U.S. DEPARTMENT OF
HOMELAND SECURITY
United States Coast Guard

Biological Assessment for the Northwest Area Contingency Plan for the Response to Spills of Oil and Hazardous Substances

Prepared for:

United States Environmental Protection Agency
Region 10

and

United States Coast Guard
Thirteenth Coast Guard District

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List of Abbreviations and Acronyms

Term	**Definition**
°C	degrees Celsius
°F	degrees Fahrenheit
BA	biological assessment
BMP	best management practice
BO	biological opinion
CDP	California Dispersant Plan
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
CEWAF	chemically enhanced water accommodated fractions
CFR	Code of Federal Regulations
cm	centimeters
CWA	Clean Water Act
CWTD	Columbian white-tailed deer
DPS	distinct population segment
DWH	Deepwater Horizon
Ecology	Washington State Department of Ecology
EEZ	exclusive economic zone
ENP	Eastern North Pacific
EPA	United States Environmental Protection Agency
ERMA	Environmental Response Management Application
ESA	Endangered Species Act
ESU	evolutionary significant unit
EU	Environmental Unit
FOSC	Federal On-Scene Coordinator
FR	Federal Register
ft	feet
GRP	Geographic Response Plan
ha	hectares

List of Abbreviations and Acronyms (cont.)

HCS	Hood Canal summer-run
IC	Incident Command
ICS	Incident Command System
IOEM	Idaho Office of Emergency Management
JBLM	Joint Base Lewis-McChord
kg	kilograms
km	kilometers
LAA	likely to adversely affect
LCR	Lower Columbia River
m	meters
MCR	Middle Columbia River
mm	millimeters
MOA	memorandum of agreement
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NE	no effect
NLAA	not likely to adversely affect
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NRC	National Research Council
NRDA	Natural Resources Damage Assessment
NW	inland and coastal zones of Washington, Oregon, and Idaho
NWAC	Northwest Area Committee
NWACP	Northwest Area Contingency Plan
NWR	National Wildlife Refuge
ODEQ	Oregon Department of Environmental Quality
ODFW	Oregon Department of Fish and Wildlife
ODOT	Oregon Department of Transportation
ORBIC	Oregon Biodiversity Information Center
OSTF	Oil Spill Task Force
PAH	polycyclic aromatic hydrocarbon
PBF	physical and biological feature
ppm	parts per million
PS/GB	Puget Sound/Georgia Basin

List of Abbreviations and Acronyms (cont.)

RM	river mile
RRT	Regional Response Team
Services	United States Fish and Wildlife Service and the National Oceanic and Atmospheric Administration National Marine Fisheries Service
SMART	Special Monitoring of Applied Response Technologies
SOSC	State On-Scene Coordinator
SONC	Southern Oregon/Northern California
sq km	square kilometers
SRB	Snake River Basin
SRKW	Southern Resident Killer Whale
UC	Unified Command
UCR	Upper Columbia River
US	United States
USCG	United States Coast Guard
USFWS	United States Fish and Wildlife Service
UWR	Upper Willamette River
WAF	water accommodated fractions
WDFW	Washington Department of Fish and Wildlife
WNHP	Washington Natural Heritage Program
WNP	Western North Pacific

Executive Summary

This biological assessment (BA) evaluates the potential for adverse effects on species and habitats protected under the Endangered Species Act (ESA) from implementation of the Northwest Area Contingency Plan (NWACP) as updated in January 2018, Change 19 (EPA 2018). The US Environmental Protection Agency (EPA) and US Coast Guard (USCG), as the federal action agencies, are authorized under the NWACP to coordinate multi-jurisdictional emergency response to the spill of oil or hazardous material within the Northwest Area, defined as the inland and coastal zones of Washington, Oregon, and Idaho (NW). The NWACP was developed to improve spill response effectiveness and provide consistency between NW spill response protocols and guidance published at local, state, and national scales.

This BA focuses on the potential effects of spill response actions carried out under the NWACP within the Action Area. The effects evaluated are those associated with the specific spill response actions used to minimize the risks from the spilled material during an emergency response, and not the material itself. Within the context of this BA, the spilled material is considered part of the baseline condition.

The NWACP provides specific protocols to be followed by spill responders at various levels of the response organization. The NWACP also provides decision tools for non-mechanical countermeasures (e.g., chemical dispersion, in situ burning) intended to maximize the effectiveness of such measures and to minimize effects on valued resources and human populations. In addition, the NWACP identifies many conditions under which the Services are to be contacted or consulted on matters of spill response planning, execution, and outcomes.

For the purpose of this consultation, the boundary of the Action Area has been focused to areas within the NW at higher risk for larger oil spills (>11,000 gallons),[1,2] which correlates with hazardous liquid pipelines, high capacity rail corridors (carrying unit trains of crude oil), and commercial shipping waterways. This is not to say that the proposed action is limited to spills of 11,000 gallons or more, but rather that this metric has been used to define the boundary of the Action Area.

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1 The limit of 11,000 gallons is the approximate volume of material carried by a large tanker truck.

2 According to the NCP, major oil spills are classified as >100,000 gallons in the marine zone and >10,000 gallons in the inland zone.

A 1-mile buffer has been extended on both sides of the high-volume transportation corridors (including waterways, pipelines, and railways carrying unit trains) and 1 mile inland along the coast. The buffers are intended to include staging areas that would be utilized during a response action and associated ingress/egress. The buffer also extends 32 km (20 miles) downstream of locations where pipelines or railways carrying unit trains cross major waterways to provide a conservative estimate of the downstream area that might be affected by a spill response (Windward et al. 2017). Waters downstream of intersections with high-risk areas are included in the Action Area because a spill response will not cease at the extent of the 1-mile buffer; rather, the spill response actions will continue downstream as necessary to contain a spill.

Mechanical countermeasures are the primary response actions and are intended to deflect, exclude, or contain and recover oil or other spilled material before it can come into contact with and impact ecological resources. Non-mechanical countermeasures include response actions that alter the physical or chemical properties of the spilled material (specifically petroleum or oil-like materials) such that the options for recovery are improved, or the overall impacts of spilled material that cannot be recovered are potentially reduced. Although non-mechanical countermeasures may increase the potential for response-related environmental impacts for individuals of some species or their habitats, these impacts are expected to be less severe and of shorter duration than allowing spilled material to reach sensitive areas.

A total of 77 species, including distinct population segments (DPSs) and evolutionary significant units (ESUs) of salmonids and designated or proposed critical habitat were considered in this BA. The species list (current as of June, 2017) was developed with input from the Services and includes ESA-listed species in the NW with distributions that overlap with the Action Area.

Critical habitat within the NW has been designated or proposed for 50 of the 77 ESA-listed species considered in this BA, 40 of which overlap with the Action Area.

The potential effects from implementation of the NWACP on ESA-listed species are evaluated in this BA in a step-wise process by first assessing the likelihood of exposure to spill response actions and then analyzing the effects of those spill response actions on ESA-listed species and critical habitat.

The underlying assumption of this evaluation is that in the event of a spill, implementing an appropriate response action would provide greater protection for ESA-listed species and habitats than not responding to the spill. Decisions made during an emergency spill response focus on protecting and reducing risks to human health and the environment, including ESA-listed species and critical habitats, from exposure to a spilled material.

In the first step of the analysis, if there is low or no likelihood of exposure, then effects of the action are concluded to be discountable. If effects are not discountable (i.e., individuals may be exposed to the action or stressors of the action), then the potential effects of a spill response on individuals were analyzed in greater detail. In this second step of the analysis, effects of spill response actions on ESA-listed species and critical habitat are evaluated to assess if they can be concluded to be insignificant. The second step considers the implementation of conservation measures. Species for which the effects of response activities are concluded to be neither discountable nor insignificant (i.e., measureable and potentially adverse) were evaluated further in to assess the cumulative effects of future nonfederal activities. Table ES-1 presents the outcome of this analysis and the effects determination for the ESA-listed species and designated critical habitat that overlap with the Action Area.

Table ES-1 Determination of Effects

Protected Species	Status	Critical Habitat in Action Area?	Determination	Rationale[a]
Responsible Agency – NMFS				
Fish				
Puget Sound Chinook salmon ESU (*Oncorhynchus tshawytscha*)	T	yes	LAA CH: LAA	• Species occurs in the marine and freshwater zones of the Action Area. • Direct injuries to salmon in freshwater streams could occur from entrainment of early-life stages from vacuuming oil at the water's surface. The effects will be minimized by the careful use of vacuums (with flat-head nozzle attachments to reduce intake), but entrainment is still possible. • Changes in behavior could occur from the use of lights during nighttime operations. The presence of responders and walking in streams could cause avoidance behavior. This will be minimized by utilizing GRPs and coordinating response activities with the Services. • Barriers to upstream or downstream migration will last no more than four days but may block migration during critical periods. • Nearshore response activities such as vegetation removal, beach cleaning, and booming could cause physical displacement of salmonids. • Chemical exposures associated with spill responses in open marine water will be of short duration (matter of hours); in the marine nearshore, exposure to dilute chemically dispersed oil is possible and could cause sublethal effects in salmon. Chemical dispersants will not be used in freshwater habitats. • Habitat degradation and alteration of the food web could result from changes in water quality caused by dispersant use, dispersed oil, or burn residues from *in situ* burning.

Table ES-1 Determination of Effects

Protected Species	Status	Critical Habitat in Action Area?	Determination	Rationale[a]
Snake River fall-run Chinook salmon ESU (*O. tshawytscha*)	T	yes	LAA CH: LAA	See Puget Sound Chinook salmon ESU, above.
Snake River spring/summer-run Chinook salmon ESU (*O. tshawytscha*)	T	yes	LAA CH: LAA	See Puget Sound Chinook salmon ESU, above.
Lower Columbia River Chinook salmon ESU (*O. tshawytscha*)	T	yes	LAA CH: LAA	See Puget Sound Chinook salmon ESU, above.
Upper Columbia River spring-run Chinook salmon ESU (*O. tshawytscha*)	E	yes	LAA CH: LAA	See Puget Sound Chinook salmon ESU, above.
Upper Willamette River Chinook salmon ESU (*O. tshawytscha*)	T	yes	LAA CH: LAA	See Puget Sound Chinook salmon ESU, above.
Hood Canal chum salmon ESU (*O. keta*)	T	yes	LAA CH: LAA	See Puget Sound Chinook salmon ESU, above. Freshwater critical habitat does not substantially overlap with the Action Area.
Columbia River chum salmon ESU (*O. keta*)	T	yes	LAA CH: LAA	See Puget Sound Chinook salmon ESU, above.
Lower Columbia River coho salmon ESU (*O. kisutch*)	T	yes	LAA CH: LAA	See Puget Sound Chinook salmon ESU, above.
Southern Oregon/Northern California Coastal coho salmon ESU (*O. kisutch*)	T	yes	LAA CH: LAA	See Puget Sound Chinook salmon ESU, above.

Table ES-1 Determination of Effects

Protected Species	Status	Critical Habitat in Action Area?	Determination	Rationale[a]
Oregon Coast coho salmon ESU (*O. kisutch*)	T	yes	LAA CH: LAA	See Puget Sound Chinook salmon ESU, above.
Lake Ozette sockeye salmon ESU (*O. nerka*)	T	yes	LAA CH: LAA	See Puget Sound Chinook salmon ESU, above. Freshwater critical habitat does not substantially overlap with the Action Area.
Snake River sockeye salmon ESU (*O. nerka*)	E	yes	LAA CH: LAA	See Puget Sound Chinook salmon ESU, above.
Snake River Basin steelhead trout DPS (*O. mykiss*)	T	yes	LAA CH: LAA	See Puget Sound Chinook salmon ESU, above.
Puget Sound steelhead trout DPS (*O. mykiss*)	T	yes	LAA CH: LAA	See Puget Sound Chinook salmon ESU, above.
Lower Columbia River steelhead trout DPS (*O. mykiss*)	T	yes	LAA CH: LAA	See Puget Sound Chinook salmon ESU, above.
Upper Columbia River steelhead trout DPS (*O. mykiss*)	T	yes	LAA CH: LAA	See Puget Sound Chinook salmon ESU, above.
Middle Columbia River steelhead trout DPS (*O. mykiss*)	T	yes	LAA CH: LAA	See Puget Sound Chinook salmon ESU, above.
Upper Willamette River steelhead trout DPS (*O. mykiss*)	T	yes	LAA CH: LAA	See Puget Sound Chinook salmon ESU, above.

Table ES-1 Determination of Effects

Protected Species	Status	Critical Habitat in Action Area?	Determination	Rationale[a]
Pacific eulachon, southern DPS (*Thaleichthys pacificus*)	T	yes	NLAA CH: NLAA	• Effects insignificant. • Spawns in lower portions of major rivers, with the primary run (in the NW) occurring in the Columbia River. • Entrainment in vacuums will be minimized through the use of flat-head nozzles on intakes. • GRPs, ERMA, and EU guidance will be available to responders to avoid impacts on spawning habitat (e.g., caused by anchoring). • Lights will be used only during the spill response, so behavioral effects will be short term (days). • Chemical exposures will be short term (less than 4 hours) in the top few meters of the water column (Bejarano et al. 2014). • Engineered controls (e.g., silt fences and fiber rolls) will minimize impacts on habitat potentially caused by construction-related responses (e.g., berms, trenches, dams, staging area establishment, and soil excavation).

Table ES-1 Determination of Effects

Protected Species	Status	Critical Habitat in Action Area?	Determination	Rationale[a]
Bocaccio rockfish, Puget Sound/Georgia Basin DPS (*Sebastes paucispinis*)	E	yes	NLAA CH: NLAA	• Effects insignificant. • Generally found in deep waters away from potential effects of response action. • Larvae could be exposed to response, but exposures and effects will be short term (matter of hours) and/or low magnitude. • Entrainment in vacuums will be minimized through the use of flat-head nozzles on intakes. • Lights will be used only during the spill response, so behavioral effects will be short term (days). • Chemical exposures will be short term (matter of hours) or of a low magnitude. • Habitat degradation, if it occurs, will be highly localized and potentially temporary.
Yelloweye rockfish, Puget Sound/Georgia Basin DPS (*S. ruberrimus*)	T	yes	NLAA CH: NLAA	See bocaccio rockfish, Puget Sound/Georgia Basin DPS, above.
Green sturgeon, southern DPS (*Acipenser medirostris*)	T	yes	NLAA CH: NLAA	• Effects insignificant. • Species is present in deep, open marine water and coastal embayments. • Species is present in the Action Area as late juveniles, subadults, and adults. • The species could come into contact with dispersants and dispersed oil; these life stages are expected to have low sensitivity to chemical dispersants and dispersed oil (Appendix B) (due to larger size). • Spawning habitat does not occur in the Action Area. • Habitat effects (including impacts to PBFs), if they occur, will be highly localized and temporary.

Table ES-1 Determination of Effects

Protected Species	Status	Critical Habitat in Action Area?	Determination	Rationale[a]
Sea Turtles				
Leatherback sea turtle (*Dermochelys coriacea*)	E	yes	NLAA CH: NLAA	• Effects insignificant. • Leatherback sea turtles are present in the Action Area to forage in marine nearshore and open water habitat during summer and fall. • The species does not nest in the Action Area. • On-water spill response operation time is typically short in duration (four days or less). • Wildlife monitoring during response action will minimize potential for vessel strikes and entanglement with equipment.
Green sea turtle, East Pacific DPS (*Chelonia mydas*)	T	no	NLAA	• Effects discountable. • Potential for exposure to spill response actions is extremely unlikely because: o the species is rarely present in the Action Area because of its intolerance for cold water; o the species does not feed or nest in the Action Area; and o on-water spill response operation is typically short in duration (four days or less).
Olive ridley sea turtle (*Lepidochelys olivacea*)	T	no	NLAA	• Effects discountable. • Potential for exposure to spill response actions is extremely unlikely because: o the species is rarely present in the Action Area because of its intolerance for cold water; o the species does not feed or nest in the Action Area; and o on-water spill response operation is typically short in duration (four days or less).

Table ES-1 Determination of Effects

Protected Species	Status	Critical Habitat in Action Area?	Determination	Rationale[a]
Loggerhead turtle, North Pacific Ocean DPS (*Caretta caretta*)	E	no	NLAA	• Effects discountable. • Potential for exposure to spill response actions is extremely unlikely because: o the species is rarely present in the Action Area because of its intolerance for cold water; o the species does not feed or nest in the Action Area; and o on-water spill response operation is typically short in duration (four days or less).
Marine Mammals				
Blue whale (*Balaenoptera musculus*)	E	no	NLAA	• Effects discountable. • Potential for exposure to spill response actions is extremely unlikely because: o the species is has an extensive home range and is rarely present in the Action Area; o the species does not feed or calve in the Action Area; and o on-water spill response operation is typically short in duration (four days or less).
Fin whale (*B. physalus*)	E	no	NLAA	• Effects discountable. • Potential for exposure to spill response actions is extremely unlikely because: o the species has an extensive home range and its use of the Action Area is thought to be limited; o the species does not calve in the Action Area; and • on-water spill response operation is typically short in duration (four days or less).

Table ES-1 Determination of Effects

Protected Species	Status	Critical Habitat in Action Area?	Determination	Rationale[a]
Humpback whale, Central America DPS (*Megaptera novaeangiliae*)	E	no	NLAA	• Effects insignificant. • Species is large and easily detected by wildlife monitors. • Conservation measures (e.g., the establishment of buffer zones) will minimize interactions with large whales in the Action Area. • Chemical exposures are not expected to have significant impacts on whales, particularly given the short duration of exposures (hours) and rapid dilution of chemicals. • Underwater noise generated during the response will last only as long as the response action, typically no more than four days. • On-water spill response operation time is typically short in duration (four days or less).
Humpback whale, Mexico DPS (*M. novaeangiliae*)	T	no	NLAA	See humpback whale, Central America DPS, above.
North Pacific right whale (*Eubalena japonica*)	E	no	NLAA	• Effects discountable. • Potential for exposure to spill response actions is extremely unlikely because: o the species is rarely observed in the Action Area (only once in the past decade) and o on-water spill response operation is typically short in duration (four days or less).

Table ES-1 Determination of Effects

Protected Species	Status	Critical Habitat in Action Area?	Determination	Rationale[a]
Sei whale (*B. borealis*)	E	no	NLAA	• Effects discountable. • Potential for exposure to spill response actions is extremely unlikely because: o the species is rarely present in the Action Area; o the species is not known to feed or calve in the Action Area; and o on-water spill response operation is typically short in duration (four days or less).
Killer whale, Southern Resident DPS (*Orcinus orca*)	E	yes	NLAA CH: NLAA	• Effects insignificant. • Killer whales are large and often easy to spot by wildlife monitors. • Conservation measures (e.g., establishing buffer zones) will minimize direct interactions with whales. • Underwater noise will not exceed dangerous levels for killer whales or last longer than the duration of the spill response (typically no more than four days). • Rapid dilution of chemicals into the water column will make exposures short-term (matter of hours) and localized (primarily the upper few meters of the water column). • Chemical dispersant application and *in situ* burning will not be conducted if whales are detected in the area by wildlife monitors. • On-water spill response operation time is typically short in duration (four days or less).

Table ES-1 Determination of Effects

Protected Species	Status	Critical Habitat in Action Area?	Determination	Rationale[a]
Sperm whale (*Physeter macrocephalus*)	E	no	NLAA	• Effects discountable. • Potential for exposure to spill response actions is extremely unlikely because: o the species is very rarely present in the Action Area; o the species spends much of its time diving deeply; and o on-water spill response operation is typically short in duration (four days or less).
Gray whale, Western Pacific population (*Eschrichtius robustus*)	E(F)	no	NLAA	• Effects discountable. • Potential for exposure to spill response actions is extremely unlikely because: o the Western Pacific population of gray whale is rarely present in the Action Area and o on-water spill response operation is typically short in duration (four days or less).
Guadalupe fur seal (*Arctocephalus townsendi*)	T	no	NLAA	• Effects discountable. • Potential for exposure to spill response actions is extremely unlikely because: o the species is very rarely present in the Action Area preferring warmer water of Mexico and Southern California; o the species breeds almost entirely on Guadalupe Island, Mexico; and o on-water spill response operation is typically short in duration (four days or less).

Table ES-1 Determination of Effects

Protected Species	Status	Critical Habitat in Action Area?	Determination	Rationale[a]
Responsible Agency – USFWS				
Plants				
Applegate's milk-vetch (*Arctocephalus townsendi*)	E	no	LAA	• Limited range and isolated populations that overlap with the Action Area. • Individual plants are in relatively close proximity to rail lines. • Spill response could result in crushing, destruction, or removal of individual plants or seeds.
Bradshaw's desert-parsley (*Lomatium bradshawii*)	E	no	NLAA	• Effects discountable. • Potential for exposure to spill response actions is extremely unlikely because: o the only known occurrence of the species that overlaps with the Action Area is based on an observation from 1916; and o current presence of species in Action Area is unknown.
Golden paintbrush (*Castilleja levisecta*)	T	no	LAA	• Occur in sparse, isolated populations that overlap with the Action Area (e.g., near Rocky Prairie). • Population in Action Area is close to a rail line. • Spill response could result in crushing, destruction, or removal of individual plants or seeds.

Table ES-1 Determination of Effects

Protected Species	Status	Critical Habitat in Action Area?	Determination	Rationale[a]
Howell's spectacular thelypody (*Thelypodium howellii* ssp. *spectabilis*)	T	no	NLAA	• Effects discountable. • Potential for exposure to spill response actions is extremely unlikely because: o the species has limited overlap with the Action Area (only three populations are confirmed within the Action Area); o populations of the species occurs on the easternmost edge of the 1-mile buffer with the pipeline; o staging areas would be established in existing developed areas; and o Spill response actions would be conducted well away from thelypody populations.
Kincaid's lupine (*Lupinus sulphureus* var. *kincaidii*)	T	no	NLAA	• Effects discountable. • Potential for exposure to spill response actions is extremely unlikely because: o there are few current observations of Kincaid's lupine in the Action Area; o no designated critical habitat in the Action Area; o potential suitable habitat locations in the Action Area are not currently occupied by Kincaid's lupine; and o infrastructure exists near Kincaid's lupine populations for the establishment of staging areas.

Table ES-1 Determination of Effects

Protected Species	Status	Critical Habitat in Action Area?	Determination	Rationale[a]
Nelson's checkermallow (*Sidalcea nelsoniana*)	T	no	NLAA	• Effects discountable. • Potential for exposure to spill response actions is extremely unlikely because: o of the very limited spatial overlap of Nelson's checkermallow with the Action Area; o plants are located more than 1 km (0.6 miles) from a pipeline in Salem, Oregon; and o infrastructure exists for the establishment of staging areas.
Slickspot peppergrass (*Lepidium papilliferum*)	T	Yes (proposed)	NLAA CH: NLAA	• Effects discountable. • Potential for exposure to spill response actions is extremely unlikely because: o slickspot peppergrass occupy arid areas so a spill from the nearby pipeline is unlikely to affect water bodies that would trigger a federal response; and o infrastructure exists for the establishment of staging areas and it will not be necessary to clear vegetation.

Table ES-1 Determination of Effects

Protected Species	Status	Critical Habitat in Action Area?	Determination	Rationale[a]
Spalding's catchfly (*Silene spaldingii*)	T	no	LAA	• Small populations overlap with the Action Area near Spokane Airport, Fairchild Airforce Base, and Sprague, WA, each near an oil pipeline. The populations near the airport and base appear to be directly on the pipeline route. • Infrastructure is available near the airport and Air Force base to stage a response; infrastructure is also available near Sprague to an extent. • A spill response in Sprague would likely not affect Spalding's catchfly nearly a mile from the pipeline, but a spill response near the approximately 9–12 plants near more urban locations could have a significant adverse impact on individuals. • Spill response could result in crushing, destruction, or removal of individual plants or seeds.
Ute ladies'-tresses (*Spiranthes diluvialis*)	T	no	NE	• Species is not present in the Action Area.

Table ES-1 Determination of Effects

Protected Species	Status	Critical Habitat in Action Area?	Determination	Rationale[a]
Water howellia (*Howellia aquatilis*)	T	no	LAA	• Populations in the Action Area are 0.2 km (0.1 miles) or farther from a pipeline on JBLM in WA or 2 km (0.1 miles) from Cheney, WA. Water howellia populations are separated from the pipeline by a highway, which will likely stop oil from moving into water howellia habitat and prevent the need for staging in water howellia habitat. • Populations in the Action Area also north of Vancouver, WA, and south of Olympia, WA. These populations are located in parks that will likely not be used for staging areas; infrastructure exists near either location for staging a spill response to nearby waterbodies. Some actions and effects may only occur during a limited portion of the year (e.g., wet or dry periods). • Spill response could result in crushing, destruction, or removal of individual, emergent plants and/or root structures (in dry period).
Western lily (*Lilium occidentale*)	E	no	NLAA	• Effects discountable. • Potential for exposure to spill response actions is extremely unlikely because: o the Western lily has limited overlap with the Action Area, occurring in wooded areas along the coast; o spill response actions will be in response to marine spills and are not likely to affect the wooded areas where the species occurs; o staging areas would be established in existing developed areas (e.g., along Highway 101); and o Highway 101 provides a break between the marine zone and the wooded areas.
White Bluffs bladderpod (*Physaria douglasii* ssp. *tuplashensis*)	T	no	NE	o Species is not present in the Action Area.

Table ES-1 Determination of Effects

Protected Species	Status	Critical Habitat in Action Area?	Determination	Rationale[a]
Willamette daisy (*Erigeron decumbens* var. *decumbens*)	E	yes	NLAA	• Effects discountable. • Potential for exposure to spill response actions is extremely unlikely because the species is not currently present in the Action Area.
Snails				
Banbury Springs limpet (*Lanx* spp.)	E	no	NLAA	• Effects insignificant. • The species' distribution is limited to only four springs that are not located within the 1-mile buffer of the Action Area. • Limpets tend to be in springs that are upstream of the Snake River, away from areas that could be impacted by spilled oil (and therefore a response to oil). • Several of the springs are in or near parks, where staging areas could be established using existing infrastructure.
Bliss Rapids snail (*Taylorconcha serpenticola*)	T	no	NLAA	• Effects insignificant. • Limited distribution in the Snake River 0.4 km (0.25 miles) or farther from an oil pipeline, making it somewhat unlikely that oil would reach the Snake River; a spill directly into a tributary could carry oil to the river, but this is also a very specific and unlikely circumstance; if oil did not reach the river, then no federal response would occur. • Mostly present in tributaries, where oil spilled to the Snake River would not reach (making a response in those tributaries unnecessary); responses in the tributaries would be limited, given the shallow depth and small size of those waterbodies.
Bruneau hot springsnail (*Pyrgulopsis bruneauensis*)	E	no	NE	Species is not present in the Action Area.

Table ES-1 Determination of Effects

Protected Species	Status	Critical Habitat in Action Area?	Determination	Rationale[a]
Snake River physa (*Physa natricina*)	E	no	NLAA	• Effects insignificant. • Limited distribution in the Snake River. • Exposure would require that a pipeline spill would occur in a specific location near Glenns Ferry, Idaho, and travel several miles downstream to physa habitat (and that the associated spill response occurred in physa habitat). • Conservation measures will minimize impacts of a response to the physa.
Butterflies				
Fender's blue butterfly (*Icaricia icarioides fenderi*)	E	no	NE	Species is not present in the Action Area.
Island marble butterfly (*Euchloe ausonides insulanus*)	C[b]	P	NLAA CH: NLAA	• Effects insignificant. • Limited potential for exposure to spill response actions because marine spill of oil is the most likely scenario for San Juan Island; will affect shorelines and marine waters away from most of the species' habitat. • Species is currently limited to a small area of public land where they are being actively monitored. • Infrastructure exists, so construction in uplands is unnecessary. • Foot and off-road vehicle traffic could disturb butterflies or habitat, but knowledge of habitat and population will help minimize such effects, as will availability of roads

Table ES-1 Determination of Effects

Protected Species	Status	Critical Habitat in Action Area?	Determination	Rationale[a]
Oregon silverspot butterfly (*Speyeria zerene hippolyta*)	T	yes	LAA CH: LAA	• Seven extant populations are present along the Oregon coast in the Action Area (1-mile marine buffer). • Species is reliant on several key plant species, notably the early blue violet. Destruction of individual plants could have marked impacts on Oregon silverspot. • Spill response actions have the potential to destroy individual Oregon silverspot or the plants on which they rely. • Individuals from the population at Cascade Head is unlikely to be affected due to its elevation about sea level (away from potential response), but individuals from the populations at Rock Creek-Big Creek, Bray Point, or Clatsop Plain could be affected.
Taylor's checkerspot butterfly (*Euphydryas editha taylori*)	E	yes	LAA CH: LAA	• Extant populations in the south Puget Sound and JBLM overlap with the Action Area (near a rail line and pipeline, respectively). • Taylor's checkerspot is reliant on prairie habitat (vegetation), which is highly fragmented due to historical development. • Prairie habitat may be impacted locally by response actions, particularly those that involve earth moving or construction. Plant hosts may be crushed, and individual adults or caterpillars could be crushed at the same time.

Table ES-1 Determination of Effects

Protected Species	Status	Critical Habitat in Action Area?	Determination	Rationale[a]
Fish				
Bull trout (*Salvelinus confluentus*)	T	yes	LAA CH: LAA	• Vacuuming may entrain early-life-stage individuals. This will be minimized by the use of flat-head nozzles and by limiting vacuuming to the immediate water surface. • Anchoring of booms and foot traffic may disturb spawning trout and redds. Effects will be minimized by anchoring to shorelines as possible and using booming strategies from GRPs, as available. • Response activities that require some degree of construction or disturbance of upland soils and vegetation may result in siltation of streams, potentially leading to impaired water and spawning substrate quality. Engineered controls will be put into place to minimize erosion and siltation. • *In situ* burning will increase the temperature of shallow water causing thermal stress, and residues may be introduced, smothering small areas of benthic habitat. The Services will be consulted before performing an *in situ* burn. • Use of dams or culvert blockages, though limited to only a matter of days, could impact migration of bull trout. • Use of lights during nighttime activities may affect trout behavior (e.g., habitat avoidance). • Low potential for exposure to chemical dispersants that are carried into nearshore environment (after open marine water application). Exposures of large, later life stage.

Table ES-1 Determination of Effects

Protected Species	Status	Critical Habitat in Action Area?	Determination	Rationale[a]
Kootenai River white sturgeon (*Acipenser transmontanus*)	E	yes	NLAA CH: NLAA	• Effects insignificant. • Direct injuries to sturgeon will be minimized by anchoring to shorelines. • Lights will be limited to the duration of the spill response, so behavioral effects will be short term (days). • Habitat degradation caused by response action-related construction will be minimized by conservation measures (e.g., engineered controls on siltation and erosion). • Developed areas near critical habitat could be used to stage a response.
Lost River sucker (*Deltistes luxatus*)	E	yes	NLAA CH: NLAA	• Effects insignificant. • Direct injuries to suckers will be minimized by anchoring to shorelines. • Lights will be limited to the duration of the spill response, so behavioral effects will be short term (days). • Habitat degradation will be minimized by conservation measures (e.g., engineered controls on siltation and erosion). • Developed areas near critical habitat could be used to stage a response.
Shortnose sucker (*Chasmistes brevirostris*)	E	yes	NLAA CH: NLAA	See Lost River sucker, above.

Table ES-1 Determination of Effects

Protected Species	Status	Critical Habitat in Action Area?	Determination	Rationale[a]
Herptiles				
Oregon spotted frog (*Rana pretiosa*)	T	yes	LAA CH: LAA	• Small and cryptic species, difficult to survey and avoid during spill response. • *In situ* burning could result in exposures to extreme heat and smoke. • Aquatic vegetative cover could be lost as a result of *in situ* burning and oiled vegetation removal, though vegetation will likely recover over time. • Water quality could be temporarily impaired by sediment runoff associated with upland activities (e.g., construction of berms, trenches, or staging areas), flushing, or physical herding. Erosion controls will be used to minimize water quality degradation from upland activities. Low water pressure will be used to minimize erosion from flushing or herding. • Vacuuming could entrain larval frogs. Flat-head nozzles will be used to minimize entrainment. • Behavior may be affected by the presence of responders.
Mammals				
Canada lynx (*Felis lynx canadensis*)	T	yes	NE CH: NE	Species and its critical habitat do not meaningfully overlap with the Action Area, which is limited to relatively low elevation, developed areas. The likelihood of lynx presence in those areas is negligible.

Table ES-1 Determination of Effects

Protected Species	Status	Critical Habitat in Action Area?	Determination	Rationale[a]
Columbian white-tailed deer (*Odocoileus virginianus leucurus*)	T	no	NLAA	• Effects insignificant. • Distribution of the species is limited to a small area along the Lower Columbia River, over half occurring in wildlife refuges; • Spill response will be limited to shoreline and on-water actions, away from preferred habitats; • Deer will avoid areas of activity; and o the Lower Columbia River GRP provides information on deer populations and where to place spill response actions and access the Columbia River.
Grizzly bear (*Ursus arctos horribilis*)	T	no	NLAA	• Effects discountable. • Potential for exposure to spill response actions is extremely unlikely because: o very few grizzly bears are present in the Action Area; o the species is expected to avoid areas of human activity (spill response); and o response activities will not generate food waste that could attract bears.
Gray wolf (North Rocky Mountain) (*Canis lupus*)	E	no	NE	Species is not present in the Action Area.
North American wolverine (*Gulo gulo luscus)*	P(T)	no	NE	Species is not present in the Action Area.

Table ES-1 Determination of Effects

Protected Species	Status	Critical Habitat in Action Area?	Determination	Rationale[a]
Olympia pocket gopher (*Thomomys mazama pugetensis*)	T	yes	NLAA	• Effects insignificant. • Response to a spill in pocket gopher habitat is unlikely to result in a federal response due to the lack of nearby waterbodies. • Response to a hazardous materials spill is possible. • Gophers tend to remain underground throughout their lives, making direct interactions with responders or equipment unlikely. • Construction-related spill response actions could cause destruction of gopher burrows, leading to high magnitude, long-term effects.
			CH: NLAA	• Effects insignificant. • Critical habitat (PBFs) of the gopher will not be significantly altered by spill response actions.
Roy Prairie pocket gopher (*T. m. glacialis*)	T	yes	NLAA	See Olympia pocket gopher, above.
Tenino pocket gopher (*T. m. tumuli*)	T	yes	NLAA CH: NLAA	See Olympia pocket gopher, above.
Yelm pocket gopher (*T. m. yelmensis*)	T	yes	NLAA CH: NLAA	See Olympia pocket gopher, above.

Table ES-1 Determination of Effects

Protected Species	Status	Critical Habitat in Action Area?	Determination	Rationale[a]
Birds				
Marbled murrelet (*Brachyrampus marmoratus*)	T	yes	LAA	• Bird is small and difficult for wildlife monitors to see. • The species is especially vulnerable during molting, when the murrelet is flightless. • Vessel strikes are possible, particularly during molting. • Noise may impact behaviors (e.g., foraging), though this will be limited to the duration of the response; impediments to foraging could reduce delivery of food to nestlings and fledging success.
			CH: NLAA	• Effects insignificant. • Spill response actions will not result in the removal or alteration of forest habitat used by the marbled murrelet. • Coastal responses are very unlikely to occur (e.g., be staged) in forested areas used by murrelets.
Northern spotted owl (*Strix occidentalis caurina*)	T	yes	NLAA CH: NLAA	• Effects insignificant. • Preference for mature and old growth forests; response actions are unlikely to be conducted in this type of habitat. • Trees will not be affected by response actions.
Short-tailed albatross (*Phoebastria albatrus*)	E	no	NLAA	• Effects insignificant. • Extensive home range. • Relatively rare in the Action Area. • May be attracted to lights during nighttime operations in open marine water, but this type of response is very rare (only used for very large spills of oil).

Table ES-1 Determination of Effects

Protected Species	Status	Critical Habitat in Action Area?	Determination	Rationale[a]
Streaked horned lark (*Eremophila alpestris strigata*)	T	yes	LAA	• Ground-nesting bird; nests are difficult for wildlife monitors to detect. • Nests could be destroyed by foot, vehicle, or heavy machinery traffic at the site. • Activity in nesting sites could result in nest abandonment or temporary avoidance. • Smoke or extreme heat from *in situ* burning could affect birds.
			CH: NLAA	• Effects insignificant. • Overlap with Action Area is small and limited to terrestrial areas. • Spill response actions will not significantly alter the PBFs of streaked horned lark critical habitat.
Western snowy plover, Pacific Coast DPS (*Charadrius alexandrinus nivosus*)	T	yes	LAA CH: LAA	• Small and cryptic bird that tends to nest among vegetation along high-tide line. • May be difficult for wildlife monitors to detect. • Birds will be disturbed by presence of humans and equipment noise. • Vehicle and foot traffic along high-tide line should result in destruction of nests/nestlings and nesting habitat. • *In situ* burning could expose birds to extreme heat and smoke. • Removal of oiled debris would impact critical habitat PBF (though it would reduce exposures to oil).

Table ES-1 Determination of Effects

Protected Species	Status	Critical Habitat in Action Area?	Determination	Rationale[a]
Yellow-billed cuckoo (*Coccyzus americanus*)	T	no	NLAA	• Effects discountable. • Potential for exposure to spill response actions is extremely unlikely because: o the species has very limited overlap with the Action Area (currently believed to be extirpated from Washington and Oregon and only rarely occurring in Idaho) and o surveys will be conducted prior to developing staging areas and constructing access roads, if needed.

Notes to Table 6-1:

[a] Conservation measures are described in Tables 2-2 and 4-2.

[b] On April 12, 2018, the USFWS proposed to list the island marble butterfly and designate critical habitat for the butterfly; the final listing rule is scheduled to publish on or before April 12, 2019 (83 FR 15900).

Key:

CH	critical habitat	LAA	likely to adversely affect
DPS	distinct population segment	NE	no effect
E	Endangered	NLAA	not likely to adversely affect
F	Foreign	NMFS	National Marine Fisheries Service
ERMA	Environmental Response Management Application	NW	Northwest
ESU	evolutionary significant unit	P	pending
EU	Environmental Unit	PBF	physical and biological features
FR	Federal Register	Services	USFWS and NMFS
GRP	Geographic Response Plan	T	threatened
JBLM	Joint Base Lewis-McChord	USFWS	US Fish and Wildlife Service
km	kilometers	WA	Washington

1 Introduction

This biological assessment (BA) evaluates the potential for adverse effects on species and habitats protected under the Endangered Species Act (ESA) from implementation of the Northwest Area Contingency Plan (NWACP) as updated in January 2018, Change 19 (EPA 2018). The NWACP provides a strategy for a coordinated, multi-jurisdictional emergency response to a discharge of oil or other hazardous substances within the Northwest Area, defined as the inland and coastal zones of Washington, Oregon, and Idaho, hereafter referred to as the "NW."

The coastal and inland zones are defined in the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) (40 Code of Federal Regulations [CFR] 300.5). The coastal zone is defined as all United States (US) waters subject to the tide, US waters of the Great Lakes, specified ports and harbors on inland rivers, waters of the contiguous zone, other waters of the high seas subject to the NCP, and the land surface or land substrata, ground waters, and ambient air proximal to those waters. The inland zone is defined as the environment inland of the coastal zone excluding the Great Lakes and specified ports and harbors on inland rivers. The term inland zone delineates an area of federal responsibility for response actions. The precise boundaries are determined by agreement between the US Environmental Protection Agency (EPA) and US Coast Guard (USCG) in the NWACP (Section 1320). The coastal zone extends to the limits of the exclusive economic zone (EEZ).[3]

The NWACP is jointly prepared by the EPA and USGC, Washington State Department of Ecology (Ecology), Idaho Office of Emergency Management (IOEM), Oregon Department of Environmental Quality (ODEQ), and members of the Northwest Area Committee (NWAC) who also serve as the Region 10 Regional Response

[3] The EEZ includes waters up to approximately 200 nautical miles offshore; the first 3 miles are under shared federal and state jurisdiction.

Team (RRT).[4] The NWACP represents a combined regional and area contingency plan, as required under the NCP,[5] and it also fulfills state requirements for emergency response planning.

This BA evaluates the potential effects resulting from specific response actions that may be implemented during a spill response (summarized in Section 2), but it does not evaluate the effects that are associated with the spilled material itself (which is part of the baseline condition).[6] An oil or hazardous materials spill is not a discretionary action under the influence of the EPA or USCG, and thus is not part of the proposed action.

1.1 Regulatory Framework

Section 7 (a)(2) of the ESA requires that federal agencies that permit, license, fund, or otherwise authorize activities (i.e., the action agencies) consult with the US Fish and Wildlife Service (USFWS) and the National Marine Fisheries Service Services (NMFS) (collectively, "the Services"), as appropriate, to ensure that those activities are not likely to jeopardize the continued existence of an ESA-listed species or destroy or adversely modify designated critical habitat. Consultation is required if an action "may affect" listed species or designated critical habitat. A BA is not required to initiate a consultation, except for major construction projects, but may be used to determine if a proposed action is likely to adversely affect ESA-listed species and/or designated critical habitats. The BA describes the current status of ESA-listed species and designated critical habitat that may be present in the proposed Action Area; it also presents an evaluation of the potential effects of the action on those species and critical habitat. If the results of the BA show that actions are "likely to adversely affect" an ESA-listed species or designated critical habitat, the action agencies must submit a request to the Services for formal consultation.

The regulatory authority that the EPA and USCG use to respond to oil incidents comes from the Oil Pollution Act of 1990, which was an amendment to the Clean Water Act (CWA). This authority is triggered by a discharge or threat of discharge of oil to surface water. If such a discharge or threat of discharge exists, these action agencies are authorized to direct response actions in order to protect human health and the environment.

[4] The NWAC is chaired by USCG Sector Columbia River, USCG Sector Puget Sound, and the EPA, and vice chaired by Ecology, the IOEM, and the ODEQ; additional members include tribes, the US Department of Defense, US Department of the Interior (representing the US Fish and Wildlife Service, Bureau of Land Management, Bureau of Ocean Energy Management, Bureau of Safety and Environmental Enforcement, Bureau of Indian Affairs, National Park Service and Office of Environmental Policy and Compliance), US Department of Commerce (representing the National Marine Fisheries Service and National Weather Service), Federal Emergency Management Agency, US Department of Health and Human Services, US Department of Justice, US Department of Agriculture (US Forest Service), US Department of Labor (Occupational Safety and Health Administration), US Department of Energy, US Department of Transportation, General Services Administration, state health agencies, state emergency management agencies, industry, spill response contractors, environmental advocates, and the public.

[5] The National Oil and Hazardous Substances Pollution Contingency Plan, more commonly called the National Contingency Plan, or NCP, is the federal government's blueprint for responding to both oil spills and hazardous substance releases (40 CFR Part 300).

[6] The "baseline condition" is defined in this BA to include all environmental conditions that lead up to but exclude a spill response action implemented consistent with the NWACP. A spill response will not occur but for a spill of oil or other hazardous material, therefore the presence of those materials in the environment is consistent with the baseline condition for this BA. Effects associated with the baseline condition are not assessed in this document.

The regulatory authority that the EPA and USCG use to respond to hazardous materials incidents comes from the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA, also known as “Superfund”). This authority is triggered by a release of hazardous materials that immediately impact human health or the environment. This law includes a petroleum exclusion clause. There does not need to be a tie to surface water for the EPA and USCG to respond to spills of hazardous material.

The NCP is the regulation that defines how the EPA and USCG will exercise the authorities granted within CERCLA and the Oil Pollution Act. The NCP requires the creation of Area Contingency Plans.

1.2 Response Planning under the Northwest Area Contingency Plan

Spill response planning in the NW is accomplished through the development of a series of interrelated plans, for which the NWACP provides the overarching framework. The NWACP uses the framework and priorities set forth in the NCP (40 CFR 300)[7] and applies them in the NW.

The purpose of the NWACP is to:

1. Provide for orderly and effective implementation of response actions to protect the people, cultural resources, and natural resources of the coastal and inland zones of the NW from the impacts of a discharge of oil or other hazardous substance.
2. Promote the coordination of and describe the strategy for a unified and coordinated federal, state, tribal, local, and other involved party response to a discharge of oil or other hazardous substances.
3. Provide consistency with the NCP and provide guidance for facility and vessel spill response plans prepared for the NW.
4. Provide guidance to all holders and viewers of facility and vessel response plans to ensure consistency with the NWACP.

The NWACP contains both administrative and technical guidance for all members of the response community to follow during an emergency response to a spill and sets up procedures that are designed to minimize the imminent threat to human health or the environment from an uncontrolled release of oil or other hazardous substance. The administrative structure for responding to an incidence is described herein. However, the action agencies are requesting consultation on the potential effects of spill response actions from the NWACP and not on the entirety of the NWACP.

The NWACP guidance is organized by first providing a description of policy (Chapters 1000—8000) organized by the National Incident Management System Incident Command System (ICS) positions.[8] These sections provide administrative guidance that establishes how spill response

[7] The EPA has proposed revisions to the NCP, which was last updated in 1994. The comment period on proposed revisions closed on March 25, 2016.
[8] ICS is a management structure made up of pre-defined roles that is used to coordinate emergency response efforts (described further in Section 1.2.1).

actions should be organized, managed, and funded. Chapter 9000 contains information on response tools (e.g., identifying wildlife deterrence resource [Section 9311] and derelict vessel best management practices [BMPs] [Section 9330]); these sections are indexed by the ICS position or section most likely to use the information. This technical guidance describes countermeasures that have been approved for use as part of response actions.

The NWACP focuses predominantly on oil spill response, with a single section devoted to hazardous materials spill response (Section 7000). The regulatory mandate for Area Contingency Plans is limited to oil response. However, because of the overlap in response agencies, response organization, and personnel, response to hazardous materials incidents is included in the NWACP. With few exceptions, the same response tools are used to respond to spills of both oil and other hazardous materials. The exceptions are discussed in Section 2. In addition, hazardous material responses are typically short in duration, lasting only one to two days. Once released, hazardous materials begin to dissipate into the environment, and the emergency response action ends when the material can no longer be recovered. Oil, on the other hand, does not mix with water, and response actions can recover oil and remove it from the environment. This recovery typically lasts no more than four days but could extend up to a week, rarely extending more than two weeks, and can involve invasive tactics that are described in Section 2.

1.2.1 Response Action Command Structure and Coordination

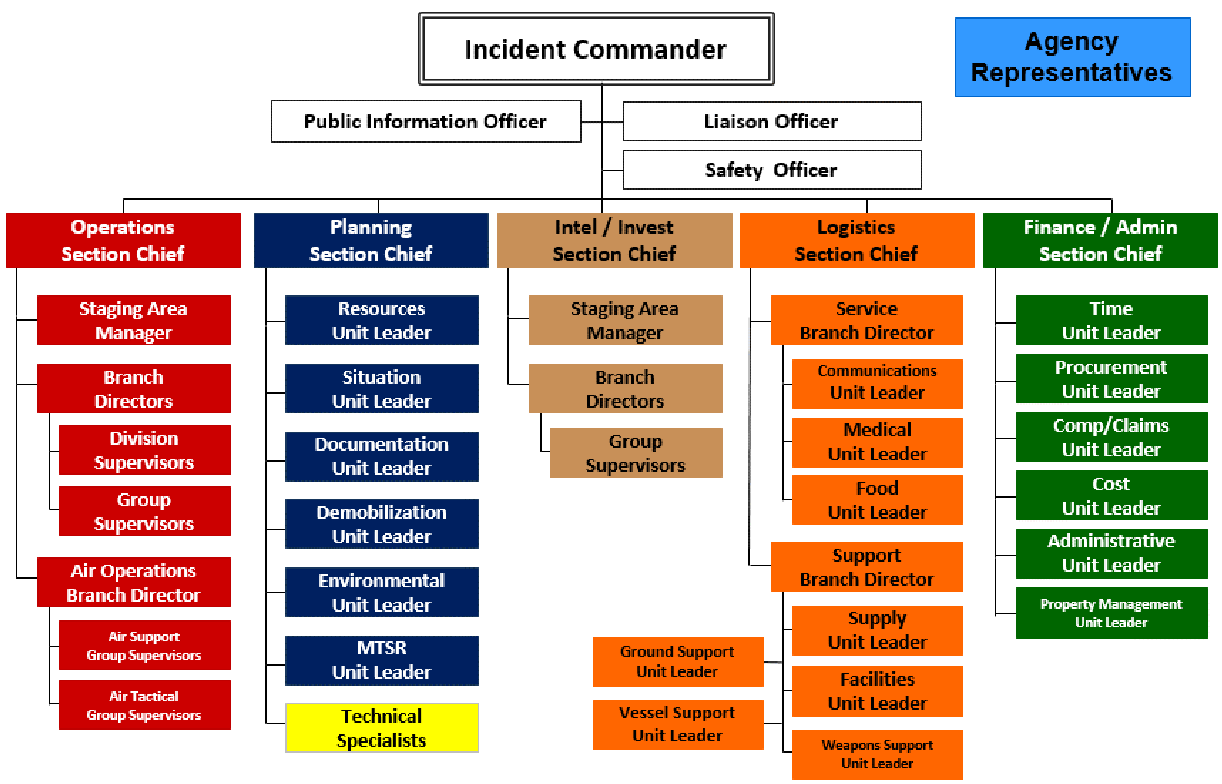
The type, size, and area of a spill will determine the response, including whether the EPA and USCG will be directly involved. Similarly, the response and ICS structure will be scaled to the appropriate level based upon the incident. As described further in Section 2.3, the majority of spills in the NW are small, the average release is 100 gallons or less, and are often cleaned up by oil spill response organizations or the state without direct involvement by the EPA or USCG. However, in the event of an unplanned release of oil or other hazardous material to the environment, response actions are taken, regardless of the size of the spill, to achieve the following objectives (NWACP Section 4500):

- Ensure the safety of citizens and response personnel;
- Control the source of the spill;
- Maximize protection of environmentally and culturally sensitive areas (including ESA-listed species and designated critical habitats);
- Contain and recover spilled product;
- Recover and rehabilitate injured wildlife;
- Manage a coordinated response effort;
- Remove oil from impacted areas;
- Minimize damage to economically sensitive areas; and
- Keep the public and stakeholders informed.

Most incidents that occur in the US are managed according to the ICS, which provides a standard framework to command, control, and coordinate emergency response through a common hierarchy and information flow (Figure 1.1). The selection and implementation of site-specific response actions are ultimately at the discretion of the Incident Command (IC). For federalized responses, the IC is led by a Federal On-Scene Coordinator (FOSC). For incidents occurring in the coastal zone where the USCG maintains and manages federal emergency response teams, the FOSC or other designated representative is the Sector Captain of the Port. The EPA manages federal response teams in the inland zone and provides an FOSC for incidents occurring inland.

The ICS can be scaled up or down depending upon the size and complexity of the emergency response. In the event of a large incident, an incident command post is established near the incident to direct the overall response. This incident management team is normally structured to include six major functional sections: Command, Operations, Planning, Logistics, Finance and Administration, and the recently added Intelligence and Investigations (FEMA 2008).

Many responses require only an Incident Commander; however, responses to large or complex incidents require management through Unified Command (UC). A UC includes, but is not limited to, an FOSC, a State On-Scene Coordinator, a representative of the Responsible Party, and Local and/or Tribal On-Scene Coordinators (NWACP Section 2000).



Source: USCG Incident Command Handbook

Figure 1-1 Oil and Hazardous Substance Response Incident Command System Structure

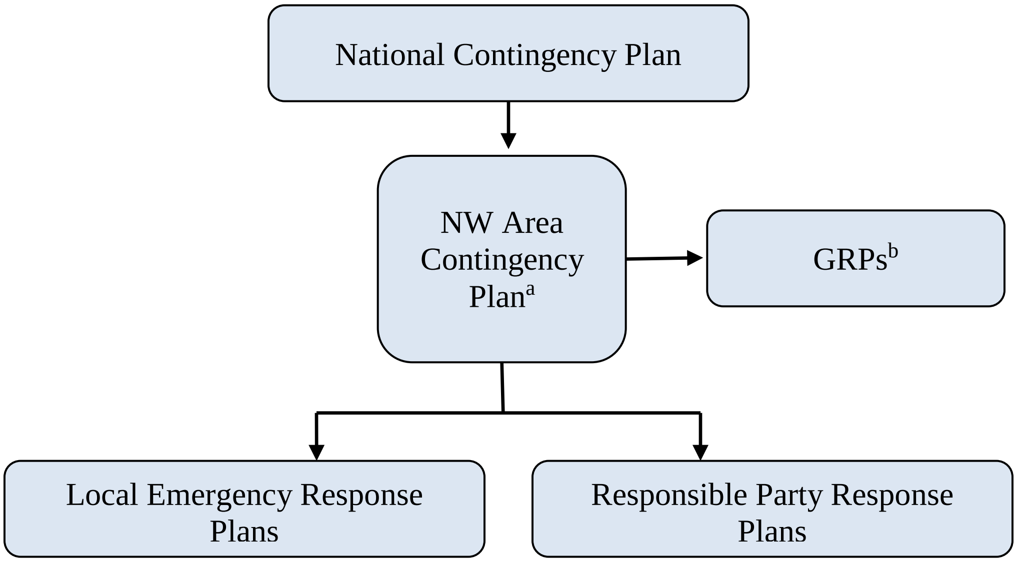
The Command, either a UC or a single Incident Commander, is responsible for selecting, prioritizing, and implementing response strategies that will meet the objectives of the NWACP as listed above. During a spill, responses are modified as environmental conditions change or additional information becomes available.

Every response strategy has uncertainties, along with potential environmental tradeoffs, that are evaluated as part of the action selection process. The spill response community relies on training and exercises to reduce uncertainties. The commanders rely upon their training and/or input from the Environmental Unit (EU) to ensure that at-risk environmental resources, such as threatened or endangered species and designated critical habitats, are properly protected within the scope of resources available or mobilized during an emergency spill response.

The Services have been identified as having roles in the response in both the EU and the Wildlife Branch in Operations. It is the policy of the NWAC that representatives of the USFWS will assume the positions of Director and Deputy Director of the Wildlife Branch. Representatives from state fish and wildlife departments will assume these positions if designated by a USFWS representative or if a USFWS representative is not available. If there is a significant marine mammal response component to an incident, a representative from the NMFS may be appointed to the position of Deputy Director. Unless otherwise indicated by the USFWS, the Wildlife Branch Director position will be delegated to the Washington Department of Fish and Wildlife (WDFW) for spills that occur within the legal boundaries of Washington State.

The Wildlife Branch Director is responsible for implementing the operational guidelines and standard of care requirements in both marine and fresh waters, including the *USFWS Best Practices for Migratory Bird Care During Oil Spill Responses (USFWS 2003b), Washington Sea Otter Response Handbook* (WDFW 2009b), and *Killer Whale Hazing and Monitoring Plan* (NOAA Fisheries 2014a). The Wildlife Branch Director will coordinate with technical staff from the National Oceanic and Atmospheric Administration (NOAA) and NMFS for spills within marine environments. At this time, there are limited wildlife operations protocols for inland or fresh water response (e.g., there is no plan in the NWACP for hazing or moving salmon that may be affected by a spill in a river). Geographic Response Plans (GRPs) (described in Section 1.2.2) are in the process of being updated to include ESA-listed species and habitats, including inland waters. The coordination of spill response planning and implementation with the requirements of the ESA is also addressed in the NWACP Section 4314: Endangered Species Act, and is discussed further in this BA, Section 1.2.2.

The final level of response planning occurs at the local level and includes vessel- and facility-specific plans. The hierarchy and relationships among the various NW spill response plans are shown in Figure 1-2.



[a] Incorporates requirements of State Master Plan, NWACP, and Federal Area Plan guidance.
[b] Includes site-specific response action methods (i.e., mechanical and non-mechanical), locations of sensitive resources (e.g., wildlife haul out areas and nesting areas), and notification strategies to assist in immediate and effective response actions to protect human health and the environment; guidance provided in GRPs is developed separately from the NWACP to inform decision making during a spill response at the local level.

Figure 1-2 Integrated Oil and Hazardous Substance Spill Response Planning

Emergency spill response under the NWACP focuses on the implementation of both mechanical and non-mechanical countermeasures as described in Chapter 9000. The NWACP incorporates guidance on the use of non-mechanical countermeasures[9] because of their greater potential for effects on the environment and resources. Furthermore, it describes the decision process leading to the selection of a non-mechanical countermeasure to evaluate tradeoffs associated with implementation (i.e., magnitude of environmental harm versus benefit). Additional details are provided in Section 1.2.3 and in supplemental documents to the NWACP such as GRPs (discussed in Section 1.2.2). A list of the supplemental documents that may be utilized during a response action, including a list of GRPs, is provided in Appendix A.

1.2.2 Role of Geographic Response Plans

The NWACP is supplemented by GRPs, which contain spill response strategies for specific coastal and inland waters of Washington, Oregon, and Idaho (Figures 1-3a, 1-3b, and 1-3c, respectively). GRPs are plans that guide spill response and include tactical response strategies tailored to a particular shore or waterway (Ecology 2014). They are considered part of the NWACP but are distributed and revised separately (EPA 2017; Ecology 2014). GRPs are developed at a much smaller scale than the NWACP, with regional GRPs typically covering less than 483 kilometers (km) (300 miles) of shoreline and describe use of individual strategies on a small scale (e.g., a stretch of shoreline). They are intended to facilitate the immediate (i.e., 12 to 24 hours post-spill)

[9] Non-mechanical countermeasures includes the application of chemical dispersants, other chemical agents, and *in situ* burning.

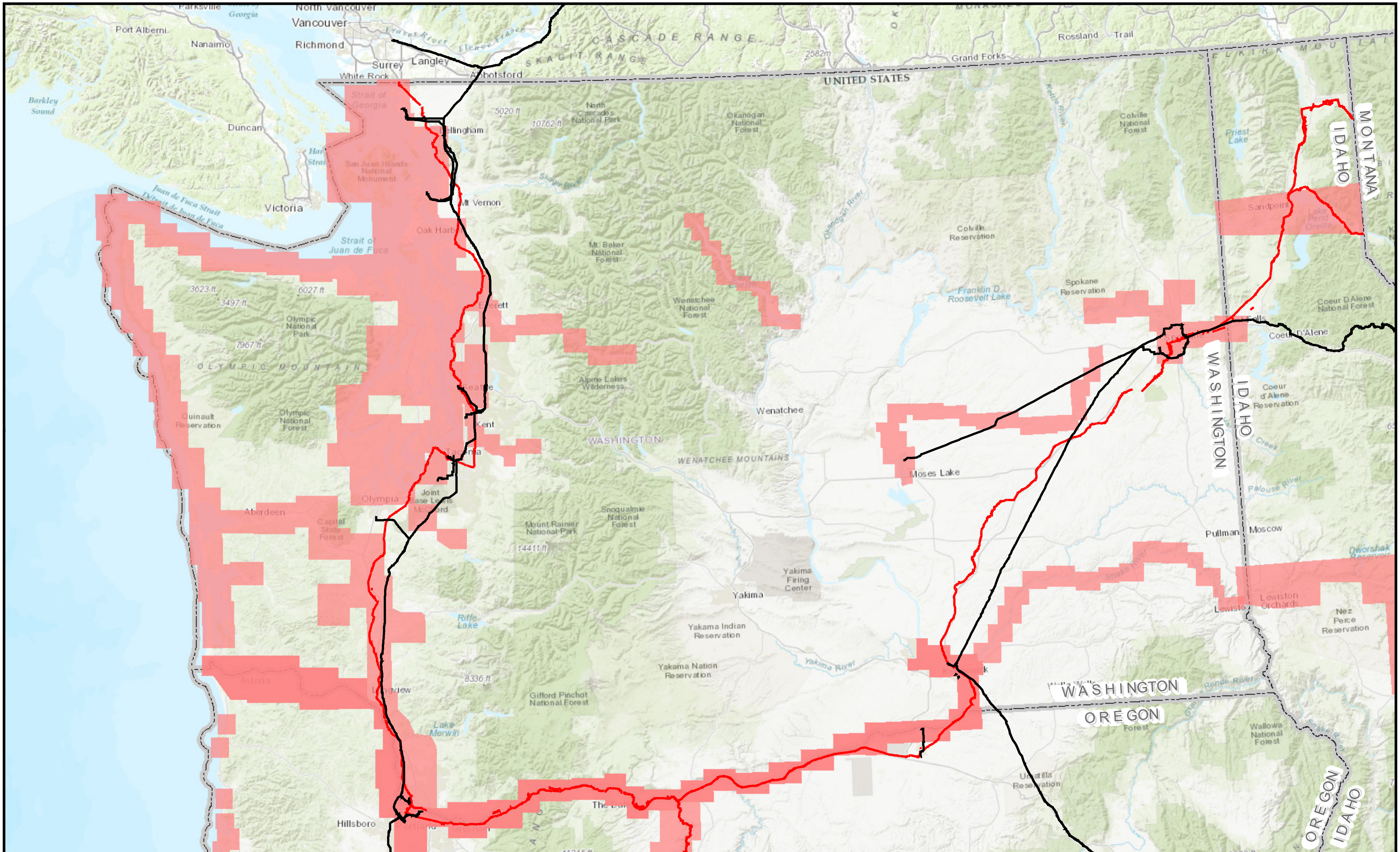
response to a release of persistent oil. GRPs can be accessed through the same website that provides the NWACP.[10]

GRPs are developed cooperatively by the EPA, USCG, and members of the NWAC, with the respective states taking the lead. Revisions can be made at any time, and the states have begun working with the Services to improve integration of details about listed species and habitats. The Washington marine waters GRPs, including the GRP for the lower Columbia River (LCR), are maintained by Ecology and the USCG. GRPs for the Spokane, Snake, and Middle Columbia Rivers are jointly maintained by Ecology and the EPA (Region 10). For Oregon, coastal GRPs are maintained by ODEQ and the USCG, and the Lower Deschutes River GRP is maintained by the EPA (Region 10). GRPs for Idaho are maintained by the EPA (Region 10).

GRPs identify natural, cultural, and significant economic resources in a specific region and describe and prioritize response strategies to minimize damages to these resources during an emergency response. Within the GRPs, sensitive resources (or "resources at risk") are broadly defined to include human and cultural resources, as well as species and habitats of concern (i.e., not just ESA-listed resources). GRPs are updated periodically in response to changing local conditions and public input. The GRPs have specifically been developed as guidelines for response actions at the local scale, and strategies described in GRPs are developed to be consistent with the NWACP and NCP. The GRPs themselves are not considered independently in this BA; however, all actions and strategies described in GRPs are directly or indirectly assessed by this ESA Section 7 consultation. Areas currently covered by GRPs are shown in Figures 1-3a through 1-3c.

As GRPs are written or updated, trustee agencies are consulted to ensure that any information regarding resources at risk is accurate and complete. When a spill happens at a location covered by a GRP, federal and state responders refer to the GRP to answer several questions: whether there are water intakes that should be notified, where booms should initially be placed, and what resources may be impacted by the spill. Responders do not have the expertise to ensure that spill response actions will not unnecessarily damage resources at risk. Therefore, responders rely on trustee advice to achieve a net environmental benefit; they use the GRPs to ensure that they coordinate with the correct trustee agency regarding response tactics. For example, the Clearwater/ Lochsa GRP specifically identifies summer steelhead as being threatened under the ESA and potentially present in the area. This information triggers responders to contact the NMFS and request assistance in making response decisions.

[10] www.rrt10nwac.com



Unit Train

Petroleum Pipeline

Geographic Response Plan Sector Coverage

State

Data Sources:

WDOE 2014;
EPA 2017; ESRI 2014

Figure 1-3a
Area in Washington Covered by Geographic Response Plans

0 20 40 80
Miles

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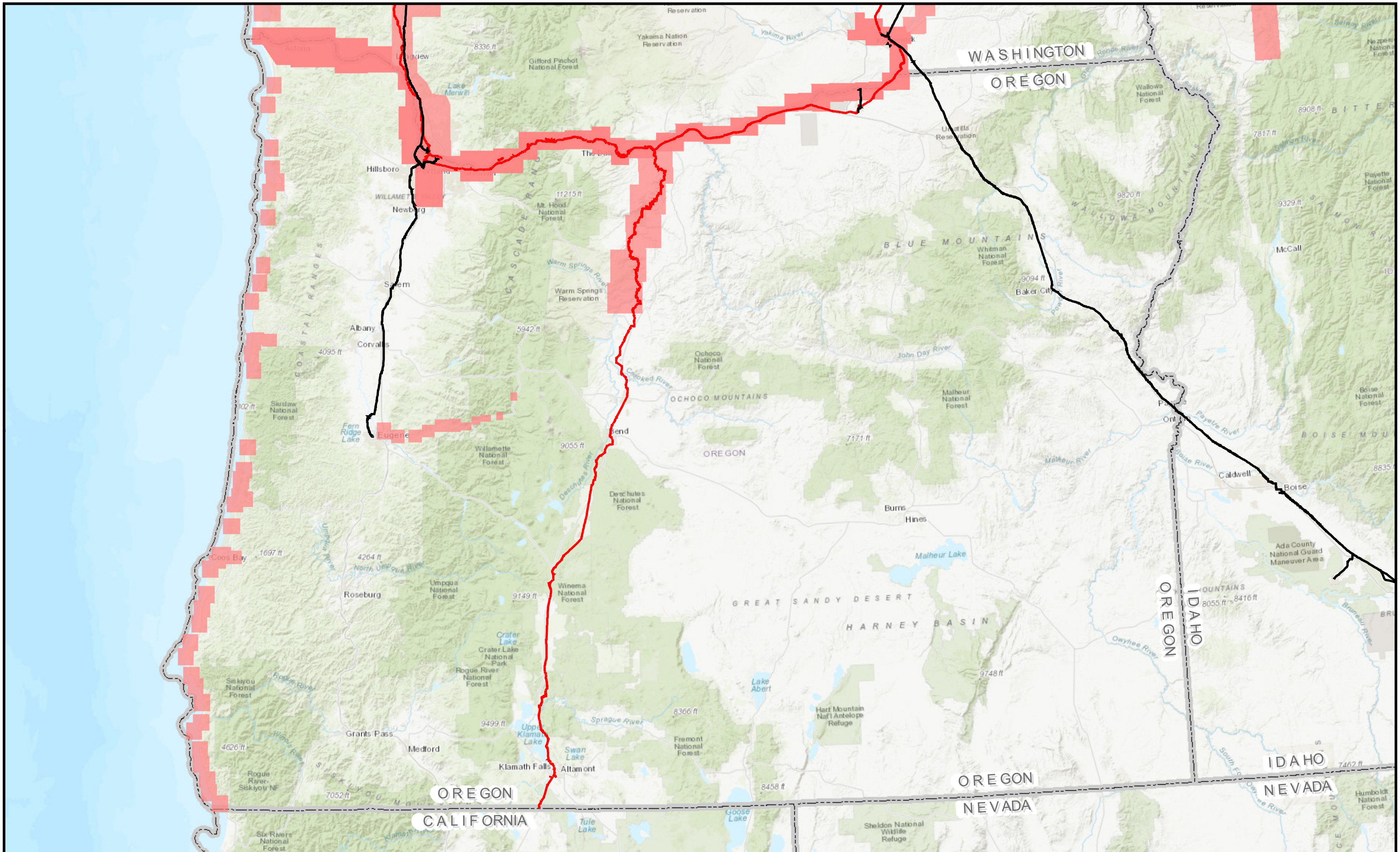

Data Sources:

ODEQ 2015;
EPA 2017; ESRI 2014

Figure 1-3b
Area in Oregon Covered by Geographic Response Plans

0 25 50 100
Miles

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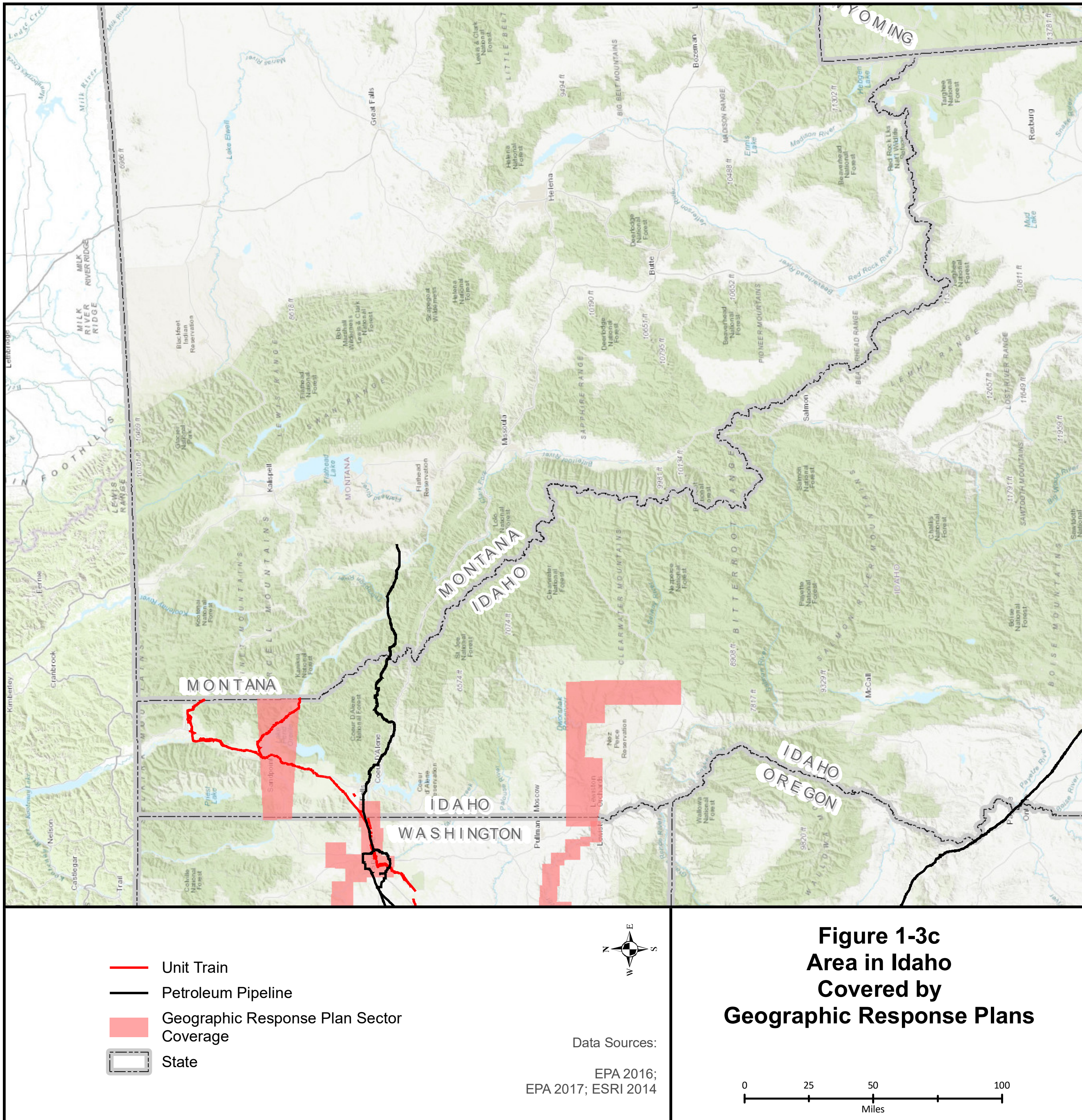


Figure 1-3c
Area in Idaho Covered by Geographic Response Plans

1.2.3 Coordination of Response Activities with the Endangered Species Act

A national interagency memorandum of agreement (MOA) between the EPA and USCG and the Services (EPA et al. 2001) is included by reference in the NWACP (EPA 2017). The purpose of this MOA is to provide a process for coordination with the Services to protect ESA-listed species and critical habitats during an emergency response. The MOA specifies when and how the Services will be engaged and addresses the roles and responsibilities of each agency during the pre-spill planning activities, spill response, and post-spill activities. The purpose of the MOA is to provide a framework to avoid or minimize adverse effects on ESA-listed species and critical habitats from response actions undertaken by the EPA and/or USCG. The MOA also provides a process for conducting ESA Section 7 consultations before and after incidents and recommendations for addressing potential impacts to ESA-listed species or critical habitat.

In accordance with the MOA, prior to an incident, the Services are encouraged to participate in developing response methods that are incorporated into the NWACP, guidance documents, and in periodic response training.

Once a spill has occurred, the Services are notified consistent with Section 9404 of the NWACP, emergency consultation processes are invoked (if necessary), and representatives of the Services may join the incident management team to advise the FOSC. The FOSC may contact the Services via the NOAA Scientific Support Coordinator and US Department of the Interior (DOI) Regional Environmental Officer, who engages the Services' assistance in developing methods to help avoid and minimize impacts to ESA-listed species and their critical habitats. In most cases, impacts from the response do not rise to the level of take, thus formal consultation is not required. Nonetheless, as part of the emergency consultation process, the EPA and/or USCG must document impacts and request concurrence from the Services after the response is concluded. Should response activities cause an adverse effect on a listed species or critical habitat, the USCG and/or EPA provide documentation of the injuries that occurred, the recommendations that were made, and the results that will be used as part of a subsequent formal consultation process that will be conducted after the spill response is complete (see 50 CFR 402.05). The Services prepare a post-spill biological opinion documenting whether or not the impacts from the response action jeopardized the survival and recovery of the species and/or destroyed critical habitat. Figure 1-4 illustrates how response planning is coordinated with the requirements of the ESA.

As described in Section 9404 of the NWACP, once contact with the Services is made, the FOSC provides initial information regarding spill response actions to the Services within 24 hours of initiating emergency response activities. The Services then acknowledge receipt of the notification and provide information to the FOSC on any species and/or habitats that may occur in the area and may be affected by the response activities, as well as recommended BMPs or other measures to avoid or minimize potential effects on those resources. The Services should provide any proposed conservation measures to the FOSC no more than 24 hours after receipt of the FOSC's formal notification to the Services that a spill response has been initiated. The EU's resources at risk specialists are another source of information for the FOSC. The FOSC continues to coordinate with the Services as appropriate throughout the emergency response action. Staff from the Services may also be involved with the long-term cleanup phase to ensure that regulatory mandates are followed.

Long-term response actions may include:

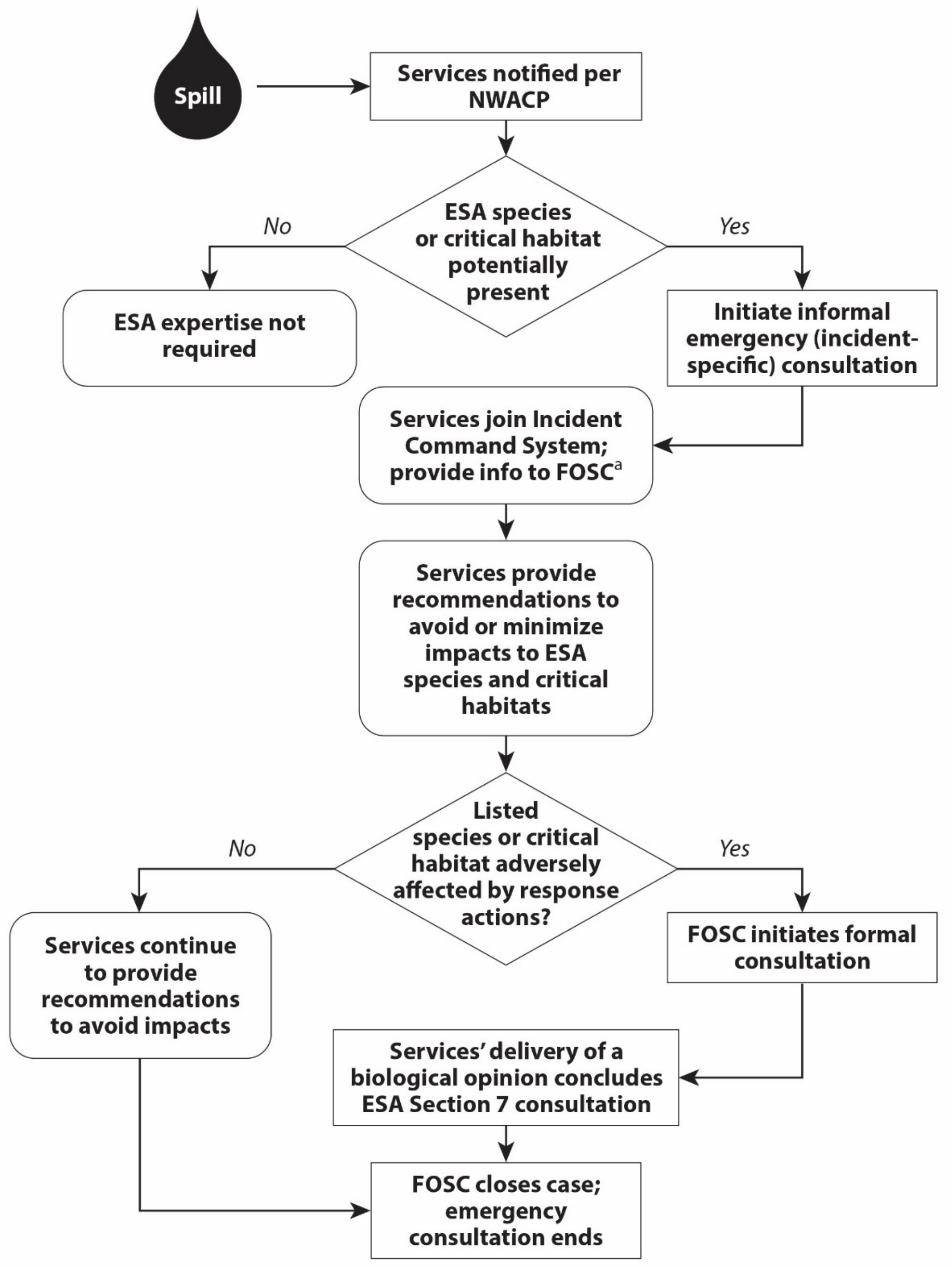
- Evaluation of cleanup/decontamination options;
- Implementation of cleanup alternatives; and
- Long-term monitoring or remediation of the impacted area, if necessary.

1.2.4 Decision Process for Use of Non-Mechanical Countermeasures

Spill responses in the NW can be hampered by a number of factors, such as the distance between the spill and response equipment and personnel, access, weather, sea conditions, and topography. Dispersants or *in situ* burning can help minimize the impacts of oil when mechanical recovery is limited and the risk of environmental harm from the oil is great. The use of dispersants (chemical countermeasures) and *in situ* burning (a chemical countermeasure when an accelerant is used) for oil spills requires an additional decision-making process under the NCP and NWACP (EPA 2017) that is not applicable to mechanical countermeasures.[11] The use of dispersants does not apply to hazardous materials other than oil, and the use of *in situ* burning does not apply to hazardous materials other than crude or refined petroleum products.

No other non-mechanical countermeasures have been pre-approved for use in the NW; any proposal for such countermeasures would require incident-specific RRT 10 approval and input from the Services to ensure that effects on species are considered during selection of a response action. Those countermeasures include shoreline cleaning agents, herding agents, and solidifiers.

[11] Mechanical countermeasures are not specifically discussed in Section 1 because the decision process for using mechanical countermeasures is adequately described in this section (above).



Note: Adapted from EPA (2001).

[a] Services refer to USFWS and NOAA Fisheries.

Figure 1-4 Coordination between Response Planning and Implementation and the Endangered Species Act

Decisions regarding the use of chemical countermeasures (e.g., dispersants) must take into account the resources at risk, the size of the spill, the physicochemical properties of the type of oil spilled, the feasibility of the response action, and site-specific conditions (e.g., waterbody type, weather conditions, and whether sensitive species are in the vicinity of the oil spill). Considerations for biological resources and their habitat include:

1. Temporality – What is the expected recovery time for potentially oiled habitat or fish and wildlife resources? How long might the oil remain in impacted habitats before reaching a “safe” concentration? What is the duration that listed species are present in potentially oiled habitat; what season(s) are they present; and are they present at the time of the spill (and response)?
2. Substrate – Is it feasible to clean the oiled substrate along the shoreline? Will cleanup result in greater injury to important (e.g., critical) habitat than leaving the hazardous material in place?
3. Habitat quality and pattern – Is the potentially oiled habitat isolated and/or sparsely distributed over the landscape (e.g., critical habitat)? Is the habitat of very high quality? Will off shore chemical countermeasures reduce habitat quality more than oil on the shoreline?

1.2.4.1 Chemical Dispersion

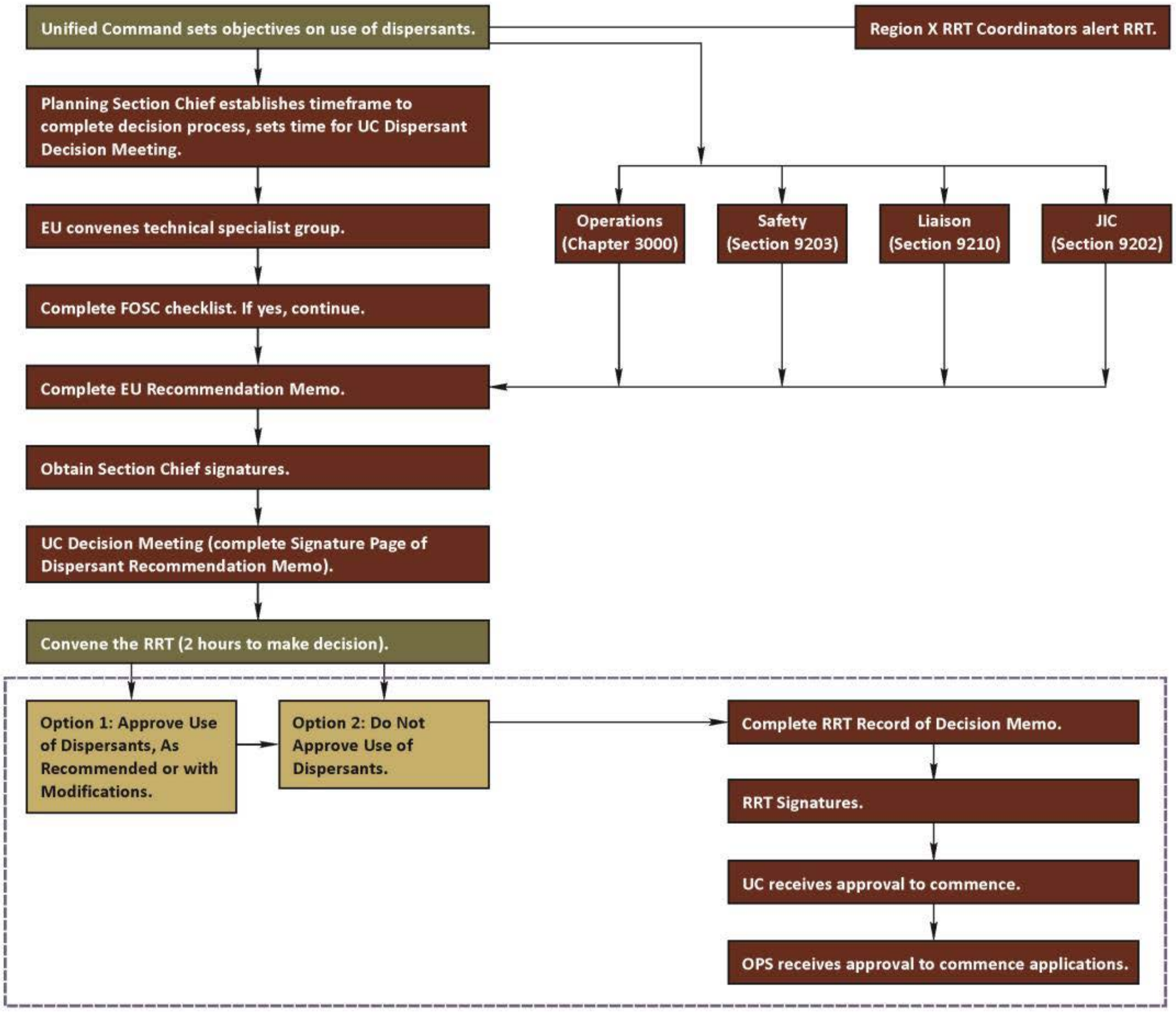
The overarching criterion for decision-making with regard to the use of dispersants is that the dispersion of oil must be less harmful than allowing oil to reach sensitive areas or to affect marine life at the ocean surface (e.g., sea birds, marine mammals). Figure 1-5 shows the decision process flow chart regarding the use of dispersants in a Case-by-Case Authorization Zone during an emergency response action.

The dispersant use policy in the NWACP (Sections 4610 through 4616) defines the zones where the use of dispersants is either pre-authorized, decided on a case-by-case basis, or not approved. These areas are described below and can be viewed online.[12]

No Dispersant Use Zones are areas where dispersants will never be applied. These areas include:

- Marine waters that are both less than 3 nautical miles from the US coastline and less than or equal to 10 fathoms (60 feet [ft]) in depth;
- Marine waters south of a line drawn between Point Wilson (48º 08' 41" N, 122º45' 19" W) and Admiralty Head (48º 09' 20" N, 122 40' 70" W) (border defining primary entrance to Puget Sound from the Pacific Ocean); and
- Freshwater environments (i.e., the inland zone).

[12] To view dispersant application zones (Pre-Authorization, Case-by-Case Authorization and No Dispersant Use Zones), use the following web address:
http://waecy.maps.arcgis.com/apps/webappviewer/index.html?id=ff1d0cd00e6641209e25b9ee56df46fc



Source: NWACP Section 4610 (EPA 2017)

Key: EU = Environmental Unit; EUL = Environmental Unit Lead; FOSC = Federal On-Scene Coordinator; JIC = Joint Incident Command, OPS = Operations Section; RRT = Regional Response Team; UC = Unified Command

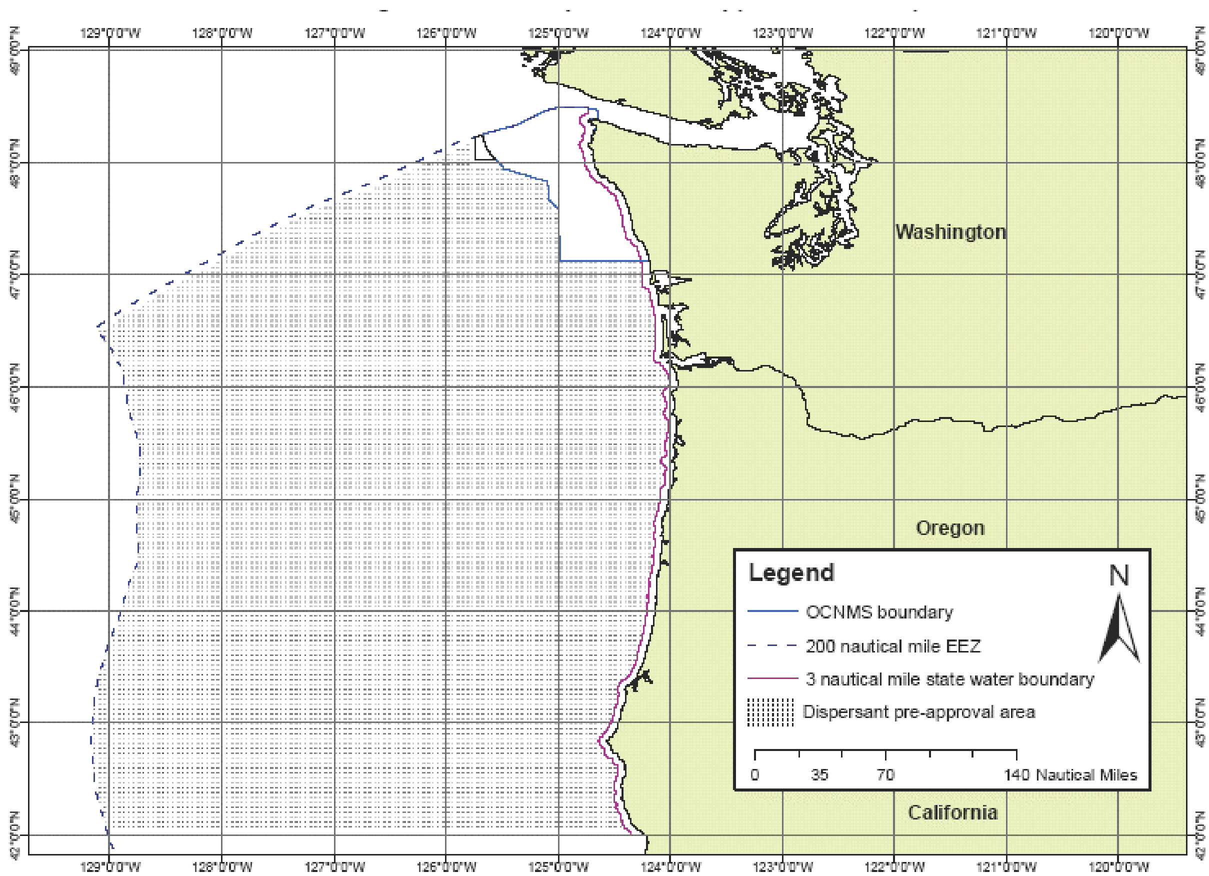
Figure 1-5 Decision Process Flow Chart Regarding the Use of Dispersants in a Case-by-Case Authorization Zone

Case-by-Case Authorization Zones are areas where RRT 10 must approve each application of dispersants, which is done on the first day after a spill occurs and includes:

- All US marine waters in Puget Sound and the Strait of Juan de Fuca that are both within 3 nautical miles from the coastline or an island shoreline and greater than 10 fathoms (60 ft) in depth;
- Waters designated as a part of a National Marine Sanctuary and waters that are part of the Makah Tribe Usual and Accustomed marine area and that are also greater than 10 fathoms (60 ft) in depth;
- The Strait of Juan de Fuca and North Puget Sound from Point Wilson to Admiralty Head and north, and greater than 10 fathoms (60 ft) in depth; and

- Waters within 5 km (3 miles) of the border of the country of Canada or the Makah Tribe Usual and Accustomed marine area.

In the absence of pre-authorization, the FOSC must formally request to use dispersants in Washington or Oregon's marine waters.[13] The FOSC works with the responsible party, NOAA's Scientific Support Coordinator, and the ICS EU, which includes other resource agencies, to complete a comprehensive, detailed checklist and application, and the FOSC then submits those documents to the incident-specific RRT 10 for expedited approval. This process is shown in Figure 1-6. The checklist and application document the conditions under which the dispersant would be applied and the environmental tradeoffs associated with the decision. RRT 10 considers each request on a case-by-case basis. The EPA, state, and tribal representatives to RRT 10 with jurisdiction must concur, modify, or reject the request. The DOI and NOAA RRT representatives must be consulted before the authorization decision is made. The Services may also be consulted informally throughout the decision-making process via the emergency consultation process identified in the MOA (EPA et al. 2001).



Source: NWACP Section 4612 (EPA 2017)
Key: EEZ = Exclusive Economic Zone; OCNMS = Olympic Coast National Marine Sanctuary

Figure 1-6 Dispersant Pre-Authorization Zone in the Northwest

[13] Idaho has no marine waters; therefore, dispersants will not be applied in waters of that state.

Dispersant Pre-Authorization Zones are areas where the FOSC has the authority to apply dispersants without incident-specific RRT 10 approval. These areas (shown on Figure 1-6) include US marine waters 3 to 200 nautical miles from the coastline outside Puget Sound and the Strait of Juan de Fuca or an island shoreline, except for waters designated as a part of a National Marine Sanctuary and the Makah Tribe Usual and Accustomed fishing areas.

Prior to an FOSC exercising their authority to apply dispersants in a pre-authorized area, they must complete a checklist[14] verifying that:

- The oil is dispersible (based on the oil type, location, and state of weathering and sea conditions);
- The planned dispersant is on the NCP Product Schedule of allowed dispersants;[15]
- Mechanical response options alone will be inadequate to contain and recover spilled oil, and the dispersant application would provide the most environmental protection to potentially exposed wildlife and shorelines;
- Appropriate equipment is available for dispersant application and monitoring;
- If needed, staff will be available to observe wildlife that should be avoided; and
- Natural Resource Trustees[16] have been contacted regarding threatened and endangered species and essential fish habitat that have the potential to be impacted by the oil spill and dispersant application response action.

Subsea dispersant use is not a response action identified in the NWACP because the NW area has no offshore structures such as oil wells or drilling facilities.[17]

1.2.4.2 *In Situ* Burning

Decision-making regarding *in situ* burning of oil (NWACP Section 4617) should take into account information similar to that considered for dispersant use. Burning of oil may be considered if mechanical countermeasures alone would be ineffective at collecting and removing oil from the aquatic environment; burning is feasible (based on the oil type, location, and state of weathering and sea conditions); and burning can be conducted at a safe distance from populated areas or sensitive resources. Prior to any *in situ* burning operation, the FOSC will use the decision tree shown in Figure 1-7 to guide the decision-making process. This decision process includes notification of Trustees and Tribes, as appropriate, and establishing a group of technical experts (e.g., resource trustees, agency representatives, and industry/consultant technical experts) to help evaluate whether the use of *in situ* burn is feasible and appropriate for the specific incident (NWACP Section 9407.1.3). This process will include coordination with the Services, who provide recommendations for how to avoid or minimize impacts to threatened and endangered species or critical habitats from burning oil or burning activities.

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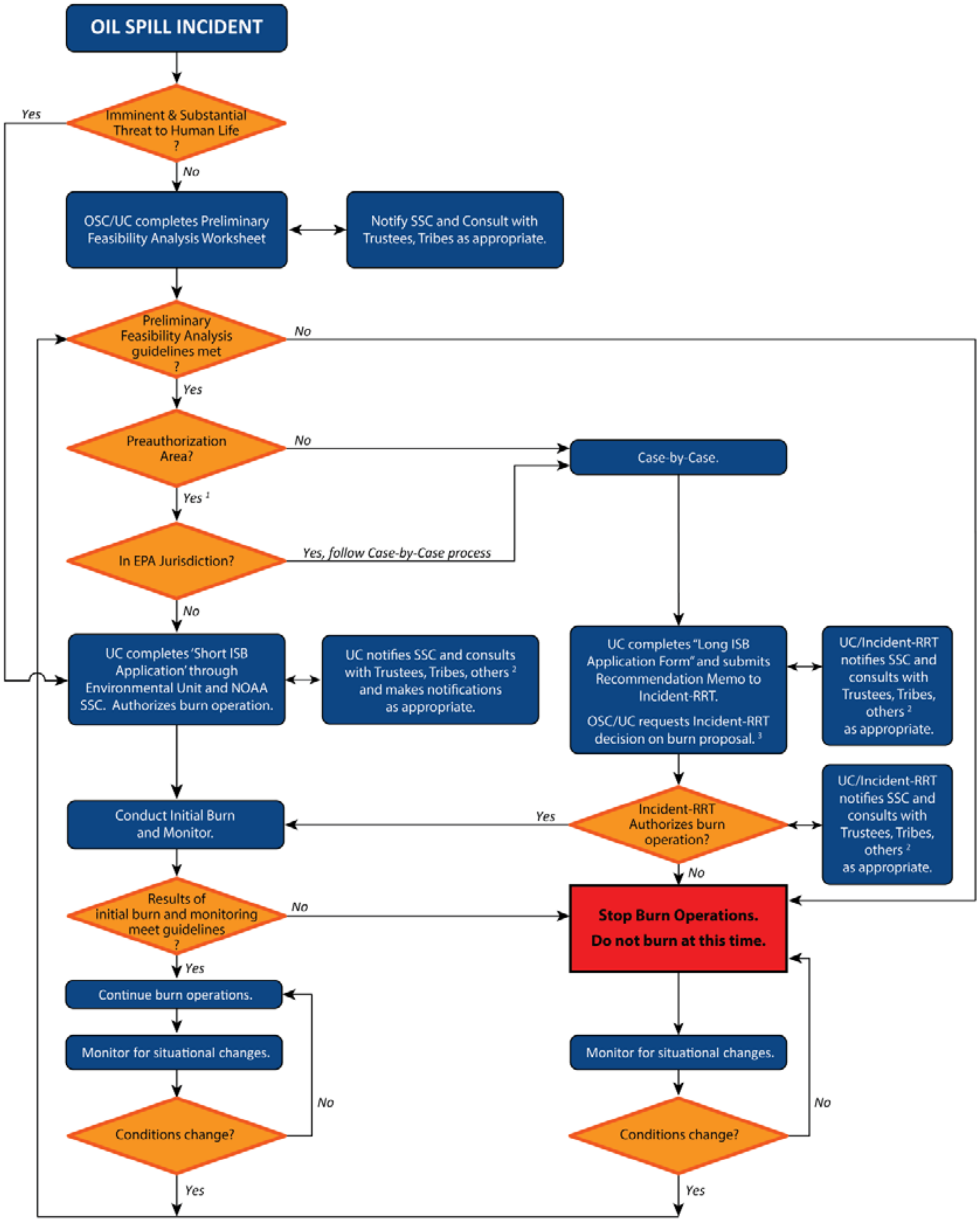
[14] See Section 9406 of the NWACP (EPA 2017).

[15] Currently, only Corexit® EC9500A is stockpiled for use in the NW area (making it the most likely product to be used), although other dispersants on the NCP Product Schedule could be applied.

[16] The NCP defines Natural Resource Trustees as federal, state, or tribal officials who are to act on behalf of the public to manage and control natural resources.

[17] As a result, subsea dispersant applications will not be evaluated in this BA.



Source: NWACP Figure 9407-1 (EPA 2017)
Notes:
1 Indicates that the initial burn decision will be made by the UC.
2 Other includes but not limited to: State & Local Health Departments, Air Agencies, and Emergency Management Agencies.
3 Incident RRT approval not required if burning agent not used.
Key: ISB = *in situ* burning; OSC = On-Scene Coordinator; RRT = Regional Response Team; SSC = Scientific Support Coordinator; UC = Unified Command;

Figure 1-7 Regional Response Team 10 *In Situ* Burning Decision Tree

The NWACP establishes two *in situ* burning areas—Pre-Authorization and Case-by-Case Authorization Areas—that delineate locations and conditions under which burning operations may occur.

Pre-Authorization Area —*In situ* burning is pre-authorized for any on-water area that is more than 5 km (3 miles) from human population, defined as 100 or more people per square mile.[18] The EPA does not intend to utilize preauthorization in the inland zone; decisions about use of *in situ* burning in inland areas more than 5 km (3 miles) from human population will be decided on a case-by-case basis. Within the pre-authorization area under proper conditions, FOSCs have the authority to ignite the spilled oil either with or without using burning agents without RRT approval.

Case-by-Case Authorization Areas—*In situ* burning is decided on a case-by-case basis for any areas within 5 km (3 miles) of human population and in all inland areas under EPA jurisdiction.[16] FOSCs must receive incident-specific RRT approval for *in situ* burns in case-by-case areas where use of burning agents are being considered. The following criteria are considered when deciding whether *in situ* burning is appropriate:

- Weather and oil conditions are conducive to burning;
- Mechanical recovery is inadequate to contain and recover spilled oil;
- Potential impacts of smoke and burnt oil residues have been considered;
- Burning the oil provides the greatest human and environmental protection;
- The appropriate materials are available for ignition and monitoring of oil and burn residues; and
- Natural Resource Trustees have been contacted regarding threatened and endangered species and essential fish habitat in the vicinity of the *in situ* burn.

1.3 Emergency Consultation

Emergency consultation under the Section 7 regulations will be required for response actions that are not within the scope of this programmatic consultation. As noted in the MOA (EPA et al. 2001), the Services acknowledge that oil spill response actions qualify as an emergency action. The NWACP says that the nature of a response does not allow for a normal consultation process so emergency consultation processes are followed as described in the NCP (50 CFR 402.02). The MOA provides guidance on how the EPA, USCG, USFWS, and NMFS will work collaboratively before, during, and after an emergency and provides templates for required documentation. The federal action agencies have initiated this consultation to interact with the Services on the majority of spill response actions. The goal of this consultation is to eliminate the need for emergency consultation when these common response actions are implemented during typical spills in the NW. Those response tools are listed and described in Table 2-2.

Coordination may still be needed for many spills (e.g., response needed in salmonid critical habitat) but emergency consultation may be avoided.

[18] View a map of the *in situ* burning pre-authorization and case-by-case areas at this link: https://waecy.maps.arcgis.com/apps/webappviewer/index.html?id=13a6c63a1f9a4385837262 92e0adb816

The few conditions under which emergency consultation will still be needed are limited to the following:

- Spills occurring outside the Action Area
- When the RRT is activated to make a decision on using a chemical countermeasure in navigable water (NCP Subpart J)
  - Use of dispersants in areas outside the dispersant use pre-authorization zone (NWACP Sections 4000 and 4612); see Figure 1-6 for pre-authorized dispersant use area.[19]
  - Use of chemicals other than dispersants (i.e., shoreline cleaners, solidifiers, bioremediation) (NWACP Section 4000).
  - Use of burning agents (a.k.a. accelerants) to initiate and/or sustain *in situ* burns in the case-by-case *in situ* burn area and in the inland zone (NWACP Section 9407).[20]

1.4 Summary

The EPA and USCG, as the federal action agencies, are authorized under the NWACP to coordinate multi-jurisdictional emergency response to the spill of oil or hazardous material within the NW. The NWACP was developed to improve spill response effectiveness and provide consistency between NW spill response protocols and guidance published at local (e.g., GRPs), state, and national (i.e., NCP) scales.

Spills of hazardous material are regulated under the Comprehensive Environmental Response, Compensation, and Liability Act, which grants authority to action agencies to respond to any such spills. Releases of oil that might impact waters of the US are regulated under the CWA, which grants authority to the action agencies to respond. Jurisdiction for spills of oil that will not impact water lies with the state where the spill occurs.

The NWACP is organized in a series of chapters providing specific protocols to be followed by spill responders at various levels of the ICS, including the FOSC. The NWACP also identifies many conditions under which the Services are to be contacted or consulted on matters of spill response planning, execution, and outcomes, consistent with the NCP and the MOA (EPA et al. 2001).

This BA focuses on the potential effects of spill response actions carried out under the NWACP within the proposed Action Area (see Section 2 for a description of the Action Area). Specifically excluded from this BA, however, is an evaluation of the effect of the spilled material itself on ESA-listed species or designated critical habitat. Within the context of this BA, the spilled material is considered part of the baseline condition, and thus not subject to this consultation—with certain exceptions as follows. For example, dispersed oil or burnt residues generated by non-mechanical countermeasures (i.e., chemical dispersant application, *in situ* burning) are subject to evaluation

[19] Dispersants are pre-authorized for use only in US marine waters 3 to 200 nautical miles from the coastline outside Puget Sound and the Strait of Juan de Fuca or an island shoreline, except for waters designated as a part of a National Marine Sanctuary and the Makah Tribe Usual and Accustomed fishing areas. Use of dispersants in all other areas require incident-specific RRT approval.

[20] *In situ* burning is decided on a case-by-case basis for any areas within 3 miles of human population and in all inland areas under EPA jurisdiction.

because exposure to these products would not occur in the absence of the spill response. Decision tools provided by the NWACP for non-mechanical countermeasures are intended to maximize effectiveness of such measures and to minimize effects on valued resources and human populations. These actions, in addition to all others, are discussed in more detail in Section 2.

2 Proposed Action

This section discusses elements of the NWACP that may result in effects on ESA-listed species. Section 2.1 describes the Action Area, where spill response actions are most likely to occur, and the habitats potentially affected by those response actions, and Section 2.2 describes the potential response actions specified in the NWACP.

The information provided in Section 2 is compared with information about specific ESA-listed species and critical habitats (Section 3) to evaluate potential effects from the action (Section 4), then evaluate cumulative effects (Section 5), and ultimately make a determination of effects (Section 6).

2.1 Action Area and Associated Habitats

This section describes the Action Area and the habitats within the Action Area that may be affected by NWACP response actions.

It is the intent of the federal action agencies to minimize impacts that emergency response to an oil spill or spill of other hazardous substance may have on species listed federally as threatened or endangered and on proposed or designated critical habitat. Although the majority of oil in the NW is still transported through marine waters via tank ship, the amount of oil transported over inland areas of the NW has increased significantly over recent years (e.g., transport of Bakken crude oil from North Dakota and Montana via pipelines and railways) (Ecology 2015).

2.1.1 Description of the Action Area

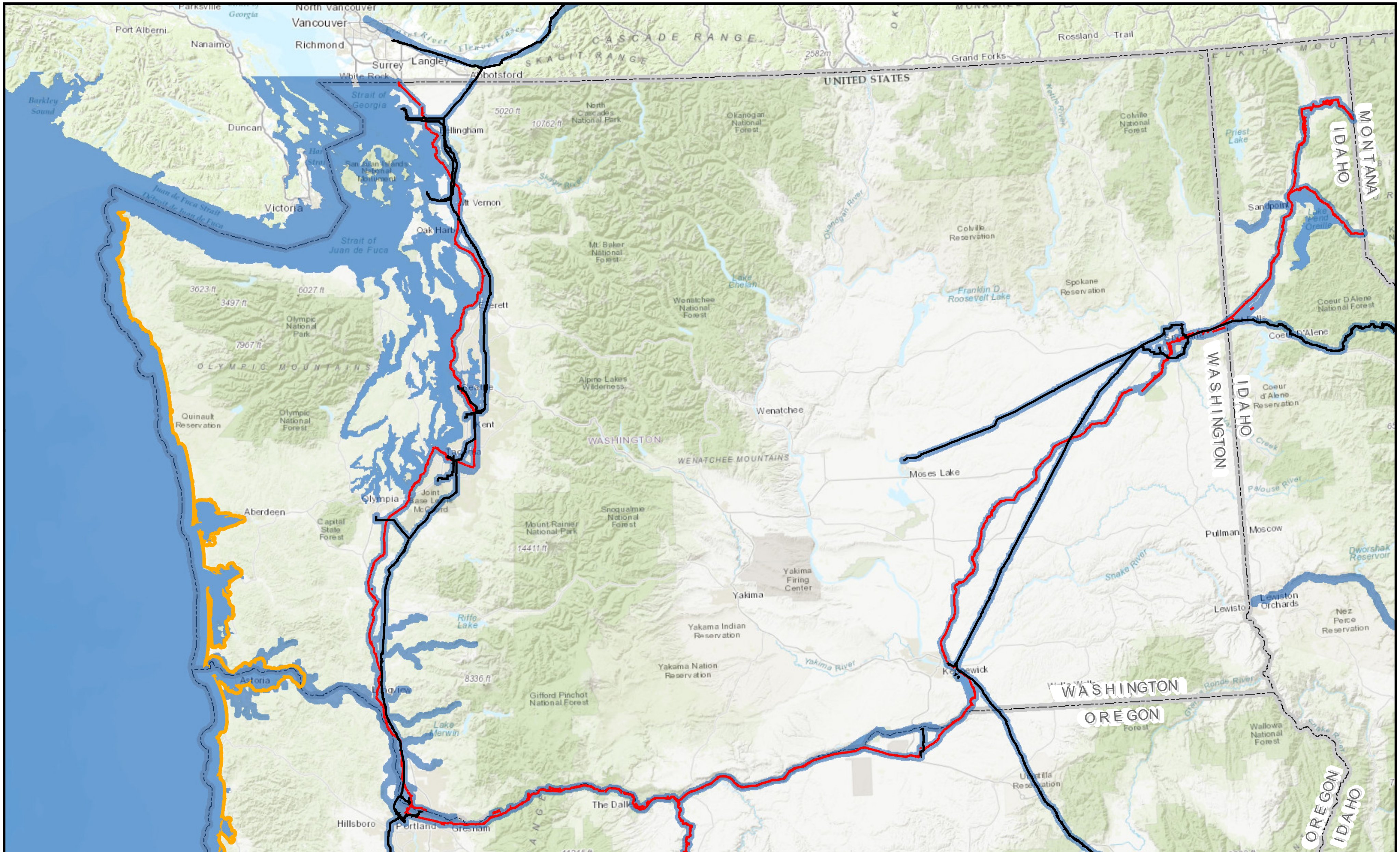
The NWACP covers the entire NW. However, to provide a reasonable focus for this consultation, the Action Area is defined in this BA as areas within the NW that have a higher risk of larger oil spills (>11,000 gallons),[21,22] which correlates with hazardous liquid pipelines, high capacity rail corridors (carrying unit trains of crude oil), and commercial shipping waterways, including the entire coastal zone out to

[21] The limit of 11,000 gallons is the approximate volume of material carried by a large tanker truck.
[22] According to the NCP, major oil spills are classified as >100,000 gallons in the marine zone and >10,000 gallons in the inland zone.

the extent of the EEZ and along the Columbia River downstream of its confluence with the Snake River. This is not to say that the proposed action is limited to spills of 11,000 gallons or more, but rather that this metric has been used to define the boundary of the Action Area. This BA addresses spills of hazardous material and oil spills greater than 500 gallons that would trigger a federal response. This criterion is a metric used within the response community to identify and prioritize response planning.

In the marine zone, the assumption is that the primary causes of oil spills are vessel grounding or collisions. However, in the NW the majority of spills come from derelict vessels, commercial vessel fuel transfer operations, bilge discharges from recreational and commercial fishing vessels, and non-point source pollution. Although most reported spills in the marine environment are less than 42 gallons and no spills greater than 10,000 gallons occurred between 2002 and 2016, the potential for spills to occur increases in areas with greater vessel traffic, including shipping lanes and shipping activity (e.g., the Port of Seattle, and vessel traffic to Vancouver and other ports in British Columbia). Similarly, in the inland zone although most spills are small and do not threaten surface water, areas at greater risk for spills include areas with increased vessel traffic (e.g., on the Columbia River) and along pipeline and high-capacity rail corridors.

A 1-mile buffer has been extended on both sides of the high-volume transportation corridors (including waterways, pipelines, and railways carrying unit trains) and 1 mile inland along the coast. The buffers are intended to include staging areas that would be utilized during a response action and associated ingress/egress. The buffers will provide a range of staging area and access options to reduce potential impacts on critical habitat during a response. The buffer also extends 32 km (20 miles) downstream of locations where pipelines or railways carrying unit trains cross major waterways to provide a conservative estimate of the downstream area that might be affected by a spill response (Windward et al. 2017). Waters downstream of intersections with high-risk areas are included in the Action Area because a spill response will not cease at the extent of the 1-mile buffer; rather, the spill response actions will continue downstream as necessary to contain a spill. Species outside of the high-risk corridors are considered less likely to be impacted by the response to spills because of the lower likelihood of a large spill occurring outside of the corridors. Figures 2-1a, 2-1b, and 2-1c show the Washington, Oregon, and Idaho portions of the Action Area, respectively.



Unit Train
Petroleum Pipeline
Coastal 1-mile Inland Buffer
Action Area
State

Data Sources:

EPA 2018; ESRI 2014

0 20 40 80
Miles

Figure 2-1a
Action Area in
Washington

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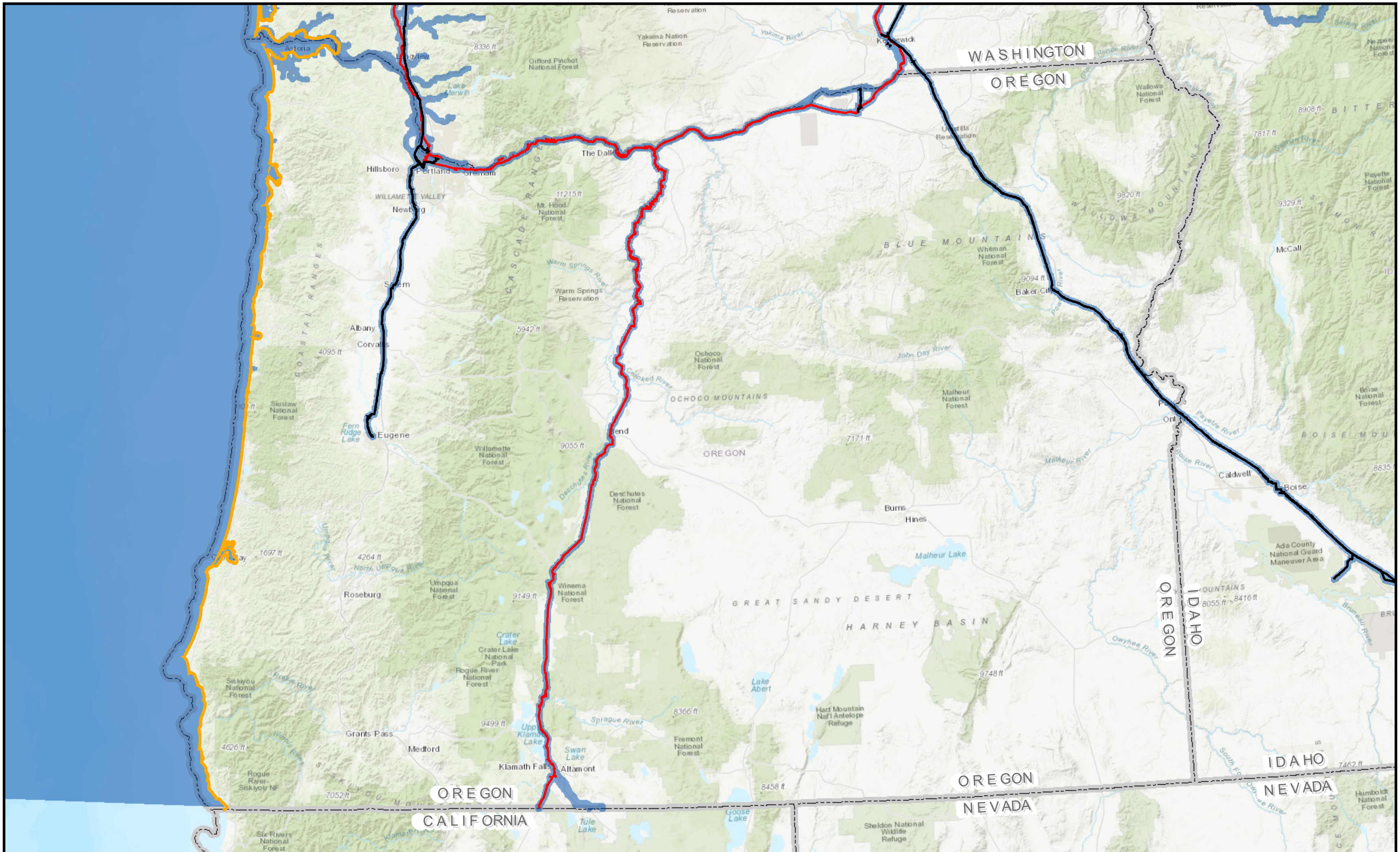

Unit Train

Petroleum Pipeline

Coastal 1-mile Inland Buffer

Action Area

State

Data Sources:

EPA 2018; ESRI 2014

Figure 2-1b
Action Area in Oregon

0 25 50 100
Miles

M:\Boulder\EPA_USCG\EPA_ActionArea_Maps.mxd 5/2/2018

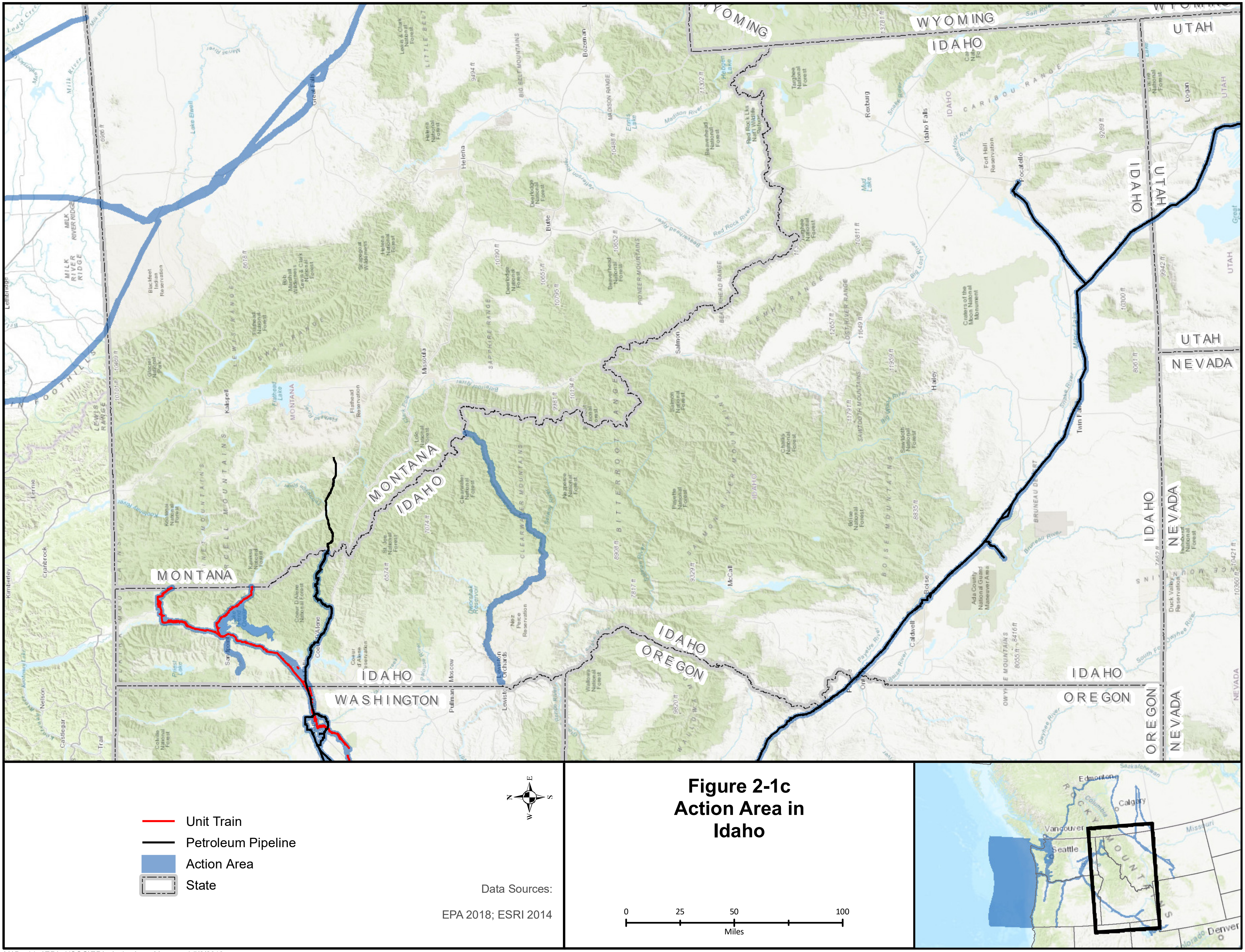

Figure 2-1c
Action Area in Idaho

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2.1.2 Description of Habitats within the Action Area

The NW, covering all of Washington, Oregon, and Idaho, is a large area with a wide variety of habitat types. For the purposes of the evaluation in this BA, those habitats are grouped according to the specific habitat types identified in the NWACP. Habitats in the Action Area are briefly described below and include:

- Terrestrial
- Riparian
- Riverine and Lacustrine (on water)
- Wetlands
- Shoreline (freshwater and marine)
- Marine Nearshore
- Open Marine Water

Hot springs are a habitat in the NW that is not discussed in detail below because it represents a fairly unique habitat for a single ESA-listed species. The Bruneau hot springsnail (*Pyrgulopsis bruneauensis*) inhabits thermal springs in southwestern Idaho along the Bruneau River and Hot Creek. Typically, the snails inhabit small geothermal springs, runs, and seeps on basalt bedrock, where they can be found on gravel, silt, sand, mud, or biofilms.

2.1.2.1 Terrestrial

Because the authority to respond to spilled oil is granted to the EPA and USCG by the CWA, oil spill response actions in terrestrial habitats may only be coordinated by federal agencies so long as there exists a nexus to water (including staging areas and access points). Otherwise, state agencies have the responsibility to respond to terrestrial oil spills.

Terrestrial habitats in the NW include forests (e.g., ponderosa pine, mixed conifer, and lowlands conifer/hardwood forest types), areas of exposed bedrock, rocky cliffs, coastal dunes, shrub-steppe, and grasslands. Terrestrial habitat does not include riparian habitats along streams or other waterbodies. Forests are typically dominated by coniferous and deciduous trees with varying densities of shrubs, forbs, mosses, grasses, and lichens. Terrestrial habitats provide important habitat for many listed species, particularly those managed by the USFWS (excluding freshwater fish). For example, trees and shrubs provide important nesting and denning habitat for listed birds and small mammals and the prey of larger, listed species like grizzly bear (*Ursus arctos horribilis*) and Canada lynx (*Felis lynx canadensis*).

2.1.2.2 Riparian

Riparian habitats include any soils and vegetation that are adjacent to freshwater streams (or other waterbodies) and that are influenced by the flow of water from those waterbodies. These habitats are distinct from adjacent terrestrial habitats in terms of hydrology, soil composition, and vegetative community. Riparian soils are generally composed of deposited sediments, often transported away from the main channel during high flows or flood events. Water from the adjacent waterbody tends to permeate into and flow through riparian soils, creating much wetter soils than the surrounding terrestrial habitats. The difference in soil type and water availability alters the type of vegetative community present; riparian plants tend to be adapted to living in wetter soils and are often resilient to flooding and erosion events. Riparian habitats are very common in the NW, present along most riverine and lacustrine habitats. Riparian habitat is often missing in developed areas such as along urbanized or agricultural streams.

Riparian habitats provide many important features and services to fish and wildlife, some of which are described herein. Riparian vegetation stabilizes stream banks and traps sediment (e.g., during flood events), prevents excessive erosion, and sequesters nutrients. Overhanging trees and bushes provide shade, keeping water temperatures cooler and dissolved oxygen levels higher, and insects living on overhanging branches provide an important source of nutrients to aquatic species (e.g., when terrestrial insects fall into the streams). Large woody debris provides habitat complexity as well as channel stability. Vegetation provides nest and forage habitat for birds, and mammals can also burrow into exposed spaces around riparian tree roots.

2.1.2.3 Riverine and Lacustrine (on Water)

For the purpose of this BA, riverine and lacustrine habitats are defined as all fully inundated portions of streams, rivers, lakes, ponds, or similar freshwater habitats (excluding wetlands, described below).[23] The NW has a complex system of riverine and lacustrine habitats, which are important to freshwater and anadromous fish species, as well as birds, reptiles, mammals, and amphibians. In addition to being a source of drinking water for larger animals, riverine and lacustrine habitats provide forage habitat for fish, birds, and mammals and breeding/spawning, rearing, migration, refuge, and/or forage habitat for aquatic species and amphibians.

Important considerations for spill response in riverine and lacustrine habitats include the influence of flowing water on oil collection (riverine) and habitat destruction and mobilization of oil into sediments (lacustrine). For example, booms need to be positioned and anchored such that they are not dragged by a flowing river or rapidly overtopped by spilled material. Also, they should be positioned to maintain migration corridors, if possible. Lastly, they should be anchored and positioned to minimize the suspension of sediment, which would reduce water quality.

2.1.2.4 Wetlands

The term “wetlands” refers to several types of habitats, all of which are seasonally or permanently inundated. Wetlands are also often definable by their unique vegetation communities, which are adapted to living in fully submersed soils. Freshwater wetlands are common in the NW because of heavy precipitation and/or snow melt in areas with soils of limited permeability or drainage. Wetlands provide important breeding habitat for many fish, amphibians, and birds. Plants associated with wetlands are adapted to permanently or seasonally saturated conditions. The NWACP refers to several types of wetlands, including estuarine, riverine, lacustrine, and palustrine wetlands. These are differentiated by the size of adjacent waterbodies and by the depth of water in the wetlands. For example, riverine and lacustrine wetlands are created near rivers and lakes (or similar waterbodies), respectively, and their waters must be greater than 2 meters (m) (6.6 ft) deep. Wetlands with waters less than 2 m deep are considered palustrine; this includes marshes, fens, wet meadows, potholes, playas, bogs, swamps, and shallow ponds.

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[23] Riverine habitat is associated with flowing water bodies (e.g., rivers, streams); lacustrine habitat is associated with still water bodies (e.g., lakes, ponds).

Marsh habitat is difficult to distinguish from shoreline habitat in areas where it immediately fringes rivers, lakes, estuaries, or coastal habitats (e.g., lagoons). In Section 9420, the NWACP refers to marshes as a type of shoreline (Section 2.1.2.5); therefore it is treated as such in this assessment.

2.1.2.5 Shoreline

Shorelines are locations where aquatic and terrestrial habitats meet in either freshwater or marine environments. The physical and biological characteristics of shorelines in the NW are highly variable. Shorelines support a variety of different organisms, serving important functions for marine mammals and birds in particular (i.e., haul-out and nesting habitat, respectively).

The response actions that may be employed in freshwater and marine shoreline habitats are selected with consideration for the type of shoreline substrate, exposure to wave and tidal energy, biological productivity or sensitivity, and the ease of cleanup for a given shoreline type. The NWACP describes 14 types of shoreline and identifies countermeasures applicable for each type (NWACP Section 9420):

- Exposed rock shores and vertical, hard man-made structure (e.g., seawalls);
- Sheltered vertical rock shores and vertical hard man-made structures (e.g., seawalls or docks);
- Exposed wave-cut platforms;
- Fine- to medium-grained sand beaches and steep unvegetated river banks;
- Coarse-grained sand beaches;
- Mixed sand and gravel beaches, including artificial fill containing a range of grain size and material;
- Gravel beaches (pebbles to cobble);
- Gravel beaches (cobbles to boulders);
- Exposed rip-rap;
- Exposed tidal flat;
- Sheltered rubble slope;
- Sheltered sand and mud flats;
- Sheltered vegetated low bank; and
- Marshes.

Freshwater shoreline is defined as the area extending from the wetted channel or lake edge to bankfull height. This excludes riparian habitat (Section 2.1.2.2).

Marine shoreline is defined as the area between mean lower low water and the highest tide mark along a marine or estuarine body of water. This is difficult to discern in marshlands, where low gradient lands remain inundated for long periods; terrestrial areas may be differentiable from wetlands by local changes in elevation (resulting in a lack of water) or dominant vegetation type.

Shoreline habitats are strongly influenced by adjacent landforms and water bodies and are used by both terrestrial and aquatic species. The shoreline, including the intertidal zone, is also the area where marine plants (including kelp and sea grasses) receive sufficient sunlight to create both habitat and food for other species.

2.1.2.6 Marine Nearshore

For the purpose of this BA, the marine nearshore is defined as the area between mean lower low water and 20 m (60 ft) deep, including estuaries and river deltas. This area is strongly influenced by tides and nearshore currents. Nearshore habitats are highly productive and are used as areas of refuge, feeding, and breeding by many ESA-listed species and their prey.

2.1.2.7 Open Marine Water

Open water is defined as the area adjacent to the coast that is more than 20 m (60 ft) deep (offshore to the extent of the EEZ, 200 nautical miles). This definition is intended to align with the definitions of dispersant and *in situ* burn areas; the NWACP does not provide a clear delineation between open water and nearshore habitats. Open marine water provides habitat for numerous marine mammals, sea turtles, and fish. The relative abundances and distributions of these species vary temporally (e.g., seasonally). For the purposes of this consultation, open water is considered to include both coastal and inland marine waters (i.e., the Salish Sea/Puget Sound and the Strait of Juan de Fuca), as long as they exceed 20 m deep.

2.2 Description of Response Tools

This section briefly describes the response tools that may be implemented during emergency spill response.

The response tools from the NWACP that are included in this consultation are listed in Table 2-1, along with elements of the response actions that could potentially have an effect on ESA-listed species and designated critical habitat, the habitats where each response action can be effectively employed, and the groups of species that might be affected by the response action.

Table 2-2, describes each response action, including the areas where they may be implemented, the factors affecting where and when they are used, the elements influencing potential exposures of ESA-listed species, the potential stressors, and the conservation measures used by spill responders to minimize potential effects. Additional information regarding spill response actions is provided below Table 2-2.

In Table 2-2, conservation measures included in the NWACP are shown in plain text. Those that are not explicitly included in the NWACP but are standard practices are shown in italics. For the purposes of this BA, it is assumed that all conservation measures pertaining to the selected response action(s) described in Table 2-2 (including those related to supporting actions common to most responses) will be followed in the event of a spill response. In some cases, Table 2-2 describes the potential for exposure to oil in association with a response action or stressors generated by the oil during the response; however, the presence of oil and oiled substrates is assumed in the baseline condition. For this reason, the analysis of effects will focus on the response actions themselves rather than effects of the oil or spilled materials. Response actions are intended to have a net benefit on the environment in all cases, given that a response will never occur without hazardous materials (e.g., oil) already being in the environment.

Tables 2-1 and 2-2 include several supporting response actions that are common to most spill response strategies (e.g., use of vessels, vehicles, or heavy machinery; waste management); they may be conducted in addition to any mechanical or non-mechanical countermeasure(s). As a result, any effects of the mechanical or non-mechanical countermeasure(s) will combine with the effects of supporting actions common to most spill responses.

Spill response is a complex action involving multiple entities and actions (as described in Section 1). There are means within ICS that allow the response to expand as needed. If a response covers a large area, the UC may establish divisions for operations based upon geographical areas. There may be a need for groups. Groups are labeled according to the job that they are assigned to (i.e., Sampling Group, Disposal Group, Shoreline Protection Group, etc.). If the number of divisions or groups exceeds the span of control, it may be necessary to establish another level of organization called operational branches. Operational Branches manage operations within a region and work under the IC's Section Chief. Finally, there are task forces, which comprise a combination of mixed resources with common objectives operating under the direct supervision of a Task Force Lead.

The point of describing the organization of the ICS implementation structure of the spill response is to demonstrate the complexity of operations and activities that are directed under the UC. The functions and activities implemented by these divisions, groups, and task forces, although under the direction of the UC, do not all involve implementing the response tools on the ground, which is the action under consultation. Therefore, even though an activity may be directly or indirectly authorized under the UC, it does not make it interrelated to or interdependent with the proposed action. We are not consulting on the NWACP, which includes such things as administration and finance and the work done by the organization as described above. We are not consulting on the effects of the variety of activities that occur because of the spill, but only the tools and tactics implemented to respond to the spill, as presented in the following tables.

Table 2-1 Response Actions, Elements in Scope of Consultation, and Habitat Types Potentially Affected

Response Action	Elements in Scope of Consultation	Habitat Types Potentially Affected							Groups of Listed Species Potentially Affected (by Service Agency)
		Terrestrial	Riparian	Riverine/ Lacustrine (On Water)	Wetland	Shoreline (Freshwater and Marine)	Marine Nearshore (<60 ft)	Open Marine Water (>60 ft)	
Supporting Actions Common to Most Response Actions									
Use of vessels	Mobilization of vessels to and from site; presence of vessel in atypical locations, shoreline access		X	X		X	X	X	NMFS: fish, sea turtles, marine mammals USFWS: herptiles, fish
Use of vehicles or heavy machinery	Mobilization of vehicles to and from site; presence of vehicles or machinery in atypical locations	X	X			X			NMFS: fish, marine mammals USFWS: plants, snails, butterflies, fish, herptiles, mammals, birds
Staging area establishment and use	Mobilization of personnel to and from the site; manual construction/deconstruction using heavy equipment placement of components (e.g., waste oil tanks and equipment) and establishment of access points	X	X						USFWS: plants, butterflies, mammals, birds
Foot traffic at spill site	Mobilization of personnel to and from the site, presence of responders	X	X		X	X			USFWS: plants, butterflies, herptiles, mammals, birds
Use of aircraft (e.g., to monitor for wildlife and track spill trajectory)	Flights over the impacted spill area	X	X	X	X	X	X	X	NMFS: sea turtles, marine mammals USFWS: mammals, birds
Solid waste management	Handling, storage, and transport of wastes	X	X	X	X	X	X	X	NMFS: fish USFWS: plants, snails, butterflies, fish, herptiles, mammals, birds
Liquid waste management	Handling, storage, and transport of wastes; decanting to open waters (within 24 hours of spill discovery)	X		X		X	X	X	NMFS: fish, sea turtles, marine mammals USFWS: plants, snails, butterflies, fish, herptiles, mammals, birds

Table 2-1 Response Actions, Elements in Scope of Consultation, and Habitat Types Potentially Affected

Response Action	Elements in Scope of Consultation	Habitat Types Potentially Affected: Terrestrial	Riparian	Riverine/ Lacustrine (On Water)	Wetland	Shoreline (Freshwater and Marine)	Marine Nearshore (<60 ft)	Open Marine Water (>60 ft)	Groups of Listed Species Potentially Affected (by Service Agency)
Decontamination	Decontamination operations of equipment, personnel, and vessels	X	X	X		X	X	X	NMFS: fish, sea turtles, marine mammals USFWS: plants, snails, butterflies, fish, herptiles, mammals, birds
Mechanical Countermeasures									
Deflection/Containment									
Booming	Transport, deployment, anchoring (including on land), presence, access, tending, removal, and disposal of equipment		X	X	X	X	X	X	NMFS: fish, sea turtles, marine mammals USFWS: plants, butterflies, fish, herptiles, mammals, birds
Berms, dams, or other barriers; pits and trenches	Construction, maintenance, and deconstruction	X	X	X	X	X			NMFS: fish, marine mammals USFWS: plants, snails, butterflies, fish, herptiles, mammals, birds
Culvert blocking	Construction, transport, and placement of barrier; re-plumbing of outlet; and establishment of access points and staging areas			X	X	X			NMFS: fish, marine mammals USFWS: plants, snails, fish, herptiles, mammals, birds
Recovery of Spilled Material									
Skimming	Transport, deployment, and operation of skimmer and placement of hoses			X	X	X	X	X	NMFS: fish, sea turtles, marine mammals USFWS: snails, fish, herptiles
Vacuuming	Transport, deployment, and operation of vacuum equipment and placement of hoses			X	X	X	X	X	NMFS: fish, sea turtles, marine mammals USFWS: snails, fish, herptiles
Passive collection of oil with sorbents (e.g., sorbent pads, sausage boom, pom poms, peat)	Deployment, transport, maintenance, and removal of sorbent materials	X	X	X	X	X	X		NMFS: fish, sea turtles, marine mammals USFWS plants, snails, butterflies, fish, herptiles, mammals, birds

Table 2-1 Response Actions, Elements in Scope of Consultation, and Habitat Types Potentially Affected

Response Action	Elements in Scope of Consultation	Habitat Types Potentially Affected							Groups of Listed Species Potentially Affected (by Service Agency)
		Terrestrial	Riparian	Riverine/ Lacustrine (On Water)	Wetland	Shoreline (Freshwater and Marine)	Marine Nearshore (<60 ft)	Open Marine Water (>60 ft)	
Removal/Cleanup									
Manual removal of oil and oiled substrate using hand tools (e.g., rakes and shovels)	Site access, removal of oil/oiled material, collection and transport of oily waste, and transport and use of equipment	X	X		X	X			NMFS: fish, marine mammals USFWS: plants, snails, butterflies, fish, herptiles, mammals, birds
Mechanical removal of oil and oiled substrate (with or without excavation >2.5 cm [1 inch]) Sediment reworking	Site access, removal of oil/oiled material, collection and transport of oily waste, and transport and use of equipment	X	X			X			NMFS: fish, marine mammals USFWS: plants, snails, butterflies, fish, herptiles, mammals, birds
Woody debris removal (before or after oiling) Terrestrial and aquatic cutting/ removal of vegetation (before or after oiling)	Site access, removal of oiled or unoiled material, collection and transport of oily waste, and transport of equipment	X	X		X	X			NMFS: fish, sea turtles, marine mammals USFWS: plants, snails, butterflies, fish, herptiles, mammals, birds
Ambient temperature, low pressure flooding/flushing	Transport, deployment, and use of equipment and oil re-mobilization	X	X	X[a]	X	X			NMFS: fish, marine mammals USFWS: plants, snails, fish, herptiles, mammals, birds
Pressure washing/ steam cleaning/sand blasting	Transport, deployment, and use of equipment; oil re-mobilization; and introduction of sand from blasting	X	X			X			NMFS: fish, marine mammals USFWS: plants, snails, butterflies, fish, herptiles, mammals, birds
Physical herding	Use, deployment, and transport of equipment and oil re-mobilization			X	X	X	X		NMFS: fish, sea turtles, marine mammals USFWS: aquatic plants, snails, fish, herptiles, mammals, birds

Table 2-1 Response Actions, Elements in Scope of Consultation, and Habitat Types Potentially Affected

Response Action	Elements in Scope of Consultation	Habitat Types Potentially Affected							Groups of Listed Species Potentially Affected (by Service Agency)
		Terrestrial	Riparian	Riverine/ Lacustrine (On Water)	Wetland	Shoreline (Freshwater and Marine)	Marine Nearshore (<60 ft)	Open Marine Water (>60 ft)	
Non-mechanical Countermeasures									
Chemical dispersion[b,c]	Surface application from vessel or aircraft (including deployment, transport, and use of dispersant chemical)							X	NMFS: fish, sea turtles, marine mammals USFWS: birds
In situ burning[b]	Transport, deployment, maintenance, and removal of fire booms; burning; residual collection	X	X	X[a]	X	X	X	X	NMFS: fish, sea turtles, marine mammals USFWS: plants, snails, butterflies, fish, herptiles, mammals, birds
Other Response Actions									
Natural attenuation (with monitoring)	Accessing/monitoring site	X	X	X	X	X	X	X	NMFS: fish, sea turtles, marine mammals USFWS: plants, snails, butterflies, fish, herptiles, mammals, birds
Places of refuge for disabled vessels	Relocation of disabled vessels			X		X	X	X	NMFS: fish, sea turtles, marine mammals USFWS: fish, birds
Non-floating oil	Recovery of non-floating oil			X			X	X	NMFS: fish USFWS: snails, fish
Hazing and deterrence	Deterring and hazing wildlife to prevent oiling		X		X	X	X	X	NMFS: sea turtles, marine mammals USFWS: mammals, birds

Notes to Table 2-1:

[a] Ambient temperature, low pressure flooding/flushing and i*n situ* burning can be used in lacustrine open water habitat but is typically not used in fast flowing riverine habitat.

[b] *In situ* burning and use of chemical dispersants as part of the response action require prior approval. Use of *in situ* burning and chemical dispersants is authorized in preauthorized areas and on a case-by-case basis as described in Section 9407 and 9406, respectively, and in Section 1 of this BA.

[c] No dispersants are currently formulated for use in freshwater. Dispersants are not recommended for use in areas near protected resources.

Key:

BA	biological assessment
cm	centimeters
ft	feet
NMFS	National Marine Fisheries Service
USFWS	US Fish and Wildlife Servic

Table 2-2 Response Actions, Exposure/Stressor Pathways, and Conservation Measures

Response Action	Related Response Actions[a]	Areas Implemented	Factors Affecting Where/ When Used	Elements Influencing Exposure	Stressors[b, c]	Conservation Measures[d]
Supporting Actions Common to Most Responses Actions[c]						
Use of vessels	Decontamination of vessels	Rivers/Lakes Shoreline Marine nearshore Open marine water	Type of vessel used determined based on its capabilities relative to spill-specific needs. Adverse weather (e.g., thunderstorms, low visibility) may limit use. Draft of vessel may limit use in shallow areas.	Vessel types range from small tenders to large ships, with smaller vessels providing access to shallow or narrow habitats. Larger vessels are associated with deep water and responses to large volumes of oil. Most spills are minor so smaller vessels are used and would primarily be used to place/replace boom. There is limited loitering or need to anchor or ground. Fueling and launch locations further from the spill require travel over greater distances and at greater speeds. Vessels are generally deployed at the time of or immediately after a spill and repeatedly, as necessary, for the duration of the spill; may be used at night. The use of vessels for on-water recovery is short term (hours to days). Given the nature of oil dissipation and degradation (particularly in the NW environment), on-water recovery periods are short. Use of vessels for on-water recovery of more than four days is not typical, although vessels may be used for shoreline clean-up for weeks in areas that are difficult to access from land.	Vessel strikes may occur. Wildlife may be disturbed due to noise, light, and presence. Benthic habitat and organisms may be destroyed by anchoring, grounding, or prop wash.	The use of vessels would take into consideration sensitive habitats (e.g., nesting areas or spawning areas) based on presence and distribution of wildlife such as birds and mammals (to the extent that information is available in GRPs), and avoid these areas when possible. Observe instructions in GRPs that outline boat and watercraft use restrictions within 183 m (200 yards) of National Wildlife Refuge sites or other sensitive areas. Obtain maps of sanctuary zones and vessel BMPs and SOPs for marine mammals. Do not stage boats such that shoreline vegetation is crushed. Boats should not rest on or press against vegetation at any time. Avoid anchor or prop-scarring of submerged vegetation. Maintain a buffer of at least 91 m (100 yards) from marine mammals (e.g., whales) and 183 m (200 yards) from Southern Resident Killer Whales. Do not move into the path of whales. If approached by a marine mammal, put the engine in neutral and allow it to pass.
Use of vehicles or heavy machinery	Decontamination Staging area establishment and use to support heavy machinery	Terrestrial Riparian Shorelines	Type of vehicle used determined based on its capabilities relative to spill-specific needs. Adverse weather (e.g., thunderstorms, low visibility) may limit use. Response very rarely involves establishing staging areas in undeveloped environments. Most staging areas are in developed areas such as parking lots.	Vehicle types range from small ATVs to large earth movers. Vehicles or equipment may be operated in sensitive areas (e.g., soft substrates, vegetated areas, or intertidal beaches). Operation of vehicles may adversely affect shoreline habitats that are susceptible to erosion. The presence of durable surfaces in the path of ingress/egress to staging area limits physical impacts. Staging locations further from the spill location require travel over greater distances and at greater speeds. Vehicles are generally deployed at the time of or immediately after spill and repeatedly, as necessary, for duration of spill; may be used at night. Establishing staging areas in undeveloped areas is very rarely done.	Plants may be crushed or otherwise destroyed. Habitat may be disturbed or destroyed (e.g., soil compaction, erosion from truck or foot traffic, destruction of vegetation). Vehicle strikes may occur. Wildlife may be disturbed due to noise, light, and presence of responders.	Minimize traffic through oiled areas on non-solid substrates (e.g., sand, gravel, dirt) to reduce the likelihood that oil will be worked into the sediment. The use of heavy machinery is rare; when necessary, its use will take into consideration sensitive habitats (e.g., nesting areas or spawning areas) based on presence and distribution of fish and wildlife in the area and avoid these areas when possible. Consult GRPs, if established for the response area, to set staging area in location already identified for the purpose and having minimal additional impact on threatened and endangered species and designated critical habitat. Generally, vehicles are used on sand beaches and restricted to transiting outside of the oiled areas along the upper part of the beach. Use vehicles near listed plants or wildlife only if the benefits outweigh potential impacts.

Table 2-2 Response Actions, Exposure/Stressor Pathways, and Conservation Measures

Response Action	Related Response Actions[a]	Areas Implemented	Factors Affecting Where/ When Used	Elements Influencing Exposure	Stressors[b, c]	Conservation Measures[d]
Staging area establishment and use	Use of vehicles or heavy equipment Foot traffic Solid waste management Liquid waste management	Terrestrial Riparian	Establishing a new staging area (beyond using an existing parking lot or otherwise already developed area) is rare. Typically, response vessels launch from existing marinas. Equipment staging for routine spills is minimal and typically contained in small cargo trailers. Spills nearshore and in open water are typically accessed from existing vessel locations. Spills located in remote locations may require construction of new vessel, vehicle, and personnel access locations with associated land clearing and staging of necessities such as fuel tanks.	Due to the rarity of this response action, the likelihood of exposure is low. Greater numbers of on-site personnel require more infrastructure over a larger space for eating, sleeping, and restroom facilities. Distance travelled on-site and transportation mode (e.g., foot, vehicle, vessel) determine type and magnitude of stressors (e.g., trampling). Used from time of or immediately after spill and accessed as necessary for duration of spill. May be used during night.	Habitat may be disturbed or destroyed (e.g., soil compaction, erosion from truck or foot traffic,). Wildlife may be disturbed (e.g., noise, light, presence of people).	Use same access point for repeat entries. Construct new access points only when no other options are available to reach the location (emergency consultation may be necessary). If new access points are needed, conduct preliminary survey to determine best route. Locate staging area and support facilities in the least sensitive area possible (use areas identified in GRPs, if available). Special restrictions should be established for sensitive areas where foot traffic and equipment operation may be damaging, such as soft substrates. Establish work zones and access in a manner that reduces contamination of clean areas. Observe species-specific buffer zones (e.g., 91 to 183 m (100 to 200 yards) for marine mammals, see Section 4) when planning and implementing response action. Remove all trash or anything that would attract wildlife to the site daily. Do not cut, burn, or otherwise remove vegetation unless specifically approved by the EU. Do not attempt to capture oiled wildlife. Report oiled wildlife sightings to the Wildlife Hotline.
Foot traffic at spill site	Staging area establishment and use	Terrestrial Riparian Wetlands Shorelines	Oiled shorelines may be accessed from existing roads, paths, etc. or from the water.	Occurs from time of or immediately after spill and as necessary for duration of spill response and demobilization. Most staging areas are already existing and developed areas like parking lots, so likely to be very little disturbance from foot traffic.	Habitat may be disturbed or destroyed (e.g., soil compaction, erosion from truck or foot traffic, working of oil into sediments). Wildlife may be disturbed (e.g., noise, light, presence of people).	Restrict access to specific areas for periods of time to minimize impacts on sensitive biological populations (e.g., nesting, breeding, or fish spawning). Walk on durable surfaces to the extent practicable; restrict foot traffic from sensitive areas (e.g., marshes, shellfish beds, salmon redds, algal mats, bird nesting areas, dunes, etc.) to reduce the potential for damage; use plywood or other material to reduce compaction. Minimize foot traffic through oiled areas on non-solid substrates (sand, gravel, dirt, etc.) to reduce the likelihood that oil will be worked into the sediment.
Use of aircraft (e.g., to monitor for wildlife and track spill trajectory)	None	All (over but not within habitats)	Flying is typically restricted within a 457-m (1,500-ft) radius, below 305 m (1,000 ft) from areas identified as sensitive, with some areas (e.g., Olympic Coast National Marine Sanctuary) having more restrictive zones. Adverse weather (e.g., thunderstorms, low visibility, low cloud ceiling) may limit use. Aerial surveillance usually only happens during a large spill, so it's not a typical occurrence.	Frequency of monitoring Altitude of monitoring Type of aircraft (e.g., helicopter, fixed wing, or drone) can influence exposure. Drones are able to fly at very low altitudes and can get closer to the habitat, so they may increase exposures Aircraft may be used from time of or immediately after spill and as necessary for duration of spill; may be used during night. Use is not routine and is generally limited to large spills.	Use may exclude animals from essential resources (e.g., food, refuge, nesting area) and/or critical habitat areas. Birds are subject to aircraft strikes. Wildlife may be disturbed by noise and presence.	Observe flight restriction zones specified in the GRPs, including minimum ceiling height (altitude of 305 m [1,000 ft] above ground is advised) and distance from known or suspected wildlife areas (e.g., nesting areas) in order to reduce wildlife exposure to noise or presence of airplanes or helicopters.

Table 2-2 Response Actions, Exposure/Stressor Pathways, and Conservation Measures

Response Action	Related Response Actions[a]	Areas Implemented	Factors Affecting Where/ When Used	Elements Influencing Exposure	Stressors[b, c]	Conservation Measures[d]
Solid waste management	Staging area establishment and use	All	Solid waste management is common to all response actions except natural attenuation.	The specific methods used to collect, transfer, contain, transport, and dispose of waste affect exposure. Any incineration of waste in the NW is subject to federal and state air regulations. Extreme weather may increase the likelihood of an accidental release during handling or transport. Waste management is used from time of or immediately after spill and repeated as necessary for duration of spill.	Accidental re-release of pollution, which has low likelihood of occurring, see Section 4.1 for discussion.	Oregon and Washington require that responders develop a waste management plan in accordance with the local ACP (or RCP in the absence of an ACP) that describes how waste will be stored and handled and how the possibility for disposed wastes to cause future environmental damage will be minimized. Solid waste management must be addressed in the disposal plan. Follow standard protocols for waste management actions. Waste accumulation and storage locations should meet the following criteria: spill prevention, control, and countermeasures are in place; storm water pollution prevention plans have severe weather contingency plans; ample storage for segregation of wastes; and an emergency response plan for waste accumulation/storage locations. Access to waste is restricted (temporary and semi-permanent). Waste disposal plans describe the waste tracking system. Reporting system should be established (temporary and semi-permanent). Maintain adequate response equipment during waste management actions to respond quickly and appropriately to re-release of pollution. Establish temporary upland collection sites for oiled waste materials for large spill events; collection sites should be lined and surrounded by berms to prevent secondary contamination from run-off. Coordinate the locations of any temporary waste staging or storage sites with the EU. Separate and segregate any contaminated wastes generated to optimize waste disposal stream and minimize what has to be sent to hazardous waste sites.
Liquid waste management	Staging area establishment and use Decanting Booming Skimming/vacuuming Use of vessels	Terrestrial Rivers/Lakes Shoreline Marine nearshore Open marine water	Liquid waste management is common to many response actions. Decanting of oily water may be necessary during operations involving recovery of oil. Water may be mixed with the oil during recovery and need to be returned to the response area to preserves storage space for recovery of the maximum amount of oil possible.	The specific methods used to collect, transfer, contain, transport, and dispose of waste affect exposure. Any incineration of waste in the NW is subject to federal and state air regulations. Extreme weather may increase the likelihood of an accidental release during handling or transport. Waste management is used from time of or immediately after a spill and repeated as necessary for duration of spill. Decanting is conducted in conjunction with the use of appropriate equipment in place (e.g., boom) to prevent re-release of oil to the marine environment. Use oil/water separator or allow sufficient retention time for the oil and water to separate. Decant ahead of an operating skimmer where feasible.	Accidental re-release of pollution, which has low likelihood of occurring. Authorized incidental release of the minimal amount of oil possible mixed into a large volume of water (decanting) as a way to manage limited liquid storage capacity.	Liquid waste management must be addressed in the disposal plan. The response contractor or responsible party will seek approval from the FOSC and/or SOSC prior to decanting. Follow standard protocols for waste management actions. Maintain adequate response equipment during waste management actions to respond quickly and appropriately to re-release of pollution. Minimize the amount of water collected during skimming. All decanting in a designated "Response Area" within a collection area, vessel collection well, recovery belt, weir area, or directly in front of a recovery system; a containment boom will be deployed around the collection area, where feasible, to prevent the loss of decanted oil or entrainment of species in recovery equipment. Decanting shall be monitored at all times, so that discharge of oil in the decanted water is promptly detected. Where feasible, decanting will be done just ahead of a skimmer recovery system so that discharges of oil in decanting water can be immediately recovered. Coordinate the locations of any temporary waste staging or storage sites with the EU.

Table 2-2 Response Actions, Exposure/Stressor Pathways, and Conservation Measures

Response Action	Related Response Actions[a]	Areas Implemented	Factors Affecting Where/ When Used	Elements Influencing Exposure	Stressors[b, c]	Conservation Measures[d]
Decontamination	Staging area establishment and use Solid waste management Liquid waste management Booming Sorbents	All, except wetlands	Decontamination is required anytime durable (not disposable) equipment is used on a spill response.	Extent of contaminated materials/vessels or personnel can affect exposure. Specific materials to be decontaminated can affect exposure. Decontamination is used when personnel or vehicles exit the spill site and repeated as necessary for duration of spill.	Accidental re-release of pollution, which has low likelihood of occurring, see Section 4.3 for discussion.	Decontamination areas for personnel and equipment must be addressed in the disposal plan. A decontamination/exclusion zone will be set up at each staging area. The area will be plastic lined to prevent pollution from oiled PPE and equipment. Oiled PPE and equipment will be collected in plastic barrels. Maintain adequate response equipment during decontamination to respond quickly and appropriately to re-release of pollution. The placement and containment of materials from decontamination is an important consideration during spill response, so safety controls and proper disposal areas are used to significantly reduce the risk that oil would re-enter the environment.
Mechanical Countermeasures						
Deflection/Containment						
Booming (containment, diversion, deflection, exclusion, recovery)	Use of vessels Staging area establishment and use Hazing and deterrence Solid waste management Liquid waste management Foot traffic	All, except terrestrial	Booming is a typical response tool to control the spread of a spill. Effectiveness is maximized when depth is ≥5 times the draft of the boom; not used in water <46 cm (18 inches) in depth. Booms are less effective in rough water, high winds, and fast currents. In current >1 knot booms are not set across the river, but rather at an angle to direct oil into an area where it can be collected. Booms are used to prevent oil from contacting shorelines, to prevent oil from spreading, and collect oil to enable oil recovery. Booms are also used to contain remobilized oil during decontamination (e.g., vessels, industrial equipment) and shoreline cleanup.	Boom draft varies from 15 to >229 cm (6 to >90 inches), depending on use and habitat where deployed (and may include skirting). Booms may be anchored to the shore, the sea bottom (in waters <30 m [100 ft] deep), or to vessels (in deep water, when anchoring is infeasible, or to avoid sensitive habitats). Boom may be towed by vessels to actively collect oil. Booms are generally deployed at the time of or immediately after spill and repeated as necessary. The duration of deployment is typically <1 week for booms moored in place, anchored to the shoreline, or tidal seal booms; towed boom deployment duration is shorter (hours). Short booms (<61 cm [<24 inches] in depth) are used in rivers. Larger booms are used only in open water marine areas.	Placement of boom may exclude animals from essential resources (e.g., food, refuge, nesting area). Birds or marine mammals may be exposed to oil when perching on booms. Benthic habitat and organisms may be destroyed by anchors, anchor chains, or boom contact in shallow waters or along shorelines (reduction in habitat quality and resources).	Boom strategies in the GRPs are designed to consider species occurrence and habitat use, to the extent possible. Monitor for the presence of marine mammals and seabirds. Ensure that EU provides information on possible presence and impacts to ESA-listed (protected) species or critical habitats. To the extent practicable, and when practicable, observe species-specific buffer zones (e.g., 91 to 183 m [100 to 200 yards] for marine mammal) when planning and implementing response action. Evaluate need to restrict access to sensitive habitats (e.g., nesting areas or spawning areas) based on presence and distribution of wildlife such as birds and mammals. Arrange booms to minimize impacts to wildlife and wildlife movements. Locate boom anchors using strategies identified in GRPs, if available.

Table 2-2 Response Actions, Exposure/Stressor Pathways, and Conservation Measures

Response Action	Related Response Actions[a]	Areas Implemented	Factors Affecting Where/ When Used	Elements Influencing Exposure	Stressors[b, c]	Conservation Measures[d]
Berms, dams, or other barriers; pits and trenches	Use of vehicles and heavy equipment Staging area establishment and use Foot traffic Solid waste management Liquid waste management	All, except open marine water and marine nearshore	These are tactics with the objective of containing spilled oil and limiting spreading of oil slicks. These tactics are used when oil threatens sensitive habitats (e.g., upper intertidal and back-shore areas) and other barrier options (e.g., boom, skimmers, less invasive barriers) are not effective. The water body must be small enough to dam (not more than about 3 m (10 ft) across) and have low enough flow to not blow out an underflow dam. Equipment type – Motor graders are used if beach can sustain motor traffic well; front-end loaders or bulldozers are used if beach cannot sustain motor traffic well.	These tactics disturb the upper 0.5 m (2 ft) of beach or riparian sediments. Size of underflow dam – larger dams result in a larger pool behind the dam. Water flow/rainfall mobilizes oil from upstream spill sites to downstream berm/dam collection site. Use of a berm/dam in locations subject to dramatic changes in water flow can result in blowout. Duration/frequency typically installed shortly after spill and left in place about 1 week up to 5 weeks, until upstream cleanup activity is completed. Decontamination occurs after spill has been contained and contamination removed.	Construction may result in removal of substrate; loss, trampling, or crushing of vegetation; and increased erosion or sedimentation in streams. Placement may exclude animals from essential resources (e.g., food, refuge, nesting area) or disrupt passage between critical habitat areas. Underflow dams will result in increased oiling behind the dam than would have occurred without the dam; dams are intended to stop oil from entering sensitive downstream habitats.	Coordinate with the Services. Contact the EU to determine if any permits are required. Restrict use and closely monitor operations in sensitive habitats. Line the bottom of trenches that do not reach the water table (dry) with plastic to prevent the collected oil from penetrating deeper into the substrate. Minimize erosion and sediment runoff using engineered controls (e.g., silt fences and settling ponds). Minimize suspension of sediment to limit effects on water quality. Remove structures and fill trenches once response action is completed. Coordinate with the Services prior to constructing underflow dams.
Culvert blocking	Staging area establishment and use Foot traffic	Rivers/Lakes Wetlands Shoreline	Open culverts present a potential route for spilled oil to enter otherwise unaffected areas. This tactic is often used to protect sensitive habitats that are located downstream of the barrier. This tactic is used to block tidal inflow to an upgradient waterbody. Generally only 61-cm- (<24-inch-) diameter culvert pipes are blocked. If complete blocking results in flooding, an underflow dam or booming would be used instead.	Material used (e.g., plywood, plug, plastic sheeting, sandbags) and other construction elements may affect sedimentation or other shoreline processes. Frequency/duration – typically placed shortly after spill and remains less than three days.	Construction may result in removal of substrate; loss, trampling, or crushing of vegetation; and increased erosion or sedimentation in streams. Placement may exclude animals from essential resources (e.g., food, refuge, nesting area) or critical habitat areas. It may result in increased predation, and increased exposure to spilled material.	Monitor water quality and sufficient flow downstream of barriers. Evaluate need to restrict access to sensitive habitats (e.g., nesting areas or spawning areas) based on presence and distribution of wildlife such as birds and mammals. To the extent practicable, and when practicable, observe species-specific buffer zones (e.g., 91 to 183 m [100 to 200 yards] for marine mammals) when planning and implementing response action. Minimize erosion and runoff using engineered controls (e.g., silt fences and settling ponds). Remove structures once completed.

Table 2-2 Response Actions, Exposure/Stressor Pathways, and Conservation Measures

Response Action	Related Response Actions[a]	Areas Implemented	Factors Affecting Where/ When Used	Elements Influencing Exposure	Stressors[b, c]	Conservation Measures[d]
Recovery of Spilled Material						
Skimming/ vacuuming	Staging area establishment and use Use of vessels Use of vehicles Booming Liquid waste management Berms, dams, or other barriers; pits and trenches	Rivers/Lakes Wetlands Shoreline Marine nearshore Open marine water	Skimming/vacuuming is typically deployed in areas where floating oil naturally accumulates. Oil can be collected against a shoreline or contained by a boom. Skimming only works as long as there is sufficiently thick oil, approximately 6.3 mm (0.25 inches). Shallow water prevents use of some skimmers. Emulsified oil (affected by weathering/wave action/heat/type of oil) cannot be skimmed. Skimming is less effective in rough water and strong currents. Waves, debris, seaweed, and kelp reduce efficiency.	Skimming/vacuuming often proceeds through night (with continuous presence of responders) if there is enough oil. Safe and effective night operations require floodlights. Vessel size depends on the response; since most spills are small, vessels may be small, 6 m (20 ft) or more. In the rare event of a large spill, vessels up to 61 m (200 ft) w/pump (in ocean water) could be used. Skimming vessels are slow moving. Skimming/vacuuming often generates wastewater that requires additional space for storage and treatment. Duration/frequency for shoreside skimming is typically <4 days; open water is typically <1 week; repeated as necessary. Vacuuming is done at the very top of the water to minimize the amount of water intake and maximize the amount of product removed.	Noise (in air and underwater) due to vessels and pumps can cause stress. Lighting can attract birds to oiled environment Vacuuming may entrain eggs, plankton, fish larvae.	Use methods that minimize the amount of water relative to oil taken in (e.g., flat-head nozzle [duckbill] and skim/vacuum at water surface only). Operations in sensitive areas (e.g., marshes, submerged aquatic vegetation, worm beds) must be very closely monitored, and a site-specific list of procedures and restrictions must be developed to minimize damage to vegetation. Adequate storage for recovered oil/water mixtures, as well as suitable transfer capability, must be available. Position intake to minimize plankton and larvae entrainment. To the extent practicable, and when practicable, observe species-specific buffer zones (e.g., 91 to 183 m [100 to 200 yards] for marine mammals, see Section 4) when planning and implementing response action.
Passive collection of oil with sorbents (e.g., sorbent pads, sausage boom, pom poms, peat)	Staging area establishment and use Foot traffic Use of vehicles Use of vessels Solid waste management	All, except open marine water	Use of sorbents is labor intensive, typically hand placed from light motor vehicle or shallow water craft; usually used for small quantities of oil and as indicator of oil presence (will be marked by oil). Sorbents are often used on sheen, though ineffective. There must be sufficient product to be absorbed (sheen usually not sufficient quantity). Sorbents are more likely to be used in difficult-to-access areas where skimming is infeasible in conjunction with most other response actions (not skimmers). Sorbents may be reused. Wave and tidal energy, as well as the oil type, affect efficacy.	Passive collection elements are tended more frequently immediately after spill and less frequently with time after spill. Water flows past sorbent booms. Distribution of sorbent pads on oil contained in booms can help to suppress waves and prevent splash-over. Standard practice is that, when passive collection/containment is the best practice, sorbent booms are tended to ensure they stay in place, and sorbents are routinely replaced. The effectiveness of passive collection is highest when the sorbent boom is not saturated. Pads/booms can sink if left in place for extended duration, especially if dirt is present. Lightweight pads can get caught by wind and dispersed outside of response areas. Pads are often one of the first response actions to be used because they are readily available Duration: pads generally ~1 day, sausage boom <2 weeks. Frequency: pads <3 days after spill, boom used until saturated, then replaced.	Intertidal environmental effects can occur if sorbent material is not recovered when saturated. Placement or use of sorbent booms may create concentrations of oil that could lead to additional exposure. Sunken sorbents may expose pelagic/ demersal/riverine habitats to oil, although the pads are regularly monitored to avoid this.	Retrieval of sorbent material, and at least daily monitoring to check that sorbents are not adversely affecting wildlife or breaking apart, are mandatory. Coordinate with the EU for corrective actions if entrapment of small crustaceans is observed. Continually monitor and collect passive sorbent material to prevent it from entering the environment as non-degradable, oily debris Follow appropriate cleaning and waste disposal protocols and regulations.

Table 2-2 Response Actions, Exposure/Stressor Pathways, and Conservation Measures

Response Action	Related Response Actions[a]	Areas Implemented	Factors Affecting Where/ When Used	Elements Influencing Exposure	Stressors[b, c]	Conservation Measures[d]
Removal/Cleanup						
Manual removal of oil and oiled substrate using hand tools (e.g., rakes, shovels, scrapers)	Staging area establishment and use Foot traffic Solid waste management Liquid waste management Decontamination	Terrestrial Riparian Wetlands Shorelines	This method is generally used on shorelines where the oil cannot be easily removed by mechanical means. Manual removal can be used on mud, sand, gravel, and cobble when oil is light, sporadic, and/or at or near the beach surface, or when there is no beach access for heavy equipment. Manual removal can be used to remove gross oil contamination (e.g., thick black oil, tar balls, congealed oils,) from shorelines or submerged oil that has formed semi-solid or solid masses. Manual removal is used in places that are difficult to access with heavy equipment. Adverse weather conditions (e.g., thunderstorms, snow and ice, extreme temperatures) may limit access and use.	Manual removal is a large, complex operation with a large footprint due to the logistical support necessary for workers (e.g., facilities, utilities). Manual removal may use ATV support. Duration: throughout cleanup activities (potentially long duration up to several weeks). Anything beyond a week would require consultation with Services. Frequency: repeated as necessary to remove oiled substrates. Does not occur at night. Use of hand tools and rakes typically require coordination with both the Services and other and stakeholders if there would be removal of natural debris or sand from shorelines.	Intertidal environmental effects are minimal if surface disturbance by cleanup activities and work force movement is limited. No effects on subtidal is expected. Noise from vehicles and continuous presence of crew. Trampling and loss of vegetation. Potentially increased erosion. Increased sedimentation of streams. May disturb or remove sediment and shallow burrowing organisms or cause root damage. Habitat and/or wildlife disturbance or loss from noise, crushing, lighting, and/or presence of people. Can distribute the contamination deeper into substrates.	Restrict sediment removal to supra and upper intertidal zones (or above waterline on stream banks) to minimize disturbance of biological communities. Minimize the amount of sediment removed with the oil. Sediments should be removed only to the depth of oil penetration. Protect nearby sensitive areas from increased oil runoff/sheening or siltation by the proper deployment of booms, siltation curtains, sorbents, etc.; monitor for effectiveness of protection measures. Do not remove clean wrack; instead, move large accumulations of clean wrack to above the high-water line to prevent it from becoming contaminated. If in an archaeological and/or culturally sensitive area, activities may need to be monitored or may not be appropriate.
Mechanical removal of oil and oiled substrate (with or without excavation >2.5 cm [>1 inch]) Sediment reworking	Staging area establishment and use Foot traffic Heavy equipment use Solid waste management Liquid waste management Decontamination	Terrestrial Riparian Shorelines	Mechanical removal with heavy equipment (e.g., bulldozers, backhoes) is usually implemented when the spill area/debris size exceeds the capacity of manual removal. It is typically used in sand, gravel, or cobble, where surface sediments are amenable to, and accessible by heavy equipment. The contaminated substrate is excavated to the depth of contamination. Dredging of sediments is only considered for sinking oils (rare). Sediment reworking may be used on sand or gravel beaches with high erosion rates or low sediment replenishment rates or where remoteness or other logistical limitations make sediment removal unfeasible.	Duration: throughout cleanup activities (potentially over a long duration up to several weeks) Frequency: repeated as necessary to remove oiled substrates. Very rarely occurs at night. This would be a long-term action, and the action agencies would request input from the Services if under consideration for area with critical habitat.	Intertidal environmental impacts if excessive sediment is removed without replacement. Noise, crushing, and lighting from vehicles and continuous presence of crew. Trampling and loss of vegetation. Potentially increased erosion. Increased sedimentation of streams/ nearshore environment. May disturb or remove sediment and shallow burrowing organisms or cause root damage. Can distribute the contamination deeper into substrates.	Implement after the majority of oil has come ashore, unless significant burial (sand beaches) or remobilization is expected; implement between tidal cycles to minimize burial and/or remobilization of oil. Protect nearby sensitive areas from increased oil runoff/sheening or siltation by the proper deployment of booms, siltation curtains, sorbents, etc.; monitor for effectiveness of protection measures. Minimize the amount of oiled sediment removed by closely monitoring mechanical equipment operations. In areas prone to erosion, replace removed sediment or soil with clean sediment. Minimize erosion and runoff using engineered controls. Monitor for the presence of special status animals and plants. To the extent practicable, and when practicable, observe species-specific buffer zones (e.g., 91 to 183 m [100 to 200 yards] for marine mammals, see Section 4) when planning and implementing response action.

Table 2-2 Response Actions, Exposure/Stressor Pathways, and Conservation Measures

Response Action	Related Response Actions[a]	Areas Implemented	Factors Affecting Where/ When Used	Elements Influencing Exposure	Stressors[b, c]	Conservation Measures[d]
Woody debris removal (before or after oiling) Terrestrial and aquatic cutting/removal of vegetation (before or after oiling)	Staging area establishment and use Foot traffic Solid waste management Liquid waste management Use of vessels	Terrestrial Riparian Wetlands Shorelines	Conducted before or after spill has been contained and cleanup activities begin. More likely to be used for plants that will grow back. Lightly oiled vegetation typically left in place. Vegetation is removed if it poses a contact hazard to wildlife. Beach wrack is relocated before oil comes ashore when possible. Removal of large wood is generally avoided, unless it poses a persistent source of oil.	Duration: typically occurs after progress has been made on mobile oil removal. Done within first few days of incident. UC would request input from the Services if operations are to occur in critical habitat. Frequency: typically once.	Removal of cover and forage can cause stress to juvenile fish and salmonid prey. Noise from vehicles, heavy machinery, hand tools, and cleanup crew. Along the exposed section of shoreline, the vegetation may not regrow, resulting in erosion and permanent loss of the habitat. Reduction in habitat quality because of loss of structure. Long-term subtidal impacts from increased sediment load can occur as a result of increased erosion in the intertidal area.	Resource experts are routinely consulted regarding these concerns prior to vegetation cutting activities. Strict monitoring of the operations must be conducted to minimize the degree of root destruction and mixing of oil deeper into the sediments. For plants attached to rock boulder or cobble beaches, sources of population recruitment must be considered. Access to bird nesting areas should be restricted during nesting seasons. Concentrate removal on vegetation and wood debris that is moderately to heavily oiled; leave lightly oiled and clean vegetation and wood debris in place. Do not remove clean, natural shoreline debris; instead, move large accumulations of clean debris to above the high-water line to prevent it from becoming contaminated.
Ambient temperature, low pressure flooding/flushing	Staging area establishment and use Use of vessels Foot traffic Booming Skimming Sorbents	Terrestrial Riparian Lakes Wetlands Shorelines	Flooding is applicable on all shoreline types where equipment can be effectively deployed; however, not recommended for steep intertidal or shorelines with fine grains or muddy substrates. Not generally useful on exposed rocky shorelines or submerged tidal flats because these areas are naturally well flooded. Location must accommodate a collection boom (sufficiently large area and receiving water flow needs to be slow). Works only on fresh oil (others require pressure washing).	Oil is flushed into the water where it is collected with sorbent. Method or procedures (i.e., flow rates, temperature, volume, chemicals, delivery system (by fire hose [with low pressure flow] or header pipe) can affect exposure. In marine environment, ambient marine water is typically used, though fresh water may be used if marine water is oiled. Flooding should be restricted to tidal stages when subtidal zones are under water to prevent secondary oiling. Equipment may include: deluge system (perforated pipe sprinkler system) or trash pump with hose. Duration: in freshwater environment typically about 2 days; in marine environment typically <1 week. Timing: done within first week, at the soonest 2 to 3 days after spill. This technique is only effective if conducted quickly after a spill occurs.	Physical habitat disturbance/smothering from gravel components washed down slope and sedimentation of streams/nearshore environment.	Implement after the majority of oil has come ashore, unless significant remobilization is expected; implement between tidal cycles to minimize remobilization of oil. Protect nearby sensitive areas, identified in the GRPs or under advisement of the Services, from increased oil runoff/sheening or siltation by the proper deployment of booms, siltation curtains, sorbents, etc.; monitor for effectiveness of protection measures. Use the lowest pressure that is effective and prevent suspension of bottom sediments (do not create a muddy plume). Conduct all flushing adjacent to marshes from boats. In marshes conduct at high tide either from boats or from the high-tide line to prevent foot traffic in vegetation. Closely monitor flooding of shorelines with fine sediments (mixed sand and gravel, sheltered rubble, sheltered vegetative banks, marshes) to minimize excessive siltation or mobilization of contaminated sediments into the subtidal zone. Prevent pushing or mixing oil deeper into the sediment by directing water above or behind the surface oil to create a sheet of water to remobilize oil to containment area for recovery. Restrict flushing in marshes during high tide above the high tide line to minimize mixing oil into the sediments or mechanically damaging plants.

Table 2-2 Response Actions, Exposure/Stressor Pathways, and Conservation Measures

Response Action	Related Response Actions[a]	Areas Implemented	Factors Affecting Where/ When Used	Elements Influencing Exposure	Stressors[b, c]	Conservation Measures[d]
Pressure washing/ steam cleaning or sand blasting	Staging area establishment and use Use of vessels Foot traffic Booming Skimming Sorbents	Terrestrial Riparian Shorelines	Pressure washing/steam cleaning or sand blasting are infrequently used when heavy oil residue must be removed for aesthetic reasons (ship-hulls, break-walls, man-made structures). Steam and sand blasting are very infrequently, if ever, used in the NW. Contaminated vessels are boomed with sorbents in industrial area, cleaned, and then released when clean.	The selected method for washing is always done from least intrusive to most intrusive, as acceptable based on the surface being cleaned and the presence of organisms. Ambient water is preferred to heated or pressurized water. Heated water can be used to pressure wash structures such as the hull of a ship, pier structures, or asphalt. A spray and wipe chemical may be considered prior to going with higher heats. Higher temperatures and higher pressures can be used to mobilize oil but can lead to more potential impacts. Similarly, sand is used to physically scour oil from surfaces. Endpoints for degree of removal desired (e.g., no visible sheening, no ability to wipe oil off, not able to scratch oil off). Duration/frequency: typically 1 day to weeks (for vessel cleaning, depending on size of vessels, number of vessels, and type of oiling).	Direct harm to organisms in spray zone. Heat, scouring, runoff, disturbance, flooding, and increased erosion and sedimentation. Heated water may affect freshwater or intertidal habitats. Introduction of sand into aquatic environment could smother invertebrates or contribute to suspended sediments.	Implement after the majority of oil has come ashore. Restrict use to certain tidal elevations so that the oil/water effluent does not drain across sensitive low-tide habitats. Closely monitor operations in sensitive habitats. If small volumes of warm water are used to remobilize weathered oil from rocky surface, include larger volume of ambient water at low pressure to help carry re-mobilized oil into containment area for recovery. Monitor booms and oil collection methods to prevent transport of oil and oiled sediments away from site to near shores and down coast. Monitor for wildlife such as birds and mammals (evaluate need for hazing); establish buffer zone (i.e., nesting areas, haulout areas, spawning areas). Avoid sensitive habitats (e.g., soft substrates, aquatic vegetation, spawning areas, etc.).
Physical herding	Staging area establishment and use Use of vessels Booming Skimming Sorbents	Rivers/lakes Shorelines Wetlands Marine Nearshore	Physical herding is used to move oil into containment. It is rarely used to move oil more than a few hundred feet. Sufficiently thick product is required. When oil contained in hard-to-access places (e.g., against seawalls or under docks), prop-wash from a vessel can help to push the product to a collection area (e.g., boom).	Not used at night. Frequency: typically shortly after spill on fresh oil. Duration <1 week. The exposure is based upon the method(s) used to herd the oil.	Erosion May disrupt movement patterns of fish. Generation of in-air sound from vessels.	Monitor for the presence of wildlife and plants. Minimize erosion and runoff using engineered controls (to the extent practicable).

Table 2-2 Response Actions, Exposure/Stressor Pathways, and Conservation Measures

Response Action	Related Response Actions[a]	Areas Implemented	Factors Affecting Where/ When Used	Elements Influencing Exposure	Stressors[b, c]	Conservation Measures[d]
Non-Mechanical Countermeasures						
Chemical dispersion	Use of vessels Use of aircraft	Open marine water (outside of No Dispersant Use Zone; use in Case-by-Case Zone (see Section 1.2.4.1) will require emergency consultation)	Only used in marine water bodies with sufficient depth (>18 m [60 ft] deep). Applied as soon as possible after a spill (when oil is not weathered and more concentrated. Works best when there is wave energy to mix the dispersant into the oil. Can be used in strong currents and higher sea states. Only applied to spilled oil and completion of the dispersant use checklist, as described in the NWACP. In areas where dispersant use is not pre-authorized, RRT activation and approval is necessary before use.	Dispersants have not been used in the NW for decades. Used to protect organisms at the water surface or shorelines from oiling. Can impact organisms in the upper water column (<10 m [33 ft]). Amount of oil requiring dispersion. Amount of mixing/current affects rate of dissipation Weather conditions (e.g., wind, waves, and currents) determine efficacy and dispersal area and environmental fate. Nozzles are used to give a flat, uniform spray of droplets, rather than a fog or mist. The mechanical wave energy of a wake from a boat enhances dispersion. Duration: <1 day with a few passes over spill. Too much dispersant will be ineffective and dispersion must happen soon after a spill to be effective. Frequency: once Application rate to be determined by dispersant manufacturer and the UC.	Direct exposure routes include inhalation, ingestion, absorption, and physical contact. Possible disturbance from vessels in the area, including noise; potential for vessel strikes. Possible disturbance from aircraft. Change in oil fate and transport can result in increased exposures to oil for shallow-dwelling aquatic species. Such exposures are not consistent with the baseline condition. However, if oil is not dispersed or recovered using mechanical means (e.g., booming and sorbents) the oil will break down due to wave, wind, and water activity. Naturally dispersed oil will remain at the surface longer than dispersed oil (affecting surface-active species like birds, whales, and turtles).	Requires Regional Response Team approval prior to use unless in a Pre-Authorization Zone. The EU would prepare a Net Environmental Benefit Analysis to evaluate the potential risk to animals and habitats in the area compared to not using dispersants. Monitor wildlife; establish species-specific buffer zone(s); use in water with adequate volume for dilution; apply only under conditions known to be successful; use only chemicals that are approved for use; implement wildlife deterrent techniques as needed. SMART will be used to measure efficacy. SMART is a standardized monitoring program designed to monitor chemical dispersion and in situ burning activities. Follow dispersant policy checklist of environmental conditions which dictates favorable conditions for use. Aircraft should spray while flying into the wind and avoid spraying into strong crosswinds.
In situ burning	Staging area establishment and use Booming Use of vessel Use of aircraft	Pre-authorization zone is any area that is more than 3 miles from human population (>100 or more people per square mile). All other areas need incident-specific authorization.	Conducted after containing oil slick in fire boom, soon after spill has occurred; while oil still has enough volatility to burn easily. May be ignited with gelled fuel or flares. Oil needs to be sufficiently thick. Only used where the spread of the fire can be controlled. Wind, ability to put in fire-break, meteorological conditions (e.g., no inversion); no heavy wind, offshore winds are favorable. Should not burn substances regulated by EPA (e.g., PCBs)	Duration: each burn lasts about half an hour, then fresh oil is gathered, and the burn is repeated. Frequency: typically over two days, within the first few days of a spill.	Exposure to fire, smoke, or particulates Exposure to burn residues; exposures to burn residues are not consistent with the baseline condition. Burn residues are less acutely toxic than oil because the relatively toxic components of oil are removed during the burning process.	Requires Regional Response Team approval prior to use. Prior to an in situ burn, an on-site survey must be conducted to determine if any threatened or endangered species are present or at risk from burn operations, fire, or smoke. A Net Environmental Benefit Analysis would be conducted to evaluate the possible risk to species in the area of the in-situ burn and compare it to the risk of not using in-situ burning. Protection measures may include moving the location of oil (in water) to an area where listed species are not present; temporary employment of hazing techniques, if effective; and physical removal of individuals of listed species only under the authority of the trustee agency. Provisions must be made for mechanical collection of burn residue following any burn(s) (e.g., collection with nets, hand tools, or strainers). SMART will be used to measure efficacy. SMART is a standardized monitoring program designed to monitor chemical dispersion and in situ burning activities.

Table 2-2 Response Actions, Exposure/Stressor Pathways, and Conservation Measures

Response Action	Related Response Actions[a]	Areas Implemented	Factors Affecting Where/ When Used	Elements Influencing Exposure	Stressors[b, c]	Conservation Measures[d]
Other Response Actions						
Natural attenuation (with monitoring)	Foot traffic	All	When the adverse impacts resulting from response activities outweigh the benefits. Examples include: 1) when oiling has occurred on high-energy beaches where wave action will remove most of the oil in a short time; 2) remote or inaccessible shorelines; 3) wetlands, where treatment or cleaning may cause more damage than leaving it to recover naturally; 4) other response techniques are not practical. This method may be inappropriate for areas with high numbers of people, mobile animals, or ESA-listed species.	Areas affected by small amounts of non-persistent oil can recover naturally, given appropriate circumstances. May be inappropriate for areas where high numbers of mobile animals (e.g., birds, marine mammals, crabs) use the intertidal zone (shoreline) or adjacent nearshore waters.	Wildlife disturbance from presence of people and equipment necessary for monitoring.	May consider relocation or hazing activities if appropriate. Minimize presence of people and equipment.
Places of refuge for disabled vessels	Use of vessels	Rivers Shorelines Marine nearshore Open marine water	Which resources at risk are in the area, including ESA-listed species, seasonal breeding locations, or designated critical habitat; Essential Fish Habitat; aquaculture facilities; other resources, lands and/or waters with special designations; offshore fisheries; near shore fisheries. The USCG Captain of the Port has the authority to designate a place of refuge for a specific disabled vessel.	Because many of the spills in the NW are due to vessels sinking, finding places of refuge for compromised vessels is a routine part of response. Many conditions could dictate refuge location: weather, distance to location, seaworthiness of ship, types of hazards, captain's navigation ability.	Wildlife disturbance from presence of people and vessel(s).	Follow the places of refuge decision matrix (NWACP Section 9410) when human life is not at risk. EPA must be consulted on any off shore scuttling of a vessel. States, tribes, local governments, and other stakeholders will be conferred with on a case-by-case basis.
Non-floating oil recovery	Staging area establishment and use Use of vessels Use of vehicles Foot traffic	Rivers/Lakes Marine nearshore Open marine water	Identified presence of oils (e.g., diluted bitumen, Group V residual fuel oils, low API oil, asphalt and asphalt products) that may submerge or sink when spilled.	Non-floating oils are difficult to detect and recover. Spills of non-floating oil rarely happen in the NW. Duration: responders must be capable of responding within 24 hours of discovery of a discharge of non-floating oil; duration will depend on extent of spill. Frequency: once during spill response	Disturbance of bottom substrate (habitat) by use of suction dredge, diver-directed pumping and vacuuming	Priority given to preventing, minimizing, and containing non-floating oils. Respond rapidly and aggressively to recover oils when on the surface (if safe to do so) before the oils start to sink.
Hazing and deterrence	Staging area establishment and use Use of vessels Use of aircraft Use of vehicles Foot traffic	Riparian Wetlands Shorelines Marine nearshore Open marine water	Will only be used when wildlife are observed near a spill and when deemed necessary to prevent exposure to spilled material or direct injury.	Duration: could last for the length of a response (typically less than four days) or be limited to isolated instances of wildlife presence, as needed. Will depend on the selected deterrence measures. For example, reflective tape or automated noise generators (e.g., propane cannons) would provide a near-constant deterrence, whereas vocalizations, "bird bombs" (or similar noise-makers) would be limited to short durations and isolated instances.	Noise Lights Movement/presence of hazing-related objects (e.g., silver fluttering tape tied to vegetation in wetlands and riparian areas to deter birds) Presence of personnel conducting the hazing.	Hazing or deterrence measures will be conducted only as necessary under in coordination with the Services. Hazing and deterrence will prevent direct injuries and chemical toxicity (associated with the spilled material) to wildlife at the expense of behavioral effects and temporary exclusion from resources. NMFS has granted pre-authorization to the FOSC to implement specific deterrence activities to prevent killer whales from entering oil (Section 9310).

Notes to Table 2-2:

[a] Related response actions include those actions that are typically implemented as part of this response action. It does not include those response actions that typically include this response action (e.g., skimming would include booming as a related action but booming does not include skimming).

[b] Stressors associated with related actions are described with those respective actions.

[c] Although exposures to oil is noted throughout Table 2-2, such exposures are considered to be less than or equal to the exposures associated with the baseline condition. In other words, spill response actions will typically reduce exposures to oil. However, this is not necessarily true of chemical countermeasures, which may increase exposures of aquatic species to oil.

[d] Conservation measures associated with related actions are described with those respective actions. All conservation measures provided in Table 2-2 are included in the proposed action and will be followed in the event of a spill response.

Key:

ACP	Area Contingency Plan	NW	Northwest
API	American Petroleum Institute	NWACP	Northwest Area Contingency Plan
ATV	all-terrain vehicle	PCB	polychlorinated biphenyl
BMP	best management practice	PPE	personal protective equipment
cm	centimeters	RCP	regional contingency plan
EPA	US Environmental Protection agency	RRT	Regional Response Team
ESA	Endangered Species Act	Services	USFWS and NMFS
EU	environmental unit	SMART	Special Monitoring of Applied Response Technologies
FOSC	federal on-scene coordinator	SOP	standard operating procedure
ft	feet	SOSC	State On-Scene Coordinator
GRP	geographical response plan	UC	Unified Command
m	meters	USCG	US Coast Guard
NMFS	National Marine Fisheries Service	USFWS	US Fish and Wildlife Service

2.2.1 Hazardous Material Spill

Chapter 7000 of the NWACP presents guidance on the response to spills of hazardous materials. The tools and techniques used to respond to chemical (non-oil) spills and oil spills are similar. Both response types use comparable supporting actions, deflection and containment, and removal and cleanup (Table 2-1).

The response to a hazardous material spill depends in large part on the chemical properties of the released material, which affect the transport and fate of the material in soil, sediment, air, and water. When the hazardous material is a gas, typically transported and stored under pressure, the responses focuses on stopping the leak and monitoring impacts as the chemical dissipates. Table 2-1 outlines the access and monitoring activities performed during these emergency responses. Chemicals that are hydrophobic and adsorb to solids (soil and sediment) can be cleaned up through removal of the contaminated media, similar to the method used for oil spills. Materials that are immiscible liquids are also cleaned up with the same tactics as oil spills.

However, some hazardous materials are miscible or have a high solubility and will readily dissolve in water. When these materials mix with surface water, they are difficult to remove, and there is no other course of action than to allow them to dissipate, as was the case for Gold King Mine in Colorado. In this example, the spill was contained in the river, but it wasn’t possible to remove the liquid waste from the river. In cases where the spilled materials affect the dissolved oxygen or pH of the receiving water, bubblers, lime, or phosphoric acid are used to bring these parameters back into normal range. This typically happens in ponds or ditches where the quantity and flow of water is limited, and therefore both the chemical and treatment have a significant effect. These activities are unique to hazardous material spills.

2.2.2 Supporting Actions Common to Most Response Actions

Several response actions are used in most spill responses, including use of vessels, use of vehicles or heavy machinery, use of aircraft, staging area construction and use, solid waste management, and liquid waste management. Solid and liquid waste management are discussed in Section 2.2.2.3.

2.2.2.1 Use of Vessels, Aircraft, Vehicles, and Heavy Machinery

A variety of vessels, vehicles, and heavy machinery are used in spill response actions to transport materials and individuals, as well as in the execution of response actions such as booming, vacuuming, and skimming, or mechanical excavation. The type and size of vehicle, vessel, or machinery used is determined based on its capabilities relative to spill-specific needs. Small responses may only need to deploy a workboat and a couple support vehicles. Large responses will likely require multiple vessels, including airplanes and helicopters to transport personnel and to monitor the spill and response actions. Planning by the EU regarding the type and number of vessels to deploy will be invaluable when developing response tactics to respond to a large spill.

2.2.2.2 Staging Area Establishment and Use

Staging areas are locations where incident personnel and equipment are placed awaiting tactical assignment. Staging areas may include on-site storage and transport of hazardous and non-hazardous materials. If possible, staging areas are established in existing large paved areas that provide access to both the spill site and transportation networks. For spills in navigable waters, established boat ramps and piers are used as staging areas if possible. When spills occur in remote areas, staging areas may need to be constructed on developed or undeveloped land (including points of access), but this is avoided when possible.

2.2.2.3 Waste Management

Solid and liquid waste handling and associated activities are common to all response actions apart from natural attenuation. Response actions produce large volumes of waste (e.g., contaminated soils, used sorbents, personal protection equipment) that must be handled, stored, decontaminated, transported, and/or disposed of properly. Protocols that comply with state and federal regulations are in place for the storage and transfer of all solid, hazardous, or petroleum wastes that may be generated during recovery and cleanup activities to minimize the reintroduction of wastes into the environment and protect habitats, endangered species, and response workers.

Waste handling and storage are required throughout a spill response. Materials (e.g., soil, sediment, and snow) used to construct diversion and exclusion or containment structures may be contaminated by the spilled material due to leaching or other processes, generating additional wastes to be handled and disposed of properly. Some spilled materials may be pumped or suctioned directly into storage tanks or drums for either recovery or treatment and disposal. Pumping and suctioning usually entrain large volumes of water that must also be stored and treated. In the case of viscous oils, reheating might be required prior to pumping.

Land storage of wastes (e.g., in barrels, tanks, or piles) prior to final disposal might contribute to soil compaction or other habitat modification at a spill site. These effects can be minimized by limiting pumping or suctioning to conditions under which it would entrain the least amount of water, using chemical agents to reduce the volume of water requiring treatment, reducing the storage footprint, and using the least sensitive on-site location to store wastes.

The handling, transport, and disposal of wastes requires the use of heavy machinery and vessel or overland transport. Accidental release is possible during the handling and storage of wastes, as mentioned above, as well as during transport. Extreme weather or other conditions may increase the likelihood of an accidental release during handling or transport. An accidental spill (e.g., transport vehicle accident) may also pose a threat of ignition and/or explosion. Burning may produce particulate and/or toxic gas emissions.

It is possible that the volume of waste produced by the response operations will exceed the capacity of local waste receivers. In this event, disposal at multiple sites will be required. There are also some wastes (e.g., oil emulsions, oily water, and hazardous wastes) that cannot be treated and must be transported. In these cases, longer transport distances could increase the possibility of spills or other accidents.

Under ideal conditions, spilled products can be recovered and reused, reducing the wastes generated by a response action. For example, recovered oil can be refined into low-grade fuel or other petroleum products (ITOPF 2010). Some chemical agents can separate oil from water or other materials, allowing the volume of wastewater that requires treatment or disposal to be reduced. Waste disposal involves either direct disposal (i.e., without treatment) or treatment and then disposal. Wastes can be incinerated (on site or off site), but any incineration of waste in the NW is subject to federal and state air regulations.

Decanting – Decanting during on-water recovery (in open marine water) is a form of liquid waste management that is preauthorized for use within the first 24 hours of a spill and thereafter with UC approval for situations where there is insufficient capacity to store the volume of recovered oil and contaminated water (see NWACP Sections 4620 and 4621). Specifically, the decanting process involves the collection of large volumes of oil and water (e.g., using skimmers, vacuums, or other recovery equipment), allowing the water and oil to separate within a separation tank, and then discharging the water that may contain a small amount of oil. The decanting process separates the water from the oil so that most of the oil is removed from the water and there is no visible sheen during discharge (NWACP Section 4621.2). The criteria are similar to requirements for shipboard oily water separators limiting the discharge of oil into the oceans to 15 parts per million (ppm) and no visible sheen when excess water is discharged (EPA 2011). The NWACP considers the decanting of water from recovered oil and return of excess water into the response area as vital to the efficient mechanical recovery of spilled oil because it allows maximum use of limited storage capacity, thereby increasing recovery operations.

Pre-authorization applies only to decanting on water; shore-side container decanting is not authorized for pre-approval. The decanting form from the NWACP must be completed and approved before shore-side container decanting can proceed. The NWACP stipulates several measures that are intended to control the release of oil in decanted water. For example, decanted water must be discharged into a containment area (e.g., surrounded by a containment boom) where there is additional recovery equipment (e.g., skimmers) to recollect oil.

On-water decanting is pre-authorized for the oil products listed below:

- All crude oils,
- Vacuum gas oils,
- Atmospheric gas oils,
- Recycle oils not containing distillates,
- Bunker fuels,
- No. 6 fuel oils,
- Cutter stocks, and
- Coker gas oils.

2.2.2.4 Decontamination

During a spill response action, all personnel, hand tools, equipment, vehicles, and vessels must be decontaminated in a manner that does not reintroduce oily wastes into the natural environment. The decontamination process involves a multi-stage flushing procedure that removes and collects such wastes. The wastes are then stored and treated in accordance with state and federal regulations.

2.2.3 Mechanical Countermeasures

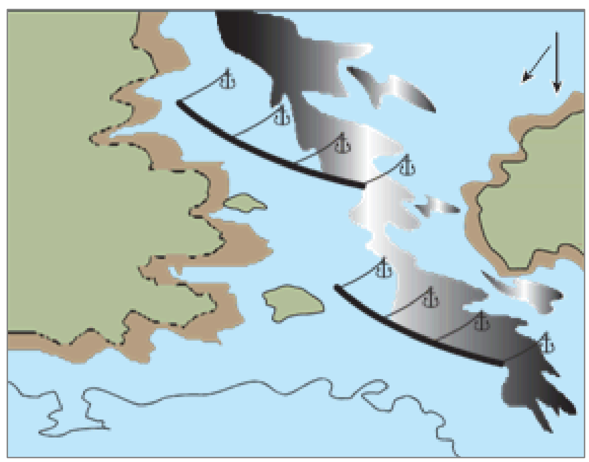
Mechanical countermeasures are primary response actions that are intended to deflect, exclude, or contain oil or other spilled material before they can further impact ecological and cultural resources. Mechanical countermeasures include:

- Deflection and containment
    - Booming
    - Berms, dams, or other barriers; pits and trenches
    - Culvert blocking
- Recovery of spilled material
    - Skimming/vacuuming
    - Passive collection of oil with sorbents
- Removal/cleanup
    - Manual and mechanical removal of oil and oiled material (including sediment reworking)
    - Vegetation and woody debris removal and disposal
    - Ambient temperature, low pressure flooding/flushing
    - Pressure washing/steaming or sandblasting
    - Physical herding

2.2.3.1 Deflection and Containment

Deflection or containment actions may involve deploying booms or constructing structures, such as earthen berms, on land to contain and collect a spilled material. In upland environments, the placement and configuration of controls is often based on detailed drainage patterns and topography. The mapping or modeling of winds, currents, and tidal patterns, in conjunction with real-time observations, may be used to support the placement and configuration of booms and sorbents. Section 9302 of the NWACP provides specific guidance on deflection and containment strategies, equipment, and methods across a range of currents.

Booming – A boom is a floating barrier that is used to contain buoyant spilled materials in aquatic environments (i.e., open water, nearshore, rivers, and lakes) until it can be removed, deflect oil away from sensitive areas, divert oil toward recovery sites, or exclude oil from entering a sensitive area. Fire booms are used to concentrate spilled oil in preparation for an *in situ* burn. The use of defensive or containment booms is one of the first response actions called for in the GRPs, which are part of the NWACP (as discussed in Section 1.2).[24]



Deflection booming (Nuka Research 2006)

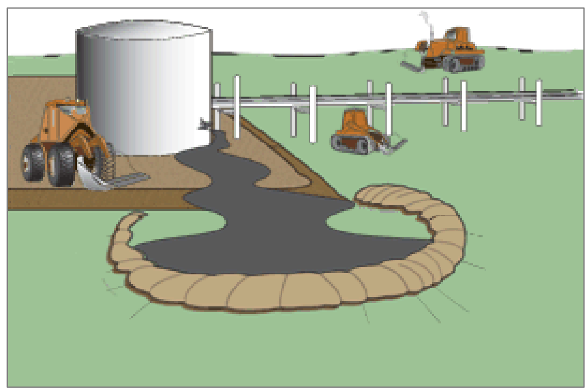
Boom designs are specific to the environment in which they will be used; however, booms are less effective in conditions of rough water, high winds, or fast currents (Stevens and Aurand 2008). In current greater than 1 knot, booms are set on angle to allow the oil to flow along the boom rather than become entrained under it (EPA 2018). Boom systems consist of floating boom sections ranging from approximately 15 to over 229 centimeters (cm) (6 to over 90 inches) in height (which may include hanging curtains), buoys, and an anchoring system. Configurations vary according to

[24] Although GRPs are discussed in the NWACP and will be used as appropriate during a spill response, in some cases they are developed independently of the Action Agencies by state agencies. Because of this, GRPs are not evaluated in this BA. This is discussed in greater detail in Section 1.2.

the site-specific conditions and purpose (e.g., containment versus deflection). Booms are set to most effectively collect or move oil at the surface; sizes and configurations are designed to avoid making contact with the substrate, as this could compromise the efficiency of the boom. Generally, shorter-draft booms are used in fresh water and river systems. Deeper-draft booms are used in open water as they provide more stability in the tide, wave and wind influenced areas.

In most cases, deployment involves the use of one or more large vessels and/or small work boats with associated crew(s). Shore-side workers and heavy machinery on barges or piers may also be used if boom ends are anchored onshore. In open water, booms are in most circumstances deployed between two vessels to concentrate the spilled substance or oil slick for recovery actions (e.g., skimming). During deployment, a boom may be moved and repositioned to maximize its effectiveness at containing, excluding, diverting, or deflecting oil, as explained in the NWACP Section 9301. In-depth descriptions of booming response actions may be found in the ExxonMobil Oil Spill Response Field Manual (ExxonMobil 2014), the International Tanker Owners Pollution Federation Limited technical papers, API et al. (2001), and NOAA et al. (2010).

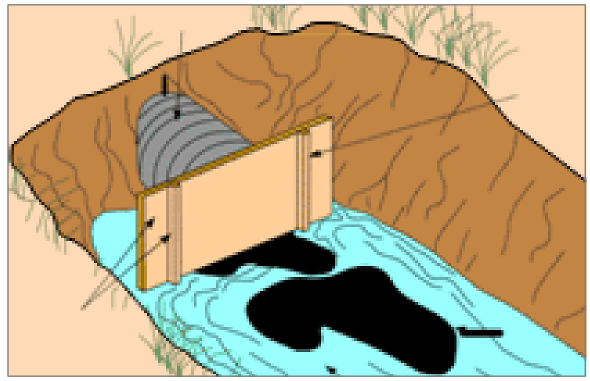
Berms, dams, or other barriers, pits, and trenches – Filter fences, berms, dams, pits, and trenches are used to divert or contain spilled materials in terrestrial, or riparian environments. These physical barriers are in most circumstances used in conjunction with skimming or other recovery techniques (e.g., sorbents, vacuuming). In-depth descriptions of these response actions may be found in the ExxonMobil Oil Spill Response Field Manual (ExxonMobil 2014), the International Tanker Owners Pollution Federation Limited technical papers, API et al. (2001), and NOAA et al. (2010).



Berming (Nuka Research 2006)

The construction of these physical structures in most circumstances requires the use of heavy machinery (or hand construction, depending on location) to install man-made materials (e.g., filter fences, sand bags, air- or water-filled seal booms) or place natural substrates (e.g., soil, snow, ice rubble). If water flow from a bermed area is necessary, an underflow culvert or weir may be included in the construction of a berm or dam. There is also activity associated with construction as equipment and personnel are mobilized to and from the site.

Culvert Blocking – Open culverts present a potential route for spilled material to enter otherwise unaffected areas. To eliminate this threat, culverts may be blocked with a temporary or permanent fixture (e.g., plywood, plug, plastic sheeting, and sandbags). Culvert blocking may also be achieved using deflection booming (as discussed above) near the culvert.



Culvert blocking (EPPR 1998)

2.2.3.2 Recovery

The recovery of spilled oil is often an important component of an oil spill response action and is typically carried out in conjunction with containment, diversion, deflection, and/or removal actions (Nuka Research 2006). In the case of uncontaminated petroleum products, recovered material is reprocessed and refined for commercial use. Several technologies or processes, including skimmers, vacuums, sorbent materials, and manual or mechanical removal, may be used in recovery, depending on the environment in which the spill occurred, the nature and amount of the material spilled, and the behavior of the material following release. Highly refined petroleum products such as gasoline, diesel, and kerosene tend to evaporate from the water very quickly, even during winter months. A significant portion of any crude oil spill in open water will also evaporate if the crude oil is not recovered within the first 24 to 48 hours after a spill (NOAA et al. 2010). Overall, recovery efforts in open water tend to have limited effectiveness; recovery rates can range from 5 to 30% (MMS 2010). Recovery efforts tend to be most effective in calm waters (e.g., lakes or protected marine areas); the effectiveness of recovery in flowing streams tends to be low.

Skimming – Skimmers are mechanical devices that collect oil or other floating contaminants at the water's surface through suction or sorption. They are designed to minimize the intake of water and maximize the uptake of spilled material but often generate wastewater that requires additional space (on land or shipboard) for storage and treatment. The efficiency of skimmers is limited if the water is rough; if aquatic vegetation, floating debris, or ice is present; or if the floating material is too viscous. Skimmers are used in marine and fresh water. They are most effective in slow water and are focused on collecting oil at the water's surface. A vessel may be used to tow boom to coral the spilled oil toward the skimmer.

Oleophilic skimmer example (Brush skimmer is shown)

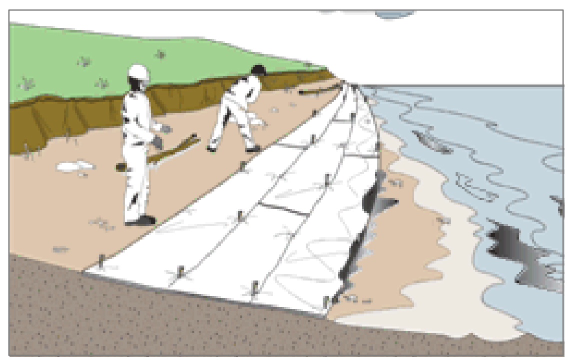
(Alyeska Pipeline Service 2008)

Vacuuming – Vacuums may be small, portable units or truck/vessel-mounted units used to remove pooled or stranded material (typically oil), regardless of the viscosity. Large amounts of water may be entrained during the vacuuming of floating material and require storage, treatment, and disposal. In routine use, vacuuming is limited to the immediate water surface to avoid entrainment of organisms, debris, and substrate as well as excessive volumes of water. Vacuuming may be used, albeit rarely, during recovery of non-floating oil.

Use of boom, rope mop skimmer, and vacuum pumps

(ITOPF 2011b)

Passive Collection of Oil with Sorbents – Sorbents collect spilled materials, particularly petroleum or similar products, through either adsorption (adherence to the sorbent surface) or absorption (penetration of the pores of the sorbent). Natural and mineral sorbents include peat moss, straw, snow, and clay. Synthetic sorbents are inert and insoluble materials that are generally manufactured in particulate form and are designed to be spread over an oil slick or deployed as sheets, rolls, pillows, or booms. They are, in most circumstances, deployed by hand or machine to the spilled material (either floating or on land) and are removed and replaced once coated or saturated. In the case of oil spills, the sorbed material is recovered from the coated/ saturated sorbents to the degree practicable. Used sorbents require collection, handling, and off-site hazardous waste disposal. Sorbents may be re-positioned during collection efforts to maximize effectiveness and minimize the potential for loss of equipment (e.g., due to wind and waves).



Passive sorbents along shoreline (Nuka Research 2006)

2.2.3.3 Removal/Cleanup

A response action may include the manual or mechanical removal of spilled material, contaminated soil, sediment, vegetation, or debris in terrestrial, shoreline, and nearshore environments. Shorelines or streams that are in the path of a spill may be subject to the pre-emptive removal of debris (including habitat features such as large logs or root balls) to minimize the retention of a spilled material and its subsequent release over time.

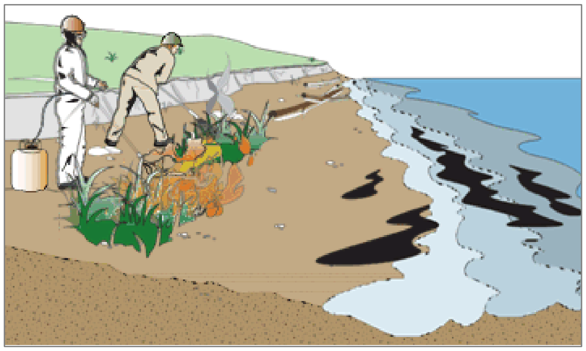
Removal may also be augmented by flushing or otherwise washing surfaces (including large vegetation) to which spilled materials have adhered. Water used for flushing may be obtained from the surface water directly next to the impacted shoreline, or trucked in from another source. Flushing or related responses are used in conjunction with containment and recovery actions.

Manual and Mechanical Removal of Oil and Oiled Material – Manual removal is conducted using hand tools (e.g., rakes, shovels, scrapers). Material is collected in containers that are typically transported by vehicle to a storage area for later disposal.

Mechanical removal relies on heavy equipment (e.g., excavators or backhoes) and is usually implemented when the spill area/debris size exceeds the capacity of manual removal.

Manual removal of spilled material[25]

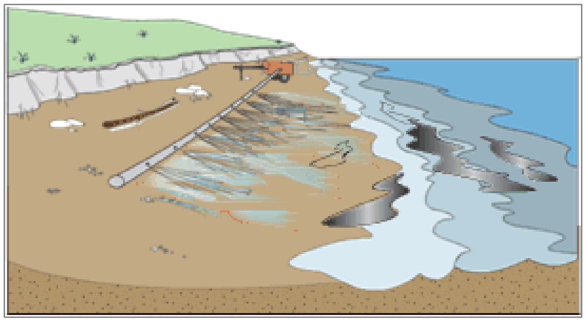
Vegetation and Woody Debris Removal and Disposal – Vegetation and woody debris that have been heavily contaminated by a spilled product may be a continuing threat to organisms that either forage on that vegetation/ debris or use it as habitat. Vegetation and debris can be removed either manually or mechanically. Debris can be removed pre-emptively (before oiling) to prevent oiling. Unoiled vegetation and debris may be moved above the high tide line to prevent contamination and to facilitate replacement once conditions allow.



Manual vegetation removal by burning (Nuka Research 2006)

Ambient Temperature, Low Pressure Flooding/Flushing – Flooding and flushing are response actions that rely on hydraulic action to remove a spilled material from a solid or semi-solid surface (e.g., rocks, bulkhead, cobble beach), so that the material can be contained and collected. These actions are, in most circumstances, applied in shoreline habitats, especially in rip rap.

Flushing involves forcing large quantities of ambient or supplied water at pressure (ranging from <50 to 1,000 pounds per square inch) through sediment (NMFS 2003) or across surfaces to move hydrophobic contaminants into a containment area. Flooding involves the use of very large quantities of water to flush a spilled product from the sediment to the surface into a containment area. Booms (typically sorbent booms) can be used to contain or direct the spilled material washed from the sediment collection areas. Skimmers and sorbent materials can be used to collect the resulting floating material. Responders are directed to maintain a scheduled replacement of sorbent booms.



Flooding (Nuka Research 2006)

[25] http://www.oilspillsolutions.org/ cited 5/1/2012.

Steam cleaning[26]

Pressure Washing/Steam Cleaning/Sand Blasting – If a constructed or low-value shoreline habitat is contaminated by a floating product, pressure washing, steam cleaning, or sandblasting may be used to remove the product from rocky substrates. This process is very limited in scope but nonetheless effective for oil recovery. This technique is very rarely used in the NW in part because there are few low-value shorelines in this area. Ambient or low pressure flooding or flushing approaches are preferred. Biota living in areas treated in this manner will likely be destroyed by the high heat, pressure, and/or abrasion.

Physical Herding – Wind or mechanically generated currents may be used to collect and concentrate oil along the shoreline or in a stationary boom attached to the shoreline. High volumes of water (e.g., from a firehose) can be used to mobilize trapped oil into containment areas.

2.2.4 Non-mechanical Countermeasures

Non-mechanical countermeasures are actions that alter the physical or chemical properties of the spilled material (i.e., petroleum or oil-like materials) such that the options for recovery are improved or the overall impacts of spilled material that cannot be recovered are potentially reduced. Several non-mechanical countermeasures may introduce response-related environmental impacts and, accordingly, are subject to RRT 10 approval prior to implementation. Non-mechanical countermeasures include:

- Application of approved chemical dispersants, and
- *In situ* burning

Currently, chemical dispersant application and *in situ* burning are the two non-mechanical countermeasures pre-approved for oil spill response under the NWACP.

Subpart J of the NCP directs the EPA to prepare a product schedule of dispersants or other chemicals or substances that may be used to remove or control oil discharges (currently, no products have been developed or approved for hazardous materials). Use of dispersants in the NW is extremely rare, but oil spill response organizations are required to maintain adequate volumes of dispersant in preparation for a rapid and effective response. Only one dispersant formulation from the EPA's product schedule, Corexit® EC9500A, is currently stockpiled in the NW. Use of dispersants requires authorization from RRT 10 (see Section 1.2.4.1). Other chemicals that are currently available for use during an oil spill (i.e., those listed on the NCP product schedule) would also require RRT 10 approval. If or when the current stockpile of Corexit® EC9500A is exhausted, approval of new products may result in re-initiation of consultation with the Services.

2.2.4.1 Chemical Dispersion

Chemical dispersants are mixtures of surfactants and hydrocarbon-based solvents that alter the spatial distribution, chemical fate, and physical transport of spilled oil in aquatic environments.

[26] http://www.oilspillsolutions.org/ cited 5/1/2012.

The application of chemical dispersants in marine environments as a response action is restricted to spilled petroleum or other oil-carried or oil-like contaminants. Dispersant use requires RRT 10 approval on a case-by-case basis, except in pre-authorized areas, or in the case of immediate risk of the ignition or inhalation of volatile and poisonous constituents of oil.[27] The use of chemical dispersant as a response option is reserved for occasions when resources are at risk and other response actions are either not feasible or not adequate to contain or control the spill because of field conditions (e.g., remote location, lack of access) (EPA 2017). Chemical dispersants have never been used to respond an oil spill in the NW.

The purpose of chemical dispersants is to reduce the concentration of oil at the surface of the water by breaking the oil into emulsified droplets that can be suspended and distributed (and thus diluted and degraded) throughout the water column. The dilution of oil is designed to reduce the amount of oil at the sea surface and reduce the likelihood or amount of oil washing ashore in sensitive coastal areas.

Dispersants are applied to the oil's surface via either vessel-mounted equipment or aerial spraying. Subsurface application, as was performed for the Deepwater Horizon (DWH) spill in the Gulf of Mexico, is not considered in the NW because there is no offshore oil drilling. The effectiveness of dispersants depends on the amount of time that has elapsed since the spill (oil weathering), surface oil thickness, oil viscosity, water depth, salinity, temperature, and sea conditions (ITOPF 2011a; NRC 2005). Dispersants require physical mixing for optimum effect. The mixing can be intentionally induced (use of propeller wash) if the sea state is too calm to adequately mix in the dispersant.

There are a total of 21 dispersants listed on the January 2012 NCP product schedule. Of these, only Corexit® EC9500A is stockpiled and available for use in the NW (and evaluated in this BA). Stockpiling of new products may result in re-initiation of consultation with the Services. As discussed in Section 1.2.4.1, specific decision criteria, including areas where they may be used, must be followed regarding the use of dispersants.

Dispersion and dilution of oil is intended to reduce wildlife exposure to oil at the sea surface (NRC 2005). However, the use of dispersants represents a tradeoff in exposure because organisms in the water column such as invertebrates, larval fish, diving birds, and marine mammals may be more exposed as oil disperses throughout the water column (at least until greater dilution or biodegradation is achieved, which occurs over the course of hours to days [for dilution] or months [for biodegradation]). The potential toxicity of dispersants or dispersed oil is a factor of, among other things, the duration of exposure and the frequency of exposure (e.g., is the animal exposed once or repeatedly). As described elsewhere in this document, the timeframe for which the use of dispersants is viable and likely to be successful is very short, so repeated use of dispersants on the same oil slick is not a reasonable tactic. Therefore, open water areas (and associated fish and wildlife) affected by a marine spill will not be repeatedly exposed to dispersants. Because there are no offshore wells in the NW, there will not be continuous spills in marine waters (e.g., caused by a well blowout).

[27] Spilled oil products may contain poisonous and flammable volatile organic compounds, and oil dispersal is an option to reduce the immediate risk of ignition or inhalation. The FOSC is empowered to use dispersants without obtaining outside consent or consultation only under these circumstances.

Recent BAs for Alaska and California provide comprehensive reviews of the properties, toxicity, and fate and transport of dispersants when applied to oil. Appendix B from the BA prepared for the Alaska Unified Plan is included in this document as Appendix B (Appendix B; EPA and USCG 2015). The EPA and USCG received a copy of the completed consultation on the California Dispersant Plan (CDP) from the NMFS. The concurrence letter from the NMFS included the most recently available information on dispersants, including the Natural Resources Damage Assessment (NRDA) report from the DWH oil spill. In order to meet its obligation to include the best available science, the EPA and USCG have incorporated the CDP analysis of dispersants into this BA and included the concurrence letters from the NMFS and USFWS as Appendix E.

As noted above, one of the objectives in using dispersants is to reduce the concentration of oil in water. The following is excerpted from the NMFS letter to the EPA and USCG:

> Bejarano *et. al*. (2014b) conducted a recent review of oil spill literature and noted that field trials showed initial high oil concentrations within the top few meters rapidly declining within minutes to hours (≤4 hours) to concentrations of 1 ppm or less following dispersant application. This is also evident from monitoring during the DWH response that showed a maximum total petroleum hydrocarbon concentration of 2 ppm at 1m depth approximately 30 minutes after chemical dispersion of a weathered oil slick at the surface (Bejarano *et. al.*, 2013). BenKinney *et. al.* (2011) noted that dispersed oil concentrations at 10m depth were consistent with background concentrations while monitoring aerial dispersant applications during the DWH response. The second BA (USCG and EPA 2015) cites several additional older studies showing similar patterns. (NMFS 2018, included in Appendix E)

The primary potential impacts associated with the application of dispersants are direct toxicity of the dispersant and dispersed oil to exposed prey organisms (e.g., plankton and larval fish) and hypothermia due to a loss of insulating oils and disruption of feather structure (Duerr et al. 2011). Although not documented in marine mammals, direct contact with dispersants or dispersed oil has been speculated to irritate eye tissues, and aspiration thought to result in chemical pneumonia (CDC and ATSDR 2010). Depending on the formulation and application rate, dispersant toxicity will vary; however, exposure and toxicity are expected to be acute (rather than chronic) because of the rapid rate at which dilution occurs after application (Gallaway et al. 2012; NOAA 2012), as well as the short half-life of dispersants (e.g., less than 28 days for individual components of Corexit® EC9500A) (Appendix B; EPA and USCG 2015).

Regarding the toxicity of dispersants, the following is excerpted from the NMFS concurrence for the CDP consultation (Appendix E):

> The toxicity of oil comes from the bioavailability and toxicity of individual hydrocarbons that make up the oil and relates to their solubility in water. Dissolved hydrocarbons, whether chemically or naturally dispersed, may diffuse across gills, skin and other membranes of organisms (NRC 2005). The sensitivity of individual species and life stages is highly variable, but embryonic and larval life stages are usually more sensitive than adults (NRC 2005, DWH NRDA Trustees 2016, Barron *et al.*, 2013, Bejarano *et al.*, 2014, NMFS 2015). Narcosis is a typical form of impact from these exposures and can result from both PAHs [polycyclic aromatic hydrocarbons] and monaromatic or heterocyclic aromatic hydrocarbons (NRC 2005). Other work has shown cardiac toxicity to developing fish embryos (Incardona *et. al.*, 2014, Carls *et. al.*, 1999) resulting in mortality.

Many studies also identified photoenhanced toxicity of PAHs as a potential means of impacting surface and near surface resources exposed to an oil spill (NRC 2005). The DWH NRDA Trustees report (2016) found DWH oil to be ~10-100 times more toxic to invertebrates and larval fish species such as red snapper, mahi-mahi, and bay anchovies. These impacts are most likely to occur to translucent or semi-transparent pelagic larvae and organisms living in shallow water areas that ingest or otherwise absorb some PAHs and where ultraviolet light exposure is greatest. This may include oiled shorelines. This type of impact may not be prominent among opaque organisms (e.g., adult fish, invertebrates, mammals, etc.) or organisms that migrate into the photic zone during the night and retreat to depths during the day (NRC 2005). The effects will occur in the shallow ocean waters whether the oil is naturally or chemically dispersed, but dispersion of an oil slick may reduce the surface area of oil impacting the photic zone and the time it is there.

The National Research Council (NRC) (1989) concluded, as shown in the second BA (USCG and EPA 2015), that the acute lethality of dispersed oil is primarily associated with the dissolved oil constituents, and very little with the dispersant itself. The NRC (2005) presented data from many studies to further illustrate that COREXIT 9500 and 9527 are significantly less toxic to multiple species compared to oil and dispersed oil. EPA (2010a, Hemmer *et. al.*, 2011) tested several dispersant formulations during the DWH oil spill response due to the concerns of the public about the volume of COREXIT dispersants being applied. These tests included COREXIT 9500 and the two NOKOMIS products subject to the CDP consultation. The EPA reconfirmed that COREXIT 9500 and the NOKOMIS dispersants were much less toxic than the test oil (Louisiana sweet crude) and the dispersed oil. Numerous other studies have also found that dispersants alone were less toxic than the oils they were tested with (Almeda *et. al.*, 2014, Adams *et. al.*, 2014, Barron *et. al.*, 2013, Coelho *et. al.*, 2011, McFarlin *et. al.*, 2011, Fuller *et. al.*, 2004, DWH NRDA Trustees 2016).

The NRC (2005) further concluded that there was no compelling evidence that chemically dispersed oil is more toxic than physically dispersed oil when the comparisons of toxicity are based upon the measured concentrations of petroleum hydrocarbons in the water column rather than the nominal concentration of oil in water. The NRC (1989) noted that dispersant toxicity thresholds were often reported as nominal concentrations (the total amount of dispersant or oil divided by the total volume of water in the experiment's design) rather than measured concentration of the compounds to which organisms were actually exposed. They (NRC 1989) noted that 2/3 of the literature published prior to 1987 presented nominal concentration data rather than measured concentrations and they concluded that a substantial number of these early studies misinterpreted the toxicity data because of this experimental technique. This is because the bioavailability of the oil components in the dissolved, colloidal and particulate phases may vary (Fuller 1999, Lin *et al.*, 2009) and the nominal concentration method does not allow for differentiation of which forms are bioavailable to the test organism. The encapsulation of the hydrocarbon molecules in a dispersant micelle reduces the toxicity of the oil by making the hydrocarbon generally incapable of diffusing across cell membranes, greatly reducing its bioavailability (Tjeerdema *et. al.*, 2010, Fuller *et. al.* 2004, Lin *et. al.*, 2009). The NRC (2005) determined that the nominal concentration method was no longer generally acceptable for toxicity evaluations involving oil and that standardized protocols (Aurand and Coehlo 2005) were necessary for future work.

To provide further analysis of this point following a number of papers published post-DWH that used the nominal concentration method, Bejarano *et. al.* (2014b) compiled a large number of paired data sets from studies conducting water accommodated fractions (WAF or naturally dispersed) and chemically enhanced water accommodated fractions (CEWAF or chemically dispersed) exposure experiments. It differentiated between the data by experimental design (nominal v. measured concentrations of oil loading) and found that the acute toxicity of CEWAF can be grossly over predicted when using the outdated nominal concentration methods. For the COREXIT products, there were 329 measured WAF-CEWAF paired data points for individual species from 36 independent studies. 89% of this paired data for COREXIT 9527 (n=67) had CEWAF ≤ WAF in toxicity. When CEWAF was determined to be more toxic, it was only between 1.62 and 1.76 fold more toxic, which is within the degree of repeatability for standard acute toxicity testing. However, when nominal concentrations were used, CEWAF was more toxic than WAF in 80% of the paired-data set by 1.1 to >1000 fold.

There are 262 paired records available for COREXIT 9500 in this examination and 78% of measured data points showed CEWAF ≤ WAF in toxicity with most (76%) within threefold of the WAF value. However for the nominal concentration information, 93% of the data had CEWAF as more toxic than WAF by 1.2 to >1000-fold. The critical review (Bejarano *et al*. 2014b) determined that the nominal concentration method is not a reliable metric of toxicity.

Dispersants also mitigate the toxic effects of oil exposure to water column resources by reducing the duration and concentration of exposure through increased, rapid dilution (NMFS 2015, NRC 2005, 2003, 1998, USCG and EPA 2015, 2014, Bejarano *et al.*, 2014b). This results in another conflict with large portions of the scientific literature (especially older studies but also many recent studies following DWH) regarding the time of exposure and determinations of toxicity based upon experiments with unrealistic exposure scenarios. The environmentally realistic scenario for the use of oil spill dispersants under consideration in the preapproval zone of the CDP will result in an exposure to dispersed oil that will rapidly spike and then dilute as the treated oil disperses deeper into the water column and is advected away from the surface slick (Aurand and Coelho, 2005). As discussed previously, the concentrations to which an organism may be exposed in the water column rapidly dilutes within minutes to hours (≤4 hours) to low (≤1 ppm) or background levels (Bejarano *et. al.*, 2014b, NRC 2005, 1998, BenKinney *et. al.*, 2011). However, a very large proportion of the studies generate information using traditional toxicological experiment designs, i.e., continuous 24 to 96-hour exposures of organisms to dispersants and dispersed oil, despite these time periods being considered invalid. Longer than realistic exposures lead to overestimates of toxicity.

Clark *et. al.*, (2001) found that spiked exposure conditions were up to 36 times less toxic than constant exposure conditions for COREXIT 9500 and 9527 when tested with three types of oil on five different species. Fuller *et. al.* (2004) found declining exposures of dispersed oil to be clearly less toxic than constant exposures by a factor of nine while, in a paper that compared the results of numerous published data sets, George-Ares and Clark (2000) found that the LC50 values for the most sensitive species in the spiked exposure experiments exceeded the maximum measured COREXIT 9500 and 9527 concentrations in field trials in most cases. Greer *et. al.* (2012) found that pulse exposures of Arabic light crude with COREXIT 9500 were not toxic to Atlantic herring while COREXIT 9500 and Alaska north slope crude resulted in toxicity at concentrations 15 minutes post mixing, but not at 30 or 60 minutes.

Dispersants may also aid in the biodegradation process by greatly increasing the surface area of the spilled oil available to bacteria although the observed rates vary among studies with some even showing the rate of biodegradation initially slows (Abbriano *et al.* 2011, Kleindienst *et al.* 2015, Prince 2015, NRC 2005, Fingas 2014). The COREXIT dispersants themselves are biodegradable (George-Ares and Clark 2000, NRC 2005, Fingas 2014), but no information was found regarding the NOKOMIS products. In general, biodegradation will take place over a matter of weeks to years and may never be complete based upon the type of oil spilled, the microbial community present and a number of environmental factors (Fingas 2014, NRC 2005). The application of dispersants may affect the biodegradation rate, but removing the oil from the surface of the ocean and causing the rapid dilution of the resultant oil droplets in suspension is their intended purpose. Although the information about biodegradation rates are interesting, it does not address a potential impact to ESA listed species under NMFS jurisdiction at this time. (NMFS 2018, included in Appendix E).

2.2.4.2 *In Situ* Burn

In situ burning is a response action used to address spilled oil in either aquatic or terrestrial habitats. As discussed in Section 1.2.4.2, it is necessary to follow specific decision criteria when conducting *in situ* burning. *In situ* burning is a valuable tool to quickly remove oil from open water or terrestrial areas and prevent it from reaching sensitive habitats or populations. Burning is considered "feasible" when spilled oil can be ignited and remain ignited until the oil has been consumed. The burning of weathered or emulsified oils is in most circumstances infeasible because they are not likely to continue burning once ignited. This is due to the emulsion of oil with water, as well as the rapid evaporation of flammable, volatile oil components. Sea and wind conditions also affect the feasibility of *in situ* burning.

Preparation for an *in situ* burn may involve the use of heavy machinery, vehicles or vessels, aircraft, and/or response personnel. Concentrated oil is better able to remain ignited. Typically, a heat-resistant fire booming system or berm is used to contain oil prior to burning; the oil is then ignited from an aerial source (i.e., helicopter-suspended torch) (Alaska Clean Seas 2010b; API 2015).

In situ burning produces viscous residues that will, to the extent possible, be collected and properly disposed of. These residues may be 2.5 cm (1 inch) or thicker, and they can be more or less dense than water (Alaska Clean Seas 2010a). Buoyant residues can be contained in fire booms and collected using nets, hand tools, or other equipment, whereas dense residues may sink and be lost. The residues generated during an *in-situ* burn contain chemicals with relatively low toxicity (compared to crude oil). The more acutely toxic components of oil are combusted during an *in situ* burn. If multiple burns will be conducted (as a result of more oil being collected in booms), then substantial amounts of buoyant residue from the first burn can be destroyed during subsequent burns. *In situ* burning removes 90 to 98% of the oil within the burn area.

2.2.5 Other Response Actions

2.2.5.1 Natural Attenuation

Natural attenuation relies on existing physical, chemical, and biological processes to dilute or degrade a spilled material so that it poses minimal harm to human health or the environment during the recovery period (Walther 2014). In some instances, it may be more protective to allow an affected habitat to recover naturally following exposure to a spilled material, without any action apart from monitoring. In these cases, allowing oil or other spilled material to naturally disperse or degrade over time may cause less harm than the response action itself. In most circumstances, this option is selected when there are few species of concern present and the spilled material will rapidly degrade, disperse, or evaporate; the spill has occurred in a high-energy environment; or the spill is very small.

2.2.5.2 Places of Refuge

Places of refuge are temporary locations for ships in need of assistance (NRT 2007). Places of refuge vary greatly and are different dependent on the situation and needs of the ship. Refuge locations can include ports, harbors, open water, and temporary beaching of the ship. The USCG Captain of the Port follows a step-wise process considering multiple factors to, among other considerations, prevent and minimize the short- and long-term impacts to the environment. Factors weighed when determining a place of refuge include multiple criteria such as the ship's location, status of the ship, economic impacts, capability of the crew, and environmental and human health risks, including resources at risk such as threatened or endangered species, seasonal breeding locations, or designated critical habitat.

2.2.5.3 Non-floating Oil

The expectation is that the presence of non-floating oil will be identified in the initial report of an oil spill to the National Response Center. With the knowledge that the spilled oil is in a non-floating form, professional oil spill responders will be able to identify specialized submerged oil equipment and personnel and bring them to the scene. Appropriate underwater detection, containment, and recovery actions will be identified by the Unified Commanders. See Section 9412 of the NWACP, "Non-floating Oil Spill Response Tool," for details on response techniques, equipment capabilities, and considerations for non-floating oil spill response. The NWAC recommends using the operational guide prepared by the American Petroleum Institute (API 2016).

2.2.5.4 Hazing and Deterrence

Although Section 9310 of the NWACP says that wildlife deterrence will be covered by the ESA Section 7 Emergency Consultation process unless otherwise authorized by a permit, planned use of hazing and deterrence does not activate the RRT (the criteria in this BA for emergency consultation (Section 1.3). Hazing and deterrence are therefore included.

The Wildlife Branch is responsible for implementing the Wildlife Response Plan for the Northwest Area, provided in Section 9310 of the NWACP, "Northwest Wildlife Response Plan." Wildlife Response Tools are provided in Section 9311, "Northwest Area Wildlife Deterrence (Hazing) Resources." The Wildlife Response Plan describes the roles, responsibilities, and duties of the Wildlife Branch and associated personnel in detail. The Wildlife Branch will be activated when either a federal or state trustee agency, Responsible Party, or UC determines that an oil spill has occurred in the vicinity of wildlife resources (mammals or birds) or has a trajectory that puts wildlife resources at risk. On every spill response, the first action of the Wildlife Branch must be to deploy skilled and experienced observers to the vicinity of spill location to conduct an initial wildlife impact assessment, in order to determine the extent of the initial and potential wildlife impacts in a timely manner. Methods, equipment, and best management practices for hazing are described by Gorenzel and Salmon (2008) and USFWS (2003b).

Deterrence actions may be utilized by the Wildlife Branch, in coordination with the appropriate trustee agency, to keep unoiled wildlife away from oil. No federal permits are required for nonlethal deterrence of migratory birds (50 CFR 21.41). However, this exemption does not apply to eagles and endangered species. The ESA does not specifically authorize deterrence and preemptive capture of endangered species. The Wildlife Branch, in consultation with the appropriate trustee agencies, may develop response strategies for deterrence and preemptive capture of endangered species for a specific spill incident. “Take” of endangered species resulting from approved response actions will be deemed incidental to the primary action of the spill response and will be covered by the ESA Section 7 Emergency Consultation process, unless otherwise authorized by a permit. To the best of our knowledge, permits are not obtained by the Wildlife Branch for wildlife deterrence. The action agencies contacted the WDFW and the U.S. Department of Agriculture Wildlife Services to discuss obtaining permits for wildlife deterrence and neither agency could point to permits obtained for this activity (LaTier and Carlson 2017; LaTier and Smith 2017). As stated in the NWACP, wildlife deterrence is included in the emergency consultation and any take that occurs is exempted through that process.

2.3 Oil Spill Response in the Action Area

2.3.1 Oil (and Hazardous Substance) Facilities and Transport in the Northwest

The production of crude oil in the US has been increasing since 2008. According to a 2015 Ecology report, the increased domestic oil production in the US between 2008 and 2013 resulted in 66% of its oil demand being met from within North America (Ecology 2015). As a result of the increased domestic oil production, the type of oil being transported throughout the NW and the methods used to transport the oil are changing. Specifically, while marine tanker vessel transport is still the dominant mode of transportation, trends are shifting toward rail and pipeline transport. For example, in Washington, oil transport by tanker historically accounted for 90% of oil transportation in the state; however, oil transport by tanker had decreased to less than 70% as of 2014 (Ecology 2015) and to 47% as of the last quarter of 2016 (Ecology 2017).

The relative decline of oil transport by marine vessel in Washington is explained by the increasing transport of oil by rail, which is predicted to increase up to sixfold by 2035 in response to greater extraction of Bakken crude oil (Ecology 2015). All three states covered by the NWACP are experiencing a similar upsurge in rail traffic. Rail traffic from oil transport in Oregon, for example had increased from zero to approximately five unit trains per week as of 2014 (Johnson 2016). Most of the unit trains carrying crude oil to Washington refineries are transporting oil from North Dakota through Idaho and along the Columbia River (Spokesman Review 2017) (Ecology 2017).

Increased production of two oils—Bakken crude oil and diluted bitumen (also referred to as “dilbit”)—accounts for the notable changes to oil transport in the NW. Bakken crude oil, which is sourced from the Bakken formation in Montana, North Dakota, and southern Canada, makes up most of the crude oil entering Washington State (Ecology 2015). The production of Bakken crude oil will likely continue to increase, because an estimated 3.65 billion barrels of oil are currently untapped, and between 35,000 and 70,000 new wells are expected to be created between 2013 and 2023 (USGS 2013).

Diluted bitumen is a treated crude oil derived from Canadian oil sands that also saw a large increase in production from 2003 to 2013, from approximately 36.2 to nearly 73.5 million gallons per day (CAPP 2016). Diluted bitumen is a heavy oil that sinks in water when spilled, and it can vary in flammability and toxicity depending on the diluent used to treat it prior to transport (Ecology 2015). Diluent is added to heavy bitumen to decrease its viscosity and thereby improve transportability by pipeline. There is currently one pipeline in northwest Washington that carries crude oil (Ecology 2015);[28] several other pipelines in Washington, Oregon, and Idaho also transport refined petroleum products. Although diluted bitumen is mostly transported through Washington via a single pipeline, rail transport also occurs (Ecology 2015). Diluted bitumen is currently transported via rail from Alberta to Tacoma, Washington, and oil moving along this route may increase in the future.

As noted, marine vessels remain the major means for transporting oil in the NW (and Washington State in particular), and many domestic and foreign tankers and articulated tug-barges enter Puget Sound every year. In 2013, approximately 700 vessels entered the Puget Sound, excluding those destined for Canada (Ecology 2015), while 264 tankers and articulated tug-barges entered the Columbia River and 17 entered Grays Harbor (Ecology 2015).

Facility expansions are projected to increase vessel traffic threefold by 2030 (Ecology 2015). Two new facility expansions are proposed for Grays Harbor. These projects would allow the number of rail cars offloading oil at Grays Harbor facilities to increase to 350 per month; storage space at those facilities would also be increased.

The shift toward using rail to transport Bakken crude oil may increase the difficulty and effectiveness of spill response in the NW (e.g., resulting from unit train car derailments). Because Bakken crude oil is more soluble, volatile, and flammable than most other transported oils (e.g., West Texas crude oil), it can more easily contaminate groundwater (Ecology 2015), and it also has a greater propensity to burn. Hazardous fumes associated with Bakken crude oil may also create unsafe conditions (Ecology 2015). The majority of crude oil rail traffic occurs along the Columbia River Gorge (Ecology 2015). As the amount of oil transported by rail has increased (approximately 44 times more than 30 years ago), the volume of oil spilled by rail cars has increased by 42%, even though the number of spills per gallon transported has decreased (Ecology 2015). Increased rail transport results in a greater risk for spills in terrestrial, riverine, wetland, shoreline, and nearshore habitats (Ecology 2015).

In August 2016, Ecology adopted a new rule as a result of legislative direction. The rule establishes a system for monitoring oil transport in Washington State and notifying the public about how oil is being transported and in what quantities. The purpose of the rule is to better understand how oil transport is changing in the state and to inform first responders about oil traffic, which will better prepare them for a spill response. Facilities moving oil by rail must report quarterly details, including the region of origin, the route of transport, scheduled time and volume, and the specific gravity of the transported oil. Information reported for pipelines must include a biannual notice of all crude oil transported in the state. Spill volumes must also be reported each quarter (Ecology 2017) (Washington Administrative Code 173-185).

[28] Although U.S. crude oil cannot be exported due to a federal export ban, bitumen and Canadian oils imported into Washington are refined and then exported via barge or tanker at the mouth of the Columbia River, Grays Harbor, and the Puget Sound (Ecology 2015).

2.3.2 Size and Types of Spills in the NW

In order to provide context for spill response, it is important to consider the sizes and types of spills that have actually occurred in the Action Area, as well as those likely to occur in the future. As noted, changes in the energy sector—including the recent and rapid increases in Bakken crude oil extraction and export through the NW—may alter the profile of oil spills, particularly along rail corridors near inland waters. Within the marine environment, there is a long history of spills and responses by the USCG that can be drawn upon to help describe spills and provide some context for response activities in the NW.

2.3.2.1 Coastal Zone

Oil spill response data for marine waters are maintained at the USCG Sectors. USCG Sectors Puget Sound and Columbia River have compiled information on oil spills within their respective coastal zone areas of responsibility since 2011; a summary of the information follows. It is important to note that equipment was not deployed in all instances of response. The intent of this summary is not to characterize response, but rather the describe spill amounts and types that have occurred in the NW.

In Sector Columbia River between 2011 and 2016, there were 470 records of petroleum spills, which ranged from 0.1 to 6,762 gallons in volume. The types of oil were diesel (32%), hydraulic (14%), automobile (8%), and unknown oil type (32%), while the remaining percentage comprised small numbers of spills of bilge slop, vegetable, lubricating, motor, and other oils. In Sector Puget Sound, there was a similar number of records, with spills ranging from 0.01 to 3,400 gallons. The types of oil were the same as those in Sector Columbia River: diesel, hydraulic, gasoline, unknown oil types, bilge slop, lubricating oil, and others.

According to data from the Sectors, the majority of spills or potentials spills in the marine area are due to equipment failure or boat groundings, or from sunken pleasure craft or fishing vessels. In most of these cases, the spills are small, and the responses are correspondingly small and do not involve establishing an Incident Command Post and Unified Command. Most often, spills are responded to with a single Incident Commander and small response team, following ICS constructs.

A recent review by the Fraser Institute on the safety of oil and gas transport indicates that risk of spills in the marine environment, actual incidents, and amounts of oil spilled have all declined significantly since the 1970s (see Figures 8 and 9 in Green and Jackson (2017)). Much of this decline is attributable to regulations implemented after the Exxon Valdez accident and oil spill that have reduced the occurrence of vessel incidents.

The Oil Spill Task Force (OSTF) for the Pacific states and British Columbia compiles data for oil spills occurring along the West Coast of the US, British Columbia, and Alaska, and tracks regional trends in spills and related causal factors. The analyses provided in the OSTF annual report (OSTF 2017) indicate that most reported spills are minor (less than 1,000 gallons in the coastal region). These finding are consistent with information collected by the USCG Sectors. For example, the majority of spills are diesel oil, and there are many small spills of less than 42 gallons in the region (OSTF 2017). In Oregon, 70% of reported spills in 2016 were 42 gallons or less; in Washington, 90% of reported spills were 42 gallons or less. In a review of spills greater than 10,000 gallons from 2002 through 2016, there were no spills of that size in the marine environment off the coasts of Oregon or Washington (OSTF 2017).

2.3.2.2 Inland Zone

As in the marine zone, the vast majority of reported spills in the inland zone are for small amounts of oil, or for oil that does not threaten surface water. In the last two years, the EPA has been notified of approximately 1,000 oil spills in Washington, Oregon, and Idaho. By law, spillers are required to notify the National Response Center of any oil release that may threaten surface water. Typically, spillers will conservatively notify the EPA after any release of oil even if it does not threaten surface water. Of the 1,000 notifications since 2016, fewer than 10 resulted in the EPA deploying an FOSC, and only five required multi-day operations and the formation of Unified Command.

2.3.3 Typical Response Time and Type

The amount of time spent on an individual spill response depends on the type of oil, the extent of oiling, whether the oil reaches the shoreline, and the nature of the response. In the marine environment, it is often possible to remove oil from the water's surface before the spill reaches a shoreline, so the response is limited to on-water cleanup. The use of chemicals (e.g., dispersants) or *in situ* burning must occur quickly, before the oil begins to change texture or becomes too diluted for the techniques to be successful. There is generally a 96-hour window to respond to oil using dispersants or *in situ* burning. The use of mechanical methods (e.g., booming and then skimming) or sorbents generally lasts from one day to one week (typically no more than four days), depending on the type of spill. As noted, most spills in the marine zone are the result of equipment failure or sinking vessels; for such spills, a boom is laid out to control the oil, which is then cleaned up. Unlike other regions of the US, where offshore drilling for oil may result in a continuous spill, there is no offshore drilling in the Action Area, so any spill would result in all or most of the oil being spilled at once. Therefore these two types of response—chemical and mechanical—and their associated actions (e.g., vessels and planes to apply and/or monitor effectiveness) would be short-term, lasting as little as a few hours and typically no more than four days.

The evaluation and cleanup of shorelines is generally more time consuming than on-water operations. Because the majority of spills in this area are minor (i.e., less than 42 gallons), there is usually very little, if any, shoreline impact, and thus no need for extensive cleaning. Shoreline cleanup is usually expected to take less than one week and considered short-term. If a cleanup operation were to take more than one week, it would be characterized as long-term.

It is important to note that response does not include restoration. The responsibility of the federal on scene coordinator is to cleanup the affected environment; each incident response determines how clean is clean. The restoration of an area and the assessment of damages caused by a spill is the role of NRDA, which is a separate process and not part of response actions taken under the NWACP.

3 Status of Listed Species and Designated Critical Habitat

The status of ESA-listed species and designated critical habitats are the focus of the environmental baseline in this BA. The regulatory definition of the environmental baseline is defined as the past and present impacts of all federal, state, or private actions and other human activities in the Action Area, the anticipated impacts of all proposed federal projects in the Action Area that have already undergone ESA Section 7 consultation, and the impact of state or private actions that are contemporaneous with the consultation in process (50 CFR §402.02).

For evaluating a response action under the NWACP, the baseline condition assumes the occurrence of a spill of hazardous substance (e.g., crude oil, diesel fuel) and the interaction of species and their habitats under the conditions of a spill. The environmental baseline discussion includes the habitats (including critical habitats) used by ESA-listed species, the current distribution and abundance of those species, and the conditions and stressors that currently affect the status of those species and habitats. The direct and indirect effects of spill response actions (if needed in response to a spill of oil or hazardous material), together with the effects of any interrelated or interdependent actions, are added to the environmental baseline, to determine the effect on ESA-listed species and their habitat.

3.1 Potential Effects from Global Climate Change

Climate change has an influence on baseline conditions related to both habitat and species, and the status of ESA-listed and proposed species and their designated and proposed critical habitat that cannot be ignored but is difficult to assess.

The increasing rate of global climate change is supported by a preponderance of scientific evidence (Ecology 2012). Observed and predicted impacts to NW habitats include:

- Warmer air and water temperatures;
- More frequent and severe extreme weather events (e.g., heavy rainfall, flooding, high temperatures, and drought) and wildfires;

- Increasing winter temperature shifting snowfall to rain and timing of melting snow and ice to earlier in the season;
- Rising sea levels; and
- Increased marine salinity and reduced marine pH (acidification)

These impacts are predicted to continue (and in some cases accelerate), which may substantially affect the ESA-listed species and their habitats considered in this BA, the incidence of oil and hazardous substance spills, and, consequently, spill responses.

The changing climate is expected to affect species and habitats in many different ways. For example, the distribution of shoreline-dependent species will shift as a consequence of rising sea levels. The California Current Large Marine Ecosystem will see northern shifting isotherms, which will shift species distribution as well as increase ocean stratification, impeding nutrient transport and plankton production (NOAA Fisheries 2016t).

Migration patterns of salmon are also expected to be affected by changing water temperatures (Ecology 2012). As a result of increasing typhoon frequency, changing water temperatures, and increasing oceanic salinity (each related to climate change), green sea turtles (*Chelonia mydas*) may experience threats, including (but not limited to), nest failure and an unstable prey base (Duarte 2002; Short and Neckles 1999).

The reduction of prey and alteration of food webs caused by climate change and ocean acidification have the potential to impact ESA-listed species. For example, survival of emigrating fall-run LCR coho salmon (*Oncorhynchus kisutch*) smolts and the abundance of LCR Chinook salmon (*O. tshawytscha*) have both been impacted by reduced prey and altered food webs (related to climate change) (NOAA Fisheries 2015b). Climate change is also cited as the most serious threat to the southern distinct population segment (DPS) of Pacific eulachon (*Thaleichthys pacificus*), which are dependent on cool water habitat and the invertebrate communities therein (Gustafson et al. 2010; Willson et al. 2006). Climate-driven impairment of invertebrate and fish populations may cause a cascading effect on species at higher tropic levels; for example, loss of prey due to climate change is a key threat to fin whales (*Balaenoptera physalus*) (NMFS 2010a). Ocean acidification is predicted to increase mortality in shell-forming species (e.g., shellfish) (NOAA Fisheries 2016t), which are important as prey for ESA-listed species (e.g., loggerhead sea turtle; *Caretta caretta*).

Effects will be seen outside of the ocean as well. Changes in the lengths of typical seasons have been observed to shift the timing of bird and other animals' migration (Ecology 2012). The spread of invasive species and disease is predicted to increase. For example, forests in Washington have become more susceptible to pine beetle (*Dendroctonus ponderosae*) infestation as a result of drought-stress (Ecology 2012). Climate change-driven disruptions to ecosystems are predicted to result in further declines of species populations and biodiversity.

Climate change has the potential to impact the number or rate of oil and hazardous substance spill incidences and subsequent spill responses. Oil refineries and associated storage tanks are located along shorelines to facilitate the offloading and transfer of oil and petroleum products. As a result, these facilities are located in areas vulnerable to sea level rise. Industrial infrastructure, including pipelines, tanks, and containment areas, was designed and built based on current water levels, and changing water levels could cause ground and infrastructure instability (Ecology 2012).

Increased flooding from heavy rains, sea level rise, saltwater intrusion, and storm surge could also play a role in changing oil spill incidences from facilities, as many facilities were built for the current environment without regard to climate change (Ecology 2012). Increased storm event frequency and severity could increase risk of spills (e.g., vessel incidents) (Ecology 2012).

3.2 Current Status of Protected Species and Habitat

A total of 77 species, including DPSs and evolutionary significant units (ESUs) of salmonids and designated or proposed critical habitat were considered in this BA (Table 3-1). The species list (current as of June, 2017) was developed with input from the Services and includes ESA-listed species in the NW with distributions that overlap with the Action Area (high-risk transportation corridors and associated buffers).

Critical habitat within the NW has been designated or proposed for 50 of the 77 ESA-listed species considered in this BA, 40 of which overlap with the Action Area (Table 3-1). When designating or proposing critical habitat, either the NMFS or USFWS identifies the physical and biological features (PBFs) that are essential to the conservation of the species.

As listed in 50 CFR §424.12(b) (2010), PBFs are features that may require special management considerations or protection, and specific areas outside the geographical area occupied by the species at the time it was listed and considered essential for the conservation of the species. Special management may be required for loss of habitat due to conversion, use of heavy equipment in suitable habitat (even if being used to control nonnative, invasive species), development, construction and maintenance of roads and utility corridors, predation, habitat modification from successive vegetation, and pest control.

PBFs for critical habitat include, but are not limited to:

- Space for individual and population growth and for normal behavior;
- Food, water, air, light, minerals, or other nutritional or physiological requirements;
- Cover or shelter;
- Sites for breeding, reproduction, or rearing (or development) of offspring, germination or seed dispersal; and
- Habitats that are protected from disturbance or are representative of the historic geographical and ecological distributions of a species.

Specific PBFs for designated or proposed critical habitat that overlaps with the Action Area are discussed in each of the subsections describing the status of the ESA-listed species.

Table 3-1 Protected Species and Critical Habitat Evaluated in the Northwest Area Contingency Plan Biological Assessment

Protected Species	Scientific Name	Status	Species Occurrence by State[a]			Critical Habitat	
			OR	WA	ID	Status	Overlap with Action Area
Responsible Agency – NMFS							
Fish[b]							
Puget Sound Chinook salmon ESU	*Oncorhynchus tshawytscha*	T		X		D	X
Snake River fall-run Chinook salmon ESU	*O. tshawytscha*	T	X	X	X	D	X
Snake River spring/summer-run Chinook salmon ESU	*O. tshawytscha*	T	X	X	X	D	X
Upper Columbia River spring-run Chinook salmon ESU	*O. tshawytscha*	E	X	X		D	X
Lower Columbia River Chinook salmon ESU	*O. tshawytscha*	T	X	X		D	X
Upper Willamette River Chinook salmon ESU	*O. tshawytscha*	T	X	X		D	X
Hood Canal chum salmon ESU	*O. keta*	T		X		D	X
Columbia River chum salmon ESU	*O. keta*	T	X	X		D	X
Lower Columbia River coho salmon ESU	*O. kisutch*	T	X	X		D	X
Oregon Coast coho salmon ESU	*O. kisutch*	T	X			D	X
Southern Oregon/Northern California Coastal coho salmon ESU	*O. kisutch*	T	X			D	X
Snake River sockeye salmon ESU	*O. nerka*	E	X	X	X	D	X
Lake Ozette sockeye salmon ESU	*O. nerka*	T		X		D	X
Snake River Basin steelhead trout DPS	*O. mykiss*	T	X	X	X	D	X
Puget Sound steelhead trout DPS	*O. mykiss*	T		X		D	X
Upper Columbia River steelhead trout DPS	*O. mykiss*	T	X	X		D	X
Middle Columbia River steelhead trout DPS	*O. mykiss*	T	X	X		D	X
Lower Columbia River steelhead trout DPS	*O. mykiss*	T	X	X		D	X
Upper Willamette River steelhead trout DPS	*O. mykiss*	T	X	X		D	X
Pacific eulachon, southern DPS	*Thaleichthys pacificus*	T	X	X		D	X
Puget Sound/Georgia Basin Bocaccio rockfish	*Sebastes paucispinis*	E		X		D	X
Puget Sound/Georgia Basin yelloweye rockfish	*S. ruberrimus*	T		X		D	X

Table 3-1 Protected Species and Critical Habitat Evaluated in the Northwest Area Contingency Plan Biological Assessment

Protected Species	Scientific Name	Status	Species Occurrence by State[a]			Critical Habitat	
			OR	WA	ID	Status	Overlap with Action Area
Green sturgeon, southern DPS	*Acipenser medirostris*	T	X	X		D	X
Sea Turtles							
Leatherback sea turtle	*Dermochelys coriacea*	E	X	X		D	X
Green sea turtle, East Pacific DPS	*Chelonia mydas*	T	X	X		D	
Olive ridley sea turtle	*Lepidochelys olivacea*	T	X	X			
Loggerhead sea turtle, North Pacific Ocean DPS	*Caretta caretta*	E	X	X		D	
Marine Mammals							
Blue whale	*Balaenoptera musculus*	E	X	X			
Fin whale	*B. physalus*	E	X	X			
Humpback whale, Central America DPS	*Megaptera novaeangiliae*	E	X	X			
Humpback whale, Mexico DPS	*M. novaeangiliae*	T	X	X			
North Pacific right whale	*Eubalena japonica*	E	X	X		D	
Sei whale	*B. borealis*	E	X	X			
Killer whale, Southern Resident DPS	*Orcinus orca*	E	X	X		D	X
Sperm whale	*Physeter macrocephalus*	E	X	X			
Gray whale, Western North Pacific	*Eschrichtius robustus*	E(F)	X	X			
Guadalupe fur seal	*Arctocephalus townsendi*	T	X	X		D	
Responsible Agency – USFWS							
Plants							
Applegate's milk-vetch	*Astragalus applegatei*	E	X				
Bradshaw's desert-parsley	*Lomatium bradshawii*	E	X	X			
Golden paintbrush	*Castilleja levisecta*	T	X	X			
Howell's spectacular thelypody	*Thelypodium howellii* ssp. *spectabilis*	T	X				

Table 3-1 Protected Species and Critical Habitat Evaluated in the Northwest Area Contingency Plan Biological Assessment

Protected Species	Scientific Name	Status	Species Occurrence by State[a]			Critical Habitat	
			OR	WA	ID	Status	Overlap with Action Area
Kincaid's lupine	*Lupinus sulphureus* var. *kincaidii*	T	X	X		D	
Nelson's checkermallow	*Sidalcea nelsoniana*	T	X	X			
Slickspot peppergrass	*Lepidium papilliferum*	T			X	P	X
Spalding's catchfly	*Silene spaldingii*	T		X	X		
Ute Ladies'-tresses	*Spiranthes diluvialis*	T		X			
Water howellia	*Howellia aquatilis*	T	X	X	X		
Western lily	*Lilium occidentale*	E	X				
White Bluffs bladderpod	*Physaria douglasii* ssp. *tuplashensis*	T		X		D	
Willamette daisy	*Erigeron decumbens* var. *decumbens*	E	X			D	
Snails							
Banbury springs limpet	*Lanx* spp.	E			X		
Bliss Rapids snail	*Taylorconcha serpenticola*	T			X		
Bruneau hot springsnail	*Pyrgulopsis bruneauensis*	E			X		
Snake River physa	*Physa natricina*	E			X		
Butterflies							
Fender's blue butterfly	*Icaricia icarioides fenderi*	E	X			D	
Island marble butterfly	*Euchloe ausonides insulanus*	C[c]		X		P[c]	X
Oregon silverspot butterfly	*Speyeria zerene hippolyta*	T	X	X		D	X
Taylor's checkerspot	*Euphydryas editha taylori*	E	X	X		D	X
Fish							
Bull trout	*Salvelinus confluentus*	T	X	X	X	D	X

Table 3-1 Protected Species and Critical Habitat Evaluated in the Northwest Area Contingency Plan Biological Assessment

Protected Species	Scientific Name	Status	Species Occurrence by State[a]			Critical Habitat	
			OR	WA	ID	Status	Overlap with Action Area
Kootenai River white sturgeon	*Acipenser transmontanus*	E			X	D	X
Lost River sucker	*Deltistes luxatus*	E	X			D	X
Shortnose sucker	*Chasmistes brevirostris*	E	X			D	X
Herptiles							
Oregon spotted frog	*Rana pretiosa*	T	X	X		D	X
Mammals							
Canada lynx	*Felis lynx canadensis*	T	X		X	D	
Columbian white-tailed deer (Columbia River DPS)	*Odocoileus virginianus leucurus*	T[d]	X	X			
Grizzly bear	*Ursus arctos horribilis*	T			X		
Gray wolf (North Rocky Mountain)	*Canis lupus*	E	X	X			
North American wolverine	*Gulo gulo luscus*	T(P)	X	X	X		
Olympia pocket gopher	*Thomomys mazama pugetensis*	T		X		D	X
Roy Prairie pocket gopher	*T. m. glacialis*	T		X			
Tenino pocket gopher	*T. m. tumuli*	T		X		D	X
Yelm pocket gopher	*T. m. yelmensis*	T		X		D	X
Birds							
Marbled murrelet	*Brachyrampus marmoratus*	T	X	X		D	X
Northern spotted owl	*Strix occidentalis caurina*	T	X	X		D	X
Short-tailed albatross	*Phoebastria albatrus*	E	X	X			
Streaked horned lark	*Eremophila alpestris strigata*	T	X	X		D	X
Western snowy plover	*Charadrius alexandrinus nivosus*	T	X	X		D	X
Yellow-billed cuckoo	*Coccyzus americanus*	T	X	X	X	P	

Notes to Table 3-1:

[a] Species occurrence within a state does not imply overlap with the Action Area.
[b] Species occurrence by state for anadromous fish is shown for inland areas.
[c] On April 12, 2018, the USFWS proposed to list the island marble butterfly and designated critical habitat; the final listing rule is scheduled to publish on or before April 12, 2019 (83 FR 15900).
[d] Status of Columbian white-tailed deer was changed from endangered to threatened in October 2016 (81 FR 71836).

Key:

D	designated
DPS	distinct population segment
E	endangered
ESU	evolutionary significant unit
F	foreign
ID	Idaho
NMFS	National Marine Fisheries Service
OR	Oregon
P	proposed
T	threatened
USFWS	US Fish and Wildlife Service
WA	Washington

A no effect (NE) determination has been made for a subset of the species listed in Table 3-1 and their critical habitat. Using the preliminary list of species that overlap with the Action Area generated with assistance from the USFWS and after subsequent discussions with USFWS biologists, the action agencies attempted to obtain the most current data on the location of designated critical habitat and species distribution (USFWS 2018a).

Specific location data were obtained through meetings and communications with biologists from the USFWS and the Oregon Department of Fish and Wildlife (ODFW) (Stephenson 2017; Thomas 2017; Marten 2017; Brown 2017) and from the Washington Department of Natural Resources Natural Heritage Program (WNHP) and Oregon Biodiversity Information Center (ORBIC) databases (WDNR 2017; OSU 2017).

Once these data were obtained, the following types of information were considered in making an NE determination depending on the species: 1) rarity of the species in the Action Area (e.g., solitary species with large home range), 2) degree of spatial overlap of designated critical habitat with the Action Area, 3) potential proximity of the action (e.g., staging area adjacent to a highway/roadway) to the species general (not necessarily critical) habitat, 4) nature of the stressor, 5) duration of the response action (short or long term) and 6) disturbance severity and intensity (USFWS and NMFS 1998).

The proposed federal action will have “no effect” on the following ESA-listed or candidate species (from Table 3-1) because they do not occur in the Action Area:

- Ute Ladies′-tresses (*Spiranthes diluvialis*),
- White Bluffs bladderpod (*Physaria douglasii* spp. *tuplashensis*),
- Bruneau hot springsnail (*Pyrgulopsis bruneauensis*),
- Fenders blue butterfly (*Icaricia icarioides fender*),
- Canada lynx (*Felis lynx Canadensis*),
- Gray wolf (*Canis lupus*), and
- North American wolverine (*Gulo gulo luscus*).

In addition, the proposed federal action will have “no effect” on designated critical habitat for White Bluffs bladderpod, Fender’s blue butterfly, and Canada lynx because their critical habitat does not overlap with the Action Area. No critical habitat has been designated for Ute Ladies’-tresses, Bruneau hot springsnail, gray wolf, or North American wolverine. These species and their critical habitat are not discussed further in this BA.

3.2.1 Species Managed by the National Marine Fisheries Service

3.2.1.1 Fish

Salmonids

This section presents the status of the 19 ESUs[29] of salmonids (i.e., Chinook, chum, coho, and sockeye salmon and steelhead trout) listed in the NW.

[29] ESUs are defined as subpopulations isolated in space and/or time with regard to spawning) (Waples et al. 1991).

Chinook Salmon (*Oncorhynchus tshawytscha)*

Chinook salmon, also called king salmon, are the largest and least abundant species of Pacific salmon (NMFS 2005). Chinook salmon are anadromous, requiring both freshwater and saltwater to complete their life cycle. Juveniles generally spend three months to two years in freshwater before migrating to estuarine waters and eventually to sea, where they spend one to six years. Adults spend most of their lives in the ocean before migrating back to natal freshwater streams to spawn and then die. Compared to other Pacific salmon species, Chinook prefer larger and deeper stream habitat (NMFS 2005). Juveniles feed on terrestrial and aquatic invertebrates, while subadults (i.e., post-smolt stage) and adults consume larger prey such as shrimp, squid, and small fish (e.g., herring [*Clupea* spp.] and sand lance [*Ammodytidae* spp.]) (Scott and Crossman 1973). The distribution of Chinook salmon in the marine environment is not well characterized; however, they may be found as far north as Alaska, as far south as California, and as far west as Russia and Japan (NMFS 2016e).

NOAA Fisheries recognizes six ESA-listed ESUs of Chinook salmon that spawn in Washington, Oregon, and Idaho: two Snake River ESUs were listed in April 1992 (57 Federal Register [FR] 14653); the Upper Willamette River (UWR) ESU was listed in March 1999 (64 FR 14308); and the two Columbia River ESUs and single Puget Sound ESU were listed in August 1999 (64 FR 41835). In 2005, NOAA published a scientific report entitled *Updated Status of Federally Listed ESUs of West Coast Salmon and Steelhead*, which includes an updated status of Chinook salmon (Good et al. 2005). The five-year status review completed in 2010 (76 FR 50448) concluded that all Chinook salmon ESUs should remain listed. Each ESU is treated as a separate species under the ESA (76 FR 50448). ESUs may include both naturally spawned and artificially propagated (hatchery stock) fish.

Puget Sound Chinook Salmon ESU

The Puget Sound Chinook salmon ESU was listed as threatened in 1999 (64 FR 14308), and its status was reaffirmed in 2005 (70 FR 37160). The Puget Sound Chinook salmon ESU includes all naturally spawned populations of Chinook salmon from rivers and streams flowing into Puget Sound, including the Strait of Juan De Fuca (east of the Elwha River), the Strait of Georgia (in Washington), and rivers and streams flowing into Hood Canal, South Sound, and North Sound. Additionally, all naturally spawned progeny of the 26 artificial propagation programs are considered part of this ESU (64 FR 14308).

Distribution

As noted above, Puget Sound Chinook salmon can be found in freshwater environments draining to the Puget Sound. Alterations to stream morphology and hydrology (e.g., construction of hydroelectric dams) has reduced salmon habitat in the Puget Sound region by limiting upstream migration to historical spawning habitats.

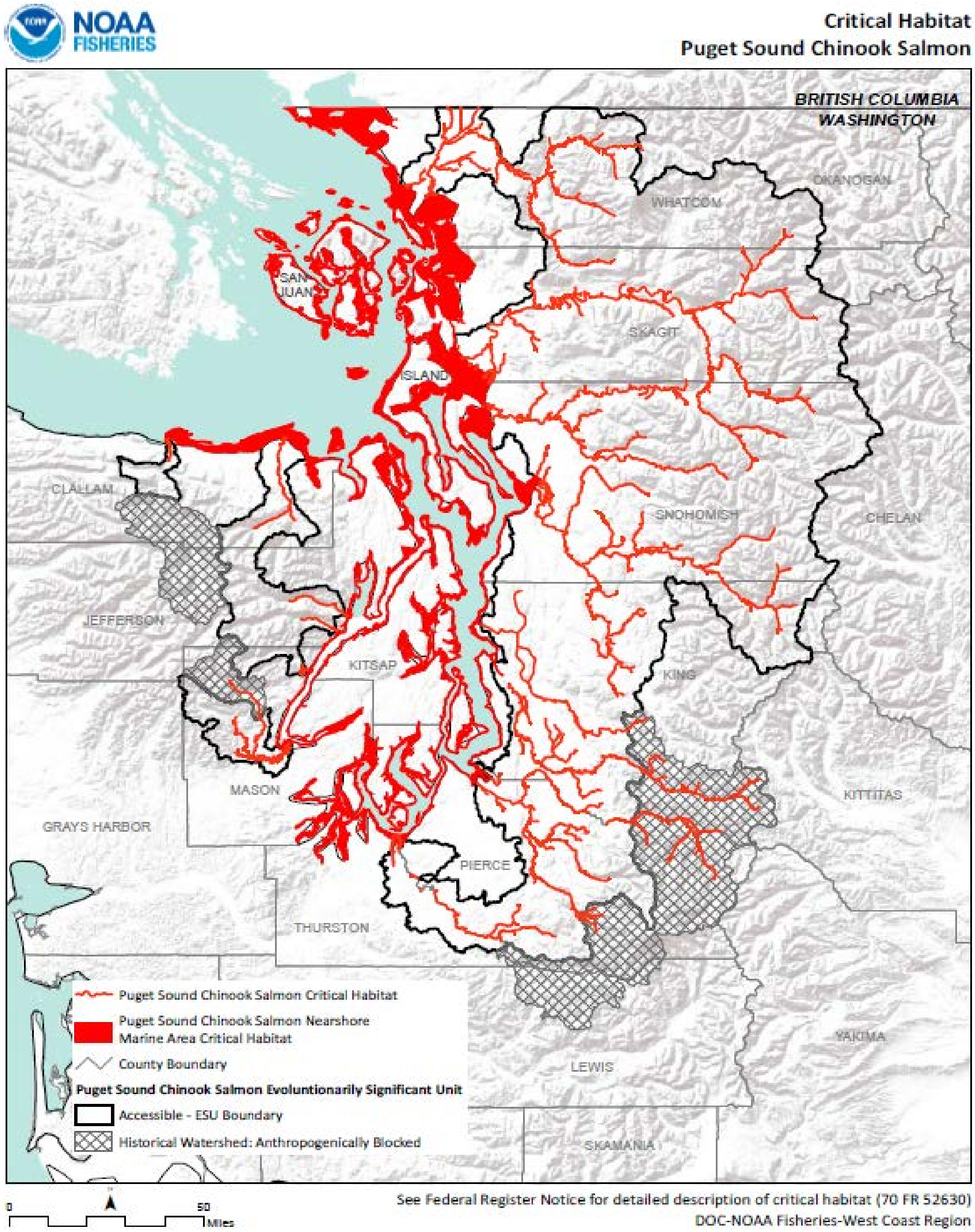
Although the exact distributions and migrations of Pacific Ocean salmon are currently not well understood, Puget Sound Chinook salmon fitted with coded tags appear to have common marine distributions, and they are mostly captured within Puget Sound and coastal Canadian waters (Weitkamp 2010). Individual salmon from the Puget Sound may migrate as far north as Alaska and as far west as Russia and Japan (NMFS 2016e).

Critical Habitat

Critical habitat for this ESU was designated in 2005 (70 FR 52630) (Figure 3-1). Critical habitat for the species includes all waters noted above (i.e., draining into Puget Sound) in which Chinook salmon rear and naturally spawn or are planted (by hatcheries).

The following PBFs apply to most West Coast salmon species (PBFs are noted in later sections, as applicable):

- Freshwater spawning sites with water quantity and quality conditions and substrate supporting spawning, incubation, and larval development;
- Freshwater rearing sites with water quantity and floodplain connectivity to form and maintain physical habitat conditions and support juvenile growth and mobility; water quality and forage supporting juvenile development; and natural cover such as shade, submerged and overhanging large wood, log jams and beaver dams, aquatic vegetation, large rocks and boulders, side channels, and undercut banks;
- Freshwater migration corridors free of obstruction with water quantity and quality conditions and natural cover such as submerged and overhanging large wood, aquatic vegetation, large rocks and boulders, side channels, and undercut banks supporting juvenile and adult mobility and survival;
- Estuarine areas free of obstruction with water quality, water quantity, and salinity conditions supporting juvenile and adult physiological transitions between fresh water and saltwater; natural cover such as submerged and overhanging large wood, aquatic vegetation, large rocks and boulders, and side channels; and juvenile and adult forage, including aquatic invertebrates and fishes, supporting growth and maturation;
- Nearshore marine areas free of obstruction, with water quality and quantity conditions and forage, including aquatic invertebrates and fishes, that support growth and maturation; and natural cover such as submerged and overhanging large wood, aquatic vegetation, large rocks and boulders, and side channels; and
- Offshore marine areas with water quality conditions and forage, including aquatic invertebrates and fishes, supporting growth and maturation.



Source: (NOAA Fisheries 2016h)
Note: Chinook salmon habitat within the Elwha River watershed (gray hatch spanning Clallam and Jefferson Counties) has been reopened now that the Elwha and Glines Canyon Dams have been removed. The map predates the change to the watershed.

Figure 3-1 Critical Habitat for Puget Sound Chinook Salmon

Life History

Chinook salmon exhibit consistent seasonal immigration patterns, with groups “running” (i.e., returning to freshwater streams) during spring, early summer, or early fall. Typically, spring-run Puget Sound Chinook salmon return to freshwater between April and May and spawn between August and September (Orrell 1976 as cited in Myers et al. 1998; Washington Department of Fisheries et al. 1993). Pre-spawn adults migrate upstream into pools, where they physiologically mature in preparation for spawning. Summer-run fish return to freshwater streams between June and July and spawn in September. Fall-run Chinook salmon return in August and spawn between late September and January (Washington Department of Fisheries et al. 1993). Within a single river, spawning times of different seasonal runs may overlap, but geographic separation within the river maintains some amount of reproductive isolation between runs (Myers et al. 1998).

Most Puget Sound Chinook salmon migrate to the sea as young-of-year juveniles,[30] where they often reside in estuaries that provide important nursery habitat for smolting juveniles.[31] The Suiattle and South Fork Nooksack Rivers are notable exceptions because migrating fish are predominantly yearlings (i.e., greater than or equal to one year but less than two years old) (Marshall et al. 1995 as cited in NOAA 2006b). In these rivers, reduced smolting and production, delayed growth, and increased age of returning adults (i.e., at four to five years rather than three to four years) may be caused by an excess of glacial till.

Current Stressors and Threats

Limiting factors for Puget Sound Chinook salmon include degraded floodplain and in-river channel structure, degraded estuarine conditions and loss of estuarine habitat, degradation of riparian habitat and loss of in-river large woody debris, excessive fine-grained sediment in spawning gravels, degraded water quality and temperature (i.e., increased temperatures), degraded nearshore conditions, impaired passage for migrating fish, and severely altered flow regimes. Other stressors include commercial and recreational harvest or bycatch (accidental) and predation (e.g., by killer whale).

Snake River Fall-run Chinook Salmon

The Snake River fall-run Chinook salmon ESU was listed as threatened on April 22, 1992 (57 FR 14653), and the threatened status was reaffirmed in 2005 (70 FR 37160).

Distribution

The Snake River fall-run Chinook salmon ESU occupies the Snake River basin, which drains portions of southeastern Washington, northeastern Oregon, and north/ central Idaho. The Snake River fall-run Chinook salmon ESU includes one extant population of fish spawning in the mainstem of the Snake River and the lower reaches of several major tributaries, including the Tucannon, Grande Ronde, Clearwater, Salmon, and Imnaha Rivers. The ESU also includes four artificial propagation programs: the Lyons Ferry Hatchery and the Fall Chinook Acclimation Ponds Program in Washington; the Nez Perce Tribal Hatchery in Idaho; and the Oxbow Hatchery in Oregon and Idaho (70 FR 37160). Historically, this ESU also included a large population that

[30] “Young of year” is a term used to describe individuals of age less than one year.

[31] Smolting is a physiological change that allows anadromous salmon to move from freshwater to saltwater environments.

spawned in the mainstem of the Snake River upstream of the Hells Canyon Dam complex, which is currently an impassable barrier to migration (NOAA Fisheries 2015a).

Critical Habitat

Critical habitat for Snake River fall-run Chinook salmon was designated in 1993 and includes reaches of the Columbia, Snake, and Salmon Rivers and passable tributaries of the Snake and Salmon Rivers (58 FR 68543). The geographic extent of critical habitat is the Snake River to Hells Canyon Dam; Palouse River from its confluence with the Snake River upstream to Palouse Falls; Clearwater River from its confluence with the Snake River upstream to Lolo Creek; North Fork Clearwater River from its confluence with the Clearwater River upstream to Dworshak Dam; and all other river reaches presently or historically accessible within the Lower Clearwater, Hells Canyon, Imnaha, Lower Grande Ronde, Lower Salmon, Lower Snake, Lower Snake–Asotin, Lower North Fork Clearwater, Palouse, and Lower Snake–Tucannon sub-basins.

The PBFs for Snake River fall-run Chinook salmon are described in Table 3-2.

Table 3-2 Physical and Biological Features of Snake River Salmon Critical Habitat

Site	Physical and Biological Feature
Adult spawning and juvenile rearing	Suitable spawning gravel, water quality and quantity, water temperature, and access to spawning areas
Migration (adult and juvenile)	Suitable substrate, water quality and quantity, water temperature, water velocity, cover/shelter, food,[a] riparian vegetation, space, and safe passage

Note:
[a] Food applies to juvenile migration only.

Life History

Snake River fall Chinook salmon enter the Columbia River in July and August, and migrate past the lower Snake River mainstem dams from August through November. Spawning takes place from October through early December in the mainstem of the Snake River, primarily between Asotin Creek and Hells Canyon Dam, and in the lower reaches of several of the associated major tributaries, including the Tucannon, Grande Ronde, Clearwater, Salmon, and Imnaha Rivers (Ford et al. 2011; Connor and Burge 2003). Spawning has occasionally been observed in the tailrace areas of the four mainstem dams (Dauble et al. 1999; Mueller 2009; Dauble et al. 1994; Dauble et al. 1995). Juveniles emerge from the gravels in March and April of the following year.

Until relatively recently, Snake River fall Chinook were assumed to follow an “ocean-type” life history (Good et al. 2005; Dauble and Geist 2000; Healey 1991) (57 FR 14658), where they migrate to the Pacific Ocean during their first year of life, normally within three months of emergence from spawning substrate (as young-of-year smolts), to spend their first winter in the ocean. Ocean-type Chinook salmon juveniles tend to display a “rear as they go” strategy in which they continually move downstream through shallow shoreline habitats during the first summer and fall until they reach the ocean by winter (Connor and Burge 2003; Coutant and Whitney 2006). However, a substantial number of Snake River fall Chinook juvenile exhibit a “reservoir-type” life history, in which they begin their seaward migration later than ocean-types, arrest their migration and overwinter in reservoirs on the Snake and Columbia Rivers, then resume migration, entering the ocean in early spring as age-1 smolts (Connor et al. 2002; Connor and Burge 2003; Connor et al. 2005; Hegg et al. 2013). Analysis of fish scales taken from non-hatchery, adult, fall-run Chinook salmon indicate that approximately half of the returns passing Lower Granite Dam are reservoir type Snake River fall Chinook and overwintered in freshwater (Ford et al. 2011). Tiffan and Connor (2012) showed that young-of-year fish favor water less than 1.8 m (6 ft) deep.

Current Stressors and Threats

Stressors to Snake River Chinook salmon include commercial and recreational harvest, bycatch, and natural predation; reduced habitat and prey quality and quantity; and impeded migration pathways.

Spawning and rearing habitat quality in tributary streams in the Snake River varies from excellent in wilderness and roadless areas to poor in areas subject to intensive human land uses (NOAA Fisheries 2015a). Critical habitat throughout much of the Interior Columbia (which includes the Snake River and the Middle Columbia River; MCR) has been degraded by intensive agriculture, alteration of stream morphology (i.e., channel modifications and diking), riparian vegetation disturbance, wetland draining and conversion, livestock grazing, dredging, road construction and maintenance, logging, mining, and urbanization. Reduced summer streamflows, impaired water quality, and reduction of habitat complexity are common problems for critical habitat in non-wilderness areas. Human land use practices throughout the basin have caused streams to become straighter, wider, and shallower, thereby reducing rearing habitat and increasing water temperature fluctuations.

In many stream reaches designated as critical habitat in the Snake River basin, streamflows are substantially reduced by water diversions (NOAA Fisheries 2015a). Withdrawal of water, particularly during low-flow periods that commonly overlap with agricultural withdrawals, often increases summer stream temperatures, blocks fish migration, strands fish, and alters sediment transport (Spence et al. 1996).

Many stream reaches designated as critical habitat in the Snake River basin are on the CWA 303(d) list for impaired water quality (e.g., due to elevated water temperature) (IDEQ 2011). Many areas that were historically suitable rearing and spawning habitat are now unsuitable due to high summer stream temperatures, such as some stream reaches in the Upper Grande Ronde. Removal of riparian vegetation, alteration of natural stream morphology, and withdrawal of water for agricultural or municipal use all contribute to elevated stream temperatures. Water quality in spawning and rearing areas in the Snake River has also been impaired by high levels of sedimentation and by metal contamination potentially from mine waste (IDEQ and EPA 2003; IDEQ 2001).

Migration habitat quality for Snake River salmon has also been severely degraded, primarily by the development and operation of dams and reservoirs on the mainstem Columbia and Snake Rivers (NMFS 2008b). Hydroelectric development has modified natural flow regimes in the migration corridor, causing higher water temperatures and changes in fish community structure that have led to increased rates of piscivorous and avian predation on juvenile salmon, and delayed migration for both adult and juveniles. Physical features of dams, such as turbines, also kill migrating fish.

Snake River Spring/Summer-run Chinook Salmon
The Snake River spring/summer-run Chinook salmon ESU was listed as threatened on April 22, 1992 (57 FR 14653), and the threatened status was reaffirmed in 2005 (70 FR 37160). The spring/summer run and fall run subpopulations are distinguished from one another by the seasons during which they return to freshwater streams.

Distribution
Snake River Chinook salmon occupy the Snake River basin in southeastern Washington, northeastern Oregon, and north/central Idaho. The Snake River ESU includes all naturally spawning populations of spring/summer-run Chinook in the mainstem Snake River (below Hells Canyon Dam) and in the Tucannon River, Grande Ronde River, Imnaha River, and Salmon River sub-basins (57 FR 23458), as well as the progeny of 15 artificial propagation programs (70 FR 37160). The historical Snake River ESU likely also included populations in the Clearwater River drainage and extended above the Hells Canyon Dam complex; however, current runs returning to the Clearwater River drainages are not considered to be a part of the Snake River spring/summer-run Chinook salmon ESU.

Critical Habitat
Critical habitat for Snake River spring/summer-run Chinook salmon was designated in 1993 and 1999 and includes reaches of the Columbia, Snake, and Salmon Rivers and accessible tributaries of the Snake and Salmon Rivers (58 FR 68543 and 64 FR 57399). The geographic extent of critical habitat includes all Snake River reaches upstream to Hells Canyon Dam; all river reaches presently or historically accessible to Snake River spring/summer Chinook salmon within the Salmon River basin; and all river reaches presently or historically accessible to Snake River spring/summer Chinook salmon within the Hells Canyon, Imnaha, Lower Grande Ronde, Upper Grande Ronde, Lower Snake-Asotin, Lower Snake-Tucannon, and Wallowa sub-basins.

The PBFs for Snake River Chinook salmon (spring/summer and fall runs) are provided in Table 3-2.

Life History. Snake River spring/summer Chinook salmon are characterized by their return times. Spring runs are counted at Bonneville Dam beginning in early March and ending the first week of June. Summer runs include Chinook adults that pass Bonneville Dam from June through August. Returning adults will hold migration in deep mainstem and tributary pools until late summer, when they move up into tributary areas to spawn. In general, spring-run Chinook salmon tend to spawn in higher-elevation reaches of major Snake River tributaries in mid- to late August, and summer-run Chinook salmon tend to spawn lower in Snake River tributaries in late August and September. The spawning areas of the two runs may overlap.

Spring/summer Chinook follow a "stream-type" life history characterized by rearing for a full year in spawning habitat before migrating to the sea (Healey 1991). Eggs are deposited in late summer and early fall, incubate through the winter, and hatch between late winter and early spring. Juveniles rear through the summer, and most overwinter and migrate to the sea in the spring of their second year. Depending on the tributary and the specific habitat conditions, juveniles may migrate extensively from natal reaches into alternative summer-rearing or overwintering areas. Snake River spring/summer Chinook salmon return from the ocean to spawn primarily as four-and five-year-old fish, after two to three years in the ocean. A small fraction of the fish return as three-year old "jacks" (precocious spawners), of which the majority are males (Good et al. 2005).

Current Stressors and Threats

Limiting factors for Snake River spring/summer run Chinook salmon are the same as those listed above for the Snake River fall-run Chinook salmon subpopulation.

Upper Columbia River Spring-run Chinook Salmon

On March 24, 1999, the NMFS listed the Upper Columbia River (UCR) spring-run Chinook salmon as an endangered species (64 FR 14308). The status of this ESU was reaffirmed on June 28, 2005 (70 FR 37160) and again on August 15, 2011, after the five-year status review (76 FR 50448).

Distribution

The ESU includes all naturally spawned populations of Chinook salmon in all river reaches accessible to Chinook salmon in the Columbia River tributaries upstream of Rock Island Dam and downstream of Chief Joseph Dam (barrier to upstream movement), excluding the Okanogan River (64 FR 14208). Six artificial propagation programs are included in this ESU: The Twisp River, Chewuch River, Methow Composite, Winthrop National Fish Hatchery, Chiwawa River, and White River spring-run Chinook hatchery programs.

Critical Habitat

Critical habitat for UCR Chinook salmon was designated for Oregon and Washington in 2005 and includes freshwater areas shown in Figure 3-2 (70 FR 52630).

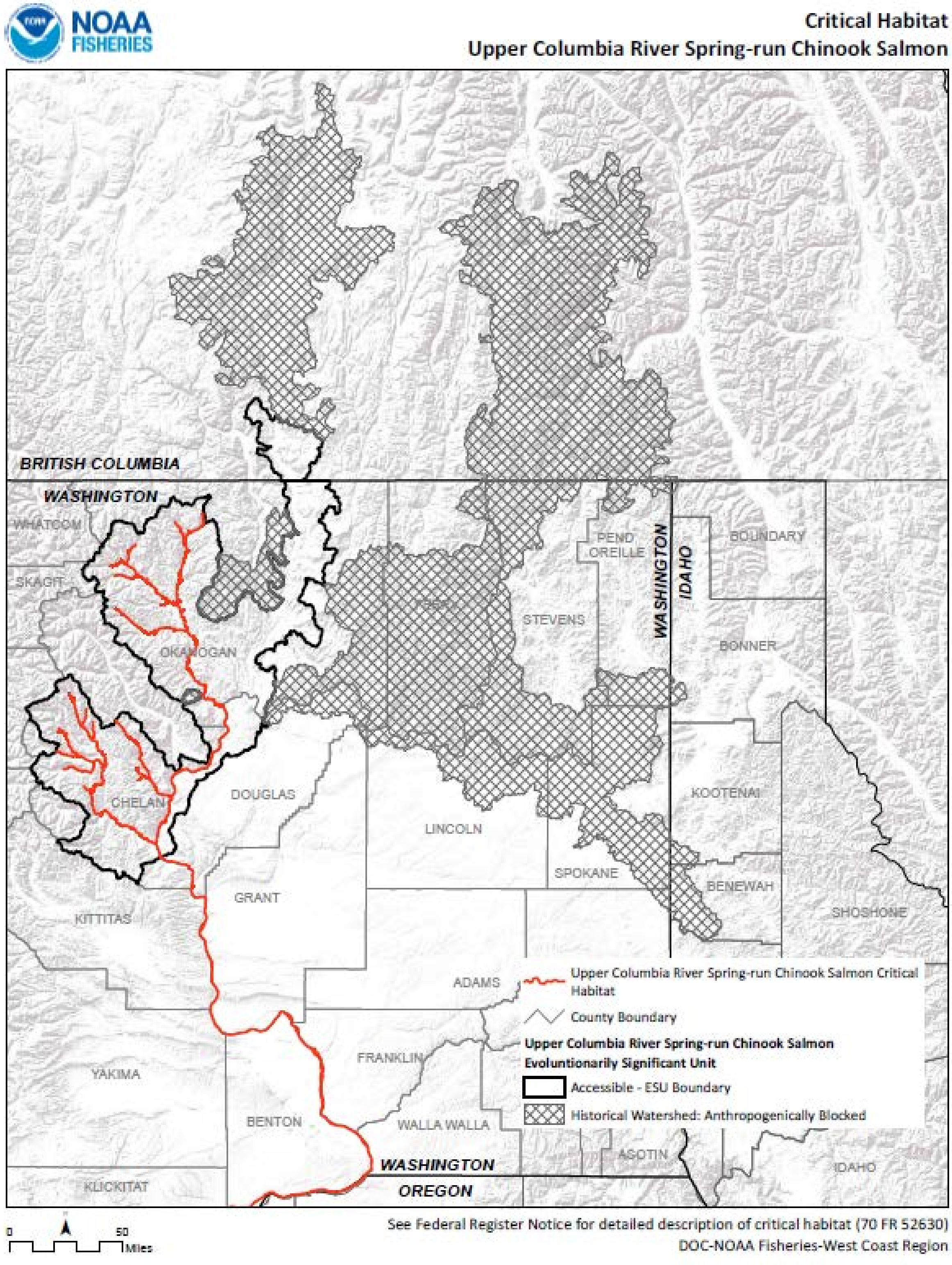
The PBFs for UCR Chinook salmon are the same as those described above for Puget Sound Chinook salmon.

Life History

UCR spring-run Chinook salmon exhibit stream-type life history strategies. Adults begin returning from the ocean in the early spring, with the run into the Columbia River peaking in mid-May. They then enter UCR tributaries from April through July, where they hold until spawning occurs in the late summer, peaking in mid to late August. Juvenile spring-run Chinook salmon spend a year in freshwater before migrating to the ocean. Most UCR spring-run Chinook salmon return as adults after two or three years in the ocean.

Current Stressors and Threats

Limiting factors for UCR spring-run Chinook salmon include impacts from Columbia River hydropower (i.e., modified hydrograph and increase in lentic conditions/decrease in riverine conditions, passage barriers, temperature; dissolved oxygen problems, and invasive species), riparian degradation and reduced large wood recruitment, altered floodplain connectivity and function, altered channel structure and complexity, reduced streamflow, and hatchery-related impacts (e.g., reduced genetic diversity) (NMFS 2011a).



Source: (NOAA Fisheries 2016j)

Figure 3-2 Critical Habitat for Upper Columbia River Spring-run Chinook Salmon

Lower Columbia River Chinook Salmon

The LCR Chinook salmon ESU was listed as threatened pursuant to 76 FR 50448, and this determination was reaffirmed in 2011.

Distribution

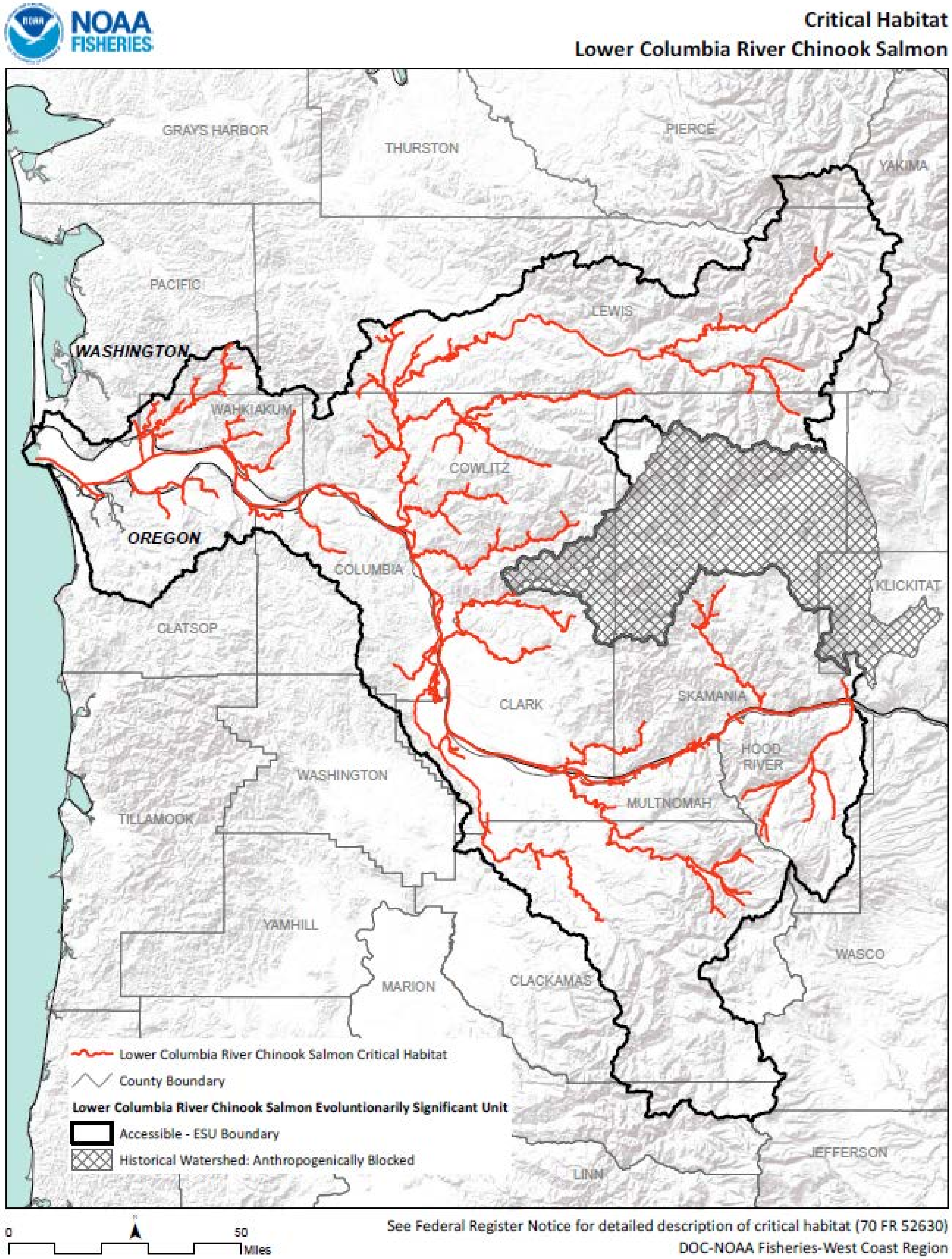
The LCR Chinook salmon ESU includes all naturally spawned Chinook salmon originating from the Columbia River and its tributaries downstream of a transitional point east of the Hood and White Salmon Rivers and any such fish originating from the Willamette River and its tributaries below Willamette Falls. Also this ESU includes Chinook salmon from 15 artificial propagation programs (79 FR 20802). The following individuals are not included in the ESU:

- Spring-run Chinook salmon originating from the Clackamas River;
- Fall-run Chinook salmon originating from the UCR bright hatchery stocks that spawn in the mainstem Columbia River below Bonneville Dam or in other tributaries upstream from the Sandy River to the Hood and White Salmon Rivers;
- Spring-run Chinook salmon originating from the Round Butte Hatchery (Deschutes River, Oregon) and spawning in the Hood River;
- Spring-run Chinook salmon originating from the Carson National Fish Hatchery and spawning in the Wind River; and
- Naturally spawning Chinook salmon originating from the Rogue River Fall Chinook Program.

Dam removal projects have reopened historical habitat once blocked to migrating LCR Chinook salmon. The removal of Marmot Dam in the Sandy River eliminated migration delays and injuries associated with holding at the dam’s fish ladder. Additionally, the removal of the diversion dam on the Little Sandy River restored access and flow to historical salmon habitat. The removal of Condit Dam on the White Salmon River provides an opportunity for the reestablishment of a spring-run population with renewed access to historical spawning grounds. Spring-run Chinook salmon in the Hood River are largely from the Deschutes River spring-run (managed under the MCR spring-run ESU) and are not considered to benefit the status of the LCR ESU. However, some LCR spring-run Chinook salmon have been detected in the Hood River (NWFSC 2015).

Critical Habitat

Critical habitat for LCR Chinook salmon was designated for Oregon and Washington in 2005 and includes watersheds shown in Figure 3-3 (70 FR 52630). The PBFs for LCR Chinook salmon are the same as those described above for Puget Sound Chinook salmon.



Source: (NOAA Fisheries 2016c)

Figure 3-3 Critical Habitat for Lower Columbia River Chinook Salmon

Life History

LCR Chinook salmon generally follow an ocean-type (fall-run) life history cycle. These salmon migrate to the ocean within the first year, after one to four months of rearing in freshwater habitat in the spring (NOAA Fisheries 2005). Chinook fry emerge in April and quickly find protection in off-stream refuge habitat. Some Chinook remain in their natal streams until the spring after hatching, at which point they emigrate as yearlings. Ocean-type Chinook return to the Columbia River at approximately three to four years of age. Entry to the Columbia River occurs generally from August to September; spawning begins in late September through November and peaks in mid-October (NOAA Fisheries 2005). Spawning occurs in the lower reaches of Columbia River tributaries (NOAA Fisheries 2005; NMFS 2013). There is also a subpopulation of fall-run LCR. The subpopulation of Chinook “brights” enter the Columbia River slightly later than the rest of the population, from August to October, and spawn from November to January. Peak bright spawning occurs in mid-November.

Spring-run or stream-type LCR Chinook spawn in August to September in Columbia River headwaters from the age of four to five years, a full year after returning to freshwater. Generally, the return of spring-run LCR Chinook occurs in March and April. Juvenile spring-run Chinook emerge from sediments between November and March with peak emergence occurring between December and January (NOAA Fisheries 2005).

There are 32 populations in the LCR Chinook salmon ESU: nine spring run, 21 fall run, and two late fall run (named according to the seasonal return to streams).

Current Stressors and Threats

Limiting factors for LCR Chinook salmon include relatively high harvest rates, especially for the spring-run, and low abundance of fall-run populations (NMFS 2012a); migratory impediment caused by dams (i.e., Mossyrock Dam on the Cowlitz River); land development and habitat degradation; and potential effects from climate change and coastal ocean conditions (e.g., reduced survival of emigrating smolts and corresponding drop in spawner abundance) (NWFSC 2015). Reduced complexity, connectivity, quantity, and quality of habitat used for spawning, rearing, foraging, and migrating are perhaps the most important limitations to LCR Chinook population growth. Degradation or loss of habitat due to conversion to agricultural or urbanized uses (e.g., diking and draining of wetlands and floodplain) is also of particular concern (Bottom et al. 2005; NMFS 2013). Reduced habitat complexity has resulted in a concomitant increase in water temperatures (NMFS 2013; ODFW 2010). Contamination of salmon habitat from wastewater treatment plant effluent, stormwater runoff, and nonpoint source pollution is a growing concern (Morace 2012; Nilsen and Morace 2014; NMFS 2013). Data collected by Ecology, ODEQ, and the Columbia River Contaminants and Habitat Characterization Project indicate that contaminants are present above levels of concern (Alvarez et al. 2014; Counihan et al. 2013; Nilsen and Morace 2014).

Upper Willamette River Chinook Salmon

The UWR Chinook salmon ESU was listed as threatened pursuant to 76 FR 50448, and this determination was reaffirmed in 2011.

Distribution
The UWR Chinook salmon ESU includes all naturally spawned populations of spring-run Chinook salmon in the Clackamas River and in the Willamette River and its tributaries above Willamette Falls, Oregon, and progeny of six artificial propagation programs 64 FR 14308 (USDC 2014). All seven historical populations of UWR Chinook salmon are contained within a single ecological subregion, the western Cascade Range (NMFS 2016g).

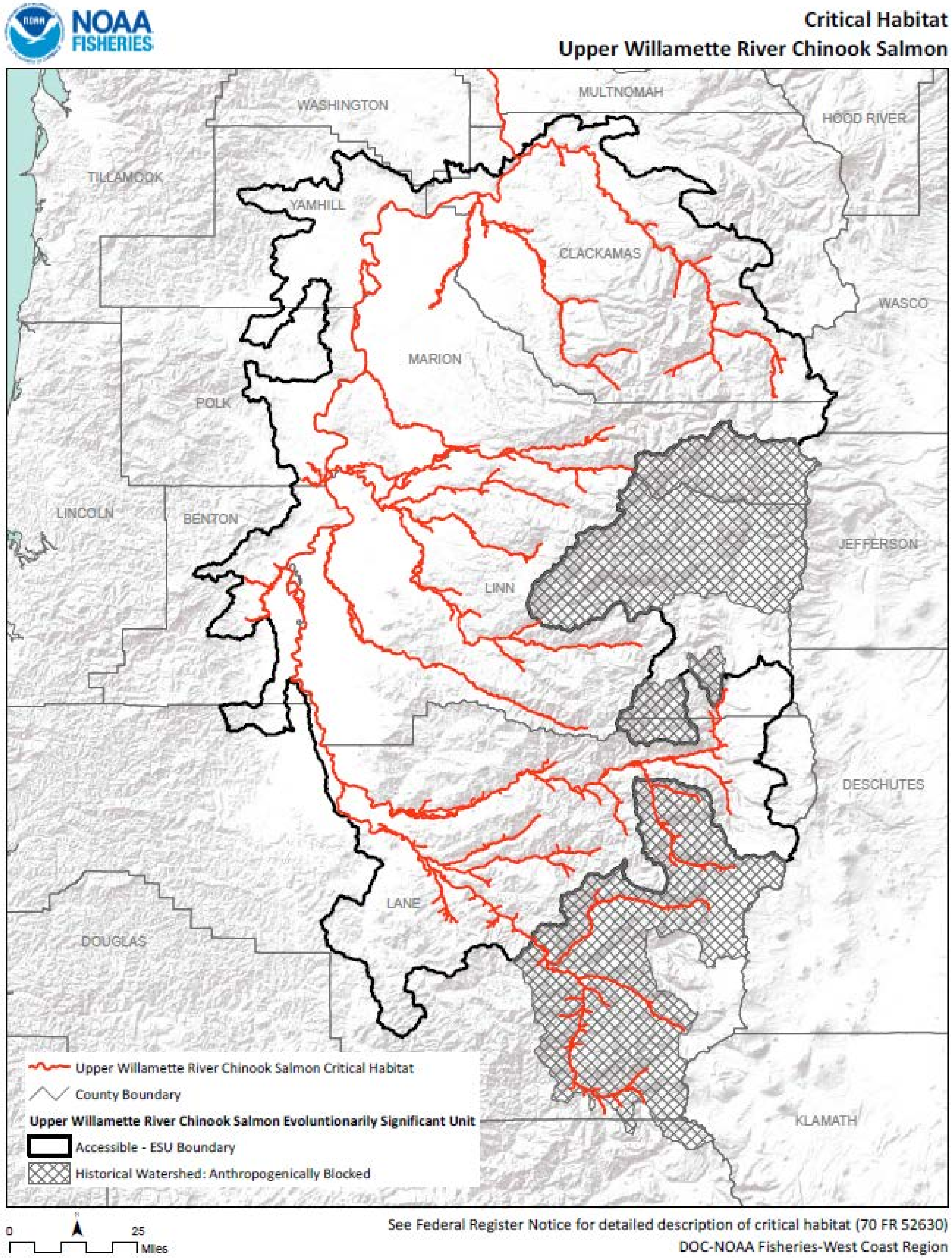
Critical Habitat
Critical habitat for UWR Chinook salmon ESU was designated for Oregon in 2005 and includes freshwater areas shown in Figure 3-4 (70 FR 52630). The PBFs for UWR Chinook salmon are the same as those described above for Puget Sound Chinook salmon.

Life History
As with other ESUs, UWR Chinook salmon can be either “ocean type” or “stream type,” which is determined by their propensity to migrate to the ocean at less than one year old or to remain in streams until they are approximately one year old (NMFS 2015b). Spawning runs in this ESU occur in spring. The abundance of UWR Chinook salmon is likely fewer than 10,000 fish, and the majority of those individuals are from the McKenzie and Clackamas River populations (ODFW and NMFS 2011).

Current Stressors and Threats
Limiting factors for UWR Chinook salmon ESU (and their critical habitat) include widespread loss and degradation of peripheral and transitional habitats (e.g., through diking and draining of wetlands and floodplains) (Ford et al. 2011; Good et al. 2005) and degraded freshwater habitat (e.g., reduced floodplain connectivity and function, channel structure and complexity, riparian habitat, large wood recruitment, and water quality). Also, recovery of this ESU is limited by increased disease incidence, altered stream flows, reduced access to spawning and rearing habitats (because of tributary dams), altered food web (due to reduced inputs of detritus), and predation by and competition with native and non-native species (including hatchery fish). Harvest and bycatch are also key limitations (ODFW and NMFS 2011).

Chum Salmon (*Oncorhynchus keta*)
Chum salmon are a species of anadromous salmonid that typically live for four years and grow to 6.8 kilograms (kg) (15 pounds) and can grow up to 1.1 m (3.6 ft) long (NMFS 2015a). They take on a characteristic greenish blue color that becomes striped with red slashes during spawning, and spawning adult males develop elongated “canine” teeth, which explains the colloquial name for this species, “dog salmon” (NMFS 2015a). Chum spawn once before dying in freshwater streams.

Juvenile chum salmon quickly migrate into the marine environment after hatching, where, unlike other salmonids, they congregate in schools (NMFS 2015a). The diet of chum salmon tends to shift from insects and other benthic invertebrates while in freshwater to crustaceans, fish, mollusks, squid, and tunicates while in the ocean (NMFS 2015a).



Source: (NOAA Fisheries 2016l)

Figure 3-4 Critical Habitat for Upper Willamette River Chinook Salmon

The distribution of chum salmon in the marine environment is not well understood; however, it appears that they migrate as far north as Alaska, as far south as California, and as far west as Russia and Japan (Beamish and Bouillon 1993).

Hood Canal Summer-run Chum Salmon

On June 28, 2005, the NMFS listed Hood Canal summer-run (HCS) chum salmon as a threatened species (70 FR 37160). This ESU includes all non-hatchery and some hatchery-raised individuals (within the designated distribution of the ESU).

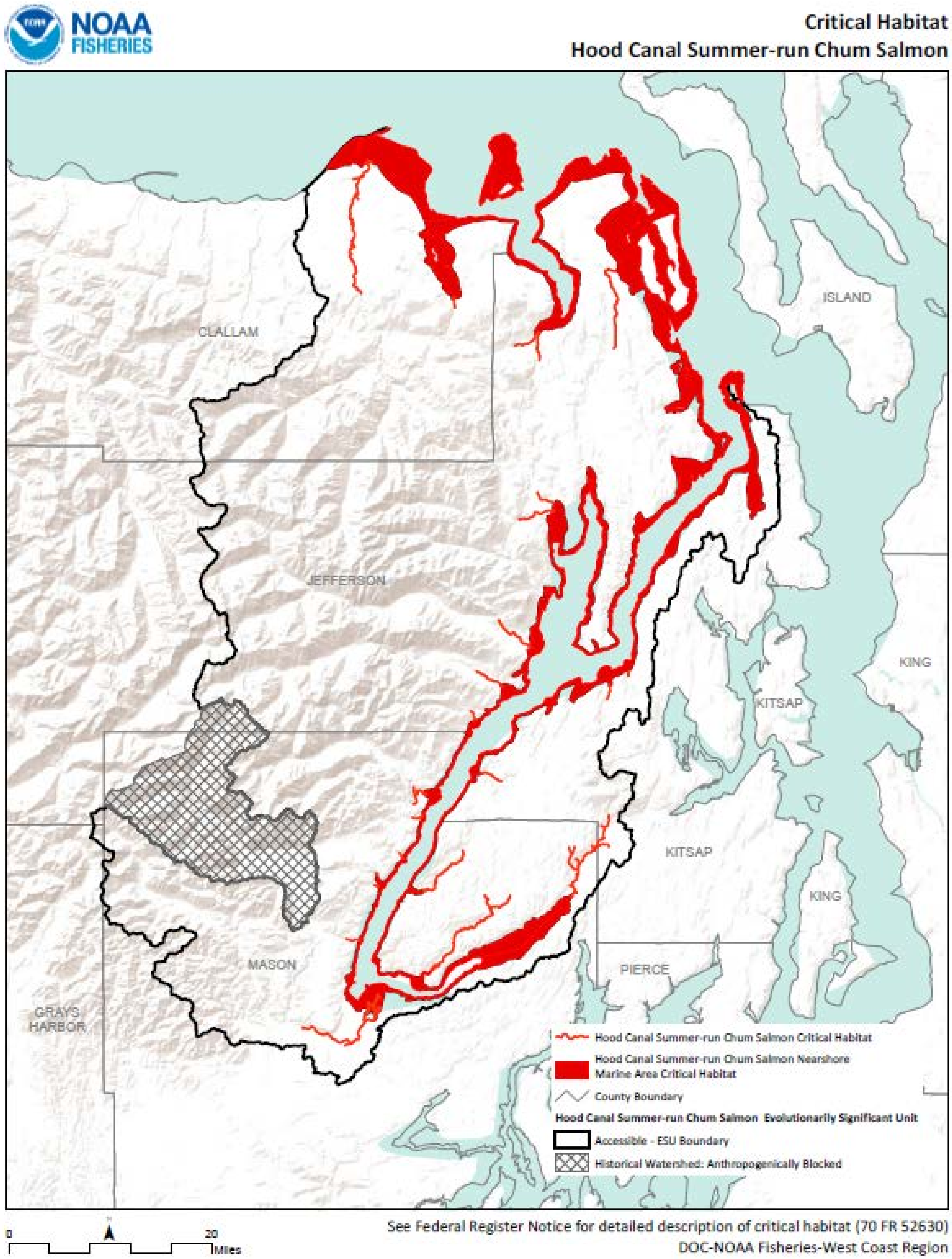
Distribution

The HCS chum salmon ESU comprises all naturally spawned populations of summer-run chum salmon in Hood Canal and its tributaries, as well as populations in Olympic Peninsula rivers between Hood Canal and Dungeness Bay, Washington. Four artificial propagation programs were listed as part of the ESU (79 FR 20802): the Hamma Fish Hatchery Program, Lilliwaup Creek Fish Hatchery Program, Tahuya River Program, and Jimmycomelately Creek Fish Hatchery Program.

The HCS chum salmon ESU has two populations (Strait of Juan de Fuca and Hood Canal populations), each containing multiple stocks or spawning aggregations. In the Strait of Juan de Fuca population, there are small but persistent natural spawning aggregations in three streams: Salmon, Snow, and Jimmycomelately Creeks. In the Dungeness River, spawning occurs but the aggregation of spawners is not known. In Chimacum Creek, HCS chum salmon were extirpated in the mid-1980s. Spawning aggregations have persisted in most of the major rivers draining from the Olympic Mountains into the western edge of Hood Canal, including Big Quilcene, Little Quilcene, Dosewallips, Duckabush, and Hamma Rivers and Lilliwaup Creek. On the eastern side of Hood Canal, persistent spawning is restricted to the Union River (Sands et al. 2009). Based on river size and historical tribal fishing records, a major spawning aggregation once occurred in the Skokomish River before the construction of Cushman Dam in the 1920s. State and tribal biologists also identified recent extinctions in Big Beef Creek, Anderson Creek, Dewatto River, Tahuya River, and Finch Creek. Historically, streams including but not limited to Seabeck, Stavis, Big Mission, and Little Mission Creek probably supported summer-run chum salmon.

Critical Habitat

Critical habitat for HCS chum salmon was designated for Washington in 2005 and includes freshwater, estuarine, and marine areas shown in Figure 3-5 (70 FR 52630). There are approximately 127 km (79 miles) of stream habitats and 607 km (377 miles) of nearshore marine habitats designated as critical habitat. The PBFs for HCS chum salmon are the same as those described above for Puget Sound Chinook salmon.



Source: (NOAA Fisheries 2016b)

Figure 3-5 Critical Habitat for Hood Canal Summer-run Chum Salmon

Life History

HCS chum salmon return to freshwater during summer. Juveniles, typically as fry, emerge from the gravel and emigrate almost immediately to seawater, indicative of an ocean-type life strategy. Upon reaching saltwater, HCS chum salmon spend several weeks in the top 2 to 3 (0.79 to 1.18 inches) of estuarine surface waters very close to the shoreline (WDFW and PNPTT 2000). Subadults and adults forage in coastal and offshore waters of the North Pacific Ocean before returning to spawn in their natal streams at age three to five. HCS chum salmon spawn from mid-September to mid-October, typically in river mainstems and lower river basins.

HCS chum salmon ESU fecundity estimates average 2,500 eggs per female, and the proportion of female spawners is approximately 45% of escapement in most populations (WDFW and PNPTT 2000).

Current Stressors and Threats

Limiting factors for the HCS chum salmon ESU include degraded habitat, barriers to migration, and changes to the salmon prey base. More specifically, limitations on habitat are caused by the degradation of water quality, loss of floodplain connectivity and function, loss of channel structure and complexity, loss of riparian habitat, reduced large woody debris recruitment, altered stream substrate (e.g., embeddedness by fine sediments), and altered stream flow (NMFS 2016b).

Human activities that affect the PBFs of critical habitat for HCS chum salmon include forestry; agriculture; road building/maintenance; channel modifications/diking; urbanization; sand and gravel mining; dams; river, estuary, and ocean traffic; and the removal of beavers. In addition to these, the harvest of salmonid prey species (e.g., herring, anchovy, and sardines) affects nearshore marine PBFs.

Stream channels and estuaries are, with few exceptions, moderately to highly degraded throughout the HCS chum salmon ESU. During the past 150 years, logging, road building, rural development, agriculture, water withdrawal, and channel manipulations (e.g., dredging and channelization) were common and widespread, especially within low gradient stream reaches utilized by summer-run chum salmon. Three quarters of the HCS chum salmon ESU's watersheds contain simplified, degraded channels either completely lacking a forested riparian zone or surrounded by small diameter, deciduous-dominated forests. Most streams have degraded or reduced pool densities and insufficient large woody debris.

Development has occurred in nearly all estuaries within Hood Canal and the eastern Strait of Juan de Fuca. Dikes, roads or causeways, ditches, and fill are the primary causes of estuarine habitat degradation. In estuarine and nearshore areas, bulkheads, revetments, and impaired riparian corridors have reduced the amount of rearing habitat. Altered river and tidal dynamics have likely reduced estuarine food web productivity and, thus, the carrying capacity for chum salmon and other salmonids in the estuarine environment (NMFS 2016g).

Columbia River Chum Salmon

The Columbia River chum salmon ESU was listed as threatened pursuant to 76 FR 50448, and this determination was reaffirmed in 2011.

Distribution

The Columbia River chum salmon ESU includes naturally spawned chum salmon originating from the Columbia River and its tributaries in Washington and Oregon. Also, the ESU includes chum salmon from two artificial propagation programs, the Grays River Program and the Washougal River Hatchery/Duncan Creek Program (79 FR 20802). The Columbia River chum salmon ESU consists of 17 historical populations in three major population groups (i.e., the Coastal, Cascade, and Gorge groups) (NMFS 2013).

Critical Habitat

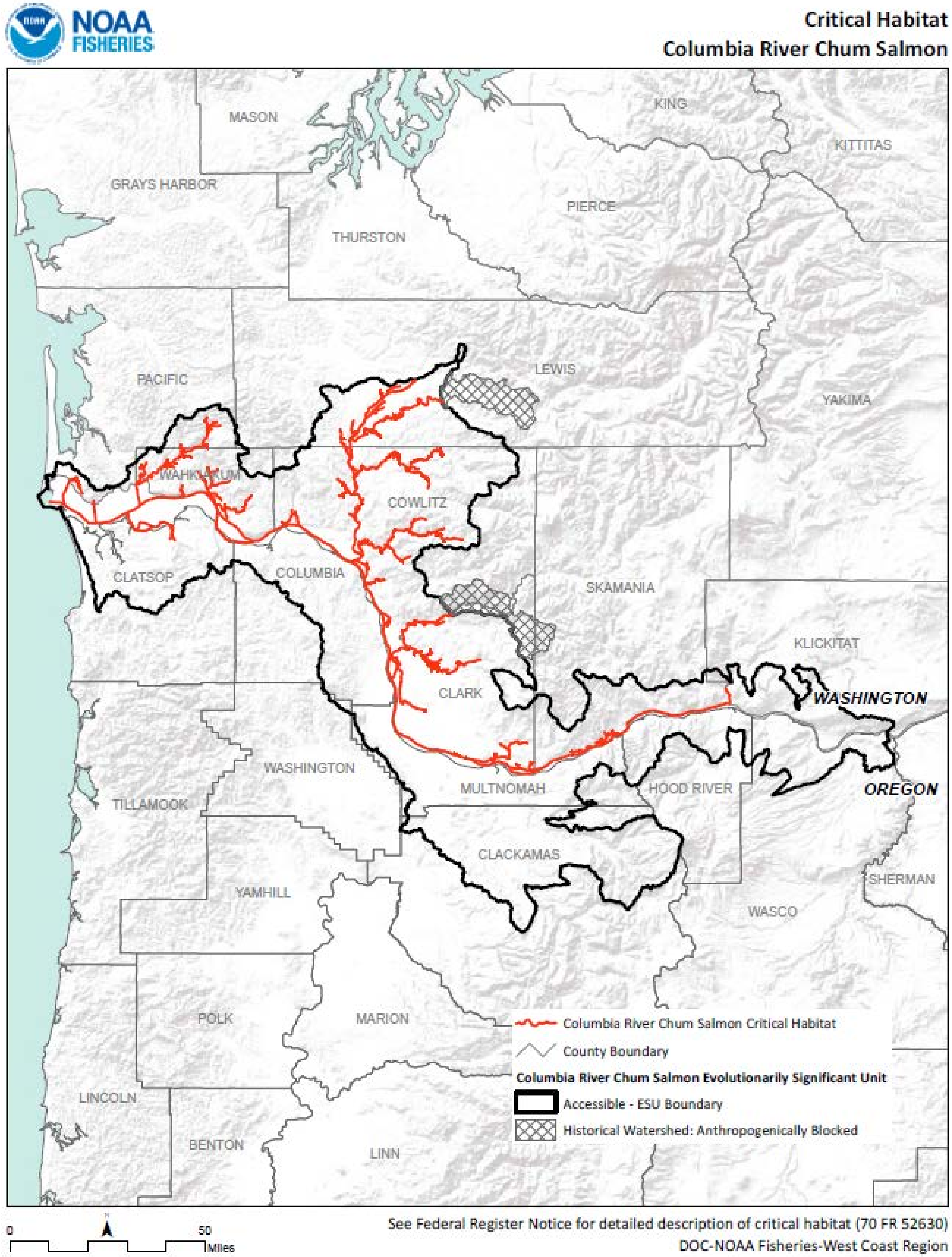
Critical habitat for Columbia River chum salmon was designated for Oregon and Washington in 2005 and includes areas shown in Figure 3-6 (70 FR 52630). The PBFs for Columbia River chum salmon are the same as those described above for Puget Sound Chinook salmon.

Life History

Columbia River Chum salmon run in the fall, spawning in tributaries of the Columbia River below the Bonneville Dam (e.g., Grays River and Hardy and Hamilton Creeks) (NMFS 2015b). Chum salmon fry emerge from spawning gravel and almost immediately drift downstream toward the ocean. Unlike other salmonids, chum salmon do not have a distinct smolt life stage. As subadults and adults, chum salmon feed in marine nearshore and open waters of the North Pacific Ocean. After three to five years, chum salmon return to their natal streams to spawn, typically between mid-October and early December (spawning until mid-January) in the mainstem Columbia River or in the lower portions of tributaries.

Current Stressors and Threats

Limiting factors for Columbia River chum salmon include poor ocean conditions in the near future (e.g., reduced or altered food web due to climate change and acidification) (limiting of juvenile survival) (NWFSC 2015), reduced freshwater habitat quality (limiting of spawning and early rearing success in some basins), and land development, especially in the low gradient reaches that chum salmon prefer. Based on projected increases in the population of the greater Vancouver-Portland area and the LCR overall (Metro 2014), land development is expected to continue to limit the recovery of most chum salmon populations.



Source: (NOAA Fisheries 2016a)

Figure 3-6 Critical Habitat for Columbia River Chum Salmon

Coho Salmon (*Oncorhynchus kisutch*)

Coho salmon adults migrate to and spawn in small streams that flow directly into the ocean, or tributaries and headwater creeks of larger rivers (Sandercock 1991; Moyle et al. 2002). Adults migrate upstream to spawning grounds from September through late December, peaking in October and November. Spawning occurs mainly November through December, with fry emerging from the gravel in the spring, approximately three to four months after spawning. Juvenile rearing usually occurs in tributary streams with a gradient of 3% or less, although they may move up to streams of 4% or 5% gradient. Juveniles have been found in streams as small as 1 to 2 m (3.3 to 6.6 ft) wide. They may spend one to two years rearing in freshwater (Bell and Duffy 2007) or emigrate to an estuary shortly after emerging from spawning gravels (Tschaplinski 1988). With the onset of fall rains, coho salmon juveniles are also known to redistribute into non-natal rearing streams, lakes, or ponds, where they overwinter (Peterson 1982). At a length of 38 to 45 millimeters (mm) (1.5 to 1.8 inches), fry may migrate upstream a considerable distance to reach lakes or other rearing areas (Sandercock 1991; Nickelson et al. 1992). Emigration from streams to the estuary and ocean generally takes place from March through June. The marine distribution of coho salmon extends from Alaska to California and west to Russia and Japan (NMFS 2016f).

Lower Columbia River Coho Salmon

The LCR coho salmon ESU was listed as threatened pursuant to 76 FR 50448, and this determination was reaffirmed in 2011.

Distribution

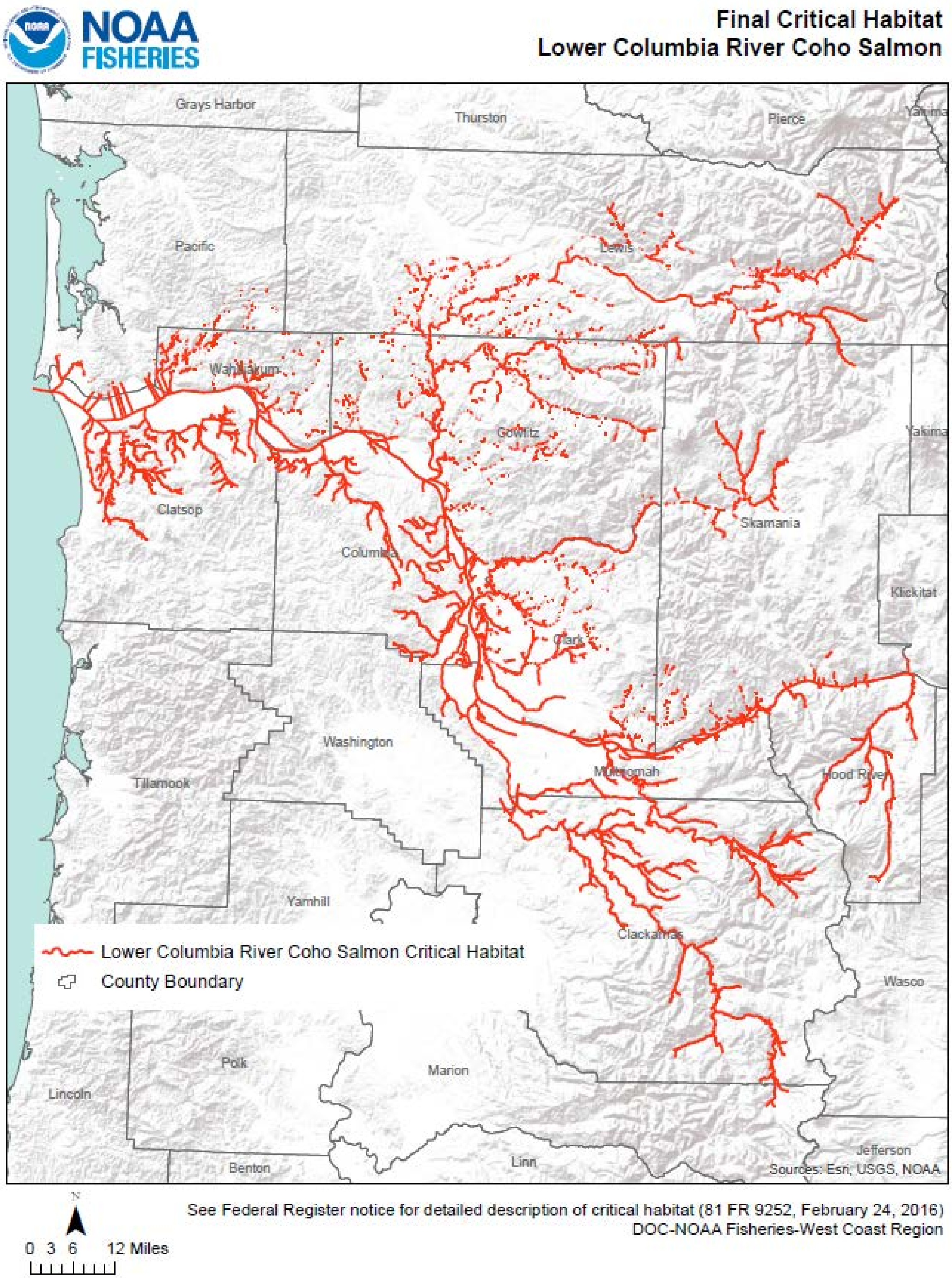
The LCR coho salmon ESU includes all naturally spawned coho salmon originating from the Columbia River and its tributaries downstream from the Big White Salmon and Hood Rivers (inclusive) and any such fish originating from the Willamette River and its tributaries below Willamette Falls. Also included in the ESU are coho salmon from 21 artificial propagation programs (79 FR 20802).

Critical Habitat

Critical habitat for LCR Coho salmon was designated for Oregon and Washington in 2016 and includes areas shown in Figure 3-7 (81 FR 9252). The PBFs for LCR coho salmon are the same as those described above for Puget Sound Chinook salmon.

Life History

Adults typically spend approximately 18 months in freshwater streams and 18 months in marine waters before returning to natal streams to spawn as three-year olds (NMFS 2015b). Two spawning groups have been identified, “type S” and “type N”; type S fish tend to enter rivers to spawn from mid-August to September and spawn in mid-October to early November, whereas type N fish enter rivers in late September to December and spawn between November and January (NMFS 2015b). Type S fish tend to spawn higher in tributaries of the Columbia River, whereas type N fish spawn in lower tributaries.



Source: (NOAA Fisheries 2016n)

Figure 3-7 Critical Habitat for Lower Columbia River Coho Salmon

Current Stressors and Threats

Limiting factors for LCR coho salmon include migratory impediment caused by dams (i.e., sediment retention structure on the North Fork Toutle River) (NMFS 2013; Fullerton et al. 2011); land development and habitat degradation; and potential effects from climate change and coastal ocean conditions (e.g., reduced survival of emigrating smolts and corresponding drop in spawner abundance) (NWFSC 2015). Reduced complexity, connectivity, quantity, and quality of habitat used for spawning, rearing, foraging, and migrating are perhaps the most important limitations to LCR coho. Degradation or loss of habitat due to conversion to agricultural or urbanized uses (e.g., diking and draining of wetlands and floodplain), reduced complexity, and persistent inputs of wastewater, stormwater, and non-point-source runoff are key concerns (Bottom et al. 2005; NMFS 2013; NOAA Fisheries 2016v; ODFW 2010; Morace 2012; Nilsen and Morace 2014). Data collected by Ecology, ODEQ, and the Columbia River Contaminants and Habitat Characterization Project indicate that contaminants are present above levels of concern (Alvarez et al. 2014; Counihan et al. 2013; Nilsen and Morace 2014)) and that Total Maximum Daily Loads are warranted for the LCR.

Oregon Coast Coho Salmon

The Oregon Coast coho salmon ESU was listed as threatened in 1998, but the listing was overturned by court decision in 2001. The ESU was re-listed as threatened in February 2008 (73 FR 7816), and that status was confirmed on June 20, 2011.

Distribution

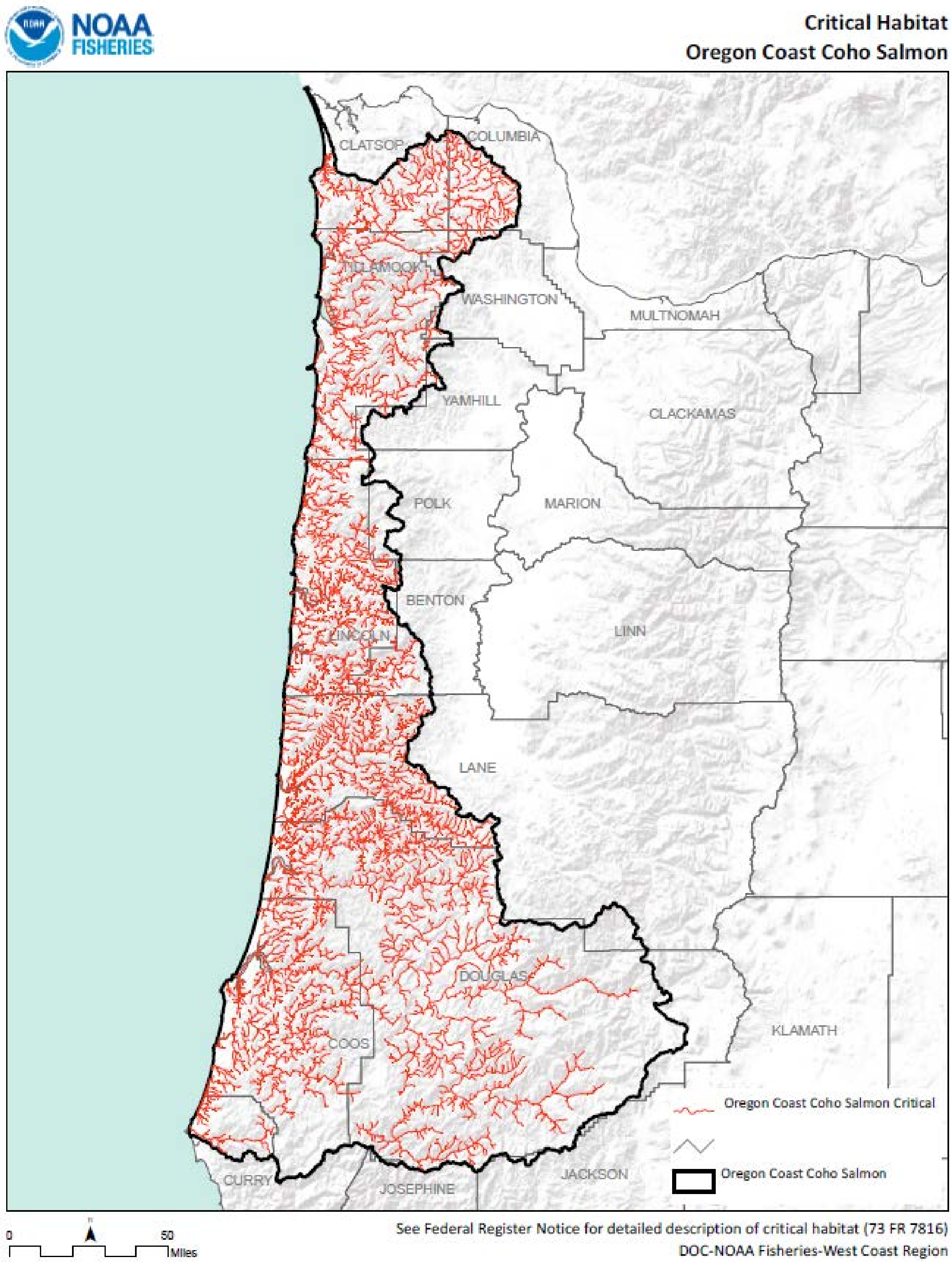
The Oregon Coast coho salmon ESU includes populations of coho salmon in Oregon coastal streams south of the Columbia River and north of Cape Blanco, Oregon. The Cow Creek stock (South Umpqua population) is included as part of the ESU because the original brood stock was founded from the local, non-hatchery population. Non-hatchery coho salmon from the South Umpqua population have been incorporated into the Cow Creek brood stock on a regular basis.

Critical Habitat

Critical habitat for OC coho salmon was designated for Oregon in 2008 and includes areas shown in Figure 3-8 (73 FR 7816). The PBFs for Oregon Coast coho salmon are the same as those described above for Puget Sound Chinook salmon.

Life History

Coho salmon have a fixed, approximately three-year lifespan that includes approximately 15 months in freshwater rearing streams and 21 months in marine waters (as subadults and adults) (NMFS 2015b). A small portion of “jacks” return to spawn after only six months at sea (i.e., two years of age). Foraging occurs in the ocean in coastal and offshore North Pacific Ocean waters. Spawning migration starts in late summer and fall and ends by mid-winter.



Source: (NOAA Fisheries 2016f)
Figure 3-8 Critical Habitat for Oregon Coast Coho Salmon

Current Stressors and Threats

The primary limiting factors in freshwater habitats for Oregon Coast coho salmon include reduced floodplain connectivity and function, reduced channel structure and complexity, degradation or loss of riparian habitat, reduced supply of large woody debris, altered stream substrate (e.g., increased embeddedness with fine sediment), altered stream flow, degraded water quality, installation or maintenance of barriers to migration (that limit access to spawning and rearing habitats) (ODFW 2007). In the marine environment, key limiting factors include impacts of climate, altered marine and estuarine productivity, and degradation of ocean ecosystem conditions (e.g., acidification) (Stout et al. 2012).

Southern Oregon/Northern California Coho Salmon

The Southern Oregon/Northern California (SONC) coho salmon ESU was federally listed as threatened in 1999 (64 FR 14308), and this listing was reaffirmed in 2005 (70 FR 37160).

Distribution

The SONC coho salmon ESU includes all naturally spawned populations of coho salmon in coastal streams from the Elk River in Oregon, through the Mattole River in California. It also includes three artificial propagation programs: the Cole Rivers Hatchery in the Rogue River Basin, and the Trinity and Iron Gate Hatcheries in the Klamath-Trinity River Basin. Recovery of tagged SONC coho salmon suggests that they generally travel from California to Oregon but do not migrate much farther north (NMFS 2014a).

Critical Habitat

Critical habitat for SONC coho salmon was designated for California and Oregon in 1999 and includes accessible reaches, estuarine areas, and tributaries between the Mattole and Elk Rivers (64 FR 24049).

Critical habitat was designated for SONC coho salmon on May 5, 1999 (64 FR 24049) and includes all river reaches accessible to listed coho salmon in coastal streams south of Cape Blanco, Oregon, and north of Punta Gorda, California. Critical habitat consists of the water, substrate, and adjacent riparian zone of estuarine and riverine reaches (including off-channel habitats) in the following counties: Klamath, Jackson, Douglas, Josephine, and Curry Counties in Oregon, and Humboldt, Mendocino, Trinity, Glenn, and Del Norte Counties in California. Major rivers, estuaries, and bays known to support coho salmon include the Rogue, Smith, Klamath, Mad, Eel, and Mattole Rivers and Humboldt Bay. Many smaller coastal rivers and streams also provide essential estuarine habitat for coho salmon, but access is often constrained by seasonal fluctuations in hydrologic conditions. Within these areas, PBF of coho salmon critical habitat include adequate substrate, water quality, water quantity, water temperature, water velocity, cover/shelter, food, riparian vegetation, space, and safe passage conditions.

The PBFs for SONC coho salmon are the same as those described above for Puget Sound Chinook salmon.

Life History

SONC coho salmon tend to follow a stream-type life history, spending a year or two in their natal streams before emigrating to the ocean (NMFS 2014a). Downstream migration of SONC coho juveniles occurs between April and June, generally depending on the stream. There are also ocean-type individuals that occur in the SONC coho ESU, which are found in streams with adequately large estuaries for rearing large numbers of juvenile fish. Emigration in ocean-type fish tends to coincide with heavy seasonal rains, though most fish use off-channel refuge habitat to avoid strong river flows. Large woody debris is vital for this species because it helps to create refuges.

Returning SONC coho adults tend to be three years old, but some “jacks” return earlier (NMFS 2014a). Returning fish typically migrate upriver between October and March, with peak migration occurring between November and January.

Current Stressors and Threats

The primary threats to the SONC coho salmon ESU include timber harvest, road construction, damming and diversions, suction dredge mining, development in floodplains, agriculture, and hatchery inputs (Williams and Williams 2002). Timber harvest, road construction, floodplain development, and agriculture all can increase sedimentation, water temperature (through sediment and clearing of riparian vegetation), pollutant loading, and other stressors as well as decrease the delivery of wood (and habitat complexity) and terrestrial nutrients (e.g., insects). Suction dredge mining has the effect of increasing scour in possible spawning habitats (Williams and Williams 2002). Damming and diversion has the effect of impeding migration and altering hydrology, both of which can interrupt spawning or emigration and decrease water quality (e.g., temperature) and quantity. Hatchery inputs can reduce the overall genetic diversity of the population, making the ESU more prone to sudden collapse. As with other species, climate change has the potential to impact this species through increased temperatures and declining oceanic conditions (e.g., altered food webs).

Sockeye Salmon (*Oncorhynchus nerka*)

Sockeye salmon are the second most abundant of the seven Pacific salmon species (Quinn 2005). They display more life history diversity than all other members of the *Oncorhynchus* genus (Burgner 1991). Sockeye salmon are generally anadromous, but distinct populations of non-anadromous *O. nerka* also exist; these fish are commonly referred to as kokanee (*O. nerka kennerlyi*) or silver trout (Wydoski and Whitney 2003). The vast majority of sockeye populations spawn in or near lakes. Spawning can take place in lake tributaries, lake outlets, rivers between lakes, and on lake shorelines or beaches where suitable upwelling or intra-gravel flow is present. Spawn timing is often determined by water temperature. In spawning habitats with cooler water temperatures, sockeye typically spawn earlier (August) than in warmer habitats (November) (Burgner 1991). Sockeye fry that are spawned in lake tributaries typically exhibit a behavior of rapid downstream migration to the nursery lake after emergence, whereas lake/beach spawned sockeye rapidly migrate to open limnetic waters after emergence. Lake-rearing juveniles typically spend one to three years in their nursery lake before emigrating to the marine environment (Gustafson et al. 1997). Other life history variants include ocean-type and river-type sockeye. Ocean-type populations typically use large rivers and side channels or spring-fed tributary systems for spawning and emigrate to sea soon after emergence. River-type sockeye rear in rivers for one year before emigrating to sea. Quinn (2005) describes the differences between ocean-type and river-type sockeye as a continuum of rearing patterns rather than as two discrete types.

Upon smolting, sockeye emigrate to the ocean. Peak emigration occurs in mid-April to early May in southern sockeye populations (generally south of 52ºN latitude) and as late as early July in northern populations (62ºN latitude and north) (Burgner 1991). Typically, river-type sockeye populations make little use of estuaries during their emigration to the marine environment (Quinn 2005). Estuarine habitats may be more extensively used by ocean-type sockeye (Quinn 2005). Upon entering marine waters, sockeye may reside in the nearshore or coastal environment for several months but are typically distributed offshore by fall (Burgner 1991).

In the marine environment, North American sockeye stocks are limited to the zone north of 46ºN latitude. Within these zones, sockeye salmon have a wide distribution. In North America, their range is south to the Sacramento River in California (historically) and as far north as Kotzebue Sound in Alaska. In the Western Pacific, sockeye can be found from the Kuril Islands of Japan to Cape Chaplina in Russia.

Snake River Sockeye Salmon

The Snake River sockeye salmon ESU was first listed as endangered under the ESA in 1991, and the listing was reaffirmed in 2005 (70 FR 37160). On May 26, 2016, in the most recent five-year review for Pacific salmon and steelhead, the NMFS concluded that the species should remain listed as endangered (81 FR 33468).

Distribution

This ESU includes all anadromous and resident sockeye salmon from the Snake River basin in Idaho, as well as artificially propagated sockeye salmon from the Redfish Lake captive propagation program.

Critical Habitat

Critical habitat for Snake River sockeye salmon was designated in 1993 and includes the Snake and Salmon Rivers, Alturas Lake Creek, Valley Creek, Stanley Lake, Redfish Lake, Yellowbelly Lake, Pettit Lake, Alturas Lake, and all inlet/outlet creeks to the aforementioned lakes (58 FR 68543). PBFs for Snake River sockeye salmon critical habitat are described in Table 3-2.

Life History

Snake River sockeye salmon adults enter the Columbia River primarily during June and July and arrive in the Sawtooth Valley, peaking in August. The Sawtooth Valley supports the only remaining run of Snake River sockeye salmon. The adults spawn in lakeshore gravels, primarily in October (Bjornn and Reiser 1991). Eggs hatch in the spring between 80 and 140 days after spawning. Fry remain in gravels for three to five weeks, emerge from April through May and move immediately into lakes. Once there, juveniles feed on plankton for one to three years before they migrate to the ocean, leaving their natal lake in the spring from late April through May. Snake River sockeye salmon usually spend two to three years in the Pacific Ocean and return to Idaho in their fourth or fifth year of life.

Current Stressors and Threats

Spawning and rearing habitat quality in tributaries of the Snake River varies from excellent in wilderness areas to poor in areas of intensive human land uses (NOAA Fisheries 2015a). Critical habitat throughout much of the Interior Columbia (which includes the Snake River and the MCR) has been degraded by intensive agriculture, alteration of stream morphology (i.e., channel modifications and diking), riparian vegetation disturbance, wetland draining and conversion, livestock grazing, dredging, road construction and maintenance, logging, mining, and urbanization. Reduced summer streamflows, impaired water quality, and reduction of habitat complexity are common problems for critical habitat in non-wilderness areas. Human land use practices throughout the basin have caused streams to become straighter, wider, and shallower, thereby reducing rearing habitat and increasing water temperature fluctuations. In many stream reaches designated as critical habitat in the Snake River basin, streamflows are substantially reduced by water diversions (NOAA Fisheries 2015a). Withdrawal of water, particularly during low-flow periods that commonly overlap with agricultural withdrawals, often increases summer stream temperatures, blocks fish migration, strands fish, and alters sediment transport (Spence et al. 1996).

Many stream reaches designated as critical habitat in the Snake River basin are on the CWA 303(d) list for impaired water quality (IDEQ 2011). In addition to elevated temperatures, water quality in spawning and rearing areas in the Snake River has been impaired by high levels of sedimentation and by metal contamination potentially from mine waste (e.g., IDEQ and EPA 2003; IDEQ 2001, 2011).

Migration habitat quality for Snake River salmon has also been severely degraded, primarily by the development and operation of dams and reservoirs on the mainstem Columbia and Snake Rivers (NMFS 2008b). Hydroelectric development has modified natural flow regimes in the migration corridor, causing higher water temperatures and changes in fish community structure that have led to increased rates of piscivorous and avian predation on juvenile salmon, and delayed migration for both adult and juveniles. Physical features of dams such as turbines also kill migrating fish.

Lake Ozette Sockeye Salmon

The Lake Ozette sockeye salmon ESU was federally listed as threatened in 1999 (64 FR 14528), and this listing was reaffirmed in 2005 (70 FR 37160).

The NMFS adopted the recovery plan for Lake Ozette sockeye salmon on May 29, 2009 (74 FR 25706). The recovery plan describes the ESU’s population structure, identifies spawning aggregations essential to recovery of the ESU, establishes recovery goals for the population, and recommends habitat, hatchery, and harvest actions designed to contribute to the recovery of the ESU (NMFS 2009b).

Lake Ozette sockeye are distinguished from other Washington sockeye ESUs based on unique genetic characteristics, early river entry, the relatively large adult body size, and large average smolt size relative to other coastal Washington sockeye populations (Gustafson et al. 1997).

Distribution

The freshwater habitat for the Lake Ozette sockeye ESU is contained within a single watershed, which includes the Ozette River, Lake Ozette, and associated tributaries.

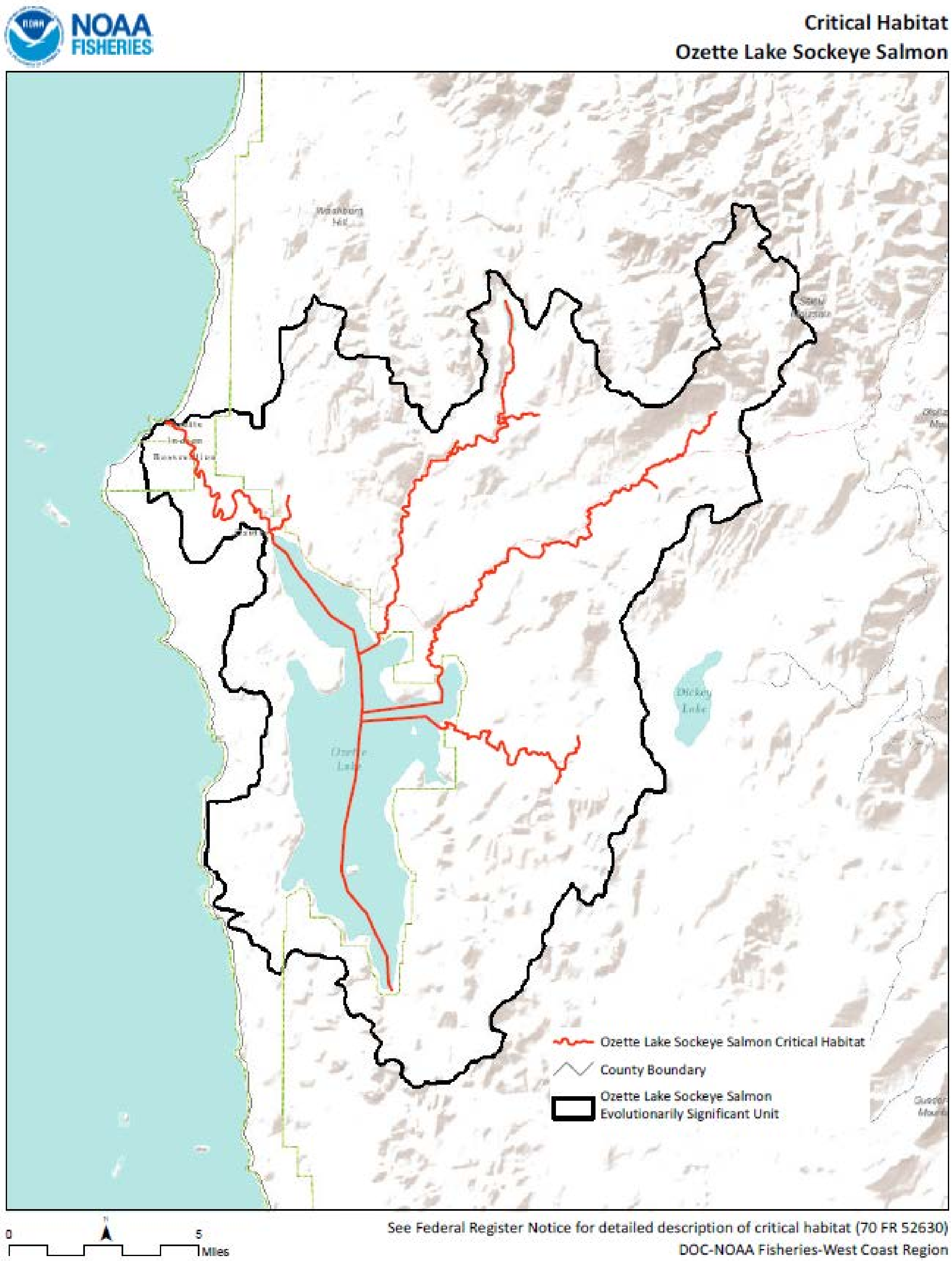
Critical Habitat

Critical habitat for Lake Ozette sockeye salmon was designated for Washington in 2005 and includes areas shown in Figure 3-9 (70 FR 52630). There are approximately 66 km (41 miles) of stream habitats and 19 square kilometers (sq km) (12 square miles) of lake habitats designated as critical habitat for Lake Ozette sockeye salmon. Critical habitat is defined as the stream channels within the designated stream reaches and extends laterally to the ordinary high-water line. In areas where ordinary high-water line has not been defined, the lateral extent is defined by the bankfull elevation. Critical habitat in lake areas is defined by the perimeter of the water body as displayed on standard 1:24,000 scale topographic maps or the elevation of ordinary high water, whichever is greater.

In the final critical habitat designation for Lake Ozette sockeye, the NMFS excluded Native American tribal lands and other habitat areas where the benefits of exclusion outweighed the benefits of inclusion. The NMFS excluded less than 1.6 km (1 mile) of stream because it overlaps with tribal lands. Approximately 3.2 km (2 miles) of stream were excluded because they are covered by a habitat conservation plan.

PBFs for Lake Ozette sockeye include the following:

- Freshwater spawning sites with water quantity and quality conditions and substrate supporting spawning, incubation, and larval development;
- Freshwater rearing sites with water quantity and floodplain connectivity to form and maintain physical habitat conditions and support juvenile growth and mobility; water quality and forage supporting juvenile development; and natural cover such as shade, submerged and overhanging large wood, log jams, and beaver dams;
- Freshwater migration corridors free of obstruction and excessive predation with water quantity and quality conditions and natural cover such as submerged and overhanging large wood, aquatic vegetation, large rocks and boulders, side channels, and undercut banks supporting juvenile and adult mobility and survival;
- Estuarine areas free of obstruction and excessive predation with water quality, water quantity, and salinity conditions supporting juvenile and adult physiological transitions between fresh water and saltwater; natural cover such as submerged and overhanging large wood, aquatic vegetation, large rocks and boulders, side channels; and juvenile and adult forage, including aquatic invertebrates and fishes, supporting growth and maturation;
- Nearshore marine areas free of obstruction and excessive predation with water quality and quantity conditions and forage, including aquatic invertebrates and fishes, supporting growth and maturation; also, natural cover such as submerged and overhanging large wood, aquatic vegetation, large rocks and boulders, and side channels; and
- Offshore marine areas with water quality conditions and forage, including aquatic invertebrates and fishes, supporting growth and maturation



Source: (NOAA Fisheries 2016g)

Figure 3-9 Critical Habitat for Lake Ozette Sockeye Salmon

Life History

Adult sockeye return to the Ozette watershed from mid-April through mid-August, with peak entry from mid-May through June (Haggerty et al. 2015 as cited in; NMFS 2016c). Adult sockeye salmon hold for three to nine months (average of six months) in the lake prior to spawning (Haggerty et al. 2009). The current, known spawning distribution of Lake Ozette sockeye salmon is limited to Olsen's Beach, Allen's Beach, Umbrella Creek, and Big River.

Within the Ozette watershed beach-spawning sockeye salmon return, spawn, and die almost exclusively at age four, which limits potential genetic exchange between fish in the four different brood lines. Otolith data from spawners collected between 2000 and 2004 indicate that 96% and 97% of spawning adults were four years old at Olsen's and Allen's Beaches, respectively (Haggerty 2015). In creek-spawning sockeye, three and five year old sockeye make up a small proportion of non-hatchery runs but can make up a significant portion of the returning hatchery-raised fish. Umbrella Creek spawners of age three, four, and five during the 2000 to 2004 time period averaged 2%, 90%, and 8% of sampled fish, respectively. Otolith age data for hatchery sockeye returning to Umbrella Creek from 2000 to 2012 show that the proportion of four-year-old sockeye among spawners ranged from 16% to 100% with an average of 69%. The proportion of three year old hatchery-raised sockeye spawners returning to Umbrella Creek ranged from 0% to 81%, with an average of 22%. The proportion of age-five sockeye ranged from 0% to 64%, with an average of 9%. Over 99% of the juvenile sockeye emigrating from the lake to the ocean are one year or older, indicating that few juvenile sockeye rear in the lake for more than one summer (Jacobs et al. 1996; MFM, unpublished otolith age data).

Current Stressors and Threats

The primary limiting factors for Lake Ozette sockeye salmon ESU include the potential impacts of climate change, such as warming water temperatures and changes in precipitation that could alter the timing and magnitude of flows needed to transport sockeye fry into Lake Ozette. Also, increased frequency of rain-on-snow events could increase the frequency and intensity of floods in mainstem spawning areas, leading to scouring flows and impacted survival and productivity of non-hatchery sockeye salmon (Haggerty et al. 2009).

Steelhead Trout (*Oncorhynchus mykiss*)

Steelhead trout is an anadromous salmonid fish that can live up to 11 years and grow up to 25 kg (55 pounds) and 120 cm (47 inches) long, though most fish tend to be much smaller than that (NMFS 2016i). They are distinguishable from other salmonids by their dark olive color, speckled body, and pinkish red stripe along their sides, though they tend to remain more silver while in the marine environment (than the non-migratory rainbow trout [*O. mykiss*]) (NMFS 2016i).

Steelhead in the NW mature in one of two distinct modes, either stream-maturing or ocean-maturing (NMFS 2016i). Stream-maturing individuals (also called summer-run steelhead) return to freshwater streams prior to becoming fully mature, typically between May and October; spawning occurs several months later. Ocean-maturing individuals (also called winter-run steelhead) mature while at sea and reenter freshwater streams during November and April. Coastal streams tend to be dominated by ocean-maturing groups, whereas inland streams tend to be dominated by stream-maturing groups (NMFS 2016i).

Spawning occurs over coarse substrates (gravel) in cold, fast-flowing streams with highly oxygenated waters, and spawning may occur more than once (NMFS 2016i). After hatching (three to four weeks after spawning), steelhead may reside in freshwater streams for up to seven years before migrating into estuaries to smolt, and they may reside in marine environments for three years (NMFS 2016i). A small number of steelhead actually return to freshwater after their first year only to migrate back out without spawning; this behavior is irregular among salmonid species.

Steelhead typically feed on zooplankton as juveniles and shift to larger insects, mollusks, crustaceans, and fish as adults (NMFS 2016i).

Snake River Basin Steelhead Trout

The Snake River Basin (SRB) steelhead trout was listed as a threatened ESU on August 18, 1997 (62 FR 43937), with a revised listing as a DPS on January 5, 2006 (71 FR 834).

Distribution

The SRB steelhead DPS occupies the SRB, which drains portions of southeastern Washington, northeastern Oregon, and north/central Idaho. This species includes all naturally spawning steelhead populations below natural and manmade impassable barriers in streams in the SRB, as well as the progeny of six artificial propagation programs (71 FR 834). The SRB steelhead listing does not include resident *O. mykiss* (rainbow trout) that co-occur with (migratory) steelhead.

Critical Habitat

Critical habitat for the SRB steelhead trout DPS was designated for Idaho, Oregon, and Washington in 2005 and includes areas shown in Figure 3-10 (70 FR 52630). Specific stream reaches are designated within the Lower Snake, Salmon, and Clearwater River Basins. Habitat areas within the DPS's geographical range that are excluded from critical habitat designation are defined in 70 FR 52630. Table 3-3 describes the PBFs for steelhead critical habitat for multiple DPS/ESUs, including the SRB steelhead DPS.

Table 3-3 Physical and Biological Features of Designated Steelhead Critical Habitats

Critical Habitat Type[a]	Physical and Biological Feature(s)	Applicable Life Stage
Freshwater spawning	Water quality, water quantity, and substrate	Spawning, incubation, and larval development
Freshwater rearing	Water quantity and floodplain connectivity to form and maintain physical habitat conditions	Juvenile growth and mobility
	Water quality and forage[b]	Juvenile development
	Natural cover[b]	Juvenile mobility and survival
Freshwater migration	Free of artificial obstructions, water quality and quantity, and natural cover[c]	Juvenile and adult mobility and survival
Estuarine	Water quality, water quantity, and salinity	Juvenile and adult physiological transitions
	Natural cover and forage[a]	Juvenile growth and maturation and adult conservation

Table 3-3 Physical and Biological Features of Designated Steelhead Critical Habitats

Critical Habitat Type[a]	Physical and Biological Feature(s)	Applicable Life Stage
Nearshore marine	Water quality, water quantity, forage,[a] natural cover[b]	Juvenile growth and maturation
Offshore marine	Water quality and forage[a]	Juvenile growth and maturation

Notes:

[a] Habitat types are based on terminology used in the Federal Register designating critical habitat for steelhead

[b] Forage includes aquatic invertebrate and fish species that support growth and maturation.

[c] Natural cover includes shade, large wood, log jams, beaver dams, aquatic vegetation, large rocks and boulders, side channels, and undercut banks.

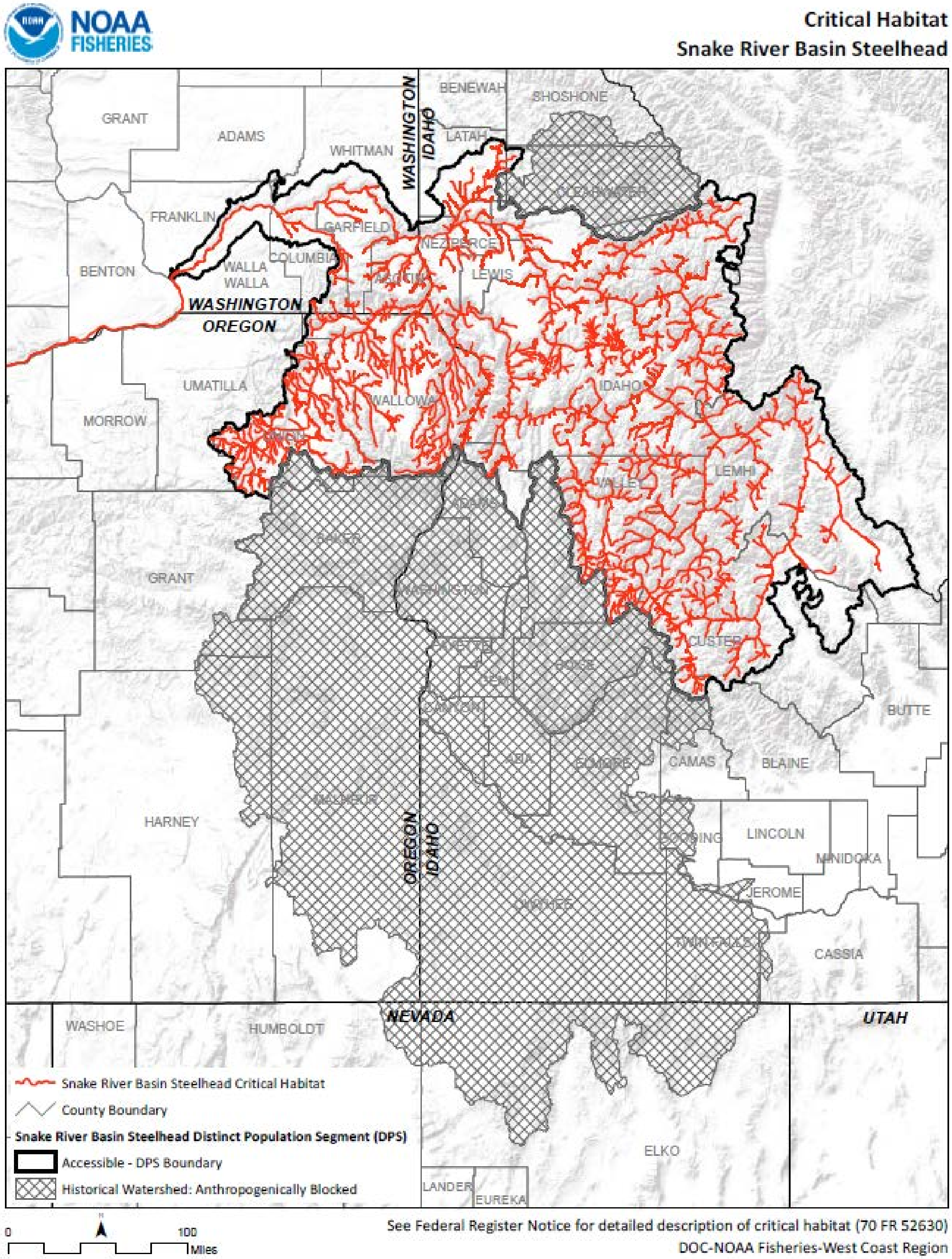
Life History

Adult SRB steelhead enter the Columbia River from late June to October to begin their migration inland. After holding over the winter in larger rivers in the SRB, steelhead disperse into smaller tributaries to spawn from March through May. Earlier dispersal occurs at lower elevations, and later dispersal occurs at higher elevations. Juveniles emerge from the gravels four to eight weeks after hatching, and move into shallow, low-velocity areas in side channels and along channel margins, where they are able to escape high velocities and predators (Everest and Chapman 1972). Juvenile steelhead then progressively move toward deeper water as they grow in size (Bjornn and Reiser 1991). Juveniles typically reside in freshwater for one to three years, although this species displays a wide diversity of life histories. Smolts migrate downstream during spring runoff, which occurs from March to mid-June depending on elevation, and typically spend one to two years in the ocean.

SRB steelhead exhibit a diversity of life-history strategies, including variations in freshwater and marine residence times. Traditionally, fisheries managers have classified SRB steelhead into two groups, A-run and B-run, based on age at return to freshwater, adult size at return, and migration timing. A-run steelhead tend to be smaller than B-run steelhead, and they predominantly spend one year in the ocean. Conversely, B-run steelhead are larger, and most individuals return after two years in the ocean. Most Snake River populations support a mixture of the two run types. The highest percentage of B-run fish are in the upper Clearwater River and the South Fork Salmon River; moderate percentages of B-run fish are in the Middle Fork Salmon River; and a very low percentages of B-run fish are in the Upper Salmon River, Grande Ronde River, and Lower Snake River (NWFSC 2015). A-run fish make up the remainder of those populations.

Current Stressors and Threats

Limiting factors for Snake River basin steelhead trout include substantial modification of the seaward migration corridor by hydroelectric power development on the mainstem Snake and Columbia Rivers, widespread habitat degradation and reduced streamflows throughout the Snake River basin (Good et al. 2005), and reduced genetic integrity caused by a high proportion of hatchery fish (Good et al. 2005; Ford et al. 2011).



Source: (NOAA Fisheries 2016i)

Figure 3-10 Critical Habitat for Snake River Basin Steelhead Trout

Spawning and rearing habitat quality in tributary streams in the Snake River varies from excellent in wilderness and roadless areas to poor in areas subject to intensive human land uses (NOAA Fisheries 2016u). Critical habitat throughout much of the Interior Columbia (which includes the Snake River and the MCR) has been degraded by intensive agriculture, alteration of stream morphology (i.e., channel modifications and diking), riparian vegetation disturbance, wetland draining and conversion, livestock grazing, dredging, road construction and maintenance, logging, mining, and urbanization. Reduced summer streamflows, impaired water quality, and reduction of habitat complexity are common problems for critical habitat in non-wilderness areas. Human land use practices throughout the basin have caused streams to become straighter, wider, and shallower, thereby reducing rearing habitat availability and impairing water temperature.

In many stream reaches designated as critical habitat in the SRB, streamflows are substantially reduced by water diversions (NOAA Fisheries 2016u). Withdrawal of water, particularly during low-flow periods that commonly overlap with agricultural withdrawals, often increases summer stream temperatures, blocks fish migration, strands fish, and alters sediment transport (Spence et al. 1996). Reduced tributary streamflow has been identified as a major limiting factor for SRB steelhead in particular (NOAA Fisheries 2016u).

Many stream reaches designated as critical habitat for these species are on the CWA 303(d) list for impaired water quality (e.g., due to elevated water temperature) (IDEQ 2011). Many areas (e.g., Upper Grande Ronde) that were historically suitable rearing and spawning habitat are now unsuitable due to high summer stream temperatures. Removal of riparian vegetation, alteration of natural stream morphology, and withdrawal of water for agricultural or municipal use all contribute to elevated stream temperatures. Water quality in spawning and rearing areas in the Snake River has also been impaired by high levels of sedimentation and by heavy metal contamination from mine waste (e.g., IDEQ and EPA 2003; IDEQ 2001, 2011).

Migration habitat quality for SRB steelhead has also been severely degraded, primarily by the development and operation of dams and reservoirs on the mainstem Columbia and Snake Rivers (NMFS 2008b). Hydroelectric development has modified natural flow regimes in the migration corridor, causing higher water temperatures and changes in fish community structure. This has led to increased rates of piscivorous and avian predation on juvenile steelhead, and delayed migration for both adult and juveniles. Physical features of dams such as turbines also kill migrating fish.

Puget Sound Steelhead Trout

The Puget Sound steelhead DPS was federally listed as threatened in 2007 (72 FR 26722).

Distribution

The Puget Sound steelhead DPS includes all naturally spawned, anadromous steelhead populations in river basins draining to the Strait of Juan de Fuca, Puget Sound, and Hood Canal, Washington. The Puget Sound steelhead DPS area is bounded to the west by the Elwha River (inclusive) and to the north by the Nooksack River and Dakota Creek (inclusive). The Puget Sound steelhead DPS also includes six hatchery stocks that are considered relatively similar (genetically) to their associated non-hatchery counterparts (79 FR 20802). Non-anadromous “resident” *O. mykiss* occur within the range of Puget Sound steelhead DPS but are not part of the DPS due to marked differences in physical, physiological, ecological, and behavioral characteristics (Hard et al. 2007).

Critical Habitat

Critical habitat was designated for the Puget Sound steelhead DPS on February 24, 2016 (81 FR 9252). There are approximately 3,269 km (2,031 miles) of freshwater and estuarine habitat designated as critical habitat for Puget Sound steelhead (Figure 3-11). There are 18 sub-basins containing 66 watersheds within the range of the Puget Sound steelhead DPS. The PBFs for West Coast steelhead critical habitat are provided in Table 3-3.

Life History

Puget Sound steelhead trout exhibit one of two distinct life history strategies based on whether individuals return in the summer or winter. Winter-run salmon are the predominant group in the Puget Sound DPS, which means that most steelhead mature in the ocean and return to streams to spawn in winter or early spring (Myers et al. 2015). In lowland, rain-dominated streams, steelhead tend to return earlier than in higher elevation, snowmelt dominated streams.

Current Stressors and Threats

Limiting factors for Puget Sound steelhead trout include widespread declines in adult abundance (total run size) despite significant reductions in harvest, reduced diversity resulting from two hatchery steelhead stocks (i.e., Chambers Creek and Skamania), uncertain but weak status of summer-runs, and reduced spatial structure. Reduced habitat quality and quantity are also key limitations. The major categories of human activities with the potential to impact Puget Sound steelhead PBFs include forestry, grazing, agriculture, road building/maintenance, channel modifications/diking, urbanization, sand and gravel mining, mineral mining, dams, irrigation impoundments and withdrawals, vessel traffic, wetland loss/removal, beaver removal, and exotic/invasive species introductions. In addition to these, the harvest of salmonid prey (e.g., herring, anchovy, and sardines) adversely influences nearshore marine PBFs.

Dams have dramatically affected steelhead habitat use in a number of Puget Sound sub-basins. In addition to eliminating accessible habitat, dams affect habitat quality by changing river hydrology, temperature, downstream gravel recruitment, and large woody debris movement. Dams have impeded upstream access to historical steelhead habitat in the Middle Fork Nooksack, Baker, Cedar, Green, White, Nisqually, and North Fork Skokomish Rivers. “Trap-and-haul” programs (capture of live spawners and transport above impassible dams) have made passage of Puget Sound steelhead above the dams on the Baker and White Rivers possible. A smolt collection facility has similarly allowed downstream passage of juveniles possible on the Baker River. On the White River, downstream migrants can pass directly through the dams.

Urban development has dramatically altered many of the lower reaches of rivers and their tributaries in Puget Sound. Urbanization has destroyed historical land cover (e.g., forests) and exchanged it for large areas of imperious surfaces (e.g., roads). Wetland and riparian habitat loss has dramatically changed urban stream hydrology by increasing flood frequency and peak flows during storm events while decreasing groundwater-driven summer flows. Conversion to agricultural land has impacted river morphology, since much of this type of development occurs in river floodplains. Dike construction, bank hardening, and channelization have reduced river braiding and sinuosity. Constricting a river, especially during high flow events, increases the likelihood of gravel scour and dislocation of rearing juveniles.

Source: (NOAA Fisheries 2016o)

Figure 3-11 Critical Habitat for Puget Sound Steelhead Trout

Habitat blockage and/or degradation occur throughout the Puget Sound steelhead DPS range. In general, upper tributaries have been adversely affected by forest practices, whereas lower tributaries and mainstem rivers have been degraded by agriculture and/or urbanization. Diking for flood control, draining and filling freshwater and estuarine wetlands, and sedimentation from timber harvests and urban development are cited as problems throughout the Puget Sound steelhead DPS (Washington Department of Fisheries et al. 1993). Bishop and Morgan (1996) identified a variety of stream habitat limitations in the range of this species including flow regime changes, sedimentation, high temperatures (in the Dungeness, Elwha, Green/Duwamish, Skagit, Snohomish, and Stillaguamish Rivers), streambed instability, estuarine loss, large woody debris loss (in the Elwha, Snohomish, and White Rivers), pool habitat loss (in the Nooksack, Snohomish, and Stillaguamish Rivers), and blockage or passage problems associated with dams or other structures (in the Cedar, Green/Duwamish, Snohomish, and White Rivers).

Upper Columbia River Steelhead Trout

The UCR steelhead DPS was listed as endangered on August 18, 1997 (62 FR 43937), and its status was upgraded to threatened on January 5, 2006 (71 FR 834). The threatened status was affirmed on August 15, 2011, after the five-year status review (76 FR 50448).

Distribution

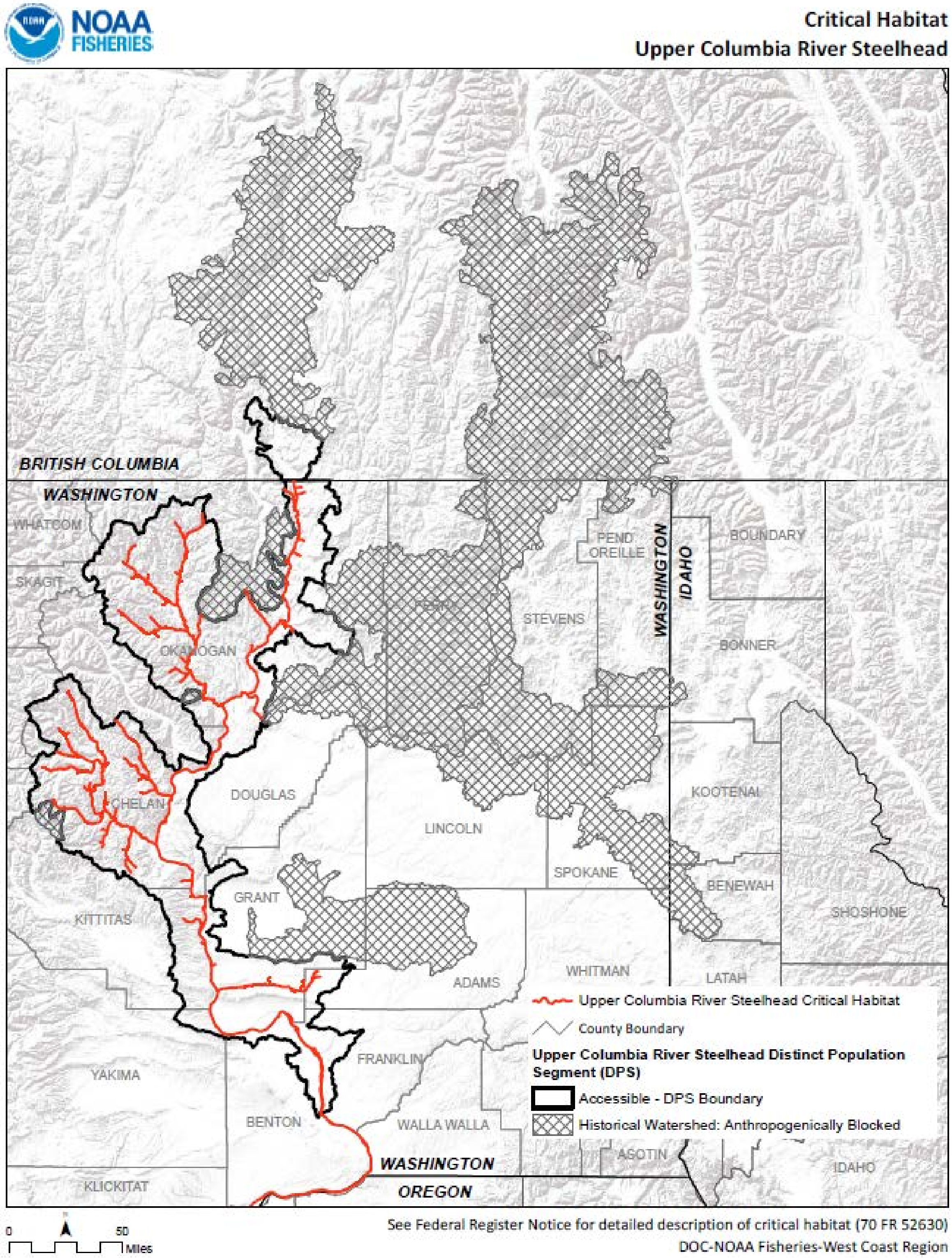
The UCR steelhead DPS includes all naturally spawned populations of steelhead in streams in the Columbia River Basin upstream from the Yakima River in Washington to the US-Canada border (62 FR 43937). There are four populations of UCR steelhead included in the UCR steelhead DPS: the Wenatchee, Entiat, Methow, and Okanogan populations. Six artificial propagation programs are also considered part of the DPS.

Critical Habitat

Critical habitat for UCR steelhead trout was designated for Oregon and Washington in 2005 and includes freshwater areas shown in Figure 3-12 (70 FR 52630). The PBFs of freshwater spawning sites include water flow, water quality, temperature conditions, and suitable substrate for spawning and incubation. These features are essential to conservation because without them the species cannot successfully spawn and produce offspring. However, there are only a few locations where spawning occurs in the Columbia River for UCR steelhead. The PBFs for West Coast steelhead critical habitat are provided in Table 3-3.

Life History

The life-history pattern of UCR steelhead is complex (Peven et al. 1994). Adults return to the Columbia River in the late summer and early fall. Unlike spring-run Chinook salmon, most steelhead do not move quickly up to spawning areas (i.e., tributaries). A portion of the returning run overwinters in mainstem reservoirs, passing over the UCR dams (up to Chief Joseph Dam, which is impassible) in April and May of the following year. Spawning occurs in the late spring. Juvenile steelhead generally spend one to three years (up to seven years) rearing in freshwater before migrating to the ocean. Most adult steelhead return to the UCR after one or two years at sea.



Source: (NOAA Fisheries 2016k)

Figure 3-12 Critical Habitat for Upper Columbia River Steelhead Trout

Current Stressors and Threats

Limiting factors for UCR steelhead trout include adverse impacts from hydropower operations (i.e., modified hydrograph, increase in lentic conditions/ decrease in riverine conditions, passage barriers, altered temperatures and dissolved oxygen, and invasive species), riparian habitat degradation, decreased large wood recruitment, altered floodplain connectivity and function, altered channel structure and complexity, reduced streamflows, and hatchery-related impacts (i.e., reduced genetic diversity) (NMFS 2011b).

Habitat quality in tributary streams in the UCR range from excellent in wilderness and roadless areas to poor in areas subject to relatively heavy agricultural and urban development (Wissmar et al. 1994; NMFS 2009a). Critical habitat throughout much of the UCR has been degraded by intense agriculture, alteration of stream morphology (i.e., channel modifications and diking), riparian vegetation removal, wetland draining and conversion, livestock grazing, dredging, road construction and maintenance, logging, mining, and urbanization. Reduced summer stream flows, impaired water quality, and reduction of habitat complexity are common problems for critical habitat in developed areas.

Many stream reaches designated as critical habitat in the UCR are over-allocated under state water law, resulting in greater extraction of water than existing streamflow conditions can support. Withdrawal of water, particularly during low-flow periods that commonly overlap with agricultural withdrawals, often results in increased summer stream temperatures. Withdrawal can also block fish migration, strand fish, and alter sediment transport (Spence et al. 1996). Reduced tributary stream flow has been identified as a major limiting factor for all listed salmon and steelhead species in this area (NMFS 2016d; UCSRB 2007).

Middle Columbia River Steelhead Trout

The MCR steelhead DPS was listed as threatened on March 25, 1999 (64 FR 14517). The threatened status was reaffirmed on June 28, 2005 (70 FR 37160) and updated on April 14, 2014 (FR 79 20802).

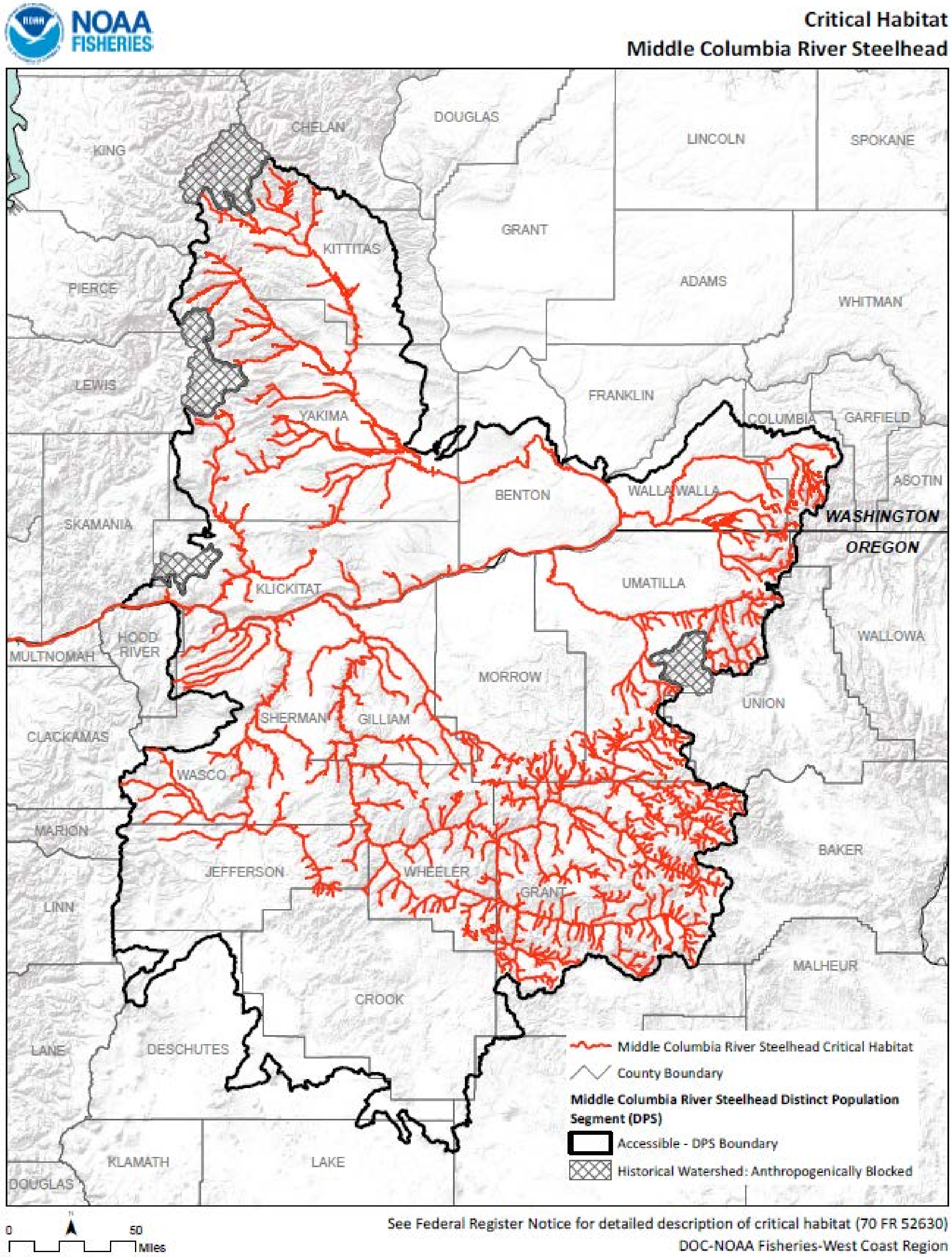
Distribution

The MCR steelhead DPS includes all naturally spawned anadromous *O. mykiss* populations below impassable barriers in streams from above the Wind River in Washington and the Hood River in Oregon, upstream to, and including, the Yakima River in Washington but excluding *O. mykiss* from the Snake River Basin. Seven artificial propagation programs are also included in the DPS.

There are 17 extant populations (and three historically extirpated populations) in the MCR steelhead DPS (ICTRT 2003, 2005). The populations are further classified into four major population groups: John Day River (five extant populations), Umatilla/Walla Walla Rivers (three extant and one extirpated populations), Yakima River (four extant populations), and the Eastern Cascades group (five extant and two extirpated populations).

Critical Habitat

Critical habitat for the MCR steelhead DPS was designated for Oregon and Washington in 2005 and includes freshwater areas shown in Figure 3-13 (70 FR 52630). The PBFs for West Coast steelhead critical habitat are provided in Table 3-3.



Source: (NOAA Fisheries 2016e)

Figure 3-13 Critical Habitat for Middle Columbia River Steelhead Trout

Life History

MCR steelhead trout follow a summer-run pattern (consistent with other inland steelhead), and they mature in streams for up to one year before spawning (DOI 2011). Spawning migration starts in mid-May, and fish pass over Bonneville Dam in July and August (DOI 2011). Fry emerge from gravel between May and June, and juvenile MCR steelhead tend to smolt after two years in freshwater streams, after which they spend one to three years in the ocean before returning to freshwater (DOI 2011). MCR steelhead co-occur with non-anadromous rainbow trout, and they may not be reproductively isolated (Carmichael 2006).

Current Stressors and Threats

Stressors and threats to the MCR steelhead DPS and critical habitat are similar to those for the UCR steelhead DPS.

Lower Columbia River Steelhead Trout

LCR steelhead were federally listed as threatened in 2006 (71 FR 834).

Distribution

The LCR steelhead DPS includes all naturally spawned anadromous *O. mykiss* originating from below impassable barriers from rivers between the Cowlitz and Wind Rivers (inclusive) and the Willamette and Hood Rivers (inclusive). The DPS excludes fish originating from the UWR Basin above Willamette Falls. This DPS also includes steelhead from seven artificial propagation programs (79 FR 20802).

Critical Habitat

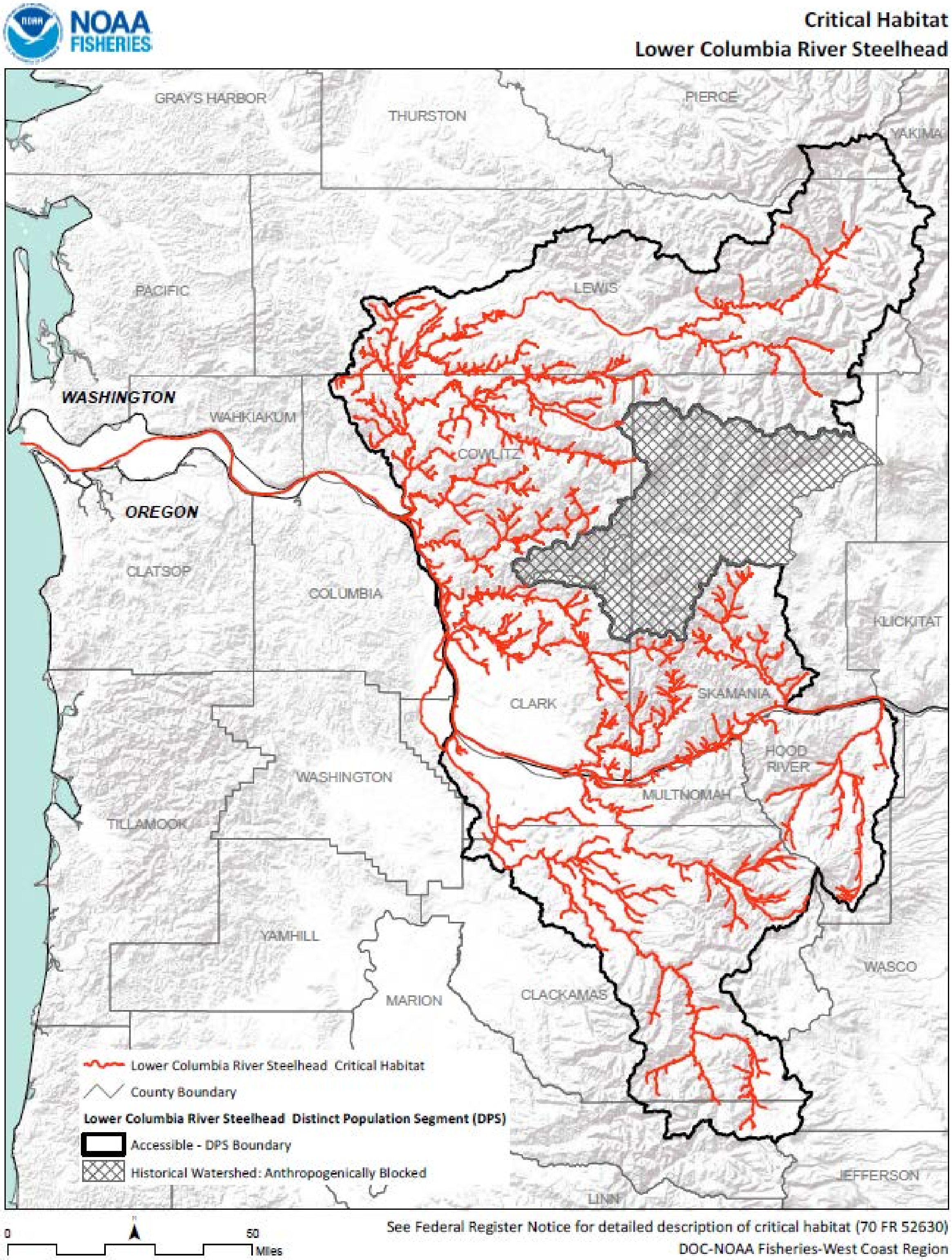
Critical habitat for LCR steelhead trout was designated for Oregon and Washington in 2005 and includes areas shown in Figure 3-14 (70 FR 52630). The PBFs for LCR steelhead critical habitat are described in Table 3-3.

Life History

Steelhead in the LCR smolt after two years spent in freshwater, then spend an additional two years in marine waters before returning to freshwater to spawn (NOAA Fisheries 2015b). Steelhead may linger in freshwater streams for up to a year before spawning (NOAA Fisheries 2015b). Unlike other Pacific salmonids, steelhead are iteroparous (can spawn multiple times), though multiple spawning events are rare and mostly restricted to females (Nickelson et al. 1992).

Current Stressors and Threats

Limitations for the LCR steelhead DPS include interactions with hatchery fish (resulting in reduced genetic diversity), limited fish passage at dams, and habitat degradation. The conversion of floodplain habitat to agricultural or urbanized land uses has reduced steelhead habitat availability throughout the LCR region. Channelization and hydrological changes have reduced habitat complexity in the lower tributary/mainstem Columbia River interface, and the concomitant change in water temperatures is a likely stressor on the LCR steelhead DPS (NMFS 2013). Contamination is a growing concern for aquatic life and designated uses of the LCR (Nilsen and Morace 2014; Counihan et al. 2013; Alvarez et al. 2014; Nilsen et al. 2014), and Total Maximum Daily Loads are needed for many pollutants.



Source: (NOAA Fisheries 2016d)

Figure 3-14 Critical Habitat for Lower Columbia River Steelhead Trout

Upper Willamette River Steelhead Trout
UWR steelhead were federally listed as threatened in 1999 (64 FR 14517). A recovery plan was published for the UWR steelhead trout DPS in 2011 (ODFW and NMFS 2011). Recovery goals for this DPS include the maintenance of all populations, including two populations with high probabilities of persistence.

Distribution
This species includes all naturally spawned steelhead populations below impassable barriers in the Willamette River, Oregon, and its tributaries upstream from Willamette Falls to and including the Calapooia River (64 FR 14308). Hatchery summer-run steelhead that are released in the sub-basins are from an out-of-basin stock, so they are not included in the DPS. Additionally, historically hatchery-raised summer-run steelhead in the McKenzie River (now an established population) are not included in the DPS (ODFW and NMFS 2011).

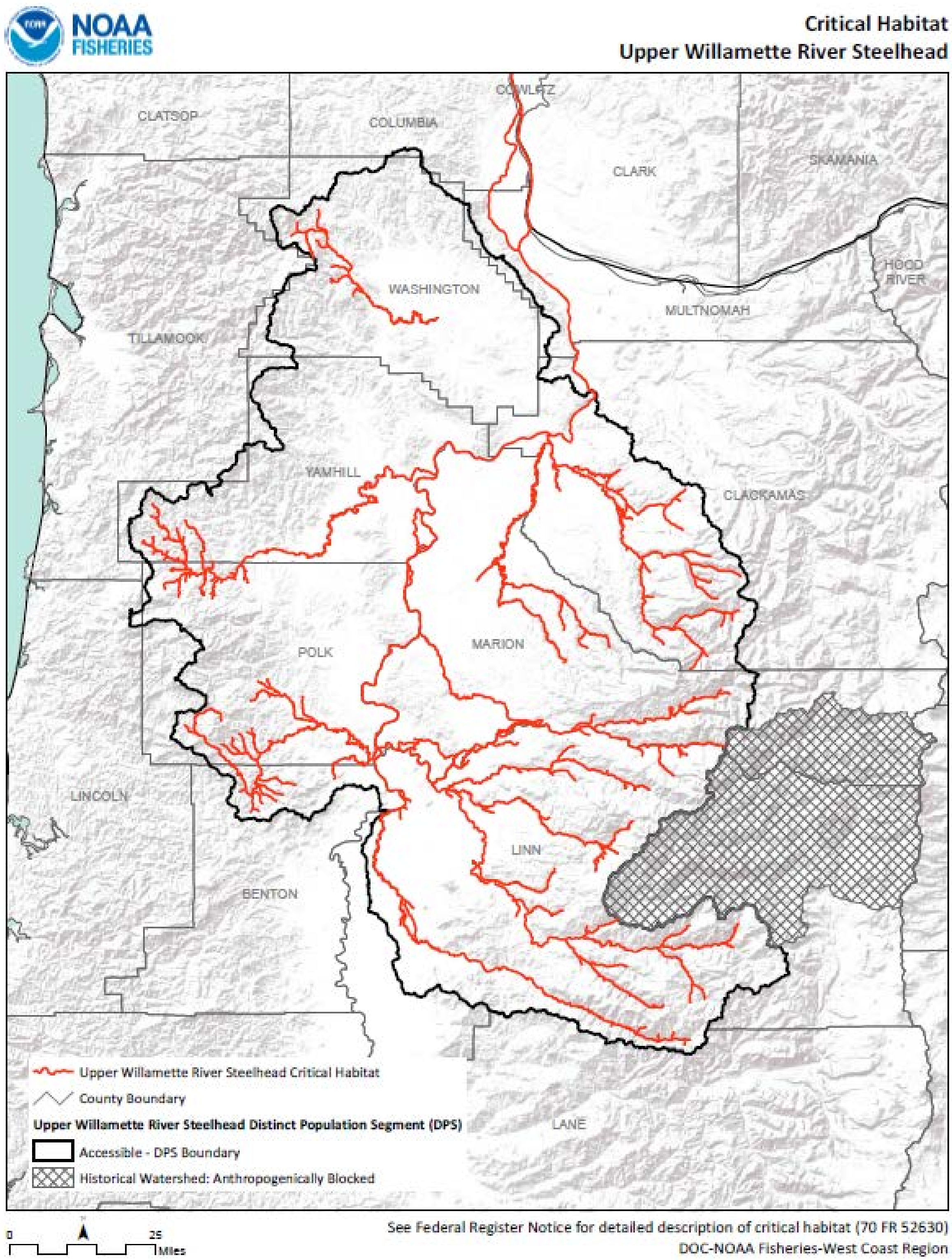
Critical Habitat
Critical habitat for the UWR steelhead DPS was designated for Oregon in 2005 and includes the freshwater areas shown in Figure 3-15 (70 FR 52630). The PBFs for UWR steelhead critical habitat are described in Table 3-3.

Life History
UWR steelhead migrate in winter, entering freshwater between January and April (ODFW and NMFS 2011). Like other steelhead DPSs, juveniles hatch and rear for two years before smolting, after which they migrate into the ocean for another two years. Spawning occurs at four or five years of age (NMFS 2015b).

Current Stressors and Threats
Limiting factors for UWR steelhead DPS include degradation of freshwater habitat (e.g., reductions in floodplain connectivity and function, channel structure and complexity, riparian habitat availability, large wood recruitment, and stream flow); degraded water quality (e.g., increased water temperature); reduced access to spawning and rearing habitats; reduced genetic diversity resulting from summer-run steelhead hatchery releases; and predation and competition related to non-native species and out-of-basin salmonid populations (NMFS 2011a; ODFW and NMFS 2011).

Pacific Eulachon (*Thaleichthys pacificus*) Southern DPS
On March 16, 2010, the southern DPS of Pacific eulachon was listed as a threatened species (75 FR 13012).

Distribution
Pacific eulachon are endemic to the northeastern Pacific Ocean, ranging from northern California to southwest and south-central Alaska and into the southeastern Bering Sea. Puget Sound lies between two of the largest eulachon spawning rivers (the Columbia and Fraser Rivers) but lacks a regular eulachon run of its own (Gustafson et al. 2010). Within the NW, most eulachon production originates in the Columbia River Basin, and the largest and most consistent spawning runs return to the Columbia River mainstem and Cowlitz River. Adult eulachon have been found at several



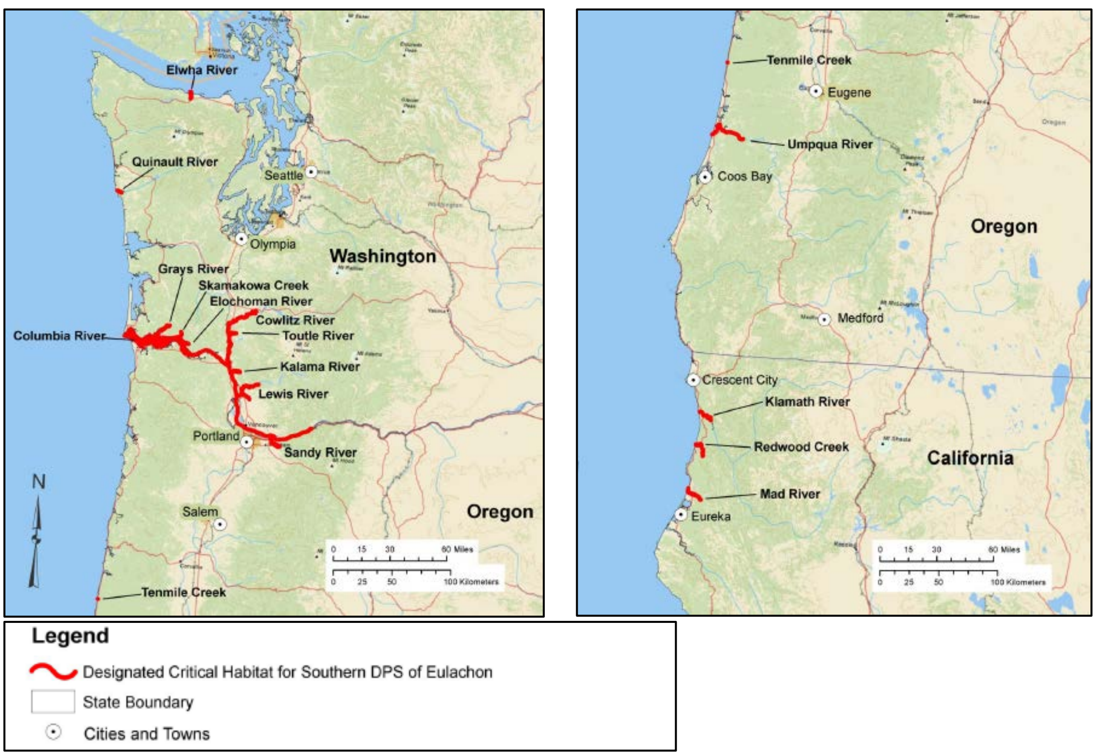
Source: (NOAA Fisheries 2016m)

Figure 3-15 Critical Habitat for Upper Willamette River Steelhead Trout

Washington and Oregon coastal locations, and they were previously common in Oregon's Umpqua River and the Klamath River in northern California. Runs occasionally occur in many other rivers and streams, though often erratically, appearing in some years but not others and only rarely in some river systems (Hay and McCarter 2000; Willson et al. 2006; Gustafson et al. 2010). Since 2005, eulachon in spawning condition have been observed nearly every year in the Elwha River by Lower Elwha Tribe fishery biologists. The Elwha is the only river within the US portion of Puget Sound and the Strait of Juan de Fuca that supports a consistent run of eulachon.

Critical Habitat

Critical habitat was designated for the southern DPS of eulachon on October 20, 2011 (76 FR 65324). Sixteen specific areas were designated as critical habitat within the states of California, Oregon, and Washington (Figure 3-16). The designated areas are a combination of freshwater creeks and rivers and their associated estuaries, comprising approximately 539 km (335 miles) of habitat. Areas designated for critical habitat in Washington include a large portion of the Columbia River (from the mouth to Bonneville Dam), the Grays, Elochoman, Cowlitz, Toutle, Kalama, Lewis, Quinault, and Elwha Rivers and Skamokawa Creek. No marine areas were designated as critical habitat. Lands of the Lower Elwha and Quinault Tribes are also excluded from critical habitat designation.



Source: 76 FR 65324

Figure 3-16 Critical Habitat for Southern DPS Pacific Eulachon in Washington and Oregon

The PBFs essential to the conservation of the Pacific eulachon southern DPS were analyzed as three major categories reflecting key life history phases of eulachon. PBFs for freshwater spawning and incubation sites include water flow, quality, and temperature conditions; spawning and incubation substrates; and migratory access. PBFs for freshwater and estuarine migration corridors include waters free of obstruction; specific water flow, quality, and temperature conditions (for supporting larval and adult mobility); and abundant prey items (for supporting larval feeding after the yolk sac is depleted). The PBFs for marine nearshore and open water foraging habitat include suitable water quality and availability of prey.

Life History

Eulachon generally spawn in rivers fed by glaciers or snowpack that experience spring freshets. Since these freshets rapidly move eulachon eggs and larvae to estuaries, it is believed that eulachon imprint and home to an estuary into which several rivers drain rather than individual spawning rivers (Hay and McCarter 2000). Eulachon typically enter the Columbia River system from December to May, with peak entry and spawning during February and March (Gustafson et al. 2010). They spawn in the LCR mainstem and multiple tributaries of the LCR.

Eulachon eggs are commonly found attached to sand or pea-sized gravel, though eggs have been found on a variety of substrates, including silt, gravel-to-cobble sized rock, and organic detritus (Lewis et al. 2002; Langer et al. 1977; Smith and Saalfeld 1955). Upon hatching, stream currents rapidly carry newly hatched larvae to the sea. Eulachon return to spawning rivers at ages ranging from two to five years as a single age class. Prior to entering their spawning rivers, eulachon hold in brackish waters while their bodies undergo physiological changes in preparation for freshwater and to synchronize their runs. Eulachon then enter rivers, move upstream, spawn, and die to complete their semelparous life cycle (COSEWIC 2011a).

Eulachon are a short-lived, high-fecundity, high-mortality forage fish, and such species typically have extremely large population sizes. Fecundity estimates range from 7,000 to 60,000 eggs per female with egg-to-larva survival likely less than 1% (Gustafson et al. 2010). This may lead to recruitment events where only a small minority of spawning individuals contribute to subsequent generations (Hedgecock 1994). Unlike other important forage fish species (e.g., Pacific herring), Columbia and Fraser River spawning stocks of Pacific eulachon appear to be limited to a single age class, which makes them vulnerable to environmental perturbations and catastrophic events (Gustafson et al. 2010).

Eulachon are an important link in the food chain between zooplankton and larger organisms. Small salmon, lingcod (*Ophiodon elongates*), white sturgeon (*Acipenser transmontanus*), and other fish feed on small larvae near river mouths. As eulachon mature, they are consumed by a wide variety of predators (Gustafson et al. 2010) (e.g., humpback whale; *Megaptera novaeangliae*).

Current Stressors and Threats

Climate change impacts on ocean habitat are the most serious threat to persistence of the southern DPS of Pacific eulachon (Gustafson et al. 2010). Physical changes associated with warming include increases in ocean temperature, increased stratification of the water column, and changes in the intensity and timing of coastal upwelling. These changes will alter primary and secondary productivity and the structure of marine communities (ISAB 2007). In the marine environment, eulachon rely on cool ocean regions and the pelagic invertebrate communities therein (Willson et al. 2006). Warming ocean temperatures will likely alter these communities, making it more difficult for eulachon and their larvae to locate or capture prey (Zamon and Welch 2005; Roemmich and McGowan 1995). Warmer waters could also allow for the northward expansion of eulachon predator and competitor ranges, increasing the already high predation pressure on the species (McFarlane et al. 2000; Rexstad and Pikitch 1986; Phillips et al. 2007). Decreased snowpack, increased peak flows, decreased base flow, changes in the timing and intensity of stream flows, and increased water temperatures may impact freshwater eulachon habitat (Morrison et al. 2002). In most rivers, eulachon typically spawn well before the spring freshet, near the seasonal flow minimum. Alterations to stream flow timing may cause eulachon to spawn earlier or be flushed out of spawning rivers at an earlier date. Early emigration may result in asynchrony between eulachon entering the marine environment and seasonal upwelling (Gustafson et al. 2010).

Historically, bycatch of eulachon in the pink shrimp fishery along the US and Canadian coasts has been very high (composing up to 28% of the total catch by weight (Hay and McCarter 2000) (Olsen et al. 2000)). Prior to the mandated use of bycatch-reduction devices in the pink shrimp fishery, 32% to 61% of the total catch in the pink shrimp fishery consisted of non-shrimp biomass, made up mostly of Pacific hake (*Merluccius productus*), various species of smelt, including Pacific eulachon, yellowtail rockfish (*Sebastes flavidus*), sablefish (*Anoplopoma fimbria*), and lingcod (Hannah and Jones 2007). Bycatch of eulachon in these fisheries is still significant. The total estimated bycatch of eulachon in the Oregon and California pink shrimp fisheries ranged from 217,841 fish in 2004 to 1,008,260 fish in 2010 (Al-Humaidhi et al. 2012).

Hydroelectric dams block access to historical eulachon spawning grounds and affect the quality of spawning substrates through flow management, altered delivery of coarse sediments, and siltation. Dredging activities during the eulachon spawning run may entrain and kill adult and larval fish and eggs.

There are numerous activities that may affect the PBFs of Pacific eulachon critical habitat. Activities include dams and water diversions (e.g., Bonneville Dam); dredging and disposal of dredged material (e.g., on the Cowlitz and Columbia Rivers); in-water construction or alterations; contamination and runoff resulting in degraded habitat quality; port and shipping terminals; and salmon habitat restoration projects, which benefit salmon to the detriment of species like Pacific eulachon. The activities may impact PBFs by altering stream hydrology; water level, flow, temperature, and dissolved oxygen levels; erosion and sediment input/transport; physical habitat structure; vegetation; soils; nutrients and chemicals; fish passage; and estuarine/marine prey resources.

Rockfish Species

Two listed rockfish species and their associated critical habitat are present in the Action Area: bocaccio (*Sebastes paucispinis*) and yelloweye rockfish (*S. ruberrimus*). Those species are discussed in detail in the following sections.

Bocaccio (*Sebastes paucispinis*) Puget Sound/Georgia Basin DPS

On April 27, 2010, the NMFS listed the Puget Sound/Georgia Basin (PS/GB) DPS of bocaccio as endangered (75 FR 22276).

Distribution

The geographic range of the listed PS/GB rockfish DPS (including bocaccio) includes Puget Sound, Georgia Basin, the Strait of Georgia, and the Strait of Juan de Fuca east of Victoria Sill.

Critical Habitat

Critical habitat was designated for PS/GB DPSs of bocaccio and yelloweye rockfish on November 13, 2014 (79 FR 68042).[32] The critical habitat in the US includes five interconnected, biogeographic basins: the San Juan/Strait of Juan de Fuca, Main, Whidbey, South Puget Sound, and Hood Canal Basins; detailed maps of these area are provided in the Federal Register (79 FR 68042). Nearly 1,500 sq km (600 square miles) of nearshore habitat in Puget Sound, Washington, as PS/GB bocaccio critical habitat. Nearshore critical habitat consists of underwater substrates such as sand, rock, and/or cobble compositions from extreme high water to 30 m (98 ft) deep (the limit of the photic zone in Puget Sound). This critical habitat supports kelp, enables forage opportunities and refuge from predators, and enables behavioral and physiological changes needed for juveniles to occupy deeper adult habitats. The PBFs of nearshore habitats include sufficient quantity, quality, and availability of prey species and suitable water quality and dissolved oxygen to support growth, survival, reproduction, and feeding opportunities.

An additional 1,000 sq km (400 square miles) of deep habitat in Puget Sound as PS/GB yelloweye rockfish and bocaccio critical habitat. Deepwater critical habitat consists of sites deeper than 30 m (98 ft) that possess or are adjacent to areas of complex bathymetry consisting of rock or other highly rough surfaces. This habitat is essential to conservation because these features provide structure for rockfish to avoid predation, seek food, and persist for decades. The PBFs for deepwater habitats include sufficient quantity, quality, and availability of prey species; sufficient water quality and dissolved oxygen; and appropriate types and amounts of structure and roughness that supports feeding opportunities and predator avoidance.

Life History

Bocaccio life history includes a larval/pelagic juvenile stage followed by a nearshore juvenile stage, and sub-adult and adult stages. In contrast to the majority of bony fishes, rockfish fertilize their eggs internally, and the young are extruded as larvae. Individual female bocaccio produce from 20,000 to 2,298,000 eggs, and as females grow and age, the number of young produced per individual increases (Love et al. 2002). Larval release timing varies throughout the geographic range. Along the Washington State coast, female bocaccio release larvae between January and April. Larvae are observed under free-floating algae, seagrass, and detached kelp (Love et al. 2002; Shaffer et al. 1995), but are also distributed throughout the water column (Weis 2004). Larvae can make small local movements to pursue food immediately after birth (Tagal et al. 2002), but dispersal is driven by passive movement on prevailing currents. In Puget Sound, sills regulate water exchange from one basin to the next, likely resulting in most larvae staying within the basin where they are released rather than being broadly dispersed (Drake et al. 2010). On average, larval bocaccio occur at approximately 25 to 30 m (Lenarz et al. 1991).

Most bocaccio remain pelagic for 3.5 months prior to settling in shallow areas, though some individuals remain pelagic as long as 5.5 months. Several weeks after settlement, fish tend to move

[32] Critical habitat was also listed for the PS/GB canary rockfish DPS, but that DPS was delisted as of March 2017.

toward deeper nearshore waters over rocky or cobble substrates with or without kelp (Love et al. 1991; Love et al. 2002). These habitat features offer a beneficial mix of warmer temperatures, food, and refuge from predators (Love et al. 1991). Young-of-the-year are often found in shallow, nearshore waters over rocky bottoms associated with algae, within and near kelp canopies, and in 18 to 30 m (59 to 98 ft) deep waters associated with rocky reefs and high relief areas (Feder et al. 1974; Carr 1983; Johnson 2006; Love and Yoklavich 2008; Sakuma and Ralston 1995). Pelagic juveniles opportunistically feed on fish larvae, copepods, krill, and other prey. Larger juveniles and adults are primarily piscivores, eating other rockfishes, hake, sablefish, anchovies, lanternfishes, and squid. Chinook salmon, terns, and harbor seals are predators of smaller bocaccio (Love et al. 2002).

Bocaccio typically mature between ages three and eight, at lengths from 32 to 61 cm (13 to 24 inches) (Love et al. 2002; Wyllie-Echeverria 1987), and bocaccio may begin to mature at earlier ages in declining populations (MacCall 2002). Sub-adult and adult bocaccio typically utilize habitats with moderate to extreme steepness, complex bathymetry, and rocky substrates (Love et al. 2002), although they may also be associated with unconsolidated sediments (e.g., silt, sand, or clay) (Washington 1977; Miller and Borton 1980). Bocaccio have large home ranges, move long distances, and spend time swimming in the water column (Love et al. 2002). Adult bocaccio inhabit waters from 12 to 478 m, but they are most common at depths between 50 and 250 m (Orr et al. 2000b; Feder et al. 1974; Love et al. 2002). Some adults are semi-pelagic and form schools above rocky areas, while some are non-schooling, solitary, benthic individuals (Yoklavich et al. 2000). Solitary bocaccio are associated with large sea anemones, rock ledges, and crevices of isolated rock outcrops (Yoklavich et al. 2000). Though difficult to age, adults may live as long as 54 years (Drake et al. 2010). Their natural annual mortality is approximately 8% (Palsson et al. 2009).

Bocaccio are long-lived, mature slowly, and have sporadic episodes of successful reproduction; (Drake et al. 2010; Tolimieri and Levin 2005), which suggests that they have inherently low productivity. PS/GB bocaccio have a very low intrinsic rate of population growth, even in the absence of a targeted fishery (Tolimieri and Levin 2005). Productivity in bocaccio is driven by high fecundity and episodic recruitment events, largely correlated with rare climatic and oceanographic conditions. Demographically, this species demonstrates some of the highest recruitment variability among rockfish species, with many years of failed recruitment being the norm (Tolimieri and Levin 2005).

Current Stressors and Threats

Benthic habitat degradation within PS/GB waters is a threat to listed rockfish, including the presence of derelict fishing gear, loss of eelgrass and kelp habitat, introduction of non-native species, and degradation of water quality.

Derelict fishing gear is considered a threat to the PS/GB bocaccio DPS (75 FR 22276); up to 117,000 derelict nets and pots are estimated to lie beneath the waters of Puget Sound (WDFW, unpublished data). Most derelict gillnets were recovered from high-relief habitats featuring rocky ledges and boulders (Drake et al. 2010), which are habitats frequently used by subadult and adult rockfish (Love et al. 2002). Gilardi et al. (2010)) estimated from their Puget Sound study of derelict gillnets that a fish becomes entangled in each derelict net every 3.6 days.

Non-native species are an emerging threat to the native Puget Sound biotic habitat. For example, *Sargassum muiticum*, an introduced brown algae now common throughout much of Puget Sound, is a competitor of kelp and eelgrass (Mumford 2007). It is possible that invasive tunicates will impact rockfish or their habitats based on observations from other regions (Levin et al. 2002) that suggest the potential for widespread impacts on rocky-reef fish populations caused by tunicate invasion.

Habitat degradation for kelp and eelgrass is another potential threat to PS/GB bocaccio. Kelp coverage is highly variable and has shown long-term declines in some regions, though some kelp beds have increased in areas where artificial substrate provides kelp habitat (Palsson et al. 2009). Kelp and eelgrass are stressed by light availability (which is reduced by turbidity), nutrient levels (e.g., eutrophication), pollutants (e.g., oils, metals, or sulfides), and physical disturbance (e.g., propeller wash and scour) (Mumford 2007). Kelp and eelgrass habitats are important for larval and young juvenile rockfish (Love et al. 2002). Low dissolved oxygen levels are an increasing concern in the PS/GB region (Palsson et al. 2009). Fish kill events occurred in Hood Canal in 2002, 2003, 2004, 2006, and 2010 (Newton et al. 2011).

Yelloweye Rockfish (*Sebastis ruberrimus*), Puget Sound/Georgia Basin DPS

On April 27, 2010, the NMFS listed the PS/GB DPS of yelloweye rockfish as threatened (75 FR 22276).

Distribution

The geographic range of the listed PS/GB rockfish DPS (including bocaccio) includes Puget Sound, Georgia Basin, the Strait of Georgia, and the Strait of Juan de Fuca east of Victoria Sill.

Prior to contemporary fishery harvests, each major basin in the PS/GB yelloweye rockfish DPS likely hosted relatively large yelloweye rockfish populations (Washington 1977; Washington et al. 1978; Moulton and Miller 1987). Currently, yelloweye rockfish are probably most abundant within the San Juan Islands Basin, but the likelihood of juvenile recruitment from this basin to adjacent basins is low due to limited circulation of currents from that basin to adjacent basins.

Critical Habitat

The critical habitat for yelloweye rockfish is the same as that for the PS/GB bocaccio rockfish DPS described above.

Life History

The yelloweye rockfish life-history includes a larval/pelagic juvenile stage followed by a nearshore juvenile stage, and sub-adult and adult stages. Yelloweye rockfish are among the largest rockfish, weighing up to 11 kg (25 pounds), and they are easily recognizable by their bright yellow eyes and red-orange color (Love et al. 2002). Adult female yelloweye rockfish may store sperm internally for several months until fertilization occurs, commonly between September and April, though fertilized individuals may be found year-round, depending on location (Wyllie-Echeverria 1987). In Puget Sound, yelloweye rockfish are believed to fertilize eggs during the winter to summer months and give birth in early spring to late summer (Washington et al. 1978). Fecundity ranges from 1.2 to 2.7 million eggs, considerably more than many other rockfish species (Love et al. 2002). Although yelloweye rockfish are generally thought to spawn once a year (MacGregor

1970), a Puget Sound study offered evidence of at least two spawning periods per year (Washington et al. 1978).

Larval yelloweye rockfish can make small local movements to pursue food immediately after birth (Tagal et al. 2002), but dispersal is likely driven by passive dispersion on prevailing currents. In the Puget Sound, sills regulate water exchange from one basin to the next, likely resulting in limited dispersal between sub-basins (Drake et al. 2010). Larvae are observed under free-floating algae, seagrass, and detached kelp (Love et al. 2002; Shaffer et al. 1995), but they are also distributed throughout the water column (Weis 2004). Larval yelloweye rockfish remain pelagic for up to three months.

When yelloweye rockfish reach sizes of 2.5 to 10 cm (1 to 4 inches), they settle primarily in shallow, high relief zones, caves, crevices, and areas with sponge gardens (Love et al. 1991; Richards et al. 1985). Juvenile yelloweye rockfish reside in waters as shallow as 15 m (49 ft) but generally move deeper as they get older (Love et al. 2002). Juvenile yelloweye rockfish eventually settle in 30 to 40 m (98 to 131 ft) of water near the upper depth range of adults (Yamanaka and Lacko 2001).

Sub-adult and adult yelloweye rockfish typically utilize habitats with moderate to extreme steepness, complex bathymetry, and rocky substrates (Love et al. 2002) that include caves, crevices, rocky pinnacles, and boulder fields (Carlson and Straty 1981; Love et al. 1991; Yoklavich et al. 2000). Within Puget Sound, yelloweye rockfish are associated with areas of high relief rocky and non-rocky substrates such as sand, mud, and other unconsolidated sediments (Washington 1977; Miller and Borton 1980). In waters less than 90 m (295 ft) deep, adult yelloweye rockfish are observed at a mean depth of 45.8 m (150 ft) (Johnson et al. 2003). Overall, yelloweye rockfish adults are most commonly found from 40 to 250 m (131 to 820) (Love et al. 2002; Orr et al. 2000a).

Yelloweye rockfish are generally solitary, demersal residents with small home ranges, though they are infrequently found in aggregations (Coombs 1979; DeMott 1983; Love et al. 2002). They are opportunistic feeders, targeting different food sources during different phases of their life history; early life stage rockfish diets include sand lance, gadids, flatfishes, shrimps, crabs, and gastropods (Love et al. 2002; Yamanaka et al. 2006). Due to their large sizes, subadult and adult yelloweye rockfish are able to handle large prey (e.g., smaller rockfish), and they are preyed upon less frequently than earlier life stages (Rosenthal et al. 1982). Yelloweye rockfish predators include salmon and killer whale (Ford et al. 1998; Love et al. 2002). Yelloweye rockfish are among the longest lived rockfish species, living up to at least 118 years (Love 1996; Love et al. 2002) with natural mortality rates estimated from 2 to 4.6% (Yamanaka and Kronlund 1997; Wallace 2007).

Because yelloweye rockfish are long-lived, mature slowly, and have sporadic episodes of successful reproduction, it is likely that the species has inherently low productivity; (Drake et al. 2010; Tolimieri and Levin 2005). Adult yelloweye rockfish typically occupy relatively small ranges (Love et al. 2002) and may not move to find suitable mates. As the density of mature fish decreases, productivity may also be impacted by density-dependent (Allee) effects. Moreover, commercial and recreational fishing may have forced the yelloweye rockfish population below the

threshold at which optimal productivity is attainable (Drake et al. 2010)**Current Stressors and Threats**
Current stressors and threats to the PS/GB yelloweye rockfish DPS are the same as those discussed above for the PS/GB bocaccio rockfish DPS.

Green Sturgeon (*Acipenser medirostris*), Southern DPS

The southern DPS of green sturgeon was listed as threatened on April 6, 2005 (71 FR 17757) because the majority of spawning adults are concentrated in one spawning river (i.e., the Sacramento River) and at risk for extirpation due to catastrophic events. The ESA section 4(d) rule published by the NMFS includes measures necessary to conserve the southern DPS of green sturgeon (75 FR 30714). The northern DPS of green sturgeon, which is not listed, spatially overlaps with the southern DPS, but is genetically distinct. Approximately 70% to 90% of the green sturgeon present in the Columbia River estuary and Willapa Bay are from the southern DPS, and 40% of green sturgeon in Grays Harbor are from the southern DPS (NMFS 2015e).

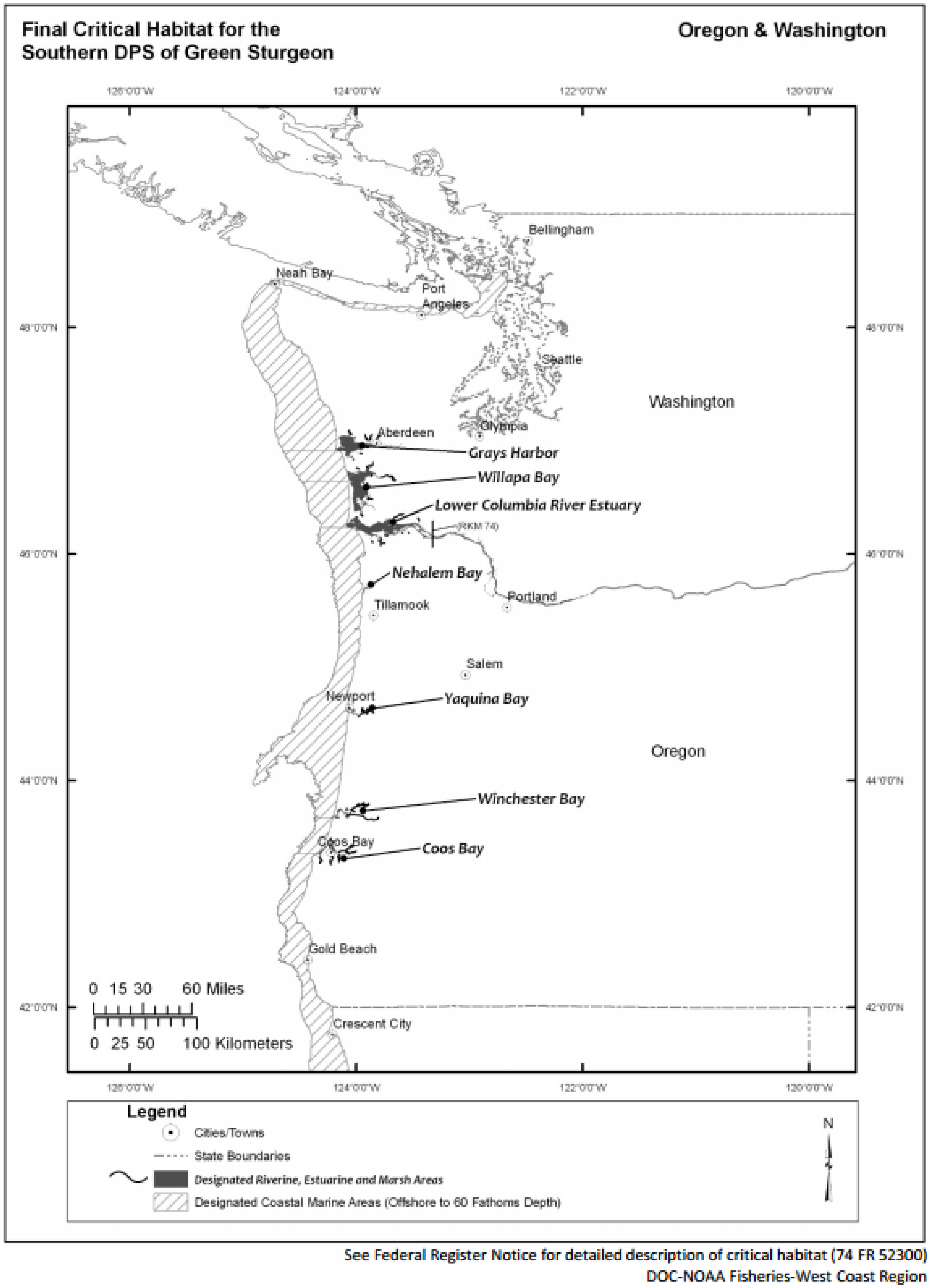
Distribution

Green sturgeon are distributed throughout the West Coast of North America (Colway and Stevenson 2007 (NMFS 2015e; Rosales-Casian and Almeda-Jauregui 2009), primarily north of Point Conception in California with seasonal (spring and winter) aggregation off Vancouver Island, British Columbia (NOAA Fisheries 2016p). The only known spawning river for the entire DPS occurs in the Sacramento River in California (Poytress et al. 2012), outside of the Action Area.

Major areas of non-spawning aggregations in the Action Area include Willapa Bay, Grays Harbor, and the Columbia River estuary (summer and fall), though these groups tend to be predominately composed of subadult sturgeon (WDFW and ODFW 2012, as cited in NMFS 2015e; Moser and Lindley 2007; Lindley et al. 2011; Lindley et al. 2008).

Critical Habitat

Critical habitat was designated for the southern DPS green sturgeon on October 9, 2009 (74 FR 52300). Freshwater habitat was designated in the mainstem of the Sacramento River downstream of the Keswick Dam, in the Feather River below Oroville Dam, in the Yuba River below Dagueere Point Dam, and in the Sacramento-San Joaquin Delta. Marine critical habitat was designated in areas shallower than 110 m (361 ft) between Monterey Bay in California to the US-Canada Border in Washington, including the following bays and estuaries: San Francisco, Humboldt, Coos, Winchester, Yaquina, and Newhalem Bays; Willapa and Grays Harbors; and the Lower Columbia River Estuary (up to river km 74 [river mile; RM 46]). These critical habitat areas, where they overlap with the NW area, are shown in Figure 3-17.



Source: Fisheries (2009)

Figure 3-17 Critical Habitat for Southern DPS Green Sturgeon in Oregon and Washington

The following PBFs were identified for freshwater and estuarine green sturgeon habitats:

- Abundant prey for all life stages;
- Suitable substrates for egg deposition and development (e.g., bedrock sills, shelves, cobble or gravel, or hard clean sand); free of excessive siltation; availability of in-sediment voids for evading predators;
- Suitable flow regime to maintain normal behavior, growth, and survival of all life stages;
- Suitable water quality (i.e., temperature, salinity, dissolved oxygen, and "other chemical characteristics") for normal behavior, growth, and viability of all life stages;
- Migratory corridors that allow for safe and timely passage;
- Adequately deep holding pools (≥5 m (16.4 ft); and
- Suitable sediment quality for normal behavior, growth, and viability of all life stages.

The following PBFs were identified for coastal nearshore marine habitats:

- Migratory corridors that allow for safe and timely passage;
- Suitable water quality; and
- Abundant prey items (e.g., benthic invertebrates and fishes).

Life History

Green sturgeon are one of two West Coast sturgeon species. They are distinguished from white sturgeon by their greenish color, sharper but fewer scutes, a relatively elongated head, and a conspicuous stripe of color down their ventral side. They have an iteroparous, anadromous life history, typically spawning every three to four years in deep freshwater pools with coarse substrates (NMFS 2015e). Sturgeon reach sexual maturity at approximately 15 years, and they can live for up to 70 years. Upon hatching, larval green sturgeon live on the bottom of rivers in coarse substrate, where they can avoid predators, absorb nutrients from their yolk sac, and grow into juveniles (NOAA Fisheries 2016q). Larvae then disperse downstream, spending one to four years in their natal stream before migrating into estuaries and marine waters. Green sturgeon spend the majority of their lives in the ocean, migrating long distances (NOAA Fisheries 2016q). They tend to be reside at depths between 20 and 60 m (66 and 197 ft) (Huff et al. 2011). However, sturgeon show strong stream fidelity when selecting a spawning river. Adults return in large numbers to Washington and Oregon estuaries during the summer and fall, and spawning migrations typically occur between April and June (NOAA Fisheries 2016q). During the winter and spring, green sturgeon tend to migrate further north, where they form aggregations off Vancouver Island in British Columbia (NOAA Fisheries 2016q).

Green sturgeon feed using an elongated mouth appendage that sucks food and sediment from the sediment surface (NOAA Fisheries 2016p). Burrowing shrimp species (e.g., *Neotrypaea* spp.) are an important dietary component for subadult and adult green sturgeons, but they also eat fish (e.g., lingcod), crab (e.g., *Cancer* spp.), amphipods (e.g., *Anisogammarus* spp.), clams (e.g., *Cryptomya californica*), and polychaetes (Dumbauld et al. 2008). Predators of green sturgeon are not clear, but they may include pinnipeds (e.g., Steller sea lion [*Eumetopias jubatus*]), sharks (NMFS 2015e), and humans (through poaching or bycatch) (Israel and May 2007).

Current Threats

The significant decline in green sturgeon that has occurred in the last century is primarily due to harvest pressure and the destruction of spawning habitat or migration corridors (NOAA Fisheries 2016r). Since listing, the loss of freshwater habitat has remained a threat to the recovery of green sturgeon. Alterations to natural hydrology resulting from dams, channelization, sedimentation, and water withdrawal (for irrigation) are key culprits for degraded green sturgeon habitat (NOAA Fisheries 2016r). Flow is an important factor for green sturgeon larval survival and to cue adult spawning migrations (NMFS 2015e). Also, given the large number of spawning green sturgeon returning to the Sacramento River, genetic diversity may be relatively low. The impacts of invasive species, climate change, pesticide applications (i.e., carbaryl and imidacloprid), and future development are concerns (NMFS 2015e), but more data on their effects on green sturgeon are needed.

3.2.1.2 Sea Turtles

Four species of sea turtles have been observed within the Action Area: leatherback (*Dermochelys coriacea*), green, loggerhead, and olive ridley (*Lepidochelys olivacea*) sea turtles. Of these, only leatherbacks are known to occur regularly in the Action Area as they are the only species capable of tolerating the cold water temperatures in the NW.

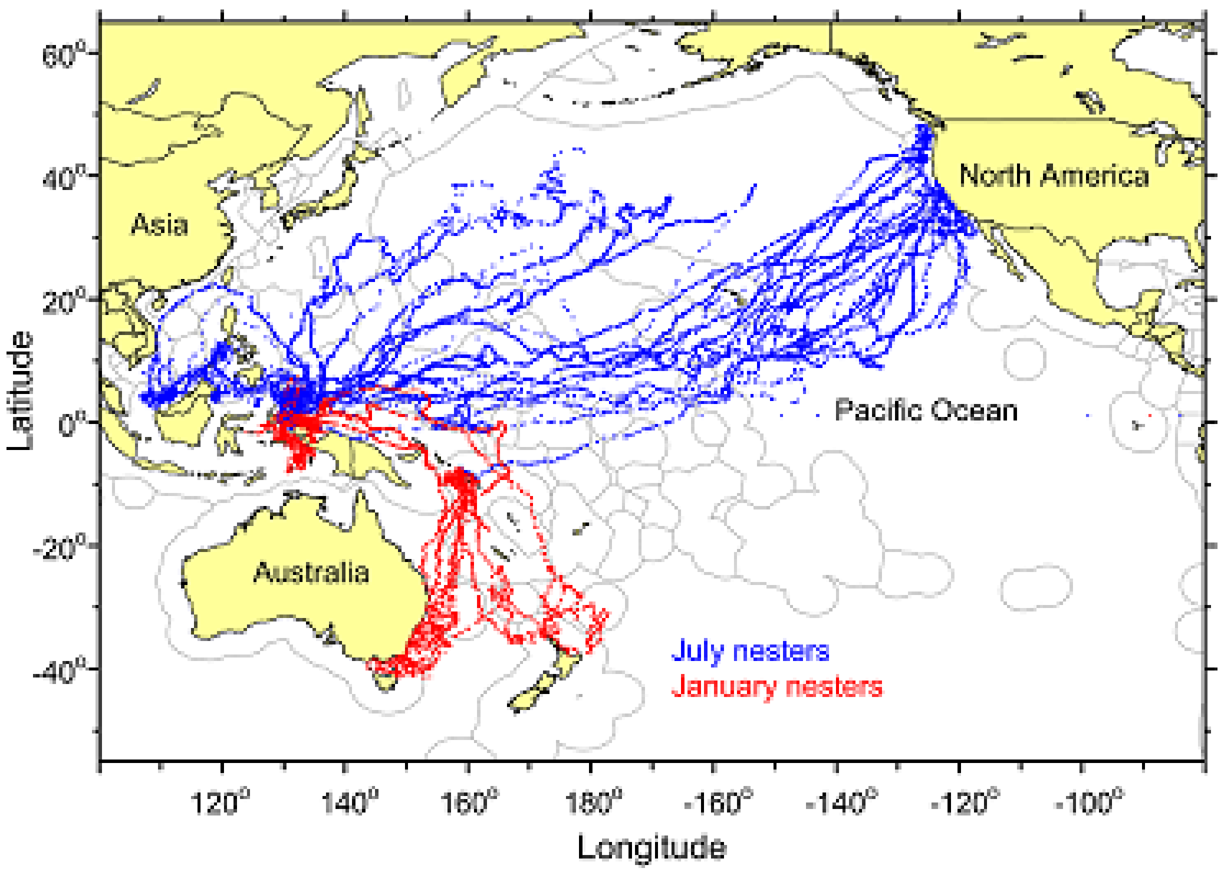
Leatherback Sea Turtle (*Dermochelys coriacea*)

Leatherback sea turtles are the largest living reptile in the world; on average, they weigh 900 kg (2,000 pounds) and are 2 m (6.5 ft) long (NOAA Fisheries 2013). The turtles are black with pinkish-white coloration on their ventral side and have been named “leatherbacks” because they lack the hard, bony shells featured by other sea turtles. Instead, they have a 4 cm (1.5 inch) thick carapace made of leathery, oil-saturated connective tissue covering dermal bones (NOAA Fisheries 2013). Leatherbacks are the most widely distributed species of sea turtles, occurring in all oceans and in a wider range of water temperatures than hard-shelled turtles (i.e., they are found in tropical waters as well as temperate waters of the NW and Alaska) (NOAA 2016b). Leatherback sea turtles are difficult to detect despite their large size because they tend to only extend their heads above the water; detecting this species from the air is somewhat easier.

Species Distribution

Pacific leatherback sea turtles are genetically and biologically unique from other populations around the world. They are split into two subpopulations, Western and Eastern Pacific leatherbacks, based on range distribution and biological and genetic characteristics. Western Pacific leatherbacks nest in the Indo-Pacific and migrate to a variety of feeding areas after nesting, including off the Pacific coast of North America. Pacific leatherback sea turtle nesting grounds are located in tropical latitudes in the eastern and western Pacific Ocean. The largest remaining nesting assemblages are found on the coasts of Northern South America, New Guinea and Papua New Guinea, West Africa Solomon Islands, Mexico, and Costa Rica. Eastern Pacific leatherbacks nest along the Pacific coast of the Americas in Mexico and Costa Rica, and they do not occur along the US West Coast.

Leatherback sea turtle migration routes are not fully understood. Recent telemetry work (Eckert 2006; James et al. 2005; James et al. 2007; Benson et al. 2011) indicates that leatherback sea turtles undertake transoceanic migrations between nesting and foraging grounds and that a leatherback sea turtle can swim more than 10,000 km (6,213 miles) in the course of one year (Eckert 2006; Eckert et al. 2006). A telemetry study observing 126 deployed leatherback sea turtles noted migrations as far north as Washington State and southern British Columbia (Benson et al. 2011). Foraging habitat was largely concentrated along the coast of California, and nesting occurred primarily in Southeast Asia, Solomon Islands, eastern Australia, Papua New Guinea, and New Zealand. Further, only leatherbacks nesting in July traveled across the Pacific to the West Coast to feed. January nesters foraged much closer to nesting areas in the Indo-Pacific. Figure 3-18 shows the results of telemetric leatherback monitoring in the Pacific Ocean.



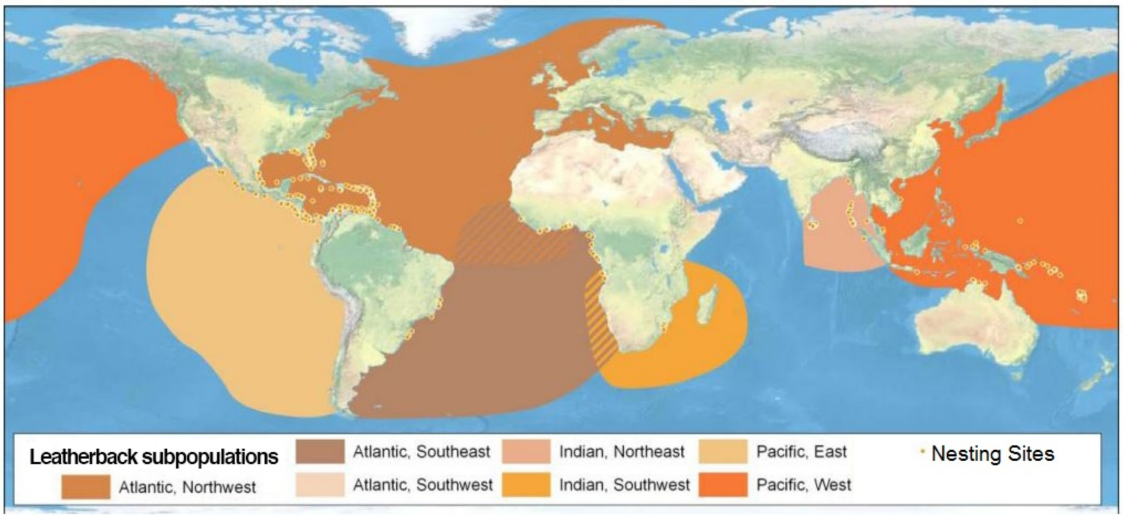
Source: (NOAA Fisheries 2016s)

Figure 3-18 Leatherback Turtle Movements Monitored by Telemetry

As noted above, only Western Pacific leatherbacks occur in the Action Area (Figure 3-19). Sea turtles do not occur in fresh water, so they will not be exposed to actions in fresh water (e.g., rivers). Sea turtles may be found in brackish waters, although these are not part of their usual range. Leatherback sea turtles have been observed in the coastal portion of the Action Area during summer and fall when prey are abundant and at highest densities at highly productive areas near the mouth of the Columbia River out to depths of 2,000 m (6,562 ft) and along the Heceta Bank in Oregon (Benson et al. 2011).

Critical Habitat

Critical habitat for the leatherback sea turtle along the US West Coast was designated in 2012 (Figure 3-20), including the waters from Cape Flattery, Washington to Cape Blanco, Oregon, east of the 2,000 m (6,562 ft) depth contour. The PBFs of leatherback critical habitat are the presence of prey species, primarily the jellyfish scyphomedusae of the order Semaeostomeae (i.e., *Chrysaora* spp., *Aurelia* spp., *Phacellophora* spp., and *Cyanea* spp.), of sufficient condition, distribution, diversity, abundance, and density to support the individual and population growth, reproduction, and development of leatherbacks (77 FR 4170).



Source: (NOAA Fisheries 2016s)

Figure 3-19 Global Distribution of Leatherback Sea Turtle Subpopulations

Life History

Although commonly considered pelagic animals, leatherback sea turtles forage in coastal waters on cnidarians and tunicates (77 FR 4171). Convergence zones and upwelling areas along continental margins and in archipelagic waters, where concentrations of prey occur, are exploited by leatherback sea turtles (NMFS and USFWS 2007b). Multiple telemetry and tagging studies have documented leatherback sea turtles traveling long distances to arrive in coastal waters coincident with seasonal peak aggregations of jellyfish (Benson et al. 2007; Bowlby 1994). As noted above, leatherback sea turtles occur off the coasts of Washington and Oregon in the summer and fall when oceanographic conditions concentrate prey in waters ≤2,000 m (6562 ft) deep. Leatherbacks are capable of deep dives; however, satellite-linked dive recorders placed on animals along the California coast indicate that they spend most of their time at depths of less than 100 m (328.1 ft) (NOAA Fisheries 2013), >75% of their time within the upper 5 m (16.5 ft), and about 50% of their time at or within 1 m (3.3 ft) of the surface (Benson, 2007).

Leatherback sea turtles do not nest in the Pacific Northwest. Females nest on sandy beaches in tropical and subtropical areas, selecting sloped beaches that minimize the crawl to dry sand. Preferred beaches are near deep water with relatively rough seas (USFWS 2001a).

Population Status

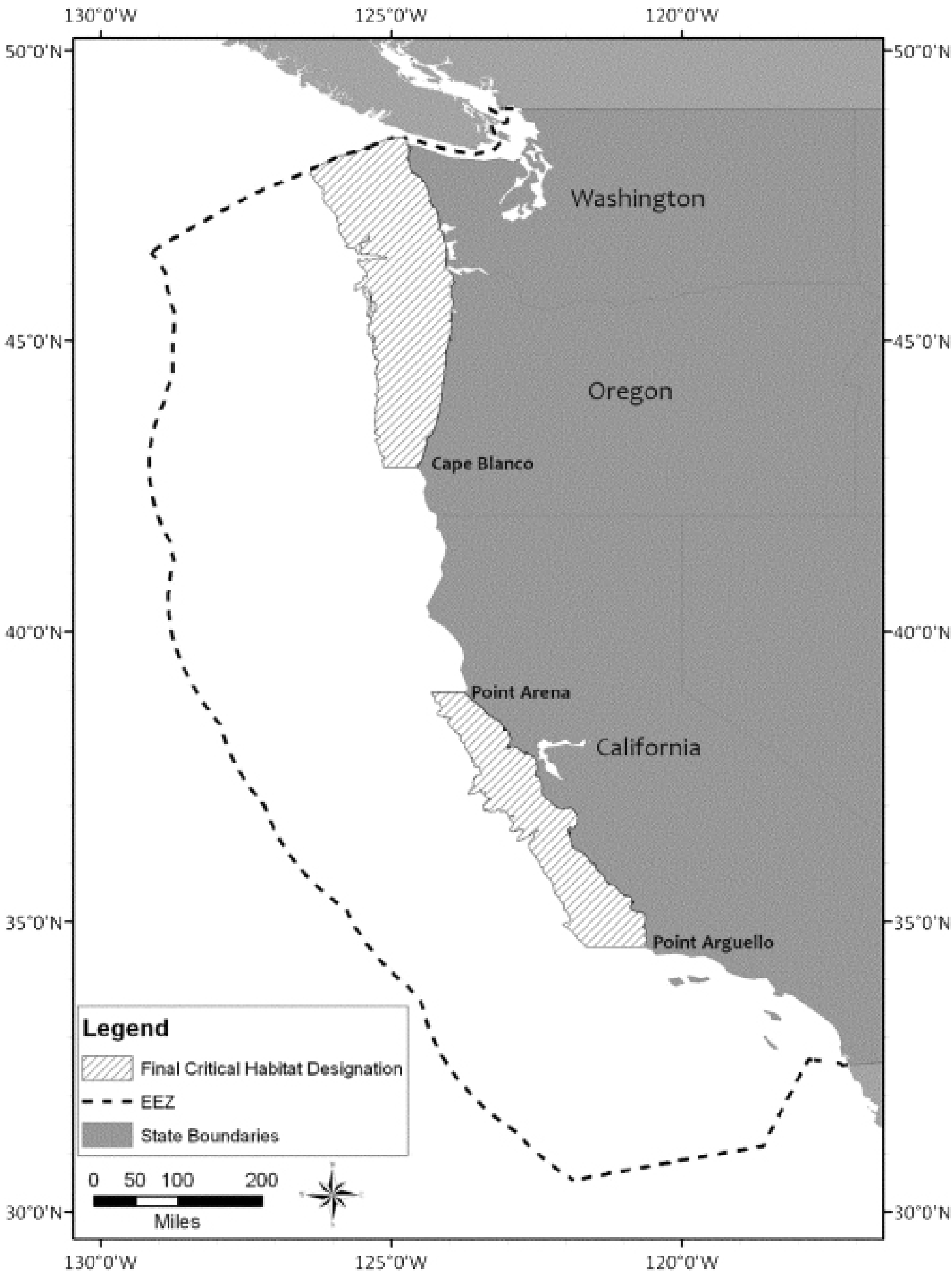
Western Pacific leatherbacks travel to a number of different areas to forage, including an average of fewer than 200 leatherback sea turtles that migrate along the US West Coast (Benson et al. 2011; Benson et al. 2007). Analyses of satellite-tracked leatherbacks indicate higher densities and numbers foraging along the coast of central California, though some foraging does occur along the coast of Oregon and Washington States. Leatherback sea turtles are the only species of sea turtle that tolerate the cold water temperatures in NW open marine water and nearshore habitats. Leatherbacks have also been tracked to Alaska and British Columbia.

Current Stressors and Threats

Pacific leatherback sea turtle populations have plummeted in recent decades. In the Atlantic, the total population is estimated to be as high as 96,000 (Turtle Expert Working Group 2007), and in some areas there are indications of increasing populations. However, the Western Pacific and Eastern Pacific leatherback sea turtle populations continue to decline. Western Pacific leatherbacks have declined more than 80% over the last three generations and Eastern Pacific leatherbacks have declined by more than 97% over the last three generations (Spotila et al. 2000). Of the Eastern Pacific leatherbacks, the Mexico nesting population—once considered to be the world's largest, with 65% of the worldwide population—is now less than 1% of its estimated size in 1980.

Leatherback turtles face threats both on nesting beaches and in the marine environment. Extensive egg harvest and bycatch in fishing gear are the primary causes of leatherback population decline, though egg harvest is unlikely to occur in the Action Area. Incidental capture in fishing gear occurs primarily in gillnets, but also in trawls, traps and pots, longlines, and dredges. Additionally, leatherbacks are threatened by the existence of marine debris such as plastic bags and balloons, which they often consume. Together, these threats are serious ongoing sources of mortality that adversely affect the species' recovery. It is estimated that only about one in a thousand leatherback hatchlings survive to adulthood.

Climate change has the potential to impact all sea turtles throughout their range, with the most significant impacts occurring in nesting areas outside the Action Area. Warming in nesting areas has the potential to skew turtle sex ratios (Kaska et al. 2006; Chan and Liew 1995), increase the rate of embryonic mortality (Matsuzawa et al. 2002), and increased typhoon frequency and severity (Webster et al. 2005) leading to coastal erosion and nest failure (Van Houtan and Bass 2007). Sea turtles along the US West Coast are in the Action Area to forage, and feeding there may be affected by climate change. Climate change could cause shifts in ocean productivity (Hayes et al. 2005), which may affect foraging behavior and reproductive capacity for sea turtles (Solow et al. 2002) similar to what has been observed during El Niño events in the Western Pacific (Chaloupka 2001).



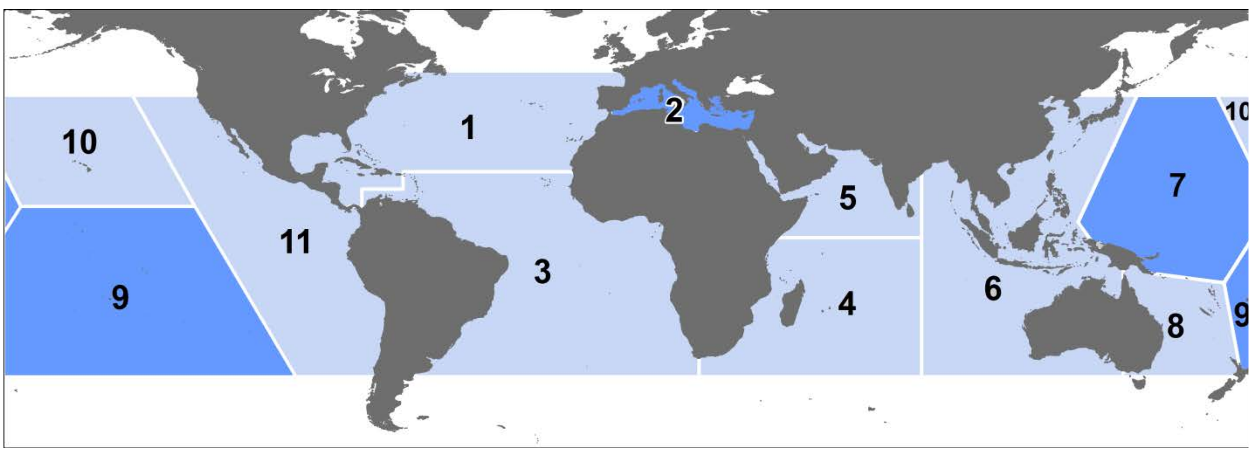
Source: 77 FR 4170

Figure 3-20 US West Coast Critical Habitat for the Leatherback Sea Turtle

Green Sea Turtle (*Chelonia mydas*), East Pacific DPS

On average, green sea turtles weigh 135 to 160 kg (300 to 350 pounds) and are 1 m (3 ft) in length (NOAA Fisheries 2013). They are similar in length to, but heavier than, the loggerhead sea turtle. Green sea turtles are the largest hard-shelled turtle. Despite its name, the green sea turtle's shell can be several colors (shades of black, grey, green, brown, and yellow are all on record), and undersides are pale (NOAA Fisheries 2013). These turtles are very difficult to detect because they only extend their heads above the water.

On April 6, 2016, the Services published a final rule to identify 11 DPSs of the green sea turtle across the species' global range (81 FR 20058) (Figure 3-21). The Eastern Pacific DPS is the one that occurs in the Action Area. Green sea turtles in the Eastern Pacific DPS were historically considered one of the most depleted populations of green sea turtles in the world. The NMFS and USFWS (2007a) provided population estimates and trend status for 46 green sea turtle nesting beaches around the world. Of these, 12 sites had increasing populations (based on an increase in the number of nests over 20 or more years ago), four sites had decreasing populations, and 10 sites were considered stable. For 20 sites, there are insufficient data to make a trend determination, or the most recent, available information is too old (i.e., 15 years or older). Seminoff et al. (2015) provides a review of the current information on green sea turtles.



Source: (81 FR 20058)

Note: Threatened (light blue) and endangered (dark blue) green turtle DPSs: 1. North Atlantic, 2. Mediterranean, 3. South Atlantic, 4. Southwest Indian, 5. North Indian, 6. East Indian-West Pacific, 7. Central West Pacific, 8. Southwest Pacific, 9. Central South Pacific, 10. Central North Pacific, and 11. East Pacific.

Figure 3-21 Map of Recognized Green Turtle Distinct Population Segment Boundaries

Distribution

Green sea turtles are found throughout the world, occurring primarily in tropical and, to a lesser extent, subtropical waters. The species occurs in five major regions: the Pacific Ocean, Atlantic Ocean, Indian Ocean, Caribbean Sea, and Mediterranean Sea. The eastern Pacific population includes turtles that nest on the coast of Mexico, which have been historically been listed under the ESA as endangered.

Molecular genetic techniques have helped researchers gain insight into the distribution and ecology of migrating and nesting green sea turtles. Throughout the Pacific, nesting assemblages group into two distinct regional areas—western Pacific and South Pacific islands—as well as eastern Pacific and central Pacific islands, including the rookery at French Frigate Shoals, Hawaii. In the eastern Pacific, green sea turtles forage coastally from southern California in the north to Mejillones, Chile, in the South. Green sea turtles foraging in southern California and along the Pacific coast of Baja California, Mexico, originate primarily from rookeries of the Islas Revillagigedos (Nichols 2003 and P. Dutton unpubl. data in Seminoff et al. 2015).

Like other hard-shelled sea turtles, green sea turtles are commonly found in warm water (temperature over 20 degrees Celsius [°C]; 68 degrees Fahrenheit [°F]) so their typical range does not include the Action Area, where water temperatures rarely exceed 15°C (59°F). During warm water periods (e.g., El Niño), the northern spread of warmer-than-usual water may bring green sea turtles into the Action Area. Stranding of green sea turtles has been reported in the waters off Washington and Oregon, although many of these are actually deaths due to "cold stunning," an inability to survive in typical cold waters in the area (Seminoff et al. 2015).

There are two known feeding areas for green sea turtles along the US West Coast, in San Diego Bay and in northern Orange County, both of which are in Southern California. There is no known nesting of green sea turtles along the US West Coast (Seminoff et al. 2015).

Critical Habitat

Critical habitat for the green sea turtle does not overlap with the Action Area. As noted above, the global population of green sea turtle were split into DPSs in 2016. As part of that process, NMFS is required to consider designation of critical habitat; however, no such changes to green sea turtle critical habitat have been made. Currently designated critical habitat for the green sea turtle was listed in 1998 (63 FR 46693), surrounding the island of Culebra, east of the main island of Puerto Rico.

Life History

Adult green sea turtles forage primarily on marine algae and seagrass, though some populations include invertebrates as a large component of their diet (Bjorndal 1997). Coastal foraging areas are dynamic, with conditions varying seasonally and annually (Carballo et al. 2002). Ocean habitats are used by juveniles and migrating adults, although little is known about how oceanography affects survival or migration. Warm, north-flowing currents may attract vagrant individuals from California and Mexico to the Action Area.

Current Stressors and Threats

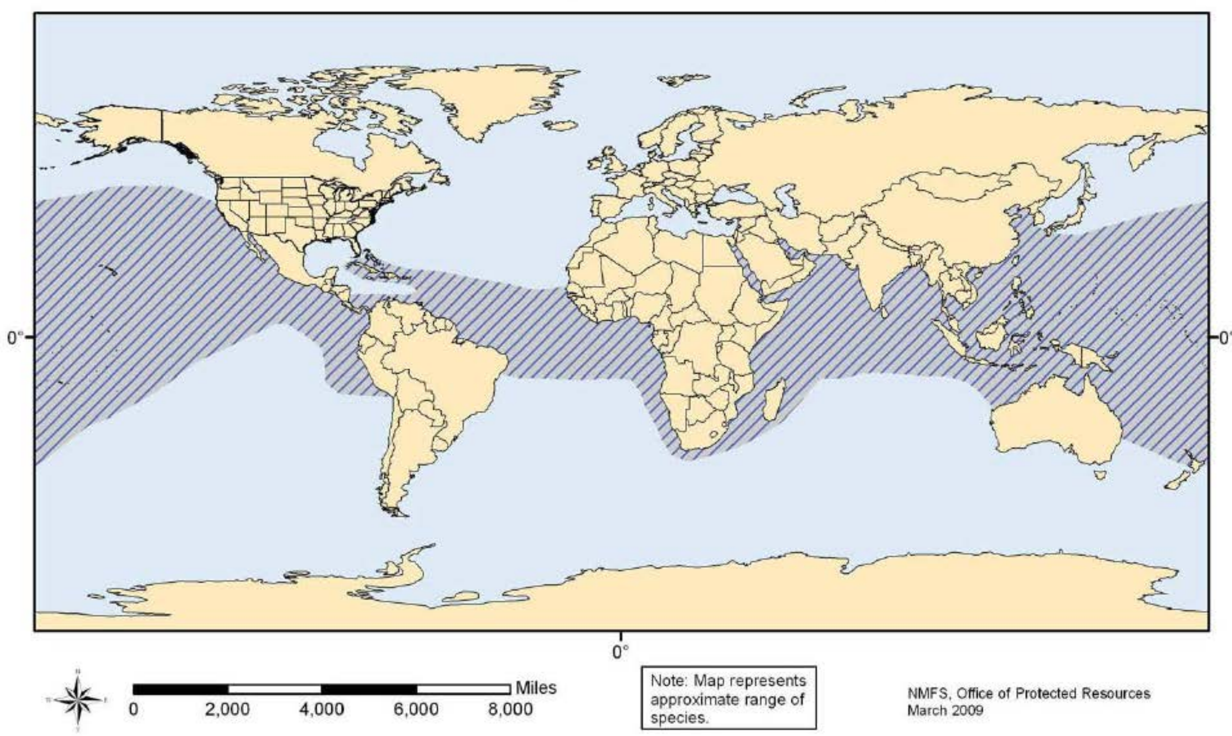
A thorough discussion of threats to green sea turtles worldwide can be found in the 2015 status review for the green sea turtle (Seminoff et al. 2015). Major threats include coastal development and loss of nesting and foraging habitat; incidental capture by fisheries; harvest of eggs, juveniles, and adults; and climate change. As noted above, green sea turtles do not generally venture into cold NW waters, so the majority of these impacts are expected to occur outside of the Action Area. Climate change has the potential to affect these species on a global scale and may actually expand their range farther north as a result.

Olive Ridley Turtle (*Lepidochelys olivacea*)

The olive ridley turtle is considered the most abundant sea turtle in the world, with an estimated 800,000 nesting females annually. Despite the large overall population of olive ridley turtle, the breeding populations on the Pacific coast of Mexico are listed as endangered; elsewhere, the species is listed as threatened. Olive ridleys are very difficult to detect because they only extend their head above the surface of the water.

Distribution

The olive ridley turtle has a circumtropical distribution in the Pacific Ocean (Figure 3-22). Although this species is not known to move between ocean basins, it does move between oceanic (>200 m [656 ft] depth) and neritic (coastal; <200 m) zones within a given region (Plotkin et al. 1995; Shanker et al. 2003). Olive ridley turtles in the eastern Pacific are generally found from Peru to northern California and have only been documented as far north as Alaska three times between 1960 and 2007 (Hodge and Wing 2000). No migration corridors between foraging and nesting habitats appear to exist. Rather, olive ridley turtles are nomadic migrants, foraging across large oceanic areas (Plotkin et al. 1994, 1995). Similar to other hard-shelled sea turtles, olive ridleys cannot tolerate the cold waters off the coasts of Oregon and Washington. There have been incidents of stranded olive ridleys in the NW, although they are often dead due to cold-stunning (NOAA Fisheries 2014b). Therefore, their presence in the Action Area is expected to be rare. Warm, north-flowing currents may attract vagrant olive ridley turtles to the Action Area, and this effect may be exacerbated by periodic or ongoing warming conditions.



Source: (NOAA Fisheries 2014b)

Figure 3-22 Olive Ridley Sea Turtle Range Map

Critical Habitat
Critical habitat has not been designated for the olive ridley sea turtle.

Life History
Olive ridley turtles reach sexual maturity around 15 years, a young age compared to some other sea turtle species. Females nest every year, once or twice a season, laying clutches of approximately 100 eggs. Incubation takes about two months.

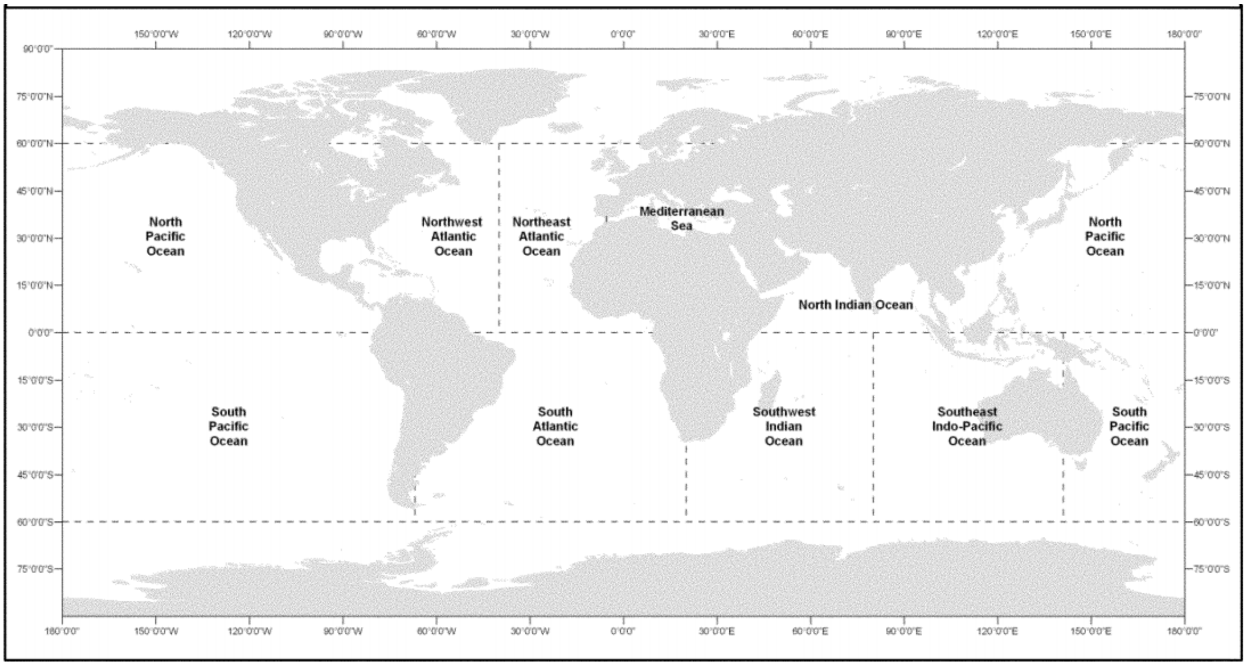
Olive ridley turtles in the eastern Pacific are believed to spend most of their non-breeding lives in the oceanic zone, moving to the neritic zone only during the breeding season (Plotkin et al. 1994, 1995). Both juvenile and adult olive ridley turtles forage on jellyfish, salps, and tunicates in ocean habitats (Kopitsky et al. 2005), as well as small crabs, mollusks, and fish.

Olive ridley turtles from the Eastern Pacific nesting beaches (Mexico and Central America) are the most likely to occur along the US West Coast.

Current Stressors and Threats
The greatest threats to olive ridley turtle populations are the continued harvest of both adults and eggs, incidental capture in fishing gear, and loss of habitat (NMFS and USFWS 2007c). Most of these impacts are assumed to occur outside of the Action Area because hard-shelled sea turtles do not tolerate the cold temperatures in the NW. The NMFS has implemented measures to reduce sea turtle interactions in fisheries by regulations and permits under the ESA and Magnuson-Stevens Fishery Conservation and Management Act. Since the early 1990s, the NMFS has implemented sea turtle conservation measures including, but not limited to, turtle excluder devices in trawl fisheries, large circle hooks in longline fisheries, seasonal and area-specific closures for gillnetting, and modifications to pound net leaders.

Loggerhead Sea Turtle (*Caretta caretta*), North Pacific DPS
Loggerhead sea turtles are hard-shelled, weigh an average of 113 kg (250 pounds), and measure about 1 m (3 ft) in length as adults (NOAA Fisheries 2013). They have a red-brown shell and pale green or tan skin. Their common name comes from their relatively large heads, which support powerful jaws for crushing sturdy prey species (NOAA Fisheries 2013).

In 2011, the USFWS and NMFS determined that the previous global listing of loggerheads would be divided into nine DPSs (76 FR 58868 2011). The North Pacific Ocean DPS, whose range overlaps with the Action Area (Figure 3-23), is listed as endangered.



Source: (76 FR 58868 2011)

Figure 3-23 Map of Recognized Loggerhead Sea Turtle DPS Boundaries

Complete population data do not exist for the North Pacific Ocean DPS of loggerhead sea turtles; available data consist of counts of nests and nesting females at nesting beaches. Kamezaki et al. (2003) reviewed available data from Japanese nesting beaches and concluded that there had been a 50% to 90% decrease in the size of the North Pacific Ocean DPS loggerhead nesting population since the 1950s. The most recent population estimate is 6,673 adult females (Van Houtan 2011).

Distribution

The North Pacific DPS of loggerhead turtles ranges from the equator to 60 degrees north (76 FR 58868 2011). Although loggerheads can be found throughout tropical and temperate Pacific waters, nesting areas in the North Pacific are limited to Japan (Hatase et al. 2002; Kamezaki et al. 2003) and potentially to areas surrounding the South China Sea (Chan et al. 2007; Kamezaki et al. 2003, cited in 76 FR 58868). Important juvenile foraging areas are the Kuroshio Extension Bifurcation Region, Japan (Polovina et al. 2006) and off the Baja California Sur Coast, Mexico (Seminoff et al. 2014).

Loggerhead sea turtles do not nest along the US West Coast, and there are no known loggerhead turtle foraging areas in the US EEZ (79 FR 39856). Occasional sightings have been reported in Washington and Oregon waters. It is possible that warm, north-flowing currents attract vagrant loggerhead sea turtles to the Action Area, where they become stranded. Similar to other hard-shelled sea turtles, loggerhead sea turtles cannot tolerate the cold water temperatures typical of NW open marine water and nearshore habitats, and their presence in the Action Area is rare (Seminoff et al. 2014).

Critical Habitat

Critical habitat for the loggerhead sea turtle was designated in 2014 (79 FR 39856) but does not overlap with the Action Area. Loggerhead sea turtle critical habitat was designated in 38 occupied areas within the range of the Northwest Atlantic Ocean DPS along the US East Coast and the Gulf of Mexico. Critical habitat for the East Pacific DPS was considered during the critical habitat review process but determined to not be warranted along the US West Coast.

Life History

Loggerhead sea turtles occupy three different ecosystems during their lives, beaches, open water, and nearshore coastal areas. Loggerheads nest on ocean beaches, generally preferring high energy, steeply sloped, coarse-grained beaches backed by low dunes (Miller et al. 2003; cited in Conant et al. 2009). Mitochondrial DNA data indicate strong female natal homing, with nesting populations independent of demographic units (Bowen and Karl 2007). Eggs require high-humidity sand with temperatures conducive to development (e.g., not excessively warm) (Miller 1997; Miller et al. 2003; both cited in Conant et al. 2009). Post-hatchling loggerheads are found in areas of local downwellings, where accumulations of floating material are commonly available for foraging (Witherington 2002) or where there are eddies and meanders that concentrate prey. Juvenile loggerheads have also been found in the transition zone chlorophyll front, where surface prey is concentrated (Polovina et al. 2001; Kobayashi et al. 2008). Juvenile loggerheads appear to enter the oceanic zone and follow predominant currents for several years before returning to the neritic zone (McClellan and Read 2007; Bolten 2003). The species is primarily carnivorous and consumes a wide variety of prey items (Bjorndal 1997).

Current Stressors and Threats

The greatest threats to loggerhead sea turtle populations are incidental capture in fishing gear (i.e., bycatch) and loss of habitat from coastal development and the coastal armoring on Japanese nesting beaches (Conant et al. 2009). A variety of fishing gear results in incidental capture (primarily longlines and gill nets, but also trawls, traps and pots, and dredges). Threats to loggerhead sea turtles from loss of nesting habitat will likely be compounded by the anticipated sea level rise associated with climate change. Climate change may also have other impacts on hard-shell sea turtles, particularly in nesting habitats outside of the Action Area (e.g., altered sex ratio, increased embryonic mortality, and intensified tropical storms leading to nest failure).

3.2.1.3 Marine Mammals

Blue Whale (*Balaenoptera musculus*)

The blue whale, a mysticete (baleen) whale, is the largest mammal ever known to have inhabited Earth. The largest blue whale on record was seen off the coast of Japan in 1959 and measured 27.1 m (89 ft) in total length (J. Gilpatrick, pers. comm., cited in Reeves et al. 1998). Blue whales in the northern hemisphere tend to be smaller than those in the southern hemisphere, and females are generally larger than males (Reeves et al. 1998). Blue whales are most often observed in pairs but will also travel alone or in small groups (MarineBio 2012a). Observations of diurnal diving behavior in blue whales indicates that they engage in deeper dives during the daytime and shallower dives at night. Blue whales are easy to detect from the air due to their large size, though they tend to exhibit little surface activity (e.g., showing fluke before dives) and feed at depth.

The blue whale was originally listed as endangered in 1970 under the Endangered Species Preservation Act (35 FR 18319 1970), the precursor to the ESA. Because the blue whale is an endangered species under the ESA, it is, by default, also considered to be depleted by the Marine Mammal Protection Act. A recovery plan was released in 1998 (Reeves et al. 1998).

Blue whale abundance appears to have increased in most regions over the past several decades, although it is unclear if numbers have returned to pre-whaling levels. There is evidence of an increase of just under 3% annually from the US West Coast through Baja California, Mexico, based on mark recapture methods (Calambokidis et al. 2009). However, there is evidence of shifts in the distribution of blue whales along the West Coast, which may bias the mark-recapture estimates (Carretta et al. 2016). A population dynamics model estimated that the eastern North Pacific population is at 97% of carrying capacity as of 2013 (Monnahan et al. 2015). The minimum population estimate for the US West Coast population of blue whales is 1,551 individuals (Carretta et al. 2016).

Distribution

Blue whales are found worldwide, from sub-polar to sub-tropical latitudes. Poleward movements in spring allow the whales to take advantage of high zooplankton production in summer. Although blue whales are found in coastal waters, they are thought to occur generally more offshore than other whales. Blue whales accompanied by young calves have been observed often in the Gulf of California from December through March, and, thus, at least some calves may be born in or near the Gulf of California (Calambokidis et al. 1990); this area is probably an important calving and nursing area for the species.

Blue whales occur along the US West Coast year round. They spend late spring through fall feeding in highly productive areas along the California coast ranging from San Diego to Fort Bragg, and nine biologically important areas for foraging have been identified (Calambokidis et al. 2015). In the fall, most blue whales travel south to the eastern tropical Pacific and the Costa Rica Dome (Bailey et al. 2009). However, some blue whales move north out of California feeding areas into northern waters of the NW, British Columbia, and Alaska (Calambokidis et al. 2009). There is evidence from satellite-tagged blue whales of feeding off the Washington coast in winter (Bailey et al. 2010; Irvine et al. 2014). There are also sightings of blue whales along the Washington coast in December and January, although survey effort is very limited in the winter (Calambokidis et al. 2015). In addition, blue whales have been sighted in nearshore waters off of Oregon during aerial and boat-based surveys in the summer and fall (Carretta et al. 2016).

Critical Habitat

Critical habitat has not been designated for blue whales.

Life History

Blue whales are found in a variety of marine environments. They inhabit and feed in open water, both offshore coastal regions and open ocean areas, and are frequently found on the continental shelf (Calambokidis et al. 1990; Fiedler et al. 1998; both cited in Reeves et al. 1998) and far offshore in deep water (Wade and Friedrichsen 1979; cited in Reeves et al. 1998). The primary prey of North Pacific blue whales is krill (small euphausiid crustaceans, specifically *Euphausia pacifica*, several *Thysanoëssa* species, and *Nematoscelis megalops)* (Rice 1986; cited in Reeves et al. 1998). The stomach contents of some whales have been found to contain a mixture of euphausiids and copepods or amphipods (Nemoto 1957; Nemoto and Kawamura 1977; both cited in Reeves et al. 1998), but the copepods and amphipods could have been ingested incidentally (Reeves et al. 1998). Blue whales are frequently found along the edges of continental shelves and in upwelling regions, where phytoplankton and krill concentrations are more concentrated (Bailey et al. 2009; Reilly and Thayer 1990; Schoenherr 1991; all cited in US Navy 2011).

Current Stressors and Threats
The greatest threats to the blue whale population are vessel strikes, fishing gear entanglements, habitat degradation resulting in reduced zooplankton availability, and noise disturbance (NMFS 2011d; Reeves et al. 1998; McKenna et al. 2015). Additionally, effects of climate change may significantly impact blue whales. The waters around California have been the site of a fair number of ship strikes to blue whales, including three documented incidents between 2010 and 2014 (McKenna et al. 2015). Lesser threats to the blue whale population are disease or parasites, predation, and contaminants. Blue whales can be infected with the *Crassicauda boopis* nematode, which is suspected of causing renal failure in fin whales and ultimately death (Baylis, 1928, cited in NMFS 2011d; Lambertsen 1992).

Fin Whale (*Balaenoptera physalus*)
Fin whales are the world's second largest whale species by length (NMFS 2010a). This mysticete (i.e., baleen whale) practices lunge-feeding, during which the whale engulfs large amounts of water and prey and then filters it through baleen plates (Goldbogen et al. 2006). During feeding, the fin whale's pleated throat and chest expand to hold food and seawater, giving it a tadpole-like appearance (NMFS 2010a, b). The similarity in appearance of the fin whale to the Bryde's whale (*Balaenoptera edeni/brydei*) and sei whale (*Balaenoptera borealis*) contributes to the confusion in determining the distribution of the species (NMFS 2010a). These whales are found individually, in small groups of two to seven, or in some instances, in larger pods that include as many as 20 individuals. Fin whales have interbred with blue whales in the North Atlantic and North Pacific (Bérubé and Aguilar 1998; Doroshenko 1970; both cited in NMFS 2010a). Their size makes them easy to detect when at the surface; however, they are typically not very active when at the surface, apart from exposing their flukes when diving.

The most recent population estimate of fin whales along the US West Coast is a minimum population estimate of 2,598 individuals (Carretta et al. 2016). The population is estimated to have increased by an estimated 51% between 1996 and 2008.

Distribution
Fin whales are found in deep, offshore waters and in nearshore waters of all major oceans, primarily in temperate to polar latitudes, and less commonly in the tropics. They occur year-round in a wide range of latitudes and longitudes, but the density of individuals in any one area changes seasonally.

Fin whale migratory patterns are not well understood; many move seasonally into and out of high-latitude feeding areas, but the overall migration pattern is complex. There is evidence of year-round occurrence of fin whales in some areas, including southern California with whales making only short range migrations within a given region (Schorr et al. 2010). Evidence from satellite-tagged fin whales does indicate long-range migration seasonally following euphausiid food resources: high latitudes in the summer and low latitudes in the winter (Mizroch et al. 2009). Most populations probably migrate thousands of kilometers a year (NMFS 2010a).

Fin whales have been satellite-tagged and tracked along the California and Washington coasts and are regularly seen as part of annual marine mammal surveys. These studies indicate that the greatest density of fin whales is near the continental shelf and slope (Schorr et al. 2010), and based on the available information, Guide and Grays Canyons (off Washington) are considered important feeding areas for fin whales (Calambokidis et al. 2015).

Critical Habitat
Critical habitat has not been designated for the fin whale.

Life History
Fin whales are drawn to areas where prey gather such as mixing zones between coastal and oceanic waters (roughly the 200 m [656 ft] isobath) Summer habitat is variable, ranging from waters immediately offshore (Rice 1974; cited in NMFS 2010a) to continental shelves or slopes in the ocean (Gregr and Trites 2001; Reeves et al. 2002; both cited in US Navy 2011). The main prey of the fin whale are euphausiids (i.e., *Euphausia pacifica* and *Thysanöessa* species); large copepods (*Calanus cristatus*); and schooling fish, such as herring, Pollock (*Pollachius* spp.), and capelin (*Mallotus villosus*) (Nemoto 1970; Kawamura 1982; both cited in NMFS 2010a). Fin whale distribution is largely related to seasonal and annual variations in prey availability (Ingebrigtsen 1929; Jonsgård 1966a, b; all cited in NMFS 2010a).

Diving is a key aspect of whale behavior that highlights the importance of the deep ocean environment for fin whales. Various studies on fin whale populations around the world (US Navy 2011; Croll et al. 2001; Goldbogen et al. 2006; Panigada et al. 2003) have reported a broad range of diving depths and durations, from depths of less than 50 m (164 ft) to a maximum of 600 m (1,969 ft) and durations of 4 minutes to nearly 17 minutes, with typical durations ranging between 4 and 7 minutes. Based on research conducted by Goldbogen et al. (2006), fin whales spend approximately 44% of their time at depths of less than 50 m, 23% of their time at depths of 50 to 225 m (738 ft), and 33% of their time at depths greater than 225 m.

Current Stressors and Threats
According to NMFS (2010a), the greatest potential threats to the fin whale population are ship strikes, loss of prey as a result of climate and ecosystem change, and harvest. Ship strikes are a threat to many whale species, and any increase in the level of vessel traffic in whale habitats increases their risk of injury and mortality (NMFS 2010a). Overfishing and global climate change are both factors in the reduction of the fin whale's prey (e.g., schooling fish) (NMFS 2010a), which affects population recovery. The commercial hunting of fin whales from 1947 to 1987 resulted in a harvest of 46,000 whales in the North Pacific (Barlow et al. 1997; cited in NMFS 2010a), and several countries continue to harvest fin whales (International Whaling Commission 2006; Nishiwaki et al. 2006; both cited in NMFS 2011d).

Less severe threats to the fin whale population include anthropogenic noise, contaminants and pollutants, fishery interactions, and disease.

Humpback Whale (*Megaptera novaeangliae*), Mexico DPS and Central America DPS

The humpback whale is a large mysticete, reaching lengths of 18 m (60 ft) at maturity (Winn and Reichley 1985; cited in NMFS 1991). In the North Pacific, humpback whales feed in coastal waters from California to Alaska and west to Russia.

In 2016, the NMFS finalized a rule recognizing 14 DPSs of humpback whales, listing some DPSs as endangered and some as threatened (81 FR 62259). Two DPSs, the threatened Mexico DPS and the endangered Central America DPS, occur in the Action Area. The majority of humpback whales that feed off the coast of Oregon and Washington are from the Mexico DPS (81 FR 62259), whereas only a few individuals from the Central America DPS have been observed in feeding areas in Washington State. Individuals from the Central American DPS tend to feed in areas farther south, offshore of Oregon and California (81 FR 62259).

Humpback whales, like many marine mammals, use acoustic signals to communicate, navigate, locate prey, and sense their environment (NMFS 1991; US Navy 2008, 2011; NMFS 2011c). Humpback whales are known to form small groups that occasionally aggregate for long periods of time in areas of concentrated food (NMFS 2011c). Worldwide, there are thought to be about 13 stocks that winter in sub-tropical waters in lower latitudes (NMFS 1991). Observations of humpback whales indicate that they have diurnal dive patterns, with deeper dives occurring during the daytime and shallower dives occurring at night. Humpbacks are generally easy to detect due to their level of surface activity (e.g., feeding with head above water, breaching, fin slapping).

The current population of humpback whales in the North Pacific is approximately 22,000 individuals, of which approximately 1,900 are part of the Washington/Oregon/California stock (Carretta et al. 2016)). Average abundance estimates for subpopulations of the North Pacific DPS ranges from approximately 200 individuals for southern British Columbia/northern Washington and 1,700 for California/Oregon.

Distribution

Humpback whales occur in all major oceans of the world, but those in the northern hemisphere spend the summer between 40° and 75° latitude, where food productivity is greater than in southern latitudes (Nemoto 1957; Tomilin 1967; Johnson and Wolman 1984; all cited in NMFS 1991). Humpback whales are present in waters over continental shelves and along their edges, and around oceanic islands (Balcomb and Nichols 1978; Whitehead 1987; both cited in NMFS 1991).

The California/Oregon/Washington stock winters in coastal waters of Mexico and Central America and migrates to feeding areas from California to southern British Columbia in summer and fall (Carretta et al. 2013). Humpback whale densities tend to be greatest in foraging areas and less so during migration. Feeding grounds tend to be shallow banks or ledges with high sea floor relief (Payne et al. 1990; Hamazaki 2002; cited in US Navy 2011). The majority of humpback whale feeding occurs during the summer in northern latitudes (NMFS 1991). Their summer habitats tend to be closer to shore and include major coastal embayments and channels (Brueggeman et al. 1987, 1988; cited in NMFS 1991). The winter distribution also reflects areas of greater prey abundance, which are related to oceanographic factors such as upwelling, converging currents, and other factors characteristic of fjords, channels, continental shelves and their edges, and offshore banks (NMFS 1991).

In recent years, humpback whales have been sighted with increasing frequency in the inside waters of Washington, including Puget Sound, primarily during the fall and spring. Important feeding areas in the NW include the mouth of the Strait of Juan de Fuca and Heceta Bank in Oregon (Calambokidis et al. 2015). Because humpback whale populations along the US West Coast are generally increasing, their distribution has expanded into the Strait of Juan de Fuca and Salish Sea (Cascadia Research 2017).

Critical Habitat
Critical habitat has not been designated for the humpback whale.

Life History
Humpback whales follow their prey and are known to have the most diverse feeding behaviors of all the baleen whales, which include bubble netting, herding prey by maneuvering, using the water surface as a barrier, feeding in formation, synchronized feeding lunges, and short- and long-term cooperation between individuals (Ingebrigtsen 1929; Jurasz and Jurasz 1979; Watkins and Schevill 1979; Hain et al. 1982; Weinrich 1983; Baker and Herman 1985; Baker 1985; Hays et al. 1985; Winn and Reichley 1985; D'Vincent et al. 1985; all cited in NMFS 1991).

Major prey species for humpback whales include small schooling fish and large zooplankton, primarily krill (Nemoto 1957, 1959, 1970; Klumov 1963; Krieger and Wing 1984, 1986; Tomilin 1967; all cited in NMFS 1991). Fish prey species consist of Pacific herring (*Clupea pallasii*), juvenile walleye (*Sander vitreus*), pollock, capelin, and sand lance (Bryant et al. 1981; Baker et al. 1985; Krieger and Wing 1984, 1986; Perry et al. 1985; Dolphin 1987; all cited in NMFS 1991; NMFS 2006a).

Diving is a key aspect of whale behavior and highlights the importance of the deep oceanic environment for humpback whales. North Pacific humpback whale dive times are typically less than 5 minutes but occasionally last up to 10 minutes (US Navy 2011). Most of their prey base is located within 300 m (984 ft) of the surface, and humpback whales spend most of their dive time between 92 and 120 m (302 and 394 ft) deep (NMFS 2011c), although they are known to dive as deep as 500 m (1,640 ft) (US Navy 2011).

Current Stressors and Threats
As reported by NMFS (1991), major threats to the humpback whale population include entanglement in fishing gear, ship strikes, and noise disturbance. Changes in oceanic conditions (e.g., food web) related to climate change will also affect the humpback whale. Entanglement in fishing gear is the most frequent human-related cause of injury and death among humpback whales (NMFS 1991). Netting can be easily broken by a swimming humpback, but lead and anchor ropes are stronger and can cause serious injury. Entanglements in the Action Area are somewhat frequent. From 2010 to 2014, there were 27 incidents along the US West Coast involving humpback whales and pot/trap fisheries and eight incidents involving gillnet (or other) fisheries, resulting in an annual average (for that time period) of about five whale deaths per year (Carretta et al. 2016).

Ship strikes are an increasing threat to humpback whales, as well as to many other whale species (NMFS 1991). Humpback feeding grounds are located within major shipping lanes off the US

West Coast. Calves and juveniles are more vulnerable to ship strikes because they are smaller, more difficult to see, and spend more time at the surface (Herman et al. 1980; Mobley et al., 1999, cited in US Navy 2011). Noise disturbance from ships, aircraft, coastal development, industrial activities, and research can affect humpback whale behaviors such as resting, feeding, nursing, mating, calving, and migrating (NMFS 1991). Humpback whales generally avoid busy or noisy areas, but some will approach or circle boats, especially fishing and whale-watching boats (NMFS 1991).

North Pacific Right Whale (*Eubalaena japonica*)

The North Pacific right whale is a large, slow-swimming mysticete that shares its genus with two other right whale species, the North Atlantic and Southern Hemisphere right whales (*E. glacialis* and *E. australis*, respectively). These three subspecies are genetically distinct populations. The right whale's body is dark grey and rotund. North Pacific right whales, like many marine mammals, use acoustic signals to communicate, navigate, locate prey, and sense their environment (NMFS 2006b; US Navy 2011; Richardson et al. 1995). They most often travel in small groups, ranging from about 3 to 13 individuals, but they also congregate in coastal areas (Allen and Angliss 2011). They exhibit almost no surface behaviors, making them difficult to detect.

North Pacific right whales are considered the rarest of all large whale species and among the rarest of all marine mammal species. The most recent minimum population estimate of abundance is 25.7 individuals (Muto et al. 2016). They were listed as endangered under the precursor to the ESA in 1970 (35 FR 18319 1970) as the "northern right whale," and the endangered listing continued under the ESA beginning in 1973. The northern right whale was listed as two separate endangered species by the NMFS in 2006 (71 FR 38277 2006): the North Pacific right whale and the North Atlantic right whale. As these were considered new listings, the NMFS designated critical habitat (73 FR 19000 2008) for the species, as required by the ESA.

Distribution

Migratory patterns of the North Pacific right whale are unknown, although it is thought that the whales spend the summer at high-latitude feeding areas and migrate to more temperate waters during the winter. They may occur in the Action Area, but rarely, and their habitat associations in the NW are not clearly defined. North Pacific right whales are rarely encountered on the US West Coast. There have been two sightings in British Columbia waters: one off Haida Gwaii in June 2013 and another in the Strait of Juan de Fuca in October 2013 (Muto et al. 2016). Also, two right whale calls were detected on a bottom-mount hydrophone off the Washington coast (Carretta et al. 2016).

The eastern population of North Pacific right whales used major feeding areas that covered virtually the entire Gulf of Alaska waters adjacent to the Aleutian Islands, and much of the Bering Sea south of 60°N (Shelden et al. 2005; Scarff 1986; Clapham et al. 2004). However, recent work by Josephson et al. (2008; cited in Allen and Angliss 2011) indicates that the species actually has been infrequently encountered in the central northern Pacific Ocean, indicating two distinct stocks, east and west. North Pacific right whales have been observed since 1969 in the summer ranging from the sub-Arctic Bering Sea and Sea of Okhotsk in the north to Hawaii and Baja California in the south (Allen and Angliss 2011). Sightings that occurred as far south as Hawaii and Mexico are probably at or beyond the typical range of North Pacific right whale (Brownell et al. 2001). These whales are drawn to areas where prey populations congregate and seem to prefer the middle to outer portion of the continental shelf in water depths between 50 and 80 m (164 and 262 ft), but they are also known to be present in deeper waters ranging from 250 to 1,700 m (820 to 5,577 ft) (Allen and Angliss 2011). Right whales are typically found individually or traveling in small, slow-moving groups. No calving grounds have been identified for the North Pacific right whale (Scarff 1986).

Critical Habitat

Critical habitat was designated for the eastern North Pacific right whale in 2008 (73 FR 19000 2008) within the Gulf of Alaska and Bering Sea. Designated critical habitat for the North Pacific right whale is not evaluated in this BA because it does not overlap with the Action Area.

Life History

As reviewed by Shelden et al. (2005), habitat selection is often associated with features influencing the abundance and availability of zooplankton and copepod prey. North Pacific right whales likely require dense prey aggregations for efficient foraging, similar to those recorded for North Atlantic right whales (Baumgartner and Mate 2003; as cited in Clapham et al. 2006). Thus, North Pacific right whales require habitats where the physical and biological oceanography combine to promote high productivity and aggregation of copepods into patches of sufficient density (Clapham et al. 2006).

Diving is a key aspect of whale behavior that highlights the importance of the deep oceanic environment and the surface environment for North Pacific right whales. Information describing right whale diving behavior is limited. North Atlantic right whales are known to dive for 5 to 15 or more minutes; the average depth of a dive is strongly related to the depth of copepod prey abundance, or roughly between 80 and 175 m (US Navy 2011).

The North Pacific right whale's habitat requirements for breeding and calving are unidentified, as the past and present locations are completely unknown.

Current Stressors and Threats

As reviewed by the NMFS (2006b), current stressors and threats to North Pacific right whales include the potential for habitat degradation, disease, vessel collisions, and entanglement in fishing gear. As the North Pacific right whale population is very small and relatively unstudied due to rarity, many of the threats to other baleen whales are assumed to similarly affect right whales.

Sei Whale (*Balaenoptera borealis*)

The sei whale is a subpolar mysticete that is difficult to distinguish from its close relatives, Bryde's whale, Omura's whale (*B. omurai*), and the fin whale (NMFS 2011e). Two subspecies of sei whale have been identified but not yet confirmed by empirical evidence: the northern sei whale, *B. borealis*; and the southern sei whale, *B. borealis schlegelli* (Rice 1998; cited in NMFS 2011e).

Sei whales range in size from 12.2 to 18.3 m (40 to 60 ft) in length and weigh up to 45,359 kg (100,000 pounds). The very fine bristles of the sei whale's baleen plate have been cited as the most reliable feature that distinguishes it from other *Balaenoptera* species (Mead 1977; cited in NMFS

2011e).They are typically observed in groups of two to five individuals but have been known to gather in groups of thousands during migration or if food is abundant (MarineBio 2012b).

Sei whales were originally listed as endangered under the Endangered Species Protection Act (35 FR 18319 1970) in 1970. Currently, the best estimate of the California/Oregon/Washington stock of sei whales is 519 individuals (Carretta et al. 2016).

Distribution

Sei whales are distributed globally between 60°N and 60°S and are found in the North Atlantic and North Pacific Oceans, as well as in the southern hemisphere (NMFS 2011e). Although sei whales are circumpolar, they prefer subtropical to subpolar waters on the continental shelf edge and slope. Sei whales are known to migrate towards the poles during the summer for feeding opportunities and then winter in warmer temperate or subtropical waters (Horwood 1987; Jefferson et al. 2008; both cited in NMFS 2011e). They are highly mobile, and, despite a lack of definitive information on residency, there is no indication that any population remains in a particular area throughout the year (NMFS 2011e). North Pacific sei whales are found throughout temperate waters north of 40°N.

Critical Habitat

Critical habitat has not been designated for the sei whale.

Life History

Studies in both the North Pacific and North Atlantic have demonstrated a strong connection between the presence of sei whales and ocean fronts and eddies (Nasu, 1966, cited in NMFS 2011e; Nemoto and Kawamura, 1977, cited in Reeves et al. 1998; Skov et al. 2008). Such oceanographic features are likely concentrate prey, which is then exploited by foraging sei whales. It is also possible that sei whales use currents during large-scale movements or migrations (Olsen et al. 2009; cited in NMFS 2011e). Sei whales are generally found in deep water areas, often over the continental slope, shelf breaks, and deep ocean basins located between banks (NMFS 2011e). Sei whales feed upon a variety of prey species, from copepods and euphausiids to pelagic squid and fish the size of adult mackerel (Nemoto and Kawamura 1977; Kawamura 1982; both cited in NMFS 2011e). Flinn et al. (2002) and Tamura et al. (2009; cited in NMFS 2011e) documented a variety of prey species in the stomach contents of commercially harvested whales, and they found that the prevalence of certain prey varied both within and between years, indicating that sei whales are opportunistic feeders with flexible diets. They capture their prey by gulping or skimming (at the sea surface) and prefer to feed at dawn (NOAA Fisheries 2013).

Information on sei whale diving behavior is limited. According to the MarineBio Conservation Society (2012b), sei whales are not deep divers, rarely diving deeper than 300 m (984 ft), and they remain under water for 5 to 10 minutes at a time.

Current Stressors and Threats

As reported by NMFS (2011e), potential threats to the sei whale include ship strikes; entanglement in fishing equipment; anthropogenic noise related to ships, military sonar, and explosives; contaminants and pollutants; disease; interaction with marine debris; research-related disturbance; predation and natural mortality; and competition with other species (including humans) for prey resources. Hunting and possible loss of or changes in habitat associated with climate and ecosystem change are also believed to pose a risk to sei whale recovery.

Climate change will affect sei whale habitat and prey abundance by altering water temperatures and ocean currents. Although specific potential impacts related to climate change are unknown, it is possible that the sei whale will be more resilient than other whale species because of its relatively wide variety of prey species and habitats (NMFS 2011e).

Southern Resident Killer Whale (*Orcinus orca*) DPS

Photo: Karen Tobiason

Killer whales (often referred to as "orcas") are the largest odontocete (toothed) dolphin species; adults tend to be 6.1 to 7.3 m (20 to 24 ft) in length, but killer whales may grow as large as 9.8 m (32 ft) (NOAA Fisheries 2017a). The DPS are social and are found in familial pods of 20 to 40 individuals led by a dominant matriarch (NOAA Fisheries 2017b, a). Stable social groups tend to include 2 to 15 individuals at a time, but large, temporary aggregations of the entire population occur, particularly in the summer (NOAA Fisheries 2017a). Aggregation and separation of groups tends to follow seasonal trends in prey availability and courtship and mating activities. Temporary associations of the pods, called "superpods," of 50 or more individuals may form for a matter of days during late summer, consistent with when whales are mating (Barrett-Lennard and Heise 2007). Transient killer whales and offshore killer whales also occur in the area. It is nearly impossible to distinguish the three types of killer whales (i.e., resident, transient, and offshore killer whales) visually; however, their behaviors are substantially different. Transient killer whales generally travel in small groups and will hunt marine mammals. Offshore killer whales are uncommon, although groups of over 100 have been observed. Killer whales use several types of calls, whistles, and clicks to communicate or to navigate and hunt (NOAA Fisheries 2017b).

Observations of Southern Resident Killer Whale (SRKW) behavior indicates that their active time is primarily budgeted to travel (70.4%), followed by foraging (21%), rest (6.8%), and socialization (1.8%) (Noren and Hauser 2016). Others have suggested that foraging accounts for a greater amount of activity, 40 to 67% (Ford 2006). Diving tends to be concentrated within the upper 30 m (98 ft) of the water column, with deeper dives of 100 to 200 m (328 to 656 ft) (or more) being occasional (Baird et al. 2005). Diving activity is greatest during the day, and dive depths and frequencies are greater for males than females (in adults) but are not greater for adults than juveniles (on average) (Baird et al. 2005). Killer whales are relatively recognizable due to their distinctive coloring and high level of surface activity (e.g., breaching and tail slapping), though SRKWs cannot easily be differentiated from transient individuals.

The historical abundance of SRKWs was between 140 and 400 whales (Krahn et al. 2004; Olesiuk et al. 1990). As of December 31, 2016, there were a total of 78 whales (CWR 2016). Of the three pods, the L pod is the largest at 35 members followed by J, which has 24 members, and then K, which only has 19 members (CWR 2016).

Distribution

SRKWs are present in the Salish Sea (Puget Sound, Strait of Juan de Fuca, and the Strait of Georgia) from spring to fall each year (NOAA Fisheries 2017a). In winter, some SRKWs remain in the Salish Sea, while others travel along the Washington, Oregon, and California coasts (as far south as central California) (NWFSC 2015). SRKWs may also travel north along the British Columbia border as far as the Queen Charlotte Islands and southeast Alaska. Between late spring and early autumn, SRKWs spend a significant portion of time in the Georgia Basin (Canada) and around the San Juan Islands of Washington following incoming salmon runs (NOAA Fisheries 2017a). Satellite- tagged animals and tracking has identified an important winter through spring foraging area along the west coast of Washington down to the mouth of the Columbia River (Hanson et al. 2013). Although SRKWs can occur along the outer coast of Washington and Oregon at any time of the year, occurrence along the outer coast is more likely from late autumn to early spring.

SRKWs co-exist in areas with West Coast transient killer whales, but resident and transient groups generally do not have significant interactions (e.g., socializing or attacking one another) (Barrett-Lennard and Heise 2007).

Critical Habitat

Approximately 6,630 sq km (2,560 square miles) of critical habitat were designated for the SRKW at the end of 2006 (71 FR 69054) (Figure 3-24). Critical habitat includes all US waters within the Salish Sea, excluding 18 areas designated for military use (291 sq km; 112 square miles), any waters less than 6.1 m (20 ft) deep (at extreme high tide), and Hood Canal. Military installations were excluded from critical habitat as a matter of national security. The critical habitat was subdivided into three areas that provide necessary habitat elements: a core summer area (Haro Strait and San Juan Islands), Puget Sound, and the Strait of Juan de Fuca. These subareas correspond with seasonal prey (e.g., salmon) concentrations. The Strait of Juan de Fuca, Haro Strait (between San Juan Island and Vancouver Island), and Georgia Strait (in Canada) are narrow areas that concentrate salmon as they return to inland Washington and British Columbia, Canada waters from the Pacific Ocean.

PBFs for this critical habitat are stated in 71 FR 69054 as: water quality to support growth and development; prey species of sufficient quantity, quality, and availability to support individual growth, reproduction and development, as well as overall population growth; and passage conditions to allow for migrating, resting, and foraging.

In 2014, a petition was submitted requesting revisions to SRKW critical habitat to include (in addition to those areas just noted) “Pacific Ocean marine waters along the West Coast of the US that constitute essential foraging and wintering areas…” (80 FR 9682). The petition also requests that the NMFS expand the PBFs for killer whales to include “protective in-water sound levels,” which was initially considered as a PBF in 2006 but ultimately was not included (71 FR 69054). It is anticipated that the next steps related to the 2014 petition for critical habitat revision will be a proposed rule to revise critical habitat in 2017 (80 FR 9682).

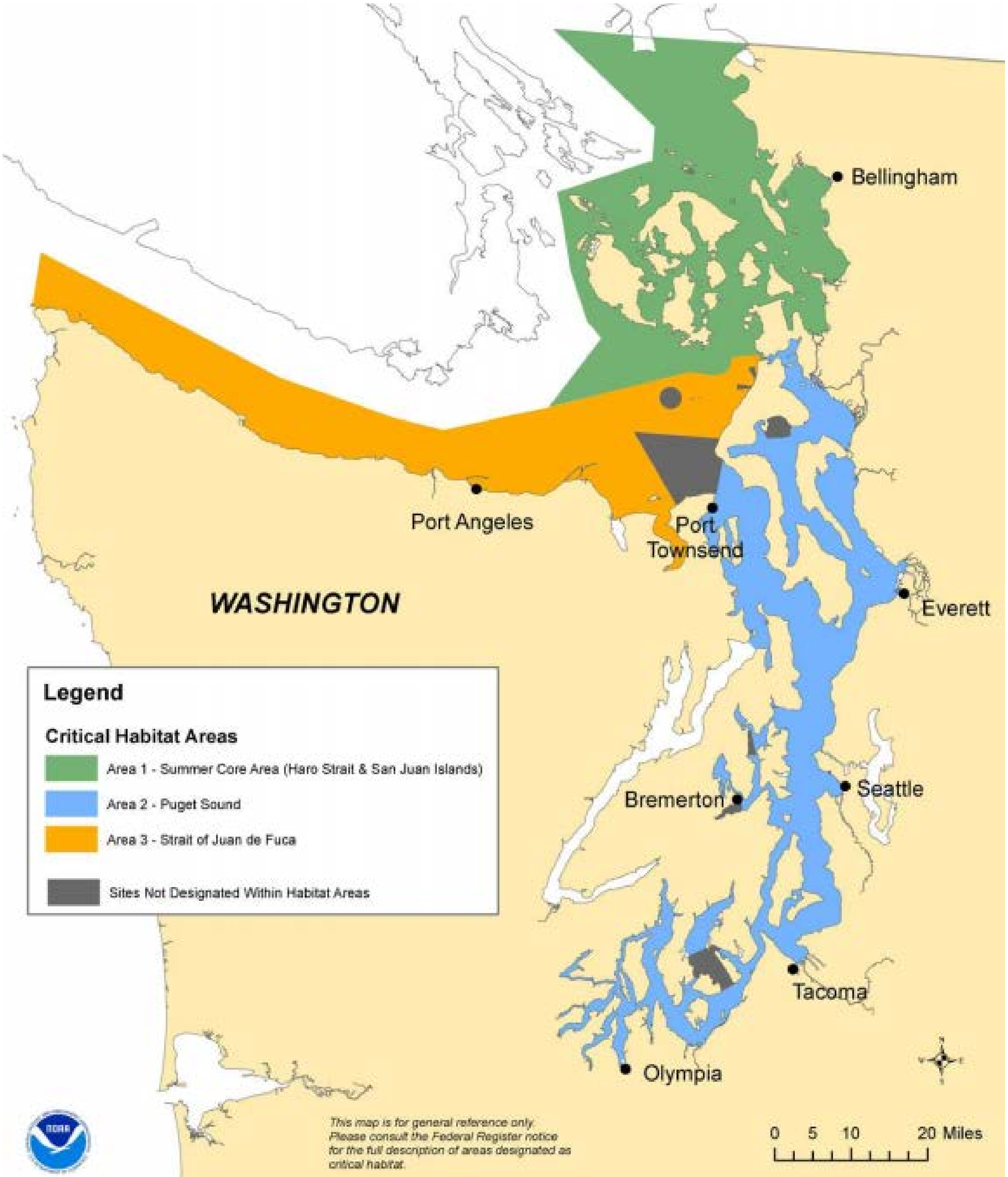
Life History

The SRKW is a long-lived species with a late onset of sexual maturity (NMFS 2008a). Mothers and offspring maintain highly stable social bonds throughout their lives, which is the basis for the matrilineal social structure in the SRKW population.

SRKWs live in inland and coastal marine waters, generally 49 to 55 m (160 to 180 ft) deep (Noren and Hauser 2016). Based on acoustic activity of whales, it is inferred that whale movements and presence are driven by local availability and abundance of salmon (Hanson et al. 2013), suggesting that prey are the most important habitat element for SRKWs. SRKWs preferentially consume Chinook salmon, but their diets also include squid and several other fish species (i.e., other salmonids and bottomfish) (Ford et al. 1998). Chinook salmon are the preferred salmonid prey item (Ford et al. 1998).

Current Stressors and Threats

Key stressors and threats to the SRKW population include human factors such as fishing, boating, water (and prey) quality, and noise pollution (e.g., caused by military activities) (NMFS 2015d). Water quality in Puget Sound is degraded (Johnson et al. 2010). For example, elevated concentrations of pollutants in the Salish Sea and elsewhere have been linked to elevated concentrations in salmon and in killer whales (Krahn et al. 2007; Krahn et al. 2009; Lachmuth et al. 2010; Hickie et al. 2007). Once in the environment, many contaminants accumulate in biological tissues, and some biomagnify up the food chain, reaching high levels in long-lived apex predators like SRKWs. Maternal transfer of persistent and bioaccumulative contaminants from mother to offspring increases killer whale body burdens in subsequent generations (by increasing the baseline burden at birth) (Krahn et al. 2009). Elevated concentrations of pollutants may result in reduced immune function and/or reproductive capability and mortality (Krahn et al. 2007; Krahn et al. 2009).



Data source: (NOAA 2006a)

Figure 3-24 Southern Resident Killer Whale Critical Habitat

SRKWs are subject to intensive whale watching and have been since the 1980s. In 2011, the NMFS promulgated regulations to limit effects from vessel traffic around the whales. The rule prohibits vessels from approaching any killer whale closer than 183 m (200 yards) and forbid vessels from intercepting a whale or positioning a vessel in the path of the whales (76 FR 20870). There are exemptions for safety, including vessels actively fishing, cargo vessels traveling in shipping lanes, and government and research vessels, but spill response vessel activities (either during spill response training or otherwise) are not exempt under this provision of the regulation.

Vessel activity has been shown to affect SRKWs and has been identified as one of the key threats to this population. Whale watching and other boating activities have the potential to disturb whales from foraging or resting, although this appears to be less of a stressor than decreased prey resources (Ayres et al. 2012). As noted above, the NMFS promulgated a regulation that restricts vessel approaches to killer whales in the inland waters of Washington. This is in addition to an active campaign at the federal, state, and local levels to educate mariners about SRKWs and encourage responsible boating. The operation of large boats and the use of subsea acoustic equipment (e.g., military sonar) interferes with whale communication and navigation and is likely to interrupt feeding as well, which is facilitated by echolocation (NMFS 2015d). Human activities can interfere with movements of the whales and impact their passage. In particular, vessels and acoustic disturbance may present obstacles to whale passage, causing the whales to swim further and change direction more often. This increases energy expenditure and impacts foraging behavior (NMFS 2011f).

Sperm Whales (*Physeter macrocephalus*)

The sperm whale is a toothed whale that has a disproportionately large head and a narrow, under-slung jaw. Sperm whales are generally dark gray, with white lips and white areas on the belly and flanks. Males grow to be much larger than females, up to 18 m (60 ft) in length and 70 tons in weight, compared with 11.5 m (38 ft) and 17 tons for females. Their diet consists of mostly medium to large squid, but they also feed on sharks, skates, and fish. Sperm whales use acoustic signals to communicate, navigate, locate prey, and sense their environment (Southall et al. 2007; cited in NMFS 2010b). They are highly gregarious and are typically observed in loose family groups of about 30 individuals (MarineBio 2012c). These groups are frequently made up of either sexually inactive males or mature females and their juveniles. Older mature males are usually solitary, except during the breeding season (MarineBio 2012c). Sperm whales are difficult to detect due to their propensity for long, deep dives.

The sperm whale was originally listed under the Endangered Species Conservation Act (35 FR 8491 1970) and remained listed after the passage of the ESA in 1973. Based on limited information, and lacking additional data concerning population structure, the sperm whales of the eastern North Pacific have been divided into three separate stocks, reflecting the waters in which they are found: Alaska (North Pacific), California/Oregon/Washington, and Hawaii (Allen and Angliss 2011).

Commercial whaling of this species ended in 1986 with the implementation of a moratorium by the International Whaling Commission. Although it is often assumed that the worldwide population of sperm whales has increased since the moratorium was implemented, insufficient data exist on population structure and abundance of ocean basins where sperm whales are present to accurately determine population trends (NMFS 2010b).

Distribution

Sperm whales inhabit all oceans of the world and are widely distributed across the entire North Pacific. They are found as far north as the southern Bering Sea in summer, and the majority of them are thought to remain south of 40°N in the winter (Gosho et al. 1984; Miyashita and Kato 1998; Rice 1974, 1989; all cited in Carretta et al. 2009; Allen and Angliss 2011).

Sperm whales can be seen close to the edge of pack ice in both hemispheres and are also common along the equator, especially in the Pacific. Their distribution is dependent on their food source and suitable conditions for breeding, and varies with the sex and age composition of the group. Females and younger whales remain in warmer waters year-round, with older males joining them during the breeding season. In the Action Area, sperm whales occur off the coasts of Washington and Oregon every season except winter (Carretta et al. 2016).

Critical Habitat

Critical habitat has not been designated for the sperm whale.

Life History

Adult male sperm whales are generally found in open, largely ice-free waters between 500 and 1,000 m (1,640 and 3,280 ft) deep but are occasionally found in water as shallow as 300 m (984 ft) (NMFS 2010b). Female sperm whales are generally found in deep waters (at least 1,000 m [3281 ft]) at low latitudes (less than 50° N, in the North Pacific Ocean) far from land. These depths and locations generally correspond to sea surface temperatures greater than 15°C (59°F) (Rice 1989; cited in Taylor et al. 2008).

Immature males stay with females in tropical and subtropical waters until they are between the ages of 4 and 21 years, at which time they form bachelor schools. Over time, these bachelors migrate from temperate waters toward the poles to feed in the summer (Rice 1989; cited in Carretta et al. 2009). Older, larger males are generally found near the edge of pack ice at higher latitudes (Best 1979; cited in Dufault et al. 1999); however, these males will occasionally return to the warm-water breeding area (Rice 1989; cited in Carretta et al. 2009).

Diving is a key aspect of whale behavior that highlights the importance of the deep oceanic environment for sperm whales. During deep dives, sperm whales forage for squid and other deep-sea-dwelling cephalopods and fish (NMFS 2010b). These dives often exceed a depth of 400 m (1,312 ft) and durations of 30 minutes, although dives as deep as 2,000 m (6,562 ft) have been documented (Watkins et al. 2002; cited in US Navy 2008). In general, males tend to spend more time below the sea surface, up to 83% of daylight hours, and do not spend extensive periods of time at the surface (Jacquet et al. 2000; cited in US Navy 2008). Females, on the other hand, spend less time below the sea surface and more time at the surface, where they have been observed to spend prolonged periods of time, on the order of 1 to 5 hours a day without foraging (Whitehead and Weilgart 1991; Amano and Yoshioka 2003; both cited in US Navy 2008). The tendency of sperm whales to do deep, long dives may make sperm whales difficult to detect at the surface.

Current Stressors and Threats

As reported by NMFS (2010b), there are currently few threats to sperm whales. Various studies reviewed by the NMFS evaluated fishery interactions, vessel interactions, disease, injury from marine debris, research, predation and natural mortality, direct harvest, competition for resources, and cable laying, and all were deemed to present a low or unknown but potentially low threat to the recovery of the species. The effects of anthropogenic noise, pollution, and loss of prey base due to climate and ecosystem change were unknown. Natural threats to sperm whales include killer whales, which have been documented killing at least one sperm whale in California. Typically, however, it is believed that most killer whale attacks are unsuccessful. Large sharks may also be a threat, especially for young sperm whales.

Western North Pacific Gray Whale (*Eschrichtius robustus*)

Gray whales are bottom-feeding baleen whales found in the North Pacific Ocean. There are two geographically distinct populations of gray whales, which are also thought to be genetically distinct: the Western North Pacific (WNP) stock and the Eastern North Pacific (ENP) stock (Carretta et al. 2013). The WNP stock is listed under the ESA as endangered and occurs in very small numbers along the US West Coast; the ENP stock, which is the predominant group of gray whales along the US West Coast, was delisted in 1994 (NOAA Fisheries 2013). The abundance of whales in the WNP stock is estimated to be between 100 and 200 individuals (Bradford et al. 2008; MMC 2017). Because of the density and abundance of gray whales in foraging areas, they tend to be easily detected; however, a WNP gray whale will not be easily distinguishable from an ENP gray whale.

Distribution

Annually, gray whales migrate 16,093 to 22,531 km (10,000 to 14,000 miles) roundtrip from sub-tropical breeding grounds to high-latitude feeding grounds in the Arctic and Subarctic (ADF&G 2008; Weller et al. 2002). They generally travel alone or in small groups of three individuals, although they have been observed in larger groups (ADF&G 2008). Little is known about the distribution of WNP gray whales and their migratory and breeding patterns due to their highly depleted population. The general migration path of the WNP stock ranges from the South China Sea along the Asian coast to Sakhalin Island in Russia (Carretta et al. 2013). Although reproductive timing is unclear for the WNP stock, calving in the ENP stock generally occurs between December and February, prior to the northbound migration, during which calves are weaned during summer feeding (Carretta et al. 2013). Though more than 19,000 gray whales migrate through California annually, only a small number of those whales could possibly be from the endangered WNP stock.

As bottom feeders, gray whales require shallow coastal waters with dense and diverse benthic invertebrate communities. The primary feeding ground of gray whales in the NW are off the Washington and Oregon coasts within 16 km (10 miles) of shore. Gray whale activity tends to be closer to shore during the spring, when calves are present, than during the fall (Calambokidis et al. 2015). A small group of gray whales occurs off the Washington and Oregon coasts throughout much of the year.

ENP gray whales in the Pacific Northwest subpopulation are approximately 5.6% of the total estimated ENP stock (Weller et al. 2012). The frequency of these sightings relative to the total population suggests that the two stocks likely have more exchange than previously thought (Weller et al. 2012). More focused research on the migratory routes of North Pacific gray whales has been conducted in recent years using photo identification and genetic data. The results of these studies have confirmed that the WNP stock migrates to the eastern North Pacific. Vladimirov et al. (2012) provides a map showing documented migration routes for the WNP stock.

Critical Habitat

Critical habitat has not been designated for either the WNP or ENP stocks because the original listing under the ESA was prior to 1978.

Life History

Unlike other mysticetes, gray whales primarily forage for benthic fauna in sea-floor sediment in shallow, nearshore areas rather than filtering their prey from the water column (Nerini 1984). They feed by suctioning and filtering the surface layers of sediment through coarse baleen as they roll and skim along the ocean floor, leaving behind shallow depressions and plumes of disturbed sediment (Nerini 1984).

In these areas, they feed on a variety of amphipods, decapods, and other small invertebrates (Nerini 1984). These shallow feeding grounds also provide protected habitat where calves are weaned and become independent (Carretta et al. 2013). Gray whales forage widely and opportunistically within their migratory ranges, but the summer feeding grounds provide the majority of the food consumed, as evidenced by the higher body mass, fat content, and blubber thickness observed in southbound gray whales (Rice and Wolman 1971; cited in Tilbury et al. 2002).

Current Stressors and Threats

Subsistence whaling is allowed in Alaska and Russia (outside of the Action Area), with an estimated annual take of 123 gray whales (based on data from 2006 to 2010) (Carretta et al. 2013). The annual take of WNP gray whales specifically is undetermined (Weller et al. 2002). Aside from subsistence hunting, both populations (the WNP in particular) remain vulnerable to the impacts of other human activities. Fishing gear entanglement, ship strikes, illegal hunts, habitat degradation, disturbance from ecotourism, and anthropogenic noise are among the threats to gray whale populations (NOAA Fisheries 2013). Vessel noise from commercial and industrial activity is an anthropogenic stressor that has been shown to cause a range of behavioral responses (e.g., changes in swimming speed and direction, calling rates, call structure) in gray whales (Moore and Clarke 2002). Gray whales are also likely to encounter vessel traffic in their breeding grounds and other locations along their migration route, which are destinations for whale watching, ecotourism, and scientific research (Moore and Clarke 2002).

Guadalupe Fur Seal (*Arctocephalus townsendi*)

Guadalupe fur seals are an “eared seal” of the family Otariidae with strong sexual dimorphisms; males can reach nearly 2.1 m (7 ft) in length and 181.4 kg (400 pounds), whereas females tend to be 1.5m (5 ft) in length and 49.9 kg (110 pounds) (NMFS 2015c). Guadalupe fur seals have dark brown pelage and narrow pointed heads with broad flippers. Due to their solitary nature and small size (relative to larger marine mammals), they are difficult to detect. Guadalupe fur seals were listed as threated throughout their range in 1985 (50 FR 51252).

The pre-commercial-harvest population of Guadalupe fur seal is estimated to have been 20,000 to 100,000 individuals, and the population in 1993 was estimated as 7,400 individuals (Gallo-Reynoso 1994). Conservative estimates put the total population between 3,000 and 6,500 individuals (NMFS 2015c). The population appears to be growing exponentially at an average rate of approximately 14% per year (Gallo-Reynoso 1994).

Distribution
Guadalupe fur seals generally reside in the tropical waters of the Southern California/Mexico region. During breeding season, they are found in coastal rocky habitats and caves. Little is known about their whereabouts during the non-breeding season. Guadalupe fur seals are non-migratory, and their breeding grounds are almost entirely on Guadalupe Island, Mexico. There are small populations off of Baja California on San Benito Island and off of Southern California at San Miguel Island. It is the only species of the *Arctocephalus* genus that occurs north of the equator. Based on their typical range, the presence of Guadalupe fur seals in the Action Area is improbable. They may exist all year in the Action Area, though in very low numbers. Their presence in Washington and Oregon States has only been documented as a result of strandings. Their distribution in the Action Area is not well known, but several strandings have been observed (OSU Marine Mammal Institute 2017).

Critical Habitat
Critical habitat for the Guadalupe fur seal has been designated for rookeries and haul-outs off the coast of California, well outside the Action Area.

Life History
Guadalupe fur seals tend to be solitary but are polygamous, with males having up to a dozen female mates (NMFS 2015c). Males establish small territories that they maintain through vocalizations. Breeding for this species occurs almost exclusively on Guadalupe Island in Mexico.

While hunting at night, Guadalupe fur seals will dive to depths up to 20 m (65 ft) in search of squid, mackerel, and lantern fish (NMFS 2015c).

Current Stressors and Threats
Historically, commercial seal hunting was the primary threat to the Guadalupe fur seal. Currently, interaction with fishing equipment is the key threat to this species. Insufficient data exist on the incidental bycatch of Guadalupe fur seals in fishing gear to fully understand the threat of fishery interactions.

3.2.2 Species Managed by the United States Fish and Wildlife Service

3.2.2.1 Plants
Information on the distribution of plants was obtained from the USFWS's Environmental Conservation Online System (USFWS 2018a), Habitat Conservation Plans prepared in Oregon, and the WNHP and ORBIC databases. The Oregon Department of Transportation (ODOT) Statewide Habitat Conservation Plan for Routine Maintenance Activities (ODOT 2015) was particularly relevant in that it is recent, and all populations of ESA-listed plants known to occur in

the ODOT rights-of-way were field located and verified. The locations are pertinent because petroleum pipelines and rail lines are often located adjacent to roadway rights-of-way.

Applegate's milk-vetch (*Astragalus applegatei*)

Applegate's milk-vetch was listed as endangered on July 28, 1993 (58 FR 40547). Applegate's milk-vetch was believed to be extinct until it was rediscovered in 1983. At the time of listing, it was known from only two extant sites.

Applegate's milk-vetch is a slender perennial in the pea family (Fabaceae) with stems 3 to 4 decimeters (12 to 16 inches) long. The leaves are typically 3.5 to 7 cm (1.4 to 2.8 inches) long with 7 to 11 leaflets. The petals are whitish, measuring up to 7 mm (0.3 inches) long. The tip of the keel is faintly lilac-tinged. The fruit is a pod and is widely spreading or declined. Dehiscence (pod opening at maturity) starts at the top of the pod and continues downward. Applegate's milk-vetch typically flowers from June to early August (USFWS 2003a).

Species Distribution

Applegate's milk-vetch is a narrow endemic only found in Klamath County, Oregon (USFWS 1998a). It is believed to occur only in the Lower Klamath Basin, near the City of Klamath Falls in southern Oregon. According to the Oregon Department of Transportation (ODOT) (2015), this plant is present in only six known locations, three of which are small; two of the six occurrences are on state-protected land, and four are on private land, including one large patch on Nature Conservancy property (Figure C-1 in Appendix C). This species no longer occurs on ODOT right-of-way (which is the focus of ODOT's Habitat Conservation Plan). The milk-vetch is a habitat specialist, so it is adapted to a narrow range of environmental conditions.

In 2009, Applegate's milk-vetch was known to be extant at three large occurrences—Ewauna Flats Preserve, Collins Tract, and the Klamath Falls Airport—and three smaller ones at Washburn Way-Railroad, Miller Island, and Worden. Collectively, these sites support approximately 33,000 individuals (USFWS 2009a). Additionally, two historical occurrences were noted where plants were thought to have been extirpated by agricultural practices (58 FR 40547).

Critical Habitat

Critical habitat has not been designated for Applegate's milk-vetch.

Life History

Applegate's milk-vetch grows in flat, seasonally moist, alkaline soil with underlying clay hardpan. The underlying hardpan provides retention of seasonal moisture, which forms a hydrological regime that may be required for soil saturation during the dry summer months when flowering and seeding occur (USFWS 1998a). The alkaline soils may also support mycorrhizal fungi and rhizobium bacteria beneficial to the survival and growth of the milk-vetch (USFWS 1998a). As observed in other plant species growing under conditions of extreme alkalinity, heavy metals, and/or salinity, the alkaline soils help reduce competition from other species benefiting the Applegate's milk-vetch (USFWS 1998a)

Historically, the species' habitat was characterized by sparse, native bunch grasses and patches of bare soil, allowing for some seed dispersal by wind. Today, dense coverage by introduced grasses and weeds has caused seed dispersal to become highly localized, with most seedling establishment found adjacent to mature plants (USFWS 1998a).

Current Stressors and Threats

In the final ruling to classify Applegate's milk-vetch as an endangered species, the USFWS identified agricultural use, urban development, land management practices, wildlife grazing, and irrigation/flood control on the Klamath River as threats that destroy, modify, or curtail the plant's habitat or range. Extensive agricultural use has extirpated at least one Applegate's milk-vetch population in Klamath County. Road construction near Klamath Falls eliminated both plants and habitat (58 FR 40547). In Oregon's Klamath Wildlife Management Area, the Applegate's milk-vetch population has been threatened by fire and flood management schemes, overgrazing by rabbits, and cattle (58 FR 40547).

Habitat loss and modification due to development and hydrologic manipulation also threaten Applegate's milk-vetch. Portions of the Ewauna Flat population have been destroyed by urban development on private land, and more are at risk because they occupy properties zoned for industrial development. Construction of ditches and dikes in the Klamath Basin have altered the hydrologic character of the species' habitat. These changes may result in dry conditions, which may cause mortality or indirectly impact the species by introducing competition from drought-tolerant and exotic plant species (USFWS 1998a).

Several other factors were identified in the decision to list the Applegate's milk-vetch. Overutilization for commercial, recreational, and scientific purposes was seen as a potential threat at the time of listing due to the accessibility of the population occurrences. Limited genetic viability due to the small number of populations and small number of individuals was determined to be a stressor to the species' future survival. Additionally, the USFWS determined that potential for extinction from fires or floods is a threat to the species due to the limited distribution and small number of known populations (58 FR 40547).

Bradshaw's Desert-Parsley (*Lomatium bradshawii*)

Bradshaw's desert-parsley (*Bradshaw's lomatium*) was listed as endangered on September 30, 1988 (88 FR 38448). This species is on Oregon's State Endangered Plant list; in Washington, it is classified by the WNHP as endangered (USFWS 2010c).

The desert-parsley is a member of the Apiaceae, or parsley family. The plant is a low, upright perennial with a long slender taproot that exhibits pale-yellow flowers. The plant's leaves are smooth, minutely inter-divided, glossy bluish-green, and strictly basal (USFWS 2010c).

The species blooms in the spring, usually in April and early May. The flowers have a spatial and temporal separation of sexual phases, presumably to promote outcrossing, resulting in protandry[33]

[33] Protrandry is a state that is characterized by the development of male organs or maturation of their products before the appearance of the corresponding female product thus inhibiting self-fertilization and that is encountered commonly in mints, legumes, and composites and among diverse groups of invertebrate animals (Merriam-Webster).

on a whole plant basis, and protogyny[34] within the flowers (USFWS 2010c). A typical population is composed of many more vegetative plants than reproductive plants. The plant is pollinated by over 30 species in insects, including bees, flies, wasps, and beetles (Kaye and Kirkland 1994). It is thought that population swings are minimized because of the number of different pollinators available to this plant species (Kaye 1992).

Species Distribution

For many years, Bradshaw's desert-parsley was considered an Oregon endemic, its range limited to the area between Salem and Creswell, Oregon (Kagan 1980 as cited in; USFWS 2015). In 1994, two populations of the species were discovered in Clark County, Washington. The Washington populations are large, with one estimated at over 10 million individuals in 2010 (Arnett 2014). Due to their proximity to each other, these two populations are considered to be a single occurrence. The second population has fluctuated dramatically in size, with the number of individuals ranging from over 1,000 plants in 2004 to a low of 20 plants in 2013 (Arnett 2014).

In Oregon, there are currently more than 60 sites with Bradshaw's desert-parsley, concentrated in three population centers located in Benton, Lane, Linn, and Marion Counties (ONHIC 2014; Gisler 2004). Most of these populations are small, ranging from about 10 to 1,000 individuals, although the two largest sites each have over 100,000 plants (ONHIC 2014). Other small, isolated populations exist as well (USFWS 2015). Figure 3-25 shows the distribution of Bradshaw's desert-parsley.

Critical Habitat

Critical habitat has not been designated for Bradshaw's desert-parsley.

Life History

Bradshaw's desert-parsley is restricted to wet prairie habitats (USFWS 2010c). These sites have heavy, sticky clay soils or a dense clay layer below the surface that results in seasonal hydric soils. Most of the known populations occur on seasonally saturated or flooded prairies near creeks and small rivers in the southern Willamette Valley (Kaye 1992). The soils at these sites are dense, heavy clays with a slowly permeable clay layer 15 to 30 cm (6 to 12 inches) below the surface. This clay layer produces a perched water table in winter and spring and allows soils to become saturated to the surface or slightly inundated during the wet season (USFWS 2015).

Bradshaw's desert-parsley is often associated with tufted hairgrass (*Deschampsia cespitosa*) and frequently occurs on and around the small mounds created by aging tufted hairgrass plants. In wetter areas, Bradshaw's desert-parsley occurs on the edges of tufted hairgrass or sedge bunches in patches of bare or open soil. In drier areas, it is found in low places such as small depressions, trails, or seasonal channels with open, exposed soils (USFWS 2015).

Bradshaw's desert-parsley depends exclusively on seeds for reproduction (Kaye 1992). The plant may be pollinated by over 30 species of insects, including bees, flies, wasps, and beetles (Kaye and Kirkland 1994). The large fruits have corky, thickened wings and usually fall to the ground

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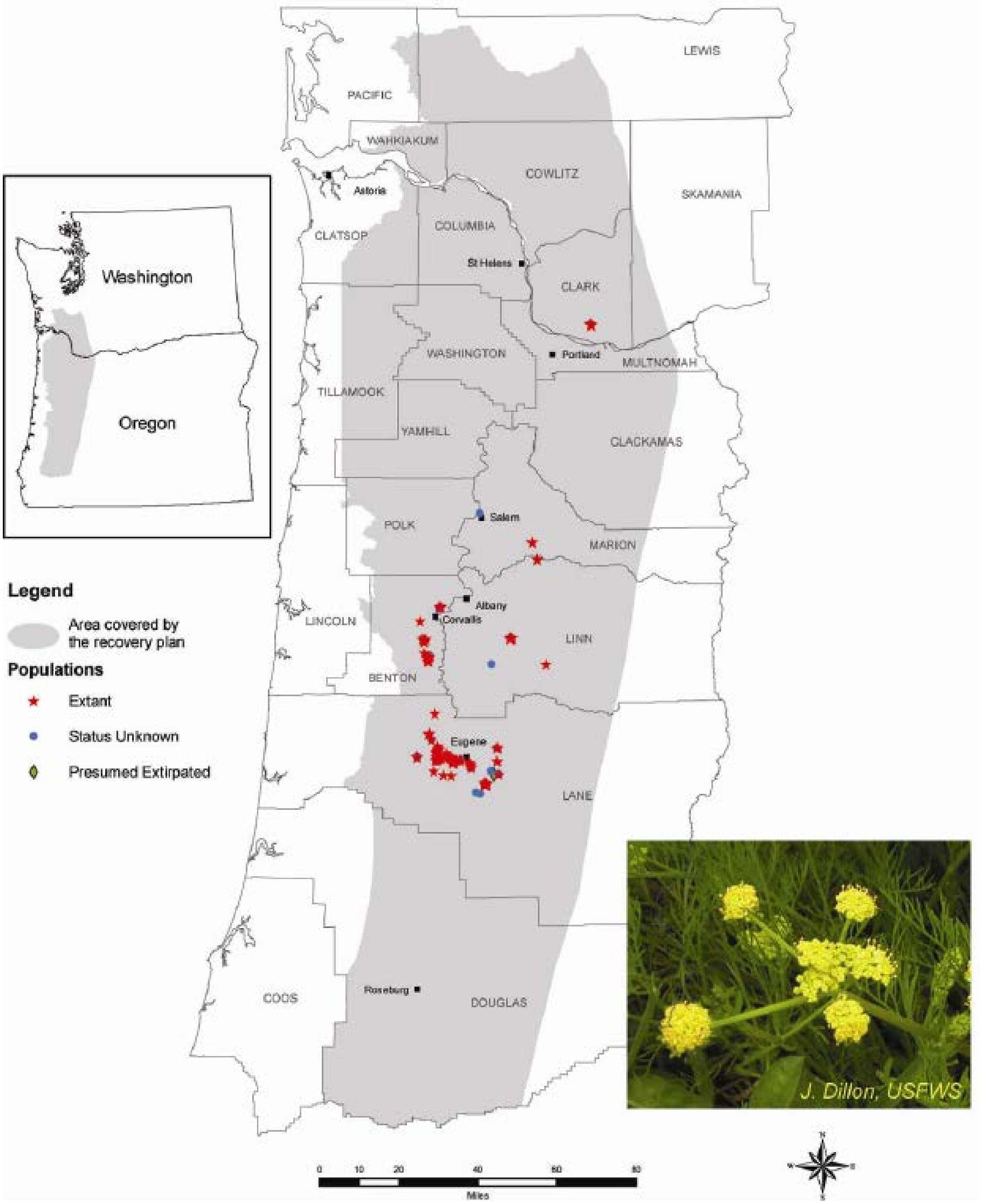
[34] Protogyny is a state that is characterized by development of female organs or maturation of their products before the appearance of the corresponding male product thus inhibiting self-fertilization and that is encountered in apples, pears, figworts, and among several groups of invertebrate animals (Merriam-Webster).

fairly close to the parent. Fruits appear to float somewhat and may be distributed by water. The fine-scale population patterns at a given site appear to follow seasonal microchannels in the tufted hairgrass prairies, but whether this is due to dispersal, habitat preference, or both, is not clear (Kaye and Kirkland 1994; Kaye 1992).



Source: (USFWS 2010c)

Figure 3-25 Distribution Map for Bradshaw's Desert-Parsley

Current Stressors and Threats

Expanding urban development, pesticides, encroachment of woody and invasive species, herbivory, and grazing are threats to the remaining Bradshaw's desert-parsley populations (88 FR 38448). The majority of Oregon's Bradshaw's desert-parsley populations are located within 16 km (10 miles) of Eugene. The continual expansion of this city represents another potential threat to the future of these sites. Even if the sites are protected, the resultant change in hydrology caused by the surrounding development may alter important habitat for the species (Gisler 2004; Meinke 1982). The majority of sites from which herbarium specimens have been collected are within areas of Salem or Eugene, which have been developed for housing and agriculture. The populations in Washington occur on private lands and are not protected (USFWS 2015; Gisler 2004).

Populations occurring on roadsides are at risk from roadside maintenance activities and from impacts of management on adjacent lands (USFWS 2010c). Pesticide use on agricultural fields and herbicide application adjacent to roads may harm Bradshaw's desert-parsley populations across its range. There is concern that pesticides kill the pollinators necessary for the plant's reproduction; Bradshaw's desert-parsley does not form a seed bank; therefore, any loss of pollinators could have an immediate effect on population numbers (Kaye and Kirkland 1994). Herbicides may drift, and applications near a population may cause damage or mortality to the plants (USFWS 2015).

Golden Paintbrush (*Castilleja levisecta*)

Golden paintbrush was federally listed as threatened on June 11, 1997 (62 FR 31740). Golden paintbrush typically has 1 to 15 erect to spreading unbranched stems, reaches a height of 30 cm (12 inches), and is covered with soft, sticky hairs. The lower leaves are entire and narrowly pointed; the upper leaves are broader, usually with one to three pairs of short lateral lobes on the distal end. The flower, mostly hidden by the overlapping bracts, has a calyx (the sepals, collectively) 15 to 18 mm (0.6 to 0.7 inches) long and deeply cleft, and a blossom 20 to 23 mm (0.8 to 0.9 inches) long, with a slender concave upper lip three to four times the length of the unpouched lower lip. It is distinguished from the other Castilleja species within its range by brilliant golden to yellow floral bracts. The plant flowers from April to June and is less conspicuous when it is not flowering (62 FR 31740).

Source: USFWS Photo

Species Distribution

Historically, golden paintbrush has been reported from more than 30 sites in the Puget Trough of Washington and British Columbia, and as far south as Brownsville in the Willamette Valley of Oregon (USFWS 2015). Many populations have been extirpated as their habitats were converted for agricultural, residential, and commercial development. In Washington, the species occurs in the Puget Trough physiographic province, whereas in Oregon, it occurs in the Willamette Valley physiographic province (Franklin and Dyrness 1988).

In Oregon, golden paintbrush historically occurred in the grasslands and prairies of the Willamette Valley; the species has since been extirpated from all of these sites as the habitat has been modified by agriculture (USFWS 2010c). The last sighting of golden paintbrush in the wild in Oregon was during 1938 in Linn County; recent surveys have failed to relocate wild populations of the species in Oregon (Sheehan and Sprague 1984). In 2005, small populations of golden paintbrush were planted in a common garden study plots at William L. Finley and Baskett Butte National Wildlife Refuges (NWRs) in the Willamette Valley. The propagules primarily came from Washington state populations, with a smaller contribution of seed from Canada. These plants still persist at both refuges. Golden paintbrush is currently known to occur in Oregon (Benton, Polk, and Multnomah Counties) and in Washington (Thomas 2015).

Wild populations of golden paintbrush declined substantially in 2014, after maintaining relatively stable numbers range-wide from 2004 through 2013, at approximately 20,000 individuals (USFWS 2015). The combined range-wide population of both wild and introduced golden paintbrush is greater than 185,000 flowering plants (USFWS 2015). The distribution of plants range-wide and the number of plants in the majority of populations has increased due to conservation efforts.

Critical Habitat
Critical habitat has not been designated for the golden paintbrush.

Life History
The mainland population in Washington occurs in a gravelly, glacial outwash prairie (USFWS 2010c). Most of the extant populations in Washington are on loamy sand or sandy loam soils derived from glacial origins. In the southern portion of the species' historic range in the Willamette Valley, populations occurred on clayey alluvial soils, in association with Oregon white oak (*Quercus garryana*) woodlands and savannah (Caplow 2004). Sites with a high abundance of native forbs and grasses have been determined to be the most suitable for reintroduction in Oregon (Lawrence and Kaye 2009), and this is likely the case throughout the species' range.

The sites where golden paintbrush occurs in the Willamette Valley, Oregon, are found on deeper, alluvial soils compared with the soil found at the Washington prairies within the species' range. Low deciduous shrubs may be present as small to large thickets, although these shrub patches readily burn during prescribed fire events. With a fire return period of two to five years for prairies (Hamman et al. 2011). In the absence of fire or other forms of management, most sites have been colonized by woody plants, primarily Douglas-fir (*Pseudotsuga menziesii*), and shrubs, including wild rose (*Rosa nutkana*), snowberry (*Symphoricarpos albus*), and Scot's broom (*Cytisus scoparius*), an aggressive nonnative, noxious weed.

Current Stressors and Threats
Threats to golden paintbrush include habitat modification due to fire suppression that permits successional changes to prairies, leading to encroachment of grasslands by woody plants. The 2014 population decline was likely due to a lack of site management (primarily prescribed fire) at several of the wild populations (USFWS 2015). Other threats to golden paintbrush include habitat modification resulting from development for commercial, residential, and agricultural use; low potential for expansion of golden paintbrush populations and their refugia because existing habitat is constricted; and herbivory (62 FR 31740).

Prairie destruction and degradation due to residential, commercial, or agricultural use is a threat at three wild populations that are still in private ownership (Arnett 2014). These populations have declined over time, and they are likely to become extirpated without intervention or some form of management. Prior to the species' listing as threatened in 1997, many populations were lost due to conversion of native prairie habitat to agricultural, residential, and commercial uses. Herbivory by rabbits, deer, and voles is also a problem at many sites where golden paintbrush occurs (USFWS 2015).

In the absence of active management, robust populations of golden paintbrush have rapidly declined to close to extirpation in less than a decade. These declines did not result from overt habitat destruction but from the threats associated with low population numbers, inbreeding depression, fire suppression, and competition with nonnative and invasive plant species (USFWS 2010c). Competition from nonnative, invasive noxious species such as mouse-ear hawkweed (*Hieracium pilosella*), Scot's broom, and ox-eye daisy (*Leucanthemum vulgare*), and other nonnative plants may severely degrade golden paintbrush habitat (Wentworth 1997).

Howell's Spectacular Thelypody (*Thelypodium howellii* ssp. *spectabilis*)

Howell's spectacular thelypody was federally listed on May 26, 1999 (64 FR 28393). This species is on the State of Oregon's State Endangered Plant list (USFWS 2010a).

This species was thought to be extinct until rediscovered near North Powder in 1980 (USFWS 2015). In 2008, the Oregon Natural Heritage Information Center's database documented 15 Howell's thelypody occurrences (USFWS 2010a). The number of flowering plants tends to vary widely from year to year in the monitoring areas. The amount of early spring precipitation appears to be an important driver of annual abundance, with high precipitation levels correlated with increased plant abundance.

Howell's spectacular thelypody is an herbaceous biennial that reaches approximately 60 cm (24 inches) tall, with branches arising from near the base of the stem. The basal leaves are approximately 5 cm (2 inches) long with wavy edges and are arranged in a rosette. Stem leaves are shorter, narrow, and have smooth edges. It is a root-forming plant and is pollinated by insects. Flowers appear in loose spikes at the ends of the stems. Flowers have four purple petals approximately 1.9 cm (0.75 inches) in length, each of which is borne on a short stalk. Fruits are long, slender pods (USFWS 2015). The plant begins actively growing in April, flowers in May, fruits in June, and goes dormant in August.

Species Distribution

Howell's spectacular thelypody is currently known to occur in Oregon (Union and Baker Counties) (USFWS 2015). The 2010 Recovery Plan identifies 11 different occurrences. The known occurrences vary substantially in size and plant abundance. Some are small patches just several hundred square feet in size, while others extend over 4 to 8 hectares (ha) (10 to 20 acres) (USFWS 2010a). All of the species' known occurrences are on private land, and many are not accessible for monitoring. Since federal listing in 1999, population monitoring efforts have focused on three sites where there are mechanisms in place that allow for monitoring: 1) the Haines Rodeo Grounds site, 2) the Miles Ranch Easement, and 3) the Baldock Slough introduction site (USFWS 2010a).

Critical Habitat

Critical habitat has not been designated for the Howell's spectacular thelypody.

Life History

Howell's spectacular thelypody occurs in wet alkaline meadows in valley bottoms, usually in and around woody shrubs that dominate the habitat on the knolls and along the edge of the wet meadow habitat between the knolls. Soils are pluvial-deposited alkaline clays mixed with recent alluvial silts, and are moderately well-drained (USFWS 2015). Associated species include greasewood (*Sarcobatus vermiculatus*), alkali saltgrass (*Distichlis stricta*), giant wild rye (*Elymus cinereus*), alkali cordgrass (*Spartina gracilis*), and alkali bluegrass (*Poa juncifolia*) (Kagan 1986). It is thought that Howell's spectacular thelypody is dependent on periodic flooding because of rapid colonization of areas adjacent to streams that have flooded (Kagan 1986). Abundance fluctuates widely from year to year in response to annual climate and soil moisture (USFWS 2010a).

Howell's spectacular thelypody is readily consumed by cows; therefore, in areas that are intensively grazed during the growing season, it is typically only found under shrubs (USFWS 2010a). This species does not compete well with encroaching weedy vegetation such as teasel (*Dipsacus fullonum*) (USFWS 2015).

Current Stressors and Threats

Howell's spectacular thelypody was listed as threatened in 1999 because of its very restricted range, the potential for further habitat destruction from agricultural and urban development, the prevalence of chronic habitat degradation from livestock grazing, invasive weeds, and alteration of wetland hydrology, as well as the fact that only one of the known populations had any legal protections in place to facilitate long-term protection of the plant (64 FR 28393).

Today, threats to the species include habitat loss due to urban and agricultural development, habitat degradation due to livestock grazing and hydrological modification, consumption by livestock, use of herbicides or mowing during the growing season, and competition with exotic species.

A large portion of habitat suitable for Howell's spectacular thelypody has been modified or lost to urban and agricultural development. Habitat degradation at all remaining sites for this species is due to a combination of livestock grazing, agricultural conversion, hydrological modifications, and competition from nonnative vegetation. These activities have resulted in the extirpation of the species from about half its former range in Baker, Union, and Malheur Counties. Plants at the type locality in Malheur County are considered to be extirpated due to past agricultural development (USFWS 2015).

Kincaid's Lupine (*Lupinus sulphureus* var. *kincaidii*)

Kincaid's lupine was listed as threatened, on January 25, 2000 (65 FR 3875). This species is on the State of Oregon's Threatened Plant list; in Washington, it is classified by the WNHP as endangered (USFWS 2010c).


Source: Photo by Tom Kaye

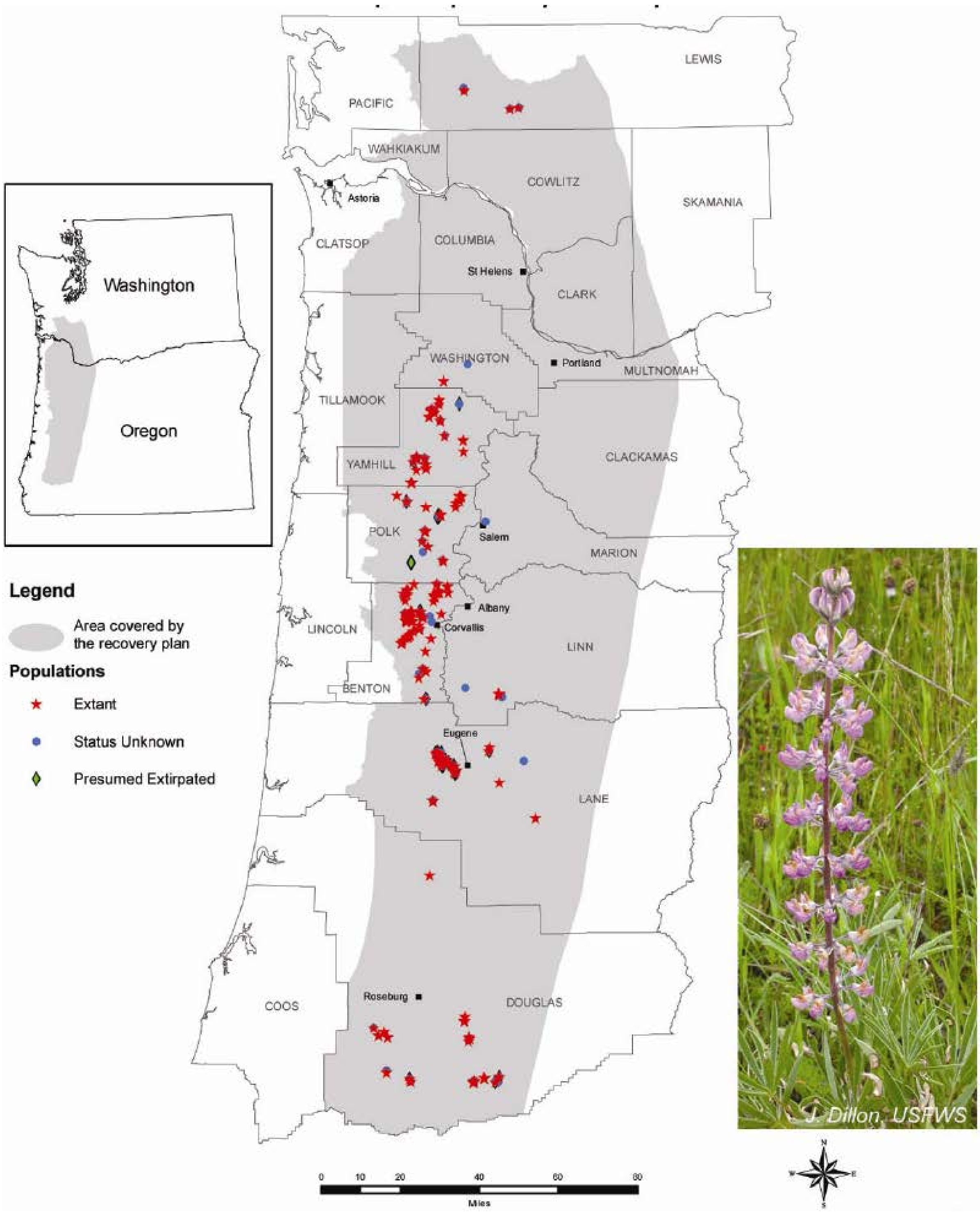
Kincaid's lupine is a long-lived perennial species that can survive for several decades (Wilson et al. 2003). Individual plants are capable of spreading by rhizomes, producing clumps of plants exceeding 20 m (33 ft) in diameter. Population counts are thus unreliable, and apparently large populations may consist of few genetic individuals. Leaves are oval-palmate, with very narrow leaflets. The small, purplish-blue pea flowers grow in loose racemes that are 15.2 to 20.3 cm (6 to 8 inches) tall.

Kincaid's lupine is the primary host plant for larvae of the endangered Fender's blue butterfly, which is discussed later in this section (Wilson et al. 2003). Female Fender's blue butterflies lay their eggs on the underside of Kincaid's lupine leaves in May and June; the larvae hatch several weeks later and feed on the plant for a short time before entering an extended diapause, which lasts until the following spring (Schultz et al. 2003). Kincaid's lupine, like other members of the genus *Lupinus*, is unpalatable to vertebrate grazers.

Species Distribution

Kincaid's lupine is found in a narrow range west of the Cascade Mountain Range in dry upland prairies from Lewis County, Washington, in the north, to the foothills of Douglas County, Oregon in the south (Figure 3-26). Most of the known and historical populations are found in the Willamette Valley of Oregon (USFWS 2010c). Historically, the species was found at one site in the vicinity of Victoria, British Columbia but is now considered extirpated in Canada ((COSEWIC 2008). The last known observation in Canada was made in 1929.

Current distribution of the Kincaid's lupine includes counties in Oregon (i.e., Benton, Lane, Polk and Yamhill Counties) and Washington (i.e., Lewis County). Range-wide, Kincaid's lupine is known to occur at about 164 sites, comprising about 246 ha (608 acres) of total coverage (USFWS 2010c). In Oregon, the Oregon Natural Heritage Information Center (OSU 2017) reports occurrences of Kincaid's lupine at over 100 sites. From these locations, at least 43 populations have the potential to contribute to recovery (USFWS 2014). Twenty-five of those populations are protected.



Source: (USFWS 2010c)
Figure 3-26 Distribution Map for Kincaid's Lupine

Critical Habitat

Critical habitat was designated for the Kincaid's lupine on October 31, 2006 (71 FR 63861). Approximately 237 ha (585 acres) have been designated as critical habitat for the species in central

Oregon and southwest Washington. Of those, 202 ha (500 acres) are designated on private lands, 32 ha (78 acres) on federal lands, and 2.4 ha (6 acres) on state lands (71 FR 63861).
The PBFs for Kincaid's lupine critical habitat are:

- Early seral upland prairie or oak savanna habitat with a mosaic of low-growing grasses and forbs and spaces to establish seedlings or new vegetative growth, an absence of dense canopy vegetation, and undisturbed subsoils
- The presence of insect outcrossing pollinators, such as the bumblebees *Bombus mixtus* and *B. californicus,* with unrestricted movement between existing lupine patches.

Life History
In the Oregon Willamette Valley and southwestern Washington, Kincaid's lupine is found in small, widely scattered populations on upland prairie remnants (USFWS 2010c). Several populations are found in road rights-of-way, between the road shoulder and adjacent fence line, where they have survived because of a lack of agricultural disturbance. Some of the populations in Washington occur in pastures and appear to benefit from light grazing by livestock, which reduces the cover of competing shrubs and grasses (Arnett 2008). Common native species typically associated with Kincaid's lupine include: Idaho fescue (*Festuca idahoensis* ssp. *roemeri*), California oatgrass (*Danthonia californica*), Tolmie star-tulip (*Calochortus tolmiei*), common woolly sunflower (*Eriophyllum lanatum*), and Virginia strawberry (*Fragaria virginiana*). The species appears to prefer heavier, generally well-drained soils and has been found on 48 soil types, typically Ultic Haploxerolls, Ultic Argixerolls, and Xeric Palehumults (Wilson et al. 2003). In contrast to historical ecosystem composition, invasive nonnative species are a significant component of Kincaid's lupine habitat today (USFWS 2010c).

Current Stressors and Threats
The three major threats to Kincaid's lupine populations are habitat loss, competition from nonnative plants, and elimination of historical disturbance (USFWS 2010c). Habitat loss from a variety of causes (e.g., urbanization, agriculture, silvicultural practices, and roadside maintenance) has been the single largest factor in the decline of Kincaid's lupine (65 FR 3875). Land development and alteration of prairies in western Oregon and southwestern Washington have been so extensive that the remaining populations are essentially relegated to small, isolated patches of habitat. Habitat loss is likely to continue as private lands are developed; at least 90 percent of the sites occupied by the species in 2000, at the time of listing, were on private lands and are at risk of being lost unless conservation actions can be implemented (65 FR 3875). Habitat fragmentation and isolation of small populations may be causing inbreeding depression in the species as well.

The loss of a regular disturbance regime, primarily fire, has resulted in the decline of prairie habitats through succession by native trees and shrubs and has allowed the establishment of numerous nonnative grasses and forbs (USFWS 2010c). When Kincaid's lupine was listed, it was estimated that 83 percent of upland prairie sites within its range were succeeding to forest (65 FR 3875).

Nelson's Checkermallow (*Sidalcea nelsoniana*)

Nelson's checkermallow was listed as threatened on February 12, 1993 (58 FR 8235). A recovery plan for the species was finalized in May 2010 (USFWS 2010c). This species is also listed on the State of Oregon's Threatened Plant list and is classified by the WNHP as endangered.

Nelson's checkermallow is a perennial herb in the mallow family (Malvaceae). It has tall, lavender to deep pink flowers that are borne in somewhat open clusters 50 to 150 cm (19.2 to 48 inches) tall at the end of short stalks (58 FR 8235). Plants are partially dioecious, in that they have either perfect flowers (male and female) or pistillate flowers (female only). The plant can reproduce vegetatively, by rhizomes, and by seeds, which drop near the parent plant. Flowering typically occurs from late May to mid-July but may extend into September in the Willamette Valley. Fruits have been observed as early as mid-June and as late as mid-October. Coast Range populations generally flower later and produce seed earlier, probably because of the shorter growing season. Seed production for a Nelson's checkermallow plant is typically high. An average plant may produce between 300 and 3,000 seeds, but could potentially exceed 10,000 seeds.

Species Distribution

Nelson's checkermallow primarily occurs in Oregon's Willamette Valley but can also be found at several sites in Oregon's Coast Range and at two sites in the Puget Trough of southwestern Washington. The plant's range extends from southern Benton County, Oregon, north to Cowlitz County, Washington, and from central Linn County, Oregon, west to the crest of the Coast Range.

In the late 1990s, the species was known from 65 occurrences within five relict population centers in Oregon and Washington (USFWS 1998c). More recently, the 2010 Recovery Plan states that Nelson's checkermallow was known from about 90 sites, comprising about 517 ha (1,278 acres) of total cover (USFWS 2010c). Data collection for a range-wide inventory of Nelson's checkermallow was completed in 2014 (USFWS 2015). Results indicated that 71 populations composed of 214,111 individual plants in Oregon have the potential to contribute to achieving recovery goals. Other smaller populations exist but are unlikely to contribute to recovery. Of the 71 populations, 21 contained fewer than 100 plants, 36 populations had 100 to 2,499 plants, and 14 populations had more than 2,500 plants. Of those 14 populations, five contained over 10,000 plants.

Critical Habitat

Critical habitat has not been designated for the Nelson's checkermallow.

Life History

In the Willamette Valley, Nelson's checkermallow is known from wet prairies and stream sides (USFWS 2010c). Nelson's checkermallow populations occur at low elevations (below 198 m [650 ft]) within a mosaic of urban and agricultural areas, with concentrations around the cities of Corvallis and Salem. Although occasionally occurring in the understory of Oregon ash (*Fraxinus latifolia*) woodlands or among woody shrubs, Willamette Valley populations usually occupy open habitats supporting early seral plant species. These native prairie remnants are frequently found at the margins of sloughs, ditches, and streams; roadsides; fence rows; drainage swales; and fallow fields. Soil textures of the occupied sites vary from gravelly, well drained loams to poorly drained, hydric clay soils (Glad et al. 1994).

Coast Range Nelson's checkermallow populations typically occur in open, wet to dry grassy meadows; intermittent stream channels; and along margins of coniferous forests, with clay to loam soil textures (Glad et al. 1987) at elevations ranging from 491 to 600 m (1,611 to 1,969 ft). These areas generally support more native vegetation than Willamette Valley sites. Native plants commonly associated with Nelson's checkermallow in the Coast Range include spear-head senecio (*Senecio triangularis*), Virginia strawberry (*Fragaria Virginiana*), rushes (*Juncus* spp.), sedges (*Carex* spp.), and common yarrow (*Achillea millefolium*); nonnative associated species often include tansy ragwort (*Senecio jacobaea*), common velvetgrass (*Holcus lanatus*), and timothy grass (*Phleum pretense*).

Current Stressors and Threats

As with several other rare prairie plants, Nelson's checkermallow is threatened by urban and agricultural development, ecological succession that results in shrub and tree encroachment of open prairie habitats, and competition with invasive weeds (58 FR 8235). At many Willamette Valley sites, seedling establishment is inhibited by the dense thatch layer of nonnative grasses (Gisler 2004). Other factors specific to Nelson's checkermallow include pre-dispersal seed predation by weevils (USFWS 2015), the potential threat of inbreeding depression due to small population sizes, and habitat fragmentation (Gisler 2003).

Nelson's checkermallow flowers later in the year than sympatric populations of rose checkermallow (*Sidalcea malviflora* ssp. *virgata*), but allopatric populations sometimes overlap in flowering periods. The two species are sexually compatible; thus, human-mediated movement of the plants could result in formation of hybrids. Nelson's checkermallow and Cusick's checkermallow (*S. cusickii*) are also fully compatible, and they also share pollinators and flowering times, but their geographic ranges are parapatric, with nearest populations narrowly separated by less than 1.6 km (1 mile) at the south end of Finley NWR (Gisler 2004). If these species come into contact through human-mediated dispersal, hybridization could easily occur.

Nelson's checkermallow is frequently found growing together with meadow checkermallow (*S. campestris*), and they also share pollinators and flowering times, but they exhibit very low sexual compatibility (Gisler 2004). Reproductive barriers among the checkermallows in the Willamette Valley likely evolved in response to selective pressure against hybridization (Gisler 2004).

Slickspot Peppergrass (*Lepidium papilliferum*)

Slickspot peppergrass was listed as threatened under the ESA on October 8, 2009 (74 FR 52014). However, on August 8, 2012, the US District Court for the District of Idaho ordered that the final rule listing slickspot peppergrass as a threatened species under the ESA, be vacated and remanded for further consideration consistent with the court's decision. On February 12, 2014, the USFWS published a Federal Register Notice that addressed the court's request that a specific definition of foreseeable future for slickspot peppergrass be provided (79 FR 8416). In addition, the USFWS proposed that threatened status be reinstated for slickspot peppergrass under the ESA. On September 16, 2016, slickspot peppergrass was reinstated as a threatened species under the ESA (81 FR 55058).

Slickspot peppergrass is an intricately branched, tap-rooted plant averaging 5 to 20 cm (2 to 8 inches) high but occasionally reaching up to 40.6 cm (16 inches) high. Leaves and stems are covered with fine, soft hairs, and the leaves are divided into linear segments. Flowers are numerous, 2.8 to 3.8 mm (0.11 to 0.15 inches) in diameter, white, and four-petalled. Fruits (siliques) are 2.5 to 3.8 mm (0.10 to 0.15 inches) across, round in outline, flattened, and two-seeded (Moseley 1994). The species is monocarpic and displays two different life history strategies—an annual form and a biennial form. The annual form reproduces by flowering and setting seed in its first year and dies within one growing season. The biennial life form initiates growth in the first year as a vegetative rosette but does not flower and produce seed until the second growing season. The proportion of annuals versus biennials in a population can vary greatly (Meyer et al. 2005), but in general, annuals appear to outnumber biennials (Moseley 1994).

Like many short-lived plants growing in arid environments, aboveground numbers of slickspot peppergrass individuals can fluctuate widely from year to year, depending on seasonal precipitation patterns (Mancuso and Moseley 1998; Meyer et al. 2005; Menke and Kaye 2006; Sullivan and Nations 2009).

Species Distribution
The range of slickspot peppergrass is restricted to the volcanic plains of southwest Idaho, occurring primarily in the Snake River Plain and its adjacent northern foothills, with a single disjunct population on the Owyhee Plateau. The plant occurs at elevations ranging from approximately 671 to 1,646 m (2,200 to 5,400 ft) in Ada, Canyon, Gem, Elmore, Payette, and Owyhee Counties (Moseley 1994). Based on differences in topography, soil, and relative abundance, the extant slickspot peppergrass populations have been divided into three physiographic regions: the Boise Foothills, the Snake River Plain, and the Owyhee Plateau.

Extreme variability in annual plant counts makes it difficult to detect significant population trends in slickspot peppergrass. However, the best scientific and commercial evidence collected over the past 18 years from the rough census areas on the Idaho National Guard's Orchard Combat Training Center shows a significant downward density trend in slickspot peppergrass plants during the past two decades (74 FR 52014).

Critical Habitat
Critical habitat was proposed for slickspot peppergrass on May 10, 2011 (76 FR 27184). On February 12, 2014, the USFWS amended the original May 10, 2011, critical habitat proposal to include recently discovered slickspot peppergrass locations that met critical habitat designation criteria (79 FR 8402).

The PBFs determined to be essential to the conservation of slickspot peppergrass are:

- Ecologically functional microsites ("slickspots") characterized by:
    - High sodium and clay content and three-layer soil horizonation sequence, which allows for successful seed germination, seedling growth, and maintenance of the seed bank
    - Sparse surrounding vegetation with low to moderate introduced invasive nonnative plant species cover;

- Low to moderate presence of nonnative species cover;
- Relatively intact native vegetation consisting of Wyoming big sagebrush (*Artemisia tridentate* ssp. *wyomingensis*) within 250 m (820 ft) of slickspot peppergrass to protect them from disturbance from wildfire, slow invasion of nonnative species and native harvester ants, and provide habitat for pollinators;
- Diversity of native plants to maintain successful population of pollinators; and
- Sufficient pollinators.

Life History

The biological soil crust, also known as a microbiotic crust or cryptogamic crust, is one component of quality habitat for slickspot peppergrass. Such crusts are commonly found in semiarid and arid ecosystems and are formed by living organisms, primarily bryophytes, lichens, algae, and cyanobacteria, that bind together surface soil particles (Johnston 1997; Moseley 1994).

Slickspot peppergrass occurs in slickspot habitat microsites scattered within the greater semiarid sagebrush-steppe ecosystem of southwestern Idaho. Slickspots are distinguished from the surrounding sagebrush matrix as having the following characteristics: microsites where water pools when rain falls (Fisher et al. 1996); sparse native vegetation, distinct soil layers with a columnar or prismatic structure, higher alkalinity and clay content, natric properties (Fisher et al. 1996; Palazzo et al. 2008); and reduced levels of organic matter and nutrients due to lower biomass production (Fisher et al. 1996; Meyer et al. 2006). They tend to be highly reflective and relatively light in color, making them easy to detect on the landscape (Fisher et al. 1996).

Slickspots account for a relatively small area within the larger sagebrush-steppe matrix, and only a small percentage of slickspots are known to be occupied by slickspot peppergrass. Slickspot peppergrass has infrequently been documented outside of slickspots on disturbed soils, such as along graded roadsides and badger mounds. These are rare observations, and the vast majority of plants documented were within slickspot microsite habitats (USFWS 2006b).

Current Stressors and Threats

The primary threats to slickspot peppergrass are loss of quality habitat, loss or damage to plant populations, ground disturbance, wildfire, removal of native vegetation, introduction of invasive nonnative plants, and chemical contaminants. Secondary threats include commercial and residential development, seed predation by Owyhee harvester ants (*Pogonomyrmex salinus*), habitat fragmentation and isolation, and climate change. Other factors include livestock grazing, fire rehabilitation activities, military training, and recreational use. Both secondary threats and these other factors have been identified as aggravating degraded habitat conditions caused by the modified wildfire regime (74 FR 52014).

Spalding's Catchfly (*Silene spaldingii*)

Source: Photo by Steve Wirt

Spalding's catchfly was listed as threatened on October 10, 2001 (66 FR 51598).

Spalding's catchfly is a member of the pink or carnation family (Caryophyllaceae). Plants range from 20 to 61 cm (8 to 24 inches) in height, occasionally reaching up to 76 cm (30 inches) (USFWS 2007a). There is generally one light green stem per plant, but sometimes there may be multiple stems. Each stem bears four to seven pairs of leaves that are 5 to 8 cm (2 to 3 inches) in length and has swollen nodes where the leaves are attached to the stem. All green portions of the plant (leaves, stems, and calyx) are covered in dense, sticky hairs that frequently trap dust and insects. The plant has a persistent root crown atop a long taproot (1 m [3 ft]) in length. Typically, Spalding's catchfly blooms from mid-July through August, but it can bloom into September (USFWS 2007a).

Species Distribution

Spalding's catchfly is found in Idaho (Idaho, Latah, Lewis and Nez Perce Counties), northeastern Oregon (Wallowa County), and Washington (Adams, Asotin, Lincoln, Spokane, and Whitman Counties). It can also found in western Montana and British Columbia.

The USFWS 2007 Recovery Plan describes occupied habitat within five physiographic regions: 1) the Palouse Grasslands in west-central Idaho and southeastern Washington; 2) the Channeled Scablands in eastern Washington; 3) the Blue Mountain Basins in northeastern Oregon; 4) the Canyon Grasslands of the Snake River and its tributaries in Idaho, Oregon, and Washington; and 5) the Inter-montane Valleys of northwestern Montana (USFWS 2007a). These regions are distinct from one another in climate, plant composition, historical fire frequencies, and soil characteristics. These differences may translate into differences in life histories, habitat trends, consequences of fire suppression, and types of weed control as they apply to Spalding's catchfly. Across the species' range, the number of populations has increased since it was first listed.

In Idaho, there are 34 populations that vary in size from 1 to over 500 individuals (USFWS 2015). In Montana, there are 15 populations, including the largest known population, which is over 16,000 plants. In Oregon, there are approximately 21 populations, varying from a few to over 40,000 individual plants documented on the Zumwalt preserve (USFWS 2015; Taylor et al. 2012). On federal lands in Oregon, this species occurs in the Wallowa-Whitman National Forest, Bureau of Land Management lands, and National Park Service Lands (Old Chief Joseph Gravesite and Cemetery). Of these 21 populations in Oregon, there are approximately 16 populations in the Blue Mountains physiographic Region and approximately five populations in the Canyon Grasslands Physiographic Region as of 2015.

In Washington, there are 53 populations composed of 563 site locations as of 2013; these populations vary from just a few individuals to several thousand plants (Arnett 2014). On federal lands in Washington, this species occurs in the Umatilla National Forest (USFWS 2015).

Critical Habitat

It has been determined that the designation of critical habitat for Spalding's catchfly is prudent; however, it will not be designated until available resources and priorities allow; therefore, no critical habitat is currently designated for the Spalding's catchfly (66 FR 51597).

Life History

In general, Spalding's catchfly is found in moist, open grassland communities or sagebrush-steppe communities (USFWS 2007a). The species can occasionally be found in open pine forests. The bunchgrass grasslands where Spalding's catchfly primarily occurs are characterized by either Idaho fescue (*Festuca idahoensis*) or bluebunch wheatgrass (*Pseudoroegneria spicata*), except in Montana, where the dominant bunchgrass is rough fescue (*Festuca scabrella*). The species can be found at elevations ranging from 365 to 1,615 m (1,200 to 5,300 ft), usually in deep, productive loess soils (fine, windblown soils). Plants are generally found in swales or on northwest to northeast facing slopes, where soil moisture is relatively higher.

Current Stressors and Threats

Spalding's catchfly is threatened by habitat loss due to human development, habitat degradation associated with grazing and trampling by domestic livestock and wildlife, and invasions of aggressive nonnative plants (USFWS 2007a). In addition, a loss of genetic fitness through the loss of genetic variability and effects of inbreeding is a problem for many small, fragmented populations where genetic exchange is limited. Other major threats include changes in fire frequency and seasonality, off-road vehicle use, and herbicide spraying and drift (USFWS 2007a).

Water Howellia (*Howellia aquatilis*)

Water howellia was federally listed as a threatened species on July 14, 1994 (59 FR 35860). The water howellia is listed as federally threatened in the states of Washington, Oregon, Idaho.

Water howellia is an annual, aquatic herb in the bellflower family (Campanulaceae) and a monotypic genus that lives in ephemeral wetlands (USFWS 2013c). The entire plant is smooth, possessing no hairs or projections. The stems are fragile, submerged, and floating, reaching up to 100 cm (39 inches) in length. Stems branch several inches from the base, and each branch extends to the water surface. The numerous leaves are narrow and range from 25 to 50 mm (1 to 2 inches) long. Water howellia produces two types of flowers: cleistogamous (closed) and chasmogamous (showy, open for pollination) (USFWS 2013c). The petals of the chasmogamous flowers are 2 to 3 mm (0.08 to 0.12 inches) long, five-lobed, and distributed on one side of the flower. Fruit capsules from chasmogamous flowers are 10 to 20 mm (0.4 to 0.8 inches) long with elongate seeds 2 to 4 mm (0.08 to 0.16 inches) long (Shelly and Moseley 1988). There chasmogamous flowers are produced on the water surface and also commonly self-pollinate (Lesica et al. 1988; Shelly and Moseley 1988).

Species Distribution

Water howellia has been documented to be more widely distributed on the landscape than at the time of listing, including in areas where it was formerly considered extirpated (USFWS 2013c). The species is endemic to the Pacific Northwest, with historical occurrences identified in California, Oregon, Washington, Idaho, and Montana (Shelly and Moseley 1988). Since its listing, new occurrences have been documented in all five states, generally in areas known historically to support the species (USFWS 2013c).

Water howellia is known to occur in Benewah, Clearwater, Idaho, Latah, Lewis and Nez Perce Counties in Idaho; Clackamas County in Oregon; and Clark, Pierce, Spokane, and Thurston Counties in Washington. It is also known to occur in California and Montana. The majority of extant occurrences (91%) are within three meta-populations occupying three distinct geographic areas: Montana's Swan Valley (Lake and Missoula Counties); Department of Defense property at Joint Base Lewis-McChord (JBLM), Pierce County in western Washington; and Turnbull NWR, Spokane County, in northeastern Washington. In Oregon, Washington, and Idaho, the number of water howellia populations has increased since listing (USFWS 2013c)

Critical Habitat

Critical habitat has not been designated for water howellia. At the time of the USFWS threatened determination, critical habitat for this species was not considered prudent because it could lead to increased predation (59 FR 35860).

Life History

Water howellia typically inhabit small, vernal freshwater wetlands and ponds with an annual cycle of filling with water in spring and drying up in summer or autumn (USFWS 1996). These habitats can be glacial potholes or depressions (Shapley and Lesica 1997 [unpublished]) or river oxbows (Lesica 1997) in Montana and western Washington, or riverine meander scars in Idaho, glacial-flood remnant wetlands (Robison 2007) in eastern Washington, but are all ephemeral to some degree (USFWS 2013c). Depending on annual patterns of temperature and precipitation, the drying of the ponds may be complete or partial by autumn; these sites are usually shallow and less than 1 m (3 ft) in depth. Some ponds supporting water howellia are dependent on complex ground and surface water interactions. Snow melt runoff is important in maintaining suitable conditions in the spring, while localized groundwater flow minimizes water loss from evaporation and plant transpiration later in the summer (Reeves and Woessner 2004). Consolidated clay and organic sediments typically dominate composition of soils underlying ponds and wetlands occupied by water howellia (USFWS 1996).

Water howellia habitat is typically surrounded or nearly surrounded by forested vegetation (USFWS 2013c). Broadleaf deciduous trees or shrubs are usually a component, with species composition varying with geographic location (Mincemoyer 2005). This aspect of water howellia habitat may be important because of numerous observations reporting water howellia occupying shaded portions of ponds and wetlands (USFWS 2015). Forested vegetation surrounding water howellia habitat also contributes large woody debris to the water body, a feature thought to be important in water howellia persistence (Robison 2007).

Current Stressors and Threats

Water howellia has narrow ecological requirements, and subtle changes in its habitat could affect an entire population (USFWS 2013c).Threats to populations include loss of wetland habitat and habitat changes due to timber harvest and road construction, livestock grazing, residential and agricultural development, alteration of the surface or subsurface hydrology, and competition from introduced plant species such as reed canary grass *(Phalaris arundinacea)* and purple loosestrife (*Lythrum salicaria*) (59 FR 35860).

Habitat threats related to land management activities have largely been removed or minimized for approximately 86% of water howellia occurrences rangewide (USFWS 2013c); this includes all lands occupied by water howellia that have active management or conservation plans that benefit water howellia. These plans have been implemented by federal and state agencies and some private entities and have been effective at minimizing impacts from forestry practices, road construction and maintenance, and grazing/trampling.

Protections for the remainder of the known water howellia occurrences on private lands without a federal nexus are limited. Habitats on these lands may still be affected by human-related development, altered hydrology, livestock grazing/trampling, and invasive species. Approximately 14% of water howellia occurrences are on private lands with no known conservation measures in place.

Small, isolated populations are vulnerable to stochastic events. However, the current distribution of water howellia is favorable to the species' long-term persistence because of the intact nature of large meta-populations and the spatial arrangement of other occurrences at different elevations and within varying climatic regimes. This distribution should improve the species' ability to persist in the face of gradual or catastrophic changes in the environment.

Western Lily (*Lilium occidentale*)

The western lily was listed as federally endangered on August 17, 1994 (59 FR 4216). The western lily can be distinguished from most other species of Lilium by its pendent red flowers, yellow to green centers, highly reflexed tepals, non-spreading stamens, and closely unbranched rhizomatous bulb. When viewed from their open end, the flowers give the appearance of a golden star because the yellow basal portion comes to a point toward the midline of each tepal. The primary distinguishing characteristic of this species is the presentation of the stamens and style that remain nearly straight.

Western lily seedlings and small juvenile plants produce a single aboveground leaf, while multiple-leaved plants commonly reach a height of 0.9 to 1.5 m (3 to 5 ft). Leaves grow along the unbranched aboveground stem, ranging from 8.9 to 19 mm (0.4 to 0.7 inches) wide by 78 to 269 mm (3 to 11 inches) long and are distributed singly or in whorls along the shoot (USFWS 2015).

Species Distribution

Western lily occurs in Del Norte and Humboldt Counties in California and Coos and Curry Counties in Oregon. The species occurs within 6.4 km (4 miles) of the coast in southern Oregon and northern California and extends from Coos Bay, Oregon, to Humboldt Bay, California (USFWS 2009b). A total of 23 populations exist in California and Oregon. Currently available data indicate that the western lily population is trending downward since listing (USFWS 2009b). Of the 23 principal populations identified in the five-year review (USFWS 2009b), only two exceeded 1,000 plants; both of these populations are in California.

Critical Habitat

Critical habitat has not been designated for the western lily.

Life History

Historically, lily populations appear to have been maintained in early seral condition by occasional fires (at least at some sites in Oregon) and by moderate grazing (USFWS 2009b). Western lily occurs in freshwater fens, bogs, coastal prairie and scrub, and the transition zones between these habitat types (USFWS 1998b). Stunted, non-flowering plants can also occur within spruce forest. Sites are often near the ocean, where fog is common, and evidence suggests that fog drip may provide an important late season moisture source (USFWS 2015). Populations occur from just above sea level to a maximum of 91.4 m (300 ft) in elevation, and from ocean-facing bluffs to nearly 6.4 km (4 miles) inland. The climate in this habitat is characterized by cool, wet winters and warm, dry summers.

Western lily occurs on two types of poorly drained soils: decomposed peat or muck substrate, or soils that are poorly drained due to a shallow iron pan, or a clay layer. In all known occurrences, the soils are high quality and native, exhibiting good structure and very low bulk density (USFWS 2009b; Imper and Sawyer 1999). Western lily also prefers soils that retain moisture later into the growing season and allow greater percolation of summer rainfall (USFWS 2009b).

Current Stressors and Threats

The primary threats to western lily are human modification and destruction of habitat. This lily is limited to coastal habitat, which is currently undergoing intense development pressure. Western lily habitat often occurs on level marine terraces that are desirable for coastal development because of gentle topography and close proximity to the ocean. From the 1940s to the present, development of cranberry farms, roads, and residential dwellings has eliminated suitable western lily habitat, including some populations between Bandon and Cape Blanco, Oregon (Schultz 1989). Cranberry bog development has been described as the largest cause of habitat loss in Oregon (USFWS 2009b). In the Bandon area alone, 647 ha (1,600 acres) of suitable soil types had been converted to cranberry bogs as of 2005.

Both vertebrates (elk [*Cervus elaphus*], deer [*Odocoileus* spp.], voles [*Microtus* spp.], and domestic cattle [*Bovinae* spp.) and invertebrates (beetle, moth, or butterfly larvae) have been documented to graze on western lily and may suppress small populations of the species (USFWS 2009b). Clearing and draining along the Elk and Six Rivers for intensive livestock grazing have eliminated many of the once numerous populations there. Although cattle represent an obvious physical hazard to individual plants during the growth period, evidence suggests that the benefits of creating suitable habitat through controlled grazing during the dormant period outweigh the losses (USFWS 2009b). High deer populations near developed areas also pose a threat as deer may remove a considerable fraction of flowers and fruit, thus seriously reducing reproductive output. Deer herbivory has occurred at nearly all sites and was responsible for the near elimination of one population's annual seed production in California (USFWS 2015).

Years of fire exclusion have led to changes in lily habitat structure and composition. Fire exclusion has altered suitable habitat for the lily by facilitating succession from open coastal prairie and wetland habitats to shrubs and trees (USFWS 2009b). Opportunities to conduct prescribed burns are limited by an increasing human population living in rural areas. Furthermore, overgrowth of vegetation can render an area susceptible to catastrophic fire.

Because most lily sites are small, populations can disappear with one environmental event, such as erosion or changes in the site's hydrologic regime. Isolation due to habitat fragmentation could inhibit re-colonization to other suitable areas and could result in a permanent loss of localized occurrences once they fall below a critical level. Many western lily populations contain fewer than 50 flowering plants (USFWS 2009b); the loss of genetic diversity due to inbreeding and/or genetic drift may also be a serious threat to some populations in the future.

Willamette Daisy (*Erigeron decumbens var. decumbens*)

The Willamette daisy was listed as endangered on January 25, 2000 (65 FR 3875).


Source: USFWS Species Fact Sheet

The Willamette daisy is a taprooted perennial herb in the sunflower or daisy family (Asteraceae). It grows 1.5 to 6 cm (0.6 to 2.4 inches) tall, with erect to sometimes prostrate stems at the base. The basal leaves often wither prior to flowering and are mostly linear, 5 to 12 cm (2 to 5 inches) long and 3 to 4 mm (0.1 to 0.2 inches) wide. Flowering stems produce two to five heads, each of which is daisy-like, with pinkish to pale blue ray flowers and yellow disk flowers. The morphologically similar Eaton's fleabane (*E. eatonii*) occurs east of the Cascade Mountains, while the sympatric species Hall's aster (*Aster hallii*) flowers later in the summer. In its vegetative state, the Willamette daisy can be confused with Hall's aster, but close examination reveals the reddish stems of Hall's aster in contrast to the green stems of the Willamette daisy (USFWS 2015).

Species Distribution

Willamette daisy is endemic to the Willamette Valley of western Oregon. Herbarium specimens show a historical distribution of Willamette daisy throughout the Willamette Valley; frequent collections were made between 1881 and 1934, but no collections or observations were recorded from 1934 to 1980. The species was rediscovered in 1980 in Lane County, Oregon (USFWS 2015). Currently, this species is known to exist in Benton, Clackamas, Lane, Linn, Marion, Polk, Washington, and Yamhill Counties in Oregon.

Population size for the Willamette daisy may fluctuate substantially from year to year. Of the 17 currently known populations, only two include protected sites that support relatively large subpopulations (i.e., containing over 2,000 plants) known to have been stable for eight years or more (USFWS 2010c). Trend data are not available for most sites, and many sites are not formally protected. Recovery criteria outlined for down listing have not been met in any of the recovery zones. Significant progress has been made to store genetic material, and efforts to collect and store seed will likely continue.

Critical Habitat

Critical habitat was designated for Willamette daisy on November 30, 2006 (71 FR 63861). Critical habitat units for the Willamette daisy have been designated in five counties in the Willamette Valley, Oregon (Benton, Lane, Linn, Marion and Polk Counties). None of the designated critical habitat overlaps with the Action Area.

Life History

The Willamette daisy typically occurs where woody cover is nearly absent and where herbaceous vegetation is low in stature (USFWS 2010e, 2015). It occurs in both wet prairie grasslands and drier upland prairie sites. The wet prairie grassland community, which was historically maintained by periodic flooding and fires, is characterized by the dominance of tufted hairgrass (*Deschampsia cespitosa*), California oatgrass (*Danthonia californica*), and a number of Willamette Valley endemic forbs. It is a flat, open, seasonally wet prairie with bare soil between the pedestals created by the bunching California oatgrass (USFWS 2015).

Current Stressors and Threats

Like many native species endemic to Willamette Valley prairies, the Willamette daisy is threatened by habitat loss due to urban and agricultural development, secondary successional encroachment of habitat by trees and brush, competition with nonnative weeds, and small population sizes (Clark 1993). In 65 FR 3875, it is estimated that habitat loss is occurring at 80% of remaining 84 remnants of native prairies occupied by Willamette daisy and Kincaid's lupine. It is also stated that 24 of the 28 extant Willamette Valley daisy populations occur on private lands and, "without further action, are expected to be lost in the near future" (65 FR 3875).

Although populations occurring on private lands are the most vulnerable to threats of development, publicly owned populations are not immune to other important limitations to the species. For instance, (Clark 1993)identified four populations that are protected from development on public lands (Willow Creek, Basket Slough NWR, Bald Hill Park, and Fisher Butte Research Natural Area) and appear to be threatened by the proliferation of nonnative weeds and successional encroachment of brush and trees (USFWS 2015). Likewise, vulnerability arising from small population sizes and inbreeding depression may be a concern for the species, regardless of land ownership, especially among 17 of the 28 remaining sites that are smaller than 3.2 ha (8 acres) (65 FR 3875). Given the predominance of privately owned populations, land ownership represents a serious obstacle to conservation and recovery of Willamette daisy.

3.2.2.2 Snails

Banbury Springs Limpet (*Lanx* spp.)

The Banbury Springs limpet (lanx) was listed as endangered on December 14, 1992 (57 FR 59244). The Banbury Springs limpet is a member of the family Lancidae, a small group of pulmonates that respire primarily through a highly vascularized mantle. Length ranges from 2.4 to 7.1 mm (0.09 to 0.3 inches), height ranges from 1.0 to 4.3 mm (0.04 to 0.17 inches), and width ranges from 1.9 to 6.0 mm (0.07 to 0.24 inches) (USFWS 1995). The species is distinguished by its red-cinnamon conical shell with a sub central apex (USFWS 2006a). The Banbury Springs limpet is currently known from four isolated colonies at springs along the middle Snake River in Idaho, with no possible conduit for dispersal or range expansion (USFWS 2006a). Little is known regarding the reproduction life history for the species.

Species Distribution

The current known range of the Banbury Springs limpet is portions of four cold-water spring complexes along 9.7 river km (6 RM) of the middle Snake River: Thousand Springs, Box Canyon Springs, Banbury Springs, and Briggs Springs (USFWS 2006a). These springs originate from the Eastern Snake Plain aquifer. Based on fossil records, the Banbury Springs limpet, along with four other snails endemic to southern Idaho, likely originated in the area within Pliocene Lake Idaho and its Pleistocene successors (USFWS 1995). It is thought likely that the Banbury Springs limpet historically occurred in large springs within Pliocene Lake Idaho (Frest and Johannes 1992).

Critical Habitat

Critical habitat has not been designated for the Banbury Springs limpet.

Life History

Banbury Springs limpets are known to occur in large, undisturbed springs containing cold, clear, and well oxygenated water where they avoid areas with large, attached plants or areas with fluctuating water levels. All known sites have swifter currents, but not turbid environments, with basalt cobbles to boulders having a minimum dimension of at least 7 cm (3 inches). The average depth at which they are found is 15 cm (6 inches). Banbury Springs limpets appear to move very little and reside in localized colonies. As this species lacks specialized respiratory organs, it is particularly susceptible to fluctuations in dissolved oxygen (Baker 1925).

Little is known regarding the dietary habits for the species. It appears to feed on periphyton (Frest and Johannes 1992).

Current Stressors and Threats

The primary factors that threaten the existence of the Banbury Springs limpet in its four remaining cold-water spring complexes and tributaries of the middle Snake River include the effects of habitat modification, spring flow reduction, reduced groundwater quality, the invasive New Zealand mudsnail (*Potamopyrgus antipodarum*), and inadequate regulatory mechanisms (USFWS 2006a). The respiratory requirements and life history attributes of the Banbury Springs limpet make it susceptible to small fluctuations in water temperature, dissolved oxygen, sediment, and the effects of pollutants. It is restricted to cold water springs with high water quality and stable substrate. Habitat modification has affected this species by reducing the availability of suitable cold-water spring habitats. Habitat modification at the four known locations includes hydroelectric development in the Thousand Springs Preserve, aquaculture diversions in Box Canyon and Briggs Springs, and past impoundments of the springflows at Banbury Springs (USFWS 2006a). Recently collected USFWS data show a declining population trend at the four monitored sites, and possible extirpation of the Thousand Springs site (Burak and Hopper 2012, 2014).

Coldwater springflows from the Eastern Snake Plain aquifer at the four Banbury Springs limpet sites are also declining. As spring flows continue to decline throughout the range of this species, flows appropriated for hydroelectric power generating facilities and cold-water springflows diverted for aquaculture facilities and other uses will continue to compete for and likely reduce the available water for the species (USFWS 2006a).

Degraded groundwater quality in the Snake River aquifer from agricultural and aquaculture practices may have contributed to the decline of the Banbury Springs limpet and will continue to affect water quality in the cold-water spring outflows upon which the species exists. Land areas overlying the Eastern Snake River Plain Aquifer, the source of spring water occupied by this species, are under intensive agricultural use and/or changing use (e.g., increasing livestock, dairies, and domestic), and many of these agricultural uses have increased their pumping and consumption of water from this aquifer while wastes associated with these activities pose threats to groundwater quality (USFWS 2006a).

The nonnative New Zealand mudsnail has invaded the cold-water springs where the Banbury Springs limpet colonies occur, and occupation of nearby cold-water spring habitat could alter the trophic dynamics of these tributary springs. Further, expansion of the mudsnail likely limits the ability of the Banbury Springs limpet to migrate and disperse to other suitable habitat in nearby locations (USFWS 2006a).

Because this species is currently restricted to four small and isolated colonies, future stochastic as well as anthropogenic disturbances could negatively impact it. Demographic as well as genetic stochasticity pose threats to the species (USFWS 2006a).

Existing regulatory mechanisms that oversee groundwater management of the Eastern Snake River Plain Aquifer may not be adequate to reverse the declining cold-water spring outflows or retain the water quality upon which the Banbury Springs limpet depends (USFWS 2006a).

Bliss Rapids Snail (*Taylorconcha serpenticola*)

The Bliss Rapids snail was listed as a threatened species on December 14, 1992 (57 FR 59244). On December 26, 2006, the State of Idaho and the Idaho Power Company petitioned the USFWS to delist the Bliss Rapids snail from the federal list of threatened and endangered species, based on new information that the species was more widespread and abundant than determined at the time of its listing. The USFWS reviewed the information provided in the petition and initiated a 12-month review of the species’ status. After compilation and review of new information, the USFWS hosted an expert panel of scientists and a panel of USFWS managers to reevaluate the species’ status. On September 16, 2009, based on the findings of these expert panels, the USFWS posted a notice in the Federal Register stating that the Bliss Rapids snail still warranted protection as a threatened species given its restricted range and the persistence of threats (USFWS 2008a).

The Bliss Rapids snail is 2.0 to 2.5 mm (0.08 to 0.1 inches) in height, with three whorls, and a very small ovoid/turbinate shell (approximately 2 to 4 mm [0.08 to 0.16 inches] long), with about 3.5 to 4.5 whorls (curls or turns in the shell). The shell is clear to white but appears to have two colors, very light tan to dark brown-red, which results in pale and orange forms. The pale form is slightly smaller with rounded whorls and with more melanin pigment on the body (USFWS 1995).

The Bliss Rapids snail occurs in cold water springs and spring-fed tributaries to the Snake River and in some reaches of the Snake River. The Bliss Rapids snail is primarily found on cobble boulder substrate (USFWS 2017a).

Species Distribution

The Bliss Rapids snail's historical range extends along the Snake River from Indian Cove Bridge roughly to Twin Falls and likely occurs upstream of American Falls in a disjunct population, where it had been reported from springs (USFWS 1995). The current documented range of extant populations is more restricted; this species has been identified from the Snake River near King Hill to below Lower Salmon Falls Dam, and from spring tributaries as far upstream as Ellison Springs (USFWS 2017a). There is an isolated river population that occupies a limited bypass reach (Dolman Rapids) between the Upper and Lower Salmon Falls reservoirs (USFWS 2017a). The species' range upstream of Upper Salmon Falls Reservoir is restricted to aquifer-fed spring tributaries where water quality is relatively high and human disturbance is less direct.

Critical Habitat

Critical habitat has not been designated for the Bliss Rapids snail.

Life History

The Bliss Rapids snail is typically found on the lateral and undersides of clean cobbles in pools, eddies, runs, and riffles, though it may occasionally be found on submerged woody debris (Hershler et al. 1994). The species seems to be restricted to shallower aquifer spring-influenced bodies of water within and associated with the Snake River from King Hill to Elison Springs. With few exceptions, the Bliss Rapids snail has not been found in sediment-laden habitats. It is typically found on, and reaches its highest densities on, clean gravel-to-boulder substrates in habitats with low-to-moderately swift currents, but it is usually absent from whitewater habitats (Hershler et al. 1994). The species' natural distribution within spring-influenced waters suggests that it requires cool water of relatively high or specific quality.

The greatest abundance of Bliss Rapids snails is found in spring habitats, where they frequently reach localized densities in the tens to thousands per square meter (Richards 2004). This is most likely due to the stable environmental conditions of these aquifer springs, which provide steady flows of consistent temperatures and relatively good water quality throughout the year. Despite the high densities reached within springs, Bliss Rapids snails may be absent from springs or portions of springs with otherwise uniform water quality conditions.

Recently completed studies found the species to be more common and abundant within the Snake River than previously thought, although typically in a patchy distribution with highly variable abundance (Richards and Arrington 2009).

The Bliss rapids snail is a "bulldozer" type grazer, feeding on periphyton found in most substrates (Richards et al. 2006).

Current Stressors and Threats

The loss of the river and spring habitat conditions within the Bliss Rapids snail's current range is the primary threat to the species. Loss of water quality, fluctuations in water temperature, and loss of water recharge rates could also pose threats.

The free-flowing, cold water environments where the species evolved have been affected by, and are vulnerable to, continued adverse habitat modification and deteriorating water quality from one or more of the following human activities: hydroelectric development, operations, and maintenance; water withdrawal and diversion; water pollution (point and non-point source); inadequate regulatory mechanisms that have failed to provide protection to the habitats; and impacts associated with nonnative species (69 FR 44676).

Development of water impoundments and hydroelectric dams has changed the fundamental character of the Snake River. This has resulted in fragmentation of previously continuous river habitat, affected fluvial dynamics, and contributed to the degradation of water quality. Habitat fragmentation has resulted in the isolation of extant snails into smaller subpopulations, which are now more vulnerable to extirpation from stochastic events and the factors outlined above (69 FR 44676).

River populations of Bliss Rapids snails are currently isolated from one another rather than being part of a larger, continuous, and interbreeding population, as was the case prior to dam construction. These smaller populations are at greater risk of extinction/extirpation due to normal fluctuations in their population numbers and are also at greater risk due to localized catastrophic events (e.g., toxics spills, sedimentation events, future development) and population declines due to sublethal effects of poor water quality (e.g., low densities of river populations of the Bliss Rapids snail) (BCA 2004).

Changes in water temperature and dissolved oxygen have been noted as critical parameters for species typically associated with cold water habitats. It is not known how impaired water quality may affect the reproduction, survival, or other life history characteristics of the Bliss Rapids snail because little research addressing these specific effects has been conducted for this species prior to or after its listing in 1992. For species that require free-flowing water and rocky substrates (such as the Bliss Rapids snail and the Snake River physa), siltation associated with erosion, reduced flow velocity, water impoundment, and other water uses, may be particularly detrimental. It is noteworthy that comparative data on the Bliss Rapids snail from colonies in the Snake River and clean, cold water tributaries and springs show its densities to be substantially larger in the springs and tributaries (Cazier 1997). Any factor that leads to chronic or acute deterioration of water quality is likely to result in the death, injury, or decline of the Bliss Rapids snail (BCA 2004).

Snake River Physa (*Physa natricina*)

The Snake River physa was listed as threatened on December 14, 1992 (57 FR 59244). The physa is a member of the family Physidae. The shells of adult Snake River physae may reach 7 mm (0.3 inches) in length with 3 to 3.5 whorls, and are amber to brown in color and ovoid in overall shape. The growth rings are oblique to the axis of coil and relatively coarse, appearing as raised threads. The body of the physa is nearly colorless, but tentacles have a dense black core of melanin in the distal half (USFWS 2014b). Population trends for this species appear to be stable; however, no studies that allow for accurate current abundance estimates or long-term demographic trends exist for this species (USFWS 2014b).

Species Distribution

At the time of its listing in 1992, the Snake River physa was presumed to occur in two disjunct populations, one in the Lower Salmon Falls and Bliss Reaches and one in the Minidoka Reach. Its historic range is believed to extend as far downstream as Grandview (USFWS 1995).

Much of the information about the species' distribution has come from recent advances in the use of genetic tools, which have provided a greater degree of certainty in identification, and hence confirmation of the species' abundance and distribution. Nevertheless, numerous questions remain regarding the factors limiting its distribution and abundance. While the full extent of the Snake River physa's range is considerably greater than originally thought, the species is not uniformly distributed throughout that range, and there remain extensive portions of the Snake River that have not been fully studied.

Critical Habitat

Critical habitat has not been designated for the Snake River physa.

Life History

The Snake River physa has only been found within the Snake River. Suitable habitat includes pebble to gravel (and possible cobble to gravel) substrates that are largely free of macrophytes, as well as substrates finer than gravel that can fill in the interstitial spaces. While its specific water temperature tolerance is unknown, the Snake River physa has been collected in areas where average water temperatures ranged from 22.6 °C to 23.4 °C (74.1 to 72.7 °F); these temperatures exceed Idaho's temperature standard for cold water biota (USFWS 2014b). The physa is most frequently found at depths of 1.5 to 2.5 m (5 to 8 ft), with their depth ranging from less than 0.5 m (1.6 ft) to over 3.0 m (9.8 ft) (USFWS 2014b). Water temperature requirements and tolerances of Snake River physa have not been specifically researched.

Diet preferences of the Snake River physa are not known. Species within the family Physidae live in a wide variety of habitats and exhibit a variety of dietary preferences to match this. Physidae from numerous studies consumed materials as diverse as macrophytes, benthic diatoms (diatom films that primarily grow on rock surfaces), bacterial films, and detritus (Dillon 2000). Physa gyrina, which co-occurs with Snake River physa in the Snake River, consumes dead and decaying vegetation, algae, water molds, and detritus (Dillon 2000).

Current Stressors and Threats

Multiple factors, including operations of existing dams, degraded water quality, and climate change, currently constitute the primary threat to the Snake River physa. The effect from degraded water quality is not uniform throughout the species' range but appears to be affecting its distribution and suitable habitat, primarily outside of the Minidoka reach. This is likely due to decreased water flow during summer months in this area, while increased flows during summer in the Minidoka reach keep substrates relatively free of fine sediments and result in macrophyte growth. Lastly, while federal consultation is now required for the Snake River physa through section 7 of the ESA, the inadequacy of existing regulatory mechanisms continues to threaten the Snake River physa due to the lack of state regulations specific to the species, along with inadequate water quality and invasive species regulations (USFWS 2014b).

3.2.2.3 Butterflies

Island Marble Butterfly (*Euchloe ausonides insulanus*)

Island marble butterfly was added to the list of candidate species on April 5, 2016 when USFWS announced the 12-month findings on a petition to list the species as endangered or threatened (81 FR 19527). The 12-month finding determined that the listing was warranted but precluded by higher priority listing actions and was given a listing priority number of 3 based on the finding that the species faces threats that are imminent and of high magnitude. On April 12, 2018, the USFWS proposed to list the island marble butterfly as an endangered species and designate critical habitat (83 FR 15900). The final listing rule for the island marble butterfly is scheduled to publish on or before April 12, 2019 (USFWS 2018b).

Credit: Thor Hansen

The island marble butterfly is a subspecies of the large marble butterfly (*E. ausonides*), which primarily consist of yellow and white butterflies. The island marble butterfly is distinguishable from other subspecies of the large marble butterfly by their larger size and expanded marbling pattern of yellow and green on the underside of the hindwings and forewings and distinctly different colorations and markings in immature stages (Black and Vaughan 2005). The island marble butterfly is also behaviorally distinct; large marble butterflies pupate directly on their larval host plants,[35] whereas the island marble butterflies leave their host plants to find a suitable pupation site up to 4 m (13 ft) away (Lambert 2011)

The island marble butterfly inhabits open coastal lowlands including grasslands, sand dunes, and tidal lagoons. All habitat types are distinguished by the presences of host plants in the mustard family (Brassicaceae), full sunlight and some type of topographic relief (e.g., bluffs, ridges, or dunes (Lambert 2011)

Species Distribution

The island marble butterfly is geographically isolated from other subspecies of large marble butterfly. The species was first described in 2001 by Guppy and Shepard[36] based on 14 specimens collected between 1859 and 1908 on or near Vancouver Island, British Columbia, Canada (in the Greater Victoria area, near Nanaimo, and on adjacent Gabriola Island [83 FR 15900]). No

[35] Host plants are defined as those plants that support development of larvae through the final instar under field conditions.

[36] Guppy, C.S., and J.H. Shepard. 2001. Butterflies of British Columbia: Including Western Alberta, Southern Yukon, the Alaska Panhandle, Washington, Northern Oregon, Northern Idaho, and Northwestern Montana. UBC Press. Vancouver, B.B. 413 pp.

specimens have been collected in British Columbia since 1908, and the species is believed to be extirpated from the province (COSEWIC 2010).

The island marble butterfly was rediscovered in 1998 on San Juan Island, Washington. Subsequent surveys in suitable habitat throughout the region located two other occupied areas—another area on San Juan Island and one on nearby Lopez Island. Since 2006, the number and distribution of the species has declined and is now observed only in a single area centered on American Camp, which is part of San Juan Island National Historical Park, managed by the National Park Service (83 FR 15900).

Critical Habitat

On April 12, 2018, the USFWS proposed to designate critical habitat for the island marble butterfly (83 FR 15900). The final listing rule is scheduled to be published on or before Aprils 12, 2019 (USFWS 2018b).

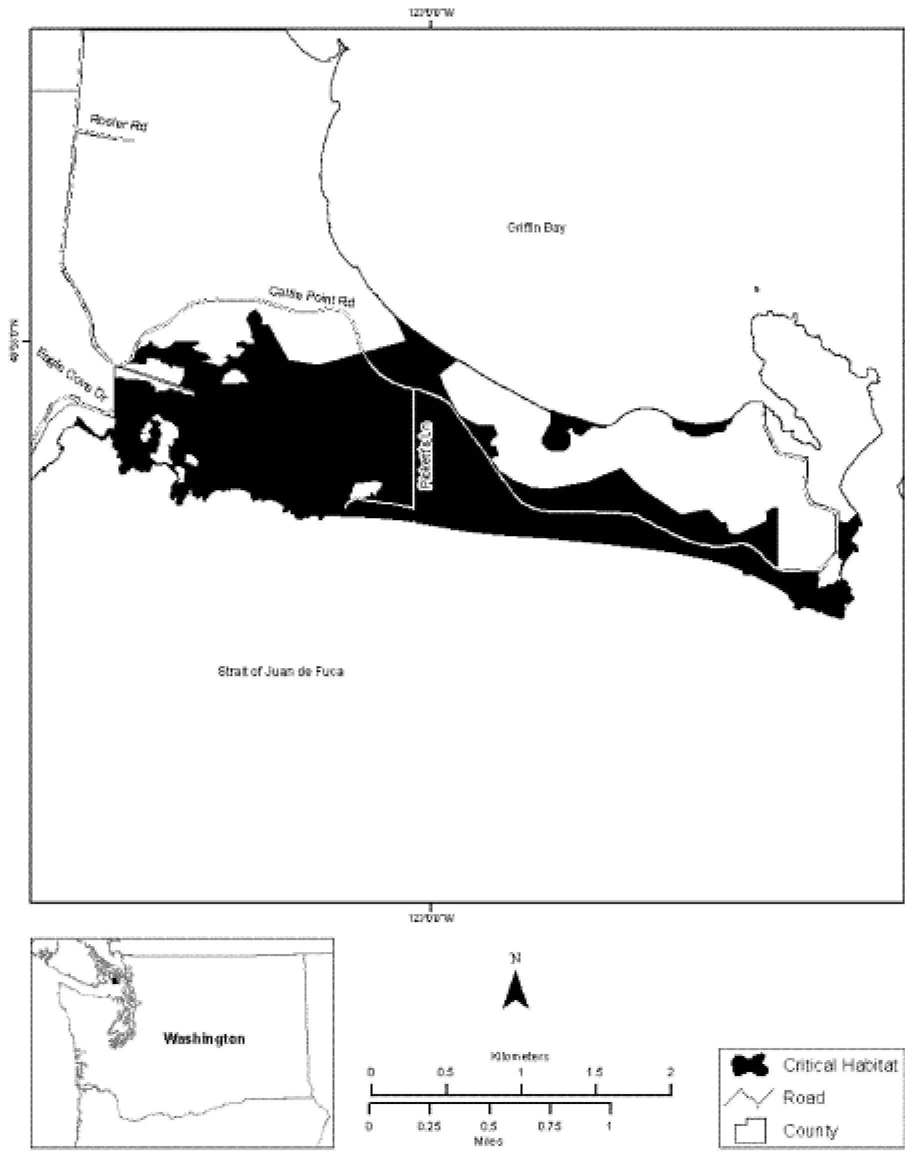
The proposed critical habitat designation consists of 329 ha (812 acres) of land at the south end of San Juan Island, with San Juan Island National Historical Park (National Park Service) being the largest landholder of 291 ha (718 acres) (90 percent). Almost all of the remaining land is also conserved for use by or for the benefit of the public; approximately 5 percent is in state ownership and 4 percent in county ownership. Less than 0.5 percent (approximately 0.8 ha [2 acres]) is held in private ownership (83 FR 15900). The National Park Service has maintained a conservation agreement for the island marble butterfly with the USFWS since 2006, although the most recent conservation agreement has lapsed. The next version has not yet been signed by both parties (83 FR 15900). Boundaries for the critical habitat unit follow the open, generally treeless habitat that the island marble butterfly relies upon during its flight period for mate-finding, reproduction, feeding, and dispersal (Figure 3-27).

PBFs determined to be essential to the conservation of the island marble butterfly include:

- Open, primarily treeless areas with short-saturated forb- and grass-dominated vegetation that include diverse topographic features such as ridgelines, hills, and bluffs, for patrolling, dispersal corridors between habitat patches, and some south-facing terrain. Areas must be large enough to allow for the development of patchy-population dynamics, allowing for multiple small populations to establish within the area.
- Low- to medium-density larval host plants for egg-laying and larval development, with both flower buds and blooms on them between the months of May through July. Larval host plants may be any of the following: *Brassica rapa*, *Sisymbrium altissimum*, or *Lepidium virginicum*.
- Adult nectar resources in flower and short-statured, white-flowering plants in bloom used for mate-finding.
- Areas of undisturbed vegetation surrounding larval host plants sufficient to provide secure sites for diapause and pupation. The vegetation surrounding larval host plants must be left standing for a sufficient period of time for the island marble butterfly to complete its life cycle.

Life History

Island marble butterflies spend most of their year-long life in diapause. They are most visible in the spring when they are winged adults, but for the rest of the year they are present as either eggs, larvae, or chrysalises (USFWS 2018b).



Source: 83 FR 15900

Figure 3-27 Proposed Critical Habitat for Island Marble Butterfly (*Euchloe ausonides insulanus*) on San Juan Island

Adults emerge in the spring in response to environmental cues that stimulate metamorphosis. After emerging, the adults immediately mate, and the females lays their eggs on the unopened flower buds of their larval host mustard plants (Lambert 2011). Females produce a single brood, and adults live for just 6 to 9 days (Black and Vaughan 2005). The eggs hatch after about 10 days, and the larvae feed on the flower petals of the host mustard plants. First instar larvae rely solely on the tender flower buds as their food source. As they grow and molt, they are able to feed on older parts of the plants. After about 35 days, the caterpillar leaves the host mustard plant and travels a short distance (approximately 2 to 5 m [6.5 to 16.5 ft]) through standing vegetation, searching for a suitable site to pupate into a chrysalis (Lambert 2011; USFWS 2018b)). Individual adult island marble butterflies seldom disperse distances greater than 0.6 km (0.4 miles) (Peterson 2010, cited in 83 FR 15900).[37]

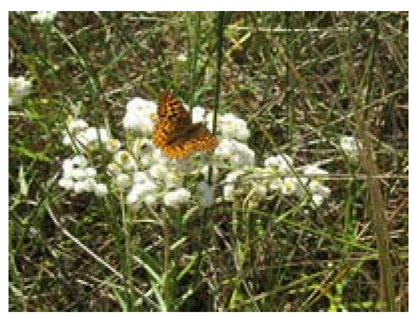
Current Stressors and Threats

Island marble butterflies are primarily threatened by disturbance or destruction of their required habitat. Because the butterfly exhibits strong site fidelity and low dispersal capacity, they are especially vulnerable to development in areas they inhabit. Island marble butterfly larvae feed on host mustard plants, which are early successional species that densely colonize disturbed soil after ground disturbing activities like plowing, burning, and digging by animals and humans. While these activities can help create habitat for the island marble butterfly, the habitat is not stable. Mowing, grazing, trampling of vegetation, burning, plowing, and herbicides can harm or kill mustard plants. The butterfly must then disperse from declining host patches to newly colonized sites (Lambert 2011; WDFW 2013)

Pesticide use, including the biocide *Bacillus thuringiensis* var. *kustaki*, on and around plants can kill butterflies and larvae. Deer predations, by way of eating the mustard flowers where eggs are deposited and larvae develop, is common and presents a threat to the butterfly (Lambert 2011; WDFW 2013).

Oregon Silverspot Butterfly (*Speryeria zerene hippolyta*)

The Oregon silverspot butterfly was listed as threatened on July 2, 1980 (45 FR 44935). The species, a true fritillary of the family Nymphalidae, is one of eight species and 36 subspecies of the genus Speyeria found in the Pacific Northwest. The Oregon silverspot butterfly is an orange and brown butterfly named for the metallic silver spots located on the ventral hindwing. It is one of five subspecies in the bremnerii group and differs from other subspecies in its coloration (i.e., dark reddish brown disc color and clear yellow sub-marginal band) and small size, with a mean forewing length of 27 mm (1.1 inches). The caterpillar development rate is very slow compared to that of other subspecies (USFWS 2001b).



Source: Gary Falxa, USFWS

Species Distribution

Historically, the Oregon silverspot butterfly was distributed along the Washington and Oregon coasts from Westport in Grays Harbor County, Washington, south to Heceta Head in Lane County, Oregon, with a disjunct population located north of Crescent City in Del Norte County, California. At the time of listing in 1980, only the Rock Creek–Big Creek population and what was then called

[37] Peterson, M.A. 2010. Monitoring Plan for the Island Marble Butterfly (*Euchloe ausonides insulanus*) at American Camp, San Juan Island National Historical Park. Unpublished report to San Juan Island National Historical Park.

the Tenmile Creek population, now called the Bray Point population, were considered healthy. One population in Washington and seven in Oregon were mentioned in the 1980 listing document. There are only five remaining populations of Oregon silverspot butterfly in existence—four in Oregon and one in northern California. Each small population is at great risk of extirpation. Currently, the five populations known to be extant are located at Rock Creek-Big Creek, Bray Point, Cascade Head, and Mt. Hebo, Oregon and Del Norte County, California (76 FR 22139).

The Oregon silverspot butterfly five-year review concluded that the species "is in danger of extinction throughout its range" and recommended an up-listing to endangered status (76 FR 22139).

Critical Habitat

Critical habitat for the Oregon silverspot butterfly was designated at the time the species was listed (45 FR 44935). This designation is for coastal salt spray meadow in Lane County, Oregon that were known to be occupied by the species at the time and believed to support the last viable population.

PBFs determined to be essential to the conservation of the Oregon silverspot butterfly is access to:

- The early blue violet (*Viola adunca*), which is the primary host plant for the butterfly larvae;
- A variety of composite plants (including, but not limited to, yarrow (*Achillea millefolium*), pearly everlasting (*Anaphalis margaritacea*), Pacific aster (*Symphyotrichum chilense*), Canada goldenrod (*Solidago canadensis*), tansy ragwort (*Senecio jacobaea*), and edible thistle (*Cirsium edule*) that bloom during that bloom during the butterfly flight period and from which the adults obtain nectar;
- Grasses and forbs in which the butterfly larvae find shelter; and
- Spruce woods in which the adults find shelter.

Life History

The Oregon silverspot butterfly occupies four types of grassland habitats: marine terrace, coastal headland "salt spray" meadows, stabilized dunes, and montane grasslands. To support the species, each habitat area must provide the caterpillar host plant, early blue violets, and adult butterfly nectar sources.

Adult Oregon silverspot butterflies leave the windy meadows for shelter in an adjacent forest. There, they will feed on nectar-producing flowers (composites) and find a mate. Mating usually takes place in relatively sheltered areas. Central to the life cycle of the Oregon silverspot butterfly is the abundance of the caterpillar host plant, the early blue violet (*Viola adunca*). Based on laboratory studies, 200 to 300 violet leaves are needed for a single Oregon silverspot butterfly to develop from caterpillar to pupae. In the wild, a caterpillar would require a clump of approximately 16 violet plants for development, assuming each violet could provide about 12 to 20 leaves.

The Oregon silverspot butterfly relies on a variety of native nectar plants; most frequently used by the adult butterflies are Canada goldenrod (*Solidago canadensis*), dune goldenrod (*Solidago spathulata*), Pacific aster (*Symphyotrichum chilense*), western pearly everlasting (*Anaphalis margaritacea*), edible thistle (*Cirsium edule*), and common yarrow. Nectar abundance and quality are also important to adult survival and, particularly, fecundity (Mevi-Schutz and Erhard 2005; Boggs and Ross 1993; Schultz and Dlugosch 1999).

Current Stressors and Threats

Habitat disturbance regimes, which maintain an early seral habitat stage, have been altered dramatically over the years. Without disturbance, meadow habitat is lost to succession. Aerial photo interpretation of the Oregon silverspot butterfly critical habitat area at Rock Creek-Big Creek performed by The Nature Conservancy determined that there were 40 ha (99 acres) of prairie in 1943, 18 ha (44 acres) in 1975, and just 11 ha (27 acres) in 2005 due to succession (Pickering 2011). In addition to allowing succession, fire suppression activities such as fire-line construction, fire roads, and use of fire retardant can destroy habitat. If, for example, a high-nutrient fire retardant were used within occupied habitat such as the meadows of Mt. Hebo, the extra nutrients would likely increase the ability of nonnative plant species to out-compete the native low-nutrient adapted plant community. While fire was used historically to maintain prairies, in the presence of nonnative invasive plants and a depleted native seed bank, fire can degrade habitat by releasing the faster-growing nonnative grass species. Prairie restoration methods have been developed for use on northwest prairies in the Puget Trough in Washington. The use of fire has been beneficial when employed in conjunction with grass-specific herbicide, followed by seeding with native species to augment the existing seed bank (USFWS 2015).

Within remaining early seral habitats, wild violet abundance and native nectar sources have declined at all Oregon silverspot butterfly habitat areas, due primarily to competition from nonnative vegetation. Nonnative plants have also played a role in stabilizing the previously dynamic coastal ecosystem. This stabilization has reduced suitable habitat for the Oregon silverspot butterfly by eliminating former grassland and preventing formation of native-dominated early seral habitat (USFWS 2015).

The most significant threat to the species is a lack of suitable habitat. At all sites, invasive plant species have degraded habitat quality. Habitat maintenance methods are currently inadequate to control nonnative plant species within habitat areas. Each habitat site has different invasive species issues depending on prior land use, soils, and ecosystem type. Most experimental research plots within the butterfly habitat areas have been small in scale. The use of herbicides is likely needed to successfully restore enough suitable habitat for the species to preserve existing populations and provide habitat for reintroduced populations (USFWS 2015).

Taylor’s Checkerspot (*Euphydyas editha taylori*)

Taylor’s checkerspot butterfly was listed as an endangered species on October 3, 2013, throughout its range in Washington, Oregon, and British Columbia (78 FR 61452).

Taylor’s checkerspot is a butterfly in the family Nymphalidae (brushfoots). It is medium sized (≤5.7 cm [≤2.25 inches]) and colorfully marked, with a checkerboard pattern on the upper side of the wings (USFWS 2015). The upper side of the wings are black with orange and yellowish (or white) spot bands, giving them a checkered appearance (USFWS 2015). Taylor’s checkerspot butterfly is one of several subspecies of Edith’s checkerspot butterfly (*Euphydryas editha*), which also includes the bay checkerspot butterfly (*E. e. bayensis*) and the Quino checkerspot butterfly (*E. e. quino*), both of which are federally listed as endangered species.

Species Distribution

Taylor's checkerspot butterfly was historically known to occur in British Columbia, Washington, and Oregon, and its current distribution represents a reduction from over 80 locations range-wide to 14 sites in 2013. Historically, this species was likely distributed throughout grassland habitat found on prairies, shallow-soil balds (a bald is a small opening on slopes in a treeless area, dominated by herbaceous vegetation), grassland bluffs, and grassland openings within a forested matrix on south Vancouver Island, the northern Olympic Peninsula, the south Puget Sound prairies, and the Willamette Valley (USFWS 2015).

Checkerspot butterfly populations can fluctuate widely from year to year, primarily due to the complex interactions of host plant phenology, annual weather conditions, and local topography (USFWS 2015; McLaughlin et al. 2002). Some Taylor's checkerspot populations in Washington have exhibited boom years with several thousand individuals and then declined dramatically to only 100 or so butterflies remaining the following year (Stinson 2005).

Critical Habitat

On October 3, 2013, the USFWS designated critical habitat for Taylor's checkerspot butterfly under the ESA (78 FR 61505). The critical habitat designation encompasses approximately 785 ha (1,940 acres) in Island, Clallam, and Thurston Counties in Washington and in Benton County, Oregon.

PBFs determined to be essential to the conservation of the Taylor's checkerspot butterfly include:

- Landscape heterogeneity, bare ground for basking, and diverse and abundant larval and adult plant resources

Life History

Taylor's checkerspot butterfly requires open grassland habitat dominated by short-statured grasses, with abundant forbs to serve as larval host plants and nectar sources. These habitats are found on prairies, shallow-soil balds (Chappell 2006), grassland bluffs, and grassy openings within a forested matrix on south Vancouver Island, British Columbia; the north Olympic Peninsula; south Puget Sound, Washington; and the Willamette Valley, Oregon. Occupied habitats range in elevation from near sea-level to over 975 m (3,200 ft) in elevation, and occupied grassland patches range in size from less than 0.4 ha (1 acre) up to 40-plus ha (100-plus acres) (USFWS 2015).

In Washington, Taylor's checkerspot butterflies inhabit glacial outwash prairies in the south Puget Sound region. Northwest prairies were formerly more common, larger, and interconnected and supported a greater distribution and abundance of the species than prairie habitat does today. On the northeast Olympic Peninsula, Taylor's checkerspot butterflies use shallow-soil balds and grasses within a forested landscape, as well as roadsides, former clear-cut areas within a forested matrix, and a coastal stabilized dune site near the Strait of Juan de Fuca (Stinson 2005).

Areas with open, bare soil are an important habitat component for Taylor's checkerspot butterfly, as these areas warm more quickly than the surrounding vegetation, and butterflies thermoregulate by basking (Stinson 2005; Kuussaari et al. 2004; USFWS 2015). Dispersal within a habitat patch benefits the larvae because they are able to elevate their body temperature to an optimal range for foraging and development (Kuussaari et al. 2004).

Taylor's checkerspot caterpillars feed on the green leaves and flowers of host plants. Adult nectar sources for the Taylor's checkerspot butterfly consist of native prairie forbs like common camas (*Camassia quamash*), common yarrow (*Achillea millefolium*), and desert-parsley or biscuit root (*Lomatium* spp.) (USFWS 2015).

Current Stressors and Threats

The primary reasons for the species' "threatened" listing are extensive habitat loss through conversion and degradation of habitat, particularly from agricultural and urban development; successional changes to grassland habitat; military training; the spread of invasive plants; and other factors such as low genetic diversity, small or isolated populations, low reproductive success, and declining population sizes. The primary long-term threat to Taylor's checkerspot butterfly is the loss, conversion, and degradation of habitat, particularly as a consequence of agricultural and urban development, successional changes to grassland habitat, and the spread of invasive plants (USFWS 2015).

Native prairies and grasslands have been severely reduced throughout the range of Taylor's checkerspot butterfly as a result of human activity due to conversion of habitat to residential and commercial development and agriculture. Prairie habitat continues to be lost, particularly to residential development (Stinson 2005) by removal of native vegetation and the excavation and grading of surfaces and conversion to non-habitat (buildings, pavement, other infrastructure). Residential development is associated with increased infrastructure such as new road construction, which is one of the primary causes of landscape fragmentation (Watts et al. 2007).

Prairies, which historically covered a vast area of the south Puget Sound region, have largely been lost over the past 150 years (Crawford and Hall 1997). The primary causes of prairie habitat loss in the region are attributed to the conversion of prairie habitat to urban development and agricultural uses (over 60% of losses) and succession to Douglas-fir forest (32%) (Crawford and Hall 1997). Today, approximately 8% of the original prairies in the south Puget Sound area remain, but only about 3% contain native prairie vegetation (Crawford and Hall 1997).

The suppression and loss of natural and anthropogenic disturbance regimes, such as fire, across vast portions of the landscape has resulted in altered vegetation structure in the prairies and meadows and has facilitated invasion by nonnative grasses and woody vegetation, rendering habitat unusable for Taylor's checkerspot butterfly. Frequent burning reduces the encroachment and spread of shrubs and trees (Storm and Shebitz 2006), favoring open grasslands with a rich variety of native plants and animals. The basic ecological processes that maintain prairies or meadows have disappeared from, or have been altered on, all but a few protected and managed sites.

Taylor's checkerspot butterfly continues to face threats from land development and loss of habitat from conversion to other uses (agriculture); the impacts of military training and recreation; existing and likely future habitat fragmentation; habitat disturbance; long-term fire suppression; and ongoing loss and degradation of habitat associated with native and nonnative invasive species.

These factors have resulted in the present isolation and limited distribution of the subspecies, and are currently ongoing and will continue into the foreseeable future. The combination of ongoing threats coupled with small population sizes and highly variable population dynamics indicate that the Taylor's checkerspot is currently in danger of extinction throughout its range (USFWS 2015).

3.2.2.4 Fish

Bull Trout (*Salvelinus confluentus*)

The coterminous US population of bull trout was listed as threatened on November 1, 1999 (64 FR 58910).

Distribution

Bull trout generally occur in the Klamath River Basin of south-central Oregon; the Jarbidge River in Nevada; the Willamette River Basin in Oregon; Pacific Coast drainages of Washington, including Puget Sound; major rivers within the Columbia River Basin in Idaho, Oregon, Washington, and Montana; and the St. Mary-Belly River, east of the Continental Divide in northwestern Montana (Bond 1992; Brewin and Brewin 1997; Cavender 1978; Leary and Allendorf 1997).

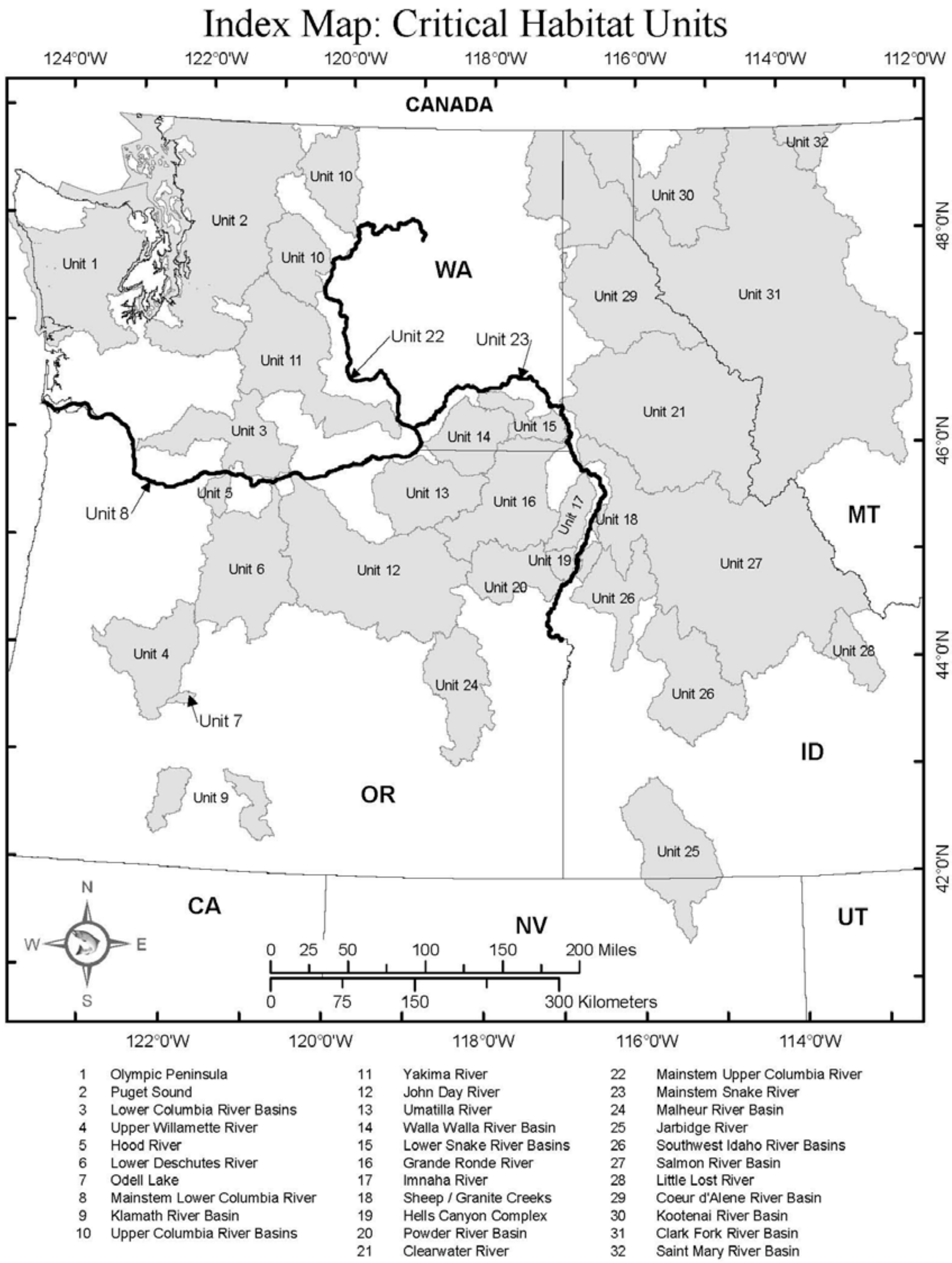
Critical Habitat

A final ruling on critical habitat for bull trout in the coterminous US was made on October 18, 2010 (effective November 17, 2010) (75 FR 63898). Critical habitat for bull trout includes approximately 32,187 km (20,000 miles) of riverine habitat, 1,207 km (750 miles) of marine shoreline, and 197,487 ha (488,001 acres) of lacustrine habitat. Critical habitat spans Washington, Oregon, Idaho, Nevada, and Montana (Figure 3-28).

The PBFs determined to be essential to the conservation of bull trout are:

- Springs, seeps, groundwater sources, and subsurface water connectivity (hyporheic flows) to contribute to water quality and quantity and provide thermal refugia;
- Migration habitats with minimal physical, biological, or water quality impediments between spawning, rearing, overwintering, and freshwater and marine foraging habitats, including but not limited to permanent, partial, intermittent, or seasonal barriers;
- An abundance of food, including terrestrial organisms of riparian origin, aquatic macroinvertebrates, and forage fish;
- Complex shorelines with features such as large wood, side channels, pools, undercut banks, and unembedded substrates, to provide a variety of depths, gradients, velocities, and structure;
- Water temperatures ranging from 2 to 15°C (36 to 59°F), with adequate thermal refugia available for temperatures that exceed the upper end of this range;
- Sufficient and appropriate substrate in spawning and rearing areas;
- Water flows approximating natural timing (historic and seasonal ranges) for peak, high, low, and base flow;
- Sufficient water quality and quantity to sustain normal reproduction, growth, and survival; and

- Low occurrence of nonnative predatory (e.g., lake trout, walleye, northern pike, smallmouth bass), interbreeding (e.g., brook trout), or competing (e.g., brown trout) species.



Source: 75 FR 63898

Figure 3-28 Critical Habitat Units for Bull Trout of the Coterminous US

Life History

Bull trout exhibit both resident and migratory life history strategies. Both resident and migratory forms may be found together, and either form may produce offspring exhibiting either resident or migratory behavior (Rieman and McIntyre 1993). Resident bull trout complete their entire life cycle in or near tributary streams where they spawn and rear. Migratory bull trout spawn in tributary streams where juvenile fish rear for one to four years before migrating to a lake, river (Fraley and Shepard 1989; Goetz 1989), or saltwater (Cavender 1978; McPhail and Baxter 1996; WDFW et al. 1997). Bull trout reach sexual maturity in four to seven years and may live longer than 12 years. They are iteroparous, meaning that they may spawn more than once in a lifetime. Bull trout typically spawn from August through November during periods of increasing flows and decreasing water temperatures. Spawning areas are often associated with cold-water springs, groundwater infiltration, and the coldest streams in a given watershed (Baxter et al. 1997; Pratt 1992; Rieman and McIntyre 1993; Rieman et al. 1997). Fry normally emerge from early April through May, depending on water temperatures and increasing stream flows (Ratliff and Howell 1992 in Howell and Buchanan 1992; Pratt 1992). Bull trout are primarily found in colder streams (below 15°C; 59°F) (Fraley and Shepard 1989; Pratt 1992; Rieman and McIntyre 1993), though they may be found in warmer waters that have access to colder refuges.

Bull trout have more specific habitat requirements than most other salmonids (Rieman and McIntyre 1993). Habitat components that influence bull trout distribution and abundance include water temperature (as described above), availability of cover, channel form and stability, valley form, spawning and rearing substrate, and migratory corridors (Fraley and Shepard 1989; Goetz 1989; Howell and Buchanan 1992; Pratt 1992; Rich 1996; Rieman and McIntyre 1993; Rieman and McIntyre 1995; Sedell and Everest 1991; Watson and Hillman 1997). All life history stages of bull trout are associated with complex forms of cover, including large woody debris, undercut banks, boulders, and pools (Fraley and Shepard 1989; Goetz 1989; Hoelscher and Bjornn 1989; Pratt 1992; Rich 1996; Sedell and Everest 1991; Sexauer and James 1997; Thomas 1992; Watson and Hillman 1997). Early life stages of bull trout, specifically the developing embryo, require the highest inter-gravel dissolved oxygen levels, and are the most sensitive life stage to reduced oxygen levels. The oxygen demand of embryos depends on temperature and stage of development, with the greatest dissolved oxygen required just prior to hatching.

Bull trout are opportunistic feeders, with food habits primarily a function of size and life-history strategy. Resident and juvenile migratory bull trout prey on terrestrial and aquatic insects, macrozooplankton, and small fish (Boag 1987; Donald and Alger 1993; Goetz 1989). Bull trout may also feed heavily on fish eggs of other salmon (Lowery and Beauchamp 2015). Subadult and adult migratory bull trout feed on various fish species (Brown 1994; Donald and Alger 1993; Fraley and Shepard 1989; Leathe and Graham 1982). In marine nearshore areas of western Washington, bull trout feed on Pacific herring, Pacific sand lance, and surf smelt (Goetz et al. 2004; WDFW et al. 1997). Bull trout of sizes greater than fry have been found to eat fish up to half their length (Beauchamp and VanTassell 2001).

Current Stressors and Threats

Throughout their range, bull trout are threatened by the combined effects of habitat degradation, fragmentation, and alterations associated with dewatering, road construction and maintenance, mining, grazing, the blockage of migratory corridors by dams or other diversion structures, entrainment in diversion channels, and introduced non-native species (64 FR 58910). Although all salmonids are likely to be affected by climate change, bull trout are especially vulnerable given that spawning and rearing are constrained by their location in upper watersheds and the requirement for cold water temperatures (Battin et al. 2007; Rieman et al. 2007). Additional threats to bull trout include industrial development and urbanization, timber harvest, and poaching or bycatch.

The iteroparous reproductive strategy of bull trout has important repercussions for the management of this species. Bull trout require passage both upstream and downstream for both spawning and foraging, and passage must be allowed for multiple spawning migrations. However, most fish ladders were designed specifically for anadromous, semelparous salmonids (spawning once before death). Therefore, fish passage facilities (e.g., fish ladders) at barriers to migration may be a factor in isolating bull trout populations because they do not provide downstream passage for adults and subadults. Additionally, in some core areas, bull trout that migrate to marine waters must pass both upstream and downstream through areas with net fisheries at river mouths. This can increase the likelihood of mortality during spawning and foraging migrations.

Climate change is likely to play an increasingly important role in determining the abundance of ESA-listed species and the conservation value of designated critical habitats in the Pacific Northwest. Average regional temperatures are likely to increase by -16°C to -12°C (3°F to 10°F) over the next century (USGCRP 2009). Overall, about one-third of the current cold-water habitat in the Pacific Northwest is likely to exceed water temperature thresholds for bull trout by the end of this century (USGCRP 2009). Significant reductions in both total snow pack and low-elevation snow pack in the Pacific Northwest are predicted over the next 50 years (Mote and Salathé 2010), which will shrink the extent of the snowmelt-dominated habitat available to salmonids and cause warmer temperatures after snowmelt has run off (USGCRP 2009). As the snow pack diminishes and seasonal hydrology shifts to more frequent and severe early large storms, stream flow timing and increased peak river flows may limit salmonid survival (Mantua et al. 2010). Similarly, marine conditions adverse to salmonids may be more likely under a warming climate (Zabel et al. 2006).

Kootenai River White Sturgeon (*Acipenser transmontanus*)

A proposed rule to list the Kootenai River white sturgeon (hereafter referred to as the “Kootenai sturgeon”) as endangered was published on July 7, 1993 (58 FR 36379), with a final rule following on September 6, 1994 (59 FR 45989).

Distribution

The Kootenai sturgeon is one of 18 land-locked populations of white sturgeon known to occur in western North America (USFWS 1999). Kootenai sturgeon occur in Idaho, Montana, and British Columbia and are restricted to approximately 270 km (168 miles) of the Kootenai River extending from Kootenai Falls, Montana, downstream through Kootenay Lake to Corra Linn Dam. Approximately 45% of the Kootenai sturgeon’s range is within British Columbia. Apperson and Anders (1990) report that 36% of observed Kootenai sturgeon over-winter in Kootenay Lake. Adult Kootenai sturgeon forage in and migrate freely throughout the Kootenai River downstream of Kootenai Falls. Juvenile Kootenai sturgeon also forage in and migrate freely throughout the lower Kootenai River downstream of Kootenai Falls and within Kootenay Lake. Apperson and

Anders (1990) observed that Kootenai sturgeon no longer commonly occur upstream of Bonners Ferry, Idaho.

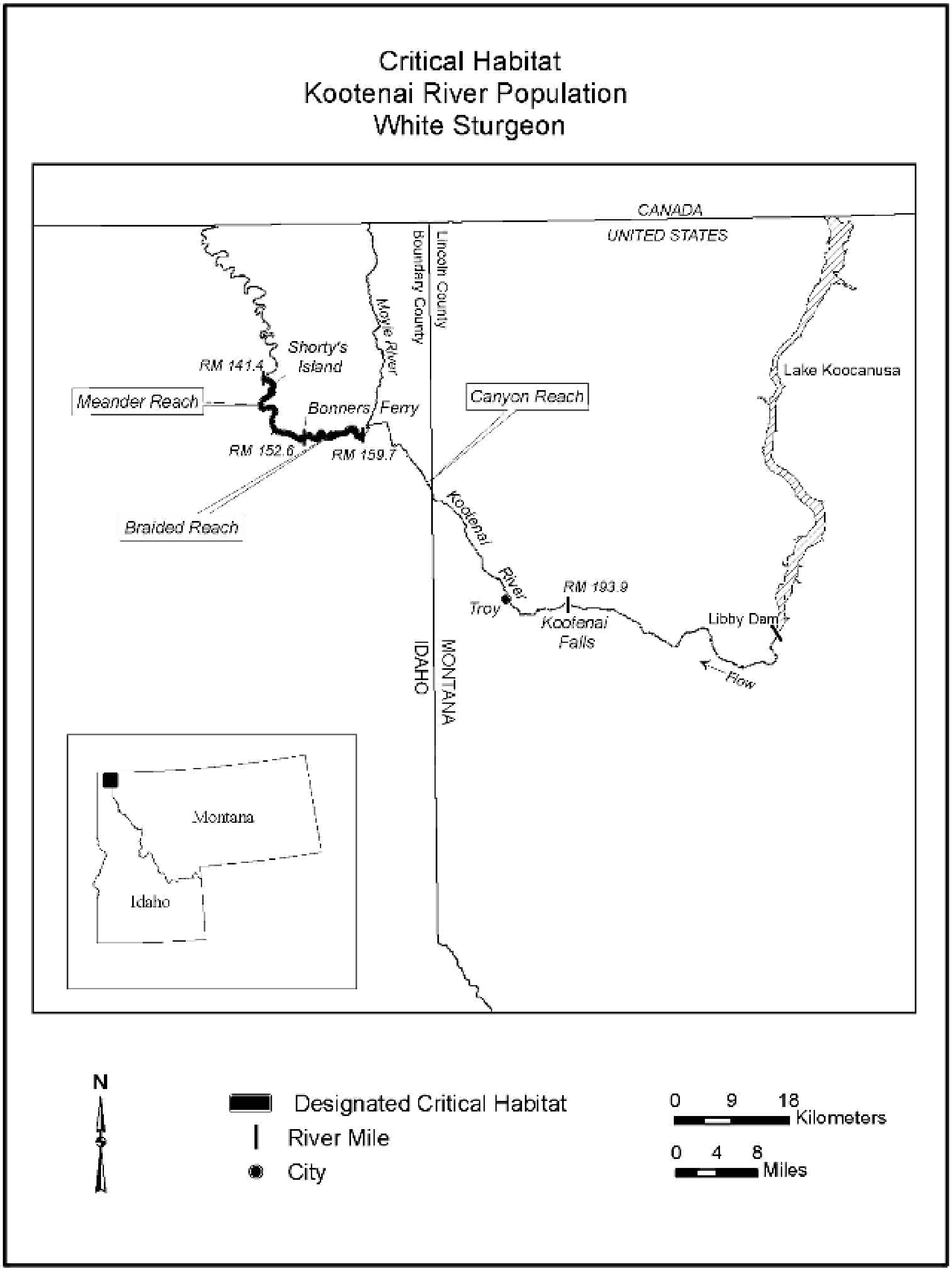
Critical Habitat

Critical habitat for the Kootenai sturgeon was designated on September 6, 2001 (66 FR 46548). The critical habitat designation extends from ordinary high water line to ordinary high water line on the right and left banks, respectively, along approximately 18 km (11 miles) of the mainstem Kootenai River from RM 141.4 to RM 152.6 in Boundary County, Idaho (Figure 3-29). On July 9, 2008, the braided reach (RM 152.6 to RM 159.7) was also designated as critical habitat (73 FR 39506). A total of 18.3 RM is designated as critical habitat for Kootenai sturgeon.

Kootenai sturgeon critical habitat PBFs are specifically focused on adult migration, spawning site selection, and survival of embryos and free-embryos, the latter two of which are the life stages now identified as limiting the reproduction and numbers of the Kootenai sturgeon. Specifically, the PBFs determined to be essential to the conservation of Kootenai sturgeon critical habitat include:

- Flow regime that creates a hydrologic profile (flow, magnitude, timing, velocity, and water depth and quality (including temperatures) necessary for normal behavior for reproduction. During the spawning season of May through June, the hydrology profile should:
  - Approximate natural conditions and produce depths of 7 m (23 ft) or greater and water velocities of 1 m per second (3.3 ft per second) or greater when natural conditions (e.g., weather patterns, water year) allow.
  - Maintain water temperatures between 8.5 and 12°C (47.3 and 53.6°F), with no more than a 2°C (3.6°F) fluctuation in temperature within a 24-hour period, as measured at Bonners Ferry.
- Flow regime of sufficient duration and magnitude to restore or maintain appropriate substrate for sheltering and incubating eggs and yolk sac fry. Sturgeon critical habitat must have submerged rocky substrates in approximately 8 continuous km (5 miles) of river to provide for natural larval dispersal.
- Flow regime to create hydrology profile necessary for the normal behavior of adult and juvenile sturgeon.
- Flow regime that limits sediment deposition and maintains appropriate rocky substrate and inter-gravel spaces for sturgeon egg adhesion, incubation, escape cover, and free embryo development.[38]

[38] Flows providing for 3.3 ft per second water velocities and 23 ft depths can be assumed to maintain an appropriate substrate for Kootenai sturgeon.



Source: 73 FR 39506

Figure 3-29 Critical Habitat for Kootenai River White Sturgeon

Life History
White sturgeon are generally long-lived, with females living from 34 to 70 years (PSMFC 1992). The largest white sturgeon on record, weighing approximately 1,500 pounds was taken from the Snake River near Weiser, Idaho in 1898 (Simpson and Wallace 1982). The largest white sturgeon reported among Kootenai sturgeon was a 159 kg (350 pound) individual, estimated at 85 to 90 years of age, captured in Kootenay Lake during September 1995 (RL&L 1998). Juvenile and adult rearing occurs in the Kootenai River and in Kootenay Lake.

As noted in the Kootenai Sturgeon Recovery Plan (USFWS 1999), Kootenai sturgeon are considered opportunistic feeders. Partridge (1983) found Kootenai sturgeon more than 71 cm (28 inches) in length feeding on a variety of prey items including clams, snails, aquatic insects, and fish. Andresen (pers. comm., 1993) noted that Kokanee salmon (*O. nerka*) in Kootenay Lake, prior to a significant population decrease, were once considered an important prey item for adult Kootenai sturgeon.

Kootenai sturgeon monitoring programs conducted from 1990 through 1995 revealed that sturgeon spawn within an 18-km (11.2-mile) reach of the Kootenai River, from Bonners Ferry, Idaho, downstream to below Shorty's Island, and most spawning occurs below Bonners Ferry over sandy substrates. That spawning habitat is in the Action Area. Kootenai sturgeon spawn at water temperatures from 2.9 to 12.0°C (37.3 to 55.4°F), but most Kootenai sturgeon spawn when the water temperature is near 10°C (50°F) (Paragamian et al. 1999).

The size or age at first maturity for Kootenai sturgeon in the wild is variable (PSMFC 1992). In the Kootenai River system, females have been estimated (based on age-length relationships) to mature at age 30 and males at age 28 (Paragamian et al. 2005). Though a small portion of Kootenai sturgeon spawn each year, most females spawn every four to six years (Paragamian et al. 2005). Spawning occurs when the physical environment permits egg development and cues ovulation. Kootenai sturgeon spawn during peak flows, from May through July (Apperson and Anders 1990; Marcuson et al. 1995), so that high water velocities can disperse and prevent clumping of their adhesive, demersal (sinking) eggs. Following fertilization, eggs adhere to rocky riverbed substrate and hatch after a relatively brief incubation period of 8 to 15 days, depending on water temperature (Brannon et al. 1985). Here they are afforded cover from predation by high near-substrate water velocities and ambient water turbidity, which preclude efficient foraging by potential predators. Kootenai sturgeon arrive in the spawning area near Bonner’s Ferry approximately two weeks before the onset of spawning, and females remain in the spawning area for up to 28 days after spawning (Paragamian and Kruse 2001).

Upon hatching, the embryos become yolk-sac larvae. Yolk-sac larvae initially undergo limited downstream redistributions by swimming into the water column before being passively redistributed downstream by the current. This redistribution phase may last from one to six days depending on water velocity (Kynard and Parker 2005). The inter-gravel spaces in the substrate provide shelter and cover during this life stage. As their yolk sac is depleted, larvae begin feeding, at which point they are no longer highly dependent on rocky substrate or high water velocity for survival (Kynard and Parker 2005). There is a period during which larvae obtain their energy both externally by feeding on prey and internally by absorbing yolk. The timing of yolk-sac depletion is dependent on ambient water temperature. At water temperatures typical of the Kootenai River, yolk-sac larvae may require more than seven days post-hatch to develop a mouth and be able to forage. At 11 or more days, Kootenai sturgeon yolk-sac larvae tend to have consumed most of the yolk, and they become increasingly dependent upon active foraging.

Current Stressors and Threats

The Kootenai sturgeon is threatened by habitat modifications in the form of a significantly altered annual hydrograph. Specifically, significant levels of natural recruitment ceased after 1974, which coincides with commencement of operations at Libby Dam. Other potential threats to the Kootenai sturgeon include removal of side-channel habitats, changes in water chemistry and habitat quality (e.g., increased metal concentrations or water temperatures), and reduced nutrient inputs historically provided by flooding. Paragamian (2002) reported that these stressors have adversely affected the fish community in Lake Koocanusa. The Libby and Corra Linn Dams have significantly altered the hydrology of Kootenai sturgeon habitat and, subsequently, spawning, egg incubation, and rearing habitats. Also, the overall biological productivity of the Kootenai River has decreased as a result of dam construction and operations. These indirect factors (i.e., reduced productivity) may adversely affect early life stages of the Kootenai sturgeon.

Though the morphology of the meander reach (Figure 3-29) has changed relatively little over time (Barton 2004), significant changes to the reach caused by the construction and operation of Libby Dam include a decrease in suspended sediment, the initiation of cyclical aggradation and degradation of the sand riverbed in the center of the channel, and a reduction in water velocities (Barton 2004). Due to a reduction of average peak flows by over 50% caused by flood control operations of Libby Dam and the reduction of the average elevation of Kootenay Lake, the PBF for water depth (i.e., 7 m [23 ft]) is infrequently achieved in the meander reach of the Kootenai River (Berenbrock 2005).

Similar to the upstream portion of the meander reach, the lower end of the “braided reach” (Figure 3-29) has become shallower during the sturgeon reproductive period as a result of dam operations (Barton et al. 2005). The loss of depth in the lower portion of the braided reach is the most significant habitat change in the braided reach.

Reduced depths in the upper end of the meander reach and the lower end of the braided reach may adversely affect Kootenai sturgeon spawning behavior. Kootenai sturgeon may avoid spawning in areas at and upstream of Bonners Ferry, even though they have suitable rocky substrate and flow conditions; instead, Kootenai sturgeon may spawn at downstream sites that have unsuitable sandy substrates and low water velocity.

Lost River Sucker (*Deltistes luxatus*)

Lost River sucker was listed as endangered on July 18, 1988 (53 FR 27130), along with the shortnose sucker (*Chasmistes brevirostris*), which shares much of the same geographic range. A final recovery plan for the Lost River and shortnose suckers was published in 1993 and revised in 2012 (USFWS 2012b).

Distribution

Lost River sucker was historically present in Upper Klamath, Tule, Lower Klamath, and Clear Lakes and their tributaries, though the species is now limited to the Upper Klamath River and its tributaries and outlet, as well as the Iron Gate Reservoir, J.C. Boyle Reservoir, and Sheepy and Lower Klamath Lakes (USFWS 2012b). Of those water bodies, only the Upper Klamath Lake and Iron Gate and J.C. Boyle Reservoirs are in the Action Area (Oregon). Strong spawning populations were historically found in the Lost River system and in Big Springs near Bonanza, Oregon (USFWS 2017b). Current spawning areas are concentrated in Upper Klamath Lake, the Williamson River (from RM 6 to the confluence with the Sprague River), and in sections of the Sprague River. The Chiloquin Dam, which was removed in 2008, provided a significant hindrance to sucker migration in the Sprague River for nearly a century (Ellsworth et al. 2009). The removal of the dam should allow for a large number of spawning Lost River sucker to migrate up the Sprague River and into its tributaries, though the effect of the dam removal is not yet known.

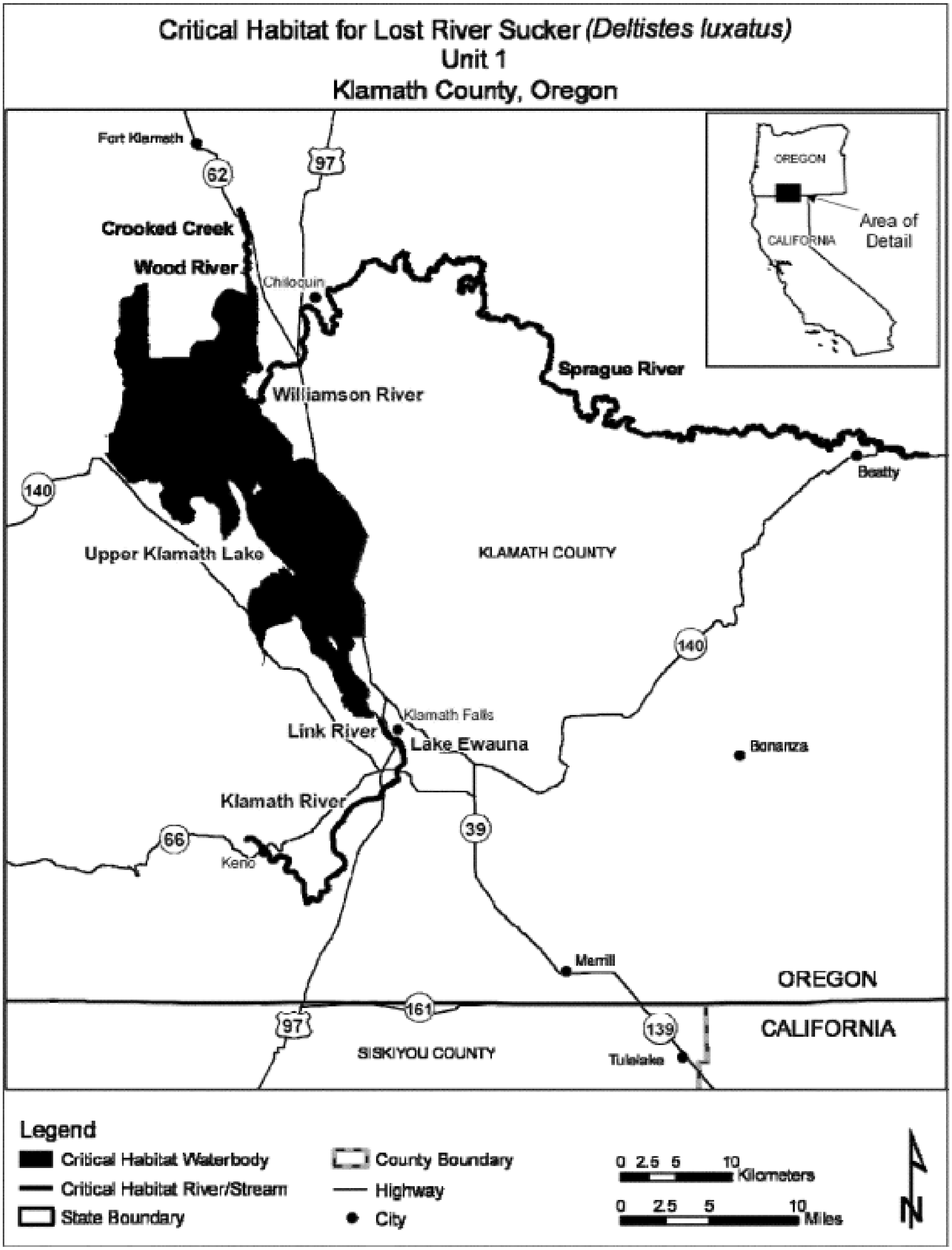
Critical Habitat

Critical Habitat for the Lost River sucker (and shortnose sucker) was listed on December 11, 2012 (77 FR 73739), effective January 10, 2013. A total of 235 km (146 miles) of streams and 47,691 ha (117,847 acres) of lake and reservoir habitat were protected in this way for Lost River sucker. The critical habitat is distributed in Klamath and Lake Counties, Oregon, and Modoc County, California. Figure 3-30 presents the location of Lost River sucker critical habitat in Oregon. Water bodies included in critical habitat include Upper Klamath Lake; the Williamson, Sprague, and Wood Rivers and Crooked Creek upstream of Upper Klamath Lake; and the Link and Klamath Rivers and Lake Ewauna downstream of Upper Klamath Lake.

The PBFs determined to be essential to the conservation of Lost River and shortnose suckers include:

- Sufficient water quantity quality, depth, and connectivity for survival including multiple water depths for various life stages, water temperatures <28°C (82.4°F), water pH <9.75, [39] dissolved oxygen concentrations >4 milligrams per liter, low levels of microcystin,[40] and unionized ammonia <0.5milligrams per liter;
- Natural (or like-natural) flow regimes;
- Spawning and rearing habitats with suitable substrates (e.g., gravel and cobble) in <1.3 m (4.3 ft) of water with an adequate stream velocity and emergent vegetation; and
- An adequate supply of food items (e.g., insects and crustaceans).

[39] This upper limit is specified in 77 FR 73739, but a lower limit is not. Assumedly very low pH would also be detrimental to suckers.
[40] Microcystins are a group of toxic chemicals produced naturally by cyanobacteria.



Source: 77 FR 73739

Figure 3-30 Critical Habitat for the Lost River Sucker in Oregon

Life History

Lost River sucker is a large and long-lived (up to 43 years) freshwater fish species that feeds by sucking up organic material (e.g., detritus, zooplankton, algae, and aquatic invertebrates) and filtering it across specialized gill structures (USFWS 2017b). Lost River sucker spawn from February to May in streams and rivers with gravel substrates (USFWS 2013b) and in shallow, stream-fed areas along the east side of Upper Klamath Lake. Individual female Lost River suckers produce between 44,000 and 200,000 eggs per year, with older females producing far more eggs than younger, smaller females. A small fraction of fertilized embryos survive to hatch. Lost River sucker reach maturity at between four and nine years old and may live up to 55 years, spawning many times in their lifetime. Larval suckers emerge from gravels soon after hatching (by mid-July) and drift into lakes or rivers to rear (Cooperman and Markle 2003; USFWS 2017b).

Lost River sucker use several habitat types throughout their life including stream, river, lake, marsh, and shoreline spring habitats of varying depths (USFWS 2012b). Adults tend to use open waters of lakes (between 1.5 and 3 m [5 and 10 ft] deep) when not spawning, though some individuals may stay in rivers, particularly in the Lost River. Upon entering lakes, larvae tend to seek out cover provided by emergent vegetation along lake shorelines and in shallow water (between 0.15 and 0.91 m [0.5 and 3 ft] deep) (Cooperman and Markle 2004). Juveniles, as they grow, shift from shallower to deeper lake waters away from emergent vegetation and over substrates ranging from mud to cobble (Burdick et al. 2008). Habitat use may be driven by patterns in dissolved oxygen, which has a pronounced effect on juvenile sucker growth and survival (Perkins et al. 2000; Rasmussen 2011; Saiki et al. 1999).

The size structure of the Lost River sucker population shifted from larger to smaller individuals between the mid-1980s and mid-1990s, resulting from significant recruitment of young individuals born in the early 1990s and relatively poor recruitment before then (Janney et al. 2008; Terwilliger et al. 2010). Recruitment between the mid-1990s and mid-2000s appeared to be lower, as the size structure trended again toward larger individuals (Janney et al. 2008).

Current Threats

The primary threats to the Lost River sucker are habitat loss or alteration, the introduction of predatory fishes (e.g., fathead minnow), poor water quality and quantity, adverse biological factors like toxic algae or pathogens, and entrainment in agricultural irrigation systems (Buettner 2005; Burdick et al. 2015; Markle and Dunsmoor 2007; Martin and Saiki 1999; Perkins et al. 2000; USFWS 2013b). Global climate change may also impact this species (USFWS 2012b, 2013b).

Shortnose Sucker (*Chasmistes brevirostris*)

As noted above, shortnose sucker was listed as endangered on July 18, 1988 (53 FR 27130), along with Lost River sucker, which shares much of the same geographic range. A final recovery plan for the shortnose and Lost River suckers was published in 1993 and revised in 2012 (USFWS 2012b).

Distribution

Shortnose sucker was historically present in Upper Klamath, Tule, Lower Klamath, and Clear Lakes and their tributaries, though the species is now limited to the Upper Klamath River and its tributaries and outlet as well as the Keno, Copco, Iron Gate, and J.C. Boyle Reservoirs (USFWS 2012b). Of those water bodies, only the Upper Klamath Lake and Iron Gate and J.C. Boyle Reservoirs are in the Action Area (Oregon). Strong spawning populations were historically found in the Lost River system and in Big Springs near Bonanza, Oregon (USFWS 2016a). Current spawning areas are concentrated in Upper Klamath Lake, the Williamson River (from RM 6 to the confluence with the Sprague River), and sections of the Sprague River.

Adult suckers in Upper Klamath Lake tend to congregate in Pelican Bay at the north end of the lake in summer, where water quality (e.g., dissolved oxygen) tends to be more suitable (Banish et al. 2009). They then move into other parts of the lake starting in September.

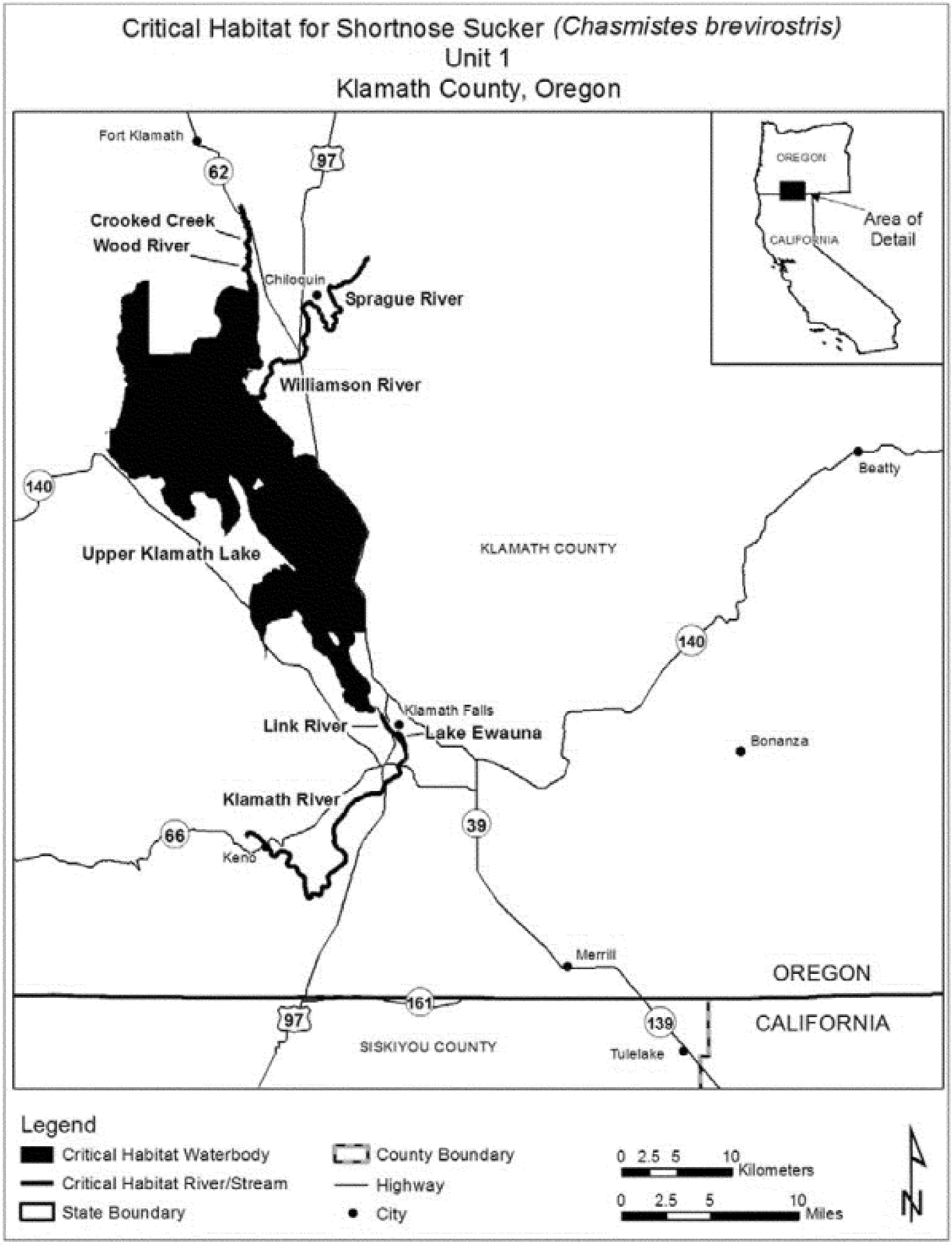
Critical Habitat

Critical habitat for the shortnose sucker (and Lost River sucker) was listed on December 11, 2012 (77 FR 73739), effective January 10, 2013. A total of 219 km (136 miles) of streams and 50,015 ha (123,590 acres) of lake and reservoir habitat were protected for shortnose sucker. The critical habitat is distributed in Klamath and Lake Counties, Oregon, and Modoc County, California. Figures 3-31 and 3-32 present the location of shortnose sucker critical habitat. Like Lost River sucker, shortnose sucker critical habitat is present in the Upper Klamath Lake and rivers both upstream and downstream of the lake (Figure 3-31); however, unlike the Lost River sucker, shortnose sucker critical habitat also includes several reservoirs in Oregon to the east of Upper Klamath Lake and associated streams and tributaries (e.g., Dry Prairie and Gerber Reservoirs and Ben Hall, Long Branch, Barnes Valley, Lapham, and Pitch Log Creeks).

The PBFs for shortnose sucker critical habitat are the same as those for the Lost River sucker, described above.

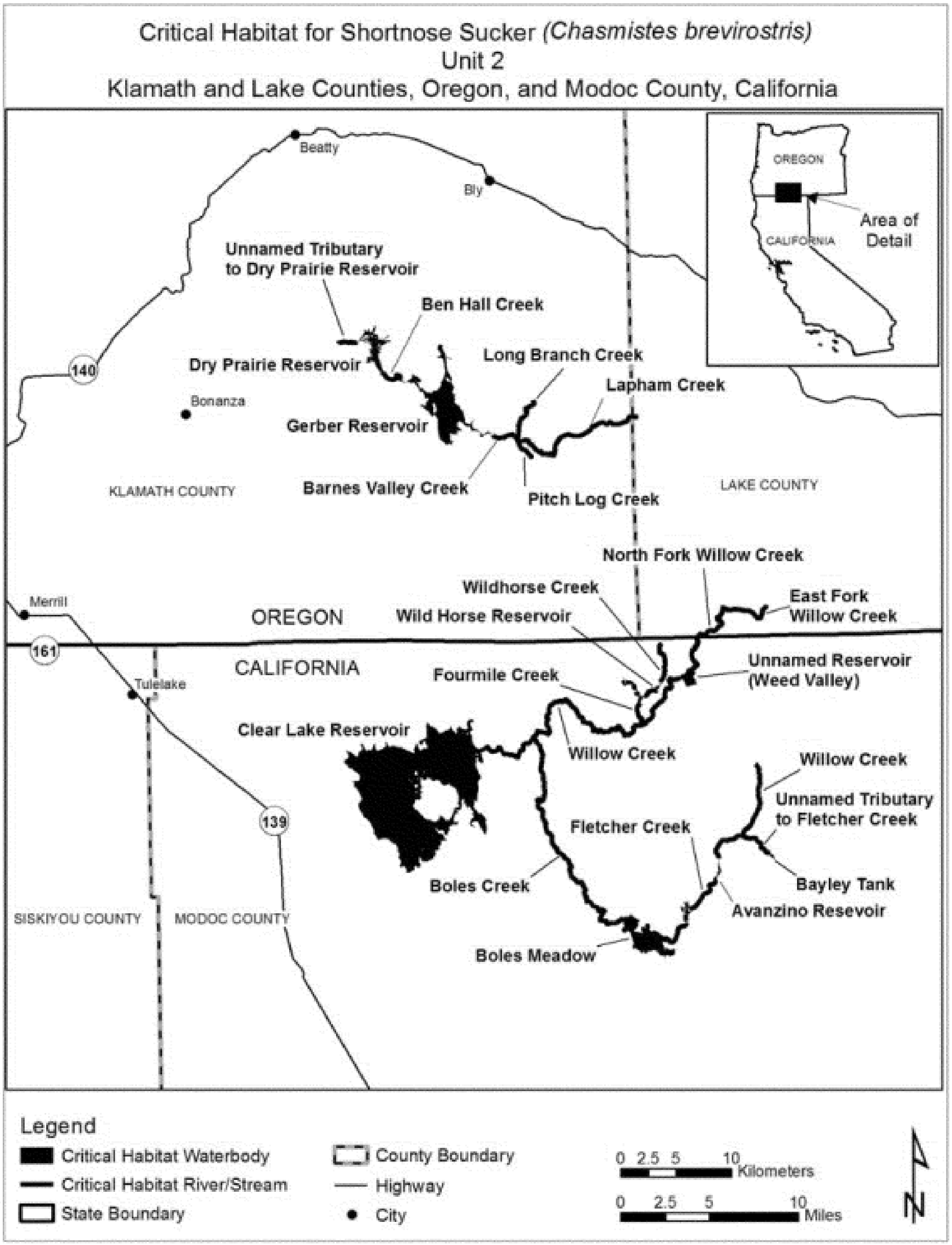
Life History

Shortnose sucker spawn from February to May in streams and rivers with gravel substrates and along the eastern shoreline of Upper Klamath Lake (USFWS 2012b). Individual female shortnose suckers produce between 18,000 and 70,000 eggs per year, with older females producing far more eggs than younger, smaller females. A small fraction of fertilized embryos survive to hatch. Shortnose sucker reach maturity at between four and six years old and may live up to 33 years, spawning many times in their lifetime. Larval suckers emerge from gravels soon after hatching (by July) and drift into lakes or rivers to feed and rear (Cooperman and Markle 2003; USFWS 2017d, 2012b).



Source: 77 FR 73739

Figure 3-31 Critical Habitat for Shortnose Sucker, Western Areas



Source: 77 FR 73739

Figure 3-32 Critical habitat for Shortnose Sucker, Eastern Areas

Shortnose sucker use several habitat types throughout their lives, including stream, river, lake, marsh, and shoreline spring habitats of varying depths (USFWS 2012b). Adults tend to use open waters of lakes (between 1.5 and 3 m [5 and 10 ft] deep) when not spawning, though some individuals may stay in rivers, particularly in the Lost River. Larvae, upon entering lakes, tend to seek out cover provided by emergent vegetation along lake shorelines and in shallow water (between 0.15 and 0.91 m [0.5 and 3 ft] deep) (Cooperman and Markle 2004). Juveniles, as they grow, shift from shallower to deeper lake waters away from emergent vegetation and over substrates ranging from mud to cobble (Burdick et al. 2008). Habitat use may be driven by patterns in dissolved oxygen, which has a pronounced effect on juvenile sucker growth and survival (Perkins et al. 2000; Rasmussen 2011; Saiki et al. 1999).

In Upper Klamath Lake, there was an apparent shift in population size from large to smaller individuals between the mid-1980s to mid-1990s followed by a shift back to larger individuals up to the mid-2000s (Janney et al. 2008; Terwilliger et al. 2010). This suggests that recruitment in the early-to-mid-1990s was high but that recruitment decreased during late 1990s and early-to-mid 2000s.

Current Threats

Threats to shortnose sucker and their critical habitat are the same as those for Lost River sucker, which are described above. In addition, genetic monitoring of shortnose sucker in the Klamath River Basin indicates that there is significant hybridization between the shortnose sucker and the Klamath largescale sucker (*Catostomus snyderi*) (Tranah and May 2006), which reduces the number of viable offspring produced by shortnose sucker.

3.2.2.5 Herptiles

Oregon Spotted Frog (*Rana pretiosa*)

The Oregon spotted frog was listed as threatened on August 29, 2014 (79 FR 51657). This species is named for the black spots that cover the head, back, sides, and legs. The dark spots are characterized by ragged edges and light centers that grow and darken with age (Hallock 2013). Body color also varies with age. Juveniles are usually brown or, occasionally, olive green on the back and white, cream, or flesh-colored with reddish pigments on the underlegs and abdomen, developing with age (McAllister and Leonard 1997). Adults range from brown to reddish brown but tend to become redder with age. The spotted frog is medium-sized, ranging from 4.3 to 10.1 cm (1.7 to 4 inches) in body length. Females are typically larger than males and can reach up to 10 cm (4 inches) or more (79 FR 51657).

Species Distribution

Historically, the Oregon spotted frog ranged from British Columbia to the Pit River basin in northeastern California (McAllister and Leonard 1997). Oregon spotted frogs have been documented at 61 historical localities in 48 watersheds (three in British Columbia, 13 in Washington, 29 in Oregon, and three in California) in 31 sub-basins (McAllister and Leonard 1997; COSEWIC 2011b) (79 FR 51657).

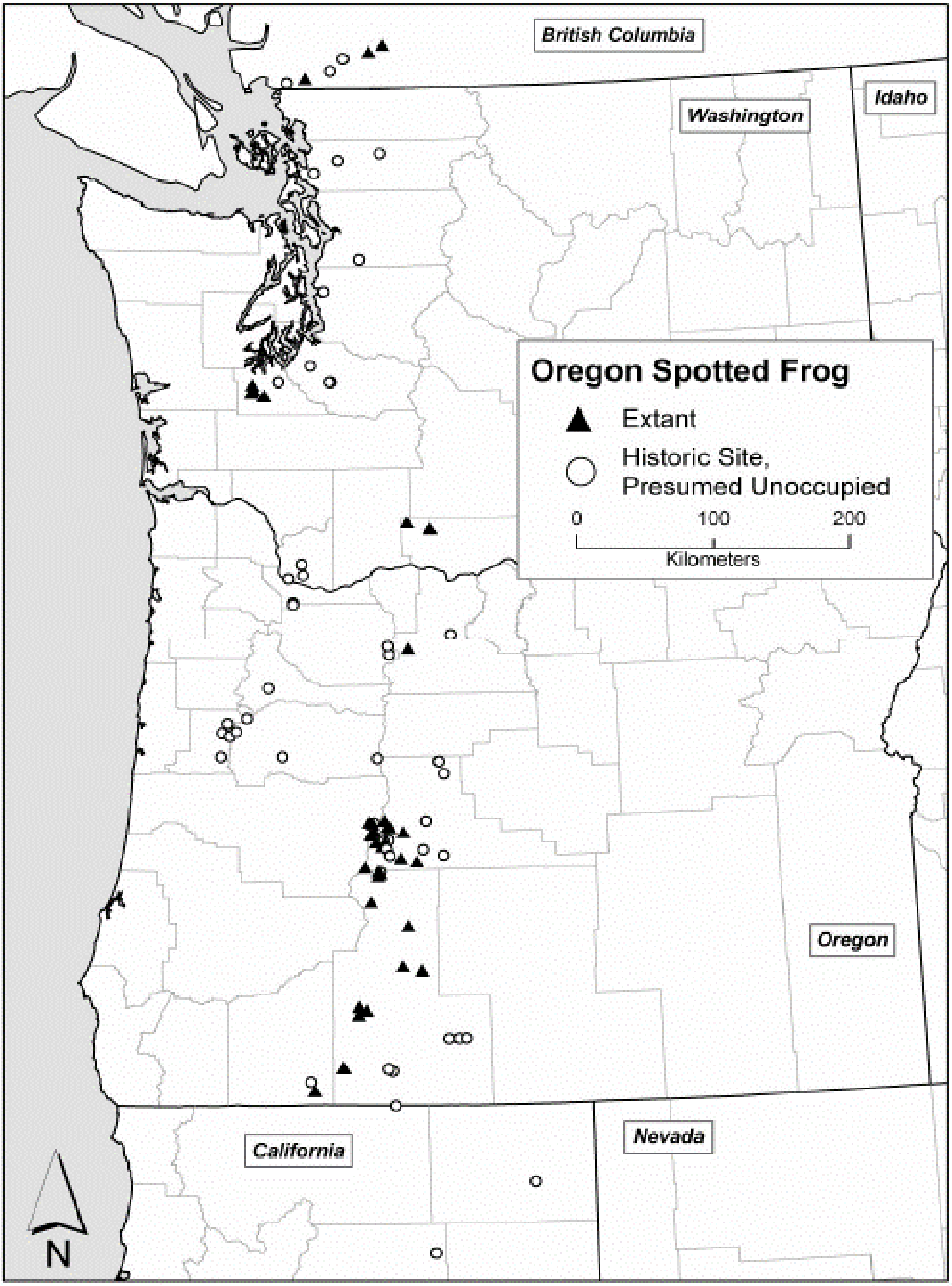
Currently, the Oregon spotted frog is found within 15 sub-basins, ranging from extreme southwestern British Columbia south through the Puget Trough, and the Cascades Range from south-central Washington to at least the Klamath Basin in southern Oregon (Figure 3-33). Oregon spotted frogs occur in lower elevations in British Columbia and Washington and are restricted to high elevations in Oregon (Pearl et al. 2010). In addition, Oregon spotted frogs currently have a very limited distribution west of the Cascade crest in Oregon and are considered to be extirpated from the Willamette Valley in Oregon (Cushman and Pearl 2007).

In Washington, Oregon spotted frogs are known to occur only within six sub-basins/watersheds: the Sumas River, a tributary to the Lower Chilliwack River watershed and Fraser River sub-basin; the Black Slough in the lower South Fork Nooksack River, a tributary of the Nooksack River; the Samish River; the Black River, a tributary of the Chehalis River; Outlet Creek (Conboy Lake), a tributary to the Middle Klickitat River; and Trout Lake Creek, a tributary of the White Salmon River. The Klickitat and White Salmon Rivers are tributaries to the Columbia River. The Oregon spotted frogs in each of these sub-basins/watersheds are isolated from frogs in other sub-basins (79 FR 51657).

In Oregon, Oregon spotted frogs are known to occur only within eight sub-basins: Lower Deschutes River, Upper Deschutes River, Little Deschutes River, McKenzie River, Middle Fork Willamette, Upper Klamath, Upper Klamath Lake, and the Williamson River. The Oregon spotted frogs in most of these sub-basins are isolated from frogs in other sub-basins, although Oregon spotted frogs in the lower Little Deschutes River are aquatically connected with those below Wickiup Reservoir in the Upper Deschutes River sub-basin. Oregon spotted frog distribution west of the Cascade Mountains in Oregon is restricted to a few lakes in the upper watersheds of the McKenzie River and Middle Fork Willamette River sub-basins, which represent the remaining 2 out of 12 historically occupied sub-basins west of the Cascades in Oregon (79 FR 51657).

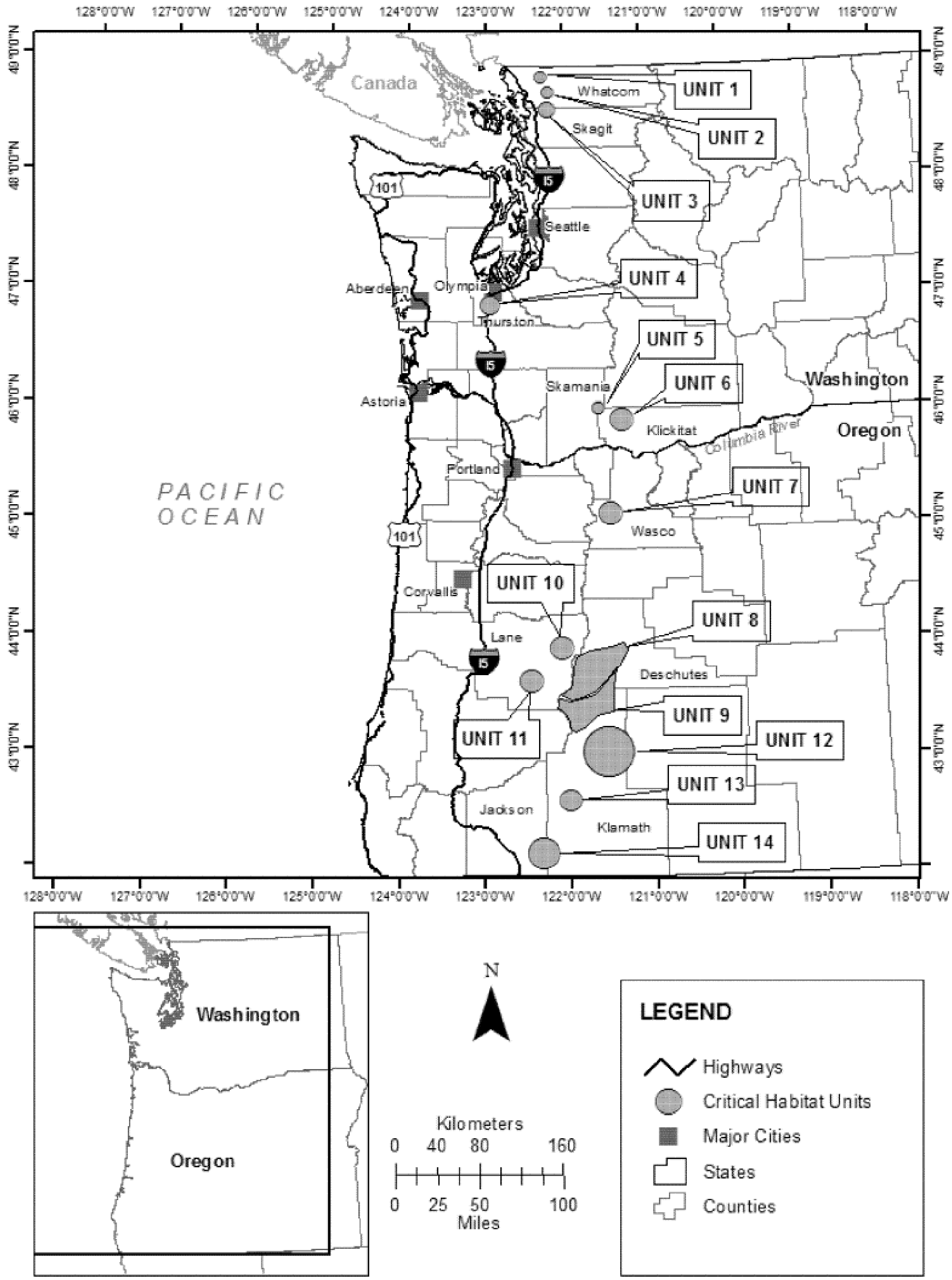
Critical Habitat

The USFWS designated critical habitat for the Oregon spotted frog of 26,319 ha (65,036 acres) and 32.7 stream km (20.3 stream miles) in Washington and Oregon on May 11, 2016 (81 FR 29335) (Figure 3-34). Critical habitat for the Oregon spotted frog is within 14 units, delineated by river sub-basins where spotted frogs are extant: (1) Lower Chilliwack River; (2) South Fork Nooksack River; (3) Samish River; (4) Black River; (5) White Salmon River; (6) Middle Klickitat River; (7) Lower Deschutes River; (8) Upper Deschutes River; (9) Little Deschutes River; (10) McKenzie River; (11) Middle Fork Willamette River; (12) Williamson River; (13) Upper Klamath Lake; and (14) Upper Klamath. Descriptions of ownership, acreages, and threats for each unit are stated in the critical habitat designation (81 FR 29335).



Source: (Cushman and Pearl 2007)

Figure 3-33 Distribution of Oregon Spotted Frog in the Pacific Northwest



Source: 81 FR 29335 (Unit maps are located in the federal register notice.)

Figure 3-34 Critical Habitat for Oregon Spotted Frog in Washington and Oregon

The PBFs determined to be essential to the conservation of Oregon spotted frog critical habitat include:

- Ephemeral or permanent freshwater bodies with the following characteristics for nonbreeding, breeding, rearing, and overwintering habitat:
    - Breeding and rearing habitat – inundated for minimum of 4 months per year (timing varies by elevation)
    - Overwintering habitat – inundated from October through March
    - Breeding and rearing habitat – ephemeral water bodies are hydrologically connected by surface water flow to a permanent water body
    - Breeding and rearing habitat – shallow water areas (<30 cm [<12 inches]) or water of this depth over vegetation in deeper water
    - Nonbreeding habitat – total surface area <50% vegetative cover
    - Breeding and rearing habitat – gradual topographic gradient (<3% slope) from shallow water toward deeper in permanent water
    - Breeding and rearing habitat – herbaceous wetland vegetation or structurally similar
    - Breeding and rearing habitat – shallow water areas with high solar exposure or low (short) canopy cover
    - Breeding, rearing, and nonbreeding habitat – absence or low density of nonnative predators
- Ephemeral or permanent freshwater bodies with aquatic movement corridors with the following characteristics:
    - Linear distance from breeding areas <5 km (3.1 miles)
    - Impediment free (including, but not limited to, hard barriers such as dams, impassable culverts, lack of water, or biological barriers such as abundant predators or lack of refugia from predators).
- Refugia habitat that includes sufficient dense vegetation and/or an abundance of woody debris in breeding, rearing, nonbreeding, and overwintering habitat.to provide refugia from predators.

Life History

The Oregon spotted frog is highly aquatic; it is almost always found in or near a perennial body of water that includes zones of shallow water and abundant emergent or floating aquatic plants, which it uses for basking and cover. Conditions required for completion of the species' life cycle are shallow water areas for egg and tadpole survival; perennially deep, moderately vegetated pools for adult and juvenile survival in the dry season; and perennial water for protecting all age classes during cold, wet weather (Watson et al. 2003).

Oregon spotted frogs breed in shallow pools near flowing water or in shallow pools that may be connected to larger bodies of water during seasonally high water or at flood stage. These locations are most often defined by shallow, often temporary, pools of water; gradually receding shorelines; location on benches of seasonal lakes and marshes; or location in wet meadows. These sites are usually associated with the previous year's emergent vegetation and are generally no more than 36 cm (14 inches) deep (Pearl and Hayes 2004).

Oregon spotted frogs concentrate breeding efforts in relatively few locations (McAllister and White 2001). The availability of the unique characteristics of egg-laying sites is limited, and adults may have limited flexibility to switch sites. This inflexibility may make the Oregon spotted frog particularly vulnerable to modification of egg-laying sites (79 FR 51657).

After breeding, during the dry season, Oregon spotted frogs move to deeper, permanent pools or creeks, where they are often observed near the water surface basking and feeding in beds of floating and submerged vegetation (Watson et al. 2003). Larger sites are more likely to provide the seasonal microhabitats required by Oregon spotted frogs, have a more reliable prey base, and include overwintering habitat. It is thought that a minimum wetland size of 3.6 ha (8.9 acres) may be necessary to reach suitably warm temperatures and support a large enough population to persist despite high predation rates (Hayes 1994). However, Oregon spotted frogs also occupy smaller sites and are known to occur at sites as small as 1 ha (2.5 acres) and as large as 1,989 ha (4,915 acres) (Pearl and Hayes 2004). Smaller sites generally have a small number of frogs and, as described above, are more vulnerable to extirpation. (Pearl and Hayes 2004) believe that these smaller sites were historically subpopulations within a larger breeding complex and that Oregon spotted frogs may only be persisting in these small sites because the sites exchange migrants or because seasonal habitat needs are provided nearby.

Known overwintering sites for the Oregon spotted frog are associated with flowing systems, such as springs and creeks, that provide water with high oxygen content (Hayes et al. 2001; Tattersall and Ultsch 2008) and sheltering locations protected from predators and freezing (Watson et al. 2003). Oregon spotted frogs burrow in mud, silty substrate, clumps of emergent vegetation, woody accumulations within the creek, and holes in creek banks when inactive during periods of prolonged or severe cold (McAllister and Leonard 1997; Watson et al. 2003). They are intolerant of anoxic conditions and are unlikely to burrow into the mud for more than a day or two because survival under anoxic conditions is only a matter of four to seven days (Tattersall and Ultsch 2008). This species remains active during the winter and selects microhabitats that can support aerobic metabolism and minimize exposure to predators (Tattersall and Ultsch 2008).

Oregon spotted frog tadpoles are grazers, having rough tooth rows for scraping plant surfaces and ingesting plant tissue and bacteria. They also consume algae, detritus, and probably carrion. Post-metamorphic spotted frogs feed on live animals, primarily insects (Hallock 2013).

Current Stressors and Threats

Large historical losses of wetland habitat have occurred across the range of the Oregon spotted frog. Wetland losses are estimated at 30% to 85% across the species' range, with the greatest percentage lost having occurred in British Columbia. These wetland losses have directly influenced the current fragmentation and isolation of remaining Oregon spotted frog populations (79 FR 51657). The historical loss of Oregon spotted frog habitat and lasting anthropogenic changes in natural disturbance processes are exacerbated by the introduction of reed canarygrass (*Phalaris arundinacea*), nonnative predators, and, potentially, climate change. In addition, current regulatory mechanisms and voluntary incentive programs designed to benefit fish species have inadvertently led to the continuing decline in quality of Oregon spotted frog habitat in some locations (79 FR 51657).

In the Final Rule to list the frog as threatened, the USFWS determined that the Oregon spotted frog is impacted by one or more of the following factors to the extent that the species meets the definition of a threatened species under the ESA:

- Habitat necessary to support all life stages continuing to be impacted and/or destroyed by human activities that result in the loss of wetlands to land conversions;
- Hydrologic changes resulting from operation of existing water diversions/ manipulation structures, new and existing residential and road developments, drought, and removal of beavers (*Castor canadensis*);
- Changes in water temperature and vegetation structure resulting from reed canarygrass invasions, plant succession, and restoration plantings;
- Increased sedimentation, increased water temperatures, reduced water quality, and vegetation changes resulting from the timing and intensity of livestock grazing (or, in some instances, removal of livestock grazing at locations where it maintains early seral stage habitat essential for breeding);
- Predation by nonnative species, including nonnative trout and bullfrogs;
- Inadequate existing regulatory mechanisms that result in significant negative impacts such as habitat loss and modification; and
- Other natural or manmade factors, including small and isolated breeding locations, low connectivity, low genetic diversity within occupied sub-basins, and genetic differentiation between sub-basins.

3.2.2.6 Mammals

Columbian White-tailed Deer (*Odocoileus virginianus leucurus*)

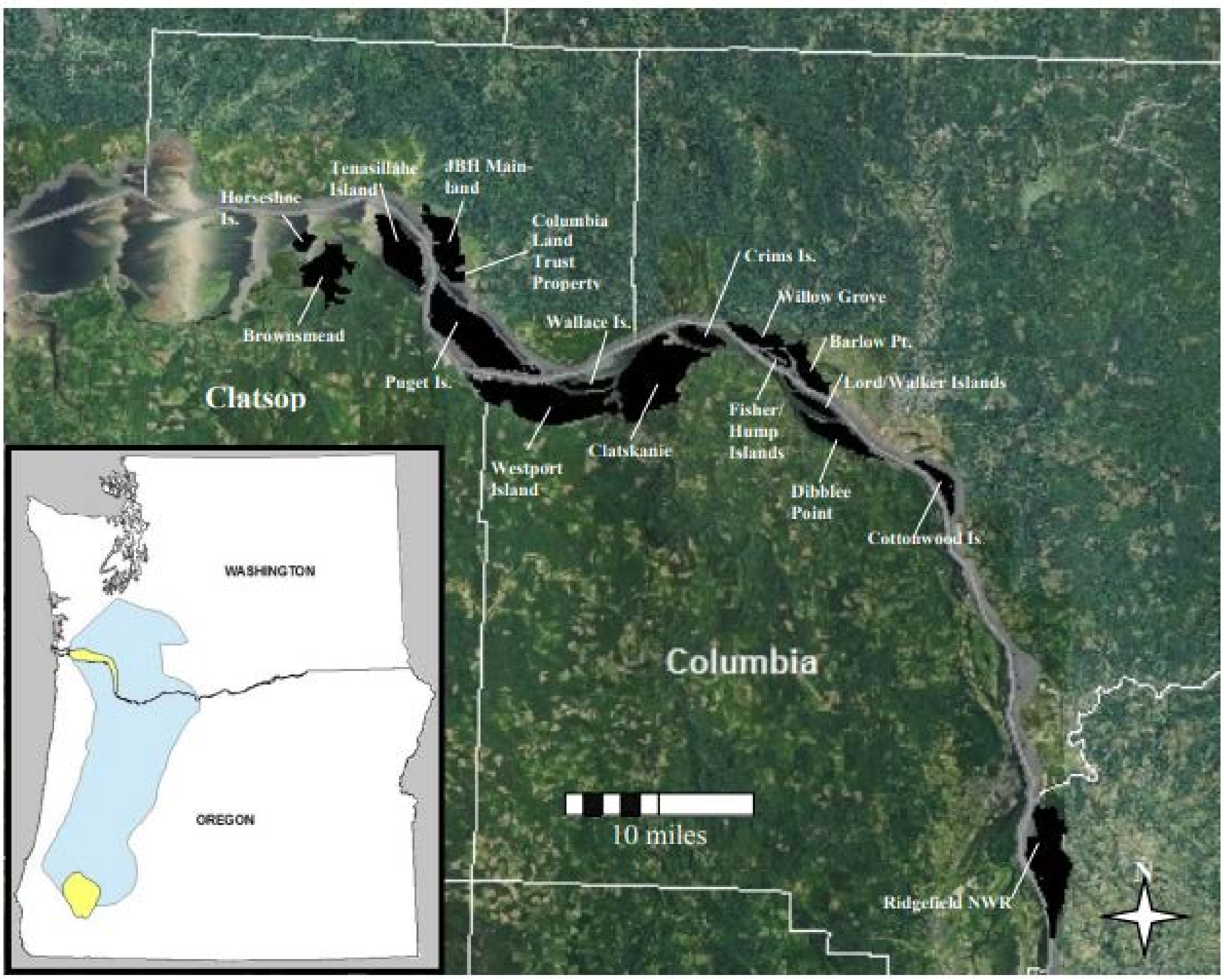
The Columbian white-tailed deer (CWTD) was listed in the Federal Register as an endangered species under the ESA on March 11, 1967 (32 FR 4001). In October 2016, the CWTD was downlisted to threatened for the Columbia River DPS, which occurs in Clark, Cowlitz, Pacific, Skamania, and Wahkiakum Counties, Washington, and Clatsop, Columbia, and Multnomah Counties, Oregon (81 FR 71386). The population in Douglas County, Oregon, has been delisted due to recovery in 2003 (68 FR 43647).

White-tailed deer are generally distinguished from mule or black-tailed deer by their longer tail that is brown rather than black on the dorsal surface, a smaller metatarsal gland, and, in adult males, antlers with prongs arising from a single main beam. The CWTD is one of the large subspecies with antlers narrowly spreading and curving steeply upward. The upper parts are dull in general tone, with a grizzled pattern approaching sayal brown. The top of the head may be grizzled. The tail varies from cinnamon buff to tawny dorsally, terminating in a small, partially concealed, subterminal patch, and broadly fringed with white above and pure white to tip below. The outer and more exposed surfaces of the legs to the base of the hoofs is near sayal brown (81 FR 71386).

Species Distribution

The historical distribution of the CWTD extended west from the Cascade foothills in the Willamette Valley of Oregon to the coast, and north from Roseburg, Oregon, to south of the Puget Sound in Washington (USFWS 1983). Early accounts indicate that CWTD were locally common, particularly in riparian areas along major rivers. In 1806, Lewis and Clark observed and recorded the presence of white-tailed deer along the Columbia River from the present location of The Dalles, Oregon, to Astoria, Oregon, on the coast (Gavin et al. 1984). Within this broader range, the CWTD was formerly distributed throughout the bottomlands and prairie woodlands of the lower Columbia, Willamette, and Umpqua River basins in Oregon and southern Washington (Verts and Carraway 1998).

The historical range of the Columbia River DPS has been reduced to its current range of approximately 241 sq km (93 square miles) in limited areas of Clatsop and Columbia Counties in Oregon, and Cowlitz, Wahkiakum, and now Clark Counties in Washington (Azerrad 2016). Within this range, it now exists on national wildlife refuges, nearby islands, and some lowlands in the LCR and occupies approximately 6,475 ha (16,000 acres), with a 2014 population estimate of about 850 deer. Figure 3-35 shows sites occupied by CWTD along the Columbia River.



Source: Azerrad (2016)
Note: Inset map shows the Columbia River population (top yellow) and the Roseburg population (bottom yellow) as well as the likely historic range of the Columbian white-tailed deer (blue).

Figure 3-35 Sites Along the Columbia River Occupied by the Columbian White-tailed Deer

Critical Habitat
Critical habitat has not been designated for the CWTD.

Life History
The CWTD typically inhabits forested areas along waterways and generally selects areas that offer both food and cover. Areas forested with Sitka spruce (*Picea sitchensis*) and a grass understory are used most frequently; however, in the summer, CWTD preferentially inhabit mixed forests of western red cedar (*Thuja plicata*), red alder (*Alnus rubra*), and parkland habitat with a grassy understory. CWTD density has been shown to be greatest in areas where woodland cover was around 50% (USFWS 1983). However, the CWTD can thrive in areas with various ratios of canopy cover. The most-important aspect of habitat appears to be the available food supply within or close to escape cover. While the CWTD frequents bottomlands, its local distribution is not limited by elevation if other suitable habitat characteristics are present (USFWS 1983).

Observations suggest that fawns on the Julia Butler Hansen NWR Mainland are most often associated with pastures of tall, dense reed canary grass and tall fescue (*Festuca arundinaceae*), as well as mixed deciduous and spruce forest (USFWS 1983; Brookshier 2004). Communities providing both cover and forage were more heavily utilized than were communities providing cover or forage alone. Communities providing forage alone were used most near adjacent cover.

The diet of the CWTD consists of forbs (broad-leaved herbaceous plants), shrubs, grasses, and a variety of other foods such as lichens, mosses, ferns, seeds, and nuts. Foraging habitat used by the CWTD is generally located in proximity to forest cover and varies greatly with the season (USFWS 2013a). The CWTD is a generalist in diet, utilizing both forage and browse. Typical forage includes meadow foxtail (*Alopecurus* spp), orchard grass (*Dactylis glomerata*), reed canary grass, tall fescue, mannagrass (*Glyceria* spp), common yarrow, red clover (*Trifolium pretense*), and buttercup (*Ranunculus repens*). Typical browse includes evergreen blackberry (*Rubus laciniatus*), Pacific ninebark (*Physocarpus capitatus*), red-osier dogwood (*Cornus stolonifera*), salal (*Gaultheria shallon*), and western red cedar. CWTD are suspected to readily utilize other species of clover, blackberry, and palatable forbs and grasses. Twenty-five to fifty percent of the CWTD's diet can be composed of woody browse species. CWTD consumption of browse species appears to increase in the fall, while grasses and forbs are the most important food items in the spring and summer (Brookshier 2004).

Current Stressors and Threats
Loss of habitat is suspected as a key factor in historical CWTD decline. Over time, CWTD have been forced into habitat that was fragmented and wetter than what would be ideal for the species. A large proportion of occupied CWTD habitat is land that was reclaimed from tidal inundation by construction of dikes and levees for agricultural use in the early 20th century (USFWS 2010b). Failure of these dikes could cause habitat loss or direct mortality to the CWTD population.

The recovery of the Douglas County, Oregon, DPS reflects the availability of more favorable habitat (managed upland oak savannah) and land-use practices (intensive sheep grazing with very high levels of predator control). Though limited access to high-quality upland habitat in the Columbia River DPS remains the most prominent hindrance to CWTD recovery, the majority of habitat loss and fragmentation has already occurred. The persistence of invasive species has reduced forage quality over much of the CWTD's range, but it remains unclear how much this change in forage quality is affecting the overall status of CWTD.

Young fawns are extremely susceptible to predation; high levels of predation from coyotes have led the USFWS to adopt coyote-control measures in some areas. The low rate of fawn survival of the Columbia River DPS may be also indicative of poor habitat quality.

Collision with vehicles remains a concern, especially with respect to newly translocated CWTD. In 2010, 15 CWTD were translocated to Cottonwood Island, Washington, from Westport, Oregon. Seven of those translocated CWTD were killed by collisions with vehicles on US Highway 30 in Oregon and on Interstate 5 in Washington (Cowlitz Indian Tribe 2010, as cited in 80 FR 60850).

While over-hunting of CWTD historically contributed to population decline, all legal harvest has ceased. Public understanding and views of CWTD have gradually changed, and poaching has decreased.

Direct mortality from flooding is generally low, but indirect mortality caused by flooding has been more significant. High waters push deer to the elevated roadways, making them susceptible to vehicle strikes, and deer move off their normal home ranges into off-refuge areas with unfamiliar dangers, such as dogs or unfamiliar predators (80 FR 60850). Flooding is a threat to CWTD habitat when grazing and fawning grounds become inundated for prolonged periods, and the risk of large flooding events could increase with impacts of climate change.

Diseases such as hoof disease or hair loss syndrome naturally occur in wild ungulate populations; these diseases can often work through a population without necessarily reducing the overall population. When compounded with additional stressors such as poor quality forage, flooding, etc., diseases could potentially affect long-term productivity and viability.

Grizzly Bear (*Ursus arctos horribilis*)

The grizzly bear of the conterminous US was listed as threatened under the ESA on July 28, 1975 (40 FR 5 7).

The grizzly bear is one of two subspecies of the brown bear that occupy North America. Grizzly bear coloration varies from light brown to almost black, with guard hairs often paled at the tips. Grizzly bears, in general, are larger than black bears (*Ursus americanus*) and can be distinguished from them by longer, curved claws, humped shoulders, and a more concave face. In the lower 48 states, male grizzly bears average 181 to 272 kg (400 to 600 pounds), and females average 113 to 159 kg (250 to 350 pounds). Adult grizzly bears stand 1 to 4.4 m (3.5 to 4.5 ft) at the hump when on all fours and can exceed 2.4 m (8 ft) in height when standing on their hind legs. The Yellowstone grizzly bear population is discrete from other grizzly populations, has markedly different genetic characteristics, and exists in a unique ecological setting where bears use terrestrial mammals as their primary source of nutrition (Mattson 1997).

Species Distribution

Historically, grizzly bears ranged from the Great Plains to the Pacific Ocean and from the northern US border with Canada to the southern border with Mexico. The current distribution of grizzly bears in the contiguous US is now roughly 2% of its former range. Grizzly bear currently occupy parts of British Columbia and Alberta in Canada, and Montana, Idaho, Wyoming, Washington, and Alaska in the US. Within the contiguous US, six recovery zones/ecosystems have been identified in the 1993 Grizzly Bear Recovery Plan (USFWS 1993): (1) Greater Yellowstone Area; (2) Northern Continental Divide; (3) Cabinet-Yaak; (4) Selkirk; (5) North Cascades; and (6) Bitterroot.

Greater Yellowstone Area
The Greater Yellowstone Area includes portions of Wyoming, Montana, and Idaho and portions of six National Forests (Beaverhead, Bridger-Teton, Custer, Gallatin, Shoshone, and Targhee), Yellowstone and Grand Teton National Parks, John D. Rockefeller Memorial Parkway, adjacent private and state lands, and lands managed by the Bureau of Land Management.

Northern Continental Divide
The Northern Continental Divide Ecosystem extends from the Rocky Mountains of northern Montana into contiguous areas in Alberta and British Columbia, Canada.

Cabinet-Yaak
The Cabinet-Yaak Ecosystem in northwestern Montana and northeastern Idaho is thought to contain at least 48 grizzly bears (USFWS 2011b).

Selkirk
The Selkirk Ecosystem includes areas in northwestern Idaho, northeastern Washington, and southeastern British Columbia.

Bitterroot
The Bitterroot Ecosystem is currently unoccupied by grizzly bears (USFWS 2000), and has been since before the time of listing. This system spans the central Idaho-Montana border, encompassing areas in both states.

North Cascades
The North Cascades Ecosystem extends from southwest British Columbia to Central Washington.

Critical Habitat
Critical habitat has not been designated for grizzly bear.

Life History
Most areas currently inhabited by the species are in contiguous, relatively undisturbed mountainous habitat exhibiting high topographic and vegetative diversity. Grizzly bear home ranges average 130 to 1,300 sq km (50 to 500 square miles). The home ranges of adult male grizzly bears are two to four times larger than that of females, averaging 884 sq km (341 square miles) for females and 3,757 sq km (1,450 square miles) for males. Home range sizes of grizzly bears vary in relation to food availability, weather conditions, and interactions with other bears. The home ranges of grizzly bear females appear to be smaller while they are with cubs, but ranges expand when the young are yearlings, to meet increased foraging demands. In addition, individual grizzly

bears may extend their range seasonally or from one year to the next. The home ranges of adult bears frequently overlap, and there is little evidence that they are territorial (USFWS 1993).

Grizzly bears exhibit a high degree of home range fidelity (Schwartz et al. 2003). Within its home range, a grizzly bear uses a diverse mixture of forests, moist meadows, grasslands, and riparian habitats to complete its life cycle. In general, grizzly bears prefer large, remote areas of habitat isolated from human development for feeding, denning, and reproduction (USFWS 1993). They require dense forest cover for hiding and security. In the Greater Yellowstone Area, lodgepole pine (*Pinus contorta*) forests are a large and dynamic part of grizzly bear habitat (Mattson 1997).

Grizzly bears generally construct dens in areas far from human disturbance at elevations of approximately 2,000 to 3,050 m (6,500 to 10,000 ft). Grizzly bears den from the end of September to late April or early May, with entrance and emergence dates affected by their gender and reproductive status.

Grizzly bear are opportunistic omnivores that use a wide variety of plant and animal food sources (Bjornlie et al. 2014). Grizzly bears in the Greater Yellowstone Area consume up to 234 different foods, 75 of which are eaten on a regular basis, with the higher caloric foods being army cutworm moths (*Euxoa auxiliaris*), various ungulate species such as elk and moose (*Alces americanus*), cutthroat trout (*Oncorhynchus clarkia)*, and whitebark pine (*Pinus albicaulis*) seeds (IGBST 2013). In areas where animal matter is less available, roots, bulbs, tubers, fungi, and tree cambium may be important in meeting nutrient requirements. High-quality foods such as berries, nuts, and fish are important in some areas. Combined food habit studies from the Greater Yellowstone Area show that grizzly bear display dietary plasticity among individuals and in different portions of the ecosystem, and also across seasonal, annual, and decadal time periods (IGBST 2013).

Grizzly bears also make use of a variety of other vegetative food sources. Grizzly bear seasonal food includes roots (Mattson 1997), graminoids, horsetail (*Equistum* spp.), forbs, fruits, and limited amounts of mushrooms (Knight et al. 1984; Mattson and Knight 1991). Plant materials that have low levels of carbohydrates or protein are eaten as plants emerge and crude protein levels are highest. Throughout late spring and early summer, grizzly bears follow plant maturity back to higher elevations. In late summer and fall, there is a transition to fruit and nut sources. These movements are a generalized pattern; individual bears will go where they can best meet their food requirements.

Current Stressors and Threats

The 5-Year Review Summary and Evaluation Plan (USFWS 2011b) identified the following four threats to the grizzly bear; please refer to this plan for additional details.

- The present or threatened destruction, modification, or curtailment of its habitat or range;
- Overutilization for commercial, recreational, scientific, or educational purposes;
- Disease or predation; and
- The inadequacy of existing regulatory mechanisms.

Habitat degradation and fragmentation, and negative human/bear interactions, are the primary factors responsible for grizzly bears' current threats (USFWS 2011b). Grizzly bears preferentially use large areas with a low density of roads and low levels of human activity. Grizzly bears have been threatened by motorized and dispersed recreational use and forest management activities, including timber harvest. Dispersed recreational uses include hunting, fishing, camping, horseback riding, hiking, biking, off-road vehicle use, and snowmobiling. Roads, off-road vehicles, and some recreational uses can displace grizzly bears from available habitat (loss of habitat effectiveness due to human disturbance). Increased development on private land, primarily of residential housing, also decreases habitat availability. Finally, grizzly bears face a decrease in the quality of available habitat due to a loss of biodiversity (especially early succession-related vegetative types) and sub-optimal composition, structure, and juxtaposition of vegetation as a result of fire suppression, management strategies, and advancing succession.

Direct human-caused mortality is the most obvious threat to grizzly bears. This kind of mortality can occur in several ways: (1) mistaken identification by big game hunters; (2) malicious killing; (3) defense of human life; or (4) management removals. Bears are removed (management removals) to protect human life or property, usually because they have become dangerously bold as a result of food conditioning at campsites, lodges, resorts, and private residences, or they become habituated predators of livestock. Habituation is the loss of a bear's natural wariness of humans caused by continued exposure to human presence, activity, noise, etc. A grizzly bear habituates to other bears, humans, or situations when such interactions give it a positive return in resources, such as food, that outweighs the cost of the stress that precedes such habituation.

Mazama Pocket Gopher (*Thomomys mazama)*

The USFWS published a final rule listing four subspecies of the Mazama pocket gopher as threatened throughout their ranges in Washington State (79 FR 19759). These four subspecies are the Roy Prairie pocket gopher (*Thomomys mazama glacialis*), Olympia pocket gopher (*T.m. pugetensis*), Tenino pocket gopher (*T.m. tumuli*), and Yelm pocket gopher (*T.m. yelmensis*).
Adult Mazama pocket gophers are reddish brown to black above, and lead-colored with buff-colored tips on their underparts. The lips, nose, and patches behind the ears are black; the wrists are white. Adults range from 189 to 220 mm (7 to 9 inches) in total length, with tails that range from 45 to 85 mm (2 to 3 inches) (USFWS 2015). Mazama pocket gophers are morphologically similar to other species of pocket gopher that exploit a subterranean existence. They are stocky and tubular in shape, with short necks, powerful limbs, long claws, and tiny ears and eyes. Their short, nearly hairless tails are highly sensitive and probably assist when navigating tunnels. The "pockets" in their name are external, fur-lined cheek pouches on either side of the mouth that are used to transport nesting material and plant cuttings.

Roy Prairie, Olympia, Tenino, and Yelm pocket gophers are recognized as separate subspecies based on morphological characteristics, distribution, and differences in number of chromosomes. These four subspecies occur in relatively close proximity to each other geographically, and at least three of them occur in the same clade (USFWS 2015).

Species Distribution

The four Thurston/Pierce subspecies of the Mazama pocket gopher are only found in Pierce and Thurston Counties, Washington. Their populations are concentrated in well-drained, friable soils often associated with glacial outwash. There are few data on historical or current population sizes of Mazama pocket gopher populations in Washington, although several local populations and one subspecies are believed to be extinct. It is currently thought that the overall population trend of each of the four Thurston/Pierce subspecies of the Mazama pocket gopher is negative.

In Thurston County, Olympia, Tenino, and Yelm pocket gophers are known to occur east of the Black River and south of Interstate 5 and State Highway 101. The present outermost boundaries of the ranges of each of the four Thurston/ Pierce subspecies of the Mazama pocket gopher are likely approximately the same as they were historically. However, entire prairie areas or portions thereof within those outer perimeters have been lost to development and woody plant encroachment.

At present, pocket gophers likely occupy a smaller range than they once had historically. The four subspecies are still known to occur in their type locality locations, and the areas immediately around those locations are considered to still be part of each subspecies' range. Beyond these areas, uncertainty remains as to the entire areal extent of each subspecies' range, and where or if populations of the subspecies coexist or abuts one another (USFWS 2015).

Olympia Pocket Gopher

The Olympia pocket gopher occurs on the prairies located 5 to 6 km (3 to 4 miles) south of Olympia, currently the location of the Olympia Airport (Dalquest and Scheffer 1942). Soil series and soil series complexes in and around this area that may support pocket gophers include Alderwood, Cagey, Everett, Indianola, McKenna, Nisqually, Norma, Spana, Spanaway-Nisqually complex, and Yelm.

Roy Prairie Pocket Gopher

The Roy Prairie pocket gopher is found in the vicinity of the Roy Prairie and on JBLM in Pierce County. The subspecies was described as plentiful in 1983, but by 1993 the type locality was described as a "small population" (USFWS 2015). Due to proximity to the subspecies' type locality, it is likely that the 91st Division Prairie and Marion Prairie in Pierce County support this subspecies. Soil series and soil series complexes in and around this area that may support pocket gophers include Alderwood, Everett, Everett-Spanaway complex, Everett-Spanaway-Spana complex, Nisqually, Spana-Spanaway-Nisqually complex, and Spanaway.

Tenino Pocket Gopher

Tenino pocket gophers were originally found in the vicinity of the Rocky Prairie Natural Area Preserve, near Tenino (Dalquest and Scheffer 1942), a relatively small prairie area. Gophers still reside there, but WDFW researchers have not seen consistent occupancy of the area in recent years (USFWS 2015), suggesting that the activity intermittently detected in the Rocky Prairie Natural Area Preserve may be attributable to individuals dispersing from a currently unidentified nearby source. Soil series and soil series complexes in this area that may support pocket gophers include Everett, Nisqually, Norma, Spanaway, and Spanaway-Nisqually complex.

Yelm Pocket Gopher

Yelm pocket gophers were originally found on prairies in the area of Grand Mound, Vail, and Rochester, Washington (Dalquest and Scheffer 1942). Surveys conducted in 1993 and 1994 found no pocket gophers near the towns of Vail or Rochester (USFWS 2015). More recent surveys have reported pocket gophers near Grand Mound, Littlerock, Rainier, Rochester, and Vail, Washington, though WDFW biologists question the validity of the reports near Littlerock and Vail (USFWS 2015). Soil series and soil series complexes in and around these areas that may support pocket gophers include Alderwood, Everett, Godfrey, Kapowsin, McKenna, Nisqually, Norma, Spana, Spanaway, Spanaway-Nisqually complex, and Yelm.

Critical Habitat
On April 9, 2014, the USFWS published a final rule designating critical habitat for three of the four listed subspecies of the Mazama pocket gopher: Olympia, Tenino, and Yelm (79 FR 19711). Critical habitat was not designated for the Roy Prairie subspecies. The USFWS designated 650 ha (1,606 acres) of critical habitat in Thurston County, Washington.

Olympia Pocket Gopher Critical Habitat – Olympia Airport Unit
This unit consists of 274 ha (677 acres) and is made up of land owned by the Port of Olympia, a municipal corporation. The Olympia Airport Unit is located south of the cities of Olympia and Tumwater, in Thurston County, Washington.

Tenino Pocket Gopher Critical Habitat – Rocky Prairie Unit
This unit consists of 162 ha (400 acres) and is owned by one commercial land owner and Burlington Northern Santa Fe Railroad. The Rocky Prairie Unit is located north of the city of Tenino, Thurston County, Washington.

Yelm Pocket Gopher Critical Habitat – Tenalquot Prairie Subunit
This subunit consists of 117 ha (289 acres) and contains lands owned by one commercial landowner and The Nature Conservancy. This subunit is located northwest of the city of Rainier, Thurston County, Washington. As proposed, the Tenalquot Prairie Subunit included 609 ha (1,505 acres) of JBLM land, which has been exempted based on a completed Endangered Species Management Plan. This exemption, based on this species-specific management plan, has been determined to provide a conservation benefit to the Yelm pocket gopher.

Yelm Pocket Gopher Critical Habitat – Rock Prairie Subunit
This subunit consists of 98 ha (242 acres) and contains lands owned by one private residential and one commercial landowner. As proposed, this subunit included 153 ha (378 acres) of private ranch land, which has been excluded.

The PBFs considered essential to the conservation of the Mazama pocket gopher include:

- Soils that support the burrowing habits of the Mazama pocket gopher, usually friable, loamy, and deep soils. This is the most important PBF for the Mazama pocket gopher.
- Areas ≥20 ha (50 acres) sufficient for breeding, foraging, and dispersal activities that have:
    - o <10% woody vegetation cover
    - o Vegetative cover suitable for foraging (e.g., leafy vegetation, succulent roots, shoots, tubers, and grasses)
    - o Few, if any, barriers to dispersal, which may include forest edges, roads, abrupt elevation changes, inhospitable soil types or substrate, development of buildings, open water

Life History

The Mazama pocket gopher is associated with glacial outwash prairies in western Washington, an ecosystem of conservation concern (Hartway and Steinberg 1997), as well as alpine and subalpine meadows and other meadow-like openings at lower elevations. Steinberg and Heller (1997) found that pocket gophers are even more patchily distributed than are prairies, as there are some seemingly high quality prairies within the species' range that lack pocket gophers.

Mazama pocket gopher distribution is affected by the rock content of soils, drainage, forage availability, and climate (Case and Jasch 1994; Stinson 2005; Hafner et al. 1998; Steinberg and Heller 1997; WDFW 2009a). Prairie and meadow habitats used by Mazama pocket gophers have a naturally patchy distribution. In their prairie habitats, there is an even patchier distribution of soil rockiness that may further restrict the total area that pocket gophers can utilize (Steinberg and Heller 1997; WDFW 2009a).

The Mazama pocket gopher's home range is composed of suitable breeding and foraging habitat. Home range size varies based on factors such as soil type, climate, and density and type of vegetative cover (Case and Jasch 1994; Hafner et al. 1998; Cox and Hunt 1992). Little research has been conducted regarding home range size for individual pocket gophers in western Washington. Witmer et al. (1996) reported an average home range size of approximately 100 square meters (1,076 square ft) for one location in Thurston County, Washington. Pocket gopher density varies greatly due to local climate, soil suitability, and vegetation types (Case and Jasch 1994; Howard and Childs 1959), and densities are likely to be higher when habitat quality is better. Therefore, this report (Witmer et al. 1996) is unlikely to represent the average density across all soil types, vegetation types, and other unique site characteristics across the ranges of the four Thurston/Pierce subspecies of the Mazama pocket gopher.

Research on other species of pocket gophers show a wide range of home range sizes, from approximately 7.4 to 1,335 square meters (80 to 14,370 square ft). Studies that have included live-capture and enumeration continue to find that densities of the four Thurston/Pierce subspecies of the Mazama pocket gopher vary significantly, between sites with dissimilar characteristics, between sites with similar characteristics, and within the same sites over time (USFWS 2015).

Pocket gophers are generalist herbivores, and their diet includes a wide variety of plant material, including leafy vegetation, succulent roots, shoots, and tubers. In natural settings, pocket gophers play a key ecological role by aerating soils, activating the seed bank, and stimulating plant growth. Foraging primarily takes place below the surface of the soil, where pocket gophers snip off roots of plants before occasionally pulling the whole plant below ground to eat or store in caches. If aboveground foraging occurs, it is usually within a few feet of an opening, and forage plants are quickly cut into small pieces and carried back to the nest or cache (Wight 1918). Any water they need is obtained from their food (Gettinger 1984; Wight 1918).

Current Stressors and Threats

The primary long-term threats to the Mazama pocket gopher are the loss, conversion, and degradation of habitat, particularly due to urban development; successional changes to grassland habitat; poor connectivity between small and isolated populations; and mortality linked to predation by domestic pets and pest control tactics against pocket gophers on private land. The threats also include increased predation pressure, which is closely linked to habitat degradation.

Native prairies and grasslands have been severely reduced throughout the range of the four Thurston/Pierce subspecies of Mazama pocket gopher, especially as a result of conversion to residential and commercial development and agriculture. Prairie habitat continues to be lost, particularly to residential development (Stinson 2005), by removal and fragmentation of native vegetation, excavation, and heavy equipment-caused compaction of surfaces and conversion to non-habitat (e.g., buildings, pavement, other infrastructure), rendering soils unsuitable for burrowing (USFWS 2015).

The suppression and loss of ecological disturbance regimes across vast portions of the landscape, such as fire, has resulted in altered vegetation structure in the prairies and meadows and has facilitated invasion by native and nonnative woody vegetation, rendering habitat unusable for the four Thurston/Pierce subspecies of Mazama pocket gopher. The basic ecological processes that maintain prairies and meadows have disappeared from, or have been altered on, all but a few protected and managed sites (USFWS 2015).

The four Thurston/Pierce subspecies of the Mazama pocket gopher face threats from loss or fragmentation of habitat. Most species' populations fluctuate naturally, responding to various factors such as weather events, disease, and predation. Populations that are small, fragmented, or isolated by habitat loss or modification of naturally patchy habitat, and other human-related factors, are more vulnerable to extirpation by natural randomly occurring events, cumulative effects, and genetic effect (collectively known as small population effects). These effects can include genetic drift (loss of recessive alleles), founder effects (over time, an increasing percentage of the population inheriting a narrow range of traits), and genetic bottlenecks leading to increasingly lower genetic diversity, with consequent negative effects on evolutionary potential (USFWS 2015).

To date, of the eight subspecies of Mazama pocket gopher in Washington, only the Olympic pocket gopher has been documented as having low genetic diversity (USFWS 2015), although the six other extant subspecies have local populations that are small, fragmented, and physically isolated from one another.

Predation has an impact on populations of the four Thurston/Pierce subspecies of Mazama pocket gopher. Urbanization, particularly in the south Puget Sound region, has resulted in not only habitat loss, but also increased exposure to feral and domestic cats and dogs.

Pocket gophers are often considered a pest because they sometimes damage crops and seedling trees, and their mounds can create a nuisance. In Washington State, it is currently illegal to trap or poison Mazama pocket gophers, or to trap or poison moles where they overlap with Mazama pocket gopher populations, but not all property owners are cognizant of these laws, nor are most citizens capable of differentiating between moles, pocket gophers, or the signs of their habitation (e.g., soil disturbance). In light of this, it is reasonable to believe that mole trapping or poisoning still has the potential to adversely affect pocket gopher populations. Local populations that survive commercial and residential development (adjacent to and within habitat) may be subsequently extirpated by trapping or poisoning. Lethal control by trapping or poisoning is most likely to be a threat to the four Thurston/Pierce subspecies where their ranges overlap with residential properties (USFWS 2015).

3.2.2.7 Birds

Marbled Murrelet (*Brachyramphus marmoratus*)

The marbled murrelet was listed as a threatened species on October 1, 1992, in Washington, Oregon, and northern California (57 FR 45328). The marbled murrelet is a small diving seabird that nests mainly in coniferous forests and forages in nearshore marine habitats. Males and females have sooty-brown upper parts with dark bars. Underparts are light, mottled brown. Winter adults have brownish-gray upper parts and white scapulars (shoulders). The plumage of fledged young is similar to that of adults in winter. Chicks are downy and tan colored with dark speckling (USFWS 2015). During a 2013 population abundance survey conducted in Washington, Oregon, and California, the population was estimated to be between 15,400 and 23,900 birds (USFWS 2016a). The 2013 estimate shows a downward movement of murrelet population; abundance during the early 1990s in Washington, Oregon, and California was estimated at 18,550 to 32,000 birds (Ralph et al. 1995).

Species Distribution

Historically, the breeding range of the marbled murrelet extends from Alaska through British Columbia, Washington, Oregon, to northern Monterey Bay in central California. This species winters throughout its breeding range and also occurs in small numbers off southern California (USFWS 2015).

At the time of listing, the distribution of active nests in nesting habitat was described as noncontinuous (USFWS 1997). The at-sea extent of the species currently encompasses an area similar in size than the species' historic distribution.

Critical Habitat

On May 24, 1996, the USFWS designated critical habitat for the marbled murrelet encompassing approximately 1.6 ha (4.0 million acres) across Washington (647,797 ha [160,741 acres]), Oregon (607,028 ha [1.5 million acres]), and California (283,278 ha [699,995 acres]) (17 FR 26256).

The final rule revising critical habitat for the marbled murrelet was published on October 5, 2011 (76 FR 61599). The USFWS reduced critical habitat in Northern California and Oregon. New data indicated that these areas did not meet the definition of critical habitat, and 76,751 ha (189,656 acres) were removed from the critical habitat designated in 1996 (76 FR 61599).

The USFWS revisited the critical habitat designation for the marbled murrelet on August 4, 2016 (81 FR 51348). The USFWS concluded that the current (2006 and 2011) designations for critical habitat met satisfactory requirements for the species. Currently, there are approximately 1.5 million ha (3.7 million acres) of designated critical habitat in Washington, Oregon, and California. Only a few areas of critical habitat overlap with the Action Area. These areas occur along the Oregon coast.

The PBFs considered essential to the conservation of the marbled murrelet are those features critical for supporting suitable nesting habitat for successful reproduction. Those feature are:

- Individual trees with potential nesting platforms
- Forested areas within 0.8 km (0.5 miles) of individual tress with potential nesting platforms, and with a canopy height of at least one-half the site-potential tree height.

Life History
Marbled murrelets spend most of their lives in the marine environment where they forage in near-shore areas and consume a diversity of prey species, including small fish and invertebrates. In their terrestrial environment, the presence of platforms (large branches or deformities) used for nesting is the most important characteristic of their nesting habitat. Murrelet habitat use during the breeding season is positively associated with the presence and abundance of mature and old growth forests, large core areas of old growth, low amounts of edge habitat, reduced habitat fragmentation, proximity to the marine environment, and forests that are increasing in stand age and height (USFWS 2015).

Nest stands are typically composed of low elevation conifer species. In California, nest sites have been located in stands containing old growth redwood (*Sequoia sempervirens*) and Douglas-fir, while nests in Oregon and Washington have been located in stands dominated by Douglas-fir, western hemlock, and Sitka spruce (USFWS 2015).

In areas with protective waters, there may be a general opportunistic shift from exposed outer coasts into more protected waters during the winter (Nelson 1997); for example, many marbled murrelets breeding on the exposed outer coast of Vancouver Island appear to congregate in the more sheltered waters within the Puget Sound and the Strait of Georgia in fall and winter (Burger 1995).

Murrelets are usually found within 8 km (5 miles) of shore, and in water less than 60 m (197 ft) deep (Burger 1995; Nelson 1997; Ainley et al. 1995). In general, this species occurs closer to shore in exposed coastal areas and farther offshore in protected coastal areas (Nelson 1997). Courtship, foraging, loafing, molting, and preening occur in marine waters.

Marbled murrelets are wing-propelled pursuit divers that forage both during the day and at night (Carter and Sealy 1986; Kuletz 2005). This species can make substantial changes in foraging sites within the breeding season, but many individuals routinely forage in the same general areas and at productive foraging sites, as evidenced by repeated use over a period of time throughout the breeding season (Carter and Sealy 1986; Hull et al. 2001; Mason et al. 2002; Piatt et al. 2007; Whitworth et al. 2000). Murrelets are also known to forage in freshwater lakes (Nelson 1997). Activity patterns and foraging locations are influenced by biological and physical processes that concentrate prey, such as weather, climate, time of day, season, light intensity, up-wellings, tidal rips, narrow passages between island, hallow banks, and kelp beds (Burger 1995; Nelson 1997; Ainley et al. 1995).

Throughout their range, marbled murrelets are opportunistic feeders and utilize prey of diverse sizes and species. They feed primarily on fish and invertebrates in marine waters, although they have also been detected on rivers and inland lakes (50 CFR 17) (Carter and Sealy 1986). In general, small schooling fish and large pelagic crustaceans are the species' main prey items. Pacific sand lance (*Ammodytes hexapterus*), northern anchovy (*Engraulis mordax*), immature Pacific herring (*Clupea harengus*), capelin (*Mallotus villosus*), Pacific sardine (*Sardinops sagax*), juvenile rockfishes (*Sebastas* spp.), and surf smelt (*Osmeridae*) are the most common fish species taken. Squid (*Loligo* spp.), euphausiids, mysid shrimp, and large pelagic amphipods are the main invertebrate prey. Marbled murrelets are able to shift their diet in response to prey availability(Becker et al. 2007). Long-term adjustment to less energy-rich prey resources appears to be partly responsible for poor reproduction in California (USFWS 2015).

Breeding adults exercise more specific foraging strategies when feeding chicks, usually carrying a single, energy-rich fish to their chicks (Burkett 1995; Nelson 1997). Freshwater prey is important to some individuals during several weeks in summer and may facilitate more frequent chick feedings (Hobson 1990). Nesting marbled murrelets that are returning to their nest at least once per day must balance the energetic costs of foraging trips; this may result in their preferring to forage in marine areas in close proximity to their nesting habitat. However, if adequate or appropriate foraging resources are unavailable in close proximity to their nesting areas, the species may be forced to forage at greater distances or abandon their nests (Huff et al. 2006). As a result, the distribution and abundance of prey suitable for feeding chicks may greatly influence the overall foraging behavior and location during the nesting season and may affect reproductive success (Becker et al. 2007). It may also significantly affect the energy demand on adults by influencing both the foraging time and number of trips required (Kuletz 2005).

Current Stressors and Threats

Several anthropogenic threats were identified as having caused the dramatic decline in the species when the marbled murrelet was listed under the ESA (57 FR 45328) and in the Recovery Plan (USFWS 1997). These threats include habitat destruction and modification in the terrestrial environment from timber harvest and human development, which caused a severe reduction in the amount of nesting habitat, unnaturally high levels of predation resulting from forest edge effects, the existing regulatory mechanisms, inadequate regulatory mechanisms, and human-caused factors such as mortality from oil spills and entanglement in fishing nets used in gill-net fisheries.

There have been changes in the levels of these threats since the 1992 listing (USFWS 2004, 2009c). The regulatory mechanisms implemented since 1992 that affect land management in Washington, Oregon, and California, and new gill-netting regulations in northern California and Washington, have reduced some threats to the marbled murrelet (USFWS 2004). The levels for the other threats identified in the 1992 listing (57 FR 45328), including the loss of nesting habitat, predation rates, and mortality risks from oil spills and gill net fisheries, have remained unchanged. However, new threats have been identified (USFWS 2009c). These new stressors are due to several environmental factors affecting marbled murrelets in the marine environment, including habitat destruction, modification, or curtailment of the marine environmental conditions necessary to support the species due to elevated levels of polychlorinated biphenyls in prey species; changes in prey abundance and availability; changes in prey quality; harmful algal blooms that produce biotoxins leading to mortality; and climate change in the Pacific Northwest.

Human factors that affect the continued existence of the species include derelict fishing gear leading to mortality from entanglement, energy development projects (wave, tidal, and on-shore wind energy projects) leading to mortality, and disturbance in the marine environment (from exposures to lethal and sublethal levels of high underwater sound pressures caused by pile-driving, underwater detonations, and potential disturbance from high vessel traffic) (USFWS 2009c).

Climate change is expected to further exacerbate some existing threats such as the projected potential for increased habitat loss from drought-related fire, mortality, insects and disease, and increases in extreme flooding, landslides and windthrow events in the short term (10 to 30 years) (USFWS 2009c).

Northern Spotted Owl (*Strix occidentalis caurina*)

The northern spotted owl was listed as threatened on June 26, 1990, due to widespread loss and adverse modification of suitable habitat across the its entire range and the inadequacy of existing regulatory mechanisms to conserve the owl (55 FR 28114).


USFWS Photo

The northern spotted owl is one of three subspecies of spotted owls currently recognized by the American Ornithologists' Union. The taxonomic separation of these three subspecies is supported by genetic, morphological and biogeographic information (Barrowclough et al. 1999; Barrowclough and Gutiérrez 1990; Gutierrez et al. 1995; Haig et al. 2004).

The northern spotted owl is medium-sized and is the largest of the three subspecies (Gutiérrez 1996). It is approximately 46 to 48 cm (18 to 19 inches) long, and the sexes are dimorphic, with males averaging about 13% smaller than females. The spotted owl is dark brown with a barred tail and white spots on its head and breast, and it has dark brown eyes surrounded by prominent facial disks. Four age classes can be distinguished on the basis of plumage characteristics (Moen et al. 1991). The northern spotted owl superficially resembles the barred owl (*Strix varia*), a species with which it occasionally hybridizes (Kelly and Forsman 2004). Hybrids exhibit physical and vocal characteristics of both species (Hamer et al. 1994).

Species Distribution

The current range of the northern spotted owl extends from southwest British Columbia through the Cascade Mountains, coastal ranges, and intervening forested lands in Washington, Oregon, and California, as far south as Marin County (55 FR 28114). The range of the northern spotted owl is partitioned into 12 physiographic provinces based on recognized landscape subdivisions exhibiting different physical and environmental features (USFWS 2011c). These provinces are distributed across the species' range as follows:

- Four provinces in Washington: Eastern Washington Cascades, Olympic Peninsula, Western Washington Cascades, Western Washington Lowlands;
- Five provinces in Oregon: Oregon Coast Range, Willamette Valley, Western Oregon Cascades, Eastern Oregon Cascades, Oregon Klamath; and
- Three provinces in California: California Coast, California Klamath, California Cascades.

The northern spotted owl is extirpated or uncommon in certain areas such as southwestern Washington and British Columbia. Timber harvest activities have eliminated, reduced, or fragmented its habitat sufficiently to decrease overall population densities across its range, particularly within the coastal provinces, where habitat reduction has been concentrated (USFWS 1992).

As of July 1, 1994, there were 5,431 known site-centers of northern spotted owl pairs or resident singles in Washington, Oregon, and California (60 FR 9483). The actual number of currently occupied northern spotted owl locations across the range is unknown because many areas remain unsurveyed (USFWS 2011c). Many historical sites are no longer occupied because northern spotted owls have been displaced by barred owls, timber harvest, or severe fires, and it is possible that some new sites have been established due to reduced timber harvest on federal lands since 1994.

Critical Habitat

The USFWS designated revised critical habitat for northern spotted owls on December 4, 2012 (77 FR 71875). The revised critical habitat currently includes approximately 3.9 million ha (9.8 million acres) in 11 units and 60 subunits in California, Oregon, and Washington.

PBFs essential for the conservation of northern spotted owl include:

- Forest types in early-, mid-, or late-seral stages and that support northern spotted owl across its geographical range. These forest types are primarily Sitka spruce, western hemlock, mixed conifer and mixed evergreen, grand fir, Pacific silver fir, Douglas-fir, white fir, and Shasta red fir, and redwood/Douglas-fir (in coastal California and southwestern Oregon);
- Nesting and roosting habitat that provides structural features for nesting, protection from adverse weather conditions, and cover to reduce predation risks for adults and young; and
- Appropriate foraging habitat

Life History

Habitat use by the northern spotted owl is highly influenced by prey availability. This species generally relies on older forested habitats because such forests contain the structures and characteristics required for nesting, roosting, and foraging; however, roost sites selected by northern spotted owls have more complex vegetation structure than the forests generally available to them (Barrows and Barrows 1978; Forsman et al. 1984; Solis and Gutiérrez 1990). Features that support nesting and roosting typically include a moderate to high canopy closure (60% to 90%); a multi-layered, multi-species canopy with large overstory trees; a high incidence of large trees with deformities, including large cavities, broken tops, mistletoe infections, and other evidence of decay; large snags; large accumulations of fallen trees and other woody debris on the ground; and sufficient open space below the canopy for spotted owls to fly (Thomas et al. 1990).

The northern spotted-owl tends to utilize forests consisting predominantly of Douglas-fir, western hemlock, grand fir, white fir (*Abies concolor*), ponderosa pine (*Pinus ponderosa*), Shasta red fir (*Abies magnifica shastensis*), mixed evergreen, mixed conifer hardwood (Klamath montane), and redwood. The upper elevation limit at which spotted owls occur corresponds to the transition to subalpine forest, which is characterized by relatively simple structure and severe winter weather (Forsman 1975; Forsman et al. 1984).

Foraging habitat is the most variable of all habitats used by territorial northern spotted owls (USFWS 2011c). Descriptions of foraging habitat have ranged from complex structure (Solis and Gutiérrez 1990) to forests with lower canopy closure and smaller trees than forests containing nests or roosts (Gutiérrez 1996).

Dispersal habitat is essential to maintaining stable populations by filling territorial vacancies when resident northern spotted owls die or leave their territories, and to providing adequate gene flow across the range of the species. Dispersal habitat, at a minimum, consists of stands with adequate tree size and canopy closure to provide protection from avian predators and at least minimal foraging opportunities. Dispersal habitat may include younger and less diverse forest stands than foraging habitat, such as even-aged, pole-sized stands, but such stands should contain some roosting structures and foraging habitat to allow for temporary resting and feeding for dispersing juveniles (USFWS 1992).

Northern spotted owls are mostly nocturnal, although they also forage opportunistically during the day (Forsman et al. 1984; Forsman et al. 2004; Sovern et al. 1994). The composition of the northern spotted owl's diet varies geographically and by forest type. Generally, flying squirrels (*Glaucomys sabrinus*) are the most prominent prey for northern spotted owls in Douglas-fir and western hemlock forests (Forsman et al. 1984) in Washington (Hamer et al. 2001) and Oregon, while dusky-footed wood rats (*Neotoma fuscipes*) are a major part of the diet in the Oregon Klamath, California Klamath, and California coastal provinces (Forsman et al. 1984; Forsman et al. 2004; Ward and Gutierrez 1998). Depending on location, other important prey include deer mice (*Peromyscus maniculatus*), tree voles, red-backed voles (*Clethrionomys* spp.), gophers (Thomomys spp.), snowshoe hares, bushy-tailed wood rats (*Neotoma cinerea*), birds, and insects, although these species make up a small portion of the northern spotted owl diet (Forsman et al. 1984; Forsman et al. 2004; Hamer et al. 2001; Ward and Gutierrez 1998). Other prey species such as the red tree vole, red-backed voles, mice, rabbits and hares, birds, and insects) may be seasonally or locally important (Courtney et al. 2004).

Current Stressors and Threats

The northern spotted owl was listed as threatened throughout its range "due to loss and adverse modification of suitable habitat as a result of timber harvesting and exacerbated by catastrophic events such as fire, volcanic eruption, and wind storms" (55 FR 28114). More specifically, threats to the northern spotted owl included low populations, declining populations, limited habitat, declining habitat, inadequate distribution of habitat or populations, isolation of provinces, predation and competition, lack of coordinated conservation measures, and vulnerability to natural disturbance (USFWS 1992). Declining habitat was recognized as a severe or moderate threat to the northern spotted owl throughout its range, isolation of populations was identified as a severe or moderate threat in 11 provinces, and a decline in population was a severe or moderate threat in 10 provinces. Together, these three factors represented the greatest concerns regarding range-wide conservation of the species. Limited habitat was considered a severe or moderate threat in nine provinces, and low populations were a severe or moderate concern in eight provinces, suggesting that these factors were also a concern throughout the majority of the northern spotted owl's range. Vulnerability to natural disturbances was rated as low in five provinces.

The degree to which predation and competition might pose a threat to the northern spotted owl was unknown in more provinces than any of the other threats, indicating a need for additional information. Few empirical studies exist to confirm that habitat fragmentation contributes to increased levels of predation on northern spotted owls (Courtney et al. 2004). As mature forests are harvested, great horned owls (*Bubo virginianus*), a predator of the northern spotted owl, may colonize fragmented forests, thereby increasing the northern spotted owl's vulnerability to predation.

Short-tailed Albatross (*Phoebastria albatross*)

USFWS Photo

The short-tailed albatross was officially listed as endangered throughout its entire range on July 31, 2000 (65 FR 46643). The status of the species has been reviewed twice since originally listed and is considered stable and improving (USFWS 2017e, 2014a).

At one time, the short-tailed albatross was likely the most abundant albatross in the North Pacific (USFWS 2008b; Olson and Hearty 2003). Between the late 18th and mid-19th century, millions were hunted for feathers, oil, and fertilizer (USFWS 2008b), and by 1949, no birds were observed breeding and the species was thought to be extinct. However, the species began to recover during the 1950s and currently occurs throughout the North Pacific Ocean.

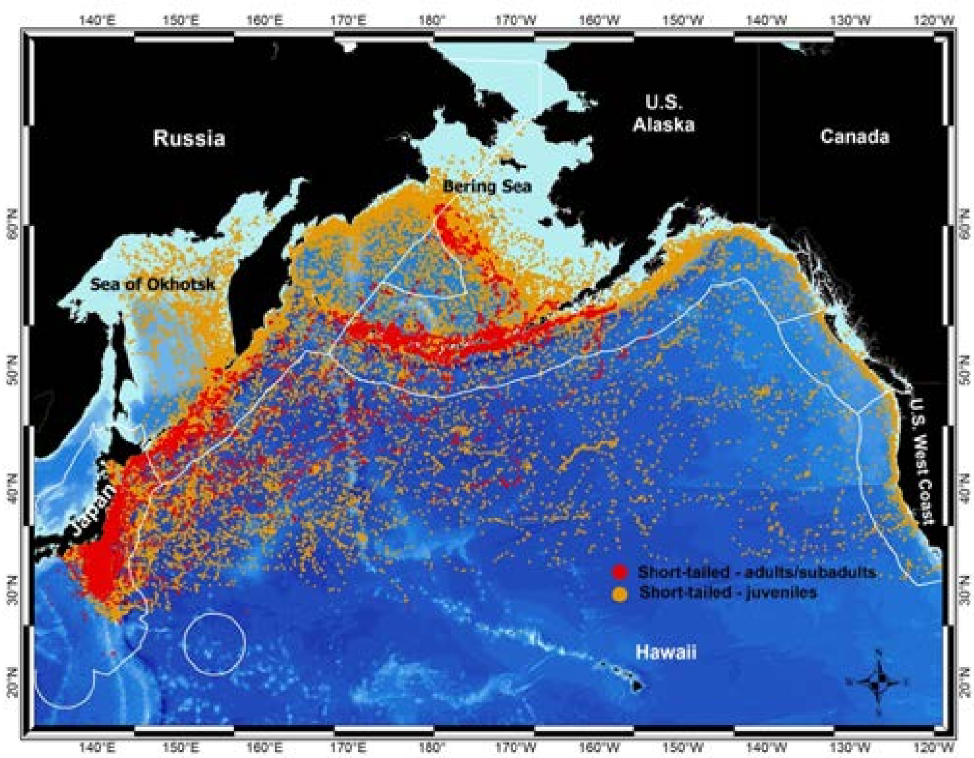
The short-tailed albatross is a large pelagic bird with long, narrow wings adapted for soaring above the water surface. It is the largest of the three albatross species found in the North Pacific. The short-tailed albatross has a body length of 84 to 94 cm (33 to 37 inches) and a wingspan of 213 to 229 cm (84 to 90 inches). Adults have a white head and body and golden cast to crown and nape. The tail is white with a black bar. A disproportionately large pink bill distinguishes it from other North Pacific albatrosses, and its hooked tip becomes progressively bluer with age. Juveniles of the species are blackish-brown, progressively whitening with age. Short-tailed albatrosses are also the only North Pacific albatross that develops an entirely white back at maturity (USFWS 2008b).

Species Distribution

The range of the short-tailed albatross covers most of the North Pacific Ocean, as well as a few observations from the Sea of Okhotsk and the East China Sea (USFWS 2008b, 2017e). The species occurs throughout international waters and within the Exclusive Economic Zones of Mexico, the US, Canada, Russia, Japan, China, North and South Korea, the Federated States of Micronesia, and the Republic of the Marshall Islands. The southern limit of the species is unknown, but probably coincides with the northern edge of the North Equatorial Current (USFWS 2008b). Historically, the short-tailed albatross was probably the most abundant albatross in the North Pacific, with 14 known breeding colonies in the northwestern Pacific and potentially in the North Atlantic (Olson and Hearty 2003; USFWS 2008b).

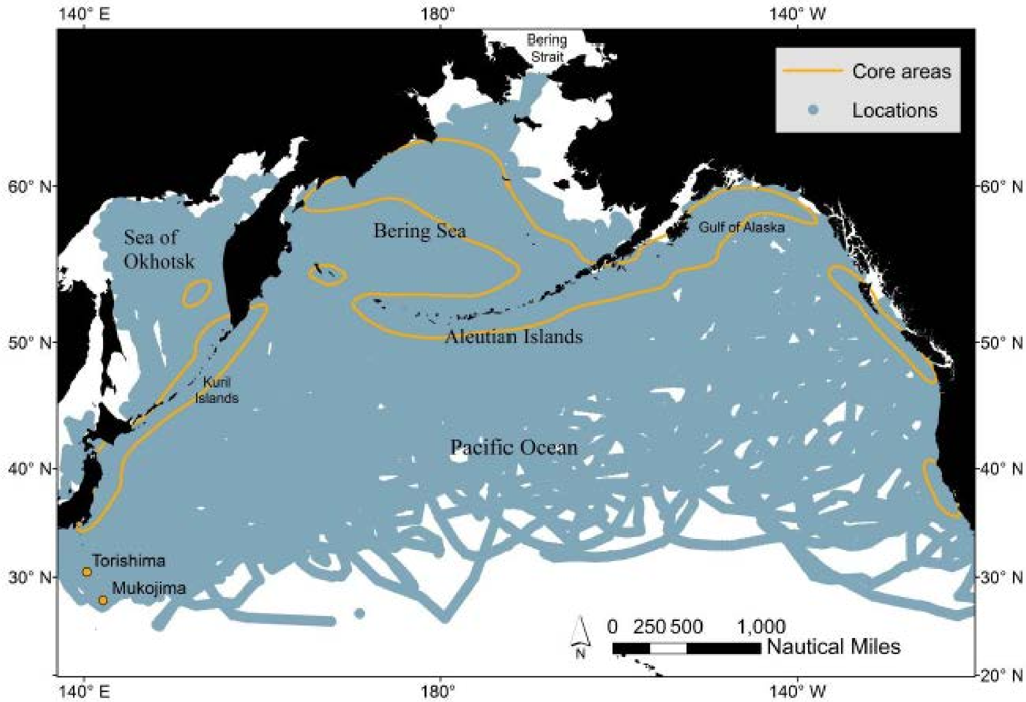
Post-fledgling juvenile and younger sub-adult birds (less than two years old) have a wider range than adults. They range widely throughout the North Pacific, and some individuals also spend time in the oceanic waters between Hawaii and Alaska (Deguchi et al. 2013). They are found in the Sea of Okhotsk, a broader region of the Bering Sea, and the US West Coast (O'Connor 2013; USFWS 2017e, 2014a).

.Although the highest concentrations of short-tailed albatross are found in the Aleutian Islands and outer shelf of the Bering Sea regions of Alaska, subadults appear to be distributed along the US West Coast of more than has been previously reported (Guy et al. 2013; O'Connor 2013). Figure 3-36 shows the distribution of 99 short-tailed albatross—distinguishing between adult and juvenile bird—tracked between 2002 and 2012 (USFWS 2017e). Figure 3-37 provides the core habitat areas for juvenile short-tailed albatross as identified by O'Connor (2013) including the core habitat for juvenile short-tailed albatross that occurs along the northern coast of Washington State.



Source: USFWS (2017e)

Figure 3-36 Short-tailed Albatross Distribution in North Pacific



Source: (O'Connor 2013)

Figure 3-37 Core Area and Point Locations for Juvenile Short-tailed Albatross

In an analysis of historic and current distribution of North Pacific albatrosses, Kuletz et al. (2014) speculated that the increase in short-tailed albatross population and changes in its distribution over the last decade was due to possible increases in squid biomass in the Aleutian Islands region of the Bering Sea. Overall, the much higher abundance of albatrosses in the Aleutians compared to the Bering Sea mirrored the relative density of squid, which is estimated to be approximately seven times higher in the Aleutians (Ormseth 2016).

Critical Habitat

Critical habitat has not been designated for the short-tailed albatross.

Life History

The short-tailed albatross tends to prefer waters shallower than 1,000 m (3,280 ft) that are associated with continental shelves. Tracking efforts based on at-sea sightings have provided more information about short-tailed albatross's use of marine habitats (Zador and Fitzgerald 2008). Both adult and juvenile birds extensively use areas of the western Pacific east of Japan.

Short-tailed albatrosses nest on isolated, windswept islands, with restricted human access in locations outside of the US. There are no nesting populations within the US; rather the species breeds on small islands near Japan and on Midway Atoll. In Japan, on Torishima, most birds nest on a steep site containing loose volcanic ash (Tsubamezaki); however, a new colony on a vegetated gentle slope (Hatsunezaki) is growing rapidly (USFWS 2014a). Efforts were made between 2008 and 2012 to reintroduce albatross to Mukojima, another island south of Torishima, and the first successful fledging on Mukojima was observed in 2015 (Kyodo News 2015; The Mainichi 2016). Breeding at Midway Atoll appears to be minimal, with only one confirmed breeding pair producing successfully fledged young (Clark 2014). Nest sites are occupied between October and July, with individuals arriving or leaving throughout that time period (Hasegawa and DeGange 1982).

The diet of short-tailed albatross is not well-known. Observations of food brought to nestlings and of regurgitated material as well as at-sea observations during feeding indicate that the diet includes squid, shrimp, fish, flying fish eggs, and other crustaceans (USFWS 2015; Hasegawa and DeGange 1982)). This species has also been reported to scavenge discarded marine mammals and blubber from whaling vessels, and they readily scavenge fisheries offal (Hasegawa and DeGange 1982). Short-tailed albatross forage diurnally and possibly nocturnally (Hasegawa and DeGange 1982). They are known to forage both individually or in groups, predominantly taking prey by surface-seizing (Piatt et al. 2006).

Current Stressors and Threats

One of the biggest threats to short-tailed albatross is their limited breeding range. Fisheries is another threat. Albatross have been known to attack baited hooks of both pelagic and demersal longlines after the hooks are deployed; if they get hooked or snagged, they are likely to be injured or pulled underwater with the rest of the gear and drowned (USFWS 2008b). Interactions with trawls may occur when seabirds fly behind vessels or float in offal plumes that trail behind vessels. Individuals can strike cables attached to the net or become entangled on the outside of nets towed at or near the surface, resulting in drownings (USFWS 2008b).

Natural mortality is a key factor affecting albatross. Shark predation is documented among other albatross species, but has not been observed for short-tailed albatross (USFWS 2008b). This predation would likely include sharks preying upon fledgling short-tailed albatross as they depart their natal colony. Black rats (*Rattus rattus*) were introduced to Torishima at some point, and they may consume seabird chicks or eggs; however, deaths of short-tailed albatross resulting from rats have also not been observed. Landslides caused by monsoon rains have previously destroyed nests and nesting habitat, resulting in the deaths of albatross (USFWS 2014a).

Oil contamination can adversely affect short-tailed albatross either through acute toxicity from being directly oiled or as a result of chronic or sublethal exposure to low levels of oil. Petroleum exposure may compromise seabirds’ thermoregulations by fouling feathers, cause direct toxicity through ingestion (during preening), contaminate food resources, reduce prey abundance, and cause toxic effects to embryos (USFWS 2008b).

Plastics have been found in the stomachs of most species of albatross. Both black-footed (*Phoebastria nigripes*) and Laysan albatross (*Phoebastria immutabilis*) are well known to ingest plastics in the course of foraging. Plastic ingestion is not only a direct dietary risk but also may contribute to chronic accumulation of contaminants that adhere to and are absorbed by plastics in albatross (USFWS 2015).

Albatross and other birds may be exposed to organochlorine contaminants such as polychlorinated biphenyls and pesticides, and to toxic metals such as mercury and lead via atmospheric and oceanic transport (USFWS 2015).

Streaked Horned Lark (*Eremophila alpestris strigata*)

USFWS Photo

The streaked horned lark was listed as threatened on October 3, 2013 (78 FR 61451). It is endemic to the Pacific Northwest (British Columbia, Washington, and Oregon) (Altman 2011) and is a subspecies of the wide-ranging horned lark (*Eremophila alpestris*). The most recent range-wide population estimates for streaked horned larks ranges from about 1,170 to 1,610 individuals (Altman 2011).

Streaked horned larks are small, ground-dwelling birds, approximately 16 to 20 cm (6 to 8 inches) in length. Adults are pale brown, and the shades of brown vary geographically among the subspecies. The male's face, in most subspecies, has a yellowish wash. Adults have a black bib, black whisker marks, black feather tufts that can be raised or lowered (horns), and black tail feathers with white margins. Juveniles lack the black face pattern and are varying shades of gray, from almost white to almost black with a silver-speckled back (Beason 1995).

The streaked horned lark possesses unique characteristics that differentiate it from other horned larks, including a dark brown back, yellowish underparts, a walnut brown nape, and yellow eyebrow stripe and throat (Beason 1995). The streaked horned lark subspecies is conspicuously more yellow beneath and darker on the back than almost all other horned lark subspecies. This coloring, as well as its small size distinguishes this subspecies from other horned larks.

Species Distribution

Historically, the streaked horned lark's breeding range extended from southern British Columbia, Canada, south through the Puget lowlands and outer coast of Washington, along the LCR, through the Willamette Valley, the Oregon coast, and into the Umpqua and Rogue River Valleys of southwestern Oregon (Altman 2011). The subspecies has been extirpated as a breeding species throughout much of its range, including all of its former range in British Columbia, the San Juan Islands, the northern Puget Trough, the Washington coast north of Grays Harbor County, the Oregon coast, and the Rogue and Umpqua Valleys in southwestern Oregon (Pearson and Altman 2005).

The current range and distribution of the streaked horned lark can be divided into three regions: 1) the south Puget Sound in Washington; 2) the Washington coast and LCR islands (including dredge spoil deposition and industrial sites near the Columbia River in Portland, Oregon); and 3) the Willamette Valley in Oregon (USFWS 2015).

The nesting season for streaked horned larks begins in early April and ends mid- to late August (Pearson and Hopey 2005). Currently, streaked horned larks breed on seven sites in the south Puget Sound. Four of these sites are on JBLM: 13th Division Prairie, Gray Army Airfield, McChord Field, and 91st Division Prairie. The largest population of streaked horned larks currently breeds at the Olympia Regional Airport, and a small population nests at the Port of Shelton's Sanderson Field (airport) (Pearson and Altman 2005; Pearson et al. 2008). One additional breeding population has recently been documented at the Tacoma Narrows Airport; however, there is very limited population abundance information available (USFWS 2015).

On the Washington coast, there are four known breeding sites in Grays Harbor and Pacific Counties: Damon Point; Midway Beach; Graveyard Spit; and Leadbetter Point (Pearson and Altman 2005). On the LCR, streaked horned larks breed on several of the sandy islands downstream of Portland, Oregon. Recent surveys have documented breeding streaked horned larks on Rice, Miller Sands Spit, Pillar Rock, Welch, Tenasillahe, Coffeepot, Whites/Browns, Wallace, Crims, and Sandy Islands in Wahkiakum and Cowlitz Counties in Washington, and Columbia and Clatsop Counties in Oregon (Pearson and Altman 2005). Larks also breed at the Rivergate Industrial Complex and the Southwest Quad at Portland International Airport; both sites are owned by the Port of Portland and are former dredge spoil deposition fields (Anderson and Pearson 2015).

In the Willamette Valley, streaked horned larks breed in Benton, Clackamas, Lane, Linn, Marion, Polk, Washington, and Yamhill Counties. Streaked horned larks are most abundant in the southern part of the Willamette Valley. The largest known population of streaked horned larks is resident at Corvallis Municipal Airport in Benton County; other resident populations occur at the Willamette Valley NWR Complex (USFWS 2015) and on the Oregon Department of Fish and Wildlife's E.E. Wilson Wildlife Area (ODFW 2008). Breeding populations also occur at municipal airports in the valley, including McMinnville, Salem, and Eugene (USFWS 2015). Much of the Willamette Valley is private agricultural land and has not been surveyed for streaked horned larks, except along public road margins. There are numerous other locations on private and municipal lands on which streaked horned larks have been observed in the Willamette Valley, particularly in the southern valley (Linn, Polk, and Benton Counties) (eBird 2017). In 2008, a large population of streaked horned larks colonized a wetland and prairie restoration site on a privately owned parcel in Linn County; as the vegetation at the site matured in the following two years, the site became less suitable for larks, and the population declined (Anderson and Pearson 2015). This is likely a common pattern, as breeding streaked horned larks opportunistically shift sites as habitat becomes available among private agricultural lands in the Willamette Valley (USFWS 2015).

Streaked horned larks spend the winter in large groups of mixed subspecies of horned larks in the Willamette Valley and in smaller flocks along the LCR and Washington Coast (Pearson and Altman 2005). It has been found that 72% of streaked horned larks winter in the Willamette Valley and 20% on the islands in the LCR; the rest spend the winter on the Washington coast (8%) or in the south Puget Sound (1%) (Pearson and Altman 2005). In the winter, most of the streaked horned larks that breed in the south Puget Sound migrate south to the Willamette Valley or west to the Washington coast; streaked horned larks that breed on the Washington coast either remain on the coast or migrate south to the Willamette Valley; birds that breed on the LCR islands remain on the islands or migrate to the Washington coast; and birds that breed in the Willamette Valley remain there over the winter (Pearson et al. 2008).

Critical Habitat

In October 2013, the USFWS designated approximately 1,873 ha (4,628 acres) of critical habitat for the threatened streaked horned lark (78 FR 61505). The critical habitat is divided into two units: one along the Washington Coast and Columbia River and the other in the Willamette Valley, Oregon.

The Washington Coast and Columbia River Unit totals 1,174 ha (2,901 acres) and includes 228 ha (563 acres) of federal ownership, 894 ha (2,209 acres) of state-owned lands, and 51 ha (126 acres) of private lands. On the Washington coastal sites, the streaked horned lark occurs on sandy beaches and breeds in the sparsely vegetated, low dune habitats of the upper beach (78 FR 61505).

The Willamette Valley Unit totals 700 ha (1,730 acres) and is entirely composed of federal lands in the Willamette Valley NWR Complex. This unit consists of land in the Basket Slough, Ankeny, and William L. Finley refuges, which are managed for restored native prairie habitat and as agricultural land to provide forage for wintering dusky Canada geese (*Branta canadensis occidentalis*) (78 FR 61505).

The PBFs determined to be essential to the conservation of the streaked horned lark are areas having a minimum of 16% bare ground that have sparse, low-stature vegetation composed primarily of grasses and forbs <22 cm (13 inches) in height. These areas are required to support life history processes during the breeding or winter seasons.

Life History

Habitat used by larks is generally characterized by large flat areas of bare ground and sparse low vegetation composed of grasses and forbs (Pearson and Hopey 2005). Suitable habitat is generally about 17% bare ground and may be even more open at sites selected for nesting. Vegetation stature is generally less than 33 cm (13 inches) (Altman 1999; Pearson and Hopey 2005). A key attribute of habitat used by larks is open landscape context. Sites used by larks are generally found in open landscapes of 121 ha (299 acres) or more. Habitats appear to be selected based on the structure of the vegetation rather than the presence of any specific food plants (USFWS 2015).

Some patches with the appropriate habitat characteristics (i.e., bare ground, low stature vegetation) may be smaller in size if the adjacent areas provide the required open landscape context; this is common in agricultural habitats and on sites near water. Streaked horned lark populations are found at many airports within the range of the subspecies, due to airport maintenance requirements providing the desired open landscape and short vegetation structure preferred by horned larks (USFWS 2015).

Horned larks forage on the ground in low vegetation or on bare ground; adults feed on a wide variety of grass and weed seeds as well as insects; and fledglings are primarily fed insects (Beason 1995).

Current Stressors and Threats

Many ongoing threats to the streaked horned lark's habitat exist throughout its remaining range. These include conversion of habitat to agriculture and industry; loss of the natural disturbance processes, such as fire and flooding, followed by encroachment of woody vegetation; invasion of coastal areas by nonnative beachgrasses; and incompatible management practices. The continued loss and degradation of the subspecies' scarce habitat could push it closer to range-wide extinction. Streaked horned lark populations have become more vulnerable because its preferred habitat is often ephemeral or subject to frequent human disturbance.

Other threats include inbreeding depression, low reproductive success, and declining population size, which have been documented in the Puget lowlands population; without substantial efforts to stem the decline, streaked horned larks may disappear from the Puget lowlands. Other ongoing threats from aircraft strikes and training activities at airports have been documented, and put lark populations at risk of further population declines throughout the range of the subspecies. In addition to the threats identified in 2013 when the lark was listed, three new potential threats have been identified: male-skewed sex ratio (Stinson 2016), avian pox on the Puget Lowlands (Stinson 2016), and potential poisoning by the rodenticide zinc phosphide at Corvallis Airport (USFWS 2016b).

Western Snowy Plover (*Charadrius nivosus nivosus*)

The Pacific coast DPS of the western snowy plover was federally listed as threatened on March 5, 1993, in California, Oregon, and Washington (58 FR 12864). The western snowy plover is defined as those individuals nesting adjacent to tidal waters within 80 km (50 miles) of the Pacific Ocean, including all nesting birds on the mainland coast, peninsulas, offshore islands, adjacent bays, estuaries and coastal rivers of the US and Baja California, Mexico (58 FR 12864).

USFWS Photo

The western snowy plover is a small shorebird with a pale gray-brown coloration above and white below, with a white hindneck collar and dark lateral breast patches, forehead bar, and eye patches. The bill and legs are blackish. In breeding plumage, males usually have black markings on the head and breast; in females, usually one or more of these markings are dark brown. Early in the breeding season a rufous crown may be evident on breeding males, but it is not typical on females. In non-breeding plumage, the sexes cannot be distinguished because breeding markings disappear. Fledged juveniles have buffy edges on their upper parts and can be distinguished from adults until approximately July through October, depending on when in the nesting season they hatched. After this period, molt and feather wear makes fledged juveniles indistinguishable from adults (58 FR 12864).

Species Distribution

Historical records indicate that nesting western snowy plovers were once more widely distributed and abundant in coastal Washington, Oregon, and California. The Pacific coast population of the snowy plover consists of individuals that nest on the mainland coast, peninsulas, offshore islands, bays, estuaries, or rivers of the US Pacific Coast and Baja California, Mexico (58 FR 12864). The snowy plover breeds from southern Washington to southern Baja California, Mexico, and winters mainly in coastal areas from southern Washington to Central America (Page et al. 2009). In 2007, the USFWS estimated a population of approximately 2,480 snowy plovers along the US Pacific coast (USFWS 2007b).

Critical Habitat

In June 2012, the USFWS revised and designated approximately 9,926 ha (24,528 acres) of critical habitat for the Pacific Coast DPS of the western snowy plover in Washington, Oregon, and California. This revised final designation constitutes an increase of approximately 5,009 ha (12,378 acres) from the initial 2005 designation of critical habitat for the Pacific Coast western snowy plover (77 FR 36727).

The following PBFs are essential to the conservation of the Pacific Coast western snowy plover:

- Areas below heavily vegetated areas or developed areas and above the daily high tides;
- Shoreline areas for feeding, with no or very sparse vegetation that are subject to tidal inundation but not constantly under water and support small invertebrates (crabs, worms, flies, beetles, spiders, sand hoppers, clams, and ostracods) that are essential food sources;
- Surf- or water-deposited organic debris (seaweed, driftwood) to attract small invertebrates (food) and provide cover or shelter from predators and weather; and
- Areas minimally disturbed by the presence of humans and human-related activities (e.g., vehicles, pets.

Life History

The snowy plover breeds primarily on coastal beaches from southern Washington to southern Baja California, Mexico. Snowy plovers nest in depressions in open, relatively flat areas near tidal waters. Snowy plovers primarily breed above the high tide line on sandy or pebbly beaches, but may also lay their eggs in existing depressions on harder ground such as salt pan, cobblestones, or dredge tailings (77 FR 36727). This habitat is variable because of unconsolidated soils, high winds, storms, wave action, and colonization by plants.

Foraging habitats consist of open, sandy areas that may contain tide-cast wrack or other vegetative debris to attract prey (77 FR 36727).

Some snowy plovers nesting on the Pacific coast migrate north or south to other Pacific coastal wintering sites, while other stay at their breeding sites year round (USFWS 2007b). Snowy plovers winter on many of the beaches used for nesting, as well as on beaches where they do not nest, including manmade salt ponds and on estuarine sand and mud flats (77 FR 36727). In Washington, Oregon, and California, the majority of wintering snowy plovers concentrate on sand spits and dune-backed beaches.

Snowy plovers typically forage in open areas by locating small invertebrates visually and capturing them with their beaks (Page et al. 2009). Deposits of tide-cast wrack such as kelp or driftwood tend to attract certain invertebrates, and so provide important foraging sites for snowy plovers (Page et al. 2009). Snowy plovers forage both above and below high tide, but not while those areas are underwater.

Current Stressors and Threats

The snowy plover population has experienced widespread loss and degradation of wintering habitat due to human disturbance, development, and encroachment of introduced European beachgrass (USFWS 2007b).

Permanent or long-term loss of nesting habitat through destruction, modification, or restriction of habitat or range has led to a decline in active nesting areas, as well as an overall decline population. Development has resulted in the loss of many historic snowy plover locations in Oregon. More than 20 historic nesting locations are listed in the recovery plan (USFWS 2007b); only 10 still support snowy plovers and suitable nesting habitat (Lauten et al. 2006). Many unoccupied historic locations are located near urban areas or have been developed to promote ATV use or camping.

Colonization of nonnative plant species, particularly European beachgrass (*Ammophila arenaria*), has eliminated habitat and continues to threaten the remaining nesting areas. Without preventative treatment, European beachgrass quickly colonizes open sand. In addition to losing essential nesting habitat, the constriction of the nesting areas forces birds to concentrate efforts within smaller areas, which increases competition, obscures predators, and increases the likelihood of predation. Natural disturbance, such as inclement weather, has also affected the quality and quantity of snowy plover habitat (58 FR 12864).

Poor reproductive success resulting from disturbance by humans and domestic animals, disease, and predation, in addition to permanent or long-term loss of nesting habitat through destruction, modification, or restriction of habitat or range has led to a decline in active nesting areas, as well as an overall decline in the breeding and wintering population. Natural disturbance, such as inclement weather, have also affected the quality and quantity of plover habitat (USFWS 2007b)

Yellow-billed Cuckoo (*Coccyxus americanus*)

The western DPS of the yellow-billed cuckoo (western yellow-billed cuckoo) was listed as threatened on October 2, 2014 (79 FR 59991).

USFWS Photo

The western yellow-billed cuckoo is a member of the avian family Cuculidae and is a Neotropical migrant bird that winters in South America and breeds in North America. Adult western yellow-billed cuckoos have moderate to heavy bills, somewhat elongated bodies, and a narrow yellow ring of colored bare skin around the eye. The plumage is grayish-brown above and white below, with reddish primary flight feathers. The tail feathers are boldly patterned with black and white below. They are medium-sized, about 30 cm (12 inches) in length, and about 60 grams (2 ounces) in weight. Males and females differ slightly; the males have a slightly smaller body size and smaller bill, and the white portions of the tail tend to form distinct oval spots. In females, the white spots are less distinct and tend to be connected (Hughes 2015).

The western yellow-billed cuckoos throughout the western continental US are generally larger than individuals in the eastern US, with significantly longer wings, longer tails, and longer and deeper bills (Franzreb and and 1993).

Species Distribution

The breeding range of the entire species formerly included most of North America from southeastern and western Canada (southern Ontario and Quebec and southwestern British Colombia) to the Greater Antilles and northern Mexico (Hughes 2015).

Based on historical accounts, the western yellow-billed cuckoo was formerly widespread and locally common in California and Arizona, more narrowly distributed but locally common in New Mexico, Oregon, and Washington, and uncommon along the western front of the Rocky Mountains north to British Columbia (Hughes 2015). The species is believed to be extirpated from British Colombia, Washington, and Oregon (Hughes 2015). The western yellow-billed cuckoo is now very rare in scattered drainages in western Colorado, Idaho, Nevada, and Utah, with single, nonbreeding birds most likely to occur (66 FR 38611). The largest remaining breeding areas are in southern and central California, Arizona, along the Rio Grande in New Mexico, and in northwestern Mexico (Hughes 2015). In 2013, the breeding population was estimated to be low, with approximately 350 to 495 pairs north of the Mexican border and another 330 to 530 pairs in Mexico for a total of 680 to 1,025 breeding pairs (78 FR 78321).

Western yellow-billed cuckoos spend the winter in South America (Hughes 2015). The species as a whole winters in woody vegetation bordering fresh water in the lowlands to 1,500 m (4,921 ft), including dense scrub, deciduous broadleaf forest, gallery forest, secondary forest, subhumid and scrub forest, and arid and semiarid forest edges (Hughes 2015). Wintering habitat of the western yellow-billed cuckoo is poorly known.

Critical Habitat

In August 2014, the USFWS proposed to designate critical habitat for the western yellow-billed cuckoo (79 FR 48547). Approximately 221,094 ha (546,335 acres) are proposed for designation as critical habitat across the states of Arizona, California, Colorado, Idaho, Nevada, New Mexico, Texas, Utah, and Wyoming (79 FR 59991). Idaho is the only state covered by the NWACP with proposed critical habitat. None of the proposed critical habitat in Idaho overlaps with the Action Area (79 FR 48548).

Life History

Western yellow-billed cuckoos are found in a variety of vegetation types during migration, including coastal scrub, secondary growth woodland, hedgerows, humid lowland forests, and forest edges. During migration, they may also use smaller riparian patches than those in which they typically nest (78 FR 78321). While migrating cuckoos have been documented from sea level to 2,477 m (8,125 ft) in elevation range-wide in Idaho, all documented observations of yellow-billed cuckoo have been below 1,829 m (6,000 ft), with few observations above 1,525 m (5,000 ft) (Hughes 2015).

Western yellow-billed cuckoos are believed to be more sensitive to habitat loss than other riparian obligate species because of specific factors that influence successful nesting. Most successful nesting territories have a combination of dense willow understory where the nest is placed and a cottonwood (*Populus* sect. *Aegiros*) overstory that is used for foraging. Available information suggests that the western yellow-billed cuckoo requires large tracts of willow-cottonwood or mesquite forest or woodland for its nesting season habitat. Habitat can be relatively dense, contiguous stands, irregularly shaped mosaics of dense vegetation with open areas, or narrow and linear (78 FR 78321).

The western yellow-billed cuckoo nests almost exclusively in low to moderate elevation multi-layered riparian woodlands that are 20 ha (50 acres) or larger (78 FR 78321). These riparian areas are located from southern British Columbia, Canada, to southern Sinaloa, Mexico, and may occur from sea level to 2,154 m (7,000 ft) (or slightly higher in western Colorado, Utah, and Wyoming) in elevation. Riparian habitats selected are generally along low-gradient rivers and streams, and in open riverine valleys that provide wide floodplain conditions (greater than 100 m [325 ft]) (Hughes 2015; Laymon and Halterman 1989).

Optimal breeding habitat contains groves with dense canopy closure and well-foliaged branches for nest building, with nearby foraging areas consisting of a mixture of cottonwoods, willows (*Salix* spp.), and/or mesquite (*Prosopis* L.) with a high volume of healthy foliage (78 FR 78321). In addition to a dense nesting grove, western yellow-billed cuckoos need adequate foraging areas near their nests. In the arid West, suitable nesting conditions are usually found in cottonwood-willow riparian associations along water courses.

Throughout the western yellow-billed cuckoo's range, a large majority of nests are placed in willow trees; however, alder (*Alnus* spp.), cottonwood, mesquite, walnut (*Juglans* spp.), box elder (*Acer negundo*), sycamore (*Platanus occidentalis*), netleaf hackberry (*Celtis laevigata* var. *reticulata*), soapberry (*Sapindus saponaria*), and tamarisk (*Tamarix*) are also used (Hughes 2015). They construct unkempt stick nests on horizontal limbs in trees or large shrubs. Canopy cover directly above the nest and in the vicinity of the nest is dense. Humid conditions created by surface and subsurface moisture appear to be important habitat parameters for western yellow-billed cuckoo. The species has been observed as being restricted to nesting in moist riparian habitat in the arid West because of humidity requirements for successful hatching and rearing of young (Hughes 2015; Gaines and Laymon 1984; Hamilton and Hamilton 1965).

Foraging areas can be less dense or patchy than nesting requirements with lower levels of canopy cover and often have a high proportion of cottonwoods in the canopy. Yellow-billed cuckoos forage primarily by gleaning insects from vegetation, but they may also capture flying insects or small vertebrates such as tree frogs and lizards (Hughes 2015). They specialize on relatively large invertebrate prey (Hamilton and Hamilton 1965); the prey species composition varies geographically. Western yellow-billed cuckoo food availability is largely influenced by the health, density, and species of vegetation.

Current Stressors and Threats

The decline of the western yellow-billed cuckoo is primarily the result of riparian habitat loss and degradation. Within the three states with the highest historical number of yellow-billed cuckoos, past riparian habitat losses are estimated to be about 90% to 95% in Arizona, 90 percent in New Mexico, and 90% to 99% in California (Greco 2013; Noss et al. 1995; Ohmart 1994). Many of these habitat losses occurred historically, and although habitat destruction continues, many past impacts have ramifications that are ongoing and affect the size, extent, and quality of riparian vegetation within the range of the western yellow-billed cuckoo. Principal causes of riparian habitat destruction, modification, and degradation in the range have occurred from alteration of hydrology due to dams, water diversions, management of river flow that differs from natural hydrological patterns, channelization, and levees and other forms of bank stabilization that encroach into the floodplain (79 FR 59991). These losses are further exacerbated by conversion of floodplains for agricultural uses such as crops and livestock grazing. In combination with altered hydrology, these threats promote the conversion of existing primarily native habitats to monotypic stands of nonnative vegetation, reducing the suitability of riparian habitats for the cuckoo.

Because of the absence or near absence of nesting by western yellow-billed cuckoos in monotypic stands of tamarisk and other nonnative vegetation, the available literature suggests that conversion of native or mixed (native and nonnative) riparian woodlands to nearly monotypic stands of tamarisk and other nonnative vegetation, coupled with the inability of native vegetation to regenerate under altered hydrological conditions is a significant threat to the western yellow-billed cuckoo now and in the future (79 FR 59991). Non-native vegetation occurs across most of the range; its establishment can be caused by altered hydrology or other disturbances, which are widespread throughout the range. Non-native vegetation is expected to increasingly modify and decrease habitat for the western yellow-billed cuckoo within a majority of its range in the US and northern Mexico. Other threats to riparian habitat include long-term drought and climate change.

4 Effects on Protected Species and Critical Habitats

The potential effects from implementation of the NWACP on ESA-listed species are evaluated in this section by combining information on the Action Area and spill response actions (proposed action as described in Section 2 and listed in Table 2-2) with the details regarding ESA-listed species and designated critical habitats that overlap with the Action Area (described in Section 3). The evaluation considers the effects that are possible assuming that a response action will be used in a particular habitat, and how conservation measures (Table 2-2) can and will be used to minimize potential effects.

The underlying assumption of this evaluation is that in the event of a spill, implementing an appropriate response action would provide greater protection for ESA-listed species and habitats than not responding to the spill. Decisions made during an emergency spill response focus on protecting and reducing risks to human health and the environment, including ESA-listed species and critical habitats, from exposure to a spilled material.

It is important to note that spill response actions will have a range of potential effects on species and habitats in terms of both duration and magnitude, depending on various factors such as the individual species' life stage, specific sensitivities or vulnerabilities to certain effects, the type of spilled material (i.e., baseline condition), and the nature and scale of the response action.

The step-wise process used in the BA to first assess the likelihood of exposure to oil spill response actions implemented in accordance with the NWACP and then analyze the effects of those spill response actions on ESA-listed species and critical habitat is presented in Section 4.1. This section also includes a description of the effects categories used in the analysis. Sections 4.2 and 4.3 then present the outcome of this analysis.

4.1 Process for Evaluating Effects of the Action

The analysis of effects was conducted following a two-step process. The first step was to evaluate the spatial overlap of species distribution and critical habitat with the Action Area, and to evaluate other factors (e.g., behaviors) that would determine the likelihood of exposure to a response action. The approach is essentially an exposure, response, and risk analysis to determine if individuals of a listed species would be exposed to the proposed actions or stressors from the action. The evaluation asks if a species is likely to be exposed, is it likely that individuals would respond, and would the response cause an adverse effect? For designated critical habitat, the proposed actions were evaluated in terms of which actions occur in which critical habitats and how proposed actions are likely to affect features of the critical habitats. The degree of effects on critical habitat features determine whether critical habitats are likely to be adversely affected.

In the first step of the analysis, if there is low or no likelihood of exposure, then effects of the action are concluded to be discountable. If effects are not discountable (i.e., individuals may be exposed to the action or stressors of the action), then the potential effects of a spill response on individuals were analyzed in greater detail. In this second step of the analysis, effects of spill response actions on ESA-listed species and critical habitat are evaluated to assess if they can be concluded to be insignificant. The second step considers the implementation of conservation measures as detailed in Section 2. Species for which the effects of response activities are concluded to be neither discountable nor insignificant (i.e., measureable and potentially adverse) were evaluated further in Section 5, which assesses the cumulative effects of future nonfederal activities. The assessment in Section 5 is the final step before making an effects determination for all ESA-listed species in the Action Area.

4.1.1 Step 1 – Evaluation of Discountable Effects

Discountable effects are those that are extremely unlikely to occur because of the low likelihood of exposure to spill response actions. As stated earlier, implementation of the NWACP in the event of a spill is intended to protect sensitive resources (such as ESA-listed species and their critical habitat). In the absence of quantifiable data on species location, best professional judgement was used to predict the likelihood of exposure.

This BA describes the possible effects of spill response actions on a large number of ESA-listed species that exist across a broad range of landscapes and water types. Because the species considered in the BA occupy diverse habitat types and display a variety of life strategies, the action agencies included a spatial component in the analysis that combined available information on the distribution and documented presence of a species with the location of the Action Area to evaluate the qualitative probability (rather than a numerical expression) of exposure of ESA-listed species. For example, to evaluate the probability of exposure of ESA-listed plant species to spill response actions, the action agencies obtained plant location data from available databases and programs in Washington, Oregon, and Idaho (i.e., WNHP, ORBIC, and the Idaho Natural Heritage program) (WDNR 2017; IDFG 2017; OSU 2017). The action agencies compiled and mapped the plant data to evaluate the possible extent of exposure considering the frequency and magnitude of overlap with the Action Area and the proximity to rail lines and pipelines transporting oil and hazardous material. For all species for which we determined effects were discountable, critical habitat has either not been designated or does not overlap with the Action Area.

4.1.2 Step 2 – Evaluation of Insignificant Effects

In cases for which the effects of a spill response were determined to not be discountable, a more detailed analysis was conducted. The outcome of these analyses concluded that effects from spill response actions are either insignificant (i.e., not likely to adversely affect; NLAA), or neither discountable nor insignificant and therefore measurable and potentially adverse (i.e., likely to adversely affect; LAA). Insignificant effects relate to the size or severity of the impact and include those effects that are undetectable, not measureable, or so minor that they cannot be meaningfully evaluated.

For each species and response action, the following categories of potential direct and indirect effects were evaluated: direct injury, change in behavior, exclusion from resources, toxicity, and habitat degradation or destruction. These categories are described in detail in the following subsections. The descriptions include common examples of each effect.

Direct Injury

Direct injury includes physical injury, physiological stress, and/or mortality of an individual organism as a result of interaction with spill response actions. Many of the response activities could cause direct injury. For example, the on-site implementation of response activities, as well as the mobilization and demobilization of a work site, could increase the risk of direct injury that occurs as a result of ship or vehicle strikes. Plants could be crushed during establishment of staging areas or when gaining access to the response site (ingress, egress). Larvae could becoming entrained in equipment. *In situ* burning is also commonly identified as having the potential to cause direct injury via heat stress and/or smoke inhalation if, for example, a whale were to surface directly within or downwind of an area being burned (ADEC et al. 2008).

Changes in Behavior

Behavioral effects are defined as any alteration of a species' normal behavior caused by an action, including, but not limited to, the presence of responders and operation of response equipment. A given species' behaviors are typically dictated by season and life stage and include feeding, breeding, rearing, and migrating. A species' behavior has evolved to optimize survival, and a key component of survival is minimizing energy expenditure. Disturbance is likely to cause an animal to flee from an area, thereby increasing that individual's energy expenditure and potentially decreasing the fitness of that individual and its offspring. In general, disturbance will be temporary. Examples of the effects of behavioral changes include whales swimming away from an area of concentrated forage as a reaction to vessels and associated noise; birds abandoning their nests as a reaction to the presence of spill response workers; underwater sound generated by vessels disrupting killer whales' ability to use acoustic signals to communicate, navigate, and locate prey; or any animal leaving an area of refuge as a reaction to a spill response action. Any injury indirectly resulting from a behavioral reaction (e.g., nestling mortality when a parent is flushed from a nest) is evaluated in this category rather than in the direct injury category, which includes only injuries directly resulting from response activities.

Note that if an action prevents a species from accessing habitat (e.g., a nesting or forage location) due to avoidance rather than a flight response, this effect is included in the exclusion from resources effects category.

Exclusion from Resources
Exclusion from resources is the prevention, directly or indirectly, of a species' ability to access necessary habitat (e.g., for breeding, forage, or refuge) by physically stopping the animal from using a habitat, or by causing the animal to avoid a habitat, either temporarily or long-term. Species are more vulnerable to exclusion during the breeding/rearing season, or in areas where large numbers of a species are congregated in a single location (e.g., salmon holding at river mouths prior to spawning runs); birds are also at greater risk during molting seasons, when flight is not possible. Specific examples of exclusion include the construction of underflow dams or placement of culvert blockages that limit fish passage in a constricted area, or *in situ* burning that temporarily excludes a bird from a nesting or foraging area.

Toxicity
For the purposes of this BA, toxicity from contaminants is limited to the application of dispersants or *in situ* burning. Oil or hazardous materials in the environment is considered to be part of the baseline condition. Use of chemical dispersants and *in situ* burning are approved for use in pre-authorization areas (see Sections 1.2.4.1 and 1.2.4.2). Outside the pre-authorization areas, use of chemicals dispersants and burning agents to initiate and sustain *in situ* burn must be approved by the RRT prior to implementation (see Section 1.3).

Use of chemical dispersants is pre-authorized for use only in the marine zone. The EPA and USCG have prepared two recent BAs that evaluate the use of dispersants in the marine environment (Appendix B; EPA and USCG 2015). The BA for the Alaska Unified Plan (included in this BA as Appendix B) evaluated the effects of the broad range of response tools (including chemical dispersants) used in Alaska, while the BA for the California Dispersant Plan focused on the pre-authorized use of dispersants. Both BAs include a comprehensive compilation of toxicity data for aquatic species for Corexit® EC9500A and an evaluation of the effects from dispersant use for the same or similar species as for this BA. Therefore, as allowed under 50 CFR 401.12(g), rather than repeating that analysis for this BA, Appendix B from the Alaska Unified Plan BA (Windward and ERM 2014) is included herein as Appendix B and the BA for the California Dispersant Plan has been incorporated by reference (EPA and USCG 2015). As noted in Section 2, the NMFS's letter of concurrence for the CDP consultation includes the most recent literature and is considered the best available science on dispersants; the NMFS letter is included as Appendix E to this BA.

Conclusions from the concurrence letter relevant to the toxicity of dispersants are:

- Embryonic and larval life stages are usually more sensitive than adults to oil.
- Acute lethality of dispersed oil is primarily associated with the dissolved oil constituents, and very little with the dispersant itself.
- Chemical dispersants (specifically, COREXIT 9500 and 9527) are significantly less toxic to multiple species compared to oil and dispersed oil.
- Chemically dispersed oil is not more toxic than physically dispersed oil.
- Dispersant mitigate the toxic effects of oil exposure in the water column by reducing the duration and concentration of exposure through increased, rapid dilution.
- Dispersants may aid in the biodegradation of oil by greatly increasing the surface area of the spilled oil

The species evaluated in the Alaska Unified Plan BA and the BA for the California Dispersant Plan that are also evaluated in this BA include:

- Fish: Chinook salmon, coho salmon, steelhead trout, pacific eulachon, and green sturgeon
- Sea turtles: leatherback, green, olive ridley, and loggerhead
- Marine mammals: blue whale, fin whale, humpback whale, North Pacific right whale, sei whale, SRKW, sperm whale, Western North Pacific gray whale, and Guadalupe fur seal
- Birds: marbled murrelet, short-tailed albatross, and western snowy plover

The dispersant formulation Corexit® EC9500A is the only dispersant currently stockpiled in the NW. Dispersants are only approved for use in the marine environment. It is important to note that listed species or their prey will most likely be exposed to dispersants in conjunction with oil (i.e., dispersed oil), rather than to concentrated or diluted dispersants alone. Exposure to dispersants without oil would only occur under the conditions of overspray or a missed target trajectory during spray, both of which are minimized by following best management practices (ITOPF 2011a). Corexit dispersants are generally less toxic than most oils and, as a result, chemically dispersed oil presents more of a risk than dispersants alone (Appendix B; EPA and USCG 2015). The acute toxicity of Corexit® EC9500A is low (in excess of 20 ppm even for sensitive species, based on LC50 and EC50 data) when compared to the toxicity of crude oil (in excess of 2 ppm even for those sensitive species, based on LC50 and EC50 data). The inadvertent or direct spraying of wildlife with dispersant chemicals is also unlikely, assuming that all appropriate measures have been taken to avoid such an exposure (e.g., spraying when wildlife are not present, monitoring for the presence of wildlife, establishing buffer zones, and/or deterring wildlife from approaching an area where a response action is being carried out).

The analysis provided by the NMFS on the CDP provides additional recent information regarding direct effects of dispersants on cetaceans. The following is excerpted from the NMFS letter to the EPA and USCG:

> The dispersants proposed in the CDP are water soluble. Therefore, in the unlikely event that a whale is sprayed, the dispersants are not likely to remain on a listed cetacean except for a very short time. They are likely to make any oil encountered less sticky to the cetaceans (Lessard and DeMarco 2000, Claireaux *et al.* 2013) and may help to minimize observed impacts such as oil sticking to dolphins during the DWH spill (Dias 2017, DWH NRDA Trustees 2016). The potential genotoxic and cytotoxic effects following the 24 hour exposure scenario of skin fibroblast cells to the COREXIT dispersants and dispersed oil presented in a newer study by Wise (2014) are unlikely to occur in a field scenario, and cytotoxic impacts are noted by Judson *et al.* (2010) as a typical response of cells to xenobiotics. The most likely scenario is that of a cetacean surfacing in an oil slick that has been sprayed with dispersant and that the dispersant/dispersed oil mixture would be washed off the whale as it swam through the area or dived again.
>
> Dispersed oil may be less sticky than undispersed oil (Lessard and DeMarco 2000, Claireaux *et al.* 2013) because of the micelle structure of dispersed oil droplets and, for the baleen whales, any oil taken into the whale's mouths during feeding may be less likely to foul their baleen. Just as uncontaminated water is ejected during feeding, water with dispersed oil would be rapidly ejected compared to the observed time for clearing oil fouled baleen with running water

(70% within 30 minutes and 95% within 24 hours – Geraci 1990 in USCG and EPA 2015). This should reduce the ingestion of oil and lower the time whales are exposed to oil. Geraci (1990 in USCG and EPA 2015) calculated that 150 gallons of oil would need to be ingested by an adult whale to cause deleterious effects. As presented in the second CDP BA (USCG and EPA 2015), Goldbogen et al. (2007) calculated the potential oil intake by a fin whale feeding in a spill zone still contaminated with 1 ppm hydrocarbons (Bejarano *et al.*, 2013) to be approximately 18 gallons per day. Therefore reducing oil concentrations to this level or lower and preventing prolonged exposure times would help prevent potential ingestion impacts to baleen whales.

While it is speculated that the direct application of dispersants onto a cetacean would cause inflammation of sensitive membranes such as on the eyes or mouth, it is known that volatile hydrocarbons cause this impact to marine mammals (Geraci and St. Aubin 1988, Geraci 1990 in USCG and EPA 2015). By mitigating exposure to volatile hydrocarbons, dispersant use could minimize this impact. No-spray buffers reduce the likelihood of direct effects from dispersants to a discountable level. (NMFS 2018, included in Appendix E)

The primary potential impacts associated with the application of dispersants are direct toxicity of the dispersant and dispersed oil to exposed prey organisms (e.g., plankton and larval fish) and hypothermia due to a loss of insulating oils and disruption of feather structure (Duerr et al. 2011). Although not documented in marine mammals, direct contact with dispersants or dispersed oil has been speculated to irritate eye tissues, and aspiration thought to result in chemical pneumonia (CDC and ATSDR 2010). Depending on the formulation and application rate, dispersant toxicity will vary; however, exposure and toxicity are expected to be acute (rather than chronic) because of the rapid rate at which dilution occurs after application (Gallaway et al. 2012; NOAA 2012), as well as the short half-life of dispersants (e.g., less than 28 days for individual components of Corexit® EC9500A) (Appendix B; EPA and USCG 2015).

Within this BA, the potential for impacts on listed species from exposure to dispersants and dispersed oil, alone or in a mixture, was determined based on:

- The toxicity of chemical dispersants and dispersed oil (an oil/dispersant mixture) to listed species and their prey (or similar surrogate species) as determined in laboratory toxicity tests, summarized in recent comprehensive literature reviews (Appendix B; EPA and USCG 2015);
- The fate and transport of dispersants and dispersed oil in the marine environment summarized in recent comprehensive literature reviews (Appendix B; EPA and USCG 2015) and;
- Species-specific factors that determine their potential exposures including, but not limited to, seasonal use of NW waters, feeding strategies, and habitat associations.

Habitat Degradation or Destruction
Habitat degradation occurs when physical or chemical perturbations result in alterations in the amount or quality of a habitat. A few examples include:

- Reduction in prey as a result of the mortality of the benthic (infaunal) and epibenthic invertebrate community following the use of hot water to clean a shoreline.
- Reduction in pelagic prey (e.g., plankton, invertebrates, and larval fish) as a result of a toxic response to dispersed oil exposures.
- The loss of vegetation and surface soil microbes and invertebrates as a result of *in situ* burning in terrestrial environments.
- Reduction in prey as a result of benthic communities being smothered by *in situ* burn residues.
- Increase in water temperature from *in situ* burning.

As with all of the effects categories, the magnitude of the impact depends on the duration, location, and spatial scale of the response action. Critical habitat is only impacted by effects of this type.
Potential effects within the five categories are further described in terms of their anticipated duration (temporary/short-term or long-term) and magnitude (low or high). For the purpose of this BA, the terms used to describe duration and magnitude are defined as follows:

- Duration
  - Short-term – Impacts will last as long as the response action or shorter. This duration will be in the range of hours to weeks, depending on the spill scenario, selected response action(s), and associated effect, typically no more than four days. As described elsewhere in this BA, most spills are small and response activities are limited (e.g., deploying boom and conducting mechanical removal of surface oil). Because the average spill response in the NW lasts as little as a few hours and typically no more than four days (see Section 2.3.3), the stressors, and therefore the effects are considered short term
  - Long-term – Impacts will extend beyond cessation of the response action. The time frame for long-term impacts is greater than a week. As described in this BA, on water activities are short, less than a week given the nature of spills and response in the proposed action area. If on-water recovery isn't entirely successful and oil reaches the shoreline, shoreline clean-up can be a longer-term activity with longer-term impacts of weeks to a month or more.
- Magnitude
  - Low – A direct or indirect effect that would not significantly impair the survival, growth, or reproduction of the protected individual or the PBFs of critical habitat; purely beneficial effects are included in this category.
  - High – A direct or indirect effect that would impair the survival, growth, or reproduction of the protected individual or the PBFs of critical habitat.

4.2 Evaluation of Discountable Effects

Table 4-1 presents a list of the protected species and their critical habitat for which the effects from spill response are discountable. The remaining species and critical habitats (for which effects are not considered discountable) are evaluated in more detail in Section 4.3.

Table 4-1 Evaluation of Discountable Effects

Protected Species	Time and Location of Potential Exposure	Factors Influencing Exposure to Action	Rationale
Responsible Agency – NMFS			
Sea turtles			
Green sea turtle, East Pacific DPS (*Chelonia mydas*)	Seasonality: Do not seasonally occur in the area. There have been year round documentation of cold-stunned or dead individuals. Habitat: Marine nearshore, open marine water, shoreline (marine); primarily tropical and to a lesser extent subtropical waters	Green sea turtles cannot survive the cold water conditions in the Action Area. The typical distribution of this species is in tropical and subtropical waters (Section 3.2.1). The species does not nest in the NW so they do not use shorelines in the Action Area. The species does not feed in the area and are brought to the area by warm current. They are occasionally found in the NW cold-stunned and dead or dying, but the Action Area is not part of their typical range. On-water operations would be of short duration, typically lasting for no more than 4 days (Section 2.2). Critical habitat for green sea turtles does not overlap with the Action Area	The action agencies conclude that because the species is rarely present in the Action Area due to their intolerance for cold water, does not feed or nest in the Action Area, and on-water spill response operation time is typically short in duration (four days or less), any effects of spill response actions on green sea turtles are extremely unlikely and therefore discountable.
Olive ridley sea turtle (*Lepidochelys olivacea*)	Seasonality: Do not seasonally occur in the Action Area. There have been year round documentation of cold-stunned dead or dying individuals. Habitat: Marine nearshore, open marine water, shoreline (marine); typically tropical and subtropical waters	Olive ridley sea turtles cannot survive the cold water conditions in the Action Area. The typical distribution of this species is in tropical and subtropical waters (Figure 3-22). The species does not nest in the NW so they do not use shorelines in the Action Area. The species does not feed in the area and are brought to the area by warm current. They are occasionally found in the NW cold-stunned and dead or dying, but the	The action agencies conclude that because the species is rarely present in the Action Area due to their intolerance for cold water, does not feed or nest in the Action Area, and on-water spill response operation time is typically short in duration (four days or less), any effects of spill response actions on olive ridley sea turtles are extremely unlikely and therefore discountable.

Table 4-1 Evaluation of Discountable Effects

Protected Species	Time and Location of Potential Exposure	Factors Influencing Exposure to Action	Rationale
		Action Area is not part of their typical range. On-water operations would be of short duration, typically lasting for no more than 4 days (Section 2.2). Critical habitat has not been designated for olive ridley sea turtles.	
Loggerhead sea turtle, North Pacific DPS (*Caretta caretta*)	Seasonality: Do not seasonally occur in the Action Area. There have been year round documentation of cold-stunned dead or dying individuals. Habitat: Marine nearshore, open marine water, shoreline (marine); tropical and temperate waters	Loggerhead sea turtles are only occasionally observed off the coasts of Oregon and Washington. The species does not nest in the NW, so they do not use shorelines in the Action Area. The species does not feed in the Action Area and may be brought to the area by warm current (Section 3.2.1). Critical habitat for loggerhead sea turtles does not overlap with the Action Area.	The action agencies conclude that because the species is rarely observed in the Action Area, does not feed or nest in the Action Area, and on-water spill response operation time is typically short in duration (four days or less), any effects of spill response actions on loggerhead sea turtles are extremely unlikely and therefore discountable.
Marine Mammals			
Blue whale (*Balaenoptera musculus*)	Seasonality: Rare in the Action Area; most commonly observed in fall Habitat: Open marine water	Blue whales do not have extensive feeding areas within the Action Area. They migrate through the NW marine habitat in the fall and early winter and may forage in open marine water off the coast of northern Washington. The species does not calve in the Action Area. The species prefers open water, offshore habitat. During migration, there are a large number of animals, though usually at a lower density than at feeding areas.	The action agencies conclude that because the species has an extensive home range, is rarely in the Action Area, does not feed or calve in the Action Area, and on-water spill response operation time is typically short in duration (four days or less), any effects of spill response actions on blue whales are extremely unlikely and therefore discountable.

Table 4-1 Evaluation of Discountable Effects

Protected Species	Time and Location of Potential Exposure	Factors Influencing Exposure to Action	Rationale
		Individuals are easy to detect from the water or air. If blue whales were observed in an area, spill response actions would be modified to avoid effects (e.g., vessels would be directed to reduce speed and watch for animals) Critical habitat has not been designated for blue whales.	
Fin whale (*B. physalus*)	Seasonality: Unclear; may be present in open waters of the Action Area throughout the year Habitat: Marine nearshore, open marine water	Fin whales have an extensive home range. They are found in the Action Area but the species use of the area is thought to be limited with no known calving areas within the Action Area. The species spends more than half its time at depths from 50 m (164 ft) to greater than 225 m (740 ft). Individuals are easy to detect from the surface or air. If fin whales were observed in an area, response actions would be modified to avoid effects (e.g., vessels would be directed to reduce speed and watch for animals). Critical habitat has not been designated for fin whales.	Given the short duration of on-water spill response actions (four days or less), the likelihood of temporal overlap is low. The action agencies conclude that because the species ranges widely, does not calve in the Action Area, and on-water spill response operation is typically short in duration (four days or less) leading to a low likelihood of temporal overlap, any effects of spill response actions on fin whales are extremely unlikely and therefore discountable.
North Pacific right whale (*Eubalena japonica*)	Seasonality: Unclear; likely in spring and fall between migrations Habitat: Open marine water; habitat associations not well understood	North Pacific right whales are very rarely in the Action Area. There has been one observation of a right whale in the Action Area in the past decade. Individuals are easily detected from the air but relatively difficult to detect from the surface because they do not display much surface activity.	The action agencies conclude that because the species is rarely observed in the Action Area (only once in the past decade) and on-water spill response operation is typically short in duration (four days or less) any effects of spill response actions on North Pacific right whale are extremely unlikely and therefore discountable.

Table 4-1 Evaluation of Discountable Effects

Protected Species	Time and Location of Potential Exposure	Factors Influencing Exposure to Action	Rationale
		Critical habitat for North Pacific right whale does not overlap with the Action Area.	
Sei whale (*B. borealis*)	Seasonality: Unclear; likely in spring and fall between migrations; rare in the Action Area Habitat: Open marine water	Sei whales have an extensive home range and are rarely present in the Action Area. The species prefers open water, offshore habitat. The species is not known to forage or calve in the Action Area. Species does not dive very deep. Critical habitat has not been designated for sei whales.	The action agencies conclude that because the species is rarely present in the Action Area, is not known to feed or calve in the Action Area, and on-water spill response operation is typically short in duration (four days or less), any effects of spill response actions on sei whales are extremely unlikely and therefore discountable.
Sperm whale (*Physeter microcephalus*)	Seasonality: Present during spring, summer, and fall Habitat: Open marine water	Sperm whales are very rarely present in the Action Area. The species is found over deep, open marine water where they spend much time diving deeply to forage for prey. Their prey consists of large, often deep-dwelling species. Individuals are easily detected when at the ocean surface. Critical habitat has not been designated for sperm whales.	The action agencies conclude that because the species is very rarely present in the Action Area, spends much of its time diving deeply, and on-water spill response operation is typically short in duration (four days or less) leading to a very low likelihood of spatial or temporal overlap resulting in exposure, any effects of spill response actions on sperm whales are extremely unlikely and therefore discountable.
Gray whale, Western North Pacific (*Eschrichtius robustus*)	Seasonality: Assumed present all year in small numbers; closer to the shore during spring; however the seasonality of Western North Pacific gray whales is less well known due to their small numbers and very limited sightings.	Western North Pacific gray whales have an extensive home range that extends from Russia to Mexico. Gray whales feed on benthic species at the sediment interface (can be deep). Western North Pacific DPS makes up only a small fraction of observed gray whales on the US West Coast, thus they are very rarely encountered. Of the total gray whale population of nearly 20,000, less	The action agencies conclude that because the species is very rarely present in the Action Area and on-water spill response operation is typically short in duration (four days or less), any effects of spill response actions on Western North Pacific gray whales are extremely unlikely and therefore discountable.

Table 4-1 Evaluation of Discountable Effects

Protected Species	Time and Location of Potential Exposure	Factors Influencing Exposure to Action	Rationale
	<u>Habitat:</u> Marine nearshore, open marine water	than 200 gray whales are from the Western population. Of these 200, an even smaller number have been tracked to the US West Coast. While the unlisted Eastern Pacific population is common in the Action Area, the listed population is very rare. Species is most often found in deep, open marine water and are easily detected when aggregated in foraging areas. Critical habitat has not been designated for gray whales.	
Guadalupe fur seal (*Arctocephalus townsendi*)	<u>Seasonality:</u> No clear seasonality for overlap with Action Area <u>Habitat:</u> Marine nearshore, open marine water, shoreline (marine)	Guadalupe fur seals are very rarely present in the Action Area; breeding grounds are almost entirely on Guadalupe Island, Mexico; small populations breed on other islands in Mexico and Southern California. Animals may not survive for extended periods of time in the cold water conditions of the marine Action Area. Evidence of presence in the Action Area is based entirely on strandings (deceased individuals). Species is non-migratory. Individuals are difficult to detect from the water or air. Critical habitat for Guadalupe fur seals does not overlap with the Action Area.	The action agencies conclude that because the species is rarely present in the Action Area, prefers warmer water of Mexico and Southern California, and does not breed in the Action Area, any effects of spill response actions on Guadalupe fur seal are extremely unlikely and therefore discountable.

Table 4-1 Evaluation of Discountable Effects

Protected Species	Time and Location of Potential Exposure	Factors Influencing Exposure to Action	Rationale
Responsible Agency – USFWS			
Plants			
Bradshaw's desert-parsley (*Lomatium bradshawii*)	<u>Seasonality:</u> Perennial species that blooms from April to May <u>Habitat:</u> Wetland Restricted to wet prairie habitat and seasonally saturated or flooded prairies near creeks and small rivers; in the southern Willamette Valley, Oregon.	Bradshaw's desert-parsley is a regional endemic species with isolated populations in Oregon and Washington. The ORBIC database (OSU 2017) shows 41 locations where Bradshaw's desert-parsley has been found in Oregon. In Oregon, three population centers occur in Benton, Lane, Linn, and Marion Counties. Most of these populations are small, ranging from about 10 to 1,000 individuals. Between 1916 and 2015, only one (historical observation in 1916) was located within the Action Area (Figure C-1 in Appendix C). In Washington, the species is documented in at only one known location, which occurs outside of the Action Area. The Washington population, located in Clark County, does not overlap with the Action Area. Critical habitat has not been designated for Bradshaw's desert-parsley.	The action agencies conclude that, because the only known occurrence of the species that overlaps with the Action Area is based on an observation from 1916, any effects of spill response actions on Bradshaw's desert-parsley are extremely unlikely and therefore discountable.
Howell's spectacular thelypody (*Thelypodium howellii* ssp. *spectabilis*)	<u>Seasonality:</u> Biennial species that begins growing in April, flowers in May, fruits in June, and goes dormant in August. <u>Habitat:</u> Wetlands Occurs in wet alkaline meadows in valley bottoms, usually in and around woody shrubs that	Howells's spectacular thelypody has isolated populations in northeastern Oregon, occurring in the Baker-Powder River Valley in Union and Baker Counties. The ORBIC database identified 14 occurrences of this species (populations) (OSU 2017) (Figure C-2 in Appendix C). Five of the 14 occurrences overlap with the Action Area; one of the five is listed as possible extirpated. Botanists were unable to locate one of the remaining four	Only five viable populations of Howell's spectacular thelypody occur within the Action Area. These populations are located along the Old Oregon Trail right-of-way in Baker County, approximately 0.8 km (0.5 miles(from where the pipeline crosses La Grande–Baker Highway. If a spill were to occur, staging areas would be established close to the pipeline in association with nearby roads (La Grande-Baker Highway and Bidwell Road) and not on the Old Oregon Trail. The action agencies conclude that, because the species has limited overlap with the Action Area and any staging

Table 4-1 Evaluation of Discountable Effects

Protected Species	Time and Location of Potential Exposure	Factors Influencing Exposure to Action	Rationale
	dominate the habitat on the knolls and along the edge of the wet meadow habitat between the knolls.	populations, but the other three remaining populations were located at the easternmost edge of the 1-mile buffer (Inset on Figure C-2 in Appendix C). According to the ODOT HCP (ODOT 2015), there are three populations of this species along ODOT right-of-way, two restricted to the Baker-Powder River Valley in Union and Baker Counties and one in the Willow Creek Valley in Malheur County. Of these, only the two populations in Baker County are within the Action Area, approximately 0.8 km (0.5 miles) from a pipeline. Critical habitat has not been designated for Howell's spectacular thelypody.	areas would be established in existing developed areas, the probability of exposure to spill response actions is low and so any effects of spill response actions on Howell's spectacular thelypody are extremely unlikely and therefore discountable.
Kincaid's lupine (*Lupinus sulphureus* var. *kincaidii*)	<u>Seasonality:</u> Perennial herb that flowers from May to June <u>Habitat:</u> Terrestrial Dry upland prairie remnants from Lewis County, Washington, in the north, to the foothills of Douglas County, Oregon in the south	Kincaid's lupine is mostly limited to isolated patches of prairies, but some have been found in road right-of-way or pastures. There are documented occurrences of Kincaid's lupine in the Action Area and suitable habitat for the species is present in Washington (WDNR 2017; OSU 2017). Most of the over 100 recorded observations of this species in Washington and Oregon are historical. The three current observations are in Washington; two along the Cowlitz River upstream of a pipeline and one on the western edge of the 1-mile pipeline buffer (in Drews Prairie) in the same vicinity (Figure C-3 in Appendix C). Critical habitat for Kincaid's lupine does not overlap with the Action Area.	The action agencies conclude that, because: 1) there are few current observations of the species in the Action Area, 2) no designated critical habitat within the Action Area, 3) many potential suitable habitat locations in the Action Area do not appear to be currently occupied, and 4) infrastructure exists for the establishment of staging areas, any effects of spill response actions on Kincaid's lupine are extremely unlikely and therefore discountable.

Table 4-1 Evaluation of Discountable Effects

Protected Species	Time and Location of Potential Exposure	Factors Influencing Exposure to Action	Rationale
Nelson's checkermallow (*Sidalcea nelsoniana*)	<u>Seasonality:</u> Perennial herb that flowers from late May to mid-July with fruits observed as early as mid-June and as late as mid-October. <u>Habitat:</u> Terrestrial Native prairie and remnants at the margins of sloughs, ditches, and streams; roadsides; fence rows; drainage swales; and fallow fields.	Nelson's checkermallow has isolated populations in Oregon and Washington but only two locations overlap with the Action Area (OSU 2017). Although there is a lack of recent annual monitoring data, 90 and 86 of natural and introduced sites were censused in 2001 and 2005, respectively; 70 percent censused since 2008 (USFWS 2012a). Plants are being reintroduced into Oregon (USFWS 2012a); locations in Multnomah and Washington counties may overlap with the Action Area but exact locations are not identified. Species occurrence is limited to only two known location within the Action Area. ORBIC data show this location is in Salem, Oregon at the Salem Municipal Airport (McNary Field) (OSU 2017) (Inset on Figure C-4 in Appendix C). These two observations are on the western edge of the Action Area approximately 1 km (0.6 miles) from the pipeline; Interstate 5 is between the one of the locations and the pipeline. Critical habitat has not been designated for Nelson's checkermallow.	The action agencies acknowledge that suitable habitat exists within the Action Area and the species is being reintroduced. However, relying on available survey data, Nelson's checkermallow's occurrence is limited to only two known locations within the Action Area, both in the vicinity of Salem, Oregon. The action agencies conclude that because: 1) of the very limited spatial overlap of this species with the Action Area, 2) plants are located far from the potential spill site and on the far side of a significant barrier (Interstate 5), and 3) infrastructure exists for the establishment of staging areas, the probability of exposure to spill response actions is low and so any effects of spill response actions on Nelson's checkermallow are extremely unlikely and therefore discountable.
Slickspot peppergrass (*Lepidium papilliferum*)	<u>Seasonality:</u> The species is monocarpic (flowering only once before dying), and displays two different life cycles, an annual and a biennial form.	Slickspot peppergrass occurs in arid portions of Idaho and not directly adjacent to bodies of water. There are four units of terrestrial critical habitat in Payette, Ada, Elmore, and Owyhee Counties, Idaho (76 FR 27184). Two critical habitat units overlap with the Action Area in Ada and Elmore Counties,	<u>Species:</u> The range for slickspot peppergrass overlaps with the oil pipeline that runs through the Snake River Plain. However, if a pipeline break were to occur in the species' habitat (sagebrush steppe), it would not impact a water body and the State would respond rather than EPA. The action agencies conclude that, because: 1) the species is located in an arid area and 2) infrastructure

Table 4-1 Evaluation of Discountable Effects

Protected Species	Time and Location of Potential Exposure	Factors Influencing Exposure to Action	Rationale
	Habitat: Terrestrial Species is restricted to the volcanic plains of southwest Idaho, primarily in the Snake River Plain.	within 1.6 km (1 mile) of a pipeline (Figure C-5 in Appendix C). An oil pipeline passes through several areas of critical habitat for slickspot peppergrass, where the species is present. The species is difficult to detect at times (i.e., when only as seed), and populations fluctuate depending upon seasonal precipitation patterns. Designation of critical habitat for slickspot peppergrass is pending.	exists for the establishment of staging areas, the probability of exposure to spill response actions is low and so any effects of spill response actions on slickspot peppergrass are extremely unlikely and therefore discountable. Critical habitat: Spill response actions are unlikely to significantly impact physical and biological features of slickspot peppergrass critical habitat because these areas are sparsely vegetated and extensive clearing, and removal of vegetation would not be necessary during a pipeline spill response. Sufficient access points are already present near critical habitat to preclude the need to clear areas to establish staging areas. The action agencies conclude that any effects of spill response actions on slickspot peppergrass critical habitat are extremely unlikely and therefore discountable.
Western lily (*Lilium occidentale*)	Seasonality: Flowering occurs from June to August Habitat: Terrestrial, wetland Occurs in freshwater fens, bogs, coastal prairie and scrub, and the transition zones between these habitat types	Isolated populations occur within 6.4 km (4 miles) of the Oregon coast in Coos and Curry Counties of southern Oregon. There are eight occurrences of lily that overlap with the Action Area (1-mile marine buffer) along the Oregon coast (USFWS 2009b), largely limited to wooded areas east of Highway 101 outside the influence of beach/shoreline or adjacent residential areas or agricultural fields. If a spill occurred in this area, it would most likely be in the marine and shoreline area, and the spill response would be staged along the shoreline rather than in wooded areas. Critical habitat has not been designated for western lily.	The action agencies conclude that because 1) the species has limited overlap with the Action Area, 2) any staging areas would be established in existing developed areas (e.g., along Highway 101), 3) plants are limited to wooded areas that will not be affected by spill response actions, and 4) Highway 101 provides a break between the marine zone and wooded areas that will block the flow of oil into lily habitat, any effects of spill response actions on western lily are extremely unlikely and therefore discountable.

Table 4-1 Evaluation of Discountable Effects

Protected Species	Time and Location of Potential Exposure	Factors Influencing Exposure to Action	Rationale
Willamette daisy (*Erigeron decumbens* var. *decumbens*)	<u>Seasonality:</u> Perennial herb in the sunflower family that flowers from June to early July. <u>Habitat:</u> Terrestrial, wetland The Willamette Valley daisy typically occurs where woody cover is nearly absent and where herbaceous vegetation is low in stature (USFWS 2010e). It occurs in both wet prairie grasslands and drier upland prairie sites.	Willamette daisy is endemic to the Willamette Valley of western Oregon. The species exists in Benton, Clackamas, Lane, Linn, Marion, Polk, Washington, and Yamhill Counties; 17 known populations fluctuate in size from year to year. According to the ORBIC database, three occurrences of this species that overlap with the Action Area as shown in Figure C-6 in Appendix C (OSU 2017). All three are considered historical (i.e., extirpated) or possibly historical with the last recorded observations occurring as late as 1984. These areas are currently developed for urban or agricultural land uses. Designated critical habitat does not overlap with the Action Area (Figure C-9 in Appendix C).	The action agencies conclude that, because the species is not currently documented (historical observations) in the Action Area (OSU 2017), the probability of exposure to spill response actions is low, and any effects of spill response actions on the Willamette daisy is considered extremely unlikely and therefore discountable.
Mammals			
Grizzly bear (*Ursus arctos horribilis*)	<u>Seasonality:</u> Hibernate beginning in October or November for 4 to 6 months at elevations >2,438 m (8,000 ft.) <u>Habitat</u>: Terrestrial Occupies a variety of habitat types from lowlands to high-elevation mountains in the North Cascade Range and in northern Idaho. Grizzly bears are habitat	Grizzly bear are typically solitary and elusive in the NW with large home range (563 to 1,088 sq km; 217 to 420 square miles) (USFWS 2016c). There a small number of grizzly bears in the Cabinet-Yaak Bear Management Unit, which overlaps with the Action Area in northeastern Idaho. Grizzly bears in the North Cascades of Washington do not overlap with the Action Area. Overlap of grizzly bear distribution in Idaho with the Action Area is small relative to the size of bear home ranges. The	The action agencies conclude that, because the species has a large home range and is expected to avoid areas with human activity, any effects of spill response actions on grizzly bear are extremely unlikely and therefore discountable.

Table 4-1 Evaluation of Discountable Effects

Protected Species	Time and Location of Potential Exposure	Factors Influencing Exposure to Action	Rationale
	generalists.	density of bears near the Action Area is very low. Exposure of a grizzly bear to a spill response action is highly unlikely; they are expected to avoid anthropogenic activities while humans and equipment are present. We have no information on the location of grizzly bears dens and so cannot say whether denning bears would be affected during spill response that occurs during the denning season. Sightings of bears have occurred near the Action Area, where unit trains pass through Bonners Ferry, Idaho (Kendall et al. 2016). Critical habitat has not been designated for the grizzly bear.	
Birds			
Yellow-billed cuckoo (*Coccyzus americanus*)	Seasonality: Nesting/breeding June–August Winters in South America (September–May) Habitat: Terrestrial Low to moderate elevation riparian wood lands with native broad leaf trees and shrubs	Only the historical range of the yellow-billed cuckoo overlaps with the Action Area Despite historical overlap with the Action Area, breeding populations of the yellow-billed cuckoo are currently believed to be extirpated from Washington and Oregon, and only rarely occur in Idaho. The riparian areas where the species nest could be cleared to provide access roads. However, clearance surveys as conservation measures will be implemented to avoid those nesting areas. Designation of critical habitat for the yellow-billed cuckoo is pending but the anticipated areas (in Idaho) do not overlap with the Action Area.	The action agencies conclude that, because of the very limited overlap of the species with the Action Area and the use of surveys before constructing access roads, any effects of spill response actions on yellow-billed cuckoo are extremely unlikely and therefore discountable.

Table 4-1 Evaluation of Discountable Effects

Protected Species	Time and Location of Potential Exposure	Factors Influencing Exposure to Action	Rationale

Key:

DPS	Distinct Population Segment
EPA	US Environmental Protection Agency
FR	Federal Register
ft	feet
GRP	geographic response plan
HCP	habitat conservation plan
km	kilometers
m	meters
NMFS	National Marine Fisheries Service
NW	Northwest
ODOT	Oregon Department of Transportation
ORBIC	Oregon Biodiversity Information Center
sq km	square kilometers
US	United States
USFWS	US Fish and Wildlife Service

4.3 Evaluation of Insignificant Effects

This section provides an analysis of potentially significant effects from implementation of response tools presented in the NWACP on ESA-listed species and critical habitat for which effects were not discountable. If all effects can be classified as insignificant (i.e., the outcomes do not represent a significant disruption of the normal behaviors of any individual) (USFWS and NMFS 1998), then an NLAA determination is warranted (Section 6). Insignificant effects are those that are undetectable, immeasurable, or so minor that they cannot be meaningfully evaluated. An NLAA determination based on the insignificance criterion was made in Section 6 if listed species or critical habitat PBFs are unlikely to be affected by a response action due to the insensitivity of listed species to stressors associated with response actions, or due to the conservation measures (or BMPs) employed as part of the action to minimize stress. The following provides some key considerations in the effects analysis.

Solid and liquid wastes, when removed to a storage location, are kept in secondary containment so that any oil that is re-released will be immediately contained and recovered. Liquid wastes that are collected but accidentally re-released in the same place are consistent with the baseline condition (i.e., no net increase in oil exposure). Re-releases of oil resulting from an accident while transporting solid or liquid wastes (e.g., to an approved hazardous waste disposal facility) are outside the scope of the initial response; in the unlikely circumstance that oil is re-released during an accident, the spill will be considered as a new event, potentially requiring a spill response consistent with the NWACP. All waste is carefully managed, and the likelihood of a spill outside the initial spill area is considered minuscule.

Although specific decontamination procedures are not outlined, the NWACP refers to two key measures intended to control the re-release of oil as a result of decontamination: a hot/warm/cold zone delineation of the response area (consistent with the Occupational Safety and Health Administration's hazardous waste operations and emergency response standard), and the establishment of containment areas for decontaminating vessels and equipment. Spill responders use conservation measures when implementing decontamination procedures to prevent the re-release of oil into the environment; for example, by establishing containment areas surrounded by booms where vessels and equipment can be safely cleaned (and oil can be collected), or lining the personnel decontamination area with plastic and maintaining the hot/warm/cold zone separation. It is expected that decontamination will involve the use of booms, recovery equipment to capture re-released oil, and surfactant chemicals to clean surfaces of boats, equipment, and personnel.

Decanting is one type of liquid waste management for open marine water (Section 2.2) used to maximize the use of limited storage capacity during on-water oil recovery. Decanting is pre-approved within the first 24 hours after a spill is discovered, and may continue on a case-by-case basis with Unified Command approval. Decanting reintroduces a small amount of oil (relative to the baseline condition) to the marine environment. Discharged water is contained within a boom, and additional recovery equipment (e.g., skimmers) is deployed in the containment area to capture re-released oil. Based on the net benefit of collecting substantial volumes of oil and releasing relatively little of it back into the environment, as well as the conservation measures outlined by the NWACP to control re-released oil, the effect of decanting on listed species or critical habitat is expected to be insignificant. Discharged oil during decanting must meet the narrative standard of the CWA, which is no visible sheen or discoloration in discharged waters (EPA 2011).

As discussed in Section 2.2, non-floating oil recovery actions are very infrequently used. Conventional oil recovery methods (e.g., booming and skimming) are not effective for submerged or sunken oil. Non-floating oil recovery methods (Section 9412 of the NWACP), which also have limited effectiveness for recovering non-floating oil, could have significant impacts on aquatic species caused by vessel strikes, entrainment in trawls or nets intended to capture oil, sediment disturbance during dredging or agitation of sunken oils, and mobilization of oil into the water column (resulting in increased aquatic exposures to oil). These activities would only be conducted under specific circumstances, for example, in areas where non-floating oil could feasibly be recovered and where sensitive resources are not at significant risk of being impacted by the spill response.

Although natural attenuation and places of refuge for disabled vessels are discussed in Section 2, these are not directly discussed in the analyses of effects. Rather, the effects associated with temporarily increased vehicle, aircraft, and/or vessel traffic, human presence, and noise—all of which are actions common to most action including natural attenuation and places of refuge—are discussed in this section.

The use of instream barriers such as underflow dams or culvert blockages will typically last no more than four days, so such barriers will not significantly impede migrating fish. However, in the event that a barrier or blockage needs to remain in a stream for more than several days, if ESA-listed species are present they could be affected by instream barriers. Short-term barriers are discussed below, where relevant.

The pre-emptive removal of unoiled large woody debris from streams or rivers is impracticable or infeasible because of the speed at which oil moves through flowing streams, the lack of information about existing debris, uncertainty about oil trajectory, and the potential for there to be significant amounts of debris in a stream. Therefore, responders will focus on tracking, containing, and recovering oil rather than protecting debris from oiling.

Table 4-2 presents the factors included in the analysis of potential insignificant effects. The table presents response actions from Table 2-2 that are applicable to specific habitats by species or groups of species and the potential stressors associated with those response actions. Conservation measures listed in Table 2-2 are also included in Table 4-2. The response actions and stressors are linked to what is known about the species as discussed in Section 3 to evaluate the potential effects that could result from exposure to those stressors and include conservation measures that would be used to minimize the potential effects. A discussion of the analyses for each species or groups of species follows Table 4-2 and includes the conclusion (i.e., either effects are insignificant or they are neither insignificant nor discountable and are therefore measureable and potentially adverse).

Table 4-2 Evaluation of Effects

Time and Location of Potential Exposure	Factors Influencing Exposure to Action	Applicable Actions[a]	Potential Stressors Associated with Applicable Actions[b]	Primary Effects Associated with Relevant Applicable Actions[c]	
				Effects on Individuals	Habitat Degradation
Responsible Agency – NMFS					
Fish					
Pacific salmon (Oncorhynchus spp.): Freshwater					
<u>Seasonality:</u> Salmon enter freshwater at different points throughout the year depending on the species, spawning stream, and distance from entry point to spawning locations. Salmon may hold near the mouth of streams or in freshwater for some time before migrating to spawning habitat. Similarly, some species (e.g., steelhead trout) rear for extended periods in freshwater before exiting streams. <u>Habitat:</u> Riverine/lacustrine Wetland	Under certain circumstances salmon have little ability to escape response actions in freshwater or resulting effects. When spawning, salmon build redds out of gravels to protect incubating embryos; redds are cryptic. Salmon-bearing streams tend to be developed toward the estuary and less developed toward the headwaters.	Use of vessels Establishing access points Foot traffic at spill site Booming and physical herding Berms, dams, or other barriers Culvert blocking Skimming/vacuuming Passive collection of oil with sorbents Manual or mechanical removal of oiled substrates Terrestrial and aquatic cutting/removal of vegetation Ambient temperature, low pressure flooding/flushing *In situ* burning	Disturbance or destruction of riparian and freshwater shoreline habitats, causing increased water temperature and siltation and decreased prey inputs Disturbance from light Exclusion from essential resources (e.g., food, refuge, spawning habitat) or disrupted passage between critical habitat areas by placement of dams or culvert blockages Destruction of benthic habitat and organisms by anchors Entrainment of larval salmon in vacuums Physical habitat disturbance/smothering by anchors or *in situ* burn residues Increase in water temperature from *in situ* burning Noise and vibration	<u>Direct injury:</u> Entrainment of larvae or juveniles in vacuums may result in death (highest-magnitude, longest-term effect). Flat-head nozzles are used to limit intake. Vacuums are used at the immediate water surface only, not in the water column. Disturbance of spawning habitat (e.g., redds) by anchors or foot traffic may cause mortality (highest-magnitude, longest term effect). Equipment will be anchored to shore when possible. The use of booms, vessels, and other anchored equipment will not be used in shallow spawning streams. <u>Change in behavior:</u> Use of lights (associated with nighttime activities) in spawning habitats may slow or halt the emergence of salmon fry from gravels, allowing predators (e.g., sculpins) to consume fry more easily (high-magnitude, long-term effect [death], but short-term stressor). Lights will be used only during the spill response (matter of days). Overall, lights are expected to have a short-term and low-magnitude effect on juvenile and adult salmon in freshwater, but effects may be greater (on salmon larvae) when used in spawning habitats. The presence of workers and walking in streams, if necessary, may cause the fish to avoid the area. <u>Exclusion from resources:</u> Dams and culvert blockages may block salmon migration if used during critical migration time periods. Barriers will likely be removed within a few days. The EU will provide responders with information on spawning areas and times, and other tools (e.g., GRPs, ERMA) will also provide planning information. <u>Toxicity:</u> Exposures to burn residues could result in toxic effects on salmon in the shallow freshwater environments. *In situ* burn will be conducted only after contacting the Services.	Increased siltation, increased temperatures, decreased dissolved oxygen, and decreased productivity of prey productivity items may occur as a result of terrestrial actions adjacent to salmon bearing streams (potentially high-magnitude, long-term effects); conservation measures will be implemented to minimize these effects. Disturbance of benthic habitat by anchors may occur (low-magnitude, potentially long-term effect), but will be localized.

Table 4-2 Evaluation of Effects

Time and Location of Potential Exposure	Factors Influencing Exposure to Action	Applicable Actions[a]	Potential Stressors Associated with Applicable Actions[b]	Primary Effects Associated with Relevant Applicable Actions[c]	
				Effects on Individuals	Habitat Degradation
Pacific salmon (Oncorhynchus spp.): Estuarine					
Seasonality: Salmon migrate into or out of estuaries at different points throughout the year depending on the species, spawning stream, and life history; can spend extended time rearing in estuaries Habitat: Marine nearshore (generally nearshore along the coast within 200 m [656 ft] isobaths)	Depth of swimming in open waters and lack of activity at surface will reduce exposures to response actions in the estuarine environment.	Use of vessels Booming Skimming/vacuuming Passive collection of oil with sorbents Physical herding *In situ* burning Use of dispersants	Disturbance from light Disturbance/smothering of benthic habitat and organisms by anchors or burn residues Physical habitat disturbance/smothering by anchors or *in situ* burn residues Increase in water temperature and generation of residues from *in situ* burning Presence of dispersed oil	Direct injury: Entrainment of larvae or juveniles in vacuums may result in death (highest-magnitude, longest-term effect). Flat-head nozzles are used to limit intake. Vacuums are used at the immediate water surface only, not in the water column. Change in behavior: Avoidance of light in response areas by juvenile, subadult, and adult salmon may reduce their exposure to spill response actions in estuarine waters; temporary avoidance of the immediate response area is not expected to significantly alter the access of salmon to forage habitat (low-magnitude, short-term effect). Lights will be used only during nighttime operations of the spill response (matter of days). Toxicity: Exposures to burn residues will not result in toxic effects on salmon in the estuarine environment (NOAA 2017b). Exposures of salmon to highly dilute chemically dispersed oils in marine nearshore areas are possible (after dispersion in open marine waters). Salmonids are among the least sensitive of the aquatic species tested to dispersants and dispersed oil (Appendix B). Dispersants will not be directly applied into marine nearshore habitats.	Disturbance of benthic habitat and by anchors (low-magnitude, potentially long-term effect).
Pacific salmon (Oncorhynchus spp.): Marine					
Seasonality: Year-round Habitat: Open marine water Marine nearshore	Depth of swimming in open waters and lack of activity at surface will reduce exposures to response actions in the marine environment.	Use of vessels Booming Skimming/vacuuming Physical herding Chemical dispersion *In situ* burning	Physical habitat disturbance/smothering by anchors or *in situ* burn residues Displacement or entrainment of prey in vacuums Increased exposures of fish or prey species to oil as a result of chemical dispersion (change in oil fate and transport)	Direct injury: Entrainment of larvae or juveniles in vacuums may result in death (highest-magnitude, longest-term effect). Flat-head nozzles are used to limit intake. Vacuums are used at the immediate water surface only, not in the water column. Change in behavior: Avoidance of light in response areas by juvenile and adult salmon may reduce their exposure to spill response actions in marine waters; temporary avoidance of the immediate response area is not expected to significantly alter the access of salmon to forage habitat (low-magnitude, short-term effect). Lights will be used during nighttime operations for very large open water spills, which typically last no more than 4 days. Toxicity: Chinook salmon could be exposed to chemically dispersed oil at a relatively high concentration for short time periods, particularly if exposures were to occur within the upper few meters of the water column; due to rapid (within hours) dilution of dispersed oils and other factors. Salmonids are among the least sensitive of the aquatic species tested to dispersants and dispersed oil (Appendix B).	Disturbance of benthic habitat and by anchors (low-magnitude, potentially long-term effect).

Table 4-2 Evaluation of Effects

Time and Location of Potential Exposure	Factors Influencing Exposure to Action	Applicable Actions[a]	Potential Stressors Associated with Applicable Actions[b]	Primary Effects Associated with Relevant Applicable Actions[c]	
				Effects on Individuals	Habitat Degradation
				Exposures to burn residues will not result in toxic effects on salmon in the estuarine environment (NOAA 2017b).	
Pacific Eulachon, Southern DPS (Thaleichthys pacificus): Freshwater and Estuarine					
Seasonality: Enter freshwater from late fall to spring to spawn After emergence, newly hatched larvae are quickly washed out of freshwater spawning habitat streams to estuaries and then to the ocean Habitat: Riverine Marine nearshore	Eulachon spawn in the mainstem of rivers and some tributaries on sand, gravel, cobble, or detritus. Early life-stage eulachon (e.g., eggs and yolk-sac larvae) may be moved to estuaries from freshwater spawning habitat by spring freshets, resulting in imprinting and homing to estuaries. Larval eulachon are present throughout the water column. Prior to entering their spawning rivers, eulachon hold in brackish waters.	Use of vessels Staging area establishment and use Foot traffic at spill site Booming Skimming/vacuuming Passive collection of oil with sorbents Manual or mechanical removal of oiled substrates Terrestrial and aquatic cutting/removal of vegetation Ambient temperature, low pressure flooding/flushing *In situ* burning (not used in freshwater habitat)	Disturbance or destruction of riparian and freshwater shoreline habitats, causing increased water temperature, increased erosion or siltation, and decreased prey inputs Disturbance from light Trampling and loss of vegetation Exclusion from essential resources (e.g., food, refuge, spawning habitat) or disrupted passage between critical habitat areas by placement of earthen barriers or culvert blockages Disturbance/smothering of benthic habitat and organisms by anchors or burn residues Displacement or entrainment of larvae, juveniles, or prey in vacuums Concentration of oil by placement or use of sorbent booms Physical habitat disturbance/smothering by anchors or *in situ* burn residues	Direct injury: Entrainment of larvae and juveniles in vacuum may result in death (highest-magnitude, longest-duration effect); the use of flat-head nozzles on vacuums will reduce the potential for this effect. Vacuuming will affect only a small area and will last a short time, typically less than four days. Vacuums are used at the immediate water surface only, not in the water column. Anchoring of vessels or equipment (e.g., booms or sorbent materials) may result in the disturbance or destruction of embryonic eulachon attached to sediment (high-magnitude, longest-duration effect). Spill planning tools provide information on when and where spawning is expected to occur and where things can be anchored to shorelines. The effects of anchoring will be highly localized. Barriers and culvert may block access to important habitat features (e.g., feeding, refuge, spawning) which could result in mortality or decreased fitness. Change in behavior: Avoidance of light in response areas may reduce the exposure of eulachon to oil (baseline condition) or response actions at the water surface (e.g., vacuuming); temporary avoidance (i.e., during the response action) of the immediate response area may occur (low-magnitude, short-duration effect). Lights will be used only during the spill response, typically lasting no more than 4 days. Toxicity: Exposures to burn residues will not result in toxic effects on eulachon in the estuarine environment (NOAA 2017b).	Increased siltation, increased temperatures, decreased dissolved oxygen, and decreased productivity of prey items may occur as a result of terrestrial actions adjacent to salmon bearing streams (potentially high magnitude, long-term effects); conservation measures are expected to minimize these effects. Sediment smothering by burn residues will be localized, and residues will be recovered to the extent practicable (negligible to low-magnitude, potentially long-term effect).
Pacific Eulachon, Southern DPS (Thaleichthys pacificus): Marine					
Seasonality: Year-round Habitat: Open marine water	Larval eulachon are present throughout the water column, but the species tends to move deeper into the water column over time. Adult and juvenile eulachon have been found at several Washington and Oregon coastal locations.	Use of vessels Booming Skimming/vacuuming Passive collection of oil with sorbents Chemical dispersion *In situ* burning	Disturbance or smothering of benthic habitat in the marine environment by anchors or *in situ* burn residues Disturbance from light Entrainment of prey in vacuums Increased exposures of fish or prey species to oil as a result of chemical dispersion (change in oil fate and transport)	Direct injury: Entrainment of larvae and juveniles in vacuum may result in death (highest-magnitude, longest-duration effect). The use of flat-head nozzles on vacuums will reduce the potential for this effect. Vacuuming will affect only a small area and will last a short time, typically less than 4 days. Vacuums are used at the immediate water surface only, not in the water column. Change in behavior: Avoidance of light in response areas may reduce the exposure of eulachon to oil (baseline condition) or response actions at the water surface (e.g., vacuuming); temporary avoidance (i.e., during the response action) of the immediate response area (low-magnitude, short-duration effect). Lights will be used only during the spill response, typically lasting no more than 4 days.	Vacuuming of prey items could result in highly localized reductions in prey availability (low-magnitude, short-term effect). Chemical dispersants will temporarily cause increased oil concentrations in the top few meters of the water column, though rapid dilution and coalescence of oil droplets will reduce the duration of this degradation of water quality (less than 4 hours (Bejarano et al. 2014)) (low-magnitude, short-term effect).

Table 4-2 Evaluation of Effects

Time and Location of Potential Exposure	Factors Influencing Exposure to Action	Applicable Actions[a]	Potential Stressors Associated with Applicable Actions[b]	Primary Effects Associated with Relevant Applicable Actions[c]	
				Effects on Individuals	Habitat Degradation
				Toxicity: Larval eulachon could be exposed to chemically dispersed oil at a relatively high concentration for short time periods, particularly if exposures were to occur within the upper few meters of the water column due to due to rapid (less than 4 hours (Bejarano et al. 2014) dilution of dispersed oils and other factors, chemical dispersion is not expected to have a significant effect on fish in the marine environment (EPA and USCG 2015) (low-magnitude, short-term effect). Exposures to burn residues will not result in toxic effects on eulachon in the estuarine environment (NOAA 2017b).	
Puget Sound/ Georgia Basin Bocaccio Rockfish (Sebastes paucispinis) and Yelloweye Rockfish (S. ruberrimus)					
Seasonality: Bocaccio larvae are released between January and April, remain pelagic for approximately 3.5 months, and then settle to shallow areas as juveniles; as they age, bocaccio move toward deeper habitat Yelloweye rockfish are present year-round; larvae are released in early spring to late summer and likely remain pelagic for up to three months Habitat: Marine nearshore Open marine water	Primarily live in deep water, well below what would be exposed to response actions. Bocaccio larvae and juveniles live in relatively shallow waters. On average, larvae occur at 25 to 30 m (82 to 98 ft). Range of depths of yelloweye rockfish larvae is unclear, but is assumed to be similar to bocaccio rockfish.	Use of vessels Booming Skimming/vacuuming Passive collection of oil with sorbents Chemical dispersion *In situ* burning	Disturbance of benthic habitat and prey by anchors Smothering of benthic habitat and prey by *in situ* burn residues Entrainment of larvae in vacuums Disturbance from light Increased exposures of fish or prey species to oil as a result of chemical dispersion (change in oil fate and transport)	Direct injury: Spill response actions are not expected to directly injure rockfish, which are generally present at 25 to 30 m (82 to 98 ft) as larvae and much deeper as subadults and adults. There is a small portion of larval rockfish that are shallower that 25 m that could be entrained by a vacuum, leading to death (highest-magnitude, longest-duration effect). The individual would have be at the immediate surface of the water (where vacuums are used), which, given the preferences of this species, is highly unlikely. Also, the use of flat-head nozzles will reduce the intake of fish into vacuums. Toxicity: Increased exposures of surface-dwelling larvae to chemically dispersed oil are possible but will be short term; oil is rapidly diluted into the water column (less than 4 hours (Bejarano et al. 2014), after which droplets may coalesce and resurface. Exposures of fish to chemically dispersed oil are not expected to cause significant impacts (EPA and USCG 2015) (low-magnitude, short-term effect). Effects on larger individuals (e.g., adults or subadults) will likely be negligible. Burn residues could be ingested by rockfish, but they are not toxic to fish (NOAA 2017b). Residues will be collected by responders to the extent practicable.	Larval prey (plankton) may be exposed to chemically dispersed oil for short time periods (less than 4 hours (Bejarano et al. 2014)); effects on plankton populations are expected to be low magnitude and short term (EPA and USCG 2015) Sediment smothering by burn residues will be localized, and residues will be recovered to the extent practicable (negligible to low-magnitude, potentially long-term effect).
Green Sturgeon, Southern DPS (Acipenser medirostris)					
Seasonality: Form aggregations in Washington and Oregon estuaries in fall and summer Present in open marine water throughout the year Habitat: Marine nearshore Open marine water	Feed along the bottom of sediment Only present in the Action Area as late juveniles, subadults, and adults; no spawning habitat present in the Action Area	Use of vessels Booming Passive collection of oil with sorbents Chemical dispersion (open marine water only; not used in marine nearshore) *In situ* burning	Disturbance/smothering of benthic habitat and organisms by anchors Increased exposures of fish or prey species to oil as a result of chemical dispersion (change in oil fate and transport) in the marine environment; dispersants will not be applied in the nearshore Exposure to burn residues	Toxicity: Chemical dispersion may temporarily increase exposures of sturgeon to oil, though sturgeon live at depths of 20 to 60 m (66 to 197 ft) where exposures will be to highly dilute oil. Exposures will be short term (e.g., hours to days) and are expected to result in low-magnitude impacts on fish species (EPA and USCG 2015), particularly at later life stages (low-magnitude, short-term effect). Burn residues could be ingested by sturgeon, but they are not toxic to fish (NOAA 2017b). Residues will be collected by responders to the extent practicable.	Reduction in benthic prey resulting from disturbed sediments after anchoring of equipment or vessels. Effect will be highly localized (low magnitude) but potentially long term (due to the disturbance of soft sediment invertebrate communities).

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Time and Location of Potential Exposure	Factors Influencing Exposure to Action	Applicable Actions[a]	Potential Stressors Associated with Applicable Actions[b]	Primary Effects Associated with Relevant Applicable Actions[c]	
				Effects on Individuals	Habitat Degradation
Sea Turtles					
Leatherback Sea Turtle (Dermochelys coriacea)					
Seasonality: Forage along the Washington and Oregon coast during summer and fall Habitat: Marine nearshore Open marine water	On-water marine operations are short, typically less than 4 days, which makes likelihood of exposure due to temporal overlap low. However, because leatherbacks seasonally forage in the Action Area and there is designated critical habitat in the area, there is possible exposure spatially. Relative large size makes them easy to detect from aircraft, but they are not easily visible from a vessel. Spend most of their time at or near the ocean surface Aggregate in upwelling relaxation zones (Columbia River plume)	Use of vessels Use of aircraft Chemical dispersion (open marine water only; not used in marine nearshore) *In-situ* burning	Vessel strike Disturbance from noise, light, and presence of people Chemical exposures to dispersants, dispersed oil, and smoke	Direct injury: Injury or death caused by vessel strike (highest-magnitude, longest-term effect). Wildlife monitors will observe area for sea turtles, and response actions will be suspended until turtles are no longer present. Buffer areas around turtles will be maintained by personnel and vessels to limit or eliminate this possibility. Change in behavior: Possible avoidance of response areas during response actions (i.e., due to noise or light disturbance) (low-magnitude, short-duration effect, potentially beneficial). Lights will only be used during the spill response. Toxicity: Exposures to smoke could impact sea turtles' lungs, reducing their ability to dive and forage (high-magnitude, potentially long-term effects). Wildlife monitors will observe area for sea turtles, and burning will not be conducted while turtles are present. Also, given the short time period of an *in-situ* burn and that leatherbacks do not commonly occur year round in the Action Area, the likelihood of exposure is low. Turtles may be exposed to chemical dispersants during applications; dispersants themselves are not highly toxic, so this is a minor change relative to the baseline condition (negligible magnitude). Any reduction in oil at the surface would likely benefit sea turtles. Exposure to chemically dispersed oil would increase when diving to forage, but effects are expected to be short term (i.e., days to weeks) and low magnitude.	Chemical dispersion of oil may increase exposures of key prey items (i.e., jellyfish). Acute toxicity in jellyfish could have an indirect effect on the leatherback sea turtle. This effect would be limited to the area where dispersants were applied. Adult jellyfish are not likely to be impacted by chemically dispersed oil, but larval jellyfish may be impacted at ecologically relevant concentrations (Echols et al. 2016). This is not expected to change the overall availability of adult jellyfish over the broad foraging areas used by leatherback turtles (negligible effect).

Table 4-2 Evaluation of Effects

Time and Location of Potential Exposure	Factors Influencing Exposure to Action	Applicable Actions[a]	Potential Stressors Associated with Applicable Actions[b]	Primary Effects Associated with Relevant Applicable Actions[c]	
				Effects on Individuals	Habitat Degradation
Marine Mammals					
Humpback Whale, Mexico DPS and Central America DPS (Megaptera novaeangiliae)					
Seasonality: Migrate seasonally between high-productivity areas; observed in Puget Sound in fall and spring; have been observed entering the Strait of Juan de Fuca and Puget Sound Habitat: Marine nearshore Open marine water	Densities are highest during foraging and less so during migration Extensive home range Easy to detect from a vessel or airplane	Use of vessels Use of aircraft Chemical dispersion (open marine water only; not used in marine nearshore) *In situ* burning	Vessel strike Disturbance from noise, light, and presence of people Chemical exposures to dispersants, dispersed oil, and smoke	Direct injury: Physical injury or death from vessel strikes (highest-magnitude, longest-duration effect). Wildlife monitors will observe area for whales, and response actions will be suspended until whales are no longer present. Buffer areas around whales will be maintained by personnel and vessels. Change in behavior: Impaired communication resulting from underwater noise during spill response actions may occur, though the noise levels produced by response vessels are not expected exceed dangerous levels (NOAA 2017a) (low-magnitude, short-duration effect). Increased vessel activity (and associated noise) will likely last a matter of days to 1 week (typically four days or less), depending on the size of the spill. Avoidance of humans and vessels during spill response actions; may reduce exposures to spilled oil (short-term [days to a week], potentially beneficial effect). Exclusion from resources: Possible temporary exclusion from a localized resource (e.g., aggregation of fish or plankton) due to the presence of response workers, vessels, and response equipment and materials, as well as the associated noise (low-magnitude, short-duration effect). Noise and presence will be limited to the duration of on-water spill response (days, up to 1 week; typically 4 days or less). Toxicity: Impaired breathing or lung damage from smoke inhalation following *in situ* burning (high-magnitude, potentially long-term effect depending on the degree of exposure). *In situ* burning will not be conducted if whales are detected in the area by wildlife monitors. *In situ* burns are rare in marine waters and or short duration, so exposure would be short term. Tissue irritation (i.e., skin, eye, nose, mucous membrane) from exposure to dispersants, dispersed oil, or smoke from *in situ* burning (low-magnitude, likely short-term effect). It is expected that irritation will subside within a matter of days or weeks. Chemical dispersant application and *in situ* burning will not be conducted if whales are detected in the area by wildlife monitors. Temporary reduction in feeding efficiency caused by the fouling of baleen by burn residues (short-term effect of uncertain magnitude) or dilute, dispersed oil (low-magnitude, likely short-term effect). Fouled baleen is expected to recover quickly (58 FR 3121). *In situ* burning will not be conducted if whales are detected in the area by wildlife monitors; however, these effects may occur after the burn has finished.	Temporary (i.e., hours) reduction in water quality from chemically dispersed oil (low-magnitude, short-duration effect). Effects of chemical exposures of prey items are expected to be low magnitude and temporary.

Table 4-2 Evaluation of Effects

Time and Location of Potential Exposure	Factors Influencing Exposure to Action	Applicable Actions[a]	Potential Stressors Associated with Applicable Actions[b]	Primary Effects Associated with Relevant Applicable Actions[c]	
				Effects on Individuals	Habitat Degradation
Killer Whale, Southern Resident DPS (Orcinus orca)					
<u>Seasonality:</u> Year-round <u>Habitat:</u> Marine nearshore Open marine water	Do not migrate but do shift movement depending upon prey availability. Generally, stay around Puget Sound in late spring through fall and have been tracked along outer coast in the fall and winter. Over the past 10 years, their movements have become less predictable and local seasonal aggregations (e.g., summers around San Juan Islands) much less common than in the 1980 and 1990s. Primarily eat one type of food (salmon), which is also ESA-listed (i.e., West Coast salmon species, particularly Chinook salmon; see above). The whales are tracked by various organizations, so their location may be available through online resources (e.g., OrcaNetwork). This information can be provided to the response as part of planning. The NWACP includes an SRKW deterrence plan that would be implemented if killer whales were observed near an oil spill. The deterrence is designed to reduce the likelihood of whales entering the oil, but also to keep whales away from response activities. To the extent possible, vessels will adhere to regulations requiring vessels to maintain 183-m (200-yard) distance from killer whales in the inland waters.	Use of vessels Use of aircraft Chemical dispersion (open marine water only; not used in marine nearshore) *In situ* burning	Vessel strike (likelihood of vessel strike may be elevated in Puget Sound and Strait of Juan de Fuca) Disturbance from noise, light, presence of people Chemical exposures to dispersants, dispersed oil, and smoke	<u>Direct injury:</u> Physical injury or death from vessel strikes (highest-magnitude, longest-duration effect). Wildlife monitors will observe area for whales, and response actions will be suspended until whales are no longer present. Buffer areas around whales will be maintained by personnel and vessels. <u>Change in behavior:</u> Impaired communication resulting from underwater noise during spill response actions may occur, though the noise levels produced by response vessels are not expected exceed dangerous levels (NOAA 2017a) (low-magnitude, short-t effect). Increased vessel activity (and associated noise) will likely last a matter of days or weeks, depending on the size of the spill, typically no more than 4 days. Avoidance of humans and vessels during spill response actions; may reduce exposures to spilled oil (short-term [days to weeks], potentially beneficial effect). <u>Exclusion from resources:</u> Temporary exclusion from a localized resource (e.g., aggregation of fish) due to the presence of response workers, vessels, and response equipment and materials, as well as the associated noise (low-magnitude, short-duration effect). Noise and presence will be limited to the duration of the spill response (likely days to weeks). <u>Toxicity:</u> Impaired breathing or lung damage from smoke inhalation following *in situ* burning (high-magnitude, potentially long-term effect depending on the degree of exposure). *In situ* burning will not be conducted if whales are detected in the area by wildlife monitors. Tissue irritation (i.e., skin, eye, nose, mucous membrane) from exposure to dispersants, dispersed oil, or smoke from *in situ* burning (low-magnitude, likely short-term effect). It is expected that irritation will subside within a matter of days or weeks.	Temporary reduction in water quality from chemically dispersed oil (low-magnitude, short-duration effect). Water quality will be degraded for a matter of hours. Effects of chemical exposures of prey items are expected to be low magnitude and temporary (see *Pacific salmon (Oncorhynchus* spp.*)*: *Marine*, above)

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Time and Location of Potential Exposure	Factors Influencing Exposure to Action	Applicable Actions[a]	Potential Stressors Associated with Applicable Actions[b]	Primary Effects Associated with Relevant Applicable Actions[c]	
				Effects on Individuals	Habitat Degradation
Responsible Agency – USFWS					
Plants					
Applegate's Milk-vetch *(Astragalus applegatei)*					
Seasonality: Perennial plant, flowering between June and August Habitat: Terrestrial Occurs in flat, seasonally moist, alkaline soil with underlying clay hardpan.	Applegate's milk-vetch has isolated and patchy distribution that is restricted to the Lower Klamath Basin near Klamath Falls in Southern Oregon. Species is observable in its vegetative state only for a limited time frame; otherwise present only as seed. Critical habitat has not been designated for Applegate's milk-vetch.	Use of vehicles Foot traffic at spill site Staging area establishment and use (including creation of new access points) Manual or mechanical removal of oiled substrates Berms or other barriers; pits and trenches *In situ* burning	Soil compaction Disturbance or removal of soil Extreme heat caused by burning	Direct injury: Removal of seeds from habitat during removal of soils (highest-magnitude, longest-duration effect) Destruction of individual plants or seeds by heavy machinery or vehicles (highest magnitude, longest-duration effect) Destruction of individual plants or seeds caused by burning (highest-magnitude, longest-duration effect)	Reduced germination may result from soil compaction caused by use of heavy machinery or vehicles (highest-magnitude, longest-duration effect)
Golden Paintbrush (Castilleja levisecta)					
Seasonality: Flowers from April to June and is less conspicuous when not flowering Habitat: Terrestrial Species found in loamy sand or sandy loam soils derived from glacial origins. Also found on clayey alluvial soils, in association with Oregon white oak (*Quercus garryana*) woodlands and savannah.	The species is possibly extirpated in Oregon and critically imperiled in Washington (NatureServe 2017). Of the seven counties in Washington where golden paintbrush was historically present, the species is extirpated or possibly extirpated in all but Island and Thurston Counties. According to Caplow (2004), a population of 5,493 individuals was located in a 12-ha (30-acre) site within Rocky Prairie, Thurston County, Washington. Recovery efforts for the species are underway in Washington and Oregon. Critical habitat has not been designated for golden paintbrush.	Use of vehicles Foot traffic at spill site Staging area establishment and use Manual or mechanical removal of oiled substrates Berms or other barriers; pits and trenches *In situ* burning	Soil compaction Disturbance or removal of soil Extreme heat caused by burning	Direct injury: Removal of seeds from habitat during removal of soils (highest-magnitude, longest-duration effect) Destruction of individual plants or seeds by heavy machinery or vehicles (highest-magnitude, longest-duration effect) Destruction of individual plants or seeds caused by burning (highest-magnitude, longest-duration effect)	Reduced germination may result from soil compaction caused by use of heavy machinery or vehicles (highest magnitude, longest-duration effect)
Spalding's Catchfly (Silene spaldingii)					
Seasonality: Plants emerge in mid-to late May; flowering occurs from mid-July through August, possibly extending into October. Habitat: Terrestrial Typically found in moist, open grasslands, sagebrush steppe, or open pine forest communicates at elevations between 365 and 1,615 m (1,200 and 5,300 ft)	Spalding's catchfly may be difficult to identify when not in bloom. Populations have been observed in eastern Washington, northeastern Oregon (near Enterprise, Oregon), and western Idaho.	Use of vehicles Foot traffic at spill site Staging area establishment and use Manual or mechanical removal of oiled substrates Berms or other barriers; pits and trenches *In situ* burning	Soil compaction Disturbance or removal of soil Extreme heat caused by burning	Direct injury: Removal of seeds from habitat during removal of soils (highest-magnitude, longest-duration effect) Destruction of individual plants or seeds by heavy machinery or vehicles (highest-magnitude, longest-duration effect) Destruction of individual plants or seeds caused by burning (highest-magnitude, longest-duration effect)	Reduced germination may result from soil compaction caused by use of heavy machinery or vehicles (highest-magnitude, longest-duration effect)

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Time and Location of Potential Exposure	Factors Influencing Exposure to Action	Applicable Actions[a]	Potential Stressors Associated with Applicable Actions[b]	Primary Effects Associated with Relevant Applicable Actions[c]	
				Effects on Individuals	Habitat Degradation
	Based on data from the WNHP (WDNR 2017), the populations that overlap with the Action Area are located in eastern Washington near Spokane. There are numerous occurrences within the Action Area, but the closest observation is 0.4 km (0.25 miles) from the rail line. There are roads and open areas adjacent to the rail lines where staging areas could be established in the event of a spill. Critical habitat has not been designated for Spalding's catchfly.				
Water howellia (Howelia aquatilis)					
<u>Seasonality:</u> Annual aquatic herb <u>Habitat:</u> Wetland Inhabit small, vernal freshwater wetlands and ponds with an annual cycle of filling with water in spring and drying up in summer or autumn	In Washington, the species occurs in Clark, Pierce, Spokane, and Thurston Counties. Based on the spatial data from the WNHP (WDNR 2017), 8 occurrences appear to be adjacent to either a railway or pipeline in the Action Area. Small vernal wetlands and ponds in the Action Area are 0.6 km (0.4 miles) or farther from railways or pipelines, reducing the potential for exposure. In Idaho, water howellia does not overlap with the Action Area. There are no known extant occurrences in Oregon. Critical habitat has not been designated for water howellia. Exposure to spill response actions during dry seasons is less likely due to the lack of water bodies during that time.	Staging area establishment and use (dry seasons) Skimming/ vacuuming (wet season) Ambient temperature, low pressure flooding/flushing Aquatic vegetation cutting/removal (wet seasons) Manual or mechanical removal of oiled substrates Berms, dams, or other barriers; pits and trenches (dams unlikely) *In situ* burning	Soil compaction Disturbance or removal of soil/sediment Extreme heat caused by burning Disturbance caused by vacuum hoses and associated equipment	<u>Direct injury:</u> Destruction of individual plants caused by intentional cutting of oiled vegetation (wet season) (highest-magnitude, longest-duration effect) Destruction of emergent plants (wet season) or seeds (dry season) caused by burning (highest-magnitude, longest-duration effect) Removal of seeds from habitat (dry season) during removal of soils (highest-magnitude, longest-duration effect) Destruction of seeds by heavy machinery or vehicles (dry season) (highest-magnitude, longest-duration effect)	Reduced germination may result from soil compaction caused by use of heavy machinery or vehicles (dry season) (highest-magnitude, longest-duration effect)

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Time and Location of Potential Exposure	Factors Influencing Exposure to Action	Applicable Actions[a]	Potential Stressors Associated with Applicable Actions[b]	Primary Effects Associated with Relevant Applicable Actions[c]	
				Effects on Individuals	Habitat Degradation
Snails					
Banbury Springs Limpet (Lanx sp.)					
<u>Seasonality:</u> Year-round <u>Habitat:</u> Riverine, freshwater shoreline (occur in large, undisturbed springs containing cold, clear, and well oxygenated water)	This species is aquatic and occurs only in 4 cold-water spring complexes along 9.7 km (6 miles) of the middle Snake River: Thousand Springs, Box Canyon Springs, Banbury Springs, and Briggs Springs near Twin Falls, Idaho (USFWS 2006a).	Foot traffic at spill site Staging area establishment and use Booming Skimming/ vacuuming Passive collection of oil with sorbents Terrestrial vegetation cutting/removal Manual or mechanical removal of oiled substrates	Entrainment of larvae in vacuums Disturbance or destruction of riparian and freshwater shoreline habitats, causing increased water temperature, increased erosion or siltation	<u>Direct injury:</u> Physical destruction of individuals resulting from foot traffic (highest-magnitude, longest-term effect). Foot traffic in springs will be limited or negligible because spilled oil will most likely approach the springs from the Snake River (as a result of a pipeline spill); the springs are tributaries to the Snake River, so oil would need to flow upstream to affect the springs habitat. Vacuuming may cause entrainment and mortality of the limpet or limpet larvae (highest-magnitude, longest-term effect). Vacuums will be used only at the surface of oil and water to minimize the intake of water (and plankton).	Soil excavation or the establishment of a staging area may cause increased erosion of the shoreline and increased turbidity and siltation of springs (high-magnitude, long-term effect). Engineered controls will minimize these effects. Because the threat of oiling in limpet habitat would be from upstream (and not in the terrestrial environment), terrestrial vegetation and soil removal adjacent to limpet habitat is highly unlikely. Staging areas and access points could be placed in developed portions of public parks near the springs (e.g., Thousand Springs State Park).

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Time and Location of Potential Exposure	Factors Influencing Exposure to Action	Applicable Actions[a]	Potential Stressors Associated with Applicable Actions[b]	Primary Effects Associated with Relevant Applicable Actions[c]	
				Effects on Individuals	Habitat Degradation
Bliss Rapids snail (Taylorconcha serpenticola)					
Seasonality: Year-round Habitat: Riverine	Only found in a small portion of the Snake River, primarily in its tributaries	Use of vessels Staging area establishment and use Foot traffic Booming Skimming/vacuuming Berms, dams, or other barriers; pits and trenches Manual or mechanical removal of oiled substrates Passive collection of oil with sorbents	Potential entrainment of larvae in vacuum Disturbance or destruction of riparian and freshwater shoreline habitats, causing increased water temperature, increased erosion, or siltation Trampling and loss of vegetation Disturbance of benthic habitat by anchors and potentially foot traffic (unlikely)	Direct injury: Destruction (highest-magnitude, longest-duration effect) through anchoring or foot traffic in small tributaries of the Snake River. Equipment will be anchored to shore, when possible. It is not expected that foot traffic will be required in small tributaries; rather, spill response actions will more likely focus on containing oil once it reaches the Snake River (where booming and other responses are practicable). *In situ* burning will generate residues that could sink to the bottom of the Snake River and physically smother benthic invertebrates (potentially high-magnitude, long-term effect). This effect will be localized, and residues will be recovered to the extent practicable. Vacuuming may cause entrainment and mortality of the snail or snail larvae (highest magnitude, longest term effect). Vacuums will be used only at the surface of oil and water to minimize the intake of water (and organisms). Change in behavior: Bliss Rapids snail is nocturnal (USFWS 1995) and will likely avoid light conditions at night; avoidance during nighttime spill response actions could reduce feeding (high-magnitude, short-term effect). Lights will be used during the spill response, which could last days to weeks but typically no more than 4 days. Toxicity *In situ* burning will generate burn residues that sink to the bottom of the Snake River, where snails could be exposed (low-magnitude, long-term effect due to persistence of residues in the environment). Sediment smothering by burn residues will be localized, and residues will be recovered to the extent practicable	Construction and foot and vehicle traffic in the terrestrial environment may cause increased soil erosion causing temporarily increased turbidity and siltation. Engineered controls will minimize erosion and siltation. Staging areas can be placed in previously cleared and developed areas. These effects are expected to be low magnitude because of conservation measures. High flows in the Snake River and rapid flows in tributaries will make these effects short term (i.e., days to weeks).

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Snake River Physa (Physa natricina)					
Seasonality: Year-round Habitat: Riverine (pebble to gravel, possibly cobble substrates which are largely free of macrophytes, as well as substrates finer than gravel that can fill in the interstitial spaces), freshwater shoreline	Only found within the Snake River	Use of vessels Staging area establishment and use Foot traffic at spill site Booming Passive collection of oil with sorbents Berms, dams, or other barriers; pits and trenches Manual or mechanical removal of oiled substrates	Disturbance or destruction of riparian and freshwater shoreline habitats, causing increased water temperature, increased erosion, or siltation Trampling and loss of vegetation Disturbance of benthic habitat by anchors	Direct injury: Destruction through anchoring or foot traffic at the site may occur (highest-magnitude, longest-duration effect). Equipment will be anchored to shore, when possible. Foot traffic will only be possible along shorelines, which should limit the potential for interactions with the physa. Responders will access the shoreline at consistent locations to minimize the potential for interacting with the physa.	Construction and foot and vehicle traffic in the terrestrial environment may cause increased soil erosion, turbidity, and siltation. Engineered controls will minimize these effects. Staging areas can be placed in previously cleared and developed areas. These effects are expected to be low magnitude, because of conservation measures. High flows in the Snake River will make these effects short term (i.e., days to weeks).
Butterflies					
Island Marble Butterfly (Euchloe ausonides insulanus)					
Seasonality: Year-round Habitat: Terrestrial Open coastal lowlands including grasslands sand dunes, and tidal lagoons distinguished by presence of cruciferous host plants (*Brassica campestris*, *Sisymbrium altissimum,* and *Lepidium virginicum* var. *menziesii*), full sunlight, and some type of topographic relief (e.g., ridgelines, hills, or bluffs).	Known populations currently found only on southeast side of San Juan Island, Washington. Larvae dependent on host plant consisting of 3 species of mustard. Critical habitat is proposed for parts of American Camp within the San Juan Island National Historical Park managed by the National Park Service. Only a portion of the habitat is in the coastal lagoon, which is the species' habitat most likely to be impacted by spill response. The species is being carefully studied and the host mustard plants surveyed.	Use of vehicles Foot traffic at spill site Staging area establishment and use Manual or mechanical removal of oiled substrates Berms or other barriers; pits and trenches	Physical crushing Destruction of plants Burning of plants Soil compaction	Direct injury: Individuals may be crushed by vehicles or feet at various life stages (highest-magnitude, longest-duration effect) Change in behavior: Adults may be temporarily disturbed by human activity	Removal of plants from habitat during removal of soils (potentially long-term effect on habitat) Destruction of plants by heavy machinery or vehicles (high-magnitude and long-duration effect)
Oregon Silverspot (Speyeria zerene hippolyta)					
Seasonality: Year-round Habitat: Terrestrial Grasslands including marine terrace and coastal headland salt-spray meadows, stabilized dunes, and montane grasslands.	Seven populations in the Action Area are located at Big Creek, Bray Point, Clatsop Plain, and Cascade Head, all in Oregon (66 FR 59807). Other populations exist outside the Action Area or have been extirpated. Species occurrences fall within the 1-mile coastal buffer of the Action Area Critical habitat has been designated for Oregon silverspot butterfly and falls within the 1-mile coastal buffer of the Action Area.	Use of vehicles Foot traffic at spill site Staging area establishment and use Manual or mechanical removal of oiled substrates Berms or other barriers; pits and trenches *In situ* burning	Physical crushing Destruction of plants Soil compaction Extreme heat caused by burning	Direct injury: Oregon silverspot may be trampled, or crushed by vehicles and machinery at various life stages (highest-magnitude, longest-duration effect) *In situ* burning could cause exposure to extreme heat (highest-magnitude, longest-duration effect) Change in behavior: Adults may be flushed out of disturbed areas, reducing foraging efficiency	Removal of plant seeds from habitat during removal of soils (potentially long term effect on habitat) Destruction of plants or seeds by heavy machinery or vehicles (high-magnitude, long-duration effect) Destruction of plants or seeds caused by burning (high-magnitude, long-duration effect) Reduced germination may result from soil compaction caused by use of heavy machinery or vehicles (high-magnitude, long-duration effect)

Table 4-2 Evaluation of Effects

Time and Location of Potential Exposure	Factors Influencing Exposure to Action	Applicable Actions[a]	Potential Stressors Associated with Applicable Actions[b]	Primary Effects Associated with Relevant Applicable Actions[c]	
				Effects on Individuals	Habitat Degradation
Taylor's Checkerspot (Euphydryas editha taylori)					
Seasonality: Year-round Habitat: Terrestrial; open grasslands dominated by short-statured grasses, with abundant forbs to serve as larval host plants and nectar sources.	Isolated populations in Oregon and Washington. Critical habitat has been designated for the species in isolated locations in Washington and Oregon. The only critical habitat areas that overlap with the Action Area are near Sequim Bay and Deception Pass and on Whidbey Island in Washington.	Use of vehicles Foot traffic at spill site Staging area establishment and use Manual or mechanical removal of oiled substrates Berms or other barriers; pits and trenches *In situ* burning	Crushing Destruction of plants Soil compaction Extreme heat caused by burning	Direct injury: Individuals may be trampled or crushed by vehicles, or machinery at various life stages (highest-magnitude, longest-duration effect) *In situ* burning could cause exposure to extreme heat (highest-magnitude, longest-duration effect) Change in behavior: Adults may be flushed out of disturbed areas, reducing foraging efficiency	Removal of plant seeds from habitat during removal of soils (potentially long-term effect on habitat) Destruction of plants or seeds by heavy machinery or vehicles (high-magnitude, long-duration effect) Destruction of plants or seeds caused by burning (high-magnitude, long-duration effect) Reduced germination may result from soil compaction caused by use of heavy machinery or vehicles (high-magnitude, long-duration effect)
Fish					
Bull Trout (Salvelinus confluentus)					
Seasonality: Spawn from August to November; fry emerge from April to May Habitat: Riverine/lacustrine Marine nearshore	Migratory or resident; some populations are anadromous Iteroparous Spawn in cold, clear headwater streams	Use of vessels Establishing access points Foot traffic Booming Skimming/vacuuming Culvert blocking Berms, dams, or other barriers; pits and trenches Manual or mechanical removal of oiled substrates Terrestrial and aquatic cutting/removal of vegetation *In situ* burning	Disturbance or destruction of riparian and freshwater shoreline habitats, causing increased water temperature, increased erosion or siltation, and decreased prey inputs Disturbance from light Trampling and loss of vegetation Disturbance of benthic habitat by anchors and foot traffic (unlikely) Displacement or entrainment of larvae or juveniles in vacuums	Direct injury: Entrainment of early-life-stage bull trout as a result of vacuuming oil at the water surface in freshwater streams could result in death (highest-magnitude, longest-duration effect). Flat-head nozzles will be used to minimize intake. Early life stage trout will seek out shelter when waters are disturbed, which will reduce the potential for entrainment. Vacuums will be used only at the water surface, not in the water column. Change in behavior: Possible avoidance of light may reduce bull trout exposures to other spill response and baseline-associated oil exposure (low-magnitude, short-duration, potentially beneficial effect). Exclusion from resources: Booming is not likely to exclude bull trout from necessary resources because booms cannot effectively be placed in very shallow streams or across fast-flowing streams. In deeper habitats, bull trout will be able to swim under booms. The use of dams or culvert blockages have the potential to exclude upstream or downstream migration of bull trout; these barriers will be removed within a few days.	Construction (e.g., berms, dams, or soil excavation) and foot and vehicle traffic in the terrestrial environment may cause increased siltation and water temperatures (high-magnitude, long-term effects). Engineered controls will be used to minimize erosion and siltation. Staging areas are not likely to be constructed for the spill response because staging areas are not constructed on shorelines. Access points between staging areas and the response area may need to be constructed in remote areas. Burn residues may sink and smother benthic habitat that supports invertebrate communities. Residues will affect a small area, so the overall effect will be low magnitude (but potentially long term). *In situ* burning in shallow or fast-moving streams will be mechanically infeasible (due to boom limitations) and logistically unlikely (due to need to transport fire booms).
Kootenai River White Sturgeon (Acipenser transmontanus)					
Seasonality: Present throughout the year; spawning occurs between May and July Habitat:	Benthic feeder and swims at bottom of streams Overlaps with the Action Area along much of their distribution within Idaho due to a unit train rail line; the rail line	Use of vessels Staging area establishment and use Booming	Disturbance or destruction of riparian and freshwater shoreline habitats, causing increased erosion, siltation, and water temperatures Disturbance from light	Direct Injury: Anchoring of vessels or equipment (e.g., booms) may result in the disturbance of spawning substrates (potentially high-magnitude, long-term effect due to disturbance of young	Construction (e.g., berms, dams, or soil excavation) and foot and vehicle traffic in the terrestrial environment may cause increased siltation, turbidity, and water temperature and decreased dissolved oxygen (high-

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Time and Location of Potential Exposure	Factors Influencing Exposure to Action	Applicable Actions[a]	Potential Stressors Associated with Applicable Actions[b]	Primary Effects Associated with Relevant Applicable Actions[c]	
				Effects on Individuals	Habitat Degradation
Riverine/lacustrine	crosses the Kootenai River at Bonners Ferry, ID, which is immediately upstream of Kootenai sturgeon critical habitat	Manual or mechanical removal of oiled substrates Terrestrial and aquatic cutting/removal of vegetation	Trampling and loss of vegetation Exclusion from essential resources (e.g., food, refuge, spawning habitat) or disrupted passage between critical habitat areas by placement of booms, barriers, or culvert blockages Destruction of benthic habitat and organisms by anchors, anchor chains, or boom contact in shallow waters or along freshwater shorelines. Physical habitat disturbance/smothering	sturgeon). Equipment will be anchored to shore to the extent possible. Change in behavior: Avoidance of light in response areas may reduce exposures to other oil (baseline condition) or other spill response-related stressors (low-magnitude, short-term, potentially beneficial effect). However, increased light conditions are also thought to impact larval white sturgeon by enabling predators (e.g., sculpin) to eat them more efficiently (high-magnitude, long-term effect). Light will be limited to the duration of the spill response (days) Exclusion from resources: Dams and culvert blockages can partly or completely impede upstream or downstream migration of fish. These barriers would be left in place for only a few days. Responders will be aware of fish spawning and migration times and locations, as made available by the Environmental Unit and spill planning tools. Damming or culvert blocking of the Kootenai River will not be feasible due to its size and flow. Tributary culverts could be blocked; however, these are not likely to affect Kootenai sturgeon. Therefore, the effects are expected to be negligible.	magnitude, long-term effect). Engineered controls will be used to minimize erosion and siltation. Staging areas will not likely need to be constructed near Kootenai sturgeon streams. Anchoring of vessels or equipment (e.g., booms) may result in the disturbance of foraging substrates (likely low-magnitude, short-term effect). Benthic invertebrates in coarse substrates will likely recolonize those substrates quickly after disturbance, particularly given the highly localized nature of the effect. Equipment will be anchored to shore to the extent possible.
Lost River Sucker (Deltistes luxatus) and Shortnose Sucker (Chasmistes brevirostris)					
Seasonality: Present throughout the year; spawn from February to May Habitat: Riverine/lacustrine (Klamath Lake and tributaries)	Live in shallow waters as larvae	See *Kootenai River White Sturgeon (Acipenser transmontanus): Freshwater*, above		Direct Injury: Entrainment of larval sucker during vacuuming of oil could result in death (highest-magnitude, longest-duration effect); however vacuums will only be used at the immediate water surface, where oil pools. Flat-head nozzles will be used to minimize intake. The area affected by vacuuming will be highly localized, and the duration will be limited to the length of the spill response. Vacuums will be used only at the water surface, not in the water column. Change in behavior: Suckers may be drawn to the surface by lights at night, where they may be exposed to oil or response actions (and associated effects) (e.g., entrainment in vacuums). Lights will be used only during the spill response, so the use of lights will be short term (days); the magnitude and duration of effects will depend on the exacerbated stressor. As noted above, the use of flat-head nozzles on vacuums and predator-avoidance behaviors are likely minimize entrainment of sucker larvae in vacuums, for example. Exclusion from resources: Dams and culvert blockages may partly or completely impede upstream or downstream migration resulting in exclusion from spawning and foraging habitats. These barriers will be left in place for only a few days. Responders will have information about spawning times and locations, as provided by the Environmental Unit and response planning tools. Therefore,	Construction (e.g., berms, dams, or soil excavation) and foot and vehicle traffic in the terrestrial environment may cause increased siltation, increased water temperatures, and decreased dissolved oxygen, which all impact the PBFs of sucker critical habitats and could impact species fitness as well (high-magnitude, potentially long-term effects). Engineered controls will minimize erosion and siltation. Prey may be entrained in vacuums. This effect will be highly localized and isolated to the very shallow waters. The effect on prey populations will likely be short term and low magnitude because populations will quickly be replaced from surrounding waters and through rapid reproduction cycles. Anchors could cause localized (low-magnitude) disturbance of benthic invertebrate communities, which may not recover for some time (e.g., months) (potentially long-term effect), particularly in soft, lacustrine sediments.

Table 4-2 Evaluation of Effects

Time and Location of Potential Exposure	Factors Influencing Exposure to Action	Applicable Actions[a]	Potential Stressors Associated with Applicable Actions[b]	Primary Effects Associated with Relevant Applicable Actions[c]	
				Effects on Individuals	Habitat Degradation
				the effects are expected to be negligible to low magnitude and short term.	
Herptiles					
Oregon Spotted Frog (Rana pretiosa)					
Seasonality: Year-round Habitat: Terrestrial Riverine (very low flow areas) Wetland Shoreline (freshwater) Perennial bodies of water that include zones of shallow water and abundant emergent or floating aquatic plants	Live almost exclusively in water, only seldom using terrestrial or shoreline habitats, and predominately found in wetlands rather than along rivers	Use of vessels Use of aircraft Use of vehicles or heavy machinery Staging area establishment and use Foot traffic at spill site Berms, dams, or other barriers; pits and trenches Booming Skimming/ vacuuming Passive collection of oil with sorbents Manual or mechanical removal of oiled substrates Terrestrial vegetation cutting/removal Physical herding Ambient temperature, low pressure flooding/flushing *In situ* burning	Disturbance or destruction of riparian, wetland, and freshwater shoreline habitats, causing increased water temperature, increased erosion or siltation Disturbance from noise, light, presence of people Trampling and loss of vegetation Disturbance of habitat by anchors Entrainment of frogs or prey in vacuums Disturbance of vegetation by *in situ* burning (temporary) Physical habitat disturbance/smothering by in situ burning and burn residues	Direct injury: Foot traffic and the use of vehicles and heavy machinery in terrestrial habitat could result in the crushing of Oregon spotted frog (high-magnitude, long-term effect). This is very unlikely due to the highly aquatic nature of Oregon spotted frog. Wildlife monitors will watch for the presence of frogs, but they are cryptic and may not be visible or audible during spill response. *In situ* burns are accompanied by intense heat, which could kill frogs in close proximity to the flame (highest-magnitude, longest-term effect). This is very unlikely due to the highly aquatic nature of Oregon spotted frog; heat from burning is not transferred through water. Wildlife monitors will watch for frogs, and, if frogs observed in the area, burning will not be conducted. Impacts to the Oregon spotted frog from vacuuming may include entrainment of frog larvae (tadpoles), which may result in death (highest-magnitude, longest-term effect). Flat-head nozzles on vacuums will be used to limit intake. The area affected by vacuuming will be very small, and vacuuming will be limited to the duration of the spill response. Vacuums will not be used below the immediate water surface (because oil pools at the surface). Change in behavior: Presence of personnel or vessels could cause frogs to reduce feeding, and predation of frogs could increase (high-magnitude, long-term effect). These stressors will be limited to the duration of the spill response. Physical herding and flushing in wetlands may disturb the surface of the water, likely causing Oregon spotted frog to avoid the affected area (low-magnitude, short-term effect). These effects will be limited to the duration of the spill response (likely days) and to a small area. Toxicity: Smoke generated by *in situ* burning may cause respiratory injuries to Oregon spotted frogs (high-magnitude, potentially long-term effect). Wildlife monitors will watch for frogs, and, if frogs observed in the area, burning will not be conducted. Exposure of Oregon spotted frog to burn residues may occur, but toxic impacts are not likely (NOAA 2017b) (negligible magnitude).	Anchoring of booms, other equipment, or vessels in soft, freshwater sediments could disturb prey (e.g., insect) populations (low-magnitude, short-term [less than 1 month] effect). Equipment will be anchored to shorelines, if possible. The effect of anchoring will be highly localized, and prey populations (e.g., insects) will rapidly recover from disturbance. Construction (e.g., berms, dams, or soil excavation) and foot and vehicle traffic in the terrestrial environment may cause temporary degradation of water quality (e.g., increased turbidity, water temperature, and decreased dissolved oxygen lasting for hours or days). Engineered controls will minimize erosion and turbidity, resulting in low-magnitude, short-term effects. *In situ* burning may temporarily reduce the availability of cover from emergent aquatic vegetation (potentially high-magnitude, long-term effect). Vegetation will likely regrow in inundated areas, where root structures are protected against thermal damage.

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Time and Location of Potential Exposure	Factors Influencing Exposure to Action	Applicable Actions[a]	Potential Stressors Associated with Applicable Actions[b]	Primary Effects Associated with Relevant Applicable Actions[c]	
				Effects on Individuals	Habitat Degradation
Mammals					
Columbian White-tailed Deer (Odocoileus virginianus leucurus)					
<u>Seasonality:</u> Year-round <u>Habitat:</u> Terrestrial Riparian Shorelines (freshwater)	Live along Lower Columbia River, where there is extensive infrastructure and human populations Spill most likely to occur upstream of deer habitat rather than into terrestrial or riparian habitat GRP for Lower Columbia River is available with considerations for deer; focus of GRP is on shoreline or on-water response actions	Use of vehicles Access point establishment Foot traffic at spill site Use of aircraft	Vehicle strike Disturbance from noise, light, presence of responders Destruction of vegetation used by deer for cover and forage	<u>Direct injury:</u> Deer struck by vehicles could be maimed or killed (highest magnitude and duration of effect). Responders will not willfully approach deer and will limit driving to established roads to the extent possible. Vehicles will be slowed or stopped in the presence of deer to prevent collision. <u>Change in behavior:</u> Avoidance behaviors resulting from presence of responders and noise in the vicinity of deer habitat, including in the Columbia River and along shorelines affected by a spill. Disturbances on Columbia River islands will be limited to freshwater shorelines for the duration of spill activities.	The establishment of new access points could result in the removal of forage or cover used by deer. Access to spill response areas will likely be limited to existing infrastructure from developed areas. The Lower Columbia River GRP provides relevant information regarding possible access points.
Mazama Pocket Gopher (Thomomys mazama)					
<u>Seasonality:</u> Year-round <u>Habitat:</u> Terrestrial	Burrow in terrestrial habitat overlapping with the Action Area. Live in areas without a nexus to surface water. Rail lines carrying hazardous materials overlap with pocket gopher habitat.	Use of vehicles or heavy machinery Staging area establishment and use Foot traffic at spill site Use of aircraft Berms, dams, or other barriers; pits and trenches Manual or mechanical removal of oiled substrates *In situ* burning	Disturbance or destruction of burrowing and foraging habitat that supports the species Disturbance from noise and presence of people Exposure to fire or smoke	<u>Direct injury</u>: Gophers could be crushed by vehicle traffic or heavy machinery, resulting in death (highest-magnitude, longest-term effect); however, this is unlikely, as pocket gophers spend most of their time underground and are unlikely to be crushed by slow-moving heavy machinery. Construction-related activities could cause destruction of gopher burrows, possibly killing individuals or leading to the abandonment of burrows, which could in turn lead to the death of young gophers (high-magnitude, long-term effect). Wildlife monitors will survey an area for evidence of gophers prior to construction activities to prevent the destruction of burrows. Thermal injury could be caused by direct exposure to an *in situ* burn (high-magnitude, long-term effect). Wildlife monitors will watch for gophers at the surface, and burning will not be conducted if gophers are present. It is not expected that fire will significantly impact gophers underground. <u>Change in behavior:</u> Avoidance behaviors resulting in decreased foraging on plants for food or nest materials could occur (likely low-magnitude, short-term effect). Plants above ground provide only a small fraction of the resources used by gophers, who obtain the majority of their nutrition from within burrows. Avoidance would be limited to the duration of the spill response (days to weeks). <u>Toxicity:</u> An *in situ* burn could expose gophers to smoke while foraging outside of burrows or dispersing, and small amounts of smoke could enter burrows (likely low-magnitude, short-term effects due to their ability to escape into burrows if exposed to smoke). Wildlife monitors will watch for gophers outside of	Construction-related activities (e.g., trenches or staging area establishment) could cause destruction of gopher burrows leading to high-magnitude, long-term effects. During spill response, it may be difficult to identify specific areas where Mazama pocket gopher burrows are located, though burrows are often visible at the soil surface.

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Time and Location of Potential Exposure	Factors Influencing Exposure to Action	Applicable Actions[a]	Potential Stressors Associated with Applicable Actions[b]	Primary Effects Associated with Relevant Applicable Actions[c]	
				Effects on Individuals	Habitat Degradation
				burrows. It is not expected that significant amounts of smoke will enter burrows and affect gophers underground.	
Birds					
Marbled Murrelet (Brachyramphus marmoratus)					
<u>Seasonality:</u> Year-round Nest mid-April to late September in old growth forests neat marine environments <u>Habitat:</u> Terrestrial (mature and old growth forests with large core areas of old growth and low amounts of edge habitat with proximity to the marine environment, and forests that are increasing in stand age and height) Marine nearshore Open marine water Forage in marine environments off the coast of Oregon and Washington and within Puget Sound.	Unable to fly during molting season.	Use of vessels Use of vehicles or heavy machinery Use of aircraft Berms, dams, or other barriers; pits and trenches Skimming/ vacuuming Physical herding Ambient temperature low pressure flooding/flushing Terrestrial vegetation cutting/removal Chemical dispersion (only in open marine water habitat; not used in marine nearshore or terrestrial habitats) *In situ* burning	Disturbance from noise, light, presence of people Exclusion from essential resources (e.g., food, refuge, nesting habitat) or disrupted passage between critical habitat areas by presence of responders Entrainment of prey in vacuums Exposure to fire or smoke Chemical exposures to dispersants, dispersed oil, and burn residues	<u>Direct injury:</u> Vessels and aircraft associated with spill response actions may strike individual murrelets, resulting in injuries and potentially death (highest magnitude and longest duration effects). Wildlife monitors will watch for the presence of murrelets, though they are small and may be difficult to see. <u>Change in behavior:</u> Human presence may flush murrelets from foraging habitat, potentially reducing feeding efficiency and the amount of food delivered to nestlings. Disturbance will be limited to the duration of the spill response, though effects could be long term and high magnitude (e.g., reduced reproductive success). Stress related to human presence may be exacerbated during the molting season, when flight is not possible. Murrelets may not willingly leave areas of human presence if prey populations are aggregated in the response area. <u>Exclusion from Resources:</u> Presence of responders may prevent murrelets from returning to preferred habitats (e.g., aggregations of prey), reducing foraging efficiency and reproductive success (potentially high-magnitude effects). This exclusion would last the duration of a spill response (typically no more than four days), though the effects of abandoning an area could be long-lasting or permanent (i.e., death). <u>Toxicity</u> Smoke generated by *in situ* burning may cause respiratory injuries to marbled murrelet (high-magnitude, potentially long-term effect). Wildlife monitors will watch for the presence of murrelet, and burning will not occur if wildlife is present. *In situ* burn residues could be ingested by murrelet while feeding near the ocean surface; ingestion is not likely to cause significant toxicological impacts (NOAA 2017b) (negligible to low-magnitude, short-term effect). Residues will be collected to the extent practicable. Direct exposures to dispersants (e.g., as a result of overspray or wind-transport away from the oil spill area) may cause the loss of the insulating properties of feathers, which could result in hypothermia and mortality of murrelets (high-magnitude, long-term effects). Overspray of dispersants would be an unlikely and unintentional event. Wildlife monitors will watch for murrelets, and dispersants will not be used in areas where birds are present. Also, weather conditions will be monitored, so that dispersants are not applied in high winds that would increase the likelihood of overspray.	Exposure of murrelet prey (i.e., marine fish and invertebrate species) to chemical dispersant and dispersed oil may cause toxicity; however, the effects of exposures to chemical dispersants and chemically dispersed oil are expected to be short term (hours) and low magnitude (Appendix B; EPA and USCG 2015). Entrainment of prey in vacuums could reduce the availability of food; however, this effect will be highly localized (low magnitude) and short term. Invertebrate prey populations will rapidly recover or will be replenished from surrounding waters (within minutes). Destabilization of shoreline sediments and loss of beach-spawning prey species could result from the removal of vegetation or debris, construction of berms or barriers, or flushing or physical herding. Only the most heavily oiled debris and vegetation will be removed, and the root structures of plants will be left intact, if possible to maintain beach stability. Engineered controls will be used if applicable to prevent erosion. Flushing and herding are both delicate operations intended to mobilize oil without also mobilizing sediments. The removal of oil from spawning habitat will likely benefit prey populations by reducing chronic exposures to oil. Overall, shoreline response activities are not expected to significantly affect prey populations of marbled murrelet (low-magnitude effect). Prey populations will recover over time (potentially long-term effect).

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Time and Location of Potential Exposure	Factors Influencing Exposure to Action	Applicable Actions[a]	Potential Stressors Associated with Applicable Actions[b]	Primary Effects Associated with Relevant Applicable Actions[c]	
				Effects on Individuals	Habitat Degradation
Northern Spotted Owl (Strix occidentalis caurina)					
Seasonality: Year-round Habitat: Terrestrial, forested areas Riparian Shoreline	Northern spotted owl nest in forested areas consisting predominantly of Douglas-fir, western hemlock, grand fir, white fir, ponderosa pine, Shasta red fir, mixed evergreen, mixed conifer hardwood, and redwood. The upper elevation limit at which spotted owls occur corresponds to the transition to subalpine forest. The proximity of spill response actions to nest sites and roost trees will determine the level of behavioral disturbance of owls. Northern spotted owl habitat is likely to be present away from areas that will be impacted by spills and associated spill responses. Critical habitat has been designated for the Northern spotted owl; owl management areas, and “owl circles” overlap with the Action Area along the Lower Columbia River, northwest of Hood Canal, and potentially along the Deschutes River (77 FR 71876).	Use of aircraft Terrestrial vegetation cutting/removal *In situ* burning	Disturbance from noise, light, presence of responders Disturbance or destruction of forested habitat Exclusion from essential resources (e.g., food, refuge, nesting habitat) or disrupted passage between critical habitat areas by presence of responders	Direct injury: Direct injury is unlikely to occur. Change in behavior: The presence of responders, vehicles, vessels, or machinery could cause stress and disturb owls from nesting or foraging areas. Because, where there is overlap between critical habitat and the Action Area, the rail lines are adjacent to the Columbia River, humans and equipment will not likely go or be placed into densely wooded areas to respond to a spill. Therefore, the potential behavioral disturbance of owls is unlikely. Exclusion from resources: Northern spotted owl will not be physically excluded from their nesting or roosting habitat by spill response actions, though they may avoid foraging in the vicinity of spill responders and equipment. Toxicity: Northern spotted owls could be affected by smoke from *in situ* burn.	Designated critical habitat and state management areas have small areas of overlap with the Action Area relative to the overall area used by Northern spotted owl. There is some overlap along the Columbia River within the 1-mile buffer. This area is covered in part of the Middle Columbia River Bonneville Pool GRP. This GRP lists 14 boat launches in this area, eliminating the need to create a new access points that would affect owl habitat. It unlikely that the construction of a staging area will impact the owl or its critical habitat in this location. Staging areas will likely be established in existing developed areas and where GRPs are available to guide their placement. Spill response actions would not require the removal of old-growth trees or the destruction of nesting, foraging, or roosting habitat in critical habitat areas. In the location where critical habitat and the Action Area overlap, there are multiple locations within developed area for staging a response (including access points). If a staging area were created near northern spotted owl habitat, trees (including snags) suitable as owl nesting, foraging, or roosting habitat would not be cut down or removed in the process. In nearly all cases, a new staging area would not be constructed but would instead be placed in a previously developed area.
Short-tailed albatross (Phoebastria albatrus)					
Seasonality: Year-round Habitat: Open marine water Waters shallower than the 1,000 m (3,281 ft) associated with continental shelves	Species occurrence in northwest is open water (on the edge of the outer shelf and on the slope); highest concentrations of short-tailed albatross are found in the Aleutian Islands and outer shelf of the Bering Sea (outside the Action Area). Juveniles are occasionally observed in coastal waters near Washington and Oregon within the Action Area.	Use of vessels Use of aircraft Skimming/ vacuuming Chemical dispersion *In situ* burning	Lights as attractive nuisance Exposure to fire or smoke Chemical exposures to dispersants, dispersed oil, and burn residues	Direct injury: Vessels and aircraft associated with spill response actions may strike individual short-tailed albatross, resulting in injuries and potentially death (highest-magnitude, longest-duration effects). Wildlife monitors will watch for the presence of albatross. Change in behavior: The use of lights during nighttime activities may attract short-tailed albatross to the spill response area, increasing the	It is not expected that habitat degradation will have a large impact on short-tailed albatross. Critical habitat has not been designated for short-tailed albatross.

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				Effects on Individuals	Habitat Degradation
	Critical habitat has not been designated for short-tailed albatross.			potential for exposures to other response activities or to spilled oil. Exclusion from Resources: Short-tailed albatross have an extensive home range and breed outside the Action Area. The northwest is within their range, but relatively few individuals (juveniles) are present at any time. Individuals will not be excluded from resource during spill responses. Toxicity Smoke generated by *in situ* burning may cause respiratory injuries to short-tailed albatross that stay in the area of a response (high-magnitude, potentially long-term effect). Wildlife monitors will watch for the presence of albatross, and burning will not occur if wildlife is present. *In situ* burn residues could be ingested by albatross while feeding near the ocean surface; ingestion is not likely to cause significant toxicological impacts (NOAA 2017b) (negligible to low-magnitude, short-term effect). Residues will be collected to the extent practicable. Direct exposures to dispersants (e.g., as a result of overspray or wind-transport away from the oil spill area) may cause the loss of the insulating properties of feathers, which could result in hypothermia and mortality of albatross (high-magnitude, long-term effects). Overspray of dispersants would be an unlikely and unintentional event. Wildlife monitors will watch for albatross, and dispersants will not be used in areas where birds are present. Also, weather conditions will be monitored, so that dispersants are not applied in high winds that would increase the likelihood of overspray.	
Streaked Horned Lark (Eremophila alpestris strigata)					
Seasonality: Year-round Habitat: Terrestrial Bare ground in agricultural fields and wetland mudflats; habitats subject to frequent human disturbance include mowed fields at airports, managed road margins, and agricultural lands Nesting habitat found in dune habitats along the coast of Washington, in western Washington and western Oregon prairies, and on the sandy beaches and spits along the Columbia and Willamette Rivers	Ground-nesting	Use of aircraft Use of vehicles or heavy machinery Staging area establishment and use Foot traffic at spill site Use of aircraft Berms or other barriers; pits and trenches Manual or mechanical removal of oiled substrates Terrestrial vegetation cutting/removal *In situ* burning	Destruction of nests by vehicles, machinery, or foot traffic Disturbance from noise, light, presence of people Exclusion from essential resources (e.g., food, refuge, nesting habitat) or disrupted passage between critical habitat areas by presence of humans Trampling and loss of vegetation Removal of oiled vegetation Exposure to fire or smoke	Direct injury: The use of vehicles, heavy machinery, and aircraft during response actions could result in vehicle or aircraft strikes or the crushing of nests on the ground (highest-magnitude, longest-duration effect). Foot traffic and construction-related actions may also result in the crushing of nests. Wildlife monitors will watch for streaked horned lark, though lark nests may be difficult to spot on the ground. *In situ* burning will produce extreme heats that could cause thermal injuries to larks if the birds remain in the area and do not fly away due to the disturbance (high-magnitude, long-term effect). Wildlife monitors will watch for larks, and *in situ* burning will not occur if larks are present. Change in behavior: Increased air traffic may cause additional stress to larks during the spill response (typically within the first 96 hours), including increased auditory disturbance and altered behaviors (e.g., flushing from foraging habitat or nests). Given that streaked horned larks are commonly observed in close proximity to	Temporary habitat degradation could occur as a result of the removal or destruction of vegetation (forage habitat) when constructing berms, trenches, or pits; establishing a staging area; using heavy machinery; or conducting an *in situ* burn. Short grasses and forbs will likely reestablish quickly after soil and vegetation disturbances, but regrowth may require more than one month (low-magnitude, long-duration effect).

Table 4-2 Evaluation of Effects

Time and Location of Potential Exposure	Factors Influencing Exposure to Action	Applicable Actions[a]	Potential Stressors Associated with Applicable Actions[b]	Primary Effects Associated with Relevant Applicable Actions[c]	
				Effects on Individuals	Habitat Degradation
				airfields, it is likely that they can become habituated to such noise. Air traffic is therefore expected to have a low-magnitude, short-term effect on streaked horned lark. Other human presence (apart from airplanes) may also cause the flushing of birds. Wildlife monitors will watch for birds during the response to minimize interactions. <u>Exclusion from resources:</u> Spill response actions could temporarily cause streaked horned lark to leave nesting habitats, which would separate nestlings from parents, the nestlings' source of food (high-magnitude effect). Avoidance behaviors will be limited to the duration of spill response actions (days to weeks) (short-term effect). <u>Toxicity:</u> Smoke generated by *in situ* burning may cause respiratory injuries or disorientation of larks (high-magnitude, potentially long-term effect). Wildlife monitors will watch for larks, and *in situ* burning will not occur if larks are present.	
Western Snowy Plover (Charadrius nivosus nivosus) Pacific Coast DPS					
<u>Seasonality:</u> Year-round <u>Habitat:</u> Terrestrial Marine shoreline Primarily nest above the high tide line on sand spits, dune-backed beaches, sparsely vegetated dunes, beaches at creek and river mouths, and salt pans at lagoons and estuaries. Present in marine shoreline and adjacent terrestrial habitat in the Action Area during breeding season.	Small-bodied and cryptic Portions of the plover DPS seasonally migrate south (outside the Action Area) during cold months	Use of vessels Use of aircraft Use of vehicles or heavy machinery Foot traffic at spill site Berms or other barriers; pits and trenches Manual or mechanical removal of oiled substrates Woody debris removal Terrestrial vegetation cutting/removal Ambient temperature, low pressure flooding/flushing Physical herding *In situ* burning	Disturbance from noise, light, presence of people Exclusion from essential resources (e.g., food, refuge, nesting habitat) or disrupted passage between critical habitat areas by human presence Disturbance of terrestrial or shoreline habitats Trampling and loss of vegetation Removal of large woody debris or oiled vegetation from shorelines Exposure to fire, smoke, or burn residues	<u>Direct injury:</u> Use of vehicles or heavy machinery and foot traffic could result in vehicle strikes or the crushing of nests, which could cause injury or death (high-magnitude, long-term effect). Wildlife monitors will watch for plovers, though plover nests may be difficult to spot on the ground. GRPs provide some information on plover nesting habitat. Manual or mechanical removal of oiled substrates has the potential to destroy nest habitat, resulting in the death of nestlings (high-magnitude, long-term effect). Conservation measures may help prevent such injuries. *In situ* burning will produce extreme heats that could cause thermal injuries to plovers (high-magnitude, long-term effect). Wildlife monitors will watch for plovers, and *in situ* burning will not occur if plovers are present. <u>Change in behavior:</u> Auditory disturbance associated with response actions may cause nest avoidance by snowy plovers, which could result in missed feeding cycles for offspring, decreased fitness in the offspring and potentially starvation (high-magnitude, long-term effect). Human presence associated with response actions will be limited to the duration of the response (short duration stressor), likely a matter of days to weeks. <u>Exclusion from resources:</u> Spill response actions will not physically exclude snowy plover from their resources, though behavioral modifications in response to a spill response (i.e., avoidance) may exclude plovers from accessing foraging beaches or nesting habitat. Abandonment of nests would have high-magnitude impacts on nestlings. Human presence associated with response actions	Degraded forage habitat quality and refuge area availability due to the removal of woody debris and vegetation (high-magnitude, long-term effect). Only the most heavily oiled materials will be removed. Increased bare ground and decreased habitat complexity may occur as a result of terrestrial actions (potentially high-magnitude, long-term effect). Infaunal invertebrate prey populations will likely recover fairly quickly if disturbed after construction or vegetation/debris removal (low-magnitude, short-term effect).

Table 4-2 Evaluation of Effects

Time and Location of Potential Exposure	Factors Influencing Exposure to Action	Applicable Actions[a]	Potential Stressors Associated with Applicable Actions[b]	Primary Effects Associated with Relevant Applicable Actions[c]	
				Effects on Individuals	Habitat Degradation
				will be limited to the duration of the response (short-term stressor), likely a matter of days to weeks. Toxicity: Smoke generated by *in situ* burning may cause toxic effects or disorientation to snowy plovers (potentially high-magnitude, long-term effect). Plovers may also be exposed to *in situ* burn residues; however, residues are not toxic (NOAA 2017b). Wildlife monitors will watch for plovers, and *in situ* burning will not occur if plovers are present.	

Notes to Table 4-2:

[a] Those response actions that are applicable within the habitat types used by a given species, as identified in Table 2-2.

[b] Those stressors associated with applicable response actions, as identified in Table 2-3, that are relevant to a given species.

[c] Effects resulting from the combination of possible relevant stressors on the listed species from exposure to applicable actions.

Key:

DPS	distinct population segment
ERMA	Environmental Response Management Application
ESA	Endangered Species Act
FR	Federal Register
ft	feet
GRP	Geographic Response Plan
ha	hectares
km	kilometers
m	meters
NMFS	National Marine Fisheries Service
NWACP	Northwest Area Contingency Plan
PBF	physical and biological feature
SRKW	Southern Resident Killer Whale
USFWS	US Fish And Wildlife Service

4.3.1 Species Managed by the National Marine Fisheries Service

The following sections provide an evaluation of the effects from implementation of the NWACP on species managed by the NMFS.

4.3.1.1 Fish

Pacific Salmon and Steelhead Trout

The 19 ESUs or DPSs of listed Pacific salmon (i.e., Chinook, chum, coho, and sockeye salmon) and steelhead trout are present in marine nearshore and open water environments of the Action Area (e.g., Figures 3-1 through 3-15) throughout the year; they are also seasonally present in freshwater and estuarine environments during early life stages or as spawning adults. While there are differences in seasonality among the salmonid species, they share similar habitat and life history characteristics. As such, the spill response actions and associated effects that have potential to impact each of the salmonid species and their critical habitat are expected to be the same. Similarly, conservation measures (Tables 2-2 and 4-2) will generally be the same for each ESU or DPS. Due to these similarities, and to avoid redundancy in the BA, the effects analyses for salmonids are presented together; any relevant differences are noted.

The status of the ESUs and DPSs for each salmonid species considered in the BA and their designated critical habitat is discussed in Section 3. Life histories, habitats, and occurrence in the Action Area for each of the salmonid ESUs are briefly summarized below, by species.

Chinook Salmon

- *Puget Sound ESU:* This ESU includes all naturally spawned populations of Chinook salmon from rivers and streams flowing into Puget Sound, Hood Canal, the South Sound, and the North Sound, as well as naturally spawned progeny from 26 artificial propagation programs. Adult Puget Sound Chinook salmon enter riverine/lacustrine or wetland habitat between spring and early fall. Marine nearshore and open waters provide rearing and foraging habitat for juvenile and adult individuals. In marine waters, juvenile and adult salmonids are typically found within the 200 m (656 ft) isobath (Pool et al. 2012), where they swim at depths that limit (or preclude them from) exposures to response actions occurring at the ocean surface (Orsi and Wertheimer 1995).
- *Snake River fall-run ESU*: Salmon from this ESU occupy the Snake River basin, which drains portions of southeastern Washington, northeastern Oregon, and north/central Idaho. Snake River fall-run Chinook salmon enter freshwater (the Columbia River) in early-to-mid summer. In the fall, adults leave marine waters to spawn in the mainstem of the Snake River and lower reaches of its major tributaries. Juveniles emerge in spring and either migrate downstream immediately (ocean-type) or remain in freshwater for one year (reservoir-type) before migrating to marine nearshore and open waters.
- *Snake River spring/summer-run ESU:* Snake River spring/summer-run Chinook salmon enter freshwater in spring and summer to spawn in late summer; larvae hatch in late winter or spring and typically remain in streams for one year before migrating to the ocean. Juvenile and adult Chinook salmon rear and forage in marine nearshore and open waters.
- *Upper Columbia River spring-run ESU:* This ESU includes all naturally spawned salmon in all accessible river reaches of the Columbia River tributaries upstream of Rock Island

Dam and downstream of Chief Joseph Dam (excluding the Okanogan River), as well as salmon from six artificial propagation programs. UCR spring-run Chinook salmon exhibit a stream-type life strategy; adults return to freshwater in spring and spawn until late summer, and juveniles migrate to the ocean after spending one year in freshwater

- *Lower Columbia River ESU:* This ESU includes all naturally spawned salmon originating from the Columbia River and its tributaries downstream of a transitional point east of the Hood and White Salmon Rivers, from the Willamette River and its tributaries below Willamette falls, and from 15 artificial propagation programs. Adult LCR Chinook salmon enter freshwater in late summer or early fall and spawn until fall; "brights" spawn until winter. Typically, individuals from this ESU exhibit fall-run and ocean-type life strategies, but a small portion of the population exhibits a spring-run, stream-type life strategy, returning to freshwater in spring to spawn in summer.
- *Upper Willamette River ESU:* This ESU includes all naturally spawned populations of spring-run Chinook salmon in the Clackamas River and the Willamette River and its tributaries above Willamette Falls, Oregon, as well as the progeny of six artificial propagation programs. UWR Chinook salmon exhibit either an ocean- or stream-type life strategy.

Chum Salmon

- *Hood Canal ESU:* This ESU comprises all naturally spawned populations of summer-run chum salmon in Hood Canal and its tributaries, as well as populations in Olympic Peninsula rivers between Hood Canal and Dungeness Bay, Washington, and progeny from four artificial propagation programs. The freshwater range of Hood Canal chum salmon does not significantly overlap with the Action Area.[41] Adult Hood Canal chum salmon return to freshwater in summer and spawn in summer and fall; juveniles migrate quickly to the ocean after hatching. Unlike other salmon, chum salmon tend to school in estuaries as juveniles before heading into open marine waters.
- *Columbia River ESU:* This ESU includes naturally spawned chum salmon originating from the Columbia River and its tributaries in Washington and Oregon, as well as salmon from two artificial propagation programs. Adult Columbia River chum salmon enter freshwater in the fall and spawn in the mainstem of the Columbia River or in lower portions of associated tributaries through mid-January. Chum salmon fry emerge from spawning gravel and almost immediately drift downstream toward the North Pacific Ocean, where they feed in marine nearshore and open waters as subadults and adults.

Coho Salmon

- *Lower Columbia River ESU*: This ESU includes all naturally spawned coho salmon originating from the Columbia River and its tributaries downstream of the Big White Salmon and Hood Rivers (inclusive), any such fish originating from the Willamette River and its tributaries below Willamette Falls, and fish from 21 artificial propagation programs. LCR coho salmon are one of two spawning types: type-S fish that return to freshwater in

[41] Overlap between Hood Canal chum salmon freshwater habitat and the Action Area only occurs where freshwater streams meet the marine environment; the 1-mile buffer around the marine environment extends into the mouths of these streams, even though no staging area will be placed in streams.

late summer and spawn in fall, or type-N fish that return to freshwater in fall and spawn from fall to winter. Larvae emerge in spring and rear in freshwater for one to two years before migrating to the ocean.

- *Oregon Coast ESU:* This ESU includes populations of coho salmon in Oregon coastal streams south of the Columbia River and north of Cape Blanco, Oregon. Oregon Coast coho salmon enter streams from fall to spring; juveniles migrate to marine waters after one to two years, typically in spring. A small number of Oregon coastal streams support populations of this ESU with ocean-type life strategies.
- *Southern Oregon/Northern California ESU:* SONC coho salmon exhibit a stream-type life strategy, entering streams from fall to spring. Juvenile coho salmon remain in freshwater for one to two years before migrating to the ocean.

Sockeye Salmon

- *Snake River ESU:* This ESU includes all anadromous and resident sockeye salmon from the Snake River Basin in Idaho, and artificially propagated sockeye salmon from the Redfish Lake captive propagation program. Adult Snake River sockeye salmon enter freshwater (via the Columbia River) in early summer and travel upstream toward the Snake River. In October, adults spawn in lakeshore gravel substrate. Larvae emerge from the substrate in late spring and remain in freshwater for one to three years before migrating to the ocean.
- *Lake Ozette ESU:* Lake Ozette sockeye salmon are limited to habitat within the Ozette watershed, which includes the Ozette River, Lake Ozette, and associated tributaries. Adult sockeye in this ESU enter Lake Ozette from spring to summer, and they remain there for three to nine months before spawning. Only the marine nearshore and marine offshore areas near the Ozette watershed are within the Action Area; Lake Ozette sockeye salmon are present in the marine environment as juveniles and adults.

Steelhead Trout

- *Snake River Basin DPS:* This DPS includes all naturally spawning steelhead populations below natural and manmade impassable barriers in streams in the Snake River Basin, as well as the progeny of six artificial propagation programs (71 FR 834). Adult Snake River Basin steelhead trout enter freshwater from summer to fall and hold through the winter before starting upstream migration; spawning occurs in spring. Juvenile steelhead typically reside in freshwater for one to three years. Smolts migrate downstream during spring runoff, which occurs from March to mid-June depending on elevation. Steelhead typically spend one to two years in the ocean before returning to freshwater to spawn.
- *Puget Sound DPS:* The Puget Sound DPS includes all naturally spawned, anadromous steelhead populations in river basins draining to the Strait of Juan de Fuca, Puget Sound, and Hood Canal in Washington State. Puget Sound steelhead trout exhibit either a winter- or summer-run strategy, the former being more prevalent. Adult winter-run steelhead in this DPS spawn in winter or early spring.
- *Upper Columbia River DPS:* This DPS includes four populations of steelhead (the Wenatchee, Entiat, Methow, and Okanogan populations) in streams in the Columbia River Basin upstream of the Yakima River in Washington to the US-Canada border (62 FR

43937), as well as progeny from six artificial propagation programs. Subadult UCR steelhead trout enter freshwater in late summer or early fall and mature (into reproductive adults) while migrating to spawning sites. Spawning occurs in late spring of the year after adults return to freshwater. Juvenile steelhead may rear for as many as seven years in freshwater before migrating to the ocean.

- *Middle Columbia River DPS:* The MCR DPS includes all naturally spawned anadromous steelhead trout populations below impassable barriers in streams from above the Wind River in Washington and the Hood River in Oregon upstream to (and including) the Yakima River in Washington, as well as progeny from seven artificial propagation programs. MCR steelhead trout exhibit a summer-run life strategy, returning to freshwater as subadults in mid-May and developing into sexually mature adults over the course of one year. Spawning occurs during the year following their return to freshwater. Juveniles typically spend two years in freshwater before migrating to the ocean.
- *Lower Columbia River DPS:* The LCR DPS includes all naturally spawned, anadromous steelhead trout originating from below impassable barriers on rivers between the Cowlitz and Wind Rivers, those originating from the Willamette and Hood Rivers, and progeny from seven artificial propagation programs. Juvenile LCR steelhead trout smolt after two years spent in freshwater, then spend an additional two years in marine waters before returning to freshwater to spawn.
- *Upper Willamette River DPS:* The UWR DPS includes all naturally spawned steelhead trout populations below impassable barriers on the Willamette River, Oregon, and its tributaries upstream from Willamette Falls to (and including) the Calapooia River. UWR steelhead trout exhibit a winter-run life strategy, migrating into freshwater between January and April. Spawning occurs at four or five years of age. Like individuals from other steelhead trout DPSs, UWR steelhead trout DPS juveniles hatch and rear for two years before smolting, after which they migrate into the ocean, where they spend another two years.

As stated above, despite the slight differences among salmon species in habitat and life history, spill response actions and associated effects that have the potential to impact salmonids are expected to be the same, as are conservation measures. Any differences in spill response actions and conservations measures would be based on location-specific factors identified by spill responders in the field, or in GRPs that apply to areas where the species occurs. GRPs applicable to the ESUs and/or DPSs include:

- *Snake River Chinook salmon ESU:* Four GRPs for the Snake River (in Washington but not Idaho) are currently available to spill responders, as well as several GRPs for the Washington and Oregon coasts and the Columbia River.
- *LCR Chinook salmon ESU:* A GRP for the LCR is available to spill responders, as are several GRPs for the Washington and Oregon coasts.
- *UWR Chinook salmon ESU:* A GRP does not currently exist for the Upper Willamette River, but several GRPs are available to spill responders for the Washington and Oregon coasts.
- *Hood Canal chum salmon ESU:* GRPs in Hood Canal are available to spill responders.

- *Columbia River chum salmon ESU:* GRPs for the lower and middle sections of the Columbia River are available to responders, but no GRP is currently available for the upper section. Several GRPs are available for the Washington and Oregon coasts.
- *Oregon Coast coho salmon ESU:* GRPs for the north and south Oregon coastal areas are available to spill responders, as are GRPs for the Washington coast.
- *SONC coho salmon ESU:* A GRP for the southern Oregon coast is available to spill responders, as are several GRPs for the Washington and north Oregon coasts.
- *Snake River sockeye salmon ESU:* There are several GRPs for the Washington and Oregon coasts and for the Columbia River.
- *Lake Ozette sockeye salmon ESU:* The Outer Coast GRP for Washington includes the Ozette watershed but excludes sections of Lake Ozette and associated tributaries, which fall outside of the Action Area. There are also several GRPs for the Washington and Oregon coasts.

If a spill were to occur in Pacific salmon habitat, the following types of response actions could adversely impact these salmonid species: use of vessels; establishment and use of staging areas; foot traffic at spill site; booming; construction of culvert blockages, dams, or other barriers; manual or mechanical removal of oiled substrates; skimming/vacuuming; passive collection of oil with sorbents; cutting/removal of vegetation; ambient temperature; low pressure flooding/flushing; physical herding; use of chemical dispersants (in open marine water); and *in situ* burning.

Direct Injury – Entrainment of early-life-stage salmonid species may occur as a result of vacuuming oil at the surface of shallow estuaries that provide important nursery habitat for juveniles. The result of such entrainment could be death (highest magnitude and longest duration effect). Often flat-head nozzles (referred to sometimes as “duckbills”) are placed over vacuum hoses to minimize the amount of water collected (thereby reducing unnecessary liquid waste) (EPA 2017); these hose attachments are also expected to decrease the entrainment of fish by decreasing the size of objects that can be entrained (limited to approximately 18 inch by 2 inch rectangular area). Smolts may be of a size that could be entrained, even if flat-head nozzles are used, though older life stages are unlikely to fit into vacuums.

In spawning habitats, anchoring booms may physically disturb redds, resulting in the destruction of salmon embryos (high-magnitude, long-term effect). Typically, booms are anchored to shorelines rather than in streams, so effects are expected to be unlikely.

While setting or tending booms in streams or assessing and cleaning freshwater shorelines, it may be necessary for response workers to walk through streams. This foot traffic has the potential disrupt salmon spawning habitat and active redds. Disruption of these areas could result in mortality among early-life-stage salmon (highest magnitude and longest duration effect). Prior to working in streams, responders will coordinate with the EU to understand the resources at risk (including spawning times); responders will also have GRPs and other tools to inform response actions.

In the marine environment, the overall effect of *in situ* burning on individual salmon is expected to be negligible. While *in situ* burning in the marine environment produces immense heat above water, there is negligible transfer of heat to the water column (NOAA et al. 2010). In the inland zone, use of *in situ* burn will be decided on a case-by-case basis and the Natural Resource Trustees will be contacted regarding threatened and endangered species and critical habitat in the vicinity of the planned burn.

Change in Behavior – The use of lights during nighttime operations is generally not expected to impact salmonid juvenile, subadult, and adult life stages (low-magnitude, short-duration effect). Avoidance of light in response areas by juvenile and adult salmon may reduce their exposure to spill response actions in estuarine and marine waters. Temporary avoidance (i.e., during the response action; days) of the immediate response area is not expected to significantly alter the access of salmon to forage habitat. However, the use of lights in freshwater spawning habitats may affect the timing and speed of the emergence of salmon fry from gravels, allowing predators (e.g., sculpins) to consume salmon fry more easily (high-magnitude and long-term effect). Tabor et al. (2004) demonstrated in laboratory and field studies that above-natural intensities of nighttime light decreased the emergence of salmon fry from redds. Due to safety concerns, nighttime operations that require the use of lights are limited to the first few days of a spill, when the goal is to collect as much of the mobile oil as possible. Therefore, the use of lights in freshwater habitat will be a short-term stressor (matter of days) to salmonid species.

Exclusion from Resources – In freshwater environments, booming is unlikely to limit or stop salmonid species from spawning or migrating to the ocean and the associated feeding and development (negligible effect). In flowing waters, booms will be placed at angles from the shoreline as appropriate for the existing conditions, with the goal of containing as much oil as possible. This orientation will also allow fish to move around the booms without being significantly impeded by them. It is not likely that booms will be used in shallow water because booms are not effective in shallow waters; dams (e.g., underflow or overflow dams) will be more frequently used in such areas, or alternatively, oil may be allowed to move into deeper waters where booming is possible. In both freshwater and marine environments, booms will be set at the surface and will not block fish passage.

Culvert blockages and dams could impact migration into or out of tributary streams. Both of these methods are used to either stop tidal flow from carrying oil from the marine environment into small streams, or to prevent oil from moving downstream into more sensitive habitat. In either case, the intent of these methods is to protect aquatic habitats from oiling and long-term effects associated with the baseline condition. If culverts are blocked or dams are built during a seasonal migration period, then either method could have an impact on the spawning success or development of downstream-migrating juveniles. However, any culvert blockages and dams will be constructed so that water is allowed to flow under them, and they will be removed as soon as the threat of oiling to sensitive habitats has ended (usually a matter of days), thereby minimizing the potential impediment of migrations. Also, the EU will provide responders with a list of resources at risk, which will include information about salmon spawning and migration times. This information will inform the use of instream barriers and ideally minimize their impacts on salmon. Barriers left in place longer than a few days will require consultation with NMFS experts. Although these measures will minimize the potential for significant effects on migrating salmon, individual salmon may be impeded during critical migration times, resulting in high magnitude and long-term impacts (e.g., inability to spawn before dying of natural causes).

Toxicity **–** In the marine environment, juvenile and adult Pacific salmon and steelhead trout are generally found within the 200 m (656 ft) isobath (Pool et al. 2012).It is possible that individuals could be exposed to chemically dispersed oil, and that the oil could be of a relatively high concentration, particularly if exposures were to occur within the upper few meters of the water column. For example, a small portion of 0- to 2-year-old Chinook salmon are present at shallow depths (<7.5 m [25 ft]) in open marine water (Orsi and Wertheimer 1995), where exposures to dispersed oil could be relatively high (Appendix B; EPA and USCG 2015). Fish directly under an oil spill during chemical dispersion would be exposed to highly concentrated oil droplets for a short time. Dispersed oil tends to dilute rapidly into the water column, biodegrade or coalesce, and then resurface, so exposures with the potential to cause acutely toxic responses in sensitive marine fish and invertebrates are generally expected to be short term (e.g., less than 24 hours) (Appendix B; EPA and USCG 2015).[42] The magnitude of potentially toxic effects (and, by extension, the duration of those effects) is therefore expected to be fairly low, even for salmon exposed during sensitive, early life stages.

Dispersants are not used in freshwater, so salmonids would not be exposed to these chemical when in freshwater.

In situ burning could be used in open marine water, marine nearshore, wetland, or lacustrine habitats where Pacific salmon and steelhead trout species may be present. Water temperature is not expected to increase substantially in the marine environment. Most of the heat from the burn (99%) is carried into the atmosphere with the combustion gases; the remaining 1% radiates back to the surface of the slick where a smaller percentage makes it into the underlying water (Buist et al. 1999). The Services will be contacted prior to an *in situ* burn in the freshwater environment. Small quantities of residues may be generated by *in situ* burning, and those residues may be ingested by salmonids. Burn residues are not toxic to fish (NOAA 2017b).

Habitat Degradation **–** For listed Pacific salmon and steelhead trout, habitat degradation is of particular concern in freshwater environments (e.g., streams and rivers) where spawning occurs due to the potential impacts on the reproductive success of the ESU. Most members of a given ESU or DPS spawn in the same areas, so significant perturbations have the potential to effect an entire population.

In nearly all cases, spill responders will be able to position staging areas in locations that have already been developed (e.g., cleared and paved with nearby access to water to deploy vessels, areas identified in GRPs). In the unlikely case that points of access must be constructed in riparian habitat, the removal of vegetation and compaction of soils could pose a localized, long-term, high-

[42] Chemical dispersants tend to be applied to an oil spill only once (unless the spill is ongoing), resulting in a single pulse of dispersed oil into the water column; continuous inputs of dispersed oil to the water column (as a result of repeated dispersant application) are not likely.

magnitude threat to early-life-stage salmon and spawning adults. The removal of vegetation and compaction of soils could cause increased siltation rates, contributing to a reduction in dissolved oxygen. These effects, while potentially significant, could be minimized by areas adding points of access in the least-sensitive areas possible (e.g., areas with sparse vegetation), and by not clearing vegetation from an area unless approved by the EU. Engineered controls (e.g., silt fences and fiber rolls) will be put into place to minimize the erosion of soils and siltation of streams. If there are no points of access from the staging area to the active response area, then emergency consultation may be necessary to select points of access that ensure the protection of salmon-bearing streams.

Anchors have the potential to cause highly localized (low-magnitude), potentially long-term impacts in soft substrates (e.g., in marine and estuarine forage habitat). Benthic invertebrate communities impacted by anchors would be disturbed, causing a temporary reduction in productivity (possibly lasting several years). Equipment (e.g., booms) will be anchored to shore, if possible.

Passive collection is not likely to be feasible in most flowing streams. If used, it will be in a small, quiescent area where oil is collecting (e.g., river bend, eddy, or containment boom). Sorbent pads could be used to a limited extent (having no effect on salmon), or pom-poms could be attached to booms or shoreline to collect oil. It is not expected that sorbent materials will be anchored in streams. Salmon are not expected to come into contact with passive collection responses (e.g., sorbent booms) in the marine environment, since salmon are present much deeper in the water column than booms. Therefore, the effects of passive collection will be insignificant. Anchoring of other equipment or vessels may be similarly limited in shallow streams.

Ambient temperature, low-pressure flooding/flushing if conducted along freshwater shorelines, could result in increased siltation of salmon-bearing streams. Flooding is used only on coarse shorelines, where sediment resuspension will be limited or negligible. Engineered controls (e.g., silt curtains) will be put in place to minimize soil erosion and siltation of streams. Therefore, the likelihood of this response measure affecting Pacific salmon and steelhead trout is low.

Small quantities of residues may be generated by *in situ* burning, and those residues may smother small portions of benthic invertebrate (prey) habitat. The effects on the prey base caused by smothering would be highly localized and therefore insignificant in terms of having an indirect effect on salmon.

Conclusion

There is the potential for the direct injury of salmonids, exclusion from resources, and degradation of sensitive spawning and rearing habitat used by the various Pacific salmon and steelhead trout species during a spill response. The use of instream anchors or foot traffic at response site could disrupt spawning habitat. Construction-based actions have the potential to cause lasting riparian habitat degradation, potentially resulting in altered water quality and spawning sediment quality conditions. The use of culvert blockages or dams have the potential to block migrating salmon individuals during time-critical periods, resulting in natural death prior to spawning. The implementation of conservation measures (Table 2-2) is expected to minimize effects in spawning and rearing habitats to a great extent. Effects of spill responses in marine environments are generally expected to be unlikely, short-term, and/or low magnitude (due in large part to the deep position of salmon in the water column). Young salmon, which reside at a much shallower depth, have the potential to be exposed to spill response actions including chemical dispersant applications and vacuuming. Although relevant exposures of young salmon to chemically dispersed oil are not expected to have a significant impact, entrainment of young salmon is likely to result in death. The action agencies therefore conclude that the effects of spill response actions on ESA-listed Pacific salmon species and steelhead trout are neither insignificant nor discountable and are therefore measureable and potentially adverse.

Pacific Salmon and Steelhead Trout Critical Habitat

The degree of overlap between the Action Area and the critical habitat areas designated for the Pacific salmon ESUs and steelhead trout DPSs differs by species. However, the same PBFs are applicable to each ESU or DPS, depending on the type of critical habitat (i.e., freshwater, estuarine, or marine) designated for each ESU or DPS. If a spill were to occur in Pacific salmon or steelhead trout critical habitat areas, the following types of response actions that could be used could impact the PBFs for freshwater, estuarine, and/or marine critical habitat: establishment and use of staging areas (specifically constructing points of access); use of vessels; construction/placement of culvert blockages and dams; manual removal of oil or oiled substrate; ambient temperature, low-pressure flooding/flushing; physical herding; and use of chemical dispersants (only in open marine water).

In freshwater and estuarine critical habitat, PBFs include spawning sites with adequate water quantity and quality conditions and substrate; rearing sites with adequate water quantity and floodplain connectivity; water of sufficient quality and forage (e.g., aquatic invertebrates and fish) to support juvenile and adult development; and natural cover (e.g., submerged and overhanging large wood, log jams, beaver dams, aquatic vegetation, and undercut banks). Estuarine critical habitat also requires areas free of obstruction with water quality, quantity, and salinity conditions supporting physiological transitions between freshwater and salt water.

Water flow, quality, and temperature conditions in freshwater or estuarine habitat could be impacted by the removal of vegetation to establish staging areas, construct barriers, or manually or mechanically remove oiled soil and sediment. The removal of vegetation could result in increased turbidity, increased water temperatures, and decreased dissolved oxygen. Salmon require substrates with low embeddedness, which permits a higher flow of oxygenated water into the space between gravel. Freshwater spawning and incubation substrates may be impacted by increased siltation after vegetation removal and a concomitant reduction in dissolved oxygen in spawning substrates. Suspended sediments could also impact water quality, both directly—by increasing turbidity—and indirectly—by increasing water temperatures and nutrients and decreasing dissolved oxygen. The following actions may also contribute to these potentially long-term, high-magnitude effects on critical habitat: vessel use in rivers or lakes (due to anchoring, which is not typically done), and manual removal of oil or oiled substrate. In general, the removal of vegetation to construct staging areas will not be necessary, since developed locations already exist throughout much of the Action Area surrounding Pacific salmon and steelhead trout critical habitat. If vegetation must be removed, engineered controls will be put in place to minimize soil erosion, stream siltation, and impacts on water quality. Furthermore, the EU will provide input to indicate when and in which streams spawning will occur in the NW; this input will inform which response actions will both effectively contain and recover oil and minimize impacts on listed species and critical habitats.

Migration corridors free of obstruction, with habitat characteristics to support juvenile and adult mobility and survival, are another PBF of freshwater critical habitat for Pacific salmon and steelhead trout species. Culvert blocking and dams may limit migratory access between freshwater and the ocean. However, both dams and culvert blockages are temporary and protect sensitive habitats from exposure to spilled oil. Still, culvert blocking and damming have the potential to cause high-magnitude or long-term impacts, especially if they are used during migratory seasons. To limit impacts to individual salmon and salmon in general, the EU will provide responders with a list of species at risk, which will include migration and spawning windows to inform the response. Culvert blockages and dams will be removed within a matter of days.

Ambient temperature, low-pressure flooding/flushing and physical herding, if conducted along freshwater shorelines, could result in increased siltation of salmon-bearing streams. Both flooding and physical herding are used only on coarse shorelines, where sediment resuspension will be limited or negligible. Also, physical herding tends to be a delicate operation because heavy mixing of oils causes oil-water emulsification, making recovery of the oil more difficult. Small amounts of fine shoreline soils and sediment could be washed into streams and settle into gravels, having a negligible to low-magnitude impact on the quality of spawning habitats. Flushing can be used on finer substrate shorelines (than can flooding), but the water pressure used during flushing to mobilize oils will be low, resulting in minimal sediment resuspension or runoff. Engineered controls (e.g., silt curtains) will be put in place to further minimize soil erosion and siltation of streams. Therefore, the effect of ambient temperature, low-pressure flooding/flushing and physical herding on salmon critical habitat will be insignificant.

The primary PBF of offshore marine (i.e., open marine water) critical habitat is comprised of areas with water quality conditions and forage, including aquatic invertebrates and fishes, to support salmon growth and maturation. Chemically dispersed oil could reduce water quality and increase the exposure of pelagic prey species to oil, resulting in limited toxicity (i.e., narcosis) to the most sensitive small prey species within the upper portion of the water column (Appendix B; EPA and USCG 2015). The exposure to and potential toxic effects of chemical dispersion on larval fish and invertebrate prey species are expected to be unlikely(Appendix B; EPA and USCG 2015) due to the short duration and magnitude of chemical exposures (to potentially toxic chemically dispersed oil concentrations).

The use of anchors could cause long-term impacts on benthic invertebrate communities in highly localized areas. Due to the small area affected by anchors, this is expected to have a low-magnitude impact on the PBFs of Pacific salmon and steelhead trout critical habitat.

The ESU- and DPS-specific critical habitat types that overlap with the Action Area are primarily freshwater and/or estuarine (i.e., marine nearshore), as summarized below. While offshore marine areas (i.e., open marine water) may have essential habitat features (e.g., forage species) for Pacific salmon and steelhead trout species, specific offshore marine critical habitat areas are not clearly designated (70 FR 52630).

Chinook Salmon

- *Puget Sound ESU:* Critical habitat includes all freshwater Washington waters (i.e., riverine habitat) draining into Puget Sound in which this species rears and naturally spawns, or that are planted by hatcheries (70 FR 52630), as well as estuarine and marine nearshore areas (Figure 3-1).
- *Snake River fall-run ESU:* Freshwater critical habitat includes reaches of the Columbia, Snake, and Salmon Rivers and passable tributaries of the Snake and Salmon Rivers (58 FR 68543); the Columbia and Snake Rivers and tributaries of the Snake River overlap with the Action Area.
- *Snake River spring/summer-run ESU:* Freshwater critical habitat includes reaches of the Columbia, Snake, and Salmon Rivers and accessible tributaries of the Snake and Salmon Rivers (58 FR 68543 and 64 FR 57399); the Columbia and Snake Rivers and tributaries of the Snake River overlap with the Action Area.
- *Upper Columbia River spring-run Chinook salmon ESU:* Critical habitat is designated in four freshwater sub-basins in Washington (i.e., Chief Joseph, Methow, Upper Columbia/Entiat, and Wenatchee), as well as in the Columbia River rearing/migration corridor between the mouth of the Columbia River upstream to Rock Island Dam, an area that includes estuarine habitat (70 FR 52630) (Figure 3-2).
- *Lower Columbia River Chinook salmon ESU:* Freshwater and estuarine critical habitat is designated in nine freshwater sub-basins in Oregon and Washington (i.e., Middle Columbia/Hood, Lower Columbia/Sandy, Lewis, Lower Columbia/Clatskanie, Upper Cowlitz, Cowlitz, Lower Columbia, Clackamas, and Lower Willamette), and in the LCR rearing/migration corridor from the mouth of the Columbia River upstream to the confluence of the Washougal, Sandy, and Columbia Rivers (70 FR 52630) (Figure 3-3).
- *Upper Willamette River Chinook Salmon ESU:* Critical habitat is designated in eight freshwater sub-basins (i.e., Middle Fork Willamette, Upper Willamette, McKenzie, North Santiam, South Santiam, Middle Willamette, Molalla/Pudding, and Clackamas) and the lower Willamette/Columbia River corridor in Oregon (70 FR 52630). The sub-basins overlap with the Action Area; the Lower Willamette/Columbia River corridor, which includes estuarine habitat, is the rearing/migration corridor from the mouth of the Columbia River upstream to the confluence of the Clackamas and Willamette Rivers at Willamette Falls (Figure 3-4).
- *Hood Canal chum salmon ESU:* Critical habitat designated for this ESU is primarily estuarine (i.e., marine nearshore) and marine (i.e., open marine water) habitat in Puget Sound (Hood Canal) (70 FR 52630). A relatively small number freshwater stream habitats is included in the critical habitat designation; however, these freshwater areas do not overlap with the Action Area (Figure 3-5).
- *Columbia River chum salmon ESU:* Designated critical habitat includes freshwater areas in six sub-basins in Oregon and Washington (i.e., Middle Columbia/Hood, Lower Columbia/Sandy, Lewis, Lower Columbia/Clatskanie, Cowlitz, and Lower Columbia) that drain into the Columbia River, as well as the LCR rearing/migration corridor from the

mouth of the Columbia River upstream to the confluence of the Washougal, Sandy, and Columbia Rivers; this corridor includes estuarine habitat (70 FR 52630) (Figure 3-6).

- *Lower Columbia River coho salmon ESU:* Freshwater critical habitat is designated in nine sub-basins in Oregon and Washington (i.e., Middle Columbia-Hood, Lower Columbia-Sandy, Lewis, Lower Columbia-Clatskanie, Upper Cowlitz, Cowlitz, Lower Columbia, Clackamas, and Lower Willamette), as well as in the LCR rearing/migration corridor from the mouth of the Columbia River upstream to the confluence of the Washougal, Sandy, and Columbia Rivers (81 FR 9252) (Figure 3-7); these areas all overlap with the Action Area. The LCR corridor includes estuarine habitat.
- *Oregon coast coho salmon ESU:* Designated critical habitat includes freshwater and estuarine areas in 13 sub-basins along the Oregon coast (i.e., Necanicum, Nehalem, Wilson-Trask-Nestucca, Siletz-Yaquina, Alsea, Siuslaw, Siltcoos, North Umpqua, South Umpqua, Umpqua, Coos, Coquille, and Sixes) (73 FR 7816) (Figure 3-8). These freshwater and estuarine areas are primarily within the 1-mile coastal buffer of the Action Area.
- *SONC coho salmon ESU:* Designated critical habitat includes all river reaches accessible to listed coho salmon in coastal streams south of Cape Blanco, Oregon, and north of Punta Gorda, California. For this ESU, freshwater and estuarine critical habitat consists of the water, substrate, and adjacent riparian zone of estuarine and riverine reaches (including off-channel habitats) (64 FR 24049). SONC coho salmon also occur in the NW several major rivers, estuaries, and Humboldt Bay, California. Many smaller coastal rivers and streams also provide essential estuarine habitat for coho salmon.
- *Snake River sockeye salmon ESU:* Freshwater critical habitat is designated in the Snake River, Salmon Rivers, Alturas Lake Creek, Valley Creek, Stanley Lake, Redfish Lake, Yellowbelly Lake, Pettit Lake, Alturas Lake, and all inlet/outlet creeks to the aforementioned lakes (58 FR 68543).
- *Lake Ozette sockeye salmon ESU:* Designated critical habitat includes approximately 66 km (41 miles) of stream habitat and 19 sq km (12 square miles) of lake habitat (70 FR 52630) (Figure 3-9). Critical habitat, which includes stream channels within designated stream reaches, extends laterally to the ordinary high-water line, or to the lateral extent defined by the bankfull elevation. Although there is a portion of designated critical habitat within the Action Area that is the access point between the Pacific Ocean and the Ozette watershed, the area overlapping with the 1-mile coastal buffer is relatively small.

Steelhead Trout

- *SRB steelhead trout DPS*: Critical habitat includes freshwater areas in Washington, Oregon, and Idaho that are within the Action Area; specific stream reaches are designated within the Lower Snake, Salmon, and Clearwater River Basins (70 FR 52630) (Figure 3-10).
- *Puget Sound steelhead trout DPS:* Critical habitat includes freshwater and estuarine habitat in 18 sub-basins surrounding Puget Sound (81 FR 9252) (Figure 3-11).
- *UCR steelhead trout DPS:* Critical habitat includes freshwater habitat in eight sub-basins in Oregon and Washington (i.e., Chief Joseph, Okanogan, Similkameen, Methow, Upper Columbia/Entiat, Wenatchee, Lower Crab, and Upper Columbia/Priest Rapids), as well as the Columbia River rearing/migration corridor from the mouth of the Columbia River

upstream to its confluence with the Yakima River (70 FR 52630) (Figure 3-12). The Columbia River corridor includes estuarine habitat. There are only a few locations where UCR steelhead spawn in the Columbia River.
- *MCR steelhead trout DPS:* Critical habitat includes freshwater areas in 15 sub-basins in Washington and Oregon, as well as the Columbia River migration/rearing corridor from the mouth of the Columbia River upstream to its confluence with the Wind River, an area that includes estuarine habitat (70 FR 52630) (Figure 3-13).
- *LCR steelhead trout DPS:* Critical habitat includes freshwater areas in eight sub-basins in Washington and Oregon, as well as the LCR migration/rearing corridor from the mouth of the Columbia River upstream to the confluence of the Washougal, Sandy, and Columbia Rivers, an area that includes estuarine habitat (70 FR 52630) (Figure 3-14).
- *UWR steelhead trout DPS:* Critical habitat includes freshwater areas in eight sub-basins in Washington and Oregon, as well as the LCR migration/rearing corridor from the mouth of the Columbia River upstream to the confluence of the Clackamas and Willamette Rivers, an area that includes estuarine habitat (70 FR 52630) (Figure 3-15).

For the majority of the Pacific salmon ESUs and steelhead trout DPSs, there is at least some overlap between freshwater or estuarine critical habitat and the Action Area, which means that a large spill response has the potential to cause the degradation of freshwater spawning and rearing habitat (e.g., due to siltation) and the obstruction of migration corridors (by culvert blockages or dams). The Puget Sound Chinook salmon ESU is the only ESU for which marine critical habitat has been designated; while spill response actions could impact PBFs in marine nearshore or open water critical habitat, the magnitude and duration of potential impacts (e.g., flooding/flushing, physical herding, and use of chemical dispersants) are expected to be relatively low.

Conclusion
Due to the overlap of the Action Area with critical habitat designated for the majority of listed Pacific salmon species and steelhead trout, a spill response in salmon critical habitat is likely. The implementation of BMPs (e.g., use of flat-head nozzles on vacuums, anchoring to shorelines, or using previously developed areas as staging areas) and conservation measures consistent with the NWACP (Table 2-2) are expected to minimize significant impacts on critical habitat to a large extent. However, due to the sensitivity of Pacific salmon to habitat degradation, particularly in sensitive freshwater areas, the action agencies conclude that effects of spill response actions on the critical habitat of Pacific salmon species and steelhead trout are neither insignificant nor discountable and are therefore measureable and potentially adverse.

Pacific Eulachon (*Thaleichthys pacificus*) Southern DPS
The NMFS identified destruction, modification, or curtailment of habitat and an inadequacy of regulatory mechanisms as the primary factors responsible for the decline of the southern DPS of the Pacific eulachon (75 FR 13012).

Pacific eulachon are present within the Action Area in freshwater habitat from late fall (e.g., December in the LCR) through spring (DOI 2012), and in estuarine and marine habitat throughout the year. From late fall to spring, spawning and early-life-stage (e.g., egg and larval) individuals may be exposed to spill response actions in riverine habitat. Pacific eulachon spawn in rivers and streams throughout the Action Area, but the strongest eulachon run in the NW spawns in the mainstem and tributaries of the LCR. After hatching, larval eulachon are quickly transported by spring freshets from freshwater spawning habitats to estuaries and the ocean, where they are present in the water column and near the water surface. Adult eulachon may be exposed to spill response actions in open marine water and in estuaries (marine nearshore).

The following responses have the potential to impact Pacific eulachon: use of vessels (due to anchoring); establishment and use of staging areas (specifically the construction of access points); foot traffic; booming; skimming/vacuuming; construction of culvert blockages; dams; or other barriers; manual or mechanical removal of oiled substrates; passive collection of oil with sorbents; cutting/removal of vegetation; ambient temperature; low pressure flooding/flushing; chemical dispersion, and *in situ* burning (in open marine water or nearshore habitats).

Direct Injury **–** Entrainment of early-life-stage eulachon could occur as a result of vacuuming oil at the surface of freshwater streams. The result of entrainment of early-life-stage eulachon in vacuums would be death (highest magnitude and longest duration effect). Often duckbills are placed over vacuum hoses to maximize the amount of oil and minimize the amount of water collected (thereby reducing unnecessary liquid waste) (EPA 2017); these hose attachments are also expected to decrease the entrainment of eulachon by decreasing the size of objects that can be entrained. Vacuuming will be limited to a small area and short duration (matter of days to weeks), which should limit the potential for interactions with eulachon.

Anchoring vessels or equipment (e.g., booms or sorbent materials) may result in the disturbance or destruction of embryonic eulachon attached to sediments. GRPs are available for the Cowlitz and Lower Columbia Rivers, but provide only limited information on eulachon spawning (e.g., seasonality and major rivers but not specific locations). The Environmental Response Management Application (ERMA) mapping tool[43] provides spatially explicit information on the location of Pacific eulachon critical habitat, which will provide information to responders that is not described in GRPs.

Change in Behavior **–** Light disturbance, which may continue at nighttime for several days, is not expected to significantly adversely impact Pacific eulachon (low magnitude, short duration). Spangler (2002) observed that larvae were more likely to enter the drift to migrate out of streams under low light conditions, suggesting a predator avoidance adaptation, and (Hannah and Jones 2014) describe how light is used in the marine environment to deter eulachon from entering shrimp traps. It is clear that eulachon are less active under or actively avoid light conditions. Avoidance of light in response areas may reduce the exposure of eulachon to oil (baseline condition) or response actions at the water surface (e.g., vacuuming); temporary avoidance (i.e., during the response action) of the immediate response area is not expected to significantly alter the access of Pacific eulachon to forage habitat.

[43] NOAA's ERMA for the Pacific Northwest is available at the following link: https://erma.noaa.gov/northwest/erma.html

Exclusion from Resources – Dams and culvert blockages are not expected to limit or stop spawning or migration of eulachon (and associated feeding and development). Pacific eulachon select spawning sites primarily in the lower reaches of streams, where the water depth will allow eulachon to pass under or around booms. Barriers to migration will be removed after a few days, so migrations of eulachon and other species will not be affected.

Toxicity – In open marine water, larval eulachon present near the ocean surface may experience increased exposures to chemically dispersed oil. Prolonged exposures to increased concentrations of oil (and constituent chemicals such as polycyclic aromatic hydrocarbons [PAHs]) could lead to abnormal or reduced growth, altered immune capabilities, internal lesions, reduced reproduction, and death. The magnitude of these effects is expected to be low, given that the exposure duration to concentrated dispersed oil will be short; dispersed oil rapidly dilutes to concentrations unlikely to cause significant toxicity in fish (Appendix B; EPA and USCG 2015). Dispersants are not used in freshwater environments, so this spill response will not affect those habitats. Marine nearshore habitats would only be exposed to highly dilute dispersed oil and chemical dispersants because dispersants are applied in open marine waters.

Habitat Degradation – Disturbance or destruction of riparian habitat that supports freshwater habitats used by Pacific eulachon may result from the establishment of staging areas or manual or mechanical removal of oil and oiled substrate (terrestrial action). The establishment of a new staging area in an area that is not already developed is expected to be a rare circumstance, given that any major spills to Pacific eulachon habitat will likely occur near developed areas, particularly along the LCR. The Lower Columbia River GRP provides information on staging areas and boat launches (including maps) and indicates their proximity to sensitive resources, such as salmon spawning areas (NWAC 2015). As indicated in the Lower Columbia River GRP, spill responders will, as much as possible, select locations that have already been developed (e.g., cleared of vegetation, paved, with nearby access to water to deploy vessels) for staging areas. It is expected that similar measures will be taken when working in other eulachon-bearing streams (e.g., the Cowlitz River). In the unlikely event that a staging area or points of access must be constructed near a eulachon-bearing stream, the removal of terrestrial and riparian vegetation could pose a localized, long-term, and high-magnitude threat to early-life-stage eulachon and spawning adults. The removal of vegetation and compaction of soils could increase siltation, temperatures, soil erosion, and siltation and decrease prey inputs and dissolved oxygen. The manual or mechanical removal of soils along eulachon-bearing streams or the construction of earthen barriers (e.g., trenches or berms) would have similar effects. Increased foot traffic along streams could also have similar effects, though likely of a far lower magnitude. To prevent these effects, engineered controls will be implemented during construction actions (i.e., staging area establishment, soil excavation, and construction of berms and other barriers) to minimize soil erosion and siltation of streams. As noted above, GRPs will be used to identify streams where eulachon are present and when spawning occurs. Also, the EU will provide responders with additional information on eulachon to guide the spill response.

In situ burning in marine nearshore habitats will generate residues that may sink and physically smother benthic habitats causing highly localized disturbance of invertebrate communities that support eulachon. Due to the persistence of residues but the small area affected, this is expected to have a low-magnitude, potentially long-term effect on eulachon forage habitat.

Conclusion

Based on the rational above regarding the potential physical disturbance of Pacific eulachon freshwater spawning habitat and direct injury to early-life-stage eulachon, there is the potential for significant, long-term impacts on this species. However, conservation measures (Table 2-2), existing planning documents (e.g., GRPs), and other tools (e.g., ERMA) will facilitate a spill response that has minimal impacts on Pacific eulachon. The action agencies therefore conclude that the effects of spill response actions on the southern DPS of Pacific eulachon are insignificant.

Pacific Eulachon Critical Habitat

Critical habitat designated for the Pacific eulachon southern DPS consists of 16 areas within Washington, Oregon, and California that are a combination of freshwater creeks and rivers and their associated estuaries. Within the Action Area, freshwater and estuarine critical habitat for the Pacific eulachon is primarily in the LCR (from the mouth to the Bonneville Dam) and certain of its tributaries; there are a few small areas of freshwater/estuarine critical habitat that overlap with the 1-mile coastal buffer of the Action Area (e.g., the Elwha and Quinault Rivers in Washington and the Umpqua River in Oregon).

At freshwater spawning and incubation sites, PBFs include water flow, quality, and temperature conditions; spawning and incubation substrates; and migratory access. Water flow, quality, and temperature conditions may be impacted by the removal of vegetation to establish staging areas or points of access; construction of berms, pits, trenches, or other barriers; or manual or mechanical removal of oiled substrate or vegetation. These actions could result in increased turbidity, increased water temperatures, and decreased dissolved oxygen (as well as siltation of spawning substrates). Freshwater spawning and incubation substrates may be impacted by increased siltation after vegetation removal and a concomitant reduction in dissolved oxygen in spawning substrates. These effects are likely to be less pronounced in Pacific eulachon, which broadcast spawn over a variety of substrates (Willson et al. 2006) rather than creating redds like salmon or having interstitially dwelling larvae like sturgeon. Salmon and sturgeon require substrates with low embeddedness, which permits a higher flow of oxygenated water into the space between gravel, whereas Pacific eulachon do not seem to have this strict habitat requirement. As discussed above, spill responders will use established staging areas as much as possible, which are laid out in GRPs, and engineered controls will be put in place to minimize soil erosion into streams. These conservation measures, combined with other planning tools such as ERMA will significantly limit impacts on Pacific eulachon critical habitat.

Culvert blocking may temporarily limit migratory access, although this is not expected to be significant. As noted above, Pacific eulachon select spawning locations in mainstem and lower tributaries, suggesting that those waterbodies are too broad or swift for culverts (and culvert blockages) or dams. Blockages, if they are possible, will only be left in place for a few days, so impacts should be minimal.

In freshwater and estuarine migration corridors, PBFs include lack of in-water obstructions; specific water flow, quality, and temperature conditions (for supporting larval and adult mobility); and abundant prey items (for supporting larval feeding after the yolk sac is depleted). Similar to the freshwater PBFs, PBFs in migration corridors may be impacted by culvert blockages or dams, though impacts are expected to be minimal. The removal of vegetation to construct staging areas or points of access could result in increased water temperatures and increased soil erosion, which could in turn also increase water temperatures.[44] The removal of vegetation to construct staging areas is not likely, given that developed locations exist throughout much of the Action Area where Pacific eulachon occur; those locations could be used instead of clearing new areas. Also, engineered controls will be put in place to minimize erosion and siltation of streams.

PBFs for marine nearshore and open water foraging habitat include suitable water quality and availability of prey, which may be impacted by the use of chemical dispersants. Chemically dispersed oil could temporarily decrease water quality and thereby increase the exposure of pelagic species to oil, potentially resulting in toxicity to sensitive prey species (Appendix B; EPA and USCG 2015). The effects of chemical dispersion on prey communities are expected to be low magnitude and short term, as the communities will be reestablished rapidly from surrounding waters (within hours) and as a result of rapid reproductive cycles (i.e., days to weeks). Also, dispersed oil and dispersants rapidly dilute and then either degrade or coalesce and resurface within a matter of hours or days, which will limit long-term exposures to high chemical concentrations (Appendix B; EPA and USCG 2015). Thus, indirect effects on Pacific eulachon (via their prey) should be low-magnitude.

In situ burning in marine nearshore habitats will generate residues that may sink and physically smother benthic habitats causing highly localized disturbance of invertebrate communities that support eulachon. Due to the persistence of residues but the small area affected, this is expected to have a low-magnitude, potentially long-term effect on eulachon forage habitat.

Conclusion

Based on the overlap of the Action Area with critical habitat designated for Pacific eulachon and the rationale provided above regarding the potential for degradation of spawning and rearing habitat and toxicity to pelagic prey species, there is the potential for lasting adverse impacts on local habitat quality. However, BMPs, conservation measures (Table 2-2), and other planning tools (e.g., ERMA) will minimize long-term and high-magnitude impacts on Pacific eulachon critical habitat PBFs. The action agencies therefore conclude that effects of spill response actions on the critical habitat of southern DPS Pacific eulachon are insignificant.

Rockfish Species

The NMFS identified overutilization for commercial and recreational purposes, habitat degradation, water quality problems that include low dissolved oxygen and elevated contaminant levels, and inadequacy of existing regulatory mechanisms as the primary factors responsible for the decline of the ESA-listed PS/GB rockfish species (75 FR 22276).

[44] Suspended particulates absorb solar radiation and emit the radiation as heat into surface waters.

Bocaccio (*Sebastes paucispinis*) Puget Sound/Georgia Basin DPS

PS/GB bocaccio rockfish are present year-round in marine nearshore and open waters in the Action Area. Larvae are released by adult females between January and April; they remain pelagic for approximately 3.5 to 5.5 months prior to settling in shallow areas (i.e., marine nearshore, estuaries). Adult and subadult bocaccio primarily live in deep water at depths well below what would be exposed to most response actions, which mostly happen at or near the ocean surface.

If an oil spill were to occur in the marine nearshore and open water environment, the following types of response actions could impact PS/GB bocaccio rockfish: the use of vessels, booms, or other anchored equipment (in shallow marine nearshore habitats); skimming/vacuuming; passive collection of oil with sorbents; the use of chemical dispersants; and *in situ* burning.

Direct Injury – During surface vacuuming of oil, entrainment of larval and juvenile bocaccio living at the immediate ocean surface may occur. However, it is expected that larval bocaccio will be most abundant below the immediate surface (Lenarz et al. 1991), where vacuuming will not entrain them. Furthermore, is it common for duckbills to be placed over vacuum hose intakes to maximize the amount of oil and limit the amount of water collected (thereby reducing liquid waste) (EPA 2017); these hose attachments are also expected to decrease the entrainment of fish by decreasing the size of objects that can be entrained. Such effects would occur only during relevant seasons, when pelagic larvae are present in the Puget Sound and Georgia Basin.

Change in Behavior – Light disturbance may have an effect on pre-settlement rockfish larvae, which appear to be attracted to light conditions (based on the use of light traps in fish surveys) (Dauble et al. 2012). Attraction to lights in a spill response area could cause larval fish to be exposed to increased concentrations of oil or chemically dispersed oil (low-magnitude, short-term effects), increased predation (high-magnitude, long-term effect), or entrainment in vacuums (high-magnitude, long-term effect). Adult and subadult bocaccio live in deep water, which would not be affected by lights associated with spill response actions. Light effects will be limited to the duration of a spill response (days) and will affect a small area surrounding response activities.

Exclusion from Resources – Spill response actions will not exclude bocaccio from their resources.

Toxicity – The use of chemical dispersants in open marine water habitat has the potential to increase exposures of PS/GB bocaccio to those chemical dispersants, although the likelihood of exposures within the PS/GB DPS is very low; these areas are not within the pre-authorized zone. Responders will need to seek approval from the RRT before applying chemical dispersants, and application can only happen within the case-by-case zone (e.g., northern Puget Sound). Increased exposures to oil and related constituents (e.g., PAHs) could lead to abnormal or reduced growth, impaired reproduction, altered immune capabilities, internal lesions, and death (high-magnitude, long-term effects). The planktonic prey of pelagic juvenile bocaccio may be reduced in areas impacted by chemical dispersion, though significant impacts in shallower nearshore marine habitats are unlikely. Dispersants will not be directly applied in the nearshore environment, so any exposures of larval bocaccio prey will be to highly dilute oil, which is less likely to cause significant adverse impacts on prey populations (low-magnitude, short-duration effects). Due to the generally non-stratified nature of Puget Sound's open marine water salinity conditions (Moore et al. 2008), it is possible that chemical dispersion will result in exposures of deep-dwelling adult and subadult bocaccio to oil. However, large adult and subadult bocaccio are not likely to be measurably affected by highly dilute oil (e.g., dispersed to depths of 30 m [98 ft] or more) (negligible effect). As noted above, the likelihood of these impacts is further minimized (for the context of this BA) because bocaccio habitat does not overlap with the pre-authorized zone for dispersant application.

The toxicity of burn residues, which are created by burning oil and could be ingested by rockfish, is negligible (NOAA 2017b). Measures will be taken to recover residues, which will reduce the potential for exposures.

Habitat Degradation – The anchoring of booms, sorbent equipment, or vessels and the use of vessels (and associated prop wash) in shallow marine nearshore habitats could result in the localized disturbance of benthic habitats, potentially impacting eelgrass and kelp habitat over a small area. Such effects, because they are localized, are unlikely to have a marked impact on the foraging efficiency of bocaccio or their ability to avoid predators. Therefore, such effects are expected to be low magnitude but long term.

Conclusion

Based on the rationale provided above, impacts on bocaccio associated with spill response actions will typically be short term and of low magnitude. Injury caused by vacuuming will be minimized by using duckbill nozzles over the vacuum intake; also, larval bocaccio will generally occur deeper than waters that would be affected by vacuuming (i.e., the immediate ocean surface). Chemical dispersant application will not occur in Puget Sound or Georgia Basin without first seeking authorization, so exposures of larval bocaccio to chemically dispersed oil are not expected. The action agencies therefore conclude that effects of spill response actions on PS/GB bocaccio rockfish are insignificant.

Bocaccio Critical Habitat

Critical habitat for the PS/GB DPS of bocaccio rockfish is designated in five major areas within Puget Sound (i.e., San Juan Islands/Straits, Whidbey Basin, Main Basin, Hood Canal, and South Puget Sound) that include nearshore and deep-water habitats that are entirely within the Action Area. Nearshore critical habitat consists of shallow substrates such as sand, rock, and/or cobble. This critical habitat supports kelp and eelgrass, enables foraging opportunities and refuge from predators, and enables the behavioral and physiological changes needed for juveniles to migrate into deeper habitats over time. The PBFs of nearshore habitats include sufficient quantity, quality, and availability of prey species, and suitable water quality and dissolved oxygen to support growth, survival, reproduction, and feeding opportunities. The PBFs of critical habitat for this species may be impacted by the use of vessels, booms, or other anchored equipment, and chemical dispersion.

The anchoring of booms, sorbent equipment, or vessels and the use of vessels in very shallow areas (resulting in prop wash) could have a localized impact on benthic habitats and associated kelp and eelgrass (low-magnitude [due to limited area], long-term effect). Impacts on kelp and eelgrass could affect the quantity and availability of bocaccio prey species that are associated with submerged aquatic plants, although these effects will be very limited in area. Resuspension of disturbed sediments could temporarily increase turbidity and affect other water quality parameters as well. Other response actions are not expected to significantly affect nearshore critical habitat PBFs. For example, chemical dispersion is unlikely to affect these habitats because dispersants are not used in shallow, marine nearshore habitats.

Deep-water (i.e., open marine water) critical habitat consists of sites deeper than 30 m (98 ft) that possess or are adjacent to areas of complex bathymetry consisting of rock or other very rough surfaces. This habitat is essential to conservation because these features provide structure for rockfish to avoid predation, seek food, and persist for decades. The PBFs for deep-water habitats include sufficient quantity, quality, and availability of prey species; sufficient water quality and dissolved oxygen; and appropriate types and amounts of structure and roughness that support feeding opportunities and predator avoidance. These PBFs will not be impacted by spill response activities. As noted above, chemical dispersants will not be applied in the PS/GB without first seeking approval to do so from the RRT.

Conclusion
Despite the overlap of the Action Area with critical habitat designated for bocaccio rockfish, the impacts of a spill response are expected to be temporary and low magnitude, especially if BMPs and conservation measures (Table 2-2) are implemented. The action agencies therefore conclude that effects of spill response actions on PS/GB bocaccio rockfish critical habitat are insignificant.

Puget Sound/Georgia Basin Yelloweye Rockfish (*Sebastes ruberrimus*)

Like the bocaccio rockfish, PS/GB yelloweye rockfish are present year-round in marine nearshore and open waters in the Action Area. Yelloweye rockfish have a slightly different seasonality than bocaccio rockfish, as larvae are released later in the year (between early spring and late summer) and have a shorter pelagic period (no more than three months) in marine nearshore areas.

Due to similarities in life history, the overall potential effects on yelloweye rockfish associated with spill response actions are similar to those summarized above for the PS/GB bocaccio rockfish.

Conclusion
Based on the rationale provided above (see PS/GB bocaccio rockfish), the action agencies conclude that the effects of spill response actions on PS/GB yelloweye rockfish are insignificant.

Yelloweye Rockfish Critical Habitat

Marine critical habitat and associated PBFs for the PS/GB yelloweye rockfish DPS, as well as the potential effects of spill response actions on critical habitat PBFs, are expected to be the same as those of the PS/GB bocaccio rockfish DPS, described above.

Conclusion
Based on the rationale provided above (see PS/GB bocaccio rockfish critical habitat), the action agencies conclude that the effects of spill response actions on PS/GB yelloweye rockfish critical habitat are insignificant.

Green Sturgeon, Southern DPS (*Acipenser medirostris*)

The NMFS has identified the destruction, modification, or curtailment of habitat and the inadequacy of existing regulatory mechanisms as the primary factors responsible for the decline of the southern DPS of green sturgeon (71 FR 17757).

Green sturgeon form non-spawning aggregations in marine nearshore and open marine water within the Action Area in summer and fall. The spawning migration of the southern DPS to the Sacramento River in California typically occurs between April and June. Larval green sturgeon spend one to four years in their natal freshwater stream, before migrating into estuaries and marine waters (potentially in the Action Area) as juveniles. The green sturgeon present in estuaries in the Action Area are predominately subadult or adult. Spill response actions in the Action Area will have no impact on Southern DPS green sturgeon eggs or larvae, because green sturgeon spawn well outside of the Action Area.

The following responses have the potential to impact green sturgeon: the use of vessels; booms or other anchored equipment (e.g., sorbent booms); chemical dispersion; and *in situ* burning.

Direct Injury – Spill response actions are not expected to result in direct injury to green sturgeon.

Change in Behavior – Spill response actions are not expected to result in behavioral changes in green sturgeon.

Exclusion from Resource – Spill response actions are not expected to result in the exclusion of green sturgeon from their resources.

Toxicity – Because adult green sturgeon spend the majority of their lives in the ocean, chemical dispersion may temporarily increase their exposures to oil. Effects of exposure to chemically dispersed oil and associated chemicals (e.g., PAHs) could include reduced or abnormal growth, reduced reproduction, internal lesions, altered immune function, and death (low-magnitude, potentially long-term effects) (Appendix B; EPA and USCG 2015). The severity of effects in green sturgeon is expected to be relatively low due to the age of potentially exposed individuals (i.e., mostly subadults and adults) and the depth at which they reside; adult sturgeon tend to reside at depths between 20 and 60 m [66 and 197 ft], so exposures would be to highly dilute oil. Early-life-stage individuals tend to be more sensitive to chemical exposures. Slightly increased effects might be expected in juveniles exposed to chemically dispersed oil, but the concentrations that juveniles would be exposed to would also be highly dilute.

The likelihood of impacts on adult green sturgeon will be reduced somewhat due to the locations where they tend to aggregate, specifically large embayments along the Washington and Oregon coasts). These areas are not in the pre-authorized zone for dispersant use, which means that approval from the RRT will be required before dispersants can be applied directly to these areas.

The toxicity of *in situ* burn residues, which are created by burning oil and could be ingested by benthic feeders such as the green sturgeon, is negligible (NOAA 2017b). Provisions for the mechanical collection of burn residue following any *in situ* burn will be made to minimize potential exposures.

Habitat Degradation – A threat to the southern DPS of green sturgeon posed by spill response actions is the destruction of benthic habitat and prey organisms. Benthic feeding habitat (e.g., sediments) and prey organisms may be disturbed or destroyed by the use of vessels (i.e., anchoring, grounding, prop wash), booms, or other anchored equipment. The area impacted by anchors will be very small and not likely to have a significant effect on green sturgeon prey (low-magnitude effect). Benthic invertebrate populations will likely recolonize disturbed areas within a matter of days, with mature communities forming after a year or more (potentially long-term effect).

Benthic habitat may be exposed to residues following *in situ* burning, although toxicological effects on benthic invertebrates are not expected to be significant (low-magnitude, long-term [due to persistence of residues in the environment] effects) (NOAA 2017b). Provisions for the mechanical collection of burn residue following any *in situ* burn will be made to minimize potential exposures.

Conclusion

Despite the overlap of the Action Area with green sturgeon habitat, spill response actions are not expected to directly affect green sturgeon, and are likely to cause only minor, indirect effects on food availability as result of sediment disturbance. Additionally, only adults and subadults will be exposed to response actions within the Action Area, suggesting that sensitivities to responses (e.g., chemical dispersant exposures) will be low. In estuaries, individuals also occur at depths that would reduce their exposure to near-surface stressors. The action agencies therefore conclude that the effects of spill response actions on the southern DPS of green sturgeon are insignificant.

Green Sturgeon Critical Habitat

The PBFs of southern DPS green sturgeon estuarine critical habitat are abundant prey; suitable water quality for normal behavior, growth, and viability; migratory corridors that allow for safe and timely passage; and suitable sediment quality for normal behavior, growth, and viability. Freshwater critical habitats do not exist in the Action Area. The PBFs of green sturgeon critical habitat may be impacted by the use of vessels, booms, or other anchored equipment, as well as chemical dispersion.

The abundance of benthic prey could be affected by the anchoring of booms, vessels, or other equipment. The effects of anchoring will be highly localized, having a low-magnitude (due to the small scale) but potentially long-term (e.g., one year or more) effect on benthic invertebrate communities.

The PBFs of southern DPS green sturgeon coastal marine (i.e., marine nearshore and open water) critical habitat are migratory corridors that allow for safe and timely passage; suitable water quality; and abundant prey items (e.g., benthic invertebrates and fishes). It is unlikely that these PBFs will be significantly affected by spill response actions. For example, chemical dispersion may occur in open marine water portions of southern DPS green sturgeon critical habitat, but is not likely to significantly affect the availability of benthic prey or fish at depths where sturgeon are present (low-magnitude, short-term [e.g., hours] effect); dispersed oil would be highly dilute in exposures at 20 to 60 m (66 to 197 ft) depths (Appendix B; EPA and USCG 2015). Chemical dispersion will not occur in marine nearshore estuaries where sturgeon aggregate, nor within 3 nautical miles of the coast (without authorization from the RRT). Anchoring could cause disturbance of benthic habitats on a highly localized scale, but this is not expected to significantly affect the availability of prey in nearshore areas (low-magnitude, long-term effect). Benthic invertebrate communities in soft sediments affected by anchoring may take months or years to recover, but, due to the localized nature of anchoring, this will have a minor effect on sturgeon PBFs.

Conclusion

The potential impacts on open marine water and nearshore critical habitat areas would generally be temporary and of low magnitude. Although the impact of anchoring on invertebrate communities may be long-term, the effect will be highly localized, and therefore will not have a significant impact on the availability of green sturgeon prey. Based on this rationale, the action agencies conclude that the effects of spill response actions on the critical habitat of southern DPS green sturgeon are insignificant.

4.3.1.2 Sea Turtles

Leatherback Sea Turtle (*Dermochelys coriacea*)

Leatherback sea turtles are present in the Action Area (along the coasts of Washington and Oregon) during summer and fall. During those seasons, marine nearshore (i.e., coastal) and open waters (out to depths of 2,000 m [6,562 ft]) serve as forage areas for leatherback sea turtles. Leatherback sea turtles may be exposed to spill response actions in these environments while foraging during summer and fall.

If an oil spill were to occur in the marine nearshore and open water environment, the following types of response actions could impact the leatherback sea turtle: use of vessels and aircraft; chemical dispersion; and *in situ* burning.

Direct Injury **–** The primary means of direct injury to leatherback sea turtles of spill response actions are vessel strikes and entanglement in response equipment. According to the recovery plan for the leatherback turtle (NMFS and USFWS 1998), entanglement in fishing gear (e.g., gillnets, fishing lines) and ingestion of marine debris are primary threats to the leatherback sea turtle. Entangled turtles may not be able to dive to feed or to surface to breathe. Although possible, it is unlikely that leatherback sea turtles will become entangled in response equipment due to procedures designed to prevent such an injury. For example, responders will continually monitor for wildlife within the response area to ensure that entanglements do not occur; appropriate actions will be enacted promptly to protect entangled wildlife. Equipment will not be left in place after the response action has ended.

Leatherback sea turtles may also be physically injured or killed (highest-magnitude and longest-term effect) by vessel strikes (NOAA 2016b). Although vessel traffic in the marine environment is likely to increase temporarily during spill response actions, conservation measures that include observation, tracking, and avoidance of the location and activities of leatherback sea turtles would be incorporated to minimize the potential for vessel strikes (Table 2-2). Leatherback sea turtles are large and spend most of their time at the ocean surface. This visibility will allow boats to avoid vessel strikes.

Change in Behavior – Although air and vessel traffic may increase in the Action Area during spill response actions, it is not expected that the associated noise will have a high-magnitude effect on the behavior or fitness of leatherback sea turtles. Noise from air traffic may cause turtles to dive, increasing energy expenditure, but any noise will be of short duration (days to weeks) and in a limited area. Underwater noise may increase as a result of increased vessel presence, but like aerial noise, it will be limited in duration. An avoidance response to vessel noise may actually benefit leatherback sea turtles by diverting them from areas where they could be struck by vessels participating in response activities or exposed to spilled oil (the baseline condition).

Light disturbance is likely to have a low-magnitude and short-duration impact on leatherback sea turtles. While light is noted as a significant stressor for reproducing turtles at nesting beaches (Hamann et al. 2006), no nesting areas are present in the Action Area. The avoidance of response areas affected by light may reduce potentially significant impacts on leatherback sea turtles, such as vessel strikes or oil exposures (the baseline condition).

Toxicity – *In situ* burning has the potential to impact leatherback sea turtles by exposing them to smoke while at the ocean surface and to burn residues while underwater. Exposure to smoke could cause injury to sea turtles' lungs, reducing their ability to breathe and to hold breath, to dive, and to forage (high-magnitude, potentially long-term effects). Decision criteria associated with *in situ* burning as a response action restricts its use in the vicinity of a protected species or critical habitat. Prior to *in situ* burning, wildlife monitors will conduct an on-site survey to determine if any ESA-listed species, including leatherback sea turtles, are downwind of a proposed burn area and at risk from burn operations, fire, or smoke. If an individual is identified, protective measures, such as temporary use of hazing, will be used to avoid exposing the turtle to fire and smoke. Spill responders may also be able to move collected oils (in fire booms) to a different location prior to burning to avoid impacting sea turtles. *In situ* burning will not be used while wildlife are present and could be impacted. Burn residues are not acutely toxic to organisms (NOAA 2017b) and are quickly dispersed in the marine environment, minimizing concern over chronic toxicity. Therefore, any exposure to *in situ* burn residue would be of low magnitude and likely short duration (e.g., while residues were sinking or after incidental contact with buoyant residues at the ocean surface), and would not likely result in significant toxicological or physical effects. Following use of *in situ* burning, efforts will be made to mechanically collect burn residues.

Specific data on the potential effects of dispersants and chemically dispersed oil on adult sea turtles are not available (EPA and USCG 2015). Exposures to both dispersants and dispersed oil could occur if turtles were in the immediate vicinity of an oil spill when dispersants were being applied. Therefore, prior to the use of chemical dispersants, the FOSC and qualified wildlife monitors will ensure that wildlife are not present in the spray zone; given the size of leatherback sea turtles, this precaution should preclude the exposure of leatherback sea turtles to highly concentrated dispersant and dispersed oil. It is more likely that a turtle would be exposed to chemically dispersed oil after the oil has mixed into the water column and been diluted significantly. Therefore, exposures of leatherback sea turtles to dispersed oil may result in low-magnitude effects. Exposures to chemically dispersed oil are expected to be far less significant than exposures to untreated oil at the ocean surface, which could have acutely toxic effects on leatherback sea turtles (Appendix B; EPA and USCG 2015).

Although information on the effects of dispersants has been and continues to be scarce, some work has become available through the DWH NRDA and associated reports. These and other relevant information was included in the NMFS concurrence letter for the CDP consultation, excerpted below:

> Recent information generated for the NRDA process for the DWH oil spill clearly shows oiled turtles absorbed PAHs from oil via ingestion and inhalation based on gastrointestinal and lung data (Ylitalo *et al*., 2017) including a Kemp's ridley sea turtle with an esophagus full of oil. Sea turtles are known to ingest petroleum, perhaps due to mistaking oiled detritus as prey or indiscriminate feeding (Camacho *et al*. 2013), and even very lightly oiled sea turtles recovered during DWH had ~50% occurrence of ingestion (DWH NRDA Trustees 2016). Ylitano *et al.* (2017) examined 492 sea turtles, but found limited data on exposure to dispersants. DOSS (dioctyl sodium sulfosuccinate – a dispersant component) levels were below quantification except in the oil in the esophagus of the aforementioned heavily oiled sea turtle. This indicates that dispersants were either not used in the vicinity of these oiled turtles before they died, or that the dispersant and or dispersed oil was not bioavailable or bioaccumulated by the turtles. This latter hypothesis is in agreement with the research of Wolfe *et al.* (2001, 1999, 1998) which found negligible trophic transfer of petroleum hydrocarbons from invertebrates to vertebrates and that depuration of petroleum hydrocarbons form both vertebrates and invertebrates increased when dispersant was used. This is likely due to the micelle structure of the dispersed oil molecule being absorbed to/by the dispersants and not bioavailable. When this information is considered in conjunction with the rarity of the four sea turtle species in the preapproved application area, the likelihood of direct adverse impacts from dispersants is insignificant. (NMFS 2018, included in Appendix E)

Leatherback turtles do not nest in the Action Area, so neither dispersants nor chemically dispersed oil poses a threat to eggs or newly hatched turtles.

Habitat Degradation **–** Leatherback sea turtles migrate over large open marine water areas to feed on aggregations of jellyfish, sea nettles, and salps (77 FR 4170), and they spend more than 75% of their time in the upper 5 m (16 ft) of the water column (NMFS 2012b). Within the Action Area, leatherback sea turtles spend their time in open water and do not use the shoreline. The potential for the degradation of leatherback sea turtle habitat within the Action Area is, therefore, limited to the effects of oil spill response actions on open marine water. Chemical dispersion of oil in open marine water could affect water quality by providing a source of dispersed oil for incidental ingestion. However, the use of chemical dispersants is likely to provide a net benefit to individual leatherback sea turtles relative to the baseline conditions, since leatherback sea turtles would otherwise be exposed to undiluted oil at the ocean surface. Jellyfish, which are the primary prey of leatherback sea turtles (and the only PBF of leatherback sea turtle critical habitat), may be exposed to increased concentrations of dispersed oil as it mixes deeper into the water column after chemical dispersion. The potential effects of chemical dispersion on critical habitat are discussed in the next section.

No additional effects (direct or indirect) are anticipated based on the life history or habitat characteristics of leatherback sea turtles.

Conclusion

Leatherback sea turtles forage in the marine nearshore and open water habitat of the Action Area during summer and fall but have no nesting sites in the Action Area. Although a direct strike resulting from an increase in vessel traffic during a spill response could cause serious injury or mortality, wildlife monitoring will be implemented during a spill response to reduce the potential for such an occurrence. Turtles are not likely to become entangled in response equipment because it is not left unattended and is removed at the completion of response actions. Neither the use of dispersants nor *in situ* burning are likely to cause long-term effects on the species. Therefore, the potential effects on leatherback sea turtles of spill response actions will be low magnitude and short-term (e.g., habitat degradation) because conservation measures (Table 2-2) will minimize potentially significant effects (e.g., direct effects from vessel strikes). The action agencies therefore conclude that the effects of spill response actions on leatherback sea turtle are insignificant.

Leatherback Sea Turtle Critical Habitat

Designated critical habitat for the leatherback sea turtle within the Action Area includes coastal waters east of the 2,000-m (6,562-ft) depth contour from Cape Flattery, Washington, south to Cape Blanco, Oregon (Figure 3-20). The single PBF of this critical habitat is the presence of prey species—primarily scyphomedusae jellyfish of the order Semaeostomeae (e.g., *Chrysaora* spp., *Aurelia* spp., *Phacellophora* spp., and *Cyanea* spp.)—of sufficient condition, distribution, diversity, abundance, and density to support the individual and population growth, reproduction, and development of leatherback sea turtles (77 FR 4170). Leatherback sea turtles feed on large jellyfish, which may be exposed to low concentrations of dispersed oil in the water column over short periods of time; exposures will be short-term (matter of hours) due to the rapid dilution, biodegradation, and coalescence of dispersed oil droplets (Appendix B; EPA and USCG 2015). The PBF of leatherback sea turtle critical habitat may be impacted by the use of chemical dispersants.

Exposures of large adult jellyfish to chemically dispersed oil may be reduced by the species' daily vertical movements between the near ocean surface and the deeper, hypoxic layers of water (Moriarty et al. 2012); deep waters are less likely to be affected by chemically dispersed oil, and any oil in deep waters will be highly dilute (Appendix B; EPA and USCG 2015). Larval jellyfish are likely to be more sensitive to dispersed oil than are adult jellyfish. If larval jellyfish within the spill response area were to be exposed to dispersed oil for several days, the effects could be higher in magnitude (Echols et al. 2016). Because jellyfish larvae live as polyps in benthic habitats (Whiteman 2008), they will be present in deep waters, where chemically dispersed oil, if also present, will be highly dilute. In the event of exposure to dispersed oil, the jellyfish population is not expected to be significantly affected, as individual replacement is quite rapid; jellyfish have a fast and effective reproductive strategy (Whiteman 2008), as evidenced by their propensity to bloom under suitable conditions (Ruzicka et al. 2016). Overall, the chemical dispersion of oil will not affect the condition, distribution, diversity, abundance, or density of jellyfish on a scale that will reduce the growth, reproduction, or development of individual leatherback sea turtles (i.e., negligible effect).

Conclusion
Leatherback sea turtle critical habitat PBFs are focused on the availability of jellyfish prey items, which will not be significantly impacted by spill response actions. The action agencies conclude that, although chemical dispersion may result in individual-level effects on small juvenile jellyfish, the effects of spill response actions on leatherback sea turtle critical habitat are insignificant.

4.3.1.3 Marine Mammals

Humpback Whale (*Megaptera novaeangliae*), Mexico and Central America DPSs

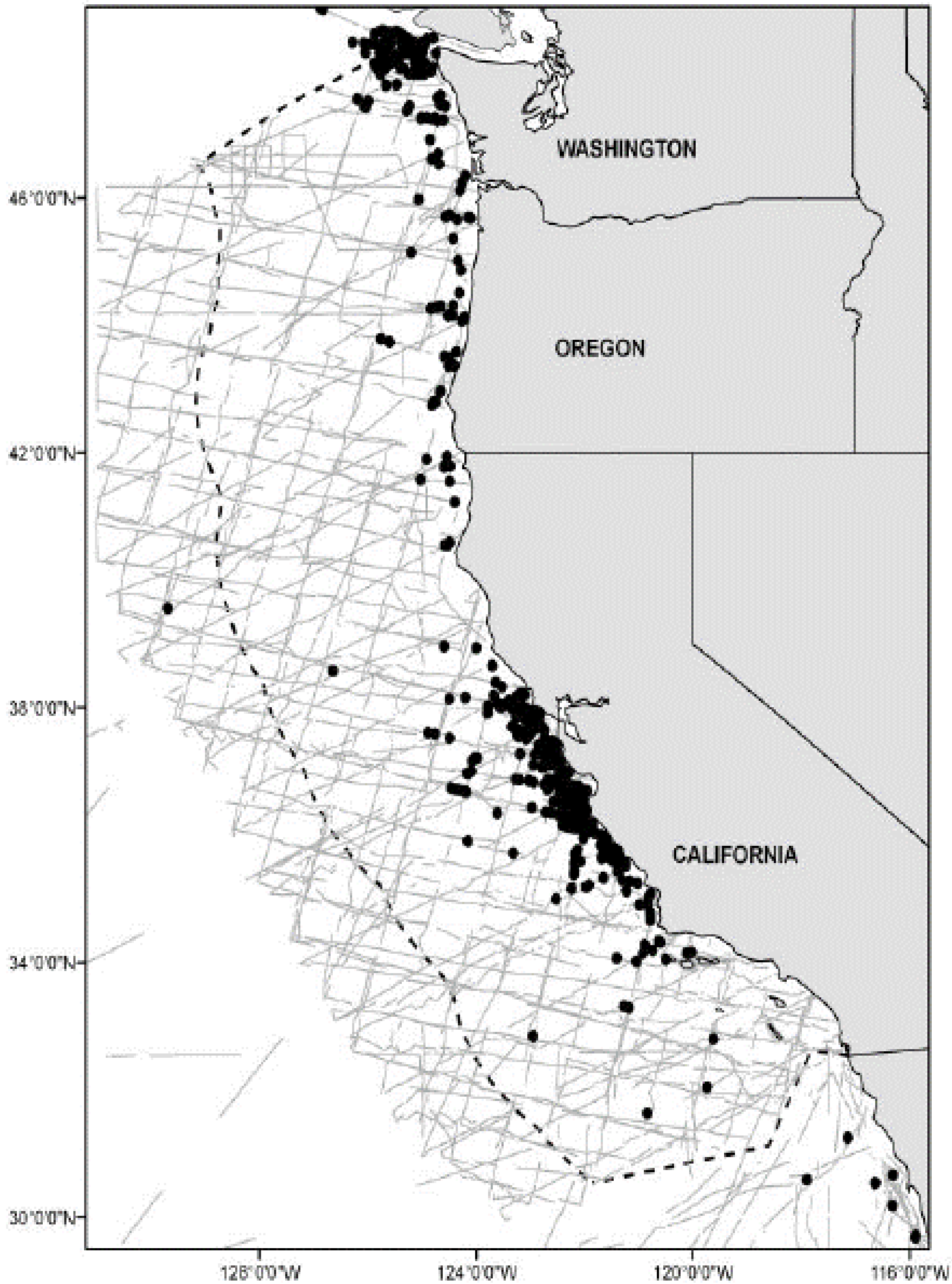
Humpback whales, which are very large and easy to spot from the water or air, have extensive home ranges and low densities, similar to other whales. Within the Action Area, humpback whales from both the Mexico and Central America DPSs feed offshore of Washington and Oregon (Figure 4-1), although few individuals from the Central America DPS have been identified in Northern Washington (NMFS 2014b). Their densities peak during foraging and are sparse during migration. Peak foraging occurs north of the Action Area during summer and south of the Action Area during colder months.

Relative to other baleen whales, humpback whales are at a greater risk of exposure to spill response actions because they travel into the Strait of Juan de Fuca and Puget Sound on their way between high-productivity regions in the northern and equatorial Pacific Ocean. Puget Sound is at elevated risk for spill response (relative to most of the Washington and Oregon coasts, excluding the Columbia River Estuary) due to the presence of refineries, pipeline terminals, and marine tanker lanes.

Spill response actions within the Action Area that could affect humpback whales include actions that would occur in areas of deep, open marine water as the whales migrate between feeding grounds, which stretch between California and Alaska, and calving grounds in Mexico or Central America. These include the use of vessels, use of aircraft, chemical dispersion, and *in situ* burning. If an oil spill were to occur in this open marine water environment, the following types of response actions could impact humpback whales: use of vessels and aircraft; *in situ* burning; and the use of chemical dispersants.

Spill response actions could also affect humpback whales in their shallower feeding grounds and in the Straits of Juan de Fuca and Puget Sound. Chemical dispersant use would not be used in this area, which is outside the Pre-Authorized Zone, but vessels, aircraft, and in situ burning could be used. For the purpose of determining potential effects on humpback whales, there is no distinction between the individuals from the Mexico and Central America DPSs, as the effects on individual whales should be the same.

Direct Injury – Humpback whales travel at or near the ocean surface while migrating, so vessel strikes are a key threat posed to humpback whales by spill response actions, as the potential effect is injury or death (highest magnitude and longest duration effect). In order to avoid such strikes, response vessels will maintain a buffer of at least 91 m (100 yards) around each whale. Additionally, vessels will not move into the direct path of a visible humpback whale. If a humpback whale approaches a response vessel, the engine will be put into neutral until the whale passes. If these conservation measures are followed, then vessel strikes will likely be avoided.



Source: NMFS (2014b)

Figure 4-1 Humpback Whale Sightings off the US West Coast between 1991 and 2008.

Change in Behavior – Air and vessel traffic will likely increase in the Action Area during a spill response, resulting in an increased level of environmental noise. While it is not expected that the related above-water noise will significantly affect the behavior or fitness of humpback whales, underwater noise, which will also increase during a spill response due to the presence of response vessels, has the potential to affect marine mammals. Underwater noise may impair communication among and foraging efficiency of individual humpback whales (Rossi-Santos 2016). However, like aerial noise, underwater noise will be limited in duration, and any potential effects are expected to be low in magnitude. An avoidance response to vessel noise may benefit humpback whales by diverting them from areas where they could be struck by vessels (associated with response activities) or exposed to spilled oil (associated with the baseline condition).

Exclusion from Resources – Humpback whales could be temporarily excluded (as a result of avoidance, discussed above) from a localized resource (e.g., aggregation of fish or plankton) due to the presence of response workers, vessels, and response equipment and materials, as well as the associated noise. Considering the size of the area likely to be occupied by spill responders in relation to the large foraging area of an individual humpback whale, it is expected that this exclusion will have a low-magnitude impact on individual humpback whales. This exclusion will last only as long as spill responders remain in the area (typically no more than four years), and since humpback whales will be able to feed elsewhere during the spill response, the effect will be short term.

Toxicity – Smoke generated by *in situ* burning may cause respiratory injuries to humpback whales; the magnitude and duration of respiratory injury would depend on the degree of exposure to smoke. Impaired breathing or lung damage resulting from sustained exposure would have a high-magnitude and potentially long-term effect on a humpback whale. Tissue irritation (e.g., skin, eye, nose, or mucous membrane) could also be caused by smoke exposure, although this would be a low-magnitude and likely short-term (i.e., reversible) effect, likely persisting for less than one month. In order to conduct an *in situ* burn, responders must implement the Special Monitoring of Applied Response Technologies (SMART) protocol and gain approval from the RRT. As part of SMART, responders will monitor the area for the presence of wildlife as well as local weather conditions (e.g., wind direction). *In situ* burning operations can be moved (using vessel-mounted fire booms) to avoid a humpback whale, or burning can be halted until the whale leaves the area. Because humpback whales are easy to detect, these NWACP specifications are likely to minimize *in situ* burn-related injuries to humpback whales.

Whales may also be exposed to burn residues in the water column or at the ocean surface. Although residues are considered to have low toxicity, if a whale were to be engulfed during feeding, residues could foul its baleen, which could reduce feeding efficiency. It is not clear what magnitude of effect this would have on baleen whales, although it has been noted that fouling would be short term (58 FR 3121). Measures will be put into place to mechanically recover burn residues, thus minimizing such effects on humpback whales. Also, as noted above, wildlife observers will be deployed to determine if humpback whales are feeding in an area being considered for *in-situ* burning. The process for use of *in-situ* burning described in the NWACP includes early coordination with the Services, in part to help the EPA and USCG know if ESA-listed species may be present in the area and what steps may be needed to minimize impacts.

Exposure to dispersants or dispersed oil could result in toxicity to humpback whales, depending on the degree of exposure (e.g., tissue irritation or a temporary reduction in feeding efficiency due to baleen fouling). Significant exposures to dispersants and dispersed oil could occur if whales were in the immediate vicinity of an oil spill when dispersants were applied. Prior to the use of chemical dispersants, the FOSC and qualified wildlife monitors will ensure that wildlife are not present in the spray zone (e.g., within 5 km [3 miles]); given the size of humpback whales, this precaution should preclude their exposure to highly concentrated dispersant and dispersed oil. It is more likely that a whale will be exposed to chemically dispersed oil after the oil has mixed into the water column and diluted significantly (Appendix B; EPA and USCG 2015). Therefore, exposures of whales to dispersed oil are expected to result in low-magnitude toxic effects; baleen fouling, if it occurs, will likely be short term (58 FR 3121). Exposures to chemically dispersed oil are expected to be far less significant than exposures to untreated oil at the ocean surface, which could have acutely toxic effects on humpback whales (Appendix B; EPA and USCG 2015).

The NMFS concurrence for the CDP consultation (Appendix E) provides additional information related to the use of dispersants around baleen whales, including humpback whales:

> As touched upon earlier in discussing dispersants, some zooplankton as well as the larval life stages of some fish species are expected to be impacted by chemically dispersed oil at an increased level compared to physically dispersed oil in the treated footprint of an oil slick, although environmentally realistic exposure times are an important factor not properly considered in some of the experimental designs (Adams *et al.* 2014, Almeda *et al.* 2014, 2013b, Fern *et al.* 2015, Fingas 2014, Incardona *et al.* 2013, Lee *et al.* 2011, Mearns *et al.* 2001, Ortman *et al.* 2012, Prince 2105, Rico-Martinez *et al.* 2013, NRC 2005, Bejarano *et al.* 2014b, Clark *et al.* 2001, Frantzen *et al.* 2015, Georges-Ares and Clark 2000). This impact occurs because the dispersants rapidly force greater amounts of soluble aromatics and PAHs into the water column and oil droplets at sizes that may be consumed by the zooplankton and larval species (NRC 2005, Fingas 2014, Carls *et al.* 2008, Fuller *et al.* 2004). While some invertebrates may bioaccumulate PAHs or hydrocarbons through direct consumption of the droplets, trophic transfer of dispersed oil was not found in experiments by Wolfe *et al*. (2001, 1999, 1998) and vertebrate organisms such as fish and marine mammals have the ability to metabolize and depurate (i.e., eliminate) them (Wolfe *et al.* 2001, 1999, Stein 2010, Varanashi *et al*., 1989).
>
> This increased impact to some species in the water column, targeted or incidentally consumed by feeding cetaceans, is expected to be brief and only in the immediate vicinity of the dispersant application (Varela 2006, Bejarano *et al.*, 2014b, BenKinney *et al.*, 2011). This is minor in comparison to the distribution of the prey and whales, and may potentially be a smaller area than that impacted by a large volume, untreated spill (Carls *et al.*, 2008). Many of the prey species of cetaceans occupy portions of the water column much deeper than will be impacted by dispersant applications and therefore are not expected to be significantly affected. Studies have shown that zooplankton will rapidly recolonize an impacted area (Varela *et al.* 2006, Abbriano *et al.* 2011, Symons and Arnott 2013, NRC 2005). The DWH NRDA Trustees (2016) noted there was not any apparent system-wide population crashes to monitored fish or water column invertebrate species, despite the substantial short-term loss to the water column food web, from the oil spill and dispersant application. Based upon these factors, impacts to

> zooplankton for actions covered under the CDP are insignificant to baleen whales. (NMFS 2018, included in Appendix E)

Habitat Degradation – The chemical dispersal of oil could have an impact on the prey of humpback whales, particularly larval krill and larval fish. Krill and fish at the larval life stage tend to be concentrated in shallower oceanic waters (photic zone), where exposures to dispersed oil would be possible. It is unlikely, however, that humpback whale prey will experience prolonged exposures to highly concentrated dispersed oil (due to rapid dilution, degradation, or coalescence) (Appendix B; EPA and USCG 2015). Rather, humpback whale prey species could be reduced temporarily in quantity and quality, but such reductions would not persist or be significantly widespread to have a significant effect on humpback whale individuals (i.e., a low-magnitude, short-duration effect).

The NMFS concurrence letter for the CDP consultation (Appendix E) provides additional recent information that support the insignificant determination being made here:

> As noted previously, dispersant application will increase the mass of PAHs and other hydrocarbons in the water column up to approximately 10-20m deep for a few hours (Bejarano *et al.* 2014b, 2013, BenKinney *et al.* 2011, DWH NRDA Trustees 2016) to levels that could be a concern for adult fish which do not leave the impacted area (Mearns *et al.* 2001). However, fish species that are prey for the baleen whales such as the Humpback whale DPS's are highly mobile and distributed deeper in the water column than just the top 10-20 meters. It is unlikely that mobile schools of prey fish such as Pacific herring, Northern anchovy, or mackerel will be exposed for prolonged periods of time to dispersants or dispersed oil. As discussed previously, the toxicity of the dispersed oil to exposed adult fish is likely to be no worse than that of naturally dispersed oil found in the upper water column. Additionally, dispersing a surface slick that can serve as a reservoir of oil droplets that undergo natural dispersion as the slick expands should prevent a prolonged oil exposure event that results in potentially problematic oil concentrations over a longer time and greater surface area and/or volume of water (Carls *et. al.*, 2008). Therefore, the potential effects to baleen whales from impacting their forage fish species is insignificant. (NMFS 2018, included in Appendix E)

Conclusion

Although the range of humpback whales is expanding into more heavily populated areas (e.g., Puget Sound) where there is greater potential for interactions with a spill response (e.g., vessel strikes and exposure to smoke) than in the open ocean, conservation measures will be put in place to avoid any interaction with marine mammals (Table 2-2). Due to the large size of humpback whales, it expected that these measures (e.g., wildlife monitoring and avoidance) will be successful. Other stressors are expected to have low-magnitude and/or short-term effects on humpback whales. The action agencies therefore conclude that the effects of spill response actions on the Mexico DPS or the Central America DPS of humpback whale are insignificant.

Killer Whale, Southern Resident DPS (*Orcinus orca*)

The SRKW DPS is present year-round as familial pods in marine nearshore and open waters within the Action Area. The NMFS has identified three main threats to the survival of SRKW: scarcity of prey, high levels of contaminants from pollution, and disturbance from vessels and sound (NMFS 2016h). SRKWs are at elevated risk during spill responses relative to other whales, because SRKWs aggregate in Puget Sound and at the Columbia River Estuary, where salmon runs are strong. Spills of oil (and associated spill responses) are more likely in those locations than in other areas along the Washington and Oregon coasts, because of the presence of several oil refineries, marine tanker lanes, and rail terminals.

The NWACP includes an SRKW deterrence plan that would be implemented if killer whales were observed near an oil spill. The deterrence is designed to reduce the likelihood of whales entering the oil, but also to keep whales away from response activities. To the extent possible, vessels will adhere to regulations requiring vessels to maintain 200 yard distance from killer whales in the inland waters.

If an oil spill were to occur in the marine nearshore or open water environment, the following types of response actions could impact SRKWs: use of vessels and aircraft; use of chemical dispersants, and *in situ* burning.

Direct Injury – Vessel strikes are a key threat posed to SRKWs by spill response actions, as the strikes can result in physical injury or death (highest magnitude and longest duration of effect). Prior to using vessels in areas where SRKWs are known to occur (e.g., around the San Juan Islands during the summer), responders will determine if whales are present. Killer whales are fairly large and easy to spot from the water or air, and their movements are well documented. For example, Orca Network is a non-profit organization that tracks the locations of killer whales and other marine mammals via sightings from the public. Information on orca presence and movements will be available for spill responders. In order to avoid such strikes, response vessels will maintain a buffer of at least 183 m (200 yards) around each SRKW, consistent with Washington State law (RCW 77.15.740). Federal regulation 50 CFR 224.103 provides similar protection for killer whales in Washington. The regulation applies to inland waters (i.e., east of Cape Flattery and south of British Columbia) and prohibits vessels from approaching within 183 m (200 yards) of any killer whale or from positioning a vessel in the path of any killer whale at any point within 366 m (400 yards) of a whale. The regulation does not apply to federal government vessels operating during their official duties or state and local vessels when engaged in official duties involving law enforcement, search and rescue, or public safety exercises. Although spill response vessels under the direction of the FOSC fall within this exception to the federal regulation, vessels will be directed to follow the regulation to the extent possible. Vessels will avoid moving into the direct path of an SRKW if possible. If SRKWs approach a response vessel, the engine will be put into neutral until the whales pass. If these conservation measures are followed, then vessel strikes will likely be avoided and disturbance from vessels should be minor.

Change in Behavior – Although above-water noise associated with air and vessel traffic will increase in the Action Area during a spill response (for the purposes of spill tracking and wildlife monitoring), it is not expected that this noise will significantly affect the behavior or fitness of SRKWs. Underwater noise will also increase as a result of increased vessel traffic (Veirs et al. 2016) and the use of other equipment in the water (e.g., vacuums), potentially impairing SRKW communication and foraging efficiency (Lusseau et al. 2009; Veirs et al. 2016) and altering behaviors (Holt et al. 2009; Dyndo et al. 2015). SRKWs compensate for underwater noise to some extent by using louder calls (Holt et al. 2009). Like above-water noise, underwater noise will be limited in duration, but it will not likely be localized to the response area. An avoidance response to vessel noise may benefit SRKWs by diverting them from areas where they could be struck by vessels (associated with response activities) or exposed to spilled oil (associated with the baseline condition). Regardless, it is expected that behavioral changes in response to underwater noise will be short term (days to weeks), and that the magnitude of the effect will therefore be low. The response vessels will likely produce noise ranging from 135 to 160 decibels (Veirs et al. 2016), which is less than levels considered dangerous to cetaceans (180 decibels) (NOAA 2017a).

Exclusion from Resources – SRKWs could be excluded from resources if spill response actions were to spatially overlap with salmon aggregations. The avoidance of humans, vessels, and equipment (and associated noise) in the Action Area by SRKWs could result in a temporary reduction of foraging efficiency. Because SRKWs forage over a large area in an area with already high levels of vessel traffic, the localized presence of responders is expected to have a low-magnitude effect on SRKWs. The exclusion of SRKWs from a specific area will last only as long as spill responders are present (typically no more than four days), so the effect on SRKWs feeding is expected to be short term.

Toxicity – *In situ* burning would be very infrequently used in the Puget Sound or Columbia River estuary but is a tactic that could be used to prevent hazard to human life, reduce environmental impact, and reduce economic loss to critical infrastructure and public property from spill oil. If used, smoke generated by *in situ* burning may cause respiratory injuries to SRKWs; the magnitude and duration of respiratory injury would depend on the degree of exposure to smoke. The highest magnitude (and potentially longest-term) effect would be impaired breathing or lung damage resulting from sustained exposure. Tissue irritation (e.g., skin, eye, nose, or mucous membrane), although a lower-magnitude effect, could also be caused by smoke exposure; the duration of tissue irritation would likely be short term (e.g., less than one month). In order to conduct *in situ* burning, responders must implement the SMART protocol and gain approval from the RRT. As part of SMART, responders will monitor the area for the presence of wildlife as well as local weather conditions (e.g., wind direction). *In situ* burning operations can be moved (using vessel-mounted fire booms) to avoid a SRKW, or burning can be halted until the whale exits the area. Because SRKWs are easy to detect, these NWACP specifications are likely to minimize *in situ* burn-related injuries to SRKWs.

Exposure to dispersants or dispersed oil could result in toxicity to SRKWs, depending on the degree of exposure (e.g., tissue irritation). Significant exposures to dispersants and dispersed oil could occur if SRKWs were in the immediate vicinity of an oil spill when dispersants were applied. Prior to the use of chemical dispersants, the FOSC and qualified wildlife monitors will ensure that wildlife are not present in the spray zone; given the size of SRKWs, this precaution should preclude their exposure to highly concentrated dispersant and dispersed oil. It is more likely that a whale will be exposed to chemically dispersed oil after the oil has mixed into the water column and diluted significantly. Therefore, exposures of whales to dispersed oil are expected to result in low-magnitude toxic effects. Exposures to chemically dispersed oil are expected to be far less significant than exposures to untreated oil at the ocean surface, which could have acutely toxic effects on SRKWs (Appendix B; EPA and USCG 2015).

Information on the effects of dispersants and dispersed oil is included in the NMFS concurrence letter on the CDP consultation and is added here:

> Bottlenose dolphins experienced lung damage due to oil vapors as a result of the DWH spill (Smith *et al.* 2017, Kellar *et al*. 2017) as did Killer Whales from the Exxon Valdez oil spill (Matkin et al., 2008). Inhalation of oil fumes or aspiration of aerosols containing oil molecules is a particular threat to cetaceans because they lack the physical structures that filter air taken into the lungs, they exchange 80-90% of their lung volume at a time, and they may hold their breath for extended periods while they dive, allowing for elevated absorption of hydrocarbons onto the lung tissue and into the blood (Takeshita *et. al*., 2017, DWH NRDA Trustees 2016). This type of damage is likely responsible for the increased incidence of lung disease, bacterial pneumonia and reproductive failures found in stranded dolphins during and following the DWH spill (Venn-Watson *et al*. 2015, Colegrove *et al*. 2016, Schwacke *et al*. 2014, DWH NRDA Trustees 2016). COREXIT 9500 was found to cause damage to human and mice lung cells before the body compensated with anti-inflammatory reactions via anti-oxidant production (Lin et al. 2015), but studies specific to marine mammals were not located. This further illustrates the importance of the exposure prevention actions (e.g., wildlife spotters, no-spray policies and buffers) agreed to by the action agencies that make the likelihood of a whale being directly sprayed discountable. (NMFS 2018, included in Appendix E)

Habitat Degradation – The effects of spill response actions on salmon (discussed above), is not likely to have an adverse effect on SRKWs, which feed almost exclusively on Pacific salmon species (and Chinook salmon in particular). Impacts on salmon (e.g., reduced spawning habitat quality) resulting from implementation of the NWACP will not have a large enough effect on the quantity, quality, and availability of those fish to reduce SRKW growth, reproduction, and/or development. Because there would be so few spill responses in the Action Area, it seems unlikely that impacts in only a small number of salmon spawning locations would dramatically decrease the availability of prey for SRKWs.

The chemical dispersal of oil is expected to have a low-magnitude, short-term impact on the prey of SRKW (see Pacific Salmon and Steelhead Trout in this section, above), likely lasting (at the individual level rather than as a population) for no more than hours or days. Juvenile Chinook and coho salmon are present in marine waters to an approximate depth of 37 m (120 ft), and fish less than one year old (likely the most sensitive age group) are evenly distributed through the depth range (Orsi and Wertheimer 1995). These statistics indicate that early-life-stage salmon could be exposed to dispersed oil within several meters of the ocean surface. Such exposures would be very short term (e.g., matter of hours) (due to dilution, biodegradation, and/or coalescence of drops and subsequent resurfacing of oil), so significant impacts on juvenile fish within the immediately affected area would be unlikely (Appendix B; EPA and USCG 2015). Moreover, impacts would not be sufficiently widespread (e.g., over a large area or affecting a large portion of the total salmon population) to have a significant effect on the prey base of SRKW.

While they may be used in habitat where SRKWs occur, the following response actions and the associated stressors are not expected to affect individual whales: booming, skimming/vacuuming, passive collection, and physical herding. SRKWs are able to dive under booms, so booms will not pose a barrier to movements or cause exclusion from resources. Entanglement in booms is highly unlikely because booms have no netting and are confined to a small portion of the water column, making them easily avoidable by killer whales. SRKWs, being very large animals, will not be entrained in skimmers or vacuums, and they will be able to avoid such items in the marine environment. Skimming/vacuuming and passive collection are typically used in containment areas, which are small areas surrounded by booms; it is expected that whales will avoid these areas, or will be able to swim around or under them. Skimming/vacuuming and passive collection may also be used on beaches, where whales will not be found. None of these methods will significantly impact SRKW indirectly by altering their prey base (e.g., salmon populations).[45]

Conclusion

As described above, spill responses could have several impacts of varying magnitude and duration on SRKWs. The generation of underwater noise during a spill response has the potential to cause short-term behavioral effects, with unclear effects on individual whales apart from changes in behavior. It is not clear whether whales will be able to compensate for increased levels of noise. However, given the short duration of the spill response and the associated noise, as well as the likely safe levels of noise produced by response vessels, noise is expected to have a low-magnitude effect. In addition the SRKW deterrence protocols would be implemented and vessel would maintain distances of 183 m (200 yards) when possible. The action agencies therefore conclude that the effects of spill response actions on SRKW are insignificant.

Southern Resident Killer Whale Critical Habitat

SRKW critical habitat includes all US waters within the Salish Sea, excluding a total of 291 sq km (112 square miles) designated for military use, any waters less than 6.1 m (20 ft) deep at extreme high tide, and Hood Canal. There are three subareas of critical habitat that provide necessary habitat elements: a core summer area (Haro Strait and the San Juan Islands), Puget Sound, and the Strait of Juan de Fuca. These subareas correspond with seasonal prey (e.g., salmon) concentrations. PBFs for this critical habitat are water quality to support growth and development; prey species of sufficient quantity, quality, and availability to support individual growth, reproduction, and development, as well as overall population growth; and passage conditions to allow for migrating, resting, and foraging (71 FR 69054).[46] The PBFs of SRKW critical habitat may be impacted by *in situ* burning and chemical dispersion.

The use of chemical dispersants and *in situ* burning would temporarily decrease the water quality in SRKW critical habitat below the ocean surface. However, these methods would also dramatically decrease the amount of oil present at the surface, which would benefit SRKW and their critical habitat. Chemical dispersion has the potential to increase exposures of salmon (SRKW's preferred prey) to dispersed oil; as noted elsewhere (e.g., Pacific Salmon and Steelhead Trout in this section, above), the impacts of dispersion on salmonid species are expected to be low magnitude and short-term (e.g., hours to days) (Appendix B; EPA and USCG 2015). Spill response actions will not limit the movements of SRKW throughout their critical habitat or to other areas.

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[45] Individual salmon and salmon habitat may be affected by spill responses. See subsections of Section 4 on listed salmon species for more information.

[46] SRKWs do not migrate like other whales.

Overall, the effects of spill response actions on SRKW critical habitat will be short term and low magnitude.

Conclusion
The action agencies conclude that, based on the rationale provided above regarding the low potential for impacts resulting from *in situ* burning or chemical dispersion (given that conservation measures [Table 2-2] will minimize long-term or high-magnitude impacts), the effects of spill response actions on SRKW critical habitat are insignificant.

4.3.2 Species Managed by the United States Fish and Wildlife Service

4.3.2.1 Plants

Because the species considered in this BA occupy diverse habitat types and display a variety of life strategies, the action agencies included a spatial component in the analysis that combined available information on the aerial distribution and documented presence of a species with the location of the Action Area to evaluate the qualitative probability (rather than a numerical expression) of exposure of ESA-listed species. For example, to determine the probability of exposure of ESA-listed plant species to spill response actions, the action agencies obtained plant location data from available databases and programs in Washington, Oregon, and Idaho (i.e., WHNP database, ORBIC database, and the Idaho Natural Heritage program) (WDNR 2017; IDFG 2017; OSU 2017). These data are provided in Appendix D. The action agencies compiled and mapped the plant data to determine the likelihood of exposure considering the frequency and magnitude of overlap with the Action Area, and the proximity to rail lines and pipelines.

Applegate's Milk-vetch (*Astragalus applegatei*)
Within the Action Area, this species is only present in Oregon. Observations of these plants have been made near Klamath Falls and Midland, Oregon (Figure 4-2) (Appendix D). There are three clusters of observations within the Action Area: one near and within the Klamath Regional Airport grounds, the second near Midland, Oregon, and the third within the Klamath Falls city limits. With the exception of three observations west of Lake Ewauna (and the rail line), the majority of observations are in proximity to or between two rail lines. There appears to be ample area and infrastructure for staging areas within Klamath Falls based on visual inspection of satellite imagery. However, if a spill were to occur, the potential for impacts to species is considerable given the number of occurrences of Applegate's milk-vetch within the Action Area.

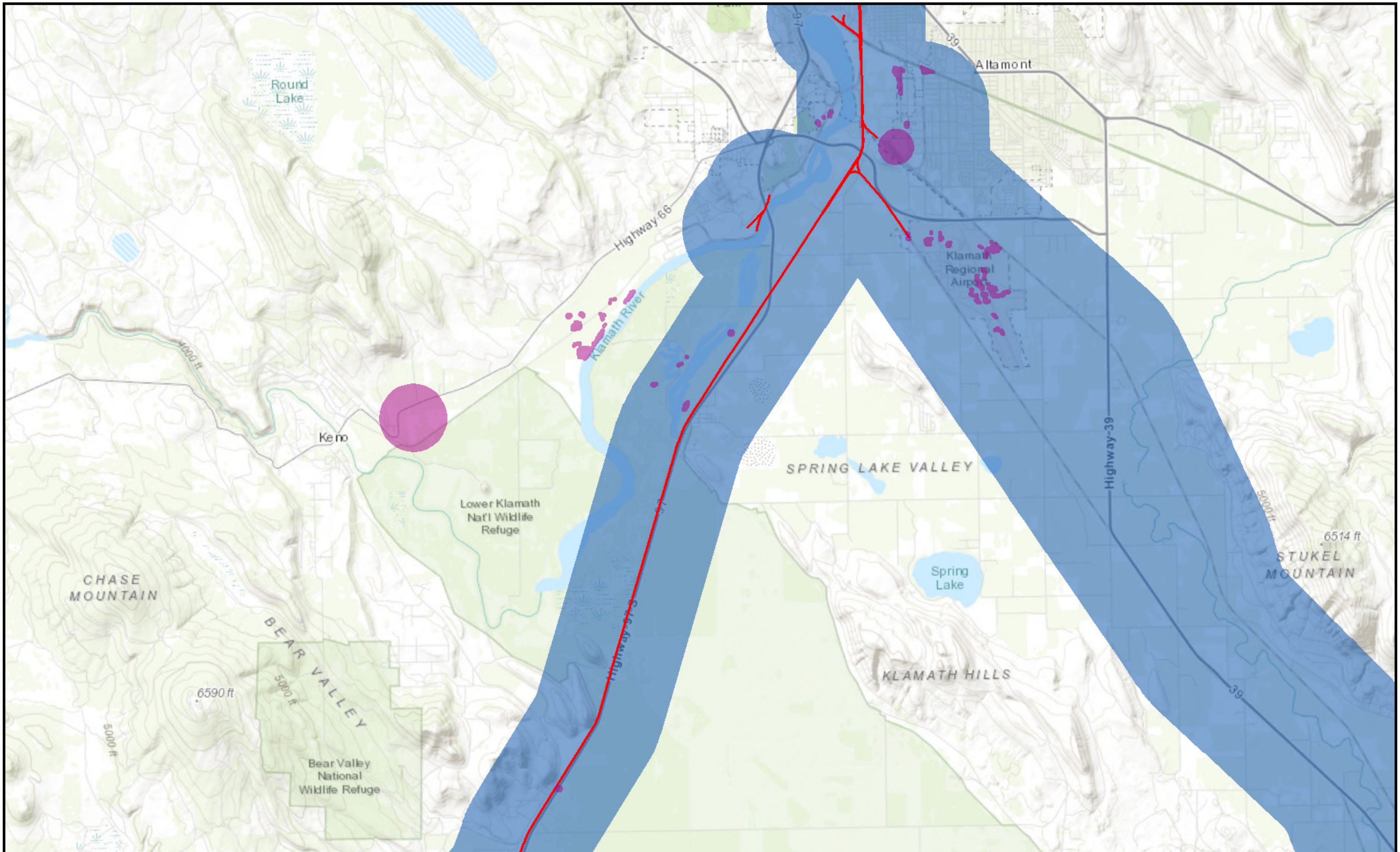
In the vicinity of Midland, Oregon, there are two observations close to town, and a third observation farther west. The first observation of Applegate's milk-vetch is of a small group of plants in an open area approximately 0.27 km (0.17 miles) west of a rail line that runs past the town. The second observation is of a group of plants approximately 2.3 km (1.4 miles) to the north. Existing impervious surfaces within the town (e.g., roads and parking lots) could provide the necessary infrastructure for a staging area for spill response near the first two clusters of observations. The third cluster of observations is approximately 1.1 km (0.7 miles) west of a rail line, which is expected to be well away from any spill response associated with a potential incident involving the rail line.

***Direct injury* –** It is possible that individual Applegate’s milk-vetch plants could be removed, crushed, or destroyed when spill response actions include the use of off-road vehicles; soil disturbance from construction of barriers, pits, or trenches; creating or use of new access points; or access of personnel by foot traffic.

***Habitat degradation* –** Compaction of soils by heavy machinery or vehicles could reduce the ability of Applegate’s milk-vetch to germinate and grow or to expand into previously suitable habitat. Disturbance or removal of soils may alter the microbial community that appears to be beneficial for Applegate’s milk-vetch (Section 3.2.2.1).

Conclusion

Given the number of occurrences of Applegate’s milk-vetch within the Action Area and their proximity to a rail line, the action agencies conclude that the effects of spill response actions on Applegate’s milk-vetch are neither insignificant nor discountable and are therefore measureable and potentially adverse.



Applegate's milk-vetch

Action Area

State

Data Sources:
ORBIC 2017;
EPA2018;
ESRI 2014

Figure 4-2
Applegate's Milk-vetch Observations Oregon

0 1 2 4
Miles

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Golden Paintbrush (*Castilleja levisecta*)

This species is present in the Action Area in Washington. According to the ORBIC database (OSU 2017), this species has been extirpated in Oregon. There are three observations of this species documented in the WDNR Natural Heritage database for Washington (WDNR 2017) and they overlap with the Action Area (Figure 4-3). One of the observations is directly on a rail line running through Rocky Prairie in Thurston County. The latest survey data for that location were recorded in 2008, when almost 10,000 flowering plants were observed. This is almost double the number observed in 2002 (5,493). Though the most recent observations in Rocky Prairie are now dated, it is possible that the golden paintbrush is still prevalent in that location.

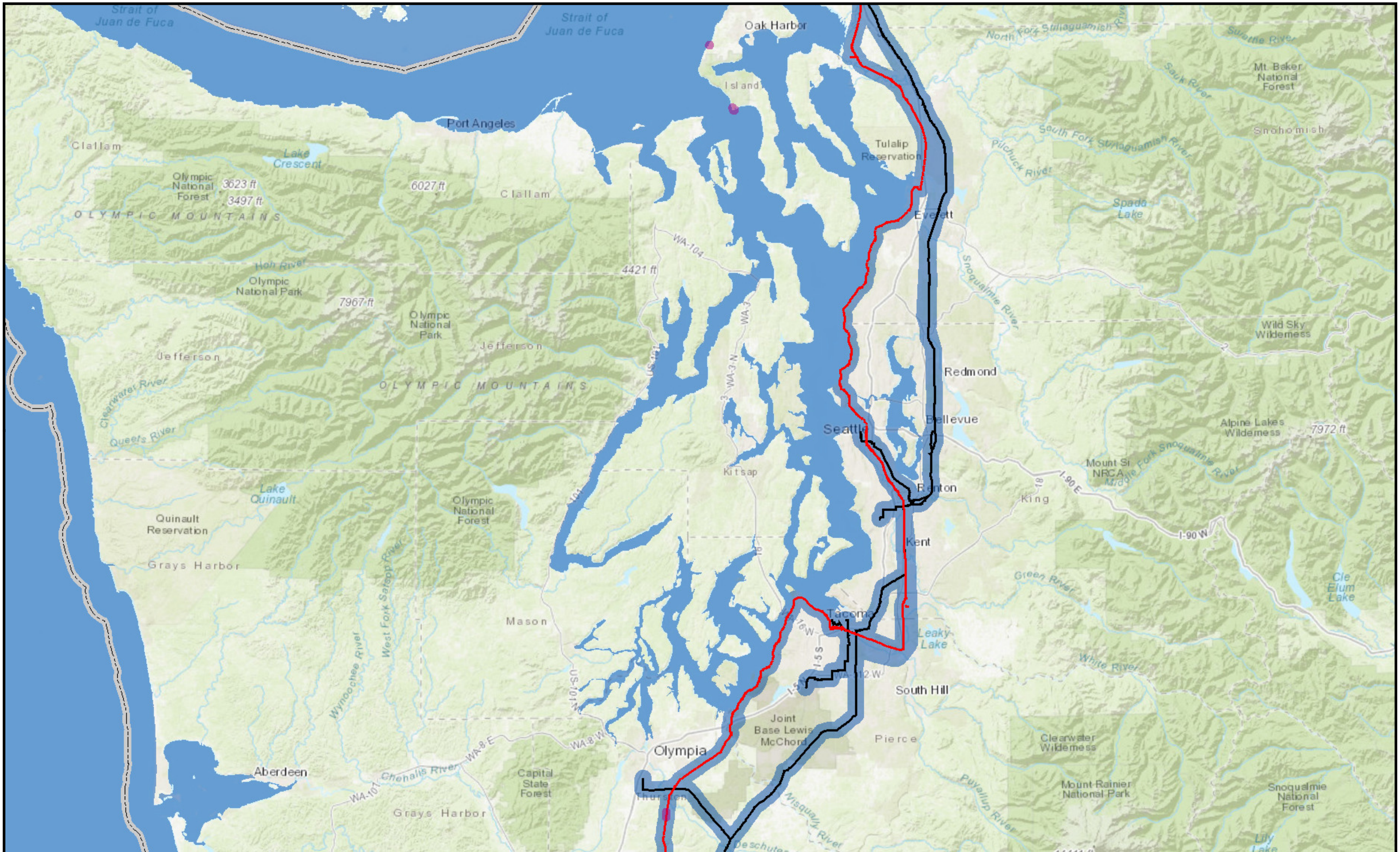
The other two locations are on Whidbey Island within the 1-mile coastal buffer. If a spill occurs at this the Rocky Prairie location, it is very likely that individual plants would be impacted by the response activities. Plants located on Whidbey Island could be avoided. One population is in Fort Casey State Park and will be well documented. The other is on the west side of Whidbey Island near developed area to provide access points and staging areas.

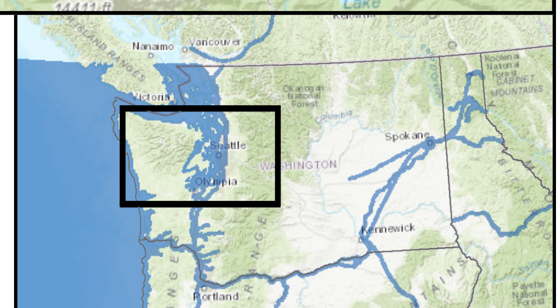
***Direct injury* –** It is possible that golden paintbrush plants could be removed, crushed, or destroyed if a spill were to occur in Rocky Prairie. Specifically, direct injury to individual plants could occur when a response included off road vehicle use; soil disturbance from construction of barriers pits and trenches; creating or use of new access points; or foot traffic in the Action Area. Extreme heat produced by *in situ* burning has the potential to destroy plants or seeds.

***Habitat degradation* –** Compaction of soils by heavy machinery or vehicles could reduce the ability of golden paintbrush to germinate and grow or to expand into previously suitable areas.

Conclusion

Although he distribution of golden paintbrush is currently limited to only three locations within the Action Area, because a large number of plants of the species are present at the Rocky Plains location (>10,000) and it is in close proximity to a rail line, the action agencies conclude that the effects of spill response actions on golden paintbrush are neither insignificant nor discountable and are therefore measureable and potentially adverse.





Golden paintbrush

Petroleum Pipeline

Action Area

State

Data Sources:
WDNR 2017;
ESRI 2014

Figure 4-3
Golden Paintbrush Observations Washington

0 5 10 20
Miles

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Spalding's Catchfly (*Silene spaldingii*)

Spalding's catchfly is only present in eastern Washington. Plants grow in small, ephemeral wetlands found within the forested portions of the channeled scablands. The WNHP database (WDNR 2017) contains 46 observations of this species, six of which are within the Action Area.[47] The reporting accuracy for all these observation is high and the last observations were recorded from 1993 to 2010. Most of the observations within the Action Area range from 0.4 to 1.3 km (0.25 to 0.8 miles) from a rail line.

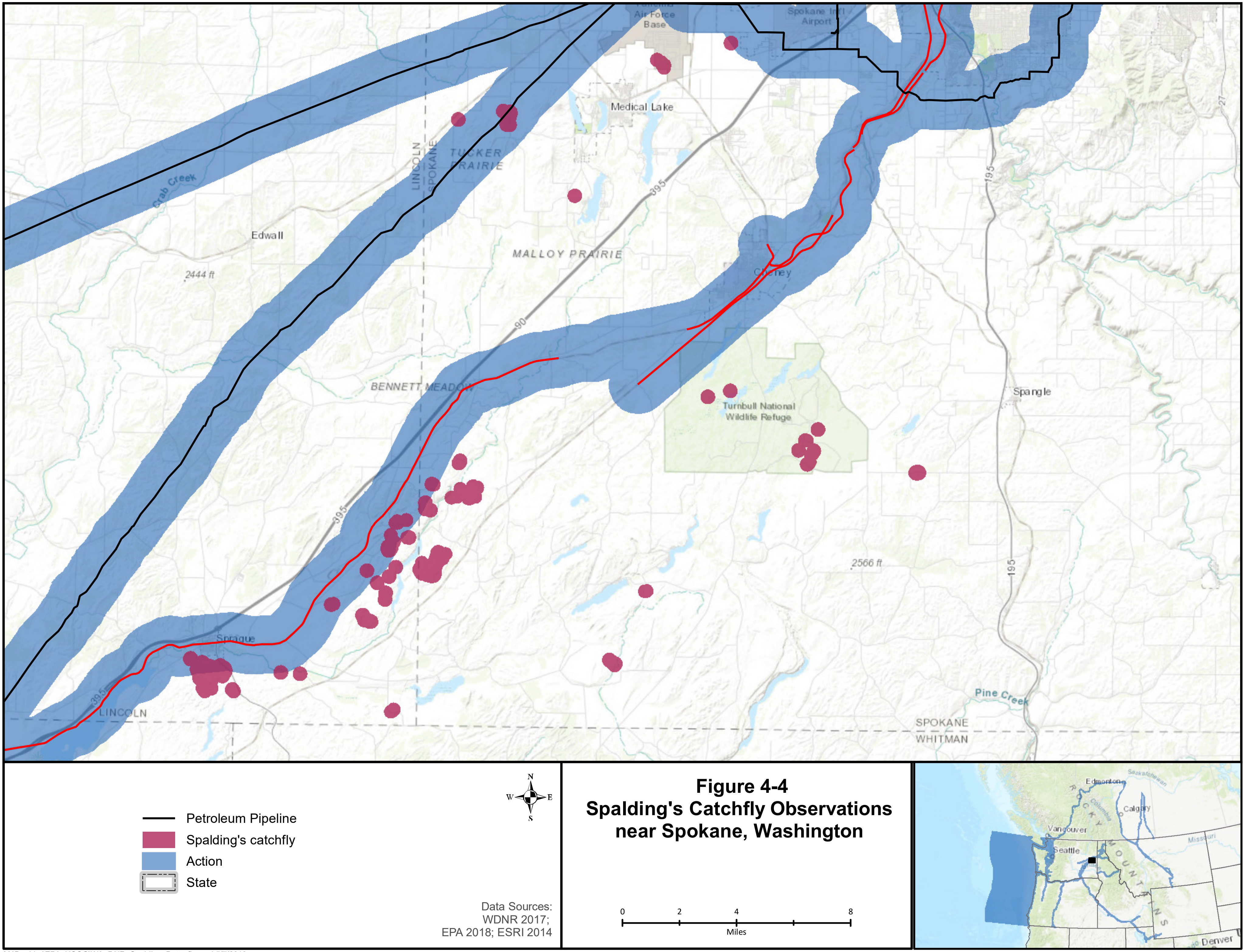
Within the Action Area, the greatest number of plants are in the vicinity of Spokane, Washington (WDNR 2017); the Action Area in that location is associated with a nearby rail line (Figure 4-4). Spalding's catchfly have been observed within several survey areas southwest of Sprague (accounting for 246 plants) and the 1-mile Action Area buffer to the northeast of Sprague (accounting for 708 plants). Another 17 plants were observed in a third location near Sprague almost a mile from the rail line (WDNR 2017).

There were three observations of Spalding's catchfly near the Spokane Airport and the Fairchild Airforce Base that fall within the Action Area (associated with a petroleum pipeline). Less than 10 individual plants have been observed at these locations, and surveys have not been conducted since 2002 (WDNR 2017). Only 9 plants were observed in 2002, and only 12 in 1991 at a survey plot centered directly over the pipeline.

Both the Sprague, Washington, and urban areas (Spokane Airport and Fairchild Airforce Base) provide the infrastructure and resources needed to stage a spill response. Additionally, numerous roads provide the transportation corridors necessary to move supplies and personnel to and from a spill site near these locations.

Because plants have been identified in the six locations described above, suitable habitat must exist at those sites. Habitat suitability is less clear for sites near urban areas. However, we assume for the sake of this analysis that occurrences reported in the WDNR Natural Heritage database account for all extant populations of Spalding's catchfly, regardless of habitat suitability. While a response action may affect suitable habitat in the Action Area, survey data suggest that this habitat is not occupied by Spalding's catchfly. If unoccupied suitable habitat is affected by a spill response, we do not anticipate that the habitat would be permanently destroyed. Rather, recovery would take place over time, and affected areas would return to functional habitat, allowing for future colonization by the plants.

[47] Appendix D provides additional information about these observations.



Data Sources:
WDNR 2017;
EPA 2018; ESRI 2014

Figure 4-4
Spalding's Catchfly Observations near Spokane, Washington

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While the action agencies do not anticipate that Spalding's catchfly in most locations would be affected by a spill response, one of the six observations show plants directly on the pipeline (with up to 12 plants recorded). South Ladd Road runs through that Spalding's catchfly survey area, and so it would be possible for responders to access a pipeline spill from the road. However, if the spill were extensive, it is likely that responders would need to go off-road in some locations to access the spill.

Plants at the location adjacent to the pipeline (nine individuals) were last observed in 2002. The location was considered "fair," based on the condition and size of the plant population and the quality of the immediate landscape for Spalding's catchfly. If a spill were to occur at that location, plants would be affected by a spill response.

Direct injury – It is possible that Spalding's catchfly plants could be removed, crushed, or destroyed if a spill were to occur near Spokane Airport and Fairchild Air Force Base. Specifically, direct injury to individual plants could occur when a response included off road vehicle use; soil disturbance from construction of barriers pits and trenches; creating or use of new access points; or foot traffic in the Action Area. Extreme heat produced by *in situ* burning has the potential to destroy plants or seeds.

Habitat degradation – Compaction of soils by heavy machinery or vehicles could reduce the ability of Spalding's catchfly to germinate and grow or expand into previously suitable habitat.

Conclusion
The action agencies conclude that, because a population of Spalding's catchfly is located directly on a pipeline route, the effects of spill response actions on Spalding's catchfly are neither insignificant nor discountable and are therefore measureable and potentially adverse.

Water Howellia (*Howelia aquatilis*)

The 5-year review for water howellia provides the range-wide, historical and extant occurrences of water howellia (USFWS 2013c). Extant occurrences of water howellia include Joint-Base Lewis McChord, the Turnbull NWR, one location in Latah County, Idaho, and one location in Clackamas County, Oregon (USFWS 2013c). A few plants were documented in wetlands in one isolated location approximately 0.8 km (0.5 miles) from the rail line southeast of Millersylvania State Park (south of Olympia, Washington), and water howellia are also present at Lancaster Lake and the Ridgefield National Wildlife Refuge (north of Vancouver, Washington). This document does not provide survey data for specific locations, therefore we relied on the WDNR Natural Heritage Database (WDNR 2017). The ORBIC database did not contain any occurrence data for this species, even though the USFWS reported that water howellia is present in Clackamas County (USFWS 2013c). The extant occurrences in Latah County, Idaho, are not in the Action Area. Appendix D provides additional information about water howellia observations.

According to the WDNR Natural Heritage Database (WDNR 2017), water howellia is present in the Action Area at 24 of the 67 documented occurrences in Washington (Figures 4-5a and 4-5b) (WDNR 2017). Collectively, these plants were last observed between 1987 and 2012. Plants were present, and the occurrence ranking (indicative of habitat quality) was "fair" to "good" (WDNR

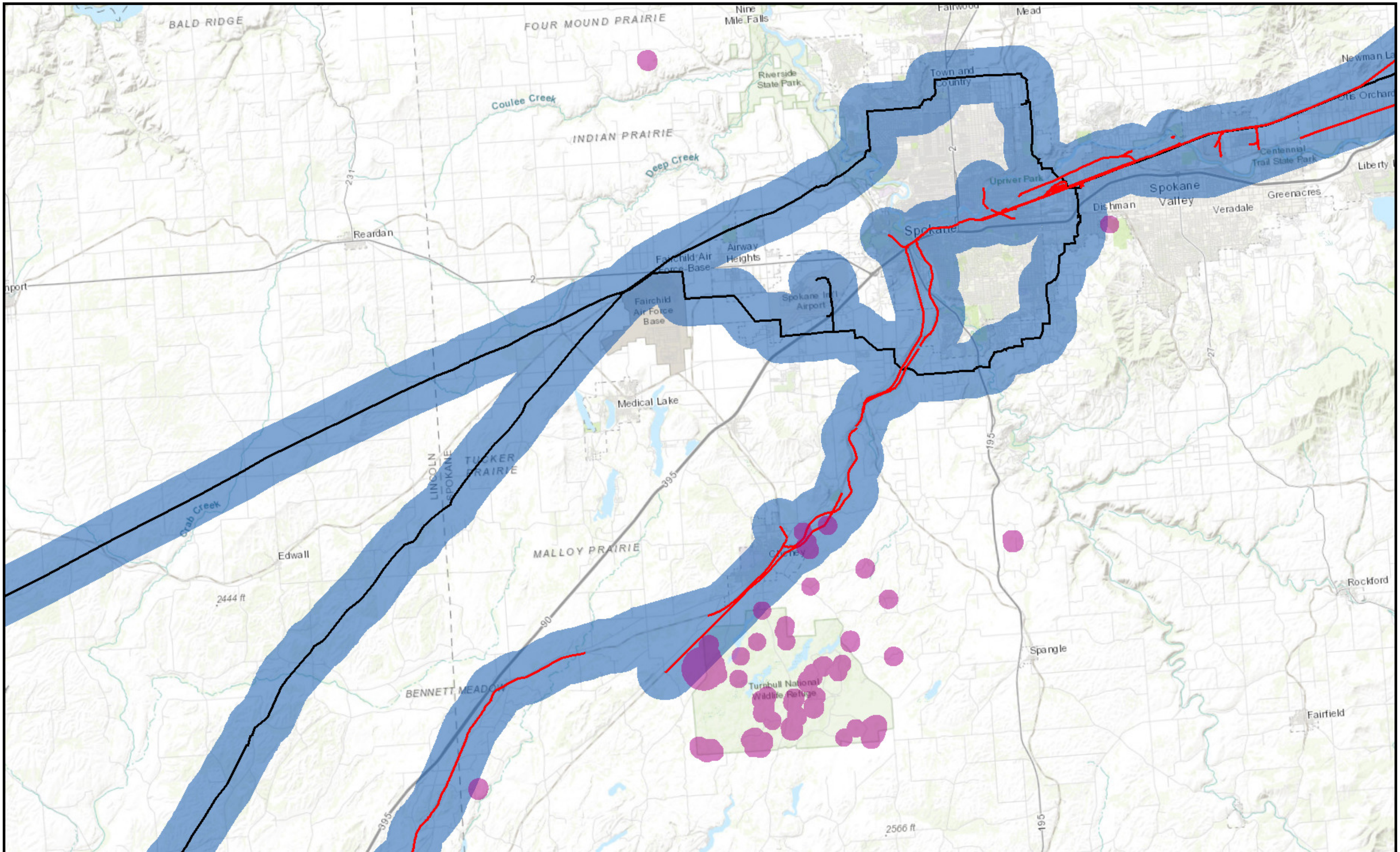
2017). While five of the observed populations have not been observed since 1987, those five occurrences were not characterized as “historic.” Therefore, we are assuming that those five populations are still viable, and that suitable habitat is still present in the Action Area.

According to the WDNR Natural Heritage Database, the 24 observations located within the Action Area are arranged in three clusters of several observations, and three individual observations. The majority of these survey data are from 1998 (nine locations), followed by 2009 (five locations), 1987 (five locations) and 1 location each reported in 1997, 2001, 2008, 2011 and 2012. The number of plants observed during the 1998 survey ranged from 0 to 800 plants (at different locations). These observations are located on the west and east side of the Cascade Mountains in proximity to the towns of Roy and Cheney, Washington, respectively. One large cluster of plant occurrences is near Roy, while the other two are located in the vicinity of Cheney.

On the west side of Washington, 11 of the plant survey areas are located within the 1-mile buffer of a petroleum pipeline in the vicinity of Roy, Washington (on JBLM). These plants are associated with Chambers Lake, Dailman Lake, Shaver Lake, and associated wetlands. There are unnamed roads in this wooded area, assumedly providing access to the lakes. The pipeline runs along the east side of the Spanaway McKenna Highway (Highway 507), and this highway is located between observed plants and the pipeline. Thus, the highway should provide access to a spill response along the pipeline. As of 1998, four survey areas in this cluster (associated with wetlands) supported 20 to 800 individual plants. The one location with 800 observed plants is in a wetland 1.4 km (0.9 miles) west of the petroleum pipeline.

There is another cluster of seven locations with plants associated with Chambers Lake and adjacent wetlands, which are at least 0.2 km (0.1 miles) to the west of the pipeline. However, Highway 507 is a barrier between these plants and the pipeline, as well. It is clear that the lake-wetland complex near Roy, Washington, provides suitable habitat for water howellia. However, because of both the distance between suitable water howellia habitat and the pipeline and the presence of a highway barrier (which would effectively block the movement of oil across the landscape), these plants are not at risk from the response to a pipeline spill.

According to survey notes prepared in 2009, new locations of plants were discovered and there are “probably more plants in the area” then were recorded. The survey location containing the plants is 0.8 km (0.5 miles) from the rail line; however, there appear to be more ponds or wetlands, which are close to the rail line (according to the aerial photograph). It is possible that these locations could contain water howellia as well. These locations are more vulnerable to a spill, and plants could be affected by a spill response at these locations.



Water howellia

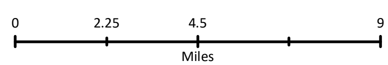
Petroleum Pipeline

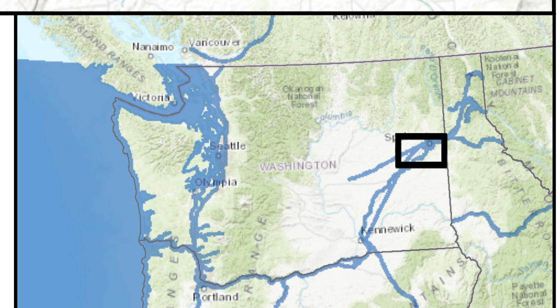
Action Area

State

Data Sources:
WDNR 2017;
ESRI 2014

Figure 4-5a Water Howellia Observations near Cheney, Washington





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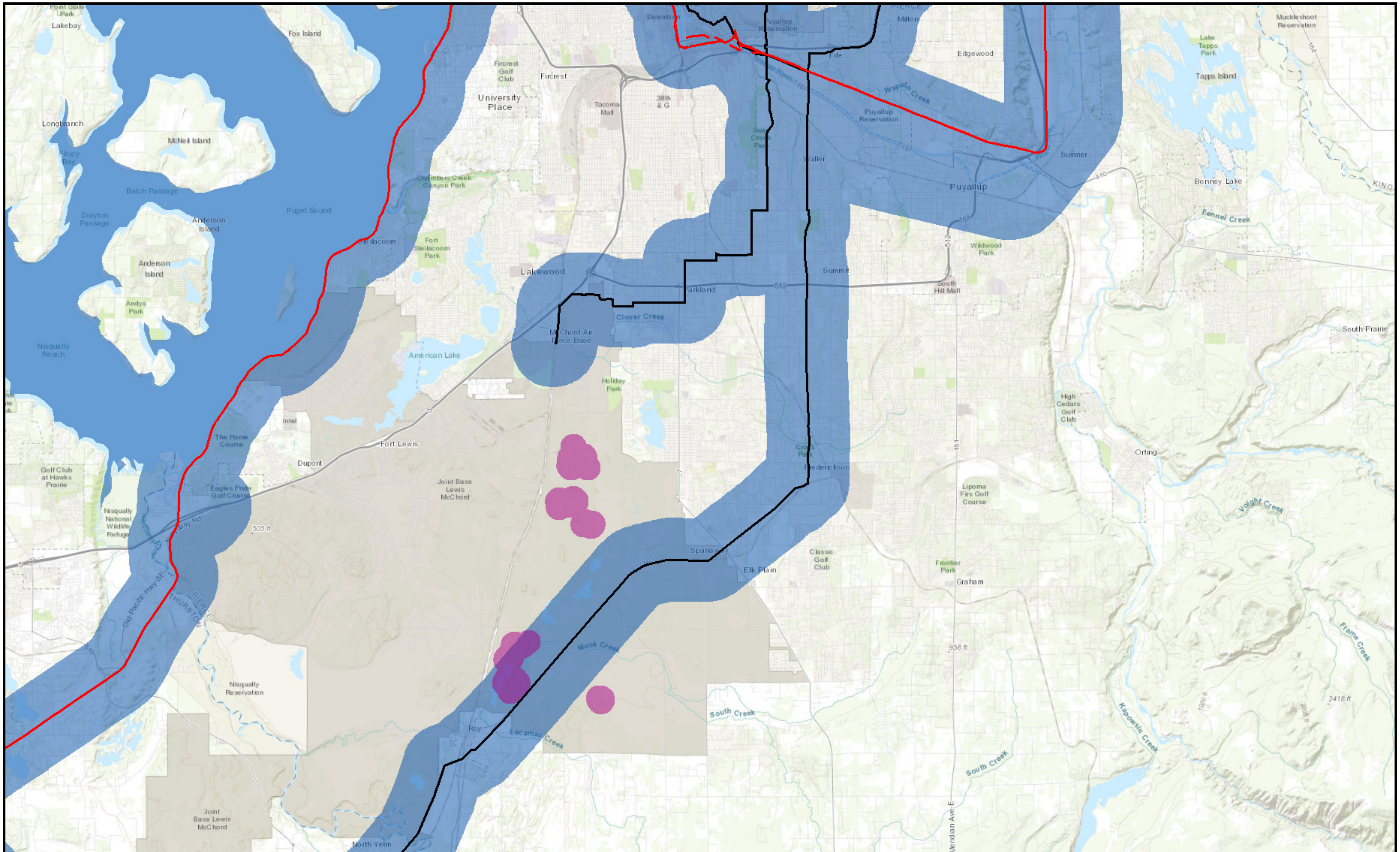

Water howellia

Petroleum Pipeline

Action Area

State

Data Sources:
WDNR 2017;
ESRI 2014

Figure 4-5b Water Howellia Observations near Roy, Washington

0 1.5 3 6
Miles

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The town of Roy is within 2.4 km (1.5 miles) of water howellia populations near Roy, so staging for a spill response would likely take place in town. Therefore, water howellia would not be affected by habitat destruction caused by staging area construction. If a pipeline spill were to occur in this area, it would have to be associated with a significant spill volume for the response actions to affect the plants. The closest observations of water howellia in this area are approximately 0.2 km (0.1 miles) from the pipeline, and Highway 507 and a frontage road are between the plants and the pipeline. This distance, in addition to the presence of roads (built higher than the surrounding landscape) in between the pipeline and the plants, would effectively cut off exposure of the plants to a response in this area.

There are two clusters of plant observations near the town of Cheney, Washington: one north of town, and the other south of town. The cluster north of Cheney contains four observations of relatively small populations in communities dominated by *Phalarus* spp., an invasive grass species. The four observations fall between the S. Cheney-Spokane Rd and the Columbia Plateau Trail, all within the 1-mile buffers of two rail lines. A fifth, individual observation from 2011 (of 50 plants) is located in a wetland approximately 0.2 km (0.1 miles) from one of those two rail lines. Of these observations, four of the five observations were very close to the rail lines (as of 1987) (WDNR 2017). Although a staging area would likely be constructed in a developed area of Cheney, the response tactics themselves could affect plants in the cluster north of town.

The second cluster of plants identified in the Action Area, south of Cheney, contains three observations. Two of the three observations were relatively recent (2009), while the third and largest observation was observed in 1997. There are plants within the wetlands south of Cheney, although there are no estimates of plant numbers (WDNR 2017). Response to a spill in this area could affect plants in two of these three locations.

Direct injury – It is possible that water howellia plants could be removed, crushed, or destroyed if a spill were to occur near Cheney, Washington. Specifically, direct injury to individual plants could occur when a response included soil disturbance from construction of barriers, pits, and trenches; flooding or flushing stranded oil for collection (including physical herding) in wetlands; creating or use of new access points; or foot traffic in the Action Area. Extreme heat produced by *in situ* burning has the potential to destroy plants or seeds. Vacuuming or skimming of wetlands during wet seasons could result in destruction of emergent water howellia. Similarly, intentionally cutting vegetation in wetlands (e.g., to remove oiled material) during wet seasons could result in destruction of water howellia.

Habitat degradation – Compaction of wetland soils during dry periods by heavy machinery or vehicles could reduce the ability of water howellia to germinate and grow.

Conclusion

The action agencies conclude that, because observations of water howellia overlap or are in proximity with rail lines, the effects of spill response actions on water howellia are neither insignificant nor discountable and are therefore measureable and potentially adverse.

4.3.2.2 Snails

Banbury Springs Limpet (*Lanx* spp.)

The Banbury Springs limpet is present throughout the year in four isolated springs that flow into the Snake River in Idaho. The limpet lives in shallow water (average of 15 cm [6 inches]) in colonies that move very little, and requires cold, clear, well-oxygenated water. The primary factors that have degraded the free-flowing, cold-water environment that the Banbury Springs limpet depends on are hydroelectric development, water withdrawal and diversion, water pollution, and aquaculture (USFWS 2006a).

The Action Area near the springs where the Banbury Springs limpet is found consists of an oil pipeline and associated 1-mile buffer. The Action Area encompasses an approximately 5-km (3-mile) segment of the Snake River where it bends north on the west side of Twin Falls, Idaho (Figure 4-6). Brigg's Spring is located within the Action Area on the opposite side of the Snake River from the pipeline. Banbury Spring is to the north of Brigg's Spring and just outside the Action Area. Box Canyon Spring and Thousand Springs are farther north, downstream of the Action Area.

If a spill were to occur in this area, it is possible that oil could reach the Snake River at the closest point to the pipeline (0.3 km; 0.2 miles); although the spill would likely be contained in the upland before reaching the river. Assuming that the oil reaches the river all four springs are downstream of this point, it is unlikely that oil would reach Banbury Springs limpet habit. Historically, the limpet was found throughout the springs and even in the Snake River, but dams and diversion of water for agriculture and fish hatcheries have reduced suitable habitat to the few remaining riffles and more swiftly flowing water above the diversions in the springs (USFWS 2006a). In Briggs Spring, the only spring within the Action Area, the limpet is only found above or just below a diversion dam located 1.1 km (0.7 miles) from the confluence with the Snake River.

It is also unlikely that spill response actions would occur in the limpet's habitat unless conducted in response to a spill in the springs themselves. Responses activities would take place nearer to the pipeline, across the river from the springs, or in the Snake River, and the limpet habitat is not likely to be inadvertently affected.

If a spill were to occur in Banbury Spring limpet habitat, the following types of response actions could adversely impact the species: establishment of staging areas and use, foot traffic, booming, skimming/vacuuming, passive collection, removal of vegetation, and manual or mechanical removal of oiled substrates.

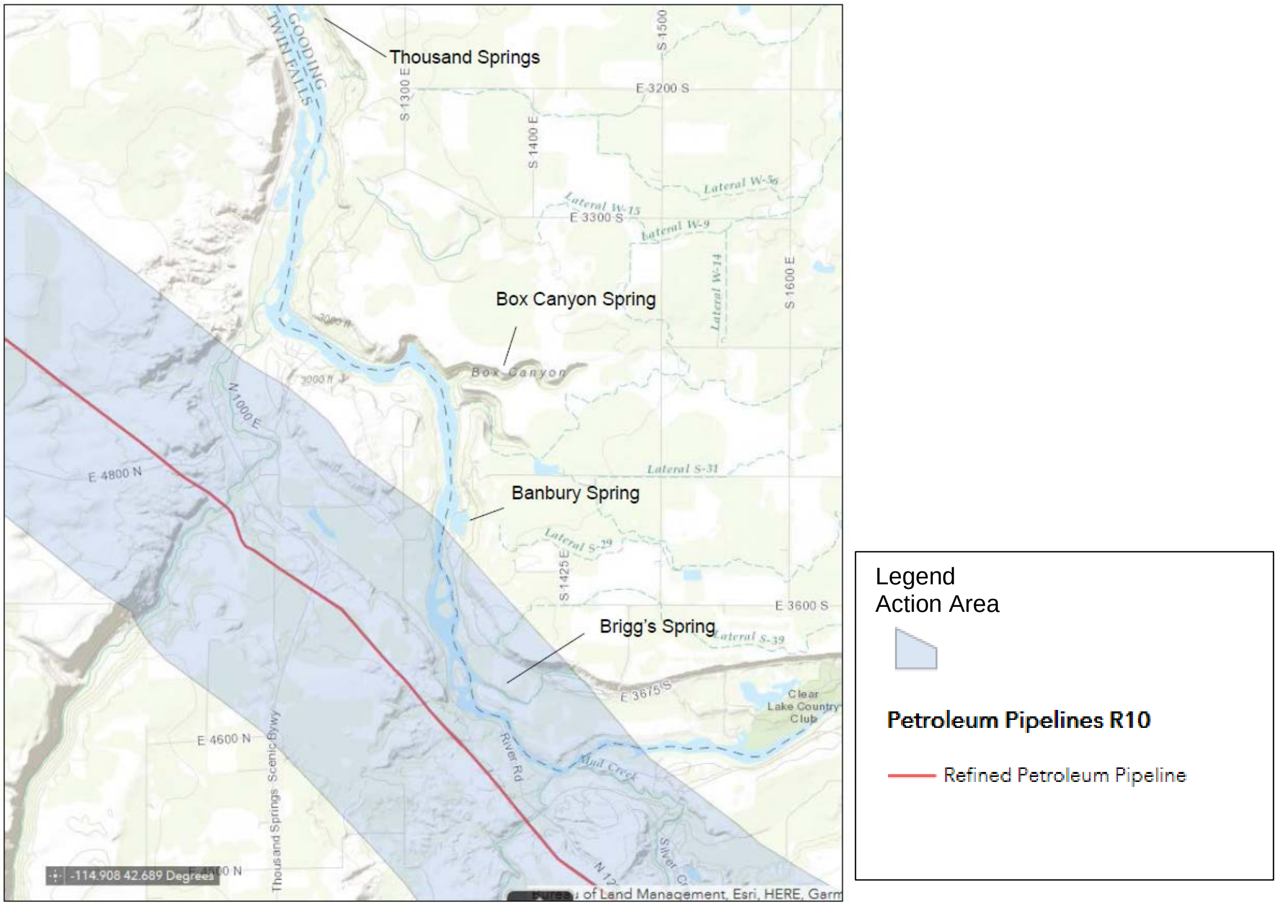


Figure 4-6 Proximity of Banbury Spring Limpet Habitat to the Action Area

***Direct Injury* –** If a large spill were to occur in the area and response activities took place in Banbury Spring limpet habitat, direct injury could occur from the use of booms or vacuums. Impacts on the limpet from booming could occur if boom anchors or anchor chains were to crush adult limpets (highest-magnitude, longest-term effect). Limpets could also be destroyed by boom contact along shorelines. Impacts on limpets caused by booming could be minimized by placing the booms in the Snake River to keep the oil from entering the springs, rather than in the springs themselves. Due to the proximity of the pipeline to downstream Banbury Springs limpet habitat (e.g., at Thousand Springs), exclusionary booming may not be possible; spill responders would need to become aware of a spill and then act very quickly to establish exclusionary booms upstream and downstream of Banbury Springs limpet habitat. If spill response in the springs were to become necessary, coordination with the USFWS would be requested to inform the response.

Vacuuming may cause entrainment and mortality among limpets or limpet larvae (highest-magnitude, longest-term effect). Impacts from vacuuming may be minimized by closely monitoring operations in sensitive areas, placing the equipment hose where it will minimize the uptake of larvae, and utilizing vacuuming methods that will minimize the uptake of water relative to oil. The use of a flat-head nozzle could also reduce the uptake of limpet larvae.

If Banbury Springs limpet habitat were to be oiled, individual limpets could be crushed by responders walking in the streams (highest-magnitude, longest-term effect). However, responders may need to walk in streams as part of shoreline cleanup and assessment, or while working with booms. This effect will be limited to areas of shallow water (where it is safe for responders to wade). As noted above, the potential for Banbury Springs limpet habitat to become oiled (and for a response to occur there) is low, so the potential for effects to occur as a result of responders walking in streams is also low.

Change in Behavior – The sensitivity of Banbury Springs limpets to light is unknown. If they are sensitive to lights, their use may have an impact on the behavior of the species. Activity in nocturnal gastropods (e.g., common periwinkle snail) decreases when they are exposed to light (Jacobsen and Stabell 1999). This response could lead to altered foraging activity and reduced overall fitness (potentially a high-magnitude, short-term effect) during nighttime spill response actions (i.e., days). The activity of the Banbury Springs limpet is not well understood, so it is not clear whether they are nocturnal and would be impacted by light conditions.

Toxicity – The passive collection of oil in sorbents could result in the exposure of limpets to oil if the sorbents were to sink. Oil exposures could result in acute (e.g., lethal) impacts on small gastropods (Abdul-Salam et al. 1996) (high-magnitude, long-term effect). However, due to the shallow habitat in which limpets live, it is not likely that sorbents will be lost if appropriately held in place. Therefore, sorbents will be monitored and collected as necessary to avoid exposing the Banbury Springs limpet.

Habitat Degradation – The cutting and removal of vegetation along the shoreline to gain access to the springs could have detrimental effects on limpet species, such as loss of habitat and forage locations, increased erosion of the shoreline, and siltation of the springs. The cutting and removal of vegetation along the shoreline could also temporarily increase turbidity, resulting in temporarily decreased dissolved oxygen and temporarily increased water temperatures (low-magnitude, short-term effects). Excavation of oiled substrates or the establishment of a staging area could have similar impacts. Erosion and siltation control measures will be put in place as needed to avoid the degradation of water quality. Sediment that does reach springs will be rapidly flushed out by fast-moving water (e.g., within hours to weeks).

Conclusion

Overall, due to the limited distribution of the Banbury Springs limpet (localized in four springs along the Snake River), the distance of those springs from the pipeline, and the dams and diversions in place that would restrict oil movement into the springs, it is unlikely that the Banbury Springs limpet would be exposed to spill response actions. If a pipeline spill did occur in the vicinity and upstream of the springs where Banbury Springs limpet is found, an appropriately executed spill response (including conservation measures [Table 2-2]) would limit the impacts of the spill and the effects on limpets and their habitat. The action agencies therefore conclude that the effects of spill response actions on the Banbury Springs limpet are insignificant.

Bliss Rapids Snail (*Taylorconcha serpenticola*)

The Bliss Rapids snail is a small freshwater snail that inhabits cobble and boulder substrates in cold-water springs, spring-fed tributaries of the Snake River, and some reaches of the Snake River. The species is currently distributed from King Hill, Idaho, to just below the Lower Salmon Falls Dam; in an isolated location between the Upper and Lower Salmon Falls Reservoirs; and in tributaries as far upstream as Ellison Springs. They are mostly restricted to tributaries with high water quality (e.g., consistent, cool temperature and low turbidity). An oil pipeline (and the associated 1-mile buffer defining the Action Area) runs south of the Snake River near Bliss Rapids snail habitat, coming within approximately 0.4 km (0.25 miles) of the nearest known population (Figure 4-7). The same pipeline crosses several tributaries that feed into the Snake River, including Salmon Falls Creek.

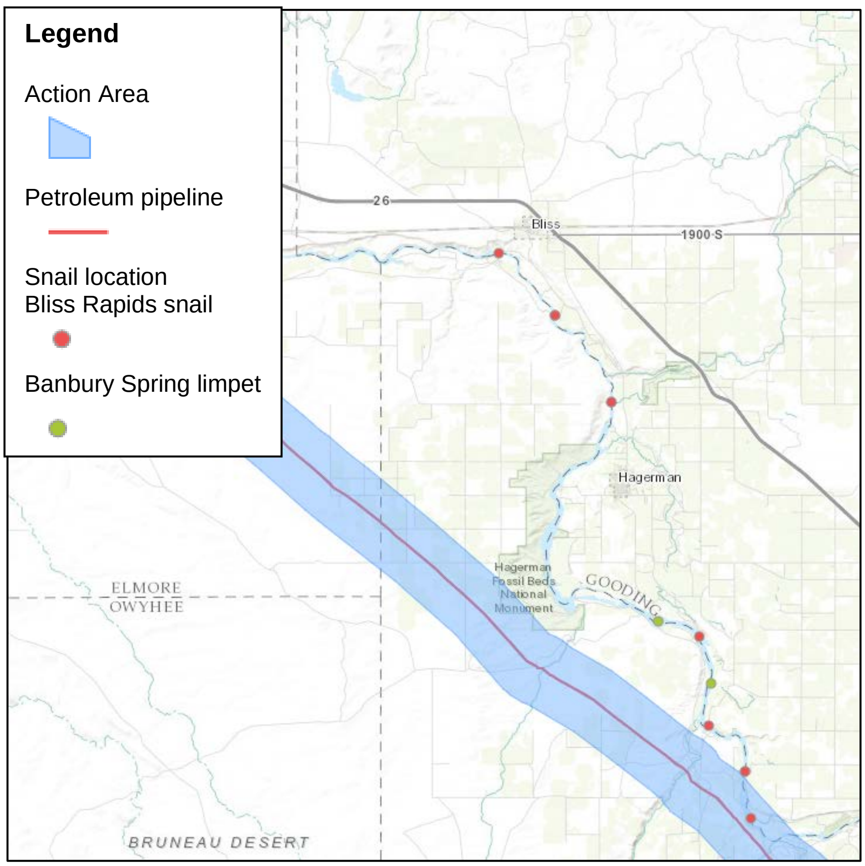


Figure 4-7 Location of Bliss Rapids Snail Relative to the Action Area

If an oil spill were to enter the Snake River at its closest point closest to the pipeline (Figure 4-7) and travel 32 km (20 miles) downstream, it could affect all but the farthest downstream population near King Hill. A spill in a tributary such as Salmon Falls Creek could carry oil farther still, affecting the population at King Hill (although upstream populations would not be affected). A federal response to these spills would likely take place in the Snake River, although the oil could potentially be stopped in the terrestrial environment or in tributaries before reaching the Snake

River, depending on the size of the spill and the lag time between discovering the spill and mobilizing a response.

If a spill were to occur in Bliss Rapids snail habitat, the following types of response actions could adversely impact the species: use of vessels; staging area establishment and use; foot traffic; booming; skimming/vacuuming; passive collection; construction of berms, dams, or other barriers; and manual or mechanical removal of oil substrates.

Given the similarities in life history, habitat use, and geographic location between Bliss Rapids snail and the Snake River physa (see previous section and Table 4-2), it is assumed that the effects of a spill response on the Bliss Rapids snail will be very similar to the effects on Snake River physa. One potential exception is that the use of lights at night has the potential to reduce Bliss Rapids snail foraging activity because the species is nocturnal and avoids light areas during the day (USFWS 1995). Also, the potential for entrainment of larvae in vacuums is unclear because little is known about Bliss Rapids snail reproduction apart from the fact that they lay eggs among coarse substrates.

Conclusion
Because of the limited distribution of Bliss Rapids snails and their preference for tributaries, it is unlikely that the snails will be exposed to a spill response action in the Snake River or its tributaries. A spill would need to occur at the point of the pipeline nearest the Snake River, or in or very near a point where the pipeline crosses a tributary. Responses within tributaries would be limited due to the depth of those streams and the potential for oil to move rapidly into the Snake River, where containment and recovery may be more practicable. A spill from the pipeline that only affected the terrestrial environment, which would be possible given the distance of the pipeline from the Snake River, would not require a federal response and so is outside the scope of this BA. The action agencies therefore conclude that the effects of spill response actions on the Bliss Rapids snail are insignificant.

Snake River Physa (*Physa natricina*)
The Snake River physa is a small freshwater snail that is discontinuously distributed in a small area of the Snake River in Idaho: immediately downstream of the Minidoka Dam below Lake Walcott and between Bliss and Grand View, Idaho (Figures 4-8 and 4-9). An oil pipeline runs along the Snake River in this part of Idaho and crosses the Snake River at Glenns Ferry between Bliss and Grand View, Idaho. Based on the proximity of the oil pipeline to the Snake River, it is possible that the Snake River physa could be exposed to spill response actions throughout much of its range if a major spill were to occur from the pipeline.

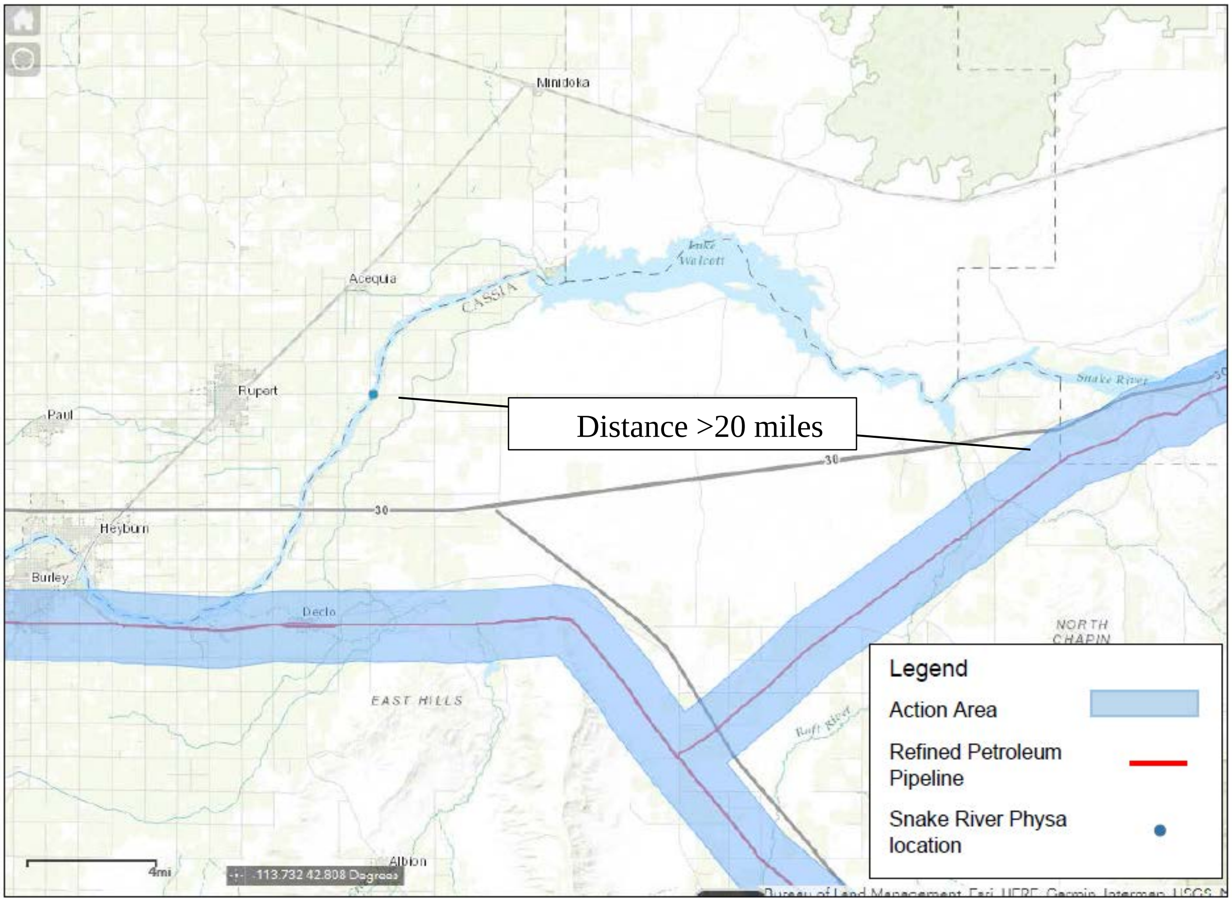


Figure 4-8 Location of Snake River Physa below Minidoka Dam Relative to the Action Area

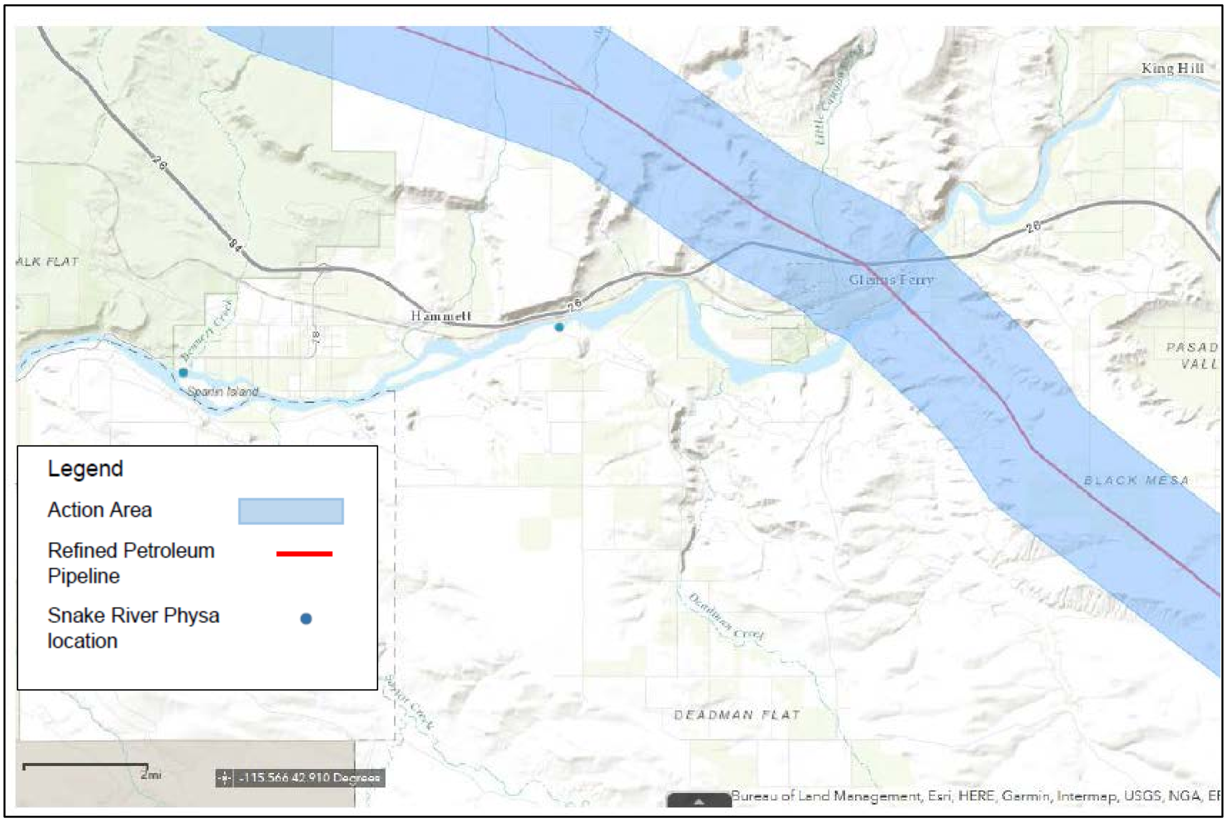


Figure 4-9 Location of Snake River Physa Near Glenns Ferry

The area below Minidoka Dam with a documented population of Snake River physa is more than 32 km (20 miles) downstream of where the Action Area overlaps with the Snake River and Lake Walcott; the area of overlap would contain the oil and provide a good response area if a major spill in this area were to occur (see Figure 4-8).

Although the populations of the Snake River physa between Bliss and Grand View, Idaho, are outside of the 1-mile buffer on either side of the pipeline, they are within 20 miles of the crossing at Glenns Ferry. If a major spill were to occur in this area, it is possible that spill response actions could occur in Snake River physa habitat (Figure 4-9).

Suitable Snake River physa habitat includes pebble- to gravel-size (and possibly cobble- to gravel-size) substrates that are largely free of macrophytes, as well as substrates finer than gravel that can fill in the interstitial spaces. The physa is most frequently found at depths of 1.5 to 2.5 m (5 to 8 ft), with its living depth ranging from less than 0.5 m (1.6 ft) to more than 3.0 m (9.8 ft) (USFWS 2014b).

If a spill were to occur in Snake River physa habitat, the following types of response actions could adversely impact the species: use of vessels; staging area establishment and use; foot traffic; booming; skimming/vacuuming; passive collection; construction of berms, dams, or other barriers; and manual or mechanical removal of oil substrates.

Direct Injury – The use of vessels during response actions may impact physa. Snake River physa would be vulnerable to destruction (highest-magnitude, longest-term effect) from anchoring or grounding. Vessel operators could avoid or minimize potential impacts on physa by adhering to conservation measures, including avoiding crushing shoreline vegetation during staging, and avoiding anchoring or prop scarring submerged vegetation (Table 2-2). Adherence to conservation measures will help minimize the impacts vessel use on Snake River physa.

Booming may impact Snake River physa by crushing individuals when a boom is anchored or anchor chains are dragged (highest-magnitude, longest-term effect). If a spill occurs in an area where Snake River physa occur, careful placement of booms will minimize any potential impact.

Use of *in situ* burning in locations occupied by the Snake River physa is unlikely for several reasons. Oil must first create a thick pool (e.g., in a boom) to enable a stable burn, and this may not be feasible in the fast-flowing water of the Snake River. Fire-resistant booms, which are recommended equipment when conducting *in situ* burning, are expensive and relatively scarce equipment that would need to be transported to the Snake River prior to initiating this type of response (LaTier et al. 2017). Furthermore, Snake River physa habitat is near areas of human population, where it may not be allowable to use i*n situ* burning. Any instance of *in situ* burning in inland areas would require prior RRT approval. If used, *in situ* burning could generate residues that could sink and smother benthic invertebrates (physical effect). However, due to the relatively small amount of residue generated and the fast-flowing nature of the Snake River, it is not likely that Snake River physa will be smothered by *in situ* burn residues. Any physa contact with such residues would be expected to have a low-magnitude but potentially long-term effect (because of the persistence of residues) (Scholz et al. 2004).

Snake River physa may be crushed (highest-magnitude, longest-term effect) by responders walking in shallow portions of the Snake River. Snake River physa are present in waters as shallow as 0.5 m (1.6 ft), where responders could wade (e.g., while tending a boom or assessing and cleaning riverine shorelines). Responders will access the shoreline at consistent locations to minimize the potential for interacting with the physa.

If done properly (i.e., at the river surface), vacuuming would not have an effect on Snake River physa, which are expected to complete their entire life cycle in the benthic environment (based on the life cycles of other physid snails) (Thorp and Covich 2010). Pulmonate physids are hermaphroditic (with the ability to fertilize eggs through self-fertilization or sexual copulation), and fertilized egg masses are laid on rocks or aquatic plants. Physids finish their larval life stage while still in the egg, hatching as shelled juveniles (Hammond and Burch 2000). Therefore, any vacuuming conducted at the river surface is not expected to result in the entrainment of Snake River physa at any life stage.

Change in Behavior – The use of lights in Snake River physa habitat may have an impact on species behavior. Activity in nocturnal gastropods (e.g., common periwinkle snail) decreases when they are exposed to light (Jacobsen and Stabell 1999). This could lead to altered foraging activity and reduced overall fitness (potentially a high-magnitude, short-term effect) during nighttime spill response actions (i.e., days). The activity of Snake River physa is not well understood, so it is not clear whether they are nocturnal and would be impacted by light conditions.

Toxicity – If the water velocity allows for the passive collection of oil by sorbents, exposure of physa to oil could occur if the sorbents were to sink. Oil exposures could result in acute (e.g., lethal) impacts on small gastropods (Abdul-Salam et al. 1996). However, due to the shallow habitat in which physa live, it is not likely that sorbents will be lost if appropriately held in place. Therefore, sorbents will be monitored and collected as necessary to avoid exposing Snake River physa.

The passive collection of oil in flowing waters will be severely limited by the ability of responders to use booms to collect oil. In fast-flowing water (>1 knot), booms must be placed at angles to the flow, and their purpose is often to redirect oil toward a quiescent collection area (or away from sensitive areas) rather than to collect oil. Without collecting large amounts of oil in booms, sorbent materials in flowing streams will not be practical for recovering oil from booms (LaTier et al. 2017).

If used, *in situ* burning could generate burn residues that could sink to the bottom of the Snake River, where Snake River physa could be exposed. However, burn residues are thought to have little potential to cause toxicity due to the very low bioavailability of contaminants (e.g., metals and PAHs) within the residue matrix (NOAA 2017b) (low-magnitude, long-term effect due to persistence of residues in the environment).

Habitat Degradation – Staging area establishment and use may impact Snake River physa by increasing soils runoff into the Snake River and increasing siltation of physa habitat. Due to the prevalence of developed areas along the Snake River that include Interstate 84 paralleling the river, it is not likely that new staging areas will need to be cleared of vegetation in response to an oil spill. Potential impacts will be minimized by locating staging areas in least-sensitive areas, repeatedly using the same staging areas and access points, and establishing reduced contamination work zones. Engineered controls on soil erosion and siltation will be put in place as needed to maintain water and substrate quality.

Conclusion

Because of the limited distribution of the Snake River physa, it is unlikely that individual physa will be exposed to a spill response action. A spill would need to occur in the vicinity of Glenns Ferry where the pipeline intersects with the Snake River, and oil would need to travel 11 km (7 miles) downstream for response activities to occur in the closest Snake River physa habitat. However, if a spill from the pipeline were to leak into the Snake River at Glenns Ferry, an appropriately executed spill response (including conservation measures [Table 2-2]) would limit the impacts of the spill on Snake River physa and their habitat. The action agencies therefore conclude that the effects of spill response actions on the Snake River physa are insignificant.

4.3.2.3 Butterflies

Island Marble Butterfly (*Euchloe ausonides insulanus*)

At present, the island marble butterfly is geographically restricted to American Camp on San Juan Island, Washington, where the species' host plant—three species of mustard plants—is found in open coastal lowlands including prairie, sand dunes, and tidal lagoons. American Camp is on the southeast side of San Juan Island, which is within the 1-mile buffer of the Action Area. A spill that would trigger a federal spill response that may affect island marble butterfly habitat would occur in marine waters off the island. A large spill could occur along the marine vessel lane to the south and east of San Juan Island (Middle/San Juan Channel) (NOAA 2016a). Department of Ecology spill records suggest that only small spills (<50 gallons) have occurred on the island to date, with larger 200- and 500-gallon diesel fuel spills having occurred along nearby Jones and Henry Islands (Ecology 2018). A GRP for San Juan Islands/North Puget Sound was developed in 2003 and includes response strategies for responding to marine spills affecting San Juan Island.

Relevant response strategies (e.g., for booming) are focused on lagoons along the southern side of Griffin Bay, which is within the proposed critical habitat for this species (Figure 3-27). American Camp has developed roads and points of access that could be used as staging areas for a spill response (Figure 3-27).

Despite the proximity of the island marble butterfly habitat to marine waters with shipping traffic, exposure of the island marble butterfly to spill response actions will be very limited. The island marble butterfly was only recently (1998) discovered on San Juan Island and since that time has been extensively studied and surveyed (USFWS 2018b). The National Park Service and USFWS have developed a Conservation Agreement to guide conservation efforts that include, for example, removing invasive vegetation that competes with beneficial plants, planting native species beneficial to the butterfly, and excluding deer from areas known to be occupied by the butterfly (USFWS 2018b). Adults are only present for 6 to 9 days in the spring, and it is very unlikely that spill response actions will coincide with their presence to disturb their mating and egg laying activities. The larval and chrysalis life stages are the most vulnerable because they are strongly associated with single host plants (larvae) or are stationary during diapause (chrysalis). However, response activities are unlikely to occur in the terrestrial habitat where island marble butterfly are primarily found because there are no major sources of oil or hazardous materials in those areas.

Direct Injury – Destruction of plant species with which the island marble butterfly is associated could result in destruction of individuals, particularly at early life stages when the species moves very little (larvae) or is immobile (chrysalis). Specifically, direct injury to butterflies could occur when a response included off road vehicle use; soil disturbance from construction of barriers pits and trenches; creating or use of new access points; or foot traffic in the Action Area. As noted above, routes of ingress/egress to American Camp already exist, and previously developed areas can be used for staging a spill response. In general, island marble butterflies will be present in terrestrial habitats away from spill response actions, which will most likely be limited to shorelines and marine waters. Of the potential response actions just mentioned, only off road vehicle use or foot traffic might be expected in island marble habitat, with foot traffic being the most likely (due to the availability of existing, developed access points). Thus, there is limited potential for direct injury resulting from any response action near American Camp.

Change in Behavior – Adult butterflies may be temporarily disturbed by foot or off road vehicle traffic through island marble butterfly habitat, resulting in reduced feeding efficiency, added energy expenditure, or disturbance from egg laying. The potential for disturbance by other response activities will be limited because a spill response on San Juan Island would most likely occur outside of terrestrial habitat.

Habitat Degradation – A spill response has the potential to degrade or destroy necessary habitat for island marble butterflies via the destruction of mustard plants. Loss of habitat is the key stressor for this species, so minor alterations of their habitat could affect individual butterflies (e.g., by removing plants necessary as hosts for larvae or as nectar sources for adults). Construction-related actions (e.g., beach sediment removal or constructing trenches or berms) could also temporarily destroy necessary plant life; however, the use of *in situ* burning or construction-related actions in the terrestrial environment of San Juan Island is very unlikely; the response activities would likely be limited to shorelines and marine waters.

Conclusion
Should a spill occur near San Juan Island, it is possible that temporary disturbance of individual island marble butterflies could result from foot traffic or off road vehicle use, but other response activities will be limited to shoreline and marine water habitat, away from terrestrial habitats occupied by this species. GRPs are available that provide response strategies for San Juan Island. Infrastructure is available for staging, precluding the need for development of terrestrial habitats near American Camp. Monitoring of island marble butterfly is ongoing in the area, so their extent and locations are well understood. Based on the available information and the low potential for a spill in island marble butterfly habitat, the action agencies conclude that effects of spill response actions on island marble butterfly are insignificant.

Island Marble Butterfly Critical Habitat
At present, critical habitat has not be designated for the island marble butterfly, which is still a candidate for listing under the ESA. However, if and when island marble butterfly are listed, critical habitat is likely to be designated at the same time on San Juan Island (and potentially adjacent terrestrial areas in their historical range) (Figure 3-27).

PBFs determined to be essential to the conservation of the island marble butterfly include:

- Open, primarily treeless areas with short-saturated forb- and grass-dominated vegetation that include diverse topographic features such as ridgelines, hills, and bluffs for patrolling; dispersal corridors between habitat patches; and some south-facing terrain. Areas must be large enough to allow for the development of patchy-population dynamics, allowing for multiple small populations to establish within the area.
- Low- to medium-density larval host plants for egg-laying and larval development, with both flower buds and blooms on them between the months of May through July. Larval

host plants may be any of the following: *Brassica rapa*, *Sisymbrium altissimum*, or *Lepidium virginicum*.

- Adult nectar resources in flower and short-statured, white-flowering plants in bloom used for mate-finding.
- Areas of undisturbed vegetation surrounding larval host plants sufficient to provide secure sites for diapause and pupation. The vegetation surrounding larval host plants must be left standing for a sufficient period of time for the island marble butterfly to complete its life cycle.

A spill response action on San Juan Island will most likely be focused on shoreline or marine water habitats affected by a marine spill of oil. Paved access points to American Camp exist, allowing for ingress/egress and staging. Impacts on potential critical habitat PBFs for island marble butterfly would require that off road vehicle or foot traffic pass through island marble habitat (resulting in destruction of vegetation). Topographic features will not be affected, nor will the prevalence of treeless areas. Destruction of vegetation and disturbance of soils are possible stresses on critical habitat PBFs. Disturbance resulting from foot traffic or off road vehicle use is expected to be minimal, given that shorelines and marine areas, the most likely to be affected by a spill response, are accessible by both paved roadways and by marine vessel.

Conclusion

The action agencies conclude that, because of the low potential for activities associated with spill responses to substantially impact critical habitat PBFs, the effects of spill response actions on island marble butterfly critical habitat are insignificant.

Oregon Silverspot Butterfly (*Speyeria zerene hippolyta*)

According to the ORBIC database, there have been 17 observations of the Oregon silverspot butterfly in Oregon (OSU 2017), of which 15 were within the Action Area. Eight of those observations (approximately 50%) indicate that the species was extirpated from the specific locations. The last observations of those populations were over 20 years ago. Of the seven populations that remain, one, two, and four of the observed populations were estimated to have "good," "fair," or "poor" population viability, respectively. The remaining populations present within the Action Area are at Cascade Head, Rock Creek, Big Creek, Bray Point, and the Clatsop Plain, all of which are points along the Oregon coast; the Mount Hebo population is outside of the Action Area.

Historically this species was found along the coast from Westport, Washington, to the Columbia River. To date the Washington population is restricted to one small area on the Long Beach peninsula, where intensive searches have revealed few adult butterflies. According to Washington WDFW surveys conducted in 1991 found no butterflies, so they concluded that there was likely no longer a viable population in Washington (Washington Department of Wildlife 1993).

The observed populations with "good" viability are located in the upland meadows on Cascade Head, on land owned by the Nature Conservancy. The Oregon silverspot butterfly has been reintroduced in this area through a cooperative program between the USFWS, the Nature Conservancy, Lewis and Clark College, and the Oregon Zoo. Cascade Head is 49 m1 (60 ft) above sea level, and any response to a spill near this location would not result in impact to butterflies. The response would more likely take place nearer to sea level, where a marine spill response might affect shorelines in this area.

The estimated viability of Rock Creek-Big Creek population, located at Big Creek between Heceta Head and Cape Perpetua, is documented as “fair” (with very high reporting accuracy) (OSU 2017). The last reported observation of this population was in September 2009. The Nature Conservancy purchased Big Creek, and critical habitat has been designated in that area. Similar to the Rock Creek-Big Creek population, the butterfly population at Bray Point also is estimated to have “fair” viability. Like the butterflies at Cascade Head and Rock Creek-Big Creek, Oregon silverspot at Bray Point occupy marine terrace and coastal headland salt-spray meadows habitat. According to the USFWS, “although the salt-spray meadow is the nursery area for the butterfly and a key element of this species' habitat, it is a rather harsh environment for the adults. Upon eclosion (metamorphosis of the pupa into the adult butterfly), the adults generally move out of the meadows into the fringe of conifers or brush…” (USFWS 2018c).

There have been no recorded observations of the Oregon silverspot butterfly in the Clatsop Plain since the early 1990s, and the viability of these populations was estimated as “poor” in the ORBIC database (OSU 2017). Nevertheless, Oregon silverspot have not yet been designated as extirpated, and, therefore, they are assumed to be viable (but perhaps not thriving). If a spill were to occur along the Clatsop Plain shoreline, it possible that Oregon silverspot, which occupies stabilized dune habitat in this area, could be impacted.

Direct injury – Destruction of plants with which Oregon silverspot butterfly is associated, particularly the early blue violet (*Viola adunca*), could result in destruction of individual caterpillars. Specifically, direct injury to caterpillars could occur when a response included off road vehicle use; soil disturbance from construction of barriers pits and trenches; creating or use of new access points; or foot traffic in the Action Area. Compaction of soils by heavy machinery or vehicles could reduce the ability of plants to germinate and grow. Also, i*n situ* burning could result in thermal injuries to individual adult butterflies or early life stages that are less mobile than adults.

Behavioral changes – Butterflies may be disturbed by responders, resulting in reduced feeding efficiency and added energy expenditure.

Habitat degradation – A spill response has the potential to degrade or destroy necessary nursery habitat for Oregon silverspot butterflies via the destruction of plants. For example, if a spill were to occur at Rock Creek-Big Creek or Bray Point, where there is documented butterfly use, it is possible that butterfly nursery habitat (designated critical habitat)—and, therefore, butterfly pupa—could be impacted by a spill response. This species is reliant on early blue violet (*V. adunca*) as a host plant for caterpillars, and, for nectar, adults utilize common yarrow (*Achillea millefolium*), western pearly everlasting (*Anaphalis margaritacea*), Pacific aster (*Symphyotrichum chilense*), Canada goldenrod (*Solidago canadensis*), tansy ragwort (*Senecio jacobaea*), and edible thistle (*Cirsium edule*). Impacts to any of these species could significantly impact Oregon silverspot individuals (and populations).

Conclusion
The action agencies conclude that, because there are seven viable populations of the Oregon silverspot butterfly within the 1-mile Action Area buffer of the Oregon coast, the effects of spill response actions are neither insignificant nor discountable and are therefore measureable and potentially adverse.

Oregon Silverspot Critical Habitat
Critical habitat was designated for Oregon silverspot butterfly at the time of listing, and includes the salt-spray meadow between Big Creek and Rock Creek, in Lane County, Oregon. The PBFs determined to be essential to the conservation of the Oregon silverspot butterfly include access to several plants and habitat types:

- The western blue violet (*V. adunca*), which is the primary host plant for the butterfly larvae;
- A variety of composite plants (including, but not limited to, yarrow, pearly everlasting (*A. margaritacea*), Pacific aster (*S. chilense*), Canada goldenrod (*S. canadensis*), tansy ragwort (*S. jacobaea*), and edible thistle (*C. edule*) from which the adults obtain nectar;
- Grasses and forbs in which the butterfly larvae find shelter; and
- Spruce woods in which the adults find shelter.

Though information about Oregon silverspot habitat use tends to be dated (OSU 2018), there is no reason to believe that Oregon silverspot butterfly have been extirpated from areas of historical use (except where areas have since been developed), so it is assumed that this species remains within its designated critical habitat.

Conclusion
Because it was determined that the effects of spill response actions on Oregon silverspot butterfly (individuals) are measurable and potentially adverse, we must also assume that the effects of response activities on PBFs—and, therefore, the critical habitat—of Oregon silverspot butterfly may also be affected by these activities. Both the host plant (early blue violet) and associated species could be trampled by spill responders and equipment brought to a spill along the shoreline, or destroyed by cleanup activities such as oiled vegetation removal. It is possible that flat meadow areas could be used to stage equipment and supplies resulting in habitat destruction. The action agencies therefore conclude that the effects of spill response actions on Oregon silverspot butterfly critical habitat are neither insignificant nor discountable and are therefore measureable and potentially adverse.

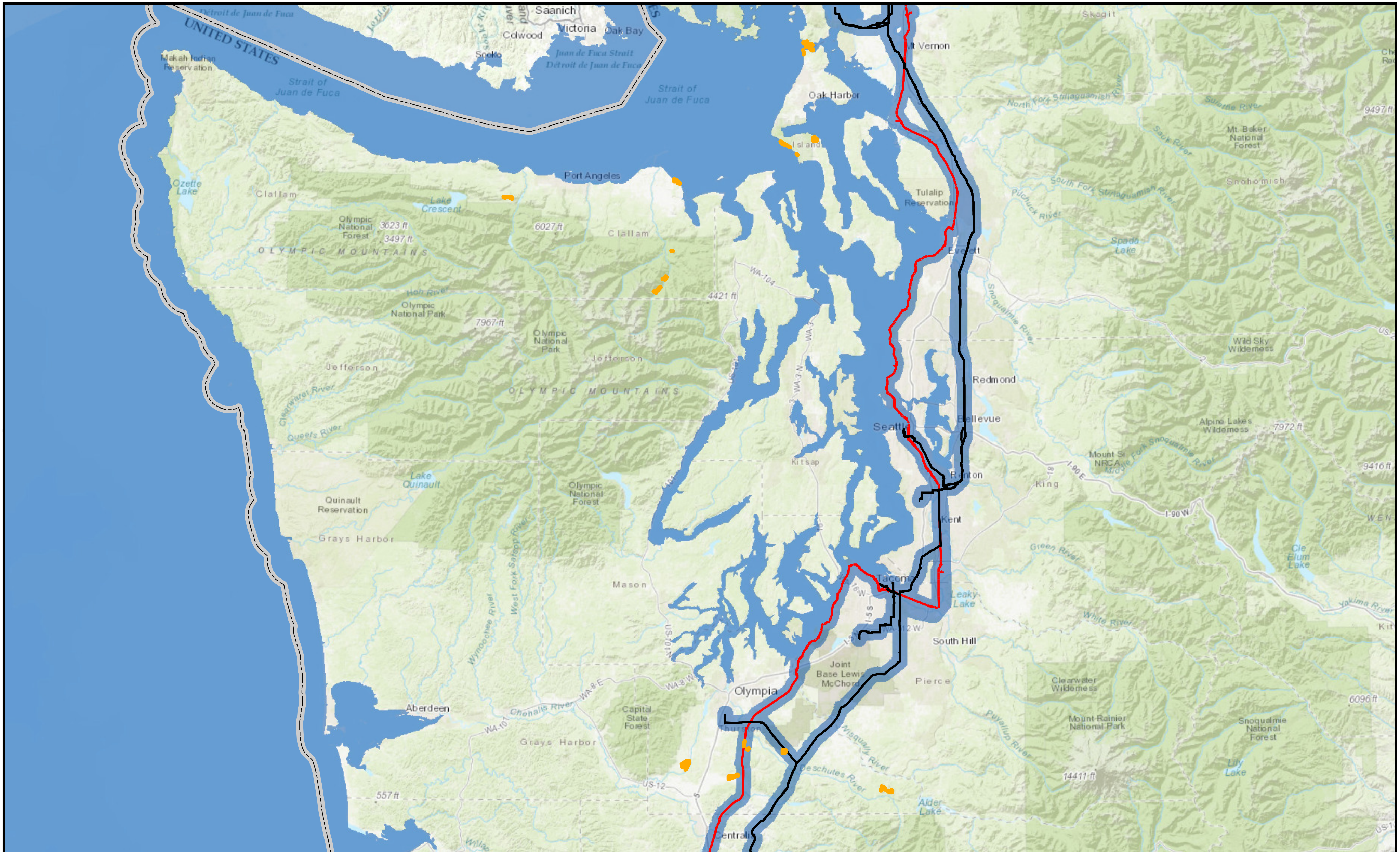
Taylor’s Checkerspot Butterfly (*Euphydryas editha taylori*)
As of 2009, Taylor’s checkerspot occupied eight sites in Washington, one in Pierce County within JBLM and seven in eastern Clallam County (Figure 4-10) (Potter 2016). Surveys have continued since 2009, but none have been successful in locating additional populations in Clallam, Island, Jefferson, Pierce, San Juan, or Thurston Counties. Efforts are underway to reintroduce the species at four sites in the south Puget Sound, including two sites in Pierce County within JBLM and two sites in southern Thurston County (Linders et al. 2015).

According to Potter (2016), "the remaining Taylor's checkerspot populations in Washington inhabit a variety of conditions: six occur in balds, old forest clearings, and forest road edges between 244 and 1219 m (800 and 4,000 ft) elevation, within forests of the northeastern Olympic Peninsula; a single coastal population is extant near Sequim, which uses stabilized dune habitat; and the sole population in the south Puget Sound region inhabits a large native grassland (prairie) site." Of these locations, the only ones in the Action Area, where the species could encounter spill response actions, would be on JBLM, near a petroleum pipeline, or in the south Puget Sound, near a rail line.

Monitoring is conducted annually for the eight remaining populations of Taylor's checkerspot. Monitoring is conducted in Clallam County on JBLM, where the number of individual butterflies ranges between 1,000 and 10,000. Where the checkerspot is being reintroduced in south Puget Sound, population counts have varied, but between 2012 and 2015, over 1,000 individuals were estimated in different one-day surveys (Potter 2016).

Direct Injury – Destruction of plant species with which Taylor's checkerspot is associated could result in destruