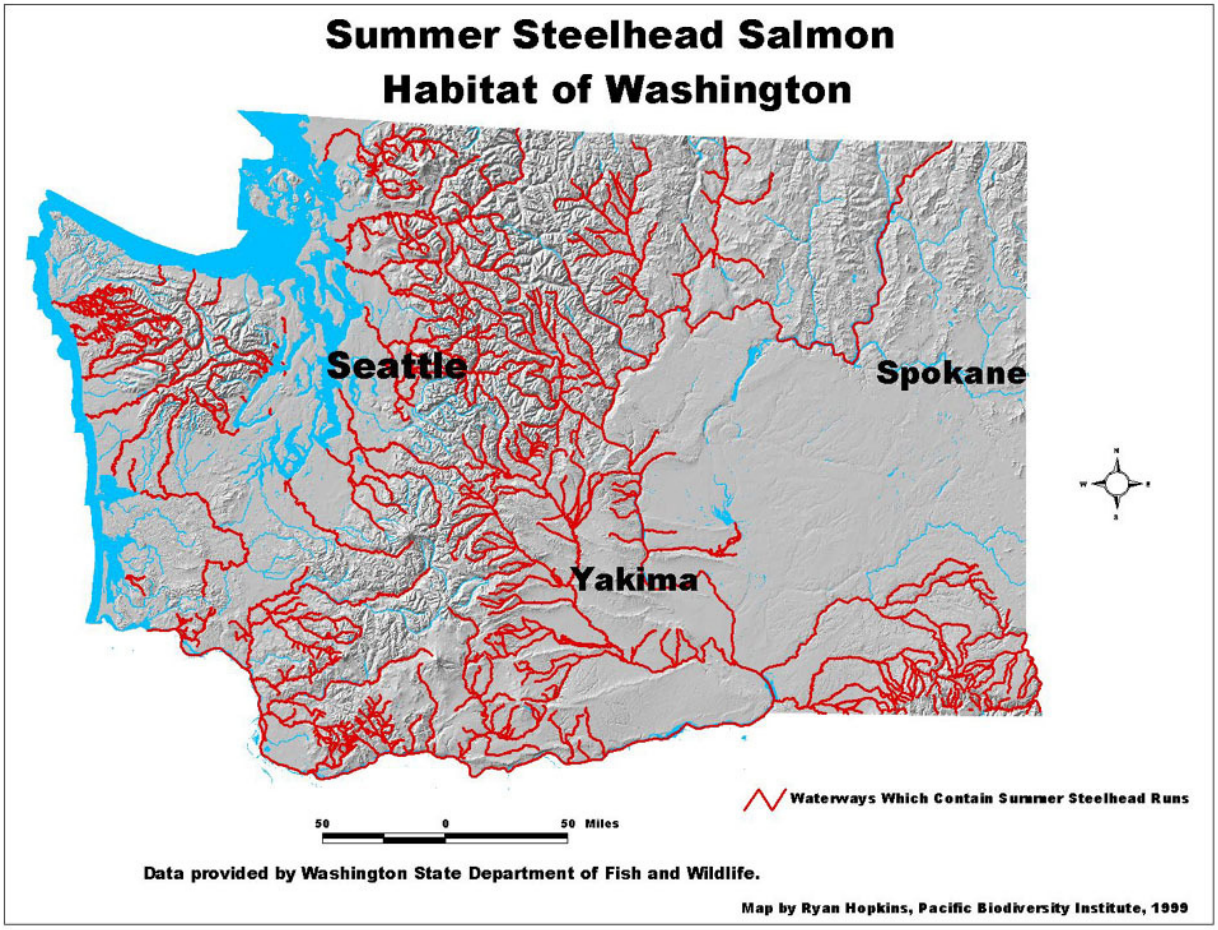

Figure 4-3. Waterways in Washington State that Contain Puget Sound Summer-run Steelhead.

The Nisqually River has both winter- and summer-run steelhead. The winter run consists of both native fish and hatchery fish of outside origin, but it is managed for natural production. This run contributes to both the Nisqually Indian commercial and non-Indian sport fisheries on the river. The summer run consists of hatchery fish of outside origin and contributes to a small non-Indian sport fishery on the river.

Hatchery plants of both winter and summer steelhead have occurred historically in the basin, but they have been eliminated to protect the native wild stock. Spawning occurs from April through June, with fry emerging from late May through August (Nisqually Chinook Recovery Team 2001).

4.1.4.2 Analysis of Direct and Indirect Effects

Construction

Modular construction would occur on approximately 210 acres (85 ha) in areas that are already developed. This construction would increase the area of impervious surface and potentially cause an increase in the overland flow of water. The alteration of soil structure during construction may increase sediment loading to streams but the effect is likely to be short-term (Spence et al. 1996). However, the proposed construction activities would be restricted to within the cantonment area on developed sites, and would be located over 4

miles (6.4 km) from the Nisqually River. Therefore, the proposed construction activities would not likely impact listed salmonid species.

Ground Training

Direct impacts to fish include those that cause mortality, physical trauma, harassment, or predation. Ground activities most likely to directly impact listed fish involve stream and river fording activities at Muck Creek and the Nisqually River. With a nearly 5-fold increase in vehicle miles from SBCT, GTA, CSS, and CAB unit vehicles from current levels, there would be a substantial increase in the number of vehicle crossings of streams and rivers, increasing the potential to directly kill, harm, or harass fish, and degrade their habitat. One phenomenon associated with vehicles crossing streambeds is the creation of an "attractive nuisance," where vehicles create gravel mounds in the streambed, which attract spawning fish, which could then be killed or harmed by further vehicle activity. Maneuvers involving Strykers and other vehicles would occur at vehicle fords that have been hardened with concrete to minimize the likelihood of salmon loitering in the area and exposing themselves to potential harm. These hardened crossings minimize the likelihood of vehicles directly impacting the streambed and therefore stop the creation of gravel mounds.

With increased training activities, particularly off-road, there is the potential for increased sedimentation to enter aquatic habitats and indirectly impact fish. This increase in instream sedimentation could result from soil compaction and increased erosion. Compacting soil increases the overland flow of water into the aquatic habitat and decreases the water storage capacity of the soil.

Over the long-term, overland flow can erode the topsoil and cut rills and gullies or deepen existing gullies, concentrating runoff. As a result, sediment production is increased. Reduced infiltration and increased runoff may decrease the recharge of the saturated zone and increase peak flow discharge.

Sedimentation can cover spawning or rearing areas and fill pool habitats, making them unusable by fish and other aquatic organisms (U. S. Forest Service 2002). A number of sublethal effects to aquatic species may also occur as a result of sedimentation, including avoidance behavior, reduced feeding and growth, and physiological stress (Waters 1995). Over the long-term, increased sediment loads reduce primary production in streams. Reduced instream plant growth, combined with the reductions in riparian vegetation, can limit populations of terrestrial and aquatic insects, which also serve as food sources for many salmonids.

The severity of the effects would vary by the training exercise, location, and the distance from the aquatic habitat. However, all training activities would continue to be conducted in existing training areas, and outside the designated 164-feet (50-m) buffers, which would continue to minimize impacts to salmonids and their habitats.

Fuel spills and leaks from vehicles present some risk to salmonids on Fort Lewis, primarily through contamination and modification of riparian habitat. However, these risks would be minimal, since all vehicle refueling sites and assembly areas would be located at least 328 feet (100 m) away from aquatic habitats.

There are fire risks associated with gunnery training and other activities that use fire or incendiary devices (such as flares and camp fires). Fires are only likely to impact fish if vegetation in the 164-feet (50-m) buffer zone adjacent to aquatic bodies is burned. Removal of this riparian vegetation would potentially increase sedimentation and short-term water temperatures of the water bodies, both of which can be harmful to fish. Since most fires attributable to training are contained in impact areas and other locations away from salmonid-bearing streams, risks are minimal. Installation fire management activities (including placing restrictions on where tracer, pyrotechnics, and troop fires are authorized during high fire risk conditions) should adequately protect salmonid populations on Fort Lewis.

Digging, bivouacking, and assembly areas generally occur in areas where soil resources have been repeatedly disturbed in the past, increasing the risk of erosion and the potential for sediment to enter water bodies, thereby indirectly impacting salmon. Since digging and bivouacking are not authorized within 164 feet (50 m) of streams, and assembly areas are at least 328 feet (100 m) away from water bodies, adverse effects to salmon from these activities should not occur.

Aviation Training

Aviation activities could contribute to sedimentation if rotor wash were to occur near water bodies. Since helicopter training would not involve extended hovering, and take-off and landing activities would occur in areas with very little exposed soil, it is expected that minimal, if any, sedimentation into salmonid-bearing waters would occur.

Some aviation units could utilize chaff. Chaff may enter aquatic habitats and could accidentally be consumed by salmonids. However, materials used to make chaff are not toxic, and the dilution of this product when in water would be at a level that effects to fish would not be expected (Haley and Kurnas 1992). Therefore, effects of chaff on bull trout, Chinook salmon, and steelhead would be negligible.

It is likely that more fires would occur because of CAB training. Despite the greater number of ignition sources, it is not expected that the risk of a fire that would cause long-term damage to resources would be substantially greater than at present.

Under the current fire management programs on Fort Lewis, measures to prevent and suppress fires are already in place that would minimize the risk of such a fire occurring, and include restrictions on where tracers, pyrotechnics, and troop fires are authorized during Level II and Level III fire hazard conditions (Fort Lewis Regulation 350-30); fire suppression activities by troops and the Forestry Program; and maintenance of firebreaks. In addition, the likelihood and severity of the effects depends on the distance of the activity from the aquatic habitat. All CAB training activities would be conducted outside the designated 164-feet (50-m) stream buffers, continuing to minimize impacts to salmonids and their habitats.

4.1.4.3 Interrelated and Interdependent Effects

Stationing of new units at Fort Lewis would potentially result in additional construction in the cantonment area to provide housing, administrative space, and other facilities for the additional soldiers and their families. All known populations of bull trout, Chinook salmon, and steelhead on Fort Lewis are located in waterways outside of the cantonment area; therefore they should not be adversely affected by construction activities. Increases in the Fort Lewis population would not result in an increase in pollutants discharged from the wastewater treatment plant, as the current permit limits for discharge volume would not be exceeded. Some of the proposed construction projects were addressed in the *Biological Assessment for Construction and Maintenance Activities within the Southern Cantonment Area, Gray Army Airfield, and the Central Impact Area at Fort Lewis, Washington* (ENSR 2004b). Other construction projects would require consultation with the USFWS and NMFS.

Possible increases in the population of soldiers and their families may see an increase in recreational uses of the surrounding area. With state regulations (such as fishing licenses) in place, any increases in salmon fishing in the Nisqually River or Puget Sound should not impact local salmonid stocks. However, there could be an increase in illegal activities such as poaching and violations of fish harvest regulations. Any increase in recreational activities in American Lake, or other lakes on the installation, would have no effect on bull trout, Chinook salmon, or steelhead, as these fish do not occur in these water bodies.

4.1.4.4 Cumulative Effects

Native American tribes catch Chinook salmon and steelhead commercially and for subsistence using beach seine and gillnets. Bull trout are caught incidentally during fishing operations and by recreational anglers. Logging and agricultural practices, industrial pollution, urbanization, and other factors associated with development in the Pacific Northwest are degrading and diminishing salmon habitat (Williams and Graves 1990; Spence et al. 1996). In addition, fuel leaks and spills from pleasure craft, fishing boats, or commercial boats may impact salmon habitat.

Inaccessible habitat (because of historical farming practices of utilizing dikes) in the Nisqually Wildlife Refuge is slowly being opened up and restored for juvenile and adult salmonids. Hatcheries within the vicinity of Fort Lewis, including the Clear Creek Fish Hatchery operated by the Nisqually Tribe on Fort Lewis land, successfully contribute salmonids (e.g., Chinook salmon) to the local watersheds. These smolts increase the production of salmonid enhancement of the region.

4.1.4.5 Pathways and Indicators Matrix Checklist

An analysis of pathways and indicators of ecological function was prepared following guidance provided by NMFS (1999). The pathway and indicator of ecological function evaluation covers all relevant habitat parameters affected either positively or negatively by the proposed action; a similar evaluation was conducted in the *Interim BCT Transformation BA* (CH2M HILL 2001b).

As in the *Interim BCT Transformation BA*, a column labeled "improve," was added to the table that summarizes the analysis of pathways and indicators to show movement of habitat function that is positive but not positive enough to produce a categorical shift in habitat function (Table 4-1). The intent of adding this column was to show modest improvements in ecosystem function.

Army activities under the proposed actions would not be likely to substantially change temperature functions, habitat access, habitat elements, channel condition and dynamics, or flow and hydrology from levels identified in the *Interim BCT Transformation BA*. There is the potential for sediment and contaminant loads to creeks and rivers to increase as a result of the increase in vehicle miles. However, use of Best Management Practices (BMPs), as well as management actions detailed in the prairie and oak woodland Management Action Descriptions, should ensure that soil condition thresholds were not violated, and water quality was maintained on the installation.

4.1.4.6 Conservation Measures to Reduce the Effects of the Action

The conservation measures already in place (e.g., use of hardened crossing to cross streams, stream buffers, improving spawning habitat by removal of accumulated sediments from spawning gravel, stream bank improvement through the treatment of noxious weeds, and riparian planting of native shrubs and trees) at Fort Lewis should be adequate for minimizing risks to bull trout, Chinook salmon, steelhead, and their habitat. Fort Lewis also has conducted detailed mapping of wetlands and streams on Fort Lewis to ensure that water bodies are identified and protected (ENSR 1998b). No additional conservation measures are required.

TABLE 4-1
Analysis of Pathways and Indicators for the Fort Lewis Area

Pathways and Indicators	Environmental Baseline			Effects of the Action(s)			
	Properly Functioning	At Risk	Not Properly Functioning	Restore	Improve	Maintain	Degrade
Water Quality							
Temperature						•	
Sediment						•	
Contaminants/Nutrients						•	
Habitat Access							
Physical Barriers						•	
Habitat Elements							
Substrate						•	
Large Woody Debris						•	
Pool Frequency						•	
Pool Quality						•	
Off-Channel Habitat						•	
Refugia						•	
Channel Condition and Dynamics							
Width/Depth Ratio						•	
Streambank Condition						•	
Floodplain Connectivity						•	
Flow/Hydrology							
Peak/Base Flows						•	
Drainage Network Increase						•	
Watershed Conditions						•	
Disturbance						•	
Riparian Reserves						•	

1 – The environmental baseline columns have been intentionally left blank. It is beyond the scope of the BA to establish baseline conditions for the Nisqually River watershed.

4.1.4.7 Determination of Effects

Ongoing and future training activities that could occur on Fort Lewis are unlikely to adversely affect protected salmonids utilizing aquatic habitats on or adjacent to the installation. Ongoing and future training activities would not significantly affect populations or habitats of fish prey either in streams on the installation, or within Puget Sound at Solo Point, or in the Nisqually River estuary. Ground maneuver training would continue to occur within designated zones, outside the 164-foot (50-m) buffers. Restrictions on where vehicles may fuel would minimize the likelihood of petroleum products being accidentally spilled into waterways used by salmon. Aerial training would have negligible impacts on bull trout and listed salmonids within the vicinity of Fort Lewis.

Most impacts would be short-term, and conservation measures in place and ongoing habitat restoration activities should mitigate for training-related impacts. No bull trout, Chinook salmon, or steelhead critical habitat is on the installation. Thus, ongoing and future military training activities on Fort Lewis **may affect, but are not likely to adversely affect** bull trout, Chinook salmon, or steelhead or their critical habitats.

4.1.5 Marbled Murrelet

4.1.5.1 Background Information

The marbled murrelet is federally listed as a threatened species. The USFWS originally designated marbled murrelet critical habitat in January of 1994, and then amended this designation based on public comment. The majority of critical habitat in Washington is located in Late Successional Reserves (LSRs) on federal land in the North Cascade Range. Marbled murrelet critical habitat has been designated in Pierce County (USFWS 2004b); however, this habitat is located primarily in LSR forests in the North Cascade Range in the eastern portion of the county. There is no critical habitat designation within Fort Lewis.

Marbled murrelets are small seabirds that have been observed near Fort Lewis on the Nisqually River, and in the Puget Sound near Solo Point (i.e., North Fort Lewis). They live in marine waters that are close to forests that provide suitable nesting habitat (Washington Department of Wildlife 1993). Marbled murrelets are found from Alaska to central California. In Washington State, they are resident all year in nearshore marine areas and spend the majority of their lives on salt water. The greatest concentration of murrelets in Washington is found in the northern Puget Sound. Murrelets feed on small fish and crustaceans in nearshore marine waters in Washington, and remain closer inshore (usually within 1.2 miles [2 km] of shore) than most other alcid seabirds (Carter and Sealy 1990, WDFW 1991).

During the breeding season, murrelets fly inland to nest in large trees (WDFW 1991). Nesting takes place between April 1 and September 15, with an incubation period of about 30 days. Murrelets nest either as a solitary pair or with other murrelets (WDFW1993). Both sexes share responsibility for incubation, with flights made to the ocean for food by the adult not attending the nest.

In Washington, murrelets tend to nest in forests that are made up of greater than 30 percent old-growth/mature stands, which are most likely to contain suitable nesting trees. Areas containing more than 25 percent clear-cut forest and/or meadow areas have significantly lower or non-existing populations of nesting murrelets (USFWS 1992). Nest trees are typically greater than 35 inches (88 cm) in diameter at breast height (dbh) and average around 80 inches (200 cm) dbh. The most important component for nesting habitat is a platform, which may be a broad, moss-covered horizontal limb of an older tree, a mistletoe broom, or a fork. A female murrelet lays a single egg on a platform, but does not construct a nest (Jordan and Hughes 1995). Forests with one or two usable platforms per acre are considered suitable nesting habitat (Grettenberger 2000). The primary threat to murrelets is the loss of suitable nesting habitat (USFWS 1992, WDFW1993).

Land-based fixed point and marine surveys were performed in 1991 on Fort Lewis to detect marbled murrelets that use forest and marine habitats (Ritchie 1998). These surveys were conducted at sunrise during good weather conditions, in locations with unobstructed views of the sky. Surveys were conducted on the Nisqually River corridor and the 4th Division Bluff above Solo Point. Boat surveys of potential foraging and loafing areas were conducted off Solo Point toward the mouth of the Nisqually River. The forest along 4th Division Bluff contains some suitable murrelet nesting trees, including trees with large, often deformed branches (Clouse 1998).

No marbled murrelets were observed during these land-based surveys in 1991. Between five and 25 murrelets were observed along the coast during each boat survey. There was no indication that breeding activities were occurring nearby, as birds were not observed flying to or from land (Bottorff et al. 1991). During similar surveys in 1992, one murrelet was tentatively observed flying over Fort Lewis; however, no information was collected to confirm the murrelet sighting or breeding behavior on Fort Lewis. A survey of the forest east of Solo Point and the Nisqually River, and a marine survey between Anderson Island, Ketron Island, and the mouth of the Nisqually River, were conducted in 1993. No murrelets were detected during the forest survey, but some were observed along the coast. Although marbled murrelets have not been sighted in the forests on

Fort Lewis, there is still the potential that they nest there and have not been detected. The Army will conduct marbled murrelet surveys using radar during the 2009 and 2010 nesting seasons.

Eight murrelets were sighted along the coast between Solo Point and the Nisqually River during summer and autumn boat surveys of seabirds in Puget Sound in 1995 and 1996. Murrelets were concentrated in well-defined areas, with seasonal shifts in the locations of these aggregations. Therefore, these sites were thought to be primarily the result of changes in food availability. Low numbers of murrelets were found in South Puget Sound, from Ketron Island to Johnson Point, during the summer (< 15 each year), and none were found in the autumn. Most murrelets were seen 1,000 to 1,600 feet (304 to 488 m) offshore (Courtney et al. 1996; Merizon et al. 1997).

4.1.5.2 Analysis of Direct and Indirect Effects

Construction
Noise and human activity associated with construction activities should not affect marbled murrelets, as noise levels would be similar to those that currently occur on or near Fort Lewis, and most noise-generating activities would occur a mile or more from the shoreline. No murrelets are known to use forests near proposed construction activities.

Ground Training
Primary marbled murrelet use areas adjacent to Fort Lewis are along the shoreline of Puget Sound, with a few birds using the mouth of the Nisqually River. There is no evidence that murrelets use forests on Fort Lewis, although surveys of potential murrelet use of forests have not been conducted during the past decade. Puget Sound in the vicinity of Fort Lewis does not appear to provide high-value habitat for marbled murrelets. Although military training does occur in potential foraging habitat and would likely increase with the proposed actions, the bulk of the increase would be in prairies and other open habitats, which are not associated with murrelet foraging. Therefore, ongoing and future ground training activities should not impact marbled murrelets.

Noise associated with an increase frequency of gunnery activities as a result of ongoing or future military training activities should not affect murrelets, as noise levels from these training activities would be similar to those that currently occur on or near Fort Lewis, and most noise-generating activities would continue to occur a mile or more inshore from the shoreline.

Aviation Training
Helicopter training would be land-based only, with no over water training proposed. This would reduce the potential for direct interaction between helicopters and murrelets. However, noise associated with helicopter training near the coastline could impact foraging and loafing murrelets in this area. Impacts would be short-term, lasting only as long as helicopters were in the area.

Aviation training may include helicopters releasing chaff. The chaff released could enter aquatic habitats and accidentally be consumed by murrelets. However, impacts of chaff on murrelets would be very low. The majority of aviation training would be overland, reducing the likelihood of chaff entering Puget Sound, and chaff training would be very rare. Given the chaff would rarely be used during training, it is not expected that significant adverse effects to marbled murrelets and their habitats would occur.

Military flights along the Nisqually River would likely increase under proposed CAB training. Few, if any murrelets are likely to use the Nisqually River in the vicinity of Fort Lewis, therefore, impacts to marbled murrelets in this area would be negligible.

4.1.5.3 Interrelated and Interdependent Effects

Possible increases in the population of soldiers and their families may result in an increase in recreational uses, such as boating, in the surrounding area. Marbled murrelets are moderately sensitive to noise and human activity, but are tolerant of humans walking along beaches in areas where murrelets feed (Bottorff et al. 1991; ENSR 1995). In addition, murrelets are tolerant of boating activity near Fort Lewis, since boating is a common activity in Puget Sound and on the Nisqually River.

4.1.5.4 Cumulative Effects

Stationing of new units at Fort Lewis would potentially result in additional construction in the cantonment area to provide housing, administrative space, and other facilities for the additional soldiers and their families. All known populations of marbled murrelets on Fort Lewis are located in waterways outside of the cantonment area; therefore they should not be adversely affected by construction activities. Recreational and commercial fisheries in the marine waters off of Fort Lewis may disturb or harm marbled murrelets. One murrelet observed in Puget Sound in 1991 had a baited herring with hook and fishing line dangling from its beak (Bottorff et al. 1991). Data collected during seabird surveys in 1995 and 1996 suggest that tribal fisheries with gillnets do not pose a significant risk to marbled murrelets in the South Puget Sound. Furthermore, murrelets are generally found farther off shore than the nearshore zone in which these fisheries operate (Merizon et al. 1997). Food sources, such as the herring, are steadily declining in Puget Sound (Stout 2001), potentially altering the murrelets foraging areas.

4.1.5.5 Conservation Measures to Reduce the Effects of the Action

The conservation measures already in place at Fort Lewis are adequate for minimizing risks to marbled murrelet populations and habitat. No additional conservation measures are required.

4.1.5.6 Determination of Effects

Proposed military training activities on Fort Lewis could disturb murrelets. Most training activity would occur a mile or more from Puget Sound. Noise and human disturbance associated with military training would occur at the Nisqually River, but would be similar to current levels. Murrelet habitat would not be physically altered or disturbed by the proposed actions. No marbled murrelet critical habitat is on the installation. Thus, ongoing and proposed military training actions **may affect, but are not likely to adversely affect** marbled murrelets or their critical habitats.

4.1.6 Northern Spotted Owl

4.1.6.1 Background Information

The northern spotted owl is associated with most of the major types of coniferous forest in the Pacific Northwest. The northern spotted owl was listed as a threatened species in 1990. Suitable habitat for the species on Fort Lewis was identified and mapped by the USFWS, and in 1992, 62,000 acres (25,090 ha) of Fort Lewis were designated as critical habitat for northern spotted owl (USFWS 1991). Based on a recent decision by the USFWS, however, the areas previously designated as critical habitat for the northern spotted owl on the installation have been removed as part of the overall critical habitat revision for this species (Federal Register 2008). Fort Lewis is considered a strategic location between known spotted owl populations on the Olympic Peninsula to the west and the Cascade Range to the east.

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 non-breeding season.

Forest practices on Fort Lewis consist of land clearing (for the development of military facilities and housing) as well as a limited timber harvest regime. In addition, military activities have resulted in an extensive network of roads throughout the forested parts of Fort Lewis. These direct and indirect forest practices have resulted in the development of the partially fragmented, mixed-age timber stands that now characterize the installation. Surveys for spotted owls using calling stations on Fort Lewis were conducted in 1991, 1994, 1995, 1998, 1999, 2002, 2003, 2006, and 2008 (Bottorff et al. 1991; Raedeke Associates, Inc. 1995; Malkin 1999; ENSR 2003, 2006, 2008). No resident or dispersing spotted owls were detected on Fort Lewis during these surveys.

Although no spotted owl occurrences have been documented on Fort Lewis, it is possible that this species was present on the installation's forests in the past, and could potentially inhabit them in the future. Fort Lewis is positioned between known populations of spotted owls on the Olympic Peninsula to the west and the Cascade Range to the east, in what is considered a strategic location. Fort Lewis is viewed as providing the potential for demographic interchange between these two known owl populations (U.S. Department of the Interior 1992). There is no evidence, however, to suggest that spotted owls travel between the existing populations (Raedeke Associates, Inc. 1995).

The nearest known habitat occupied by northern spotted owls is over 12 miles (19 km) to the south of the cantonment area in the Mineral Block of the Gifford Pinchot National Forest in southeastern Thurston County. The closest known detection of owls west of Fort Lewis occurred about 25 miles (40 km) away, near the Capitol State Forest (Raedeke Associates, Inc. 1995). Even though spotted owls have not been detected on Fort Lewis during the breeding season, the species may use the installation in the autumn and winter. Juvenile owls have been known to travel long distances from their nest and through seemingly unsuitable habitat during dispersal in autumn and winter (Raedeke Associates, Inc. 1995, ENSR 2003). Therefore, the potential exists for dispersing owls and other owls to use Fort Lewis outside of the breeding season.

The forest attributes that are generally recognized as key features of habitat suitable for spotted owl nesting, roosting, and foraging are primarily characteristics of old-growth stands. These characteristics include structural diversity, large trees and snags, coarse woody debris, sufficient space under the canopy for owls to fly, and a low level of fragmentation of habitats across the landscape (Bottorff and Swanson 1993). Presently, forests with suitable nesting and roosting habitat are primarily limited to the Nisqually River corridor, Ellsworth Woods, and the 4th Division Bluff.

4.1.6.2 Analysis of Direct and Indirect Effects

Construction

Proposed construction activities would not impact spotted owl habitat. Potential impacts associated within construction activities have been previously addressed in the *Final Biological Assessment for Construction and Maintenance Activities within the Southern Cantonment Area, Gray Army Airfield, and Central Impact Area at Fort Lewis, Washington* (ENSR 2004b).

Ground Training

The proposed action would not result in direct effects to northern spotted owls, as no populations have been recorded on the installation. By increasing mileage and training activities off-road, activities associated with the Army transformation would occur in potential spotted owl habitat on the installation; however, the majority of training would occur on prairies. These training activities would not involve removal of trees that could be used by owls, but could change the noise levels within the immediate vicinity. Noise levels associated with the increased training activities would be similar to the current munitions firing activity and other noise-generating activities that occur on or near Fort Lewis.

Aviation Training
No northern spotted owls have been recorded on Fort Lewis. Therefore, ongoing and future aviation training should not have any impact on this species.

4.1.6.3 Interrelated and Interdependent Effects

Stationing of new units at Fort Lewis would potentially result in additional construction in the cantonment area to provide housing, administrative space, and other facilities for the additional soldiers and their families. Construction activities would be located within the cantonment area and would result in minimal direct effects to northern spotted owls, as no populations have been recorded on the installation. Construction and maintenance activities within the cantonment area would occur in open areas where there is a lack of forested vegetation. The Army would consult with the USFWS on any construction projects within designated critical habitat not covered in the *Biological Assessment for Construction and Maintenance Activities within the Southern Cantonment Area, Gray Army Airfield, and the Central Impact Area at Fort Lewis, Washington* (ENSR 2004b).

4.1.6.4 Cumulative Effects

Northern spotted owl population declines in Washington and Oregon can be attributed to habitat fragmentation and degradation due to logging activities, increased urban development, and competition with barred owls (Forest Ecosystem Management Assessment Team 1993; Spotted Owl Recovery Team 1994). In general, forest stands within the vicinity of Fort Lewis are young and thus lacking key habitat components such as compositional and structural diversity, snags, and coarse woody debris. As a result, there is a lack of critical habitat elements for northern spotted owl within the vicinity of Fort Lewis.

Forest habitat on Fort Lewis remains important for potential future immigration of spotted owl and could be a link between the Olympic Peninsula habitat and Cascade Range habitat. State, tribal, local, and private activities that disturb or destroy suitable northern spotted owl habitat between these areas and Fort Lewis, however, has the potential to reduce the likelihood that northern spotted owl would use the installation in the future.

4.1.6.5 Conservation Measures to Reduce the Effects of the Action

The conservation measures already in place at Fort Lewis are adequate for minimizing risks to northern spotted owl populations and habitat within the Puget Sound region. No additional conservation measures are required.

4.1.6.6 Determination of Effects

Northern spotted owls have not been detected at Fort Lewis, although barred owls *(Strix varia*) have. Training activities associated with proposed military training are not likely to impact potential habitat and would be confined to designated training areas. Ground activities would be located sufficient distances from areas that are managed to mimic the structural and species-component characteristics of late-successional forests to ensure that potential habitat would not be affected. Fire may impact potential habitat, but ammunition training occurs in open areas that are not forested, therefore this training would not impact potential spotted owl habitat. Under the proposed action, additional aviation units may be stationed at Fort Lewis in the next 5 years, increasing the frequency of helicopter flights. As no spotted owls occur on or near the installation, the associated risk of collisions between aircraft and spotted owls would be negligible. No spotted owl critical habitat is found on Fort Lewis. Overall, future military training activities **may affect, but are not likely to adversely affect** this species or its critical habitat.

4.1.7 Canada Lynx

4.1.7.1 Background Information

On March 24, 2000, the lynx was federally listed as a threatened species in several states in the Northeast, Great Lakes Region, Southern Rockies, and North Cascades. In March 2009, the USFWS designated critical habitat in several states, including 1,836 mi^2 in Okanogan and Chelan counties, Washington.

The lynx is a medium-sized cat with long legs. The lynx's long legs and large feet make it highly adapted for hunting in deep snow. The historical and present range of the lynx north of the contiguous United States includes Alaska and the portion of Canada extending from the Yukon and Northwest Territories south across the United States border and east to New Brunswick and Nova Scotia. In the contiguous United States, lynx historically occurred in the Cascades 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). Lynx are often found in forest habitats with their main prey item, snowshoe hare (*Lepus canadensis*).

4.1.7.2 Analysis of Direct and Indirect Effects

While Canada lynx are not known to occur in the project area, the USFWS has determined that this species may be expected to occur in appropriate habitat throughout Washington. However, the lowland environments at Fort Lewis do not provide suitable habitat for this species and this species has not been recorded on the installation.

4.1.7.3 Interrelated and Interdependent Effects

No interrelated or interdependent impacts to Canada lynx are expected from the proposed actions.

4.1.7.4 Cumulative Effects

The Canada lynx is not known to occur on Fort Lewis. Most viable lynx populations occur in large blocks of boreal forests where lynx hunt snowshoe hare and other small mammals. Lynx are adapted to travel in deep snow during winter. No potential lynx habitat occurs on Fort Lewis.

4.1.7.5 Conservation Measures

Conservation measures for lynx focus on preserving large tracts of forest habitat, minimizing human activity in areas used by lynx, managing forest stands to encourage use by snowshoe hare and other prey favored by lynx, and limiting poaching or other illegal harvest of lynx.

4.1.7.6 Determination of Effects

The Canada lynx has been listed by the USFWS as occurring on or near Fort Lewis. However, the boreal forests favored by the lynx, nor its preferred prey, snowshoe hare, are not found on Fort Lewis. This species has not been recorded on the installation and no critical habitat is on or near Fort Lewis. Therefore, proposed military training actions on Fort Lewis would have **no effect** on Canada lynx or its critical habitat.

4.1.8 Gray Wolf

4.1.8.1 Background Information

The gray wolf is listed by the USFWS as potentially occurring in Pierce County. However, it is unlikely gray wolves would be found on Fort Lewis.

The gray wolf, which was once abundant across both North America and Washington, has been rare in Washington since the early 1900s. The gray wolf was first federally listed as an endangered species on March 11, 1967 (USFWS 1999). The current distribution of wolves in North America is mainly confined to the northern half of the continent, with wolves occasionally seen in the North Cascade Range and the northeastern corner of Washington (Paradiso and Nowak 1982). No critical habitat for gray wolf is found on Fort Lewis.

Gray wolves are the largest members of the dog family. With their long legs and a deep narrow chest, they are well adapted to fast, far-ranging travels, including frequent hunting expeditions (University of Nevada 1997). Wolf territories range from 40 to 1,000 square miles (104 to 2,590 square km) depending on pack size and prey density. Gray wolves use a variety of habitats, from dense forest to open tundra. The key components of wolf habitat are a sufficient, year-long prey base, suitable and somewhat secluded denning and rendezvous sites cover for tracking prey, and sufficient space with minimal interaction with humans (Thiel 1985, Frederick 1991). Dens are typically burrows constructed in sandy soil in well-drained areas near water (Mech 1970, Peterson 1986). Abandoned beaver lodges, hollow trees and logs, rock caves, and shallow surface beds are also used for denning. Pups remain in semi-open areas next to swamps or beaver ponds, near forest cover, and away from human activity while the adults hunt (Frederick 1991). 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).

Gray wolves are carnivorous, feeding on a variety of wildlife, from large ungulates such as elk, to small rodents such as mice. As opportunistic predators, their main sources of prey are deer, moose, and small animals (Paradiso and Nowak 1982, Carbyn 1987). The wolf's location and time of year are the primary factors determining their diet (University of Nevada 1997).

While it is very unlikely, the potential does exist for gray wolves to be found on Fort Lewis. If a wolf were found on the installation, it would most likely be a lone wolf migrating through in search of a new territory. Lone dispersing wolves have been known to travel as far as 500 miles (800 km) in search of a new territory. No packs, dens, or sightings are known to be in the vicinity of Fort Lewis. Howling has not been heard on or near the installation, nor have any kill sites been identified on the installation (Clouse 2003).

4.1.8.2 Analysis of Direct and Indirect Effects

While gray wolves are not known to occur in the project area, the USFWS has determined that this species may be expected to occur in appropriate habitat throughout Washington. For this reason, the gray wolf has been placed on all species lists for areas containing potentially suitable habitat. No packs or dens are known to be in the vicinity of Fort Lewis, and wolves have not been sighted in the area. Howling has not been heard on or near the installation, or have any sites where gray wolves have killed prey been identified on the installation (Zuchowski 2006). Therefore, it is anticipated that there would be no effect to the gray wolf, as no wolves are within the vicinity of the project area.

4.1.8.3 Interrelated and Interdependent Effects

No interrelated or interdependent impacts to gray wolf are expected from the proposed action.

4.1.8.4 Cumulative Effects

The gray wolf is not known to occur on Fort Lewis. Most viable wolf populations occur in remote areas away from human activities (Carbyn 1987). Potential habitat may be degraded by the presence of military personnel and training activities. The surrounding habitat has been changed considerably by urban and agricultural development. Ongoing riparian habitat restoration and enhancement activities on Fort Lewis could make these areas potentially suitable for gray wolves in the future.

4.1.8.5 Conservation Measures to Reduce the Effects of the Action

Gray wolf populations have suffered since the first European settlers arrived in North America (USFWS 1998a). Wolves were pushed out of their natural habitat and killed on a large scale, along with other large carnivores, to protect livestock. Numerous plans have been implemented since the ESA, such as the Northern Rocky Mountain Recovery Plan of 1980 which encouraged natural recovery combined with reintroduction of wolves, in order to restore populations in and around Yellowstone National Park (University of Nevada 1997). Efforts to enhance riparian and forest habitats on Fort Lewis may provide some cover for use as travel corridors by wolves, although use of the installation by wolves is unlikely.

4.1.8.6 Determination of Effects

The gray wolf is not known to occur on Fort Lewis, and the activities associated with proposed military actions should have **no effect** on this species or its critical habitat.

4.1.9 Grizzly Bear

4.1.9.1 Background Information

The grizzly bear once ranged from the Arctic Slope to Central Mexico and from the Pacific Coast to Minnesota. Grizzlies prefer rugged mountains and forests undisturbed by human encroachment. On July 28, 1975, the grizzly bear was listed as threatened in the lower 48 states (Federal Register 1975). No critical habitat has been designated for the grizzly bear. Within the United States, grizzlies are currently found in the mountain regions of Wyoming, Montana, Idaho and Washington near the border with British Columbia, throughout western Canada, and in Alaska. However, they occupy a much smaller range compared with their historic distribution (Rausch 1963).

Today, only about 1,400 grizzly bears remain in a few populations in the lower 48 states, including Washington (i.e., the Selkirk and North Cascades ecosystems where 20 bears are estimated to occur). While it is very unlikely, the potential does exist for grizzly bears to be found on Fort Lewis.

Grizzly bear are the largest land-based carnivores on the planet; although better characterized as omnivores because of their varied diet. Their diet varies by the season and includes grasses, roots, berries, nuts, insects, fish, rodents, and sometimes small and large mammals. This species is an opportunist, constantly looking to eat. They protect prime sources of food and can be aggressive towards perceived competitors. Hibernating for half the year, bears need to eat enough in 6 months to last the whole year. Stores of body fat are especially crucial for nursing grizzlies. Females give birth to one to three cubs in early February while still in their winter dens and must wait 3 more months before they can emerge and eat again. Males are usually intolerant of other bears except at mating time.

A grizzly bear territory ranges from 10 to 380 square miles (26 to 984 km^2; USFWS 1993). Most bears are active during the morning and early evening hours. During the day they rest in day beds, often constructed in dense cover to escape the heat. As food items become scarce, a grizzly bear's territory increases. Within their home range, grizzly bears use a wide variety of habitats, traveling from alpine food sources to estuaries, to

berry patches, to salmon spawning sites, visiting each site when its particular food source is available (Stirling 1993).

4.1.9.2 Analysis of Direct and Indirect Effects

While grizzly bears are not known to occur in the project area, the USFWS has determined that this species may be expected to occur in appropriate habitat throughout Washington. For this reason, the grizzly bear has been placed on all species lists for areas containing potentially suitable habitat. No grizzly bear sightings have been reported on Fort Lewis (Clouse 2004). Therefore, it is anticipated that there would be no effect to the grizzly bear, as no bears are within the vicinity of the project area.

4.1.9.3 Interrelated and Interdependent Effects

No interrelated or interdependent impacts to grizzly bear are expected from the proposed action.

4.1.9.4 Cumulative Effects

The grizzly bear is not known to occur on Fort Lewis. Most viable bear populations occur in remote areas away from human activities. Potential habitat may be degraded by the presence of military personnel and training activities. The surrounding habitat has been changed considerably by urban and agricultural development.

4.1.9.5 Conservation Measures to Reduce the Effects of the Action

Grizzly bear populations have suffered since the first European settlers arrived in North America (USFWS 1993). Bears were pushed out of their natural habitat and killed on a large scale, along with other large carnivores, to protect livestock. Numerous plans have been implemented since the ESA, such as the Grizzly Bear Recovery Plan of 1982 (revised 1993) which encouraged natural recovery combined with reintroduction of bears, in order to restore populations in selected areas of the lower 48 states (USFWS 1993).

4.1.9.6 Determination of Effects

The grizzly bear is not known to occur on Fort Lewis, and the activities associated with the proposed Army training should have no effect on this species. Continued enhancement of the open areas and overall management of forested areas on the installation should result in increased potential habitat for the grizzly bear, but it is unlikely that grizzly bears would use the habitat. There is no critical habitat for grizzly bears. Therefore, proposed actions would have **no effect** on gray wolves or their potential for establishment on Fort Lewis.

4.1.10 Marine Species

The NMFS has listed seven marine species under the ESA that could be impacted by activities on Fort Lewis: leatherback sea turtle (endangered), loggerhead sea turtle (threatened), green sea turtle (endangered), olive Ridley sea turtle (endangered), Steller sea lion (threatened), southern resident killer whale (endangered), and humpback whale (endangered).

The leatherback sea turtle is the largest turtle and the largest living reptile in the world (NMFS 2009b). Leatherback sea turtles are commonly known as pelagic animals, but also forage in coastal waters. In fact, leatherback sea turtles are the most migratory and wide ranging of sea turtle species. Leatherback sea turtle nesting grounds are located around the world, with the largest remaining nesting assemblages found on the coasts of northern South America and West Africa. Leatherback sea turtles are rarely seen in southern Puget

Sound (ENSR 1998a) and there is no critical habitat designation in Puget Sound. Ongoing and proposed military training activities would have **no effect** on leatherback sea turtles or their critical habitat.

The loggerhead sea turtle is named for its relatively large head, which support powerful jaws and enables them to feed on hard-shelled prey (NMFS 2009c). Loggerheads reach sexual maturity at around 35 years of age. Loggerheads are circumglobal, occurring throughout the temperate and tropical regions of the Atlantic, Pacific, and Indian Oceans. Loggerheads are the most abundant species of sea turtle found in U.S. coastal waters. In the U.S., occasional sightings are reported from the coasts of Washington and Oregon, but most records are of juveniles off the coast of California. Loggerheads face threats on both nesting beaches and in the marine environment. The greatest cause of decline and the continuing primary threat to loggerhead turtle populations worldwide is incidental capture in fishing gear, primarily in longlines and gillnets, but also in trawls, traps and pots, and dredges. There is no designated critical habitat for the loggerhead turtle. Sightings and strandings of these animals are very rare, and there are no breeding beaches in the Pacific Northwest. Ongoing and proposed military training activities would have **no effect** on loggerhead turtles.

The green turtle is the largest of all the hard-shelled sea turtles, but has a comparatively small head (NMFS 2009d). Adult green turtles are unique among sea turtles in that they are herbivorous, feeding primarily on seagrasses and algae. Green turtles primarily use three types of habitat: oceanic beaches (for nesting), convergence zones in the open ocean, and benthic feeding grounds in coastal areas. The green turtle is globally distributed and generally found in tropical and subtropical waters along continental coasts and islands between 30° North and 30° South. In the eastern North Pacific, green turtles have been sighted from Baja California to southern Alaska, but most commonly occur from San Diego south. Critical habitat was designated in 1998 for green turtles in coastal waters around Culebra Island, Puerto Rico. Sightings and strandings of these animals are very rare, and there are no breeding beaches in the Pacific Northwest. Ongoing and proposed military training activities would have **no effect** on green turtles or there critical habitat.

The olive ridley turtle is considered the most abundant sea turtle in the world, with an estimated 800,000 nesting females annually (NMFS 2009e). Olive ridley turtles reach sexual maturity around 15 years, a young age compared to some other sea turtle species. Olive ridley turtles are globally distributed in the tropical regions of the South Atlantic, Pacific, and Indian Oceans. In the South Atlantic Ocean, they are found along the Atlantic coasts of West Africa and South America. In the Eastern Pacific, they occur from Southern California to Northern Chile. The principal cause of the historical, worldwide decline of the olive ridley turtle is long-term collection of eggs and killing of adults on nesting beaches. There is no designated critical habitat for the olive ridley turtle. Sightings and strandings of these animals are very rare, and there are no breeding beaches in the Pacific Northwest. Ongoing and proposed military training activities would have **no effect** on olive ridley turtles.

Killer whales are the most widely distributed cetacean (e.g., whales, dolphins, and porpoises) species in the world (NMFS 2009f). Killer whales are highly social animals that occur primarily in pods, or groups, of up to 50 animals. The Southern Resident killer whale population contains three pods (or stable family-related groups), and is considered a stock under the Marine Mammal Protection Act. The range of killer whales during the spring, summer, and fall includes the inland waterways of Puget Sound, Strait of Juan de Fuca, and Southern Georgia Strait. Their occurrence in the coastal waters off Washington has been documented. The Southern Resident killer whale population is currently estimated at about 88 whales, a decline from its estimated historical level of about 200 during the mid- to late 1800s. Critical habitat has been designated in most of Puget Sound, including along Fort Lewis, and along the northern Washington coast. Sightings of each pod within Puget Sound have occurred in the northern sound-Strait of Juan de Fuca area and are occasionally in the south Puget Sound. Noise and human disturbance may increase, but would primarily be limited to North Fort and Main Post and maneuver areas and not extend to areas where killer whales occur. Noise and

human disturbance could increase over the short-term with proposed training activities, but would have **no effect** on southern resident killer whales or their critical habitat.

The humpback whale is distributed worldwide in all ocean basins, though in the North Pacific it does not occur in Arctic waters (NMFS 2009g). In winter, most humpback whales occur in the subtropical and tropical waters of the Northern and Southern Hemispheres. The North Pacific population was considerably reduced as a result of intensive commercial exploitation during the 20th century and recovery has been very slow. Studies indicate that humpback whales from the Western and Central North Pacific mix on summer feeding grounds in the central Gulf of Alaska and perhaps the Bering Sea. No critical habitat has been designated for humpback whales. Humpback whales are infrequent visitors to waters near the Nisqually National Wildlife Refuge and are considered an accidental migrant to Puget Sound. When in Puget Sound, however, they may stay for extended periods of time (Calambokidis and Steiger 1990). Noise and human disturbance could increase over the short-term with future training activities, but would be isolated to the vicinity of Solo Point and would have **no effect** on humpback whales.

The Steller sea lion, also known as the northern sea lion, is the largest member of the Otariid (eared seal) family. Steller sea lions "forage" near shore and pelagic waters (NMFS 2009h). They are capable of traveling long distances in a season and can dive to approximately 1,300 feet (400 meters) in depth. They also use terrestrial habitat as haul-out sites for periods of rest, molting, and as rookeries for mating and pupping during the breeding season. At sea, they are seen alone or in small groups, but may gather at the surface near rookeries and haul outs.

Steller sea lions typically occur in Puget Sound (in northern Puget Sound more so than central and southern Puget Sound) during the winter months (Johnson and O'Neill 2001). Puget Sound is not a high-density Steller sea lion area, with less than 50 sea lions seen each year (Adolfson and Associates, Inc. 1998). While there are no recorded Steller sea lion rookeries in Washington, there are four haul out sites, an area used for non-breeding and subadult sea lions during the non-breeding season, located along the Olympic Peninsula (three sites) and in Puget Sound (one site; NMFS 1992; Jeffries et al. 2000; Fritz 2004).

There is no critical habitat designation for Steller sea lions in Puget Sound (Jeffries et al. 2000). Steller sea lion habitat would not be physically altered or disturbed by proposed military training activities. Noise and human disturbance may increase, but would primarily be limited to North Fort and Main Post and maneuver areas and not extend to areas where sea lions occur. Therefore, ongoing and proposed military training activities would have **no effect** on Steller sea lions.

4.2 Yakima Training Center

4.2.1 Ute Ladies'-tresses

4.2.1.1 Background Information

Ute ladies'-tresses was federally listed as threatened on January 19, 1992 (USFWS 1995). Critical habitat has not been designated. Ute ladies'-tresses is a perennial, terrestrial orchid. Ute ladies'-tresses currently occurs in eight states, Colorado, Idaho, Montana, Nebraska, Nevada, Utah, Washington and Wyoming. In Washington, this species is known to occur in the north-central portion of the state (Okanogan and Chelan counties; Washington Department of Natural Resources 2006).

Ute ladies'-tresses grows in lowland areas, at elevations ranging from 1,500 to 7,000 feet (457 to 2,134 m) MSL in the western region of its habitat, and usually abutting or near moderate gradient, medium to large streams and rivers. The plant is typically found in open riparian areas in the transition zone between mountains and plains. The species' microhabitat consists of grass-dominated openings in shrubby areas, often

associated with beaked spikerush (*Eleocharis rostellata*). One of the key habitat features necessary for survival of the Ute ladies'-tresses is saturated soil throughout the growing season. It is usually located within 12 inches (30 cm) of the water table (Washington Department of Natural Resources 2006). While this species will tolerate periodic flooding, it does not occupy areas constantly inundated with water. Ute ladies'-tresses is commonly found in alkaline substrates. This species depends on natural disturbance, growing in areas where early successional conditions are perpetuated or competition from other vegetation is restricted (USFWS 2000).

The riparian and wetland habitats that support Ute ladies'-tresses have been heavily impacted by urban development, stream channelization, water diversions and other watershed and stream alterations that degrade natural stream stability and diversity. As a result, Ute ladies'-tresses habitat has been degraded or destroyed in many areas.

4.2.1.2 Determination of Effects

The Ute ladies'-tresses was listed by USFWS as a species that may occur in Kittitas and Yakima counties, Washington. Although potential habitat for this species may occur on YTC, Ute ladies-tresses' is not known to occur on the installation, therefore, the proposed project will have **no effect** on this species. In addition, wetland and riparian area protection and enhancement measures at YTC should help maintain and improve potential habitat for this species.

4.2.2 Salmonids

4.2.2.1 Background Information

Salmonid species associated with the Columbia River system have been extirpated over a greater percentage of their range than species primarily limited to coastal rivers. Coastal populations tend to be healthier than populations inhabiting interior drainages (Washington Department of Wildlife, Washington Department of Fisheries, and Western Washington Treaty Indian Tribes 1993).

Bull trout within the Columbia River Basin are federally listed as threatened. Six anadromous salmonid populations associated with the Columbia River Basin have been listed under the ESA: the Lower Columbia River Chinook ESU (threatened); the Upper Columbia River spring-run Chinook ESU (endangered); the Snake River fall-run Chinook ESU (threatened); the Snake River spring/summer-run Chinook ESU (threatened); the Upper Columbia River steelhead ESU (endangered); and the Mid-Columbia River steelhead ESU (threatened). Of the six ESUs listed, only the Upper Columbia River spring-run Chinook salmon ESU and the Upper and Mid-Columbia steelhead ESUs may potentially be influenced by activities on YTC (Carlson 1998).

Bull Trout

Columbia River bull trout population DPS is found in the watersheds of four major tributaries of the Columbia River in Washington: the Yakima, Wenatchee, Entiat, and Methow rivers. Critical habitat for Columbia River bull trout DPS extends from the Columbia River mouth and estuary throughout the Columbia Basin, including all tributaries historically accessible to the species. On September 22, 2004, the USFWS designated approximately 737 miles (1,180 km) of streams in the Columbia River Basin, Washington, as critical habitat for bull trout under the ESA. On Sept 26, 2005, critical habitat for Columbia Basin populations of bull trout was excluded from areas covered by the Federal Columbia River Power System (70 Federal Register [FR] 56253) which includes those waters on and adjacent to YTC.

Historically, bull trout were found throughout the Pacific Northwest, Montana, Idaho, and northern California, as well as Nevada (Knowles and Gumtow 2005). The Yakima River has 8 of the 16 documented

bull trout subpopulations found in the mid-Columbia River (Lohr 1998). Of the 16 subpopulations recognized by the USFWS, 10 are considered to be at risk of extinction. All bull trout stocks found in the Yakima River basin are native fish sustained by wild reproduction, as there are no hatchery bull trout in Washington (Anderson 2006). There is no available information to indicate whether these stocks are genetically distinct. The stocks are currently treated separately based on geographical, physical, and thermal isolation of the spawning populations (WDFW 1998a). Bull trout do not spawn on YTC because the streams are too small and not cold enough for long enough periods of time to provide suitable spawning and rearing habitat (Bottorff and Swanson 1993). However, bull trout could use streams for short periods for foraging (Chan 1998).

There is a fluvial stock found within the mainstem of the Yakima River, located approximately 4 miles (6.4 km) from the nearest training area on YTC (WDFW 1998a; Anderson 2006). Presence of bull trout downstream from YTC in the Yakima River has been confirmed, with bull trout observed migrating upstream near Rosa Dam by WDFW biologists (Anderson 2006). Although there has been some mention of potential bull trout spawning and rearing habitat on YTC (Bottorff and Swanson 1993), this is highly unlikely and bull trout have never been documented on YTC. The streams on YTC are not cold enough for long enough periods of time to provide suitable spawning and rearing habitat. In addition, most streams do not have continuous flow from the installation to either the Yakima or Columbia rivers during the time in which bull trout would potentially be spawning or migrating to spawn. However, bull trout could forage in streams on YTC for short periods of time when temperatures are tolerable and flows are perhaps more suitable. If there is any use, it is likely to be short-term in nature and located at the mouths of streams during the colder months when streams may provide more tolerable temperatures and dependable flows. Suitable habitat downstream of YTC is used as spawning habitat for bull trout (i.e., Naches River), while any areas that are used by bull trout upstream of YTC (i.e., Yakima River) are used for migration and adult holding areas and include deep pools where bull trout stay prior to downriver migration to spawn (Cummins 1999a).

Factors contributing to the decline of bull trout in the Columbia Basin are similar to those affecting salmon, but also include additional elements. Since bull trout are less tolerant of higher water temperatures and sediment loading, they have been affected to a greater degree by logging practices, channelization, water diversions, mining, and grazing practices which have degraded riparian communities. Hydropower and storage dams hindered and precluded migrations normal for fluvial and adfluvial populations. Bull trout are highly susceptible to capture by anglers, because of their aggressive nature. As road networks have expanded and angler access has increased, bull trout populations have declined. Finally, bull trout will interbreed with brook trout, resulting in sterile hybrids. In the past, brook trout were planted widely in the Columbia Basin and elsewhere throughout the West.

Bull trout in the Columbia River DPS spawn in September and sometimes into mid-October, depending on subpopulation. Variations in timing likely follow temperature patterns in the various tributaries. Movement into spawning areas is not well documented but would vary between resident, fluvial, and adfluvial type fish and habitat constraints in the various drainages. In general, movement toward spawning areas occurs in late summer. Spawning areas are characteristically cold, clean reaches within complex habitat, large woody debris, and preferentially with groundwater influence.

Chinook Salmon

The Upper Columbia River spring-run Chinook salmon ESU was federally listed as threatened on March 24, 1999 and as endangered on June 28, 2005. The Columbia River immediately adjacent to the installation is designated critical habitat for this ESU, but YTC is excluded from critical habitat designation for this ESU pursuant to the National Defense Authorization Act for Fiscal Year 2004 (Public Law 108-136).

Included in this ESU are all naturally spawned populations occurring in all accessible river reaches in the Columbia River tributaries upstream of Rock Island Dam and downstream of Chief Joseph Dam in

Washington, excluding the Okanogan River. Nine Upper Columbia spring Chinook stocks occur in this ESU. The Upper Columbia spring Chinook salmon ESU includes all wild stocks upstream of the Wenatchee River confluence, and does not include the Yakima River system. All nine stocks are considered depressed due either to chronically low escapement, a long-term negative trend, or a short-term severe decline in escapement. All stocks are native with wild production, except for the Methow stock, which has composite production because of hatchery stray introgression. Major river basins containing spawning and rearing habitat for this ESU comprise approximately 7,003 square miles (18,138 square km) in Oregon and Washington.

The decline in abundance of upper Columbia River stocks began in the late 1800s due to over-harvest, hydropower development, creation of water storage reservoirs, water diversions, logging, mining, and domestic livestock grazing. In particular, Chief Joseph and Grand Coulee Dams on the Columbia River block access to a substantial portion of the historic range of this ESU. The upper Columbia and upper Snake tributary stocks are thought to be among the first to be decimated by the early fishery present on the Columbia River at the turn of the 19th century.

All streams and drainages on YTC are located outside the area occupied by this ESU. The reach of Columbia River adjacent to YTC is a migratory corridor for these fish and individual residence times can be measured in days rather than weeks. Upriver runs start passing YTC in early May and extend through August, based on counts at Priest Rapid Dam. Spawning occurs from late August to mid-September and all documented spawning areas for this ESU are upstream of YTC and the proposed project area.

Habitat requirements for spring Chinook salmon consist of water quality, passage, water velocity and, to a lesser extent, food availability. Chinook salmon have the lowest high-temperature threshold in the genus *Oncorhynchus*. Of the salmonids evaluated in this document, only bull trout require cooler water. Turbidity and sediment transport are issues as it relates to food production. Gravel, cobble, and boulder substrates produce benthic macroinvertebrates when not embedded with sand or silt particulates. Chronic turbidity can also hinder the photosynthetic basis of the food chain.

Steelhead

Steelhead are the anadromous form of rainbow trout. East of the Cascade Range, steelhead are found in tributaries of the Columbia River, including the Entiat, Okanogan, and Yakima rivers, and tributaries of the Snake River, including the Grande Ronde River. Steelhead prefer cool water below 70 ºF (21 ºC), but they can survive in waters from 32 to 80 ºF (0 to 27 ºC). Steelhead require plenty of oxygen and can tolerate a wide range of salinities.

Steelhead migrate to the ocean beginning in April and continuing through June, with a peak around mid-April (Washington State Department of Transportation 1998). Unlike other salmonids, adult steelhead usually survive spawning and migrate as individuals, rather than in schools (Page and Burr 1991). Spawning typically occurs in March, but may extend into July. The eggs incubate from late March through June, and fry may emerge from the gravel from late spring to August. However, steelhead found near YTC in both the Yakima and Columbia rivers spawn from February to May, and fry emerge in May and June (Cummins 1999b). Out-migration of smolts occurs from March to early June, with smolts having spent from 1 to 7 years in freshwater, although the average is 2 to 3 years.

Upper Columbia River Steelhead ESU. The Upper Columbia River steelhead ESU was federally listed as endangered on August 18, 1997. The status was revised to threatened on January 5, 2006, and then reinstated to endangered status in June 2007 based on a U.S. District Court decision. On September 2, 2005, NMFS designated approximately 1,262 miles (2,030 km) of streams and 7 acres (2.8 ha) of lakes as critical habitat for the Upper Columbia River steelhead ESU; Yakima Training Center was excluded from this critical habitat designation.

This ESU occurs in streams in the Columbia River Basin upstream from the Yakima River, Washington, to the U.S.-Canada border. The Wells Hatchery stock steelhead are part of the listed ESU. Major river basins containing spawning and rearing habitat for this ESU comprise approximately 9,545 square miles (24,722 square km) in Washington.

Three Upper Columbia River ESU steelhead stocks are present in the Columbia River adjacent to the installation and include the Wenatchee, Entiat, and Methow/Okanogan populations. As with Chinook salmon, steelhead from the upper Columbia River are transient residents in the Wanapum and Priest Rapids Reservoirs of the Columbia River migrating past as either adults or juveniles. All three stocks are considered depressed, mixed stock, and maintained with composite production.

Of the streams on YTC, Johnson Creek contains both resident rainbow trout and steelhead (Rogers et al. 1989, Cummins 1999b). Johnson Creek is considered part of the Upper Columbia River Steelhead ESU. Several adults have been observed in the lower portion of this creek that is located east of the installation boundary and are likely hatchery strays that have become naturalized over the years. Whether the fish observed in Johnson Creek were naturalized or not, it is certain they are not of Johnson Creek origin prior to 1967. Before the Wanapum Dam was constructed, Johnson Creek was physically separated from the Columbia River. It previously spilled out into a steep, porous alluvial fan of cobble deposited by the Missoula flood. The creek flowed below the ground surface through this formation before eventually connecting with the Columbia River. For the purpose of this analysis, naturalized steelhead that inhabit Johnson Creek are considered part of the Upper Columbia River Steelhead ESU. Although Johnson Creek is located on YTC, all known observations of steelhead within it have occurred east of YTC as there are dry reaches that prevent their movement upstream onto the installation.

Mid-Columbia River Steelhead ESU. The Mid-Columbia River steelhead ESU was federally listed as threatened on March 25, 1999. On September 2, 2005, NMFS designated approximately 5,815 miles (9,356 km) of streams as critical habitat for the Mid-Columbia River steelhead; YTC was excluded from this critical habitat designation.

This ESU occurs in streams from above the Wind River, Washington, and the Hood River, Oregon (exclusive), upstream to, and including, the Yakima River, Washington. Steelhead excluded from this ESU includes those from the Snake River Basin. Major river basins containing spawning and rearing habitat for this ESU comprise approximately 26,739 square miles (69,254 square km) in Oregon and Washington. The Yakima River is the only stock near YTC and is adjacent to the installation's western boundary. The Yakima River flows into the Columbia River downstream of YTC.

Historically, the Mid-Columbia River steelhead ESU run in the Yakima River has been estimated to be approximately 10,000 fish (Busby et al. 1996). The current run size averages approximately 1,000 fish, with an annual escapement of about 800 wild fish. Stock status has been determined to be depressed because of chronically low spawner escapement. Within the Yakima Basin, five distinct populations have been identified. These include runs in Satus Creek, Toppenish Creek, Naches River, the mainstem Yakima River between Rosa Dam and Wapato, and the mainstem Yakima River above Rosa Dam.

The Mid-Columbia River steelhead ESU run in the Yakima River is a native, wild stock sustained by wild and artificial production. Population declines have been attributed to hydropower, loss of habitat, overharvesting, irrigation diversions, high temperatures/low dissolved oxygen, and a highly altered hydraulic regime (Northwest Power Planning Council 1990). Storage reservoirs are operated in concert with water needs of an extensive irrigation program in the Columbia Basin. This leads to an inverted hydraulic regime, with lower than optimal spring flow rates and excessive summer flow rates.

The run in the Yakima River is bimodal, with an early migration entering the river from September through November. The later migration is from February through June. Spawning occurs from mid-February to late May. Information on emergence timing for the mainstem river is lacking, but occurs May through June in Satus and Toppenish creeks and from June to August in the colder Naches River system. Smolt out-migration at Prosser, Washington, occurs from early March through mid-June, mostly as 2-year-olds. The median date for passage at Prosser is April 30. Habitat requirements for the Mid-Columbia River steelhead ESU are similar to the Upper Columbia River steelhead ESU.

4.2.2.2 Analysis of Direct and Indirect Effects

Construction

No major construction projects are proposed for YTC under the proposed actions. There would be some construction associated with range upgrades for the GTA proposal, but these actions should not adversely impact listed fish or their habitat.

Ground Training

One of the most significant factors limiting fish populations on YTC is the lack of water. Base flows in perennially flowing streams are very low, and most watercourses on YTC are intermittent or ephemeral. High water temperatures result from low base flows and a lack of shade from trees and shrubs; historic military and grazing activities removed riparian vegetation (CH2M HILL 1996). High intensity storm events and fires (naturally occurring or resulting from military activity) modify riparian vegetation and stream channels, which can affect fish populations within the area.

While Johnson Creek is the only creek on YTC that could potentially support salmonids (steelhead), those portions of the creek that could support fish are outside of the Mid-Columbia River steelhead ESU. There are 47 rock fords, 30 concrete fords, and 29 cable fords on YTC, with fords on Johnson Creek often exposed due to the low flow conditions in the creek. Ground training activities most likely to directly impact fish involve stream and river fording activities at the lower reach crossing. Because of the low water flow in the upper reaches of Johnson Creek, impacts from upstream crossings would be negligible.

Yakima Training Center currently prohibits vehicles, equipment, digging, bivouacking, and refueling in Zone 1 areas (those areas encompassing riparian zones; see Figure 2-4), and prohibits grazing on the installation. However, activities by troops on foot are allowed in many of the Zone 1 and riparian areas. Minor sedimentation of water bodies still occurs due to erosion of soils disturbed by military activities and maintenance of firebreaks and roads.

The potential impacts to federally listed salmonids from ground training would be negligible. Listed salmonids species are not found on YTC. It is possible that increases in sediment originating on the installation could reach spawning habitat in the Columbia and Yakima rivers, but the amount released would be small, and would only contribute a fraction of the total sediment loads in these rivers. In addition, YTC would continue to implement projects to improve fish habitat on the installation, potentially increasing the suitability of YTC rivers and streams as habitat for listed salmonids in the future. Training maneuvers and digging could increase the potential for sediments to enter streams. Although increased runoff and sedimentation resulting from increased training activities would be expected to negatively affect stream channels and other fish habitats on YTC, the potential impacts to listed salmonids would be negligible. All training activities would be conducted outside the designated 197-foot (60-m) maneuver and 328-foot (100-m) digging or bivouacking buffers, therefore minimizing impacts to salmonids and their habitats.

There are fire risks associated with gunnery training and other activities that use fire or incendiary devices (such as flares and camp fires). Fires, by burning vegetation, would be capable of exposing soil, potentially leading to erosion and sedimentation into waterways, particularly if riparian vegetation were burned.

Aviation Training
Stationing of additional aviation units would result in an increase in the amount of gunnery training occurring at YTC. The increase in ignition sources may potentially result in more range fires on the installation. Most fires would continue to be low-fuel burns through the Central Impact Area (CIA), where fires occur repeatedly, and may impact nearby water resources, including Hanson and Alkali creeks. Erosion associated with fires could lead to sediment transport to the Columbia and Yakima rivers.

Aviation units could utilize chaff. Chaff may enter aquatic habitats and could accidentally be consumed by salmonids. However, materials used to make chaff are not toxic, and the dilution of this product when in water would be at a level that effects to fish would not be expected (Haley and Kurnas 1992). Therefore, effects of chaff on bull trout, Chinook salmon, and steelhead would be negligible.

4.2.2.3 Interrelated and Interdependent Effects

Stationing of new units at YTC could potentially require that soldiers live at YTC for extended periods. Should soldiers associated with the SBCT, GTA, CSS, and CAB units be required to live at YTC, it may be necessary to construct additional housing in the cantonment area. This area is located in the very western portion of the installation, distant from salmonid-bearing streams. Therefore, it is not anticipated that bull trout, steelhead, or Chinook salmon would be affected by any construction activities that might occur on YTC.

4.2.2.4 Cumulative Effects

Native American tribes catch salmon commercially and for subsistence using beach seine and gillnets along the Columbia and Yakima rivers. Steelhead trout are caught incidentally during commercial fishing operations and by recreational anglers.

Dams associated with hydroelectric development on the Columbia and Snake rivers have blocked the access of salmon to habitat on portions of these rivers. Furthermore, urbanization and livestock grazing have degraded the quality of riparian and instream habitat for this species (Pacific States Marine Fisheries Commission 1998, NMFS 1999). Irrigation projects have contributed to the decline of salmonid populations and caused the extinction of most of the migratory bull trout subpopulations. Other factors contributing to population declines include habitat fragmentation and degradation, poor water quality, poor fisheries management, introduction of non-indigenous species, and isolation of subpopulations. For example, the majority of the Columbia River bull trout subpopulations are small in number and occur in scattered areas, isolating them from the remaining migratory bull trout.

Practices such as deforestation, agriculture, grazing, and mining can cause sediment buildup in streams, disrupting water clarity, clogging spawning gravels and causing higher water temperatures. All freshwater life stages of salmonids need complex forms of cover, including large woody debris, undercut banks, boulders, and pools. The lack of large, permanent streams and limited riparian tree cover reduces the suitability of YTC water bodies for salmonids.

4.2.2.5 Pathways and Indicators Matrix Checklist

An analysis of pathways and indicators of ecological function was prepared for YTC following guidance provided by NMFS (1999). The pathway and indicator of ecological function evaluation covers all relevant

habitat parameters affected either positively or negatively by the proposed action; a similar evaluation was conducted in the *Interim BCT Transformation BA* (CH2M HILL 2001b).

Activities under the proposed action are not likely to substantially change temperature functions, habitat access, habitat elements, channel condition and dynamics, or flow and hydrology from levels identified in the *Interim BCT Transformation BA* (Table 4-2). There is the potential for sediment and contaminant loading into creeks and rivers to increase as the number of vehicle miles increases from current levels. However, use of BMPs and management actions in the YTC Cultural and Natural Resources Management Plan (CNRMP) should ensure that land condition thresholds are not exceeded and water quality is maintained on the installation.

4.2.2.6 Conservation Measures

Existing stream and riparian vegetation protection and restoration activities outlined in the installation's CNRMP (YTC Environmental and Natural Resources Division 2002) and draft listed salmonid ESMP ensure that fish habitat on YTC is maintained or enhanced. These protection and restoration activities include riparian buffers, construction of hardened stream crossings, road upgrades, and riparian plantings. Monitoring of stream, riparian, and fish presence and use are also required as part of the CNRMP. It was these and other activities contained in the CNRMP that the Secretary of the Interior determined were beneficial to fish and justified the exclusion of critical habitat for listed salmonids on YTC pursuant to the National Defense Authorization Act for Fiscal Year 2004 (Public Law 108-136).

TABLE 4-2
Analysis of Pathways and Indicators for the Yakima Training Center Area

Pathways and Indicators	Environmental Baseline			Effects of the Action(s)			
	Properly Functioning	At Risk	Not Properly Functioning	Restore	Improve	Maintain	Degrade
Water Quality							
Temperature						•	
Sediment						•	
Contaminants/nutrients						•	
Habitat Access							
Physical barriers						•	
Habitat Elements							
Substrate						•	
Large woody debris						•	
Pool frequency						•	
Pool quality						•	
Off-channel habitat						•	
Refugia						•	
Channel Condition and Dynamics							
Width/depth ratio						•	
Streambank condition						•	
Floodplain connectivity						•	
Flow/Hydrology							
Peak/base flows						•	
Drainage network increase						•	
Watershed conditions						•	
Disturbance						•	
Riparian reserves						•	

1 – The environmental baseline columns have been intentionally left blank. It is beyond the scope of the BA to establish baseline conditions for the Yakima River watershed and Upper Columbia River Basin.

4.2.2.7 Determination of Effects

Proposed training activities that could occur on YTC are unlikely to adversely affect protected salmonids. There is a lack of suitable spawning or rearing habitat on YTC for bull trout and bull trout have not been observed on YTC. Fish from the Upper Columbia River Spring Chinook ESU have not been observed on YTC in recent years, all streams/drainages within YTC are located outside of habitat occupied by this ESU, and individual fish residence times in the Columbia River are measured in days rather than weeks. Fish from the Upper Columbia River steelhead ESU have been seen in Johnson Creek. Although Johnson Creek is located on the installation, all known observations of steelhead within it have occurred east of YTC as there are dry reaches that prevent their movement upstream onto the installation. The Mid-Columbia River steelhead ESU is not on YTC. No critical habitat has been designated for any of these species on YTC.

Still, increased runoff and sedimentation resulting from increased maneuver miles could affect salmonid habitats within the Columbia and Yakima rivers and potential salmonid habitat on the installation. Conservation measures for fish resources on YTC are helpful in protecting and restoring fish habitat and populations on the installation. Mitigation and enhancement measures provide potential positive cumulative effects through habitat and species protection. Thus, proposed military training actions **may affect, but are not likely to adversely affect** Chinook salmon, steelhead trout, or bull trout populations.

4.2.3 Greater Sage-grouse

4.2.3.1 Background Information

The greater sage-grouse (sage-grouse) is state-listed as threatened, and is a candidate for federal listing under the ESA. Sage-grouse were historically found throughout most of the sagebrush, deciduous shrub, and grass habitats of eastern Washington (WDFW 1997). Their range extends north to British Columbia, south to New Mexico and Oklahoma, east to Nebraska, and west into California (Connelly and Braun 1997). Recent studies have shown that the two remaining sage-grouse populations in Washington are primarily restricted to Douglas, Kittitas, and Yakima counties. These remaining populations are isolated and found in partially intact habitat areas (WDFW 1997, 1998b). YTC supports one of these populations, which is the only population on federally administered lands in the state.

Greater sage-grouse usually roost on the ground from evening until early morning, feed and rest during the afternoon, and then return to their roosts at night. Male and female sage-grouse gather during the spring for mating at specific locations called leks, and nest on the ground in the vicinity of these leks (Hays et al. 1998). Annual surveys for leks have been conducted on YTC since 1989, and ten leks have been active since 1999. Radio-telemetry studies have shown that sage-grouse on YTC are non-migratory, and are found on the installation throughout the year, primarily in the Lmumma and Selah Creek watersheds (Eberhardt and Hofmann 1991: Cadwell et al. 1994). These areas contain the majority of active leks and nests sites on YTC and are a priority for habitat conservation and protection (Figure 4-4; Hays et al. 1998). Sage-grouse also use the Cold Creek watershed and areas south of Yakima Ridge. Opportunistic sightings and past telemetry locations suggest that greater sage-grouse also occupy the northern portion of the installation in limited numbers.

Populations of sage-grouse on YTC have been characterized by short-term fluctuations and have exhibited trends similar to those of statewide populations, with male sage-grouse numbers per active lek decreasing (Livingston 1998). Annual surveys for leks (communal mating grounds), and lek counts have been conducted on YTC since 1989 to monitor trends and assess population status. The location of leks on YTC is shown in Figure 4-4. Eighteen known leks were monitored in 2009, and 12 were found to be active. Three of the 12 active leks were classified as major leks (i.e., ten or more male sage-grouse observed at least once during the season). In 2008 the population estimate for sage-grouse on YTC was 185, which is the lowest estimate since

1995 and the second-lowest population estimate for the 21-year period. The 21-year population average was 288. The peak population estimate of 421 occurred in 1999.

Suitable sage-grouse habitat consists of medium to dense sagebrush stands with a mix of tall and short sagebrush plants, as well as a variety of forbs and grasses (WDFW 1998b). Sagebrush is an essential food for sage-grouse throughout the year, and comprises 60 to 80 percent of the species' diet (Remington and Braun 1985). Sage-grouse on YTC tend to use habitat with slopes of less than 15 percent and areas where the dominant species are big sagebrush (*Artemisia tridentata*), three-tipped sagebrush (*Artemisia tripartita*), antelope bitterbrush (*Purshia tridentata*), and bluebunch wheatgrass (*Agropyron spicatum*; Livingston 1998). Shrubs provide nests with shelter from avian predators and weather elements. Grasses provide shelter from ground predators and create a favorable microclimate (WDFW 1995).

Population declines in greater sage-grouse throughout Washington have resulted from large-scale removal of native vegetation for agriculture purposes, combined with reduced habitat quality caused by intensive grazing by livestock (WDFW 1997). Sagebrush removal using herbicides and fire have contributed to their decline as well (WDFW 1995). From 1960 to 1995, land on YTC was used for livestock grazing. Indirect threats to greater sage-grouse on YTC are habitat-related, and are primarily from fire and military training activities.

Fire is a threat to sage-grouse habitat because it kills big sagebrush and repeated fires will make an area vulnerable to invasions by noxious weeds such as downy brome (cheatgrass; *Bromus tectorum*) and knapweed (*Centaurea* spp.). Fire regimes in the lower Columbia River Basin were historically characterized by regular, low-intensity burns, which created a mosaic of seral stages. Following fire, natural re-establishment of sagebrush is slow (about 20 to 30 years; Britton and Clark 1985). With the loss and fragmentation of shrub-steppe, fire poses a significant threat to remaining greater sage-grouse habitat in Washington. Furthermore, damage to soil and vegetation from vehicles and foot traffic associated with military training is a concern for sage-grouse and other wildlife. Although less suitable than sagebrush communities, burned areas that have become dominated by grasses still receive some use by sage-grouse as demonstrated by both radio-marked birds and observations.

Sources of sage-grouse mortality include predation, weather, accidents, disease, parasitism, and environmental hazards (e.g., pesticides). Raptors and coyotes (*Canis latrans*) are the primary predators of greater sage-grouse, while common raven (*Corvus corax*) American crow (*Corvus brachyrhynchos*), badgers (*Taxidea taxus*), and ground squirrels are nest predators. Weather influences nesting success and survival of young chicks. Diseases and parasites are not a major source of mortality (Hays et al. 1998).

4.2.3.2 Analysis of Direct and Indirect Effects

Construction

No major construction projects are proposed for YTC under the proposed actions. There would be some construction associated with range upgrades for the GTA proposal, including a sniper field fire in Training Assembly Area 1 and a multi-purpose machine gun range at Range 5. These actions should not adversely impact sage-grouse or their habitat.

Ground Training

Ground training activities can affect sage-grouse by disturbing them during the breeding season, and by altering habitat. Under the proposed actions, noise and human activity associated with ongoing and future training would have the potential to disturb sage-grouse, which are vulnerable at leks and nests during the breeding season. Any type of ground training involving noise, human activity, and vehicle movement near breeding areas could affect sage-grouse. Potential effects include flushing of birds from nests and leks, and possible abandonment of these sites. Sage-grouse also may make large, atypical movements away from the

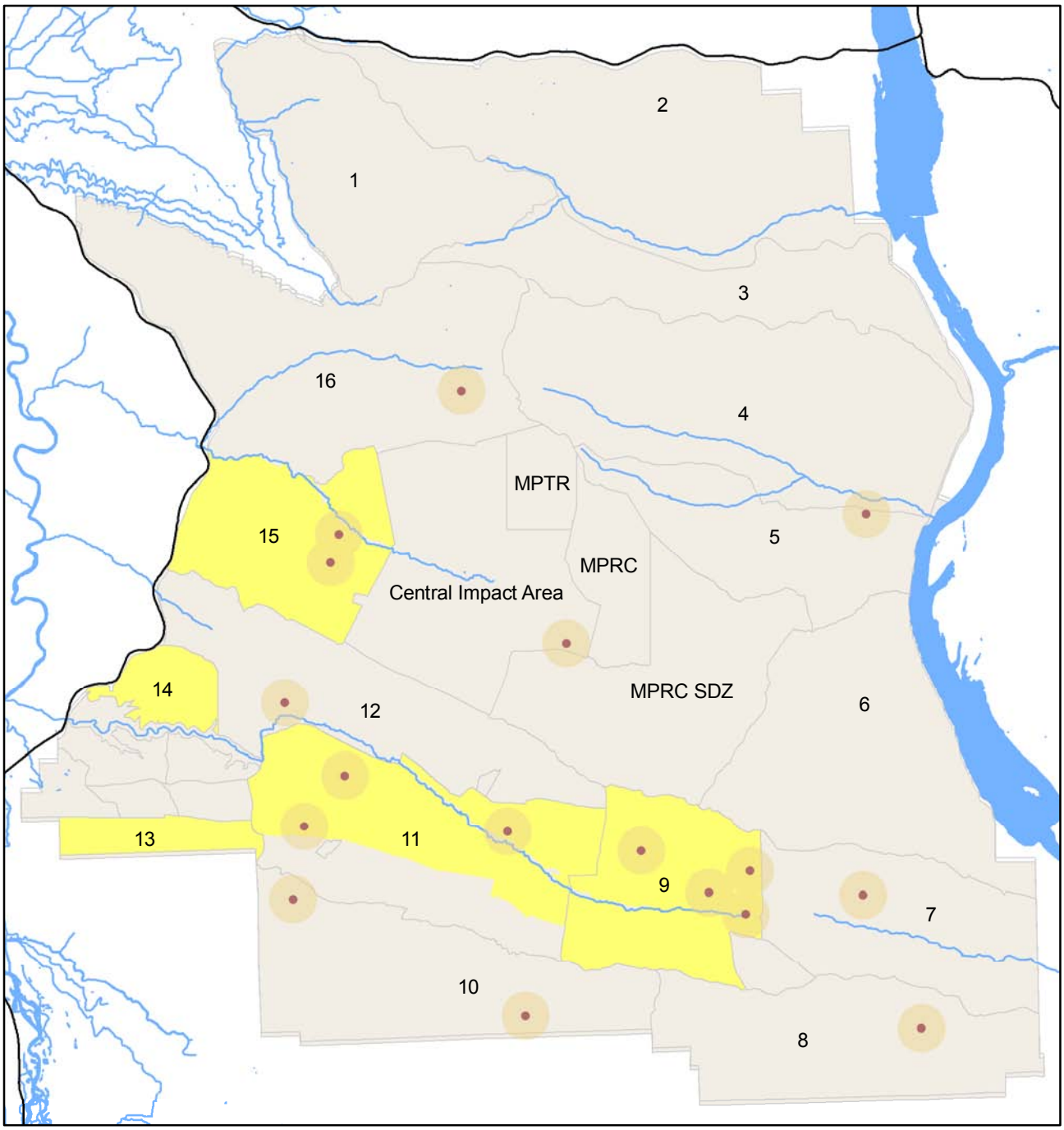

Figure 4-4. Sage-Grouse Protection Areas and Leks on Yakima Training Center

N

Sage-grouse leks and buffers

Sage Grouse Protection Areas

10 Training Areas

0 1 2 4 6 8 Miles

0 2 4 8 12 16 Kilometers

area of disturbance. All of these effects could potentially lead to decreased reproductive success of the population. To minimize the likelihood of military disturbance, YTC has implemented protection measures for sage-grouse during the breeding season. These measures prohibit all ground training activities within a 0.6-mile (1-km) radius around leks between 2400 and 0900 hours between March 1st and May 15th (or earlier if lek attendance has started); and prohibit all military training (except use of existing ranges and certain roads to ranges) within sage-grouse protection areas (Figure 2-4) between March 1st and June 15th. A few leks (MPRC and Range 15) are outside of sage-grouse protection areas and are not afforded protection during the breeding period. Because most nesting and brood rearing activity occurs within 5 miles of leks, higher levels of vehicle activity near these leks during all seasons would increase the potential for habitat loss and mortality or injury of adult sage-grouse or their young.

Because sage-grouse appear to have specific habitat requirements, ground training activities that alter habitat would have the potential to adversely affect the species. Off-road vehicle maneuvers can damage soil and vegetation within habitat used by sage-grouse. Although several sage-grouse leks and nesting areas receive seasonal protection from military training during the spring, sage-grouse breeding and foraging areas are open to maneuver training during the remainder of the year. Under the proposed actions, military training activities would potentially occur more frequently than at present as a result of additional units training at YTC. Currently, an estimated 7,450 to 11,175 acres (3,015 to 4,525 ha) are disturbed by SBCT vehicle training. Under the proposed action, SBCT, GTA, CSS, and CAB unit vehicles could disturb up to 38,000 to 56,985 acres (15,385 to 23,061 ha). Collectively, vehicles from all units could impact up to 32 percent of training lands annually. The degree of effect to sage-grouse habitat would depend on how units train in the future. Although it is likely that most impacts to vegetation would continue to be concentrated into small areas, it is also possible that future training needs would require more off-road travel in less heavily used available training lands. Under the second scenario, sagebrush communities that potentially provide habitat for sage-grouse would likely be degraded. Digging and bivouacking can also damage soil and vegetation, but would not be permitted in sage-grouse protection areas.

Fire poses a significant threat to the remaining sage-grouse habitat in Washington, because it kills sagebrush, and long periods are required to recolonize large burned areas. Most fires on YTC are started by gunnery training (both on the ground and from helicopters) and begin in the Central Impact Area (CIA) or range fans. Although most fires remain within these areas, there is the risk of a fire escaping and burning a large portion of the installation. A fire of large magnitude in the primary sage-grouse areas (Lmumma Creek, Selah Creek, and Cold Creek watersheds) would significantly impact habitat utilized by sage-grouse, and could jeopardize the species' existence at YTC. Although a greater number of ignition sources could increase the risk of such a fire occurring, weather conditions and the success of fire management programs would influence the occurrence and spread of fire, as well.

Aviation Training

Flying aircraft near leks or nests during the breeding season would have the potential to disturb sage-grouse, possibly interfering with reproductive success. The amount of aviation training on YTC would likely increase over current levels, resulting in a greater likelihood that sage-grouse would be disturbed by aircraft flying nearby. To limit such disturbances during the breeding season, aircraft are not permitted to fly over sage-grouse leks below 300 feet (91 m) AGL between 2400 and 0900 hours during the lek protection period.

Use of chaff during aviation training would be uncommon. When used, it would be dispersed over a wide area. It is possible that sage-grouse could ingest chaff fibers, but harmful effects would not be expected. Studies on ducks ingesting chaff in sand have shown that chaff would likely pass through a bird's digestive system and not be harmful (Arfsten et al. 2002).

4.2.3.3 Interrelated and Interdependent Effects

Stationing of new units at Fort Lewis under the proposed action could potentially require that soldiers reside at YTC. In such a situation, additional housing may need to be built in the cantonment area to house soldiers. This area is located outside of sage-grouse protection areas and is not near enough to any established leks to disturb nesting birds. Other construction activities that could occur on YTC include a Military Operations on Urban Terrain facility and other range construction. Construction activities in the cantonment should not adversely impact sage-grouse, but sage-grouse could be impacted by noise and disturbance associated with training area construction activities

4.2.3.4 Cumulative Effects

Habitat loss, disturbance, and food availability are important factors for determining greater sage-grouse success regionally and at YTC (Stinson et al. 2004). Greater sage-grouse population numbers are slowly declining in Washington and throughout much of the western U.S. Important factors include loss and fragmentation of habitat, conversion of shrub-steppe habitat to croplands, and isolation of sage-grouse populations. Most sage-grouse habitat that once occurred in the Columbia Basin has been converted to agriculture or residential or commercial development, a trend that continues throughout the region. In addition, fire, naturally occurring and caused by human activities (e.g., military training), reduces sage-grouse habitat; Wyoming big sagebrush, the dominant shrub on YTC, is fire intolerant (Tisdale and Hironaka 1981; Stinson et al. 2004). The two remaining greater sage-grouse populations in Washington, at YTC and in Douglas and Grant counties, are too small to be considered viable and secure. Although chance events, such as fires, may be the biggest threat to sage-grouse populations in the state, the isolation of remaining small populations will likely result in the loss of genetic quality (Lacy 1987). Based on an analysis of greater sage-grouse populations in the western U.S., Washington populations exhibited the lowest genetic diversity, with YTC populations represented by only one common haplotype (Benedict et al. 2003). Inbreeding can affect male fitness and has contributed to the declines and extinctions of several species (Brook et al. 2002). Connecting the YTC population to populations outside of the YTC is necessary for their long-term persistence (Stinson et al. 2004).

4.2.3.5 Conservation Measures

General conservation measures include temporal and spatial land use constraints found in the YTC Endangered Species Management Plan for greater sage-grouse. They provide means for avoiding or minimizing most adverse effects to sage-grouse and their habitat associated with current land use. The ESMP designates a Sage Grouse Protection Area (SGPA) that encompasses a large contiguous area of primary use by sage-grouse. The ESMP also establishes 0.6 mile (1 km) buffers around leks outside of the SGPA and includes prescriptions for avoiding/minimizing disturbance to birds, protection of habitat, and restoration of shrub-steppe. Activities such as bivouacking, digging, and maneuver training are restricted annually within the SGPA and adjacent to active leks. In addition, during critical times of year for sage-grouse (i.e. lek attendance, nesting, brood-rearing), seasonal restriction on access and activities are also implemented in the SGPA and around active leks.

Throughout the fire season, the type of military training, fuel conditions, and current weather conditions are evaluated periodically throughout the day in a fire risk matrix, which also restricts training related activities that may increase the risk of fire. Additional fire prevention activities that are of benefit to sage-grouse habitat on the installation include a system of firebreaks distributed around established training ranges, an annual control burn program, and the development of downrange wells as sources of water for fire suppression. Shrub-steppe restoration and upland vegetation reseeding programs are annual efforts (e.g., planting sagebrush and reseeding grass/forb mixtures) to restore degraded and damaged habitat conditions throughout the installation. The installation employs a noxious weed program to address problem plant species that

threaten sage-grouse habitat. An augmentation effort to address this population's low genetic diversity has been underway since 2004 the results of which are yet underdetermined at this time. Future genetic monitoring will determine if the multi-year release of translocated sage-grouse has had a beneficial effect.

Additional mitigation has been proposed to help reduce the potential impacts of maneuver training and fire on sage-grouse and their habitat:

- Rehabilitate the majority of training lands that are impacted by fire and maneuver training, with a focus on recovering the community types that have been degraded by the action. However, the ability of YTC to rehabilitate training lands would be contingent upon Army funding.

4.2.3.6 Determination of Effects

The conservation measures listed in Table 2-5 would minimize disturbances to sage-grouse on YTC during critical periods. However, given the Army's need to use shrub-steppe habitat on YTC, adverse effects to sage-grouse habitat cannot be avoided, although the proposed mitigation could help to reduce these effects. Given that the amount of training on YTC would likely increase under the proposed actions, ongoing and future training activities, under all action alternatives evaluated in the GTA EIS, would **likely jeopardize the continued existence of greater sage-grouse and would result in the destruction or adverse modification of sage-grouse habitat**. Should the greater sage-grouse become listed as threatened or endangered, the determination could be **likely to adversely affect** the greater sage-grouse. Should the species become listed, the current ESMP would be revised, and monitoring and corrective actions would be updated so that the ultimate determination would likely be **may affect, but not likely to adversely affect** the greater sage-grouse.

4.2.4 Marbled Murrelet

4.2.4.1 Background Information

A description of marbled murrelet population status and habitat requirements and potential effects to marbled murrelets from military training activities are given in Section 4.1.5.

The marbled murrelet has been listed by the USFWS as occurring on or near YTC. However, the shrub-steppe environments at YTC do not provide suitable habitat for this forest-dependent species and this species has not been recorded on the installation. There is no designated critical habitat for marbled murrelets on YTC. Therefore, proposed military training actions on YTC would have **no effect** on marbled murrelets or their habitat.

4.2.5 Northern Spotted Owl

4.2.5.1 Background Information

A description of northern spotted owl population status and habitat requirements and potential effects to northern spotted owls from military training activities are given in Section 4.1.6.

The northern spotted owl has been listed by the USFWS as occurring on or near YTC. However, the shrub-steppe environments at YTC do not provide suitable habitat for this forest-dependent species and this species has not been recorded on the installation. No northern spotted owl critical habitat is found on YTC. Therefore, proposed military training actions would have **no effect** on northern spotted owls or their critical habitat.

4.2.6 Canada Lynx

A description of Canada lynx population status and habitat requirements and potential effects to Canada lynx from military training activities are given in Section 4.1.7.

The Canada lynx has been listed by the USFWS as occurring on or near YTC. However, the shrub-steppe environments at YTC do not provide suitable habitat for this forest-dependent species and this species has not been recorded on the installation. No designated critical habitat for lynx is found near YTC. Therefore, proposed military training actions would have **no effect** on Canada lynx or their critical habitat.

4.2.7 Gray Wolf

A description of gray wolf population status and habitat requirements and potential effects to gray wolves from military training activities are given in Section 4.1.8.

The shrub-steppe environments at YTC do not provide suitable habitat for this species and this species has not been recorded on the installation. No designated critical habitat for gray wolf is found on YTC. Therefore, proposed military training actions would have **no effect** on the gray wolf or its critical habitat.

4.2.8 Grizzly Bear

A description of grizzly bear population status and habitat requirements and potential effects to grizzly bears from military training activities are given in Section 4.1.9.

The shrub-steppe environments at YTC do not provide suitable habitat for this forest-dependent species and this species has not been recorded on the installation. No critical habitat has been designated for grizzly bears. Therefore, proposed military training actions would have **no effect** on grizzly bear or its critical habitat.

5.0 ESSENTIAL FISH HABITAT ASSESSMENT

5.1 Introduction

In 1976, Congress passed the Magnuson-Stevens Fishery Conservation and Management Act. This law authorized the United States to manage its fishery resources out to 200 miles (320 km) off its coast, an area referred to as the exclusive economic zone. Under the MSA, regional councils established by Congress were charged with preparing Fishery Management Plans for every fishery requiring management. In 1996, the Sustainable Fisheries Act (Public Law 104-267) amended the MSA, requiring the identification of Essential Fish Habitat for federally managed fishery species, and the implementation of measures to conserve and enhance the habitat of these species, as described in federal FMPs. All federal agencies are required to consult with NMFS on current or proposed actions, permitted, funded, or undertaken by the agency, which may adversely affect EFH. Adverse affects may include direct (e.g., contamination or physical disruption), indirect (e.g., loss of prey), site-specific, or habitat-wide impacts.

Congress defined EFH in the interim final rule (62 FR 66551) as: "those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity." For the purpose of interpreting the definition of EFH habitat, "waters" include aquatic areas and their associated physical, chemical, and biological properties; "substrate" includes sediment underlying the waters; "necessary" refers to the habitat required to support a sustainable fishery and the managed species contribution to a healthy ecosystem; and "spawning, breeding, feeding, or growth to maturity" covers all habitat types utilized by a species throughout its life cycle.

There are four components of an EFH consultation:

1. **Notification** – the federal agency provides notification of an activity that "may adversely affect" EFH to NMFS;

2. **EFH Assessment** – the federal agency provides a description of the proposed action, an analysis, and effects determination to NMFS;

3. **Conservation Recommendations** – Under section 305(b)(4) of the MSA, NMFS is required to provide EFH conservation and enhancement recommendations to the federal agency for actions that may adversely affect EFH. In turn, NMFS will discuss EFH conservation recommendations with the federal agency and provide these recommendations to the federal agency, pursuant to section 305(b)(4)(A) of the MSA; and

4. **Federal Agency Response** – the federal agency provides written responses to NMFS and the appropriate Council within 30 days after receiving the conservation recommendations.

The objective of this EFH assessment is to describe potential adverse effects of the proposed Army GTA actions on areas designated as EFH for the federally managed fisheries of the Pacific Coast. This assessment will include conservation measures proposed to avoid, minimize, or otherwise offset potential adverse effects resulting from the proposed action in the designated EFH.

5.2 Species and Regions Involved in this EFH Assessment

The Pacific Council manages federal fisheries for Washington, Oregon, Idaho, and California under three FMPs. These FMPs are the Pacific Coast Groundfish Management Plan (82 species), the Coastal Pelagic Species Fishery Management Plan (5 species), and the Pacific Coast Salmon Plan (3 species: Chinook, coho, and Puget Sound pink salmon).

All three salmon species overseen by the Pacific Council will be reviewed in this assessment. The EFH for the Pacific Coast salmon fishery includes those waters and substrates that are necessary for salmon production, and that are capable of supporting a long-term, sustainable salmon fishery and salmon contributions to a healthy ecosystem. To achieve this level of production, EFH includes all streams, lakes, ponds, wetlands, and other viable water bodies that are accessible to salmon, as well as most of the habitat that was historically accessible (excluding areas upstream of longstanding naturally impassable barriers) in Washington, Oregon, Idaho, and California. In estuarine and marine areas, salmon EFH extends from the nearshore and tidal submerged environments within state territorial waters, out to the full extent of the exclusive economic zone offshore of Washington, Oregon, and California, north of Point Conception (Pacific Fishery Management Council 1999).

Four of the 82 managed groundfish species may occur within the area surrounding the Nisqually River Reach (Table 5-1). According to the composite EFHs of these four flatfish species, at least one stage in each species' life history utilizes the upriver extent of saltwater intrusion in rivers, such as the Nisqually River.

There are five Pacific Coast pelagic species (Pacific sardine [*Sardinops sagax*], Pacific mackerel [*Scomber japonicas*], northern anchovy [*Engraulis mordax*], jack mackerel [*Scomber trachurus*], and market squid [*Loligo* spp.]). Pelagic fish are found in open marine water near the surface and are not associated with substrate. It is unlikely that these species would use the Nisqually River and are not covered in this EFH.

TABLE 5-1
Flatfish that Potentially Occur within the Nisqually Reach Region

Common Name	Scientific Name
English sole	*Parophrys vetulus*
Petrale sole	*Eopsetta jordani*
Sand sole	*Psettichthys melanostictus*
Starry flounder	*Platichthys stellatus*

5.3 Species and Life History Stages Affected

5.3.1 Salmon

The natural ranges of the Pacific salmon species addressed within this EFH assessment include large portions of the Pacific Rim of North America and Asia. Anadromous salmonids exhibit a significant shift in habitat requirements, where adults migrate from the ocean to their natal streams to spawn (Groot and Margolis 1991). However, all anadromous salmonids (except steelhead and cutthroat trout [*Oncorhynchus clarki*]) follow the same general life history pattern, which includes incubation and hatching of embryos, and emergence and initial rearing of fry (a life stage of salmon between absorption of the yolk sac and juvenile salmonid) in freshwater; migration to oceanic habitats for extended periods of feeding and growth; and return to natal waters for completion of maturation, spawning, and death within a few weeks after spawning. Although all anadromous salmonids share the same general life cycle, there are substantial differences among species in the amount of time spent in freshwater and marine environments, as well as in the types of habitat they utilize for spawning and rearing (Table 5-2).

5.3.1.1 Habitat Requirements of Salmonids in Streams

Adult Pacific salmon typically migrate upstream at temperatures between 37 and 68° F (3 and 20° C), in water depths between 7 and 9.5 inches (18 and 24 cm; Bjornn and Reiser 1991). Salmon may spawn within

this temperature range, although spawning typically occurs between 39 and 52° F (4 and 11° C; Bell 1986). Once spawning is complete, water temperature affects the timing of salmonid egg incubation (Laufle et al. 1986; Healey 1991; Sandercock 1991; Spence et al. 1996; NMFS 1999). For example, the time it takes 50 percent of the larval salmonids of Pacific salmon species to hatch ranges from 115 to 150 days at 39° F (4° C), and from 35 to 60 days at 54° F (12° C; Bjornn and Reiser 1991). However, the alevin (a larval salmonid that has hatched but not yet fully absorbed its yolk sac) stage is generally less temperature sensitive than the embryonic stages (Spence et al. 1996). Newly hatched and juvenile salmonids are variable with regard to their temperature requirements, although as parrs most species are at risk when water temperatures exceed 77° F (25° C). Although juvenile salmonids may briefly tolerate such high temperatures, they are mostly lethal.

TABLE 5-2
Generalized Biological and Habitat Requirements in Pacific Salmonids

Species	Spawn Sites	Time in Gravel (Eggs)	Emergence	Rearing Sites	Time in Freshwater	Time in Marine	Return to Freshwater
Chinook	mainstem	*Fall run*: 90-150 days *Spring run*: 90-150 days	March-April	mainstem	*Fall run*: 60-120 days *Spring run*: 1–2 yrs	2–6 yrs	*Spring run*: April *Summer run*: July *Fall run*: Nov
Coho	tributaries	80-150 days	April-May	mainstem/ side channels, slack water	1–2 yrs	1–2 yrs	Late fall
Pink	mainstem/ tributaries/ intertidal	90-150 days (odd years only)	Late Jan, April-May	saltwater (nearshore)	several days	2 yrs	Early fall

Sources: Laufle et al. 1986; Healy 1991; Heard 1991; Meehan and Bjornn 1991; and Sandercock 1991.

Embryos and alevins are very susceptible to low dissolved oxygen (DO) levels, and require oxygen levels greater than 8 parts per million to survive (Phillips and Campbell 1961). If DO concentrations are low, the incidence of morphological abnormalities of emerging alevins is increased (Bjornn and Reiser 1991). Upon hatching, however, alevins in the gravel are able to detect oxygen gradients and move to areas with more suitable DO levels. Salmon, when rearing in freshwater, require DO levels of 6.5 to 7.0 parts per million. They may survive when DO concentrations are lower (< 5 parts per million), but growth, food conversion efficiency, and swimming performance may be adversely affected.

Riparian vegetation provides shade, shelters salmon from predation, moderates water temperature of a stream, stabilizes banks, and controls soil erosion and sedimentation. Furthermore, this vegetation provides nutrients to the stream, food for juvenile salmon, and may contribute large woody debris (LWD), which in turn increases channel complexity, creates backwater habitats, and increases the water depth of pools. Studies have shown a correlation between the amount of LWD and salmon production (Dolloff 1983, House and Boehne 1986).

Adult salmonids can successfully migrate any stream reach of reasonable length if the water depth is greater than 5 inches (12.7 cm) where substrate particles average larger than 3 inches (8 cm) in diameter, or if the depth is greater than 3.5 inches (9 cm) where particles are less than 3 inches (7.6 cm; Bjornn and Reiser 1991). Adult salmonids, upon reaching spawning beds, typically deposit eggs within a range of water depths and velocities that minimize the risk of desiccation over the coming incubation period. These depths and velocities vary depending on species and run of population (i.e., spring, summer, or fall runs). However,

studies suggest that a depth of 7 inches (18 cm) and a velocity of 0.98 feet per second (ft/s; 0.03 meters per second [m/s]) meet the minimum criteria (Thompson 1972, Neilson and Banford 1983, Bjornn and Reiser 1991, Healy 1991, Heard 1991).

Upon emerging from the substrate, fry between 0.7 and 1.4 inches (1.8 and 3.6 cm) long require water velocities of less than 0.32 ft/s (0.01 m/s), whereas juvenile salmon between 1.6 and 7 inches (4.1 and 18 cm) long usually occupy sites with velocities of up to 1.3 ft/s (0.04 m/s; Bjornn and Reiser 1991). When rearing in freshwater, juvenile salmon seek out slower velocity areas adjacent to faster water for feeding, resting, and growing. Overall, velocities required and used by juvenile salmonids vary with the size of the fish, and may change seasonally. By occupying slow velocity areas, salmon are likely to use less energy. Invertebrate drift abundance increases with velocity across a stream. Therefore, darting into the stream to feed and then resuming position in slower waters may provide a potential energy benefit for fish. Salmon use less energy maintaining their position in slow velocities while at the same time benefiting from the increased food abundance provided by faster velocities.

Within the stream channel, salmon require sufficient clean and appropriately sized cobbles and gravel (ranging from 0.5 to 4 inches [1.3 to 10 cm]) for spawning and incubation (Spence et al. 1996). Furthermore, riffles, rapids (a section of stream with considerable surface agitation, swift current, and drops of up to 3 feet [1 m]), pools, and floodplain connectivity with the stream are important for production, rearing, cover, and aeration.

5.3.1.2 Habitat Requirements of Salmonids in the Marine Environments

The marine environment can be subdivided into three general regions: estuary, coastal/nearshore, and ocean. Smoltification, the transition from fresh- to saltwater, marks a critical phase in the life history of anadromous salmonids. The emigration from freshwater to the ocean is preceded by rapid physiological, morphological, and behavioral transformations that preadapt fish for the marine environment. Once entering estuaries, juvenile salmon that have undergone smoltification (smolts) must acclimate to the new ecological conditions rapidly, including an immediate shift in diet, introduction to new predators, and a significantly different environment.

Utilization of marine habitats may vary both among and within salmon species. For pink and ocean-type Chinook salmon, smoltification occurs from within days to within a few months of life, whereas coho and stream-type Chinook salmon may reside in freshwater systems for an extended period then migrate to saltwater in their second year (or third year, more so in the case of coho salmon).

Rivers with well-developed estuaries, like the Nisqually Reach, are able to sustain larger ocean-type populations than those without (Levy and Northcote 1982). Brackish water areas in estuaries moderate the physiological stress during the parr-smolt transition. A longer estuarine residence exhibited by ocean-type Chinook salmon makes them more susceptible to changes in the productivity of the marine environment than stream-type Chinook salmon or coho salmon. This possible change in productivity, combined with the loss in coastal wetlands, may directly impact ocean-type populations.

Salmon, such as ocean-type Chinook salmon fry (as opposed to stream-type Chinook) prefer protected estuarine habitats with lower salinity, moving from the edges of marshes during low tide to protected tidal channels and creeks during high tides. Ocean-type Chinook remain in estuaries for several months before migrating to marine waters, whereas stream-type Chinook spend little time in the estuary of their natal stream before their migration. As the salmonids grow, they move to higher-salinity waters and increasingly less-protected habitats (within the estuary) before entering into the strictly marine areas. Chinook salmon can reside in the ocean between 2 and 5 years before returning to natal streams to spawn (Healey 1991). They are typically distributed throughout the Bering Sea.

Coho salmon are thought to remain in estuarine areas for several days to several weeks, as opposed to more northern populations that remain in these areas for several months. In estuaries, smolts often occur in intertidal and pelagic habitats, with deep, marine-influenced habitats (Pearce et al. 1982). When reaching the marine environment, coho salmon exhibit two dispersal patterns. Some juveniles spend weeks in estuaries before migrating to offshore waters, while others remain in coastal waters for at least the first summer before moving offshore (Pearce et al. 1982; Pearcy 1992). Due to the increase in food availability, growth of smolts is very rapid once smolts reach the estuarine area (Sandercock 1991). Juvenile coho feed mostly on marine invertebrates but also prey upon chum and pink fry (Slaney et al. 1985). Most coho remain at sea for about 18 months, moving northwest and south along the West Coast before returning to coastal areas and entering freshwater to spawn (Sandercock 1991). In Washington, adults typically enter freshwater habitat from October through November. In general, larger river basins have a wider range of river entry times than do smaller systems, with river entry occurring later the farther south a river is situated.

Pink salmon generally begin migration immediately upon emergence from the gravel. Upon entering the marine environment (around March – April), pink salmon appear to utilize the nearshore extensively for early rearing (Hard et al. 1996). The use of estuaries by pink salmon varies widely, from passing directly through en route to the nearshore areas to residing in estuaries for 1 to 2 months (Heard 1991). In general, most pink salmon prefer nearshore habitats over estuaries for their initial rapid growth. Rearing of pink salmon is typically 2 to 3 months, but may be as long as 4 months in the Puget Sound before juveniles move into the ocean (Heard 1991; Hard et al. 1996). At approximately 2 to 3 inches (5 to 7.6 cm) in length, pink salmon move from the nearshore to colder, deeper water to begin their ocean migration (Healey 1980). For populations in the Puget Sound, this movement begins in July and lasts through October as fish migrate out of the Puget Sound into the Pacific Ocean. Research shows that pink salmon from the Puget Sound migrate rapidly northward along the coasts of British Columbia and southeastern Alaska (Hartt and Dell 1986). Pink salmon is one of the fastest growing salmonid species (Heard 1991).

5.3.2 Groundfish

Given the soft sediment and estuarine conditions associated with the Nisqually Reach, four species of flatfish managed under Groundfish Management Plan are expected to occur within the upper saltwater extent of the Nisqually River.

Greater Puget Sound is a fjord-like estuary located in northwest Washington State with significant freshwater flows from rivers like the Nisqually River and multiple smaller streams around the basin (Palsson et al. 1998). Groundfish occupy most habitats of the Puget Sound ecosystem, including shallow and deepwater habitats, which are linked to freshwater and oceanic ecosystems. Due to the general similarities among the flatfish species with regard to life history stages, habitat requirements, and the potential effects the proposed action may have on them and their aquatic habitats, this section will discuss effects on the fish as groups, rather than on a species-by-species basis.

This broad, flat-bodied group of benthic fishes is typically found on shiftable substrates such as gravel, sand, or mud (Lamb and Edgell 1986). Flatfish are found in water at depths between 30 and 1,700 feet (9 and 518 m). Migration is exhibited particularly during the adult stage, when fish enter shallow water (< 70 feet [20 m]) during the summer to feed. Species such as the Starry flounder enter the river portions of estuaries. During spawning, flatfish migrate to deeper offshore areas. From winter through spring, eggs occur from the water surface to depths of greater than 650 feet (198 m).

These fish typically reside in or adjacent to estuarine areas and the upper saltwater extent in rivers, which are dominated by sandy or muddy substrates. Although not considered migratory species, adult flatfish generally migrate short distances (approximately 3 miles [4.8 km]) inshore to shallow (< 160 feet [49 m]) waters during

summer to feed, returning to deeper (230 to 650 feet [70 to 198 m]), offshore waters in winter to spawn. Sand sole and starry flounder exhibit different migration patterns than the remaining species. Both species move to the nearshore in winter to spawn, returning offshore in the spring-summer to feed (Conley 1977, Rogers and Millner 1996).

5.4 Effects of the Proposed Action

Effects of ongoing and future training activities to the various aquatic habitats and fish populations can be separated into direct and indirect effects. Direct effects are those that contribute to the immediate loss or harm to individual fish or embryos (e.g., heavy vehicles directly crushing fish or embryos). Indirect effects are those effects that occur at a later time, causing specific changes in habitat features (e.g., sedimentation or changes in habitat structure and stability). These effects may cause loss or reduction of populations of fish, or reductions in habitat quantity and quality.

Anthropogenic disruption can affect production of Puget Sound salmon and flatfish populations. Such disruptions include poor water quality, excessive nutrient input, and elimination or disruption of freshwater or estuarine habitats. Probably the most substantial issue regarding impacts to fish from activities on Fort Lewis and YTC are changes in streamflow rates increasing erosion and sedimentation, which can result from activities such as off-road vehicle travel or ordnance explosions (see Section 5.4.1). Erosion-promoting activities on a large scale may alter drainage patterns in a watershed, which may, over time, alter long-term flow regimes (e.g., flash flooding, scouring, or prolonged periods of low flows). Coupled with erosion and sedimentation is the issue of soil compaction. Compacted soil will reduce stormwater infiltration rates, which can alter runoff patterns. Compaction leads to an increase surface flow, which in turn exacerbates high-flow events entering nearby streams. It also reduces groundwater recharge, which can prolong low-flow periods.

5.4.1 Effects on Salmon

Due to the similarities in life histories and habitat requirements among species of Pacific salmon, this section will discuss the potential effects of the proposed action on salmon as a group, rather than on a species-by-species basis. Under the proposed action, ongoing and future military training activities will occur in or near the nearshore and freshwater environment on Fort Lewis and freshwater habitats at YTC. All three salmon species federally managed under the Pacific Fisheries Management Council occur on Fort Lewis, while only coho and Chinook salmon occur on or near YTC. All life history stages of salmonids at Fort Lewis may potentially be affected, while at YTC impacts occur only to freshwater stages.

Freshwater stages that may be affected include adult migration to natal spawning areas, incubation and maturation of eggs, as well as rearing and migration of juveniles to the ocean. The affected estuarine and nearshore marine stages include smoltification (i.e., the physiological process that prepares a juvenile anadromous fish to survive the transition from freshwater to saltwater) and migration of juveniles to the ocean, as well as adults returning to natal streams.

Increases in streamflow can lead to alterations in channel morphology. Doubling the speed of streamflow increases its erosive power by four times and its bedload and sediment carrying power by 64 times (U.S. Forest Service 2002). Accelerated runoff can thus cause unstable stream channels to downcut or erode laterally, accelerating erosion and sediment production. Lateral erosion results in progressively wider and shallower stream channels, which can adversely affect fish populations. Pool/riffle (riffles are defined as shallow sections of the stream with rapid current and a surface broken by gravel, rubble, or boulders) and width/depth ratios, which are important habitat components for salmonids, may be altered.

Turbidity and sedimentation affect the abundance of food, and impact juvenile salmon behavior, adult spawning, and egg incubation habitats (Laufle et al. 1986; Healey 1991; Sandercock 1991; Spence et al.

1996). An increase in turbidity can cause a short-term increase in phytoplankton, as well as in inorganic and organic materials that are suspended in the water column during high flow conditions, potentially diminishing light penetration into the stream (Spence et al. 1996). Diminished light levels can reduce algal productivity and change the instream plant composition (Samsel 1973). This reduction of plant material instream may allow sediment to drift within the water column, increasing siltation. Siltation contributes significantly to a reduction in the diversity of aquatic insects and other aquatic invertebrates (Spence et al. 1996). Silt reduces the interstices (narrow spaces) in the substrate, thereby limiting the microhabitat for benthic invertebrates (i.e., a portion of the juvenile salmon diet) in a stream. For example, feeding and territorial behaviors of juvenile coho salmon are disrupted by short-term exposure (approximately 2 to 5 days) to turbid water (Berg and Northcote 1985).

Training activities would follow the general timing restrictions within essential fish habitat provided in Table 5-3. These timing restrictions are established by WDFW (and imposed by NMFS) to limit when activities may be conducted for specific bodies of water as a means of protecting salmonid species from potential habitat disturbance during spawning. Typically activities are permitted around or within streams containing salmonids during the summer months (i.e., June through September); however, timing windows can and may vary depending on geographic location.

TABLE 5-3
Generalized Timing Restrictions in Washington, Indicating When Activities May Occur Within Streams Considered to be Essential Fish Habitat

Installation	County/Watershed	General Season	Exceptions to General Season	Activity Is Allowed Between These Dates
Fort Lewis	Pierce	July 16–August 31	Nisqually River mouth to Alder Lake to include tributaries	July 16 - August 31
	Thurston	July 16 - Sept. 15	Nisqually River mainstem	July 16 – August 31
YTC	Kittitas	July 1 – Sept. 30	--	--
	Yakima	June 1 – Sept. 15	Yakima River mouth to Roza Dam	June 1 -- Sept. 15
			On-site tributaries	July 16 – August 15
	Columbia River (above Priest Rapid Dam)	July 16 – Feb. 28	All Columbia tributaries	See county listings
Source: Chapman (2009).				

5.4.2 Effects on Groundfish

Like many of the groundfish managed by the Pacific Council, focus has been diverted to fishing pressure on the stock, more so than possible habitat disturbance. For example, the bottom trawl fishery in the Puget Sound is the dominant fishery for flatfish, targeting species such as English sole, starry flounder, rock sole, Dover sole, and sand sole (Palsson et al. 1998). Several Indian tribes have treaty-fishing rights to harvest a share of surplus groundfish resources in Puget Sound. These tribes have imposed regulations similar to those imposed by the WDFW to limit fishing participation. The 1995 Status of Stocks document found that the majority of groundfish were below normal abundance. Future military training activities would not involve any fishing, but could result in some habitat disturbance through increased instream sedimentation discharged into the lower reaches of the Nisqually River.

The impacts to the lower Nisqually River reach and estuary from ongoing and future military training action should be minimal. Sedimentation and runoff from training activities could potentially affect flatfish downstream. Within the estuary, tides, currents, and weather affect the sandy, muddy substratum of the

Nisqually Reach. Furthermore, there is usually an abundance of fine silt brought down from the land (Kozloff 1996). Thus, training activities at increased levels, that may occur in the future, should have little impact to flatfish or their estuarine habitat due to the dynamic, unstable nature of this area.

5.5 Conservation Measures

The goal of this EFH assessment is to ensure no net loss of freshwater, estuarine, and nearshore habitats valuable to both salmonid and flatfish populations, as a result of the proposed action. Activities associated with ongoing and future military training activities could have the potential to adversely affect salmonids and groundfish and their respective habitats**,** as the increased frequency of training activities could increase the rate of sedimentation entering water bodies. Implementation of the measures listed below would minimize these potential impacts. As discussed, each species requires specific types and amounts of habitat to maintain a healthy population. Their respective EFH includes habitats required by all life history phases during a species lifetime (i.e., spawning, incubation, dispersal, rearing, migration, and feeding, depending on the species).

The Puget Sound marine ecosystems are intricately linked to freshwater systems through estuaries. Activities occurring in watersheds and riverine areas can directly and indirectly affect fish species utilizing not only the freshwater habitat, but also the estuarine and nearshore ecosystems, through habitat disruption and alteration, flow and current modification, eutrophication, nutrient deprivation, and chemical contamination. These effects may be magnified by the effects of flooding and the intrusion of sediments into the marine environment that affect water quality and bottom habitats (Palsson et al. 1998).

Riparian areas include traditional riparian corridors, wetlands, intermittent streams, and other areas that help to maintain the integrity of aquatic ecosystems by: (1) influencing the delivery of coarse sediment, organic matter, and woody debris to streams; (2) providing root strength for channel stability; (3) shading the stream; and (4) protecting water quality.

Fort Lewis has ongoing programs to minimize military intrusion into streams and wetlands on the installation. Fort Lewis has conducted detailed mapping of wetlands and streams on the installation to ensure that water bodies are identified and protected and has conducted several wetland habitat enhancement projects designed to maintain or improve water quality entering nearby streams (ENSR 1998b).

Yakima Training Center has implemented several programs to enhance fish habitat. These programs include: marking drainages with siber stakes; prohibiting entry by troops and equipment; minimizing military activities near streams; restoring upland habitats with vegetation to reduce erosion; and using riparian plantings and other stream stabilization and enhancement techniques to improve fish habitat.

To reduce aquatic degradation both Fort Lewis and YTC have implemented the following measures:

- Buffer zones along streams, rivers, and wetland habitats, within which off-road vehicle activities are prohibited.
- Hardened crossings at established river crossing sites.
- Riparian buffer strips adjacent to aquatic habitats (freshwater or nearshore) to reduce direct impacts to the various life stages of fish species. These buffers protect fish and fulfill specific ecological functions (e.g., streambank stabilization, control of sediment inputs from surface erosion, and maintenance of shade to stream channels).
- Best management practices to minimize sedimentation and disturbance of riparian vegetation.
- Best management practices to reduce the risk of fire on the installations.
- Minimal construction activities near riparian areas.

- Environmental awareness training for military personnel.

5.6 Determination of Effects

The conservation measures presented in Section 5.5 will continue to prevent or minimize adverse effects from training to aquatic habitats on and near Fort Lewis and YTC. Therefore, proposed training activities would not result in a loss of freshwater, estuarine, or nearshore habitats valuable to salmonid and flatfish populations.

6.0 REFERENCES

Adolfson and Associates, Inc. 1998. Draft Biological Assessment, Extension of the Temporary Service Agreement for Treatment of Northwest Landing Flows at Tatsolo Point Wastewater Treatment Plant. Prepared for Gray and Osborne, Inc. Seattle, Washington.

Anderson, E. 2006. State Fisheries Biologist for the Mid-Columbia River, Washington State Department of Fish and Wildlife (WDFW), Yakima, Washington. May 11, 2006. Telephone Communication with Cameron Fisher, ENSR. Redmond, Washington.

Arfsten, D.P., Wilson C.L., and Spargo, B.J. 2002. Review: Radio Frequency Chaff: The Effects of It's Use in Training on the Environment. Ecotoxicology and Environmental Safety 53:1-11.

Bell, M.C. 1986. Fisheries Handbook of Engineering Requirements and Biological Criteria. U.S. Army Corps of Engineers, Office of the Chief of Engineers, Fish Passage Development and Evaluation Program. Portland, Oregon.

Benedict, N.G., S.J. Oyler-McCance, S.E. Taylor, C.E. Braun, and T.W. Quinn. 2003. Evaluation of the Eastern (*Centrocercus urophasianus urophasianus*) and Western (*Centrocercus urophasianus phaios*) Subspecies of Sage-grouse Using Mitochondrial Control-region Sequence Data. Conservation Genetics 4:301-310.

Berg, L., and T.G. Northcote. 1985. Changes in Territorial, Gill-flaring, and Feeding Behavior in Juvenile Coho Salmon (*Oncorhynchus kisutch*) Following Short-term Pulses of Suspended Sediment. Canadian Journal of Fisheries and Aquatic Sciences 42:1410-1417.

Bjornn, T.C., and D.W. Reiser. 1991. Habitat Requirements of Salmonids in Streams. American Fisheries Society Special Publication 19:83-138. Bethesda, Maryland.

Bottorff, J.A., and D. Swanson. 1993. Biological Assessment for the Restoration of an Armored Division at Fort Lewis. DACA 88-93-M-0808. Prepared by Resources Northwest, Inc., Olympia, Washington, for the Directorate of Engineering and Housing, Fort Lewis Military Reservation, U.S. Department of Defense, U.S. Army. Fort Lewis, Washington.

_____, B. Gilber, and T. Williams. 1991. 1991 Northern Spotted Owl Survey: Fort Lewis Military Reservation, Pierce County, Washington. Unpublished Report for U.S. Department of Defense by U.S. Fish and Wildlife Service (USFWS). Olympia, Washington.

Britton, C.M., and R.G. Clark. 1985. Effects of Fire on Sagebrush and Bitterbrush. K. Sanders and J. Durham (tech. eds). Rangeland Fire Effects. U.S. Department of the Interior, Bureau of Land Management (BLM). Boise, Idaho.

Brook, B.W., D.W. Tonkyn, J.J. O'Grady, and R. Frankham. 2002. Contribution of Inbreeding to Extinction Risk in Threatened Species. Conservation Ecology 6:16.

Brown, L.G. 1992. Draft Management Guide for the Bull Trout *Salvelinus confluentus* (Suckley) on the Wenatchee National Forest. Washington Department of Wildlife. Wenatchee, Washington.

Busby, P.J., T.C. Wainwright, G.J. Bryant, L.J. Lierheimer, R.S. Waples, F.W. Waknitz, and I.V. Lagomarino. 1996. Status Review of West Coast Steelhead form Washington, Idaho, Oregon, and California. National Oceanic and Atmospheric Administration Technical Memorandum NMFS-NWFSC-27. Seattle, Washington.

Cadwell, K. 1998. Environment and Natural Resources Division (ENRD). Fort Lewis Military Reservation. Department of Defense, U.S. Army, Washington. July 21, 1998. Telephone Communication with Ronda Little, ENSR. Redmond, Washington.

Cadwell, L.L., M.A. Simmons, J.L. Downs, and C.M. Sveum. 1994. Sage Grouse on the Yakima Training Center: A Summary of Studies Conducted During 1991 and 1992 (PNL-9464). Pacific Northwest National Laboratory. Richland, Washington.

Calambokidis, J., and G.H. Steiger. 1990. Sightings and Movements of Humpback Whales in Puget Sound, Washington. Northwestern Naturalist 71:45-49.

Carlson, D. 1998. Fisheries Biologist. National Marine Fisheries Service, National Oceanic and Atmospheric Administration, Olympia, Washington. November 6, 1998. Telephone Communication with Alissa Boyce. ENSR. Redmond, Washington.

Carbyn, L.N. 1987. Gray Wolf and Red Wolf. Pages. 359-376 *in* Wild Furbearer Management and Conservation in North America, M. Novak, G.A. Baker, M.E. Obbard, and B. Malloch (eds.). Ontario Trappers Association, Ministry of Natural Resources. Ontario, Canada.

Carter, H., and S. Sealy. 1990. Daily Foraging Behavior of Marbled Murrelets. Studies in Avian Biology 14:93-102.

CH2M HILL. 1994. Final Environmental Impact Statement. Stationing of Mechanized or Armored Combat Forces at Fort Lewis, Washington. Report Prepared for the U.S. Army Corps of Engineers. Mobile, Washington.

_____. 1996. Cultural and Natural Resources Management Plan Yakima Training Center, Yakima, Washington. Bellevue, Washington.

_____. 2001a. Environmental Assessment Interim Brigade Combat Team Transformation at Fort Lewis, Washington. Bellevue, Washington.

_____. 2001b. Biological Assessment Interim Brigade Combat Team Transformation at Fort Lewis, Washington. Bellevue, Washington.

Chan, J. 1998. Fisheries Biologist, USFWS, Lacey, Washington. November 19, 1998. Telephone Communication with Alissa Boyce, ENSR. Redmond, Washington.

_____. 2000. Fisheries Biologist, USFWS, Lacey, Washington. May 18, 2000. Telephone Communication with Kim Anderson, ENSR. Redmond, Washington.

_____. 2003. Fisheries Biologist, USFWS. January 6, 2003. Written Summary of Telephone Communication between J. Chan and J. Barr, Nisqually Tribe. Lacey, Washington.

_____. 2004. Fisheries Biologist, USFWS, Lacey, Washington. October 4, 2004. Electronic Mail Communication with Cameron Fisher, ENSR. Redmond, Washington.

Chapman, P. 2009. WDFW Timing Regulations. Information sent from Pat Chapman, WDFW, Olympia, Washington, to Stuart Paulus, AECOM. April 4, 2009. Redmond, Washington.

Clouse, D. 1998. Wildlife Biologist, ENRD. Fort Lewis Military Reservation. July 17, 1998. Telephone Communication with Ronda Little, ENSR. Redmond, Washington.

_____. 2004. Wildlife Biologist, ENRD. Fort Lewis Military Reservation. June 16, 2004. Personal Communication with Cameron Fisher, ENSR International. Redmond, Washington.

Conley, R.L. 1977. Distribution, Relative Abundance, and Feeding Habits of Marine and Anadromous Juvenile Fishes of Everett Bay, Washington. Masters of Science Thesis, University of Washington. Seattle, Washington.

Connelly, J.W., and C.E. Braun. 1997. Long-term Changes in Sage Grouse (*Centrocercus urophasianus*) Population in Western North America. Wildlife Biologist 3:29-234.

Courtney, S., T. Grubba, W. Beattie, and D. Brosnan. 1996. Seabird Surveys in Puget Sound 1995. Report to Northwest Indian Fisheries Commission. Report Prepared by Sustainable Ecosystems Institute. Portland, Oregon.

Cummins, J. 1999a. Fisheries Biologist, WDFW, Yakima, Washington. December 16, 1999. Telephone Communication with Alissa Boyce, ENSR. Redmond, Washington.

_____. 1999b. Fisheries Biologist, WDFW, Yakima, Washington. December 6, 1999. Telephone Communication with Kim Anderson, ENSR. Redmond, Washington.

Department of the Army. 1997. Endangered Species Management Plan for the Bald Eagle (*Haliaeetus leucocephalus*) Yakima Training Center. Yakima, Washington.

_____. 2004a Strategy for the Environment. Available at: http://www.asaie.army.mil/Public/ESOH/doc/ArmyEnvStrategy.pdf. Washington, DC.

_____. 2004b. Fort Lewis Regulation 420-5. Procedures for the Protection of State and Federally Listed Threatened, Endangered, Candidate Species, Species of Concern, and Designated Critical Habitat. Headquarters, 1st Corps and Fort Lewis, Washington. Fort Lewis, Washington.

_____. 2004c. Environmental Quality: Environmental Protection and Enhancement. Fort Lewis Regulation 200-1. Fort Lewis, Washington.

_____. 2004d. Yakima Training Center Range Regulation. Fort Lewis Regulation 350-30. Fort Lewis, Washington.

_____. 2005. Biological Assessment and Essential Fish Habitat for the Floating Bridge Training and Amphibious River Training Exercises at Yakima Training Center, Washington. Yakima Training Center, Washington.

_____. 2007. Integrated Natural Resource Management Plan. Fort Lewis, Washington.

_____. 2008. Biological Assessment and Essential Fish Habitat Assessment Firing High Mobility Artillery Rocket System (HIMARS) at Fort Lewis and Yakima Training Center, Washington.

Dolloff, C.A. 1983. Effects of Stream Cleaning on Juvenile Coho Salmon and Dolly Varden in Southeast Alaska. Transactions of the American Fisheries Society 115:743-755.

Eberhardt, L.W., and L.A Hofmann. 1991. Sage Grouse on the Yakima Training Center: A Summary of Studies Conducted During 1989 and 1990 (PNL-7647), Pacific Northwest National Laboratory. Richland, Washington.

Ellings, C. 2004. Fisheries Biologist. Nisqually River Native Char (*Salvelinus* spp.) Verification of Presence. Memorandum, 26 July 2004. Ducks Unlimited. Olympia, Washington.

ENSR. 1995. Assessment of Marbled Murrelets and Other Marine Bird Use Near the ARCO Marine Terminal. Prepared for ARCO Product Company, Cherry Point Refinery, Ferndale, Washington. Redmond, Washington.

_____. 1998a. Final Biological Assessment of Military Operations at Solo Point, Fort Lewis, Washington. Report for the Department of the Army, Fort Lewis, Washington. Redmond, Washington.

_____. 1998b. Mapping Wetland Boundaries and Major Wetland Community Types on Fort Lewis, Washington. Report Prepared for the Directorate of Public Works, Fort Lewis, Washington. Redmond, Washington.

_____. 1998c. Yakima Training Center Pest Management Plan Environmental Assessment. Report Prepared for the U.S. Army Yakima Training Center, Yakima, Washington. Redmond, Washington.

_____. 1999. Final Biological Assessment for the Fielding of M56 and M58 Smoke Generators at Fort Lewis and Yakima Training Center. Report Prepared for the Department of the Army, Fort Lewis, Washington. Redmond, Washington.

_____. 2001a. Final Biological Assessment for Training with Smoke Munitions at Fort Lewis and Yakima Training Center, Washington. Report Prepared for the Department of the Army, Fort Lewis, Washington. Redmond, Washington.

_____. 2001b. Final Environmental Assessment for Training with Smoke Munitions at Fort Lewis and Yakima Training Center, Washington. Report Prepared for the Department of the Army, Fort Lewis, Washington. Redmond, Washington.

_____. 2003. Northern Spotted Owl Survey 2002-2003 Draft Report. Report Prepared for the U.S. Army Public Works, Fort Lewis by ENSR International. Redmond, Washington.

_____. 2004a. Final Biological Assessment and Essential Fish Habitat Assessment for the Army Transformation, Resource Sustainability, and Fiscal Year 2005 at Fort Lewis, Washington. Report Prepared for the U.S. Army Public Works, Fort Lewis. Redmond, Washington.

_____. 2004b. Biological Assessment for Construction and Maintenance Activities within the Southern Cantonment Area, Gray Army Airfield, and the Central Impact Area at Fort Lewis, Washington. Report Prepared for the U.S. Army Public Works, Fort Lewis. Redmond, Washington.

_____. 2005a. Biological and Essential Fish Habitat Assessment Fiscal Year 2005 Stationing Actions at Fort Lewis, Washington. Prepared for the Department of the Army, Fort Lewis, Washington. Redmond, Washington.

_____. 2005b. Final Biological Assessment for Stationing Regimental Aviation Assets at Fort Lewis, Washington. Report Prepared for the Department of the Army, Fort Lewis, Washington. Redmond, Washington.

_____. 2006. 2006 Northern Spotted Owl Survey on Fort Lewis, Washington. Prepared for the Department of the Army, Fort Lewis, Washington. Redmond, Washington.

_____. 2008. 2008 Northern Spotted Owl Survey on Fort Lewis, Washington. Prepared for the Department of the Army, Fort Lewis, Washington. Redmond, Washington.

Federal Register. 1975. Endangered and Threatened Wildlife and Plants; the Animal, Grizzly Bear (*Ursus arctos*), Determined to be a Threatened Species. July 28, 1975. U.S. Department of the Interior, Fish and Wildlife Service. Washington D.C.

_____. 1993. Endangered and Threatened Wildlife and Plants; the Plant, Marsh Sandwort (*Arenaria paludicola*), Determined to be an Endangered Species. August 3, 1993. U.S. Department of the Interior, Fish and Wildlife Service. Washington D.C.

_____. 1994. Endangered and Threatened Wildlife and Plants; the Plant, Water Howellia (*Howellia aquatilis*), Determined to be a Threatened Species. July 14, 1994. U.S. Department of the Interior, Fish and Wildlife Service. Washington D.C.

_____. 1998. Endangered and Threatened Wildlife and Plants; the Fish, Bull Trout (*Salvelinus confluentus*), Determined to be a Threatened Species. June 28, 1998. U.S. Department of the Interior, Fish and Wildlife Service. Washington D.C.

_____. 2005. Endangered and Threatened Wildlife and Plants; Proposed Designation of Critical Habitat for 12 Evolutionarily Significant Units of West Coast Salmon and Steelhead in Washington, Oregon, and Idaho. September 2, 2005. U.S. Department of Commerce, National Oceanic and Atmospheric Administration. Washington D.C.

_____. 2007. Migratory Bird Permits; Take of Migratory Birds by the Armed Forces. Department of the Interior Fish and Wildlife Service. Volume 72, Number 39, Pages 8931-8950. February 28, 2007. Washington, DC.

Forsman, E.D., E.C. Meslow, and H.M. Wight. 1984. Distribution and Biology of the Spotted Owl in Oregon. Wildlife Monographs 87:1-64.

Forest Ecosystem Management Assessment Team. 1993. Forest Ecosystem Management: An Ecological, Economic, and Social Assessment. U.S. Forest Service and BLM. Portland, Oregon.

Fraley, J.J., and B.B. Shepard. 1989. Life History, Ecology, and Population Status of Migratory Bull Trout (*Salvelinus confluentus*) in the Flathead Lake and River System, Montana. Northwest Science 63(4):133-143.

Frederick, G.P. 1991. Gray Wolf. Pages. 33-50 *in* Effects of Forest Roads on Grizzly Bear Elk, and Gray Wolves: A Literature Review, 1-J1-73. U.S. Department of Agriculture (U.S.D.A), Forest Service, Kootenai National Forest. Libby, Montana

Fresh, K.L., D. Rabin, C. Simenstad, E.O. Salo, K. Garrison, and L. Matheson. 1979. Fish Ecology Studies of the Nisqually Reach of the South Puget Sound, Washington. Final Report. Report Prepared for the Weyerhaeuser Company by the University of Washington. Seattle, Washington.

Fritz, L. 2004. Research Biologist, NOAA Fisheries, Seattle, Washington. November 29, 2004. Electronic Mail Communication with Cameron Fisher, ENSR. Redmond, Washington.

Gamon, J.G. 1995. Report on the Status of *Castilleja levisecta* (Greenman). Washington Natural Heritage Program, Department of Natural Resources. Olympia, Washington.

_____. 1997. Endangered Species Management Plan for the Water Howellia (*Howellia aquatilis*): Fort Lewis, Washington. Unpublished Report Prepared for ENRD/Fish and Wildlife Branch of Fort Lewis. Washington Natural Heritage Program, Department of Natural Resources. Olympia, Washington.

_____. 1998. Inventory of Fort Lewis for Water Howellia (*Howellia aquatilis*): A Federally Threatened Species. Washington Department of Natural Resources, Division of Forest Resources. Natural Heritage Program. Olympia, Washington.

Gibbons, J. 2006. Environmental Compliance Manager, McChord Airforce Base, Washington. May 9, 2006. Telephone Communication with Cameron Fisher, ENSR. Redmond, Washington.

Goetz, F.A. 1989. Biology of the Bull Trout, (*Salvelinus confluentus*): A Literature Review. U.S. Department of Agriculture (USDA), Forest Service, Willamette National Forest. Eugene, Oregon.

Grettenberger, J. 2000. Endangered Species Biologist, USFWS, Lacey, Washington. May 17, 2000. Telephone Communication with Kim Anderson, ENSR. Redmond, Washington.

Groot, C., and L. Margolis (eds.). 1991. Pacific Salmon Life Histories. UBC Press. Vancouver, British Columbia.

Haley, M.V., and C.V. Kurnas. 1992. Aquatic Toxicity and Fate of Iron- and Aluminum-coated Glass Fibers. CRDEC-TR-422. Chemical Research, Development, and Engineering Center. Aberdeen Proving Ground, Maryland.

Hard J.J., R.G. Kope, W.S. Grant, F.W. Waknitz, L.T. Parker, and R.S. Waples. 1996. Status Review of Pink Salmon from Washington, Oregon, and California. U.S. Department of Commerce, NOAA Technical Memorandum NMFS-NWFSC-25. Seattle, Washington.

Hartt, A.C., and M.B. Dell. 1986. Early Oceanic Migrations and Growth of Juvenile Pacific Salmon and Steelhead Trout. International North Pacific Fisheries Commission Bulletin 46.

Hays, D.W., M.J. Tirhi, and D.W. Stinson. 1998. Washington State Status Report for the Sage Grouse. WDFW. Olympia, Washington.

Healey, M.C. 1980. The Ecology of Juvenile Salmon in Georgia Strait, British Columbia. Pages 203-229 *in* Salmonid Ecosystems of the North Pacific, W.J. McNeil and D.C. Himsworth (eds.). Oregon State University Press. Corvallis, Oregon.

_____. 1991. Life History of Chinook Salmon, *Oncorhynchus tshawytscha*. Pages 311-394 *in* Pacific Salmon Life Histories. C. Groot and L. Margolis (eds.). UBC Press. Vancouver, British Columbia.

Heard, W.R. 1991. Life History of Pink Salmon, *Oncorhynchus gorbuscha*. Pages 119-230 *in* Pacific Salmon Life Histories. C. Groot and L. Margolis (eds.). UBC Press. Vancouver, British Columbia.

House, R.A., and P.L. Boehne. 1986. Effects of Instream Structures on Salmonid Habitat and Populations in Tobe Creek, Oregon. North American Journal of Fisheries Management 6:38-46.

Jeffries, S.J., P.J. Gearin, H.R. Huber, D.L. Saul, and D.A. Pruett. 2000. Atlas of Seal and Sea Lion Haulout Sites in Washington. WDFW, Wildlife Science Division. Olympia, Washington.

Johnson, D.H., and T.A. O'Neill. 2001. Wildlife-habitat Relationships in Oregon and Washington. Oregon State University Press. Corvallis, Oregon.

Jordan, K., and S. Hughes. 1995. Characteristics of Three Marbled Murrelet Tree Nests, Vancouver Island, British Columbia. Northwestern Naturalist 76:29-32.

Kerschke, W.L. 1997. Wetland Mapping and Classification in Selected High Use Training Areas on Fort Lewis, Washington. Prepared for ENRD, Fort Lewis, Washington. The Nature Conservancy of Washington. Seattle, Washington.

Knowles, C., and R. Gumtow. 2005. Saving the Bull Trout. Electronic Drummer. The Thoreau Institute. Bandon, Oregon. Available at: http://www.ti.org/bullshort.html.

Kozloff, E.N. 1996. Seashore Life of the Northern Pacific Coast: An Illustrated Guide to Northern California, Oregon, Washington, and British Columbia. University of Washington Press. Seattle, Washington.

Kunz, J. 2009. Fisheries Biologist. Washington Department of Fish and Wildlife, Region 6. Olympia, Washington. Personal Communication to Michael Kyte, AECOM. February 23, 2009. Seattle, Washington.

Lacy, R.C. 1987. Loss of Genetic Diversity from Managed Populations: Interacting Effects of Drift, Mutation, Immigration, Selection, and Population Subdivision. Conservation Biology 2:143-158.

Lamb, A., and P. Edgell. 1986. Coastal Fishes of the Pacific Northwest. Harbour Publishing Co., Ltd. Madeira Park, Canada.

Laufle, J.C., G.B. Pauly, and M.F. Shepard. 1986. Species Profile: Life Histories and Environmental Requirements of Coastal Fishes and Invertebrates (Pacific Northwest): Coho Salmon. USFWS Biological Report 82.

Leathe, S.A., and P.J. Graham. 1983. Cumulative Effects of Micro-hydro Development on the Fisheries of the Swan River Drainage, Montana. First Annual Progress Report. Montana Department of Fisheries, Wildlife and Parks. Bigfork, Montana.

Levy, D.A., and T.G. Northcote. 1982. Juvenile Salmon Residency in a Marsh Area of Fraser River Estuary. Canadian Journal of Fisheries and Aquatic Sciences 39:270-276.

Livingston, M. 1998. Western Sage Grouse Management Plan (1 October 1998 to 30 September 2003). Report Prepared for Directorate of Environment and Natural Resources, Yakima Training Center. Yakima, Washington.

Lohr, S. 1998. Fisheries Biologist, USFWS, Boise, Idaho. October 8, 1998. Telephone Communication with Alissa Boyce, ENSR. Redmond, Washington.

Lynch, J. 2005. Ecologist, ENRD, Public Works, Fort Lewis, Washington. September 14, 2005. Telephone Communication with Cameron Fisher, ENSR. Redmond, Washington.

Malkin, D.R. 1999. Northern Spotted Owl Survey 1998-1999 Report. Report Prepared for U.S. Army Public Works, Fort Lewis, Washington and ENSR, Redmond, Washington. Bellingham, Washington.

McCord, C.M., and J.E. Cardoza. 1982. Bobcat and Lynx. Pages 728-766 *in* J.A. Chapman and G.A. Feldhamer (eds.). Wild Mammals of North America: Biology, Management, and Economics. Johns Hopkins University Press, Baltimore, Maryland.

McPhail, J.D., and J.S. Baxter. 1996. A Review of Bull Trout (*Salvelinus confluentus*) Life-history and Habitat Use in Relation to Compensation and Improvement Opportunities. Ministry of Environment, Lands and Parks, Fisheries Management Report No. 104. British Columbia, Canada.

Mech, D.L. 1970. The Wolf. Natural History Press, Doubleday and Company. New York, New York.

_____. 1989. Wolf Population Survival in an Area of High Road Density. American Midland National 121:387-389.

Meehan, W.R., and T.C. Bjornn. 1991. Salmonid Distributions and Life Histories. American Fisheries Society Special Publication 19:47-82.

Merizon, R., S. Courtney, W. Beattie, D. Brosnan, D. Evans, T. Grubba, W. Kerschke, J. Luginbuhl, R. Millner, E. Neatherlin, D. Nysewander, M. Raphael, and M. Salema. 1997. Seabird Surveys in Puget Sound 1996. Report Prepared by Sustainable Ecosystems Institute for Northwest Indian Fisheries Commission. Portland, Oregon.

Mills, D. 1998. Personal Communication with Ronda Little on April 9, 1998. WDFW. Mill Creek, Washington.

National Marine Fisheries Service (NMFS). 1992. Recovery Plan for the Stellar Sea Lion (*Eumetopias jubatus*). Prepared by the Stellar Sea Lion Recovery Team for the NMFS. Silver Springs, Maryland.

_____. 1999. Chinook Status Review: Chinook Life History. Updated November 8, 1999. U.S. Department of Commerce, Technical Memorandum NOAA-NWFSC-35. Seattle, Washington. Available at: http://www.nwfsc.noaa.gov/pubs/tm/tm35/chapters/02lifhist.htm.

_____. 2002. Consultation Initiation Checklist. Mimeograph. Washington, D.C.

_____. 2009a. Species Lists. Northwest Regional Office, Seattle, Washington. April 23, 2009. Available at: http://www.nwr.noaa.gov/Species-Lists.cfm.

_____. 2009b. Leatherback Turtle (*Dermochelys coriacea*). National Oceanic and Atmospheric Administration Office of Protected Resources. Available at: http://www.nmfs.noaa.gov/pr/species/turtles/leatherback.htm.

_____. 2009c. Loggerhead Turtle (*Caretta caretta*). National Oceanic and Atmospheric Administration Office of Protected Resources. Available at: http://www.nmfs.noaa.gov/pr/species/turtles/loggerhead.htm.

_____. 2009d. Green Sea Turtle (*Chelonia mydas*). National Oceanic and Atmospheric Administration Office of Protected Resources. Available at: http://www.nmfs.noaa.gov/pr/species/turtles/green.htm.

_____. 2009e. Olive Ridley Turtle (*Lepidochelys olivacea*). National Oceanic and Atmospheric Administration Office of Protected Resources. Available at: http://www.nmfs.noaa.gov/pr/species/turtles/oliveridley.htm.

_____. 2009f. Killer Whale (*Orcinus orca*). National Oceanic and Atmospheric Administration Office of Protected Resources. Available at: http://www.nmfs.noaa.gov/pr/species/mammals/cetaceans/killerwhale.htm.

_____. 2009g. Humpback Whale (*Megaptera novaeangliae*). National Oceanic and Atmospheric Administration Office of Protected Resources. Available at: http://www.nmfs.noaa.gov/pr/species/mammals/cetaceans/humpbackwhale.htm.

_____. 2009h. Steller Sea Lion (*Eumetopias jubatus*). National Oceanic and Atmospheric Administration Office of Protected Resources. Available at: http://www.nmfs.noaa.gov/pr/species/mammals/pinnipeds/stellersealion.htm.

Neilson, J.D., and C.E. Banford. 1983. Chinook Salmon (*Oncorhynchus tshawytscha*) Spawner Characteristics in Relation to Redd Physical Features. Canadian Journal of Zoology 61:1254-1531.

Nisqually Chinook Recovery Team. 2001. Nisqually Chinook Recovery Plan. Northwest Indian Fisheries Commission. Olympia, Washington.

Norman, F. 1998. Biologist, WDFW. Personal Communication with Ronda Little on April 7, 1998. Mill Creek, Washington.

Northwest Power Planning Council. 1990. Mid-Columbia River Subbasin (Bonneville Dam to Priest Rapids Dam) Salmon and Steelhead Production Plan. Washington Department of Fisheries. Olympia, Washington.

Pacific Fishery Management Council. 1998. Essential Fish Habitat, West Coast Groundfish Appendix. Report Prepared by the EFH Core Team for West Coast Groundfish. Pacific Fishery Management Council. Portland, Oregon.

_____. 1999. Appendix A: Identification and Description of Essential Fish Habitat, Adverse Impacts and Recommended Conservation Measures for Salmon. Amendment 14 to the Pacific Coast Salmon Plan. Pacific Fishery Management Council. Portland, Oregon.

Pacific States Marine Fisheries Commission. 1998. Steelhead Salmon Facts. Gladstone, Oregon. Available at: http://www.psmfc.org/habitat/edu_steelhead_facts.html.

Page, L.M., and B.M. Burr. 1991. Peterson Field Guides: A Field Guide to Freshwater Fishes. Houghton Mifflin Company. New York, New York.

Palsson, W.A., T.J. Northup, and M.W. Barker. 1998. Puget Sound Groundfish Management Plan. WDFW. Olympia, Washington.

Paradiso, J. L., and R. M. Nowak. 1982. Wolves. Pages 460-474 In J. A. Chapman and G. A. Feldhamer (eds.). Wild Mammals of North America. Johns Hopkins University Press. Baltimore, Maryland.

Pearce, T.A., J.H. Meyer, and R.S. Boomer. 1982. Distribution and Food Habits of Juvenile Salmon in the Nisqually Estuary, Washington, 1979-1980. USFWS. Olympia, Washington.

Pearcy, W.G. 1992. Ocean Ecology of North Pacific Salmonids. University of Washington Press. Seattle, Washington.

Peterson, R.O. 1986. Gray Wolf. Pages. 951-967 *in* Audubon Wildlife Report. The National Audubon Society. New York, New York.

Phillips, L. 2009. Fisheries Biologist. Washington Department of Fish and Wildlife, Region 6. LaConner, Washington. Personal Communication to Michael Kyte, AECOM. February 24, 2009. Seattle, Washington.

Phillips, R.W., and H.J. Campbell. 1961. The Embryonic Survival of Coho Salmon and Steelhead Trout as Influenced by Some Environmental Conditions in Gravel Beds. Pages 60-73 *in* 14th Annual Report of the Pacific Marine Fisheries Commission. Portland, Oregon.

Pratt, L.K. 1992. A Review of Bull Trout Life History *in* Proceedings of the Gearhart Mountain Bull Trout Workshop. Howell, P.J. and D.V. Buchanan, (eds.). Oregon Chapter of American Fisheries Society. Corvallis, Oregon.

Pringle, R.F. 1990. Soil Survey of Thurston County, Washington. USDA Soil Conservation Service in Cooperation with the Washington State Department of Natural Resources and Washington State University Agricultural Research Center. Olympia, Washington.

Quinn, N.W.S., and G. Parker. 1987. Lynx. *In* M. Novak, J.A. Barber, M.E. Obbard, and B. Malloch (eds.). Wild Furbearer Management and Conservation in North America. Ontario Ministry of Natural Resources, Ottawa, Canada.

Raedeke Associates, Inc. 1995. Spotted Owl Survey: Fort Lewis and Camp Bonneville, Washington. Report Prepared for ENSR. Redmond, Washington.

Ratliff, D., and P. Howell. 1992. The Status of Bull Trout Populations in Oregon. Pages 10-17 *in* Proceedings of the Gearhart Mountain Bull Trout Workshop. Howell, P.J. and D.V. Buchanan (eds). Oregon Chapter American Fisheries Society. Corvallis, Oregon.

Rausch, R.L. 1963. Geographic Variation in Size in North American Brown Bears, *Ursus arctos*, as Indicated by Condylobasal Length. Canadian Journal of Zoology 41:33-45.

Remington, T.E., and C.E. Braun. 1985. Sage Grouse Food Selection in Winter, North Park, Colorado. Journal of Wildlife Management 49:1055-1061.

Rieman, B.E., and J.D. McIntyre. 1993. Demographic and Habitat Requirements for Conservation of Bull Trout. General Technical Report, INT-302. USDA Forest Service, Intermountain Research Station. Ogden, Utah.

Ritchie, W. 1998. Marbled Murrelet Biologist, WDFW, Olympia, Washington. July 16, 1998. Telephone Communication with Ronda Little, ENSR. Redmond, Washington.

Rogers, L.E., P.A. Beedlow, L.E. Eberhardt, D.D. Dauble, and R.E. Fitzner. 1989. Ecological Baseline Study of the Yakima Firing Center Proposed Land Acquisition: A Status Report. Pacific Northwest Laboratory. Richland, Washington.

Rogers, S.I., and R.S. Millner. 1996. Factors Affecting the Seasonal Abundance and Regional Distribution of English Inshore Demersal Fish Populations, 1973-1995. Journal of Marine Science 53:1094-1112.

Rucker, R.R. 1973. Effect of Sonic Boom on Fish. Department of Transportation, Federal Aviation Administration, Washington, D.C. Report No. FAA-RD-73-29.

Samsel, G.L. 1973. Effects of Sedimentation on the Algal Flora of a Small Recreational Impoundment. Water Resources Bulletin 9:1145-1152.

Sandercock, F.K. 1991. Life History of Coho Salmon, *Oncorhynchus kisutch*. Pages 395-445 *in* Pacific Salmon Life Histories. C. Groot and L. Margolis (eds.). UBC Press. Vancouver, British Columbia.

Shelly, J.S., and J.G. Gamon. 1996. Public and Agency Review Draft: Water Howellia (*Howellia aquatilis*) Recovery Plan. Report Prepared for the USFWS. Helena, Montana.

Slaney, T.L., J.D. McPhail, D. Radford, and G.J. Birch. 1985. Review of the Effects of Enhancement Strategies on Interaction among Juvenile Salmonids. Canadian Report on Fisheries and Aquatic Science 1852.

Spotted Owl Recovery Team (SORT). 1994. Management Options for the Northern Spotted Owl in British Columbia. Prepared by Canadian Spotted Owl Recovery Team for the B.C. Ministry of Environment, Lands and Parks. Victoria, BC.

Spence, B.C., G.A. Lomnicky, R.M., Hughes and R.P. Novitzki. 1996. An Ecosystem Approach to Salmonid Conservation. Management Technology TR-4501-96-6057. Portland, Oregon.

Stinson, D.W., D.W. Hays, and M. Schroeder. 2004. Greater Sage-Grouse Recovery Plan. Washington Department of Fish and Wildlife Program. Olympia, Washington.

Stirling, I. 1993. Bears: Majestic Creatures of the Wild. Rodale Press. Emmaus, Pennsylvania.

Stout, H.A., R.G. Gustafson, W.H. Lenarz, B.B. McCain, D.M. Van Doornik, T.L. Builder, and R.D. Methot. 2001. Status Review of Pacific Herring in Puget Sound, Washington. U.S. Department of Commerce, NOAA Technical Memorandum. NMFS-NWFSC- 45. Seattle, Washington.

Swanberg, T.R. 1997. Movements of and Habitat Use by Fluvial Bull Trout in the Blackfoot River. Montana. Transactions of the American Fisheries Society 126:735-746.

Thiel, R.P. 1985. Relationship Between Road Densities and Wolf Habitat Suitability in Wisconsin. American Midland National 113:404-407.

Thompson, K. 1972. Determining Stream Flows for Fish Life. Pages 31-50 *in* Proceedings, Instream Flow Requirements Workshop. Pacific Northwest River Basins Commission. Vancouver, Washington.

Tibbits, G. 1998. U.S. Wants to Protect Chinook. Associated Press (February 26, 1998). [http://www.abcnews.aol.com/sections/science/DailyNews/salmon0226.html].

Tisdale, E.W., and M. Hironaka. 1981. The Sagebrush-grass Region: A Review of the Ecological Literature. U.S.D.A, Forest Service Forest and Range Experimental Station Bulletin No. 33. University of Idaho. Moscow, Idaho.

University of Nevada. 1997. Biological Resources Research Center, Gray Wolf (*Canis lupus*). Reno, Nevada. Available at: http://www.brcc.unr.edu/data/mammals/canilupu.html.

U.S. Army Directorate of Engineering and Housing. 1984. Natural Resources Management Plan, Part 4: Fish and Wildlife Management. Fort Lewis, Washington.

U.S. Department of Agriculture Forest Service. 2002. Biological Assessment for the Implementation of the Preferred Alternatives for the Sierra Nevada Forest Plan Draft Environmental Impact Statement. USFS, Pacific Southwest Region. Vallejo, California.

U.S. Department of Agriculture Natural Resources Conservation Service. 2006. Soil Survey of Yakima Training Center, Parts of Kittitas and Yakima Counties, Washington. In Cooperation with U.S. Department of the Army, Yakima Training Center; U.S. Army Corps of Engineers; and Washington State University Agricultural Research Center. Washington, D.C.

U.S. Department of the Interior. 1992. Recovery Plan for the Northern Spotted Owl. Portland, Oregon.

U.S. Fish and Wildlife Service (USFWS). 1991. Vector Digital Data: Final Critical Habitat for the Northern Spotted Owl (*Strix occidentalis caurina*), Published January 12, 1991. Portland Fish and Wildlife Office, Portland, Oregon, USA.

_____. 1992. Endangered and Threatened Wildlife and Plants: Determination of Threatened Status of Washington, Oregon, and California Populations of Marbled Murrelet. U.S. Department of the Interior, Fish and Wildlife Service. Federal Regulation 57:45328-45337. Washington, D.C.

_____. 1993. Grizzly Bear Recovery Plan. Missoula, Montana.

_____. 1995. Ute Ladies'-tresses (*Spiranthes diluvialis*) Recovery Plan. USFWS. Denver, Colorado.

_____. 1999. USFWS Division of Endangered Species, U.S. Listed Vertebrate Animal Species Index by Lead Region and Status as of October 31, 1999. USFWS Region 1. Portland, Oregon. Available at: http://endangered.fws.gov/vertdata.html#Mammals.

_____. 2000. Ute Ladies'-tresses, *Spiranthes diluvialis* Letter, May 10, 2000. Spokane, Washington.

_____. 2004a. Draft Recovery Plan for the Coastal-Puget Sound Distinct Population Segment of Bull Trout (*Salvelinus confluentus*). Volume I. Portland, Oregon.

_____. 2004b. Marbled Murrelet Critical Habitat Designation in Pierce County, Washington. October 8, 2004. Sacramento, California. Available at: http://sacramento.fws.gov/es/where_is_critical_habitat.htm.

_____. 2005. Endangered and Threatened Wildlife and Plants; Designation of Critical Habitat for the Bull Trout. Federal Register 70:56211-56261. Portland, Oregon.

_____. 2006. Marsh Sandwort Details. Available at: http://ecos.fws.gov/species_profile/servlet/gov.doi.species_ profile.servlets.SpeciesProfile?spcode=Q25H. January 27, 2006.

_____. 2009a. Species by County. Washington Fish and Wildlife Office. Lacey, Washington. Available at: http://www.fws.gov/westwafwo/speciesmap.html.

_____. 2009b. Northern Idaho and Eastern Washington Endangered, Threatened, Candidate, and Proposed Species by County. Upper Columbia Fish and Wildlife Office. Spokane, Washington. Available at: http://www.fws.gov/easternwashington/species/countySppLists.html.

_____, and NMFS. 1998. Consultation Handbook: Procedures for Conducting Consultation and Conference Activities under Section 7 of the Endangered Species Act. U.S. Government Printing Office. Washington, D.C.

Walter, G. 1998. Program Supervisor, Nisqually Indian Tribe, Washington. July 28, 1998. Telephone Conversation with Ronda Little, ENSR. Redmond, Washington.

Washington Department of Fish and Wildlife (WDFW). 1995. Washington State Management Plan for Sage Grouse. Game Division, WDFW. Olympia, Washington.

_____. 1997. Wildlife Research Prairie Grouse. Olympia, Washington. Available at: http://www.wa.gov/wdfw/wlm/research/grouse/grouse.htm.

_____. 1998a. 1998 Washington Salmonid Stock Inventory Appendix Bull Trout and Dolly Varden. Olympia, Washington.

_____. 1998b. Species of Concern. Final Sage Grouse Status Report: Executive Summary. Olympia, Washington. Available at: http://www.wa.gov/wdfw/wlm/diversty/soc/status/grouse/sagexsum.htm.

_____. 2008. Priority Habitats and Species Database. Olympia, Washington.

Washington Department of Wildlife. 1991. Management Recommendations for Washington's Priority Habitats and Species. Olympia, Washington.

_____. 1993. Status of the Marbled Murrelet (*Brachyramphus marmoratus*) in Washington. Unpublished Report Washington Department of Wildlife. Olympia, Washington.

_____, Washington Department of Fisheries and Western Washington Treaty Indian Tribes. 1993. 1992 Washington Salmon and Steelhead Stock Inventory. Olympia, Washington.

Washington Department of Natural Resources. 2006. Background on Ute Ladies'-tresses. Olympia, Washington. Available at: http://www.dnr.wa.gov/nhp/refdesk/fguide/htm/fsp_spdi.htm.

Washington Natural Heritage Program. 2005. Fort Lewis's Integrated Natural Resources Management Plan and Environmental Assessment. July 22, 2005. Letter to Kim Anderson, ENSR. Redmond, Washington.

Washington State Department of Transportation. 1998. Rainbow Trout/Steelhead Salmonids of Washington State. Olympia, Washington. Available at http://www.wsdot.wa.gov/eesc/environmental/Rainbow.htm.

Washington State Joint Natural Resources Cabinet. 1999. Statewide Strategy to Recover Salmon, Governor's Office Salmon Recovery Home Page. Seattle, Washington. Available at: http://www.govenor.wa.gov/esa.strategy/summary/background.htm.

Waters, T.F. 1995. Sediment in Streams: Sources, Biological Effects, and Control. American Fisheries Society Monograph 7. American Fisheries Society. Bethesda, Maryland.

Williams, T., and G. Graves. 1990. Puget Sound Tribal Fisheries Management - A Cooperative Approach *in* Status and Management of Puget Sound's Biological Resources. J. Armstrong and A. Copping (eds.). Proceedings from the Forum on Puget Sound's Biological Resources - Status and Management. Seattle, Washington.

Yakima Training Center Environment and Natural Resources Division (ENRD). 2002. Yakima Training Center Cultural and Natural Resource Management Plan. Yakima, Washington.

Zuchowski, T. 2006. Ecologist, Environment and Natural Resources Division, Public Works, Fort Lewis, Washington. May 4, 2006. Electronic Mail Communication with Cameron Fisher, ENSR. Redmond, Washington.

Zulauf, A.S. 1979. Soil Survey of Pierce County Area, Washington. USDA Soil Conservation Service in Cooperation with the Washington Agricultural Experiment Station. Olympia, Washington.

7.0 AGENCIES AND PERSONS CONSULTED

7.1 Internal Coordination

7.1.1 U.S. Department of the Army, Fort Lewis, Washington

David Clouse, Wildlife Biologist
Angela Johnson, Geographic Information System Analyst
Jim Lynch, Ecologist
Bill Van Hoesen, NEPA Specialist
Todd Zuchowski, Ecologist

7.1.2 Yakima Training Center, Directorate of Public Works, Environment and Natural Resources Division, Yakima, Washington

Colin Leingang, Wildlife Biologist
Pete Nissen, Ecologist and Land Restoration Specialist
John Rohrbaugh, Information Systems Manager

7.1.3 Stalmaster and Associates, Port Townsend, Washington

Mark Stalmaster, Wildlife Biologist

7.1.4 National Oceanographic and Atmospheric Administration National Marine Fisheries Service, Lacey, Washington

Dan Guy, Branch Chief

7.1.5 U.S. Fish and Wildlife Services, Lacey, Washington

Tom McDowell, Manager, Branch of Federal Activities
Mark Miller, Project Leader

7.1.6 Washington State Department of Fish and Wildlife, Olympia, Washington

Pat Chapman, Regulatory Species Coordinator
Jason Kunz, Fish Biologist
Jill Phillips. Fish Biologist

7.1.7 Washington State Department of Fish and Wildlife, Wenatchee, Washington

Szilvia Rideg, Ecologist
Eric Anderson, Fisheries Biologist
Jim Cummins, Fisheries Biologist

Appendix A

Fort Lewis Regulation 420-5

DEPARTMENT OF THE ARMY
HEADQUARTERS, I CORPS AND FORT LEWIS
Fort Lewis, Washington 98433-9500

FL Regulation
No. 420-5

9 August 2004

PROCEDURES FOR THE PROTECTION OF STATE AND FEDERALLY LISTED THREATENED, ENDANGERED, CANDIDATE SPECIES, SPECIES OF CONCERN, AND DESIGNATED CRITICAL HABITAT

1. PURPOSE. To prescribe procedures to protect endangered, threatened, candidate species, species of concern, and the habitat components necessary to support their continued existence on Fort Lewis and sub-Installations.

2. APPLICABILITY.

a. This regulation is applicable to all Active Duty and Reserve Component commands and units (including tenant organizations), civilian agencies, contractors, and individuals (military and civilian) living, visiting, or working at either Fort Lewis or Yakima Training Center (YTC), or other sub-Installations.

b. Commanders at Fort Lewis sub-Installations may further supplement this regulation as appropriate, to include policies and procedures, which address specific sub-Installation conditions and conform to the Endangered Species Act of 1973, as amended. Supplements to this regulation would require review by the Environmental and Natural Resources Division at Fort Lewis, Directorate of Environmental and Natural Resources at YTC, Director of Plans Training, Mobilization, and Security (DPTMS), and the Staff Judge Advocate Office (Civil Law Division) at Fort Lewis.

3. REFERENCES. See Appendix A.

4. DEFINITIONS. See Appendix B.

5. GENERAL. Several threatened, endangered, and candidate species are known to exist on Fort Lewis and YTC (sub-Installation). The Endangered Species Act of 1973, as amended (Citation in Appendix A), requires all Federal agencies, in consultation with, and with the assistance of the Secretaries of the Interior and Commerce, to ensure that their actions are not likely to jeopardize the continued existence of federally listed endangered or threatened species, or result in the destruction or adverse modification of critical habitat of such species. In accordance with Section 7 (c) of the Endangered Species Act, consultation with the U. S. Fish and Wildlife Service (USFWS) should be conducted early in the planning process to ensure that listed species and/or critical habitat are not adversely affected by proposed actions. The

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*This regulation supersedes FL Reg 420-5, 2 July 1998

Army is required to work with other agencies in the formulation of proposed actions and alternatives, which have the potential to affect listed species or critical habitat. The impacts of ongoing military activities on listed species and/or designated critical habitat must be addressed through the Section 7 process. Until the required Section 7 consultation is completed, it is imperative that no irreversible commitment of resources are made that would preclude reasonable alternatives to avoid jeopardizing listed species or adversely modifying critical habitat.

a. Failure to comply with the Endangered Species Act (Act) will delay or halt the ongoing or proposed activity and may result in substantial civil and criminal penalties, to include fines of up to $50,000, and imprisonment for not more than one year for any one violation. The Act also requires Federal agencies to utilize their resources in furtherance of the purposes of the Act by carrying out programs for the conservation of endangered and threatened species. Accordingly, Senior Mission Commanders and Adjutant(s) General will ensure that:

(1) Actions that are federally authorized, funded, or carried out do not jeopardize the continued existence of federally listed endangered or threatened species, or result in the destruction or adverse modification of the habitat of such species, which has been determined through the consultation process to be critical.

(2) Where applicable, an inventory of endangered and threatened species and their designated critical habitat on the Installation will be developed, and a program for monitoring the species status will be developed and implemented.

(3) Consideration will be first given to species protected by both federal and state laws. Proposed actions will be avoided which could result in adverse impacts to these species, or result in the need to list federal candidate species.

(4) All cooperative plans, in accordance with the Sikes Act (Citation in Appendix A), for the conservation and development of fish and wildlife and other natural resources, will include endangered species management requirements where applicable.

(5) Introduction or reintroduction of federally listed endangered and threatened species will be accomplished only after a thorough assessment has been conducted as to the feasibility and impacts of such proposals, and in concurrence with appropriate Federal and State agencies, Installation Management Agency (IMA) Northwest, and the U.S. Army Engineering and Housing Support Center. Introduction or reintroduction proposals will be in accordance with the National Environmental Policy Act.

b. Management plans will be developed for all federally listed species and critical habitat occurring on Fort Lewis and sub-Installations, as required by AR 200-3 (Citation in Appendix A).

6. RESPONSIBILITY.

a. The Senior Mission Commander has overall responsibility for management of the environmental and natural resources of Fort Lewis and Yakima Training Center. This responsibility is manifested through providing adequate financial and personnel support to carry out necessary programs for the protection and management of natural resources, to include listed species.

b. The Director of Public Works (DPW) is the staff director responsible for managing the natural resources on Fort Lewis. These responsibilities include providing necessary financial and personnel support to protect and enhance habitat for listed species, and requiring a review by the Environmental and Natural Resources Division of all activities which have been identified as potentially affecting listed species.

c. The Environmental and Natural Resources Division (ENRD) of Public Works is the Installation environmental office under DPW responsible for the protection and enhancement of habitat for listed species on Fort Lewis. The ENRD will coordinate and manage all aspects of Installation actions regarding the provisions of this regulation to include the following: inventory and manage species addressed in this regulation and the habitat considered essential for their continued existence on the Installation, assist Installation program managers and military trainers in assessing potential impacts to federally listed species, conduct consultation with the U.S. Fish and Wildlife Service as required by Section 7 of the Endangered Species Act of 1973, as amended, and serve as the point of contact for federal, state, and local government agencies in matters dealing with the management and protection of listed species occurring on the Installation.

d. The Environment and Natural Resources Division of Public Works YTC is the sub-Installation environmental office responsible for managing natural resources at YTC, which includes the protection and enhancement of habitat for listed species. These responsibilities involve providing necessary financial and personnel support to protect and enhance habitat for listed species, and includes the review by the YTC ENRD of all activities identified as potentially affecting listed species. The YTC ENRD will coordinate and manage all aspects of sub-Installation actions regarding the provisions of this regulation to include the following: inventory and manage listed species and the habitat considered essential for their continued existence on the sub-Installation, assist sub-Installation program managers and military trainers in assessing potential impacts to federally listed species, conduct consultation with the U.S. Fish and Wildlife Service as required by Section 7 of the Endangered Species Act of 1973, as amended, and serve as the point of contact for federal, state, and local government agencies in matters dealing with the management and protection of listed species occurring on the sub-Installation.

e. Unit Commanders and Activity Directors are responsible for conducting their activities in accordance with the procedures set forth in this regulation.

f. The office of the Staff Judge Advocate (SJA), Civil Law Division, will provide legal advice and assistance to the Command and ENRD in the interpretation of laws and regulations pertaining to the management and protection of federally listed species, to ensure legal and regulatory compliance, and prevent Army liability.

7. PROCEDURES. The following sections prescribe measures to be implemented for the protection of listed species and the habitat necessary to support their continued existence on Fort Lewis and sub-Installations.

8. THREATENED/ENDANGERED AND CANDIDATE SPECIES AT FORT LEWIS. Fort Lewis provides habitat for five federally listed species and six species identified as candidate or species of concern. The Fort Lewis species, discussed in this regulation, include: Bald Eagle (*Haliaeetus leucocephalus)*, federal status-threatened, state status-threatened; Water Howellia *(Howellia aquatilis)*, federal status–threatened, state status-endangered; Northern Spotted Owl (*Strix occidentalis caurina*)/Designated Critical Habitat, federal status–threatened, state status-endangered; Chinook Salmon (*Oncorhynchus tshawytscha)*, federal status–threatened, state status–candidate; Bull Trout *(Salvelinus confluentus)*, federal status–threatened, state status-candidate;. Mardon Skipper (*Polites mardon*), federal status–candidate, state status–endangered; Taylor's Checkerspot (*Euphydryas editha taylori*), federal status–candidate, state status–candidate; Streaked Horned Lark (*Eremophila alpestris strigata*), federal status–candidate, state status–candidate; Mazama Pocket Gopher (*Thomomys mazama*), federal status–candidate, state status–candidate; Western Gray Squirrel (*Sciurus griseus griseus*), federal status–species of concern, state status–threatened; and White–Topped Aster (*Aster curtus*), federal status–species of concern, state status–sensitive. The following measures provide for the protection of the species and their habitats.

a. Fort Lewis provides habitat for both nesting and wintering populations of Bald Eagles. The Recovery Plan, developed by the USFWS for the bald eagle (Citation in Appendix A), provides guidelines for the protection of this species, and the habitat elements essential for its continued existence. The plan recognizes a primary) and secondary zone (400- and 800-meter respectively) around nest sites and communal night roosts, which require specific protection measures to avoid adverse impacts to eagles.

(1) Nesting Bald Eagles. The bald eagle nesting period at Fort Lewis extends from 1 December to 31 August. The following general measures have been implemented to protect nesting bald eagles on the Installation, and apply to both primary and secondary zones around nest sites, unless otherwise specified in nest specific measures (Table 1).

(a) Major land uses such as construction of buildings, roads, power lines, and trails shall be avoided.

(b) No timber harvest shall occur within the primary zone unless designed to enhance stand characteristics for the benefit of nesting eagles (e.g., to assure the dominance of the nest tree). There shall be no cutting in the primary zone without a nest site management plan.

(c) Use of toxic chemicals, which adversely affect eagles, shall be prohibited on the Installation. These include dichlorodiphenyl trichloroethane (DDT) and other persistent organo-chlorine pesticides, polychlorinatedbiphenyls (PCBs), mercury, 2,4,5-Trichlorophenoxyacetic acid (2,4,5-T), and other substances containing tetra chlorodibenzo-p-dioxin (TCDD).

(d) No bivouacs are allowed in the primary zone during the nesting period (see Table 1 for Halverson nest exception).

(e) Military training activities within the primary zone will be avoided during the nesting period. Overflight restrictions are nest specific (Table 1).

(f) Blasting, use of firearms, and recreational activities shall be avoided during the nesting period.

(g) Use of pyrotechnics shall be prohibited from 1 June to 31 October to reduce the possibility of fires.

Table 1: Nest Specific Restrictions

Nest Name	Grid Coordinate	Restrictions*
American Lake North	3270-2060	Aircraft will fly no lower than 365 meters (1,200 feet) MSL over an area extending 400 meters (1,312 feet) in radius from the nest site. Boat landing is prohibited on Picnic Point. A no wake zone has been established, and will be delineated by buoys in the vicinity of Picnic Point (GC 3230-2010).
American Lake South	3175-1830 (Alternate Nest Site 3225-1805)	Aircraft will fly no lower than 365 meters (1,200 feet) MSL over an area extending 400 meters (1,312 feet) in radius from the nest sites. A no wake zone has been established, and is delineated by buoys in the southern portion of American Lake.
American Lake West	3200-1940	Aircraft will fly no lower than 365 meters (1,200 feet) MSL over an area extending

Nest Name	Grid Coordinate	Restrictions*
		400 meters (1,312 feet) in radius from the nest sites.
Nisqually Bluff	2435-1030	Maintain overflight scenario in place at the time of initial nest establishment [Flights no lower than 91 meters at ground level (AGL) within a 400 meter radius of nest].
Nisqually River	2540-0720	Aircraft will fly no lower than 365 meters (1,200 feet) MSL over an area extending 400 meters (1,312 feet) in radius from nest site.
Spanaway Marsh	4130-1570	Any changes in the approach zone to McChord Air Force Base within a 400-meter radius of the nest site will require consultation with the U.S. Fish and Wildlife Service. Recreational activities are prohibited in training area nine, north of grid line 15 from 1 December to 31 August.
Johnson Marsh	3890-1080	Aircraft will fly no lower than 365 meters (1,200 feet) MSL over an area extending 400 meters (1,312 feet) in radius from the nest sites.
Halverson Marsh	6950-4950	Bivouacking within 400 meters of this nest site will be prohibited on the west side of the Burlington Northern Railroad tracks, but will be allowed on the east side of the railroad tracks. This exception to the standard restriction is implemented due to the fact that bivouacking was occurring in the area east of the railroad tracks when the eagles established this nesting territory. Aircraft will fly no lower than 365 meters (1,200 feet) MSL over an area extending 400 meters (1,312 feet) in radius from nest site.

*Restrictions pertain to critical nesting period 1 December to 31 August.

(2) Wintering Bald Eagles: Wintering habitat on Fort Lewis is represented by communal night roosts and primary foraging areas.

(a) There are six identified communal night roosts located on the Installation (Table 2). Protection measures for night roosts will be limited to an area within 400 meters of roosts or 800 meters where eagles have line of sight vision, and will be in effect during the wintering bald eagle period (1 December to 31 March). Specific measures include: no blasting, demolition, or use of firearms (the exception to this is the Muck Creek roost located within the Artillery and South Impact Areas); prohibit bivouacking and recreational activities (camping and picnicking); exclude logging, construction, habitat improvement, and other activities with permanent negative effects on the environment.

(b) If consultation with the USFWS results in a beneficial or no adverse effect determination, these types of activities may proceed outside of the eagle use period.

Table 2: Bald Eagle Communal Night Roost on Fort Lewis

Name of Communal Night Roost	Training Area	Grid Coordinates
Muck Creek	Artillery Impact Area	3100-0550
Carter Woods	3 S	2490-0790
Cabin Creek	3 S	2630-0615
Riverbend	3 S	2580-0625
Yelm	18	2940-0180
Bluff	18	2945-0280

(c) Primary foraging areas on Fort Lewis are located along portions of Muck Creek and the Nisqually River, within the following specific protection zones: **Protection Zone One:** A 1,000 meter (3,280 foot) corridor along the Nisqually River between grid line 040 and 090 (from the mouth of Muck Creek to the Clear Creek Hatchery). This corridor will include 500 meters (1,640 feet) on each side of the river; and **Protection Zone Two:** A 1,000-meter (3,280 foot) corridor along Muck Creek from the mouth of the creek to grid line 32 (east slope of Harden Hill). This corridor will include 500 meters (1,640 feet) on each side of the creek.

(d) Activities occurring within protection zones one and two that have a permanent effect on the environment (vegetation removal, construction, logging, etc.), will require review and approval by ENRD. No aircraft will fly lower than 1,300 feet (MSL), within protection zone two, during the primary foraging period from 1 December to 31 March.

b. Several wetlands on the Installation either contain suitable habitat for Water Howellia, or have confirmed populations. Due to the specific habitat requirements of

water howellia, minor changes in wetland substrates, vegetation communities, or hydrology could have detrimental effects to this species. Major activities typically occurring on the Installation that could impact this species include: construction, forest management, wetland management, storm water discharge, and vehicular traffic. General measures to protect water howellia populations on Fort Lewis include:

(1) Construction Activities: All construction activities require review by ENRD for analysis of potential effects to listed species. Any projects, identified as having possible impacts to populations of water howellia or potential habitat, will require consultation with the USFWS.

(2) Forest Management Activities: Forest management activities, within the area of influence for wetlands containing water howellia or potential habitat, will be analyzed for possible impacts. The area of influence is defined as that portion of the landscape that serves as the drainage basin for a particular wetland. Forest management actions identified as having adverse impacts to water howellia populations or potential habitat will be avoided.

(3) Wetland Management Activities: Habitat enhancement projects within wetlands will be analyzed for impacts to existing populations of water howellia and potential habitat. Projects identified as having an adverse impact to either, will be avoided.

(4) Vehicular Traffic: Vehicles not traveling on established roads in the vicinity of wetlands can cause significant siltation to wetlands, resulting in adverse impacts to existing populations of water howellia or adverse modification to potential habitat. The section of Fort Lewis Regulation 200-1 (Citation in Appendix A) restricting vehicular traffic within 50 meters of wetlands and streams to established roads, and not allowing other ground disturbing activities within the 50-meter buffer zone, will provide adequate protection to populations of water howellia and potential habitat. Fort Lewis Regulation 350-33 (Citation in Appendix A) provides additional protection for this species by restricting recreational vehicular traffic to established roads.

(5) Recreational activities identified as having an adverse impact to water howellia populations will be restricted as needed on a case-by-case basis.

c. The northern spotted owl (*Strix occidentalis caurina)* is a federally threatened species. In 1992, approximately 52,000 acres of forested habitat on Fort Lewis was designated critical habitat for the northern spotted owl, as depicted on the Environmental Coordination Map (Citation in Appendix A). Activities affecting the forest structure (e.g., vegetation removal and ground disturbance) within designated critical habitat and not addressed in previous consultations with the USFWS, will require analysis by ENRD. Any actions identified as affecting designated critical habitat will require consultation with the USFWS.

d. Chinook Salmon and Bull Trout reside and spawn in the Nisqually River, but do not occur within streams on the Installation. Restrictions on ground disturbing activities within 50 meters of all bodies of water on the Installation afford adequate protection for the Nisqually River in regards to water quality and potential impacts to Chinook salmon or bull trout. There is one authorized crossing site on the Nisqually River occasionally used during military training exercises. Timing of river crossings is adjusted to avoid spawning activities within the river, providing adequate protection for both species. Proposed river crossing activities will require review and approval from ENRD. Consultation with NOAA Fisheries, concerning the military use of Solo Point, resulted in the following restrictions regarding the use of the Solo Point boat ramp and adjacent shoreline:

(1) Off-loading and deployment of floating bridge bays between 1 March and 30 June of each year should be limited to the existing boat ramp at Solo Point. Deployment from the native beach, or alterations to the native beach material should not be allowed.

(2) Off-loading and deployment of all support vessels between 1 March and 30 June of each year should be limited to the existing boat ramp at Solo Point.

(3) No more than three hours of near shore activity should occur on each of the eight days of launch activity training scheduled between March and July of each year. (Per the Department of the Army letters to NOAA Fisheries dated February 4 and February 9, 1999.)

(4) No vehicles should drive on the native beach substrate between 1 March and 30 June of each year.

e. Off-road vehicle traffic and ground disturbing activities represent the most significant potential impacts from military training to the Mardon Skipper butterfly, both from direct mortality and habitat degradation. Training activities involving off-road vehicular traffic and ground disturbing activities within a significant portion of the prairie ecosystem on Fort Lewis is prohibited. This policy is enforced within Johnson Prairie (279 acres), Upper and Lower Weir Prairies (1,372 acres), and by default is followed over a majority of the Artillery Impact Area (91st Division Prairie 6,960 acres) due to hazards associated with unexploded ordinance. Currently, the only remaining population of this species on the Installation occurs in the Artillery Impact Area (AIA), and by default is protected from most off-road training activities. Occasionally, specialized training events require limited off-road maneuvers within the AIA, but these actions will be assessed and adjusted to avoid impacts to populations of this species. Any re-introduction of this species on Fort Lewis would occur in areas currently afforded protection from off-road vehicle traffic and other ground disturbing activities. Recreational activities, identified as having an adverse impact to mardon skipper populations, will be restricted as necessary on a case-by-case basis.

f. Off-road vehicle traffic and ground disturbing activities represent the most significant potential impacts from military training to the Taylor's Checkerspot butterfly, both from direct mortality and habitat degradation. Training activities including off-road vehicular traffic and ground disturbing activities within a significant portion of the prairie ecosystem on Fort Lewis is prohibited. This policy is enforced within Johnson Prairie (279 acres), Upper and Lower Weir Prairies (1,372 acres), and by default is followed over a majority of the Artillery Impact Area (91st Division Prairie 6,960 acres) due to hazards associated with unexploded ordinance. Currently, the only remaining population of this species on the Installation occurs in the AIA, and by default is protected from most off-road training activities. Occasionally, specialized training events require limited off-road maneuvers within the AIA, but these actions will be assessed and adjusted to avoid impacts to populations of this species. Any re-introduction of this species on Fort Lewis would occur in areas currently afforded protection from off-road vehicle traffic and other ground disturbing activities. Recreational activities, identified as having an adverse impact to Taylor's checkerspot populations, will be restricted as necessary on a case-by-case basis.

g. The Streaked Horned Lark utilizes prairies and open grassland habitat on the Installation. It is a ground nesting bird that is closely associated with prairie habitat or areas that mimic native prairie habitat conditions, which include airfields and areas maintained for sporting events. Currently the only nesting populations occur at Training Area (T.A.) 14 (within the prairie habitat east of Pacemaker Airstrip), Artillery Impact Area (AIA), and Gray Army Airfield. The following restrictions are imposed during the primary nesting period (15 April to15 July) to help avoid direct mortality and nest failure:

(1) Mowing restrictions are imposed on areas identified as being used by streaked horned larks for nesting habitat within the boundary of Gray Army Airfield. These restrictions are only imposed during the primary nesting period. If at any time during the nesting period vegetation height poses a safety concern to aviation activities, remedial actions will occur to include mowing. Any remedial actions occurring during the nesting period will be coordinated with ENRD to help assure minimal effects to nesting birds.

(2) No recreational activities are allowed in T.A.14 during the primary nesting period.

(3) Military training activities, within areas occupied by nesting birds, will be reviewed by Range Control and ENRD. Impact analysis will be conducted by ENRD and adjustments to training activities will be implemented as necessary to minimize impacts to nesting birds.

(4) Recreational activities, identified as having an adverse impact to streaked horned lark populations, will be restricted as necessary on a case-by-case basis.

h. The Manzama Pocket Gopher occurs in prairie and oak woodland habitat on the Installation. Activities that cause severe soil compaction represent the most significant potential impact to this species. Repeated traversing by heavy equipment, over the same area, usually causes the ground to be compacted to the point where it can no longer support populations of pocket gophers. The other major impact from training activities, that could directly and indirectly impact pocket gopher populations, is major digging exercises. This can result in individuals being killed during the digging activity. The re-distribution of soil layers may render the site un-inhabitable for pocket gophers. Training activities including off-road vehicular traffic and ground disturbing activities within a significant portion of the prairie ecosystem on Fort Lewis is prohibited. This policy is enforced within Johnson Prairie (279 acres), Upper and Lower Weir Prairies (1,372 acres), and by default is followed over a majority of the Artillery Impact Area (91st Division Prairie 6,960 acres) due to hazards associated with unexploded ordinance. These restrictions protect the major populations of this species on Fort Lewis. Recreational activities, identified as having an adverse impact to Mazama pocket gopher populations, will be restricted as necessary on a case-by-case basis.

i. The Western Gray Squirrel is closely associated with oak woodland habitat on the Installation and typically resides in or near oak stands occurring in forested areas or prairie edges. Direct mortality from civilian and military vehicular traffic is one of the most significant impacts to this species on the Installation. The section of East Gate road between the East Gate Guard station and Highway 507 has historically been the area exhibiting the highest mortality of western gray squirrels caused by vehicle traffic. Warning signs will be placed at appropriate locations within this section of East Gate road, raising the awareness of drivers as to the presence of a rare species in an effort to reduce future mortality of this species from vehicular traffic. Recreational activities identified as having an adverse impact to western gray squirrel populations will be restricted as necessary on a case-by-case basis.

j. White-topped Aster is a small (4 – 12 inches tall) one stalked perennial; usually with a single compact cluster of heads with nearly rayless, plain flowers which are identifiable from late August through October. This species is found in and around prairies of Pierce and Thurston Counties. Currently no digging, track vehicle use, or other ground disturbance is allowed within Johnson and Weir Prairies in an effort to protect populations of this species.

9. THREATENED/ENDANGERED AND CANDIDATE SPECIES AT YAKIMA TRAINING CENTER. Yakima Training Center provides habitat for one federally listed species and eleven species as having either State status or other Federal designation. The Yakima Training Center species, discussed in this regulation, include: Bald Eagle (*Haliaeetus leucocephalus)*, federal status-threatened, state status-threatened; Golden Eagle (*Aquila chrysaetos)*, federal status-none, state status–candidate; Sage Grouse (*Centrocercus urophasianus*), federal status-candidate, state status–threatened; Ferruginous Hawk (*Buteo regalis*), federal status-species of concern, state status–

threatened; Burrowing Owl (*Athene cunicularia*), federal status-none, states status–candidate; Columbia Milk-vetch (*Astragalus columbianus*), federal status-none, state status–threatened; Basalt Daisy (*Erigeron basalticus)*, federal status-candidate, state status–threatened; Dwarf Evening Primrose (*Camissonia pygmaea*), federal status-none, state status–threatened; Hoover's Desert Parsley (*Lomatium tuberosum*), federal status-none, state status–threatened; Hoover's Tauschia (*Tauschia hooveri*), federal status-none, state status-threatened; Kalm's Lobelia (*Lobelia kalmii*), federal status-none, state status–endangered; and White Eatonella *(Eatonella nivia)*, federal status–none, state status–threatened. (Note: All grid coordinate locations are derived from the Yakima Training Center Special Map Series V791S, Edition 4 (Citation in Appendix A) and range control should be contacted for site-specific restrictions.)

a. The Bald Eagle is a winter resident at the YTC. It utilizes the Columbia River and the sub-Installation's eastern boundary for foraging. Four known roost sites on the sub-Installation are used for diurnal and nocturnal roosting: Borden Springs (KB720795), Lower Hanson Creek (GG254856), Middle Hanson Creek (GG235864), and Upper Hanson Creek (GG201871). The following table summarizes restrictions in place to avoid adverse impacts to this species.

Table 3: Bald Eagle Restrictions at YTC

Type of Restriction	Location	Time Period	Restriction
Flight	Hanson Creek Route: Between coordinates GG 190875 and GG280842	8 December to 24 March	Minimum flight level of 300 AGL (above ground level). Maintain a 1 km buffer to the north and south of Hanson Creek road, with traffic moving west remaining 1 km north of Hanson Creek road. The flight route will continue to support two-way traffic.
Flight	Columbia River Route: Between coordinates KB830 and KB690	8 December to 24 March	The flight route will support one-way traffic. Access will be coordinated by the Rattlesnake Flight Following Facility. No minimum flight level. Flights must maintain a 1 km buffer to the west of the railroad right-of-way along the Columbia River.
River Crossing	Priest Rapids Reservoir	8 December to 24 March	No river crossing exercises during this time frame.
Vehicle	Hanson Creek riparian zones	Year-Round	No off road vehicle traffic.
Vehicle	Siber staked roost trees.	Year-Round	No vehicle traffic within the enclosed area.

Vehicle	Hanson Creek road	8 December to 24 March	Traffic along Hanson Creek road is significantly curtailed between 1500 and 0900 hours, between coordinates GG180875 and GG280842. Coordination and prior approval by ENRD and Range Control is required to use this road during this time period.

b. The Golden Eagle is a year-round resident of the sub-Installation. Four historic nest sites have been identified on YTC. Golden eagles require isolation from human activity during the nesting season, February through June. The species builds its nests on cliffs on the sub-Installation. Military maneuver restrictions (Contact Range Control for site-specific information) include: a 500-meter buffer is maintained between all military activities and all nest sites, a minimum of 300 feet AGL for all over-flights of the nest sites, and no air traffic is allowed below the rim of Selah Canyon between Badger Pocket Road (GG039731) and the I-82 bridge (FG958740).

c. The Sage Grouse is a year-round resident. Several active leks have been documented on the sub-Installation. A lek is an area where males compete with other males to breed with the female sage grouse. Sage grouse begin using leks daily in early February. Their numbers increase through March with peak lek attendance occurring in April. Habitat surrounding lek sites is used during and after the lekking season for feeding, nesting, and raising young. Two habitat components needed by sage grouse are protected from military disturbance at YTC: lek sites and nest/brood rearing areas as presented in the Yakima Training Center Sage Grouse Management Plan (Citation in Appendix A).

(1) Lek site protection (Contact Range Control for site-specific information):

(a) Seasonal restrictions of military training activities and other land use practices are in place between 1 March and 15 May within a 1 km radius of each designated lek. These restrictions are enforced daily between 2400 and 0900 hours. Lek surveys by YTC ENRD staff begin 1 February. If surveys reveal sage grouse are attending leks prior to 1 March, the restriction date is changed to correspond with the earlier date. During this period, access to ranges is restricted to Main Supply Routes (MSR's) and designated roads to ranges.

(b) Over-flights by aircraft, within a 1 km radius of leks, are prohibited during the period of 1 March through 15 May between 2400 and 0900 hours. Again, earlier seasonal restrictions may apply if lek attendance occurs before 1 March.

(2) Nest and brood rearing habitat protection (Contact Range Control for site-specific information):

(a) All off-road military activities are prohibited between 1 March and 15 June (24 hours a day) within the sage grouse protection areas. Exceptions within these areas include the following existing Firing Ranges: 4, 5, 10, 10Z, 16, 26, and 55. Vehicle travel is limited to MSR's and/or designated roads to the above Firing Ranges.

(b) Bivouacs are not permitted at any time of the year in the sage grouse protection area.

(c) Excavations are only permitted in the protection area on existing firebreaks. All excavations within the sage grouse protection areas are coordinated through YTC ENRD, and carried out in accordance with the YTC dig permit process.

d. The Ferruginous Hawk breeds and raises young in the western U.S., and winters in the southwestern U.S. and Mexico. Sixteen historic nest sites have been identified at YTC. In Washington, most ferruginous hawk nests are built on top of rocks, cliffs, and trees and most occur in rock outcroppings. The nesting season is between 1 March and 31 July. Ferruginous hawks are sensitive to human disturbance and require isolation from military activity during the nesting season. When an active nest is detected the following restrictions are enforced:

(1) No military activity within 500 meters of the site.

(2) An over-flight minimum of 1,000 feet AGL of all active nests.

e. Burrowing Owls use abandoned mammal burrows for nesting. Fifteen historic burrow nests have been documented on YTC. The nesting season for this species occurs between March and July. All known active burrowing owl nest sites are protected from vehicle maneuvers by siber stakes.

f. Columbia Milk-vetch is only found within a 100 sq. mile area along the west side of the Columbia River in the Priest Rapids area in Kittitas, Yakima, and Benton counties, Washington. This species is a low, sprawling plant with white flowers and reddish stems. The species has been found at over 16 locations on YTC, with the majority occurring in the eastern region. Designated sensitive plant sites are protected through siber staking.

g. Basalt Daisy is a perennial plant that grows up to four inches tall. It has lobed leaves and numerous (20-30) light lavender to white ray flowers. This species is identifiable from May to mid-October. It is found at YTC on the south side of Selah Creek (Selah Cliffs). Designated sensitive plant sites are protected through siber staking.

h. Dwarf Evening-Primrose is an annual with small white flowers. The leaves are lance shaped to oval, and are sometimes slightly toothed. The one population known

i. Hoover's Desert Parsley is a perennial that grows from a tuber-like root. The leaves are grayish-green and the flowers are typically light purple, sometimes yellow. Three populations are known to occur on YTC. Designated sensitive plant sites are protected through siber staking.

j. Hoover's Tauschia is a low growing perennial with white flowers and few leaves that are divided into linear segments. The species is found in areas of bare rocks and gravel with little soil present. Eight main populations are known to occur on YTC. Designated sensitive plant sites are protected through siber staking.

k. Kalm's Lobelia is a perennial herb with stems that are sometimes branched and reach up to 24 inches in length. The 4 to 15 leaves are borne on the stem and are narrow. The flowers are mostly blue with a white or white and yellow eye, but may be entirely white. One population is known extant on YTC at Borden Springs. Designated sensitive plant sites are protected through siber staking.

l. White Eatonella occurs on poorly developed soils in dry, sandy or volcanic desert areas between 763 and 1,900 meters in elevation. Sites that support the taxon are rather sparsely vegetated, usually with no apparent cryptogram layer. YTC supports 21 acres of this species predominantly on slopes ranging 18 to 45 percent. Designated sensitive plant sites are protected through siber staking.

m. YTC is within the range of three sensitive salmonid species that include the Upper Columbia Spring Chinook Salmon *(Oncorhynchus tshawytscha)* – federally endangered, Upper Columbia Steelhead Trout *(Oncorhynchus mykiss)* –federally endangered, and Mid-Columbia Steelhead Trout – federally threatened. In addition, the Columbia River Bull Trout *(Salvelinus confluentus)* is listed as a federally threatened species. Currently, protection measures in place for riparian areas on YTC provide direct protection for these species, and protect habitat that may be occupied on YTC.

(AFZH-PWE, 967-3474)

JAMES M. COLLINS, JR.
Major General, USA
Deputy Commanding General/
Chief of Staff

DISTRIBUTION:
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APPENDIX A

REFERENCES

AR 200-3 (Natural Resources-Land, Forest and Wildlife Management) 28 February 1995

FL Reg 200-1 (Environmental Protection and Enhancement) 1 February 2002

FL Reg 350-30 (Fort Lewis Range Regulations) 29 March 2000

Conservation Agreement Western Sage Grouse (*Centrocercus urophasianus phaios*), 1992 and 1994

Endangered Species Act (ESA) as amended 1973

Fort Lewis Endangered Species Management Plan for Bald Eagles, 2000

Fort Lewis Endangered Species Management Plan for Northern Spotted Owl, October 2000

Fort Lewis Endangered Species Management Plan for Water Howellia, 2000

Based on Fort Lewis Special Edition, 4 Series V791S (Environmental Coordination Map) 2004

Sikes Act 16 USC 670, 18 November 1997

U.S. Fish and Wildlife Service (Recovery Plan for the Pacific Bald Eagle) 1986

Based on YTC Special Series V791S, Edition 4-DMA (Yakima Training Center Environmental Coordination Map) 2000

Yakima Training Center Sage Grouse Management Plan, June 1998

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APPENDIX B

DEFINITIONS

Federal Candidate
A plant or animal taxa, native to the U.S., being considered for possible addition to the "List of Endangered and Threatened Wildlife and Plants".

Federal Endangered
A species on the brink of extinction throughout all, or a significant portion, of its range.

Federal Species of Concern
A species, whose conservation standing is of concern to the USFWS, but status information is still needed.

Federal Threatened
A species that is likely to become endangered within the foreseeable future.

Critical Habitat
Areas of land, water, and airspace, occupied by the species at the time of its listing, that are required for its normal needs and survival.

Land Bank Zone
Areas managed for significant and sensitive natural and/or cultural resources. Most forms of training, including all tracked and wheeled vehicle use are prohibited.

Primary Buffer Zone
This is the most critical area immediately around bald eagle nests and communal night roosts (400 meter radius from nests and roosts).

Secondary Buffer Zone
The purpose of this zone is to further minimize disturbance to bald eagle nest sites and communal night roosts (800 meter radius from nests and roosts).

Siber (Seibert) Stake
A stake, with bands of white, red, and yellow coloration that designates areas limited to non-destructive activities.

State Listed Species
Species listed by Washington State Department of Fish and Wildlife as requiring special status designation due to declining populations. Federal agencies are not required to abide by restrictions associated with state listed species.

State Candidate
Species that the Washington State Department of Fish and Wildlife will review for possible listing as State Endangered, Threatened, or Sensitive.

State Endangered
Any species, native to the state of Washington that is seriously threatened with extinction throughout all or a significant portion, of its range within the state.

State Sensitive
Any species, native to the state of Washington, that is vulnerable or declining, and is likely to become endangered or threatened throughout a significant portion of its range within the state without cooperative management or removal of threats.

State Threatened
Any species, native to the state of Washington, that is likely to become an endangered species within the foreseeable future throughout a significant portion of its range within the state without cooperative management or removal of threats.

Appendix B

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

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 WESTERN WASHINGTON FISH AND WILDLIFE OFFICE

(Revised November 1, 2007)

LISTED

Bull trout (*Salvelinus confluentus*)

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

None

CANDIDATE

Mardon skipper (*Polites mardon*)
(Roy Prairie and Tacoma) Mazama pocket gopher (*Thomomys mazama* ssp. *glacialis* and *tacomensis* [historic])
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*)
California wolverine (*Gulo gulo luteus*)
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 THURSTON COUNTY AS PREPARED BY THE U.S. FISH AND WILDLIFE SERVICE WESTERN WASHINGTON FISH AND WILDLIFE OFFICE

(Revised November 1, 2007)

LISTED

Bull trout (*Salvelinus confluentus*)

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

None

CANDIDATE

Mardon skipper (*Polites mardon*)
(Olympia, Tenino, and Yelm) Mazama pocket gopher (*Thomomys mazama* ssp. *pugetensis*, *tumuli*, and *yelmensis*)
Oregon spotted frog (*Rana pretiosa*)
Streaked horned lark (*Eremophila alpestris strigata*)
Taylor's checkerspot (*Euphydryas editha taylori*)

SPECIES OF CONCERN

Bald eagle (*Haliaeetus leucocephalus*)
California wolverine (*Gulo gulo luteus*)
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)

YAKIMA COUNTY
Updated 7/24/2008

LISTED

Endangered

Gray wolf *(Canis lupus)*

Threatened

Bull trout *(Salvelinus confluentus)* – Columbia River distinct population segment
Grizzly bear *(Ursus arctos horribilis)*
Marbled murrelet *(Brachyramphus marmoratus)*
Northern spotted owl *(Strix occidentalis caurina)*
Spiranthes diluvialis (Ute ladies'-tresses), plant

Designated

Critical habitat for the northern spotted owl
Critical habitat for the Columbia River distinct population segment of the bull trout

CANDIDATE

Fisher *(Martes pennanti)* - West Coast distinct population segment
Greater sage grouse *(Centrocercus urophasianus)* – Columbia Basin distinct population segment
Mardon skipper (*Polites mardon*), butterfly
Yellow-billed cuckoo (*Coccyzus americanus*)

SPECIES OF CONCERN

Animals

Bald eagle *(Haliaeetus leucocephalus)* (delisted, monitor status)
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*) (Delisted, monitor status)
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)*
Wolverine *(Gulo gulo)*

Vascular Plants

Astragalus columbianus (Columbia milk-vetch)
Calochortus longebarbatus var. *longebarbatus* (Long-bearded sego lily)
Castilleja cryptantha (Obscure indian-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)

KITTITAS COUNTY
Updated 7/24/2008

LISTED

Endangered

Gray wolf *(Canis lupus)*

Threatened

Bull trout *(Salvelinus confluentus)* – Columbia River distinct population segment
Grizzly bear *(Ursus arctos horribilis)*
Canada lynx *(Lynx canadensis)*
Marbled murrelet *(Brachyramphus marmoratus)*
Northern spotted owl *(Strix occidentalis caurina)*
Spiranthes diluvialis (Ute ladies'-tresses), plant

Designated

Critical habitat for the northern spotted owl
Critical habitat for the Columbia River distinct population segment of the bull trout

CANDIDATE

Fisher *(Martes pennanti)* - West Coast distinct population segment
Greater sage grouse *(Centrocercus urophasianus)* – Columbia Basin distinct population segment
Yellow-billed cuckoo (*Coccyzus americanus*)

SPECIES OF CONCERN

Animals

Bald eagle *(Haliaeetus leucocephalus)* (delisted, monitor status)
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*) (Delisted, monitor status)

Pygmy whitefish (*Prosopium coulteri*)
Redband trout (*Oncorhynchus mykiss*)
River lamprey (*Lampetra ayresi*)
Sagebrush lizard (*Sceloporus graciosus*)
Sharptail snake (*Contia tenius*)
Townsend's ground squirrel (*Spermophilus townsendii*)
Western brook lamprey (*Lampetra richardsoni*)
Western gray squirrel *(Sciurus griseus griseus)*
Westslope cutthroat trout *(Oncorhynchus clarki lewisi)*
Wolverine *(Gulo gulo)*

Vascular Plants

Astragalus columbianus (Columbia milk-vetch)
Cypripedium fasciculatum (Clustered lady's-slipper)
Delphinium viridescens (Wenatchee larkspur)
Lomatium tuberosum (Hoover's desert-parsley)
Phacelia minutissima (Least phacelia)
Pinus albicaulis (Whitebark pine)
Silene seelyi (Seely's silene)
Tauschia hooveri (Hoover's tauschia)

Mosses

Orthotrichum praemorsum

Endangered and Threatened Species Under NMFS' Jurisdiction

List of Mammal Species under NMFS' Jurisdiction
(E = "endangered"; T = "threatened"; F = "foreign"; n/a = not applicable*)

Marine Mammals (21 listed "species")
Manatees and sea otters are also listed under the ESA, but fall under the jurisdiction of the U.S. Fish and Wildlife Service.

Species	Year Listed	Status	Critical Habitat*	Recovery Plan*
Cetaceans				
• beluga whale (1 listed DPS) *(Delphinapterus leucas)*				
○ Cook Inlet	2008	E	no	no
• blue whale (*Balaenoptera musculus*)	1970	E	n/a	final
• bowhead whale (*Balaena mysticetus*)	1970	E	n/a	no
• Chinese River dolphin / baiji (*Lipotes vexillifer*)	1989	E (F)	n/a	n/a
• fin whale (*Balaenoptera physalus*)	1970	E	n/a	draft
• gray whale (1 listed DPS) (*Eschrichtius robustus*)				
○ Western North Pacific	1970	E (F)	n/a	no
• Gulf of California harbor porpoise / vaquita (*Phocoena sinus*)	1985	E (F)	n/a	n/a
• humpback whale (*Megaptera novaeangliae*)	1970	E	n/a	final
• Indus River dolphin (*Platanista minor*)	1991	E (F)	n/a	n/a
• killer whale (1 listed DPS) (*Orcinus orca*)				
○ Southern Resident	2005	E	final	final
• North Atlantic right whale (*Eubalaena glacialis*)	2008	E	final	final
○ *original listing as "northern right whale"* -	1970	E		
• North Pacific right whale (*Eubalaena japonica*)	2008	E	final	final
○ *original listing as "northern right whale"* -	1970	E		

• sei whale (*Balaenoptera borealis*)	1970	E	n/a	no
• Southern right whale (*Eubalaena australis*)	1970	E (F)	n/a	n/a
• sperm whale (*Physeter macrocephalus*)	1970	E	n/a	draft
Pinnipeds				
• Guadalupe fur seal (*Arctocephalus townsendi*)	1985	T (F)	n/a	n/a
• Hawaiian monk seal (*Monachus schauinslandi)*	1976	E	final	final
• Mediterranean monk seal (*Monachus monachus)*	1970	E (F)	n/a	n/a
• Saimaa seal (*Phoca hispida saimensis*)	1993	E (F)	n/a	n/a
• Steller sea lion (2 listed DPSs) (*Eumetopias jubatus*)				
○ Eastern	1990	T	final	final
○ Western	1997	E	final	final
original listing -	1990	T		

*** NOTE:** Critical habitat and recovery plans are not required for foreign species; critical habitat is also not required for species listed prior to the 1978 ESA amendments that added critical habitat provisions.

List of Turtle Species under NMFS' Jurisdiction
(E = "endangered"; T = "threatened"; n/a = not applicable*)

Marine Turtles (8 listed "species")
Recovery plans for marine turtles are developed and implemented by NMFS and USFWS; the plans have been written separately for turtles in the Atlantic and Pacific oceans (and East Pacific for the green turtle) rather than for each listed species.

Species	Year Listed	Status	Critical Habitat*	Recovery Plan*
• green turtle (2 listed populations**) (*Chelonia mydas*)				
○ Florida & Mexico's Pacific coast breeding colonies	1978	E	final	final
○ all other areas	1978	T	final	final
• hawksbill turtle (*Eretmochelys imbricata*)	1970	E	final	final
• Kemp's ridley turtle (*Lepidochelys kempii*)	1970	E	n/a	final
• leatherback turtle (*Dermochelys coriacea*)	1970	E	final	final
• loggerhead turtle (*Caretta caretta*)	1978	T	n/a	final
• olive ridley turtle (2 listed populations**) (*Lepidochelys olivacea*)				
○ Mexico's Pacific coast breeding colonies	1978	E	n/a	final
○ all other areas	1978	T	n/a	final

*** NOTE:** Critical habitat and recovery plans are not required for foreign species; critical habitat is also not required for species listed prior to the 1978 ESA amendments that added critical habitat provisions.

****** These populations were listed before the 1978 ESA amendments that restricted population listings to "distinct population segments of vertebrate species."

List of Fish Species under NMFS' Jurisdiction
(E = "endangered"; T = "threatened"; F = "foreign"; n/a = not applicable*)

Marine and Anadromous Fish (34 listed "species")				
Species	**Year Listed**	**Status**	**Critical Habitat***	**Recovery Plan***
• Atlantic salmon (1 listed DPS) (*Salmo salar*)				
○ Gulf of Maine (originally listed in 2000)	2009* *expanded	E	final	final
• Chinook salmon (9 listed ESUs) (*Oncorhynchus tshawytscha*)				
○ California coastal	1999**	T	final	in process
○ Central Valley spring-run	1999**	T	final	in process
○ Lower Columbia River	1999**	T	final	in process
○ Upper Columbia River spring-run	1999**	E	final	final
○ Puget Sound	1999**	T	final	final
○ Sacramento River winter-run	1994**	E	final	in process
○ Snake River fall-run	1992**	T	final	in process
○ Snake River spring/ summer-run	1992**	T	final	in process
○ Upper Willamette River	1999**	T	final	in process
• chum salmon (2 listed ESUs) (*Oncorhynchus keta*)				
○ Columbia River	1999**	T	final	in process
○ Hood Canal summer-run	1999**	T	final	final
• coho salmon (4 listed ESUs) (*Oncorhynchus kisutch*)				
○ Central California coast	2005**	E	final	in process
original listing -	1996**	T		
○ Lower Columbia River	2005**	T	in process	in process
○ Oregon coast	2008	T	final	
○ Southern Oregon & Northern California coasts	1997**	T	final	in process
• green sturgeon (1 listed DPS) *(Acipenser medirostris)*				

○ southern DPS	2006	T	proposed	no
• Gulf sturgeon (*Acipenser oxyrinchus desotoi*)	1991	T	final	final
• shortnose sturgeon (*Acipenser brevirostrum*)	1967	E	n/a	final
• sockeye salmon (2 listed ESUs) (*Oncorhynchus nerka*)				
○ Ozette Lake	1999**	T	final	in process
○ Snake River	1991**	E	final	in process
• smalltooth sawfish (1 listed DPS) (*Pristis pectinata*)				
○ U.S. portion of range	2003	E	proposed	final
• steelhead trout (11 listed DPSs) *(Oncorhynchus mykiss)*				
○ Puget Sound	2007	T	final	no
○ Central California coast	1997**	T	final	in process
○ Snake River Basin	1997**	T	final	in process
○ Upper Columbia River	1997**	E	final	final
○ Southern California	1997**	E	final	in process
○ Middle Columbia River	1999**	T	final	in process
○ Lower Columbia River	1998**	T	final	in process
○ Upper Willamette River	1999**	T	final	in process
○ Northern California	2000**	T	final	in process
○ South-Central California coast	1997**	T	final	in process
○ California Central Valley	1998**	T	final	in process
• totoaba (*Totoaba macdonaldi*)	1979	E (F)	n/a	n/a

*** NOTE:** Critical habitat and recovery plans are not required for foreign species; critical habitat is also not required for species listed prior to the 1978 ESA amendments that added critical habitat provisions.
****** All Pacific salmonid listings were revisited in 2005 and 2006. Only the salmonids whose status changed as a result of the review will show the revised date; for all others, only the original listing date is shown. For more information on the listing history, please click on the link for each ESU/DPS.

List of Invertebrate and Plant Species under NMFS' Jurisdiction
(E = "endangered"; T = "threatened")

Marine Invertebrates (4 listed "species")				
Species	**Year Listed**	**Status**	**Critical Habitat***	**Recovery Plan***
• black abalone *(Haliotis cracherodii)*	2009	E	no	no
• elkhorn coral *(Acropora palmata)*	2006	T	final	no
• staghorn coral *(Acropora cervicornis)*	2006	T	final	no
• white abalone (*Haliotis sorenseni*)	2001	E	not prudent [pdf]	final

Marine Plants (1 listed "species")				
Species	**Year Listed**	**Status**	**Critical Habitat***	**Recovery Plan***
• Johnson's seagrass (*Halophila johnsonii*)	1999	T	final	final

*** NOTE:** Critical habitat and recovery plans are not required for foreign species; critical habitat is also not required for species listed prior to the 1978 ESA amendments that added critical habitat provisions.

List of Candidate, Proposed, and Delisted Species under NMFS' Jurisdiction

Candidates for Listing (7 candidate "species")

Species	Year	Federal Register notice
• Atlantic sturgeon (*Acipenser oxyrinchus oxyrinchus*)	2006	71 FR 61022 [pdf]
• Atlantic wolffish (*Anarhichas lupus*)	2008	74 FR 249 [pdf]
• bearded seal (*Erignathus barbatus*)	2008	73 FR 16617 [pdf]
• cusk (*Brosme brosme*)	2007	72 FR 10710 [pdf]
• Pacific herring (*Clupea pallasi*) ○ Southeast Alaska	2008	73 FR 19824 [pdf]
• ringed seal (*Phoca hispida*)	2008	73 FR 16617 [pdf]
• spotted seal (*Phoca largha*)	2008	73 FR 16617 [pdf]

Proposed for Listing (5 proposed "species")

Species	Year Proposed	Status
• Atlantic salmon (*Salmo salar*) ○ Gulf of Maine (other populations in streams and rivers in Maine outside the range of 2006 the listed Gulf of Maine DPS); anadromous	2008	proposed endangered [pdf]
• bocaccio (*Sebastes paucispinis*) ○ Georgia Basin	2009	proposed endangered [pdf]
• canary rockfish (*Sebastes pinniger*) ○ Georgia Basin	2009	proposed threatened [pdf]
• Pacific eulachon/smelt (*Thaleichthys pacificus*) ○ Southern DPS	2009	proposed threatened [pdf]
• yelloweye rockfish (*Sebastes ruberrimus*) ○ Georgia Basin	2009	proposed threatened [pdf]

Delisted Species (2 delisted "species")			
Species	**Year Delisted**	**Year Listed**	**Status**
• Caribbean monk seal (*Monachus tropicalis*)	2008	1967	extinct [pdf]
• gray whale (1 delisted DPS) (*Eschrichtius robustus*)			
○ Eastern North Pacific	1994	1970	recovered [pdf]; remains protected under MMPA

Last updated June 25, 2009.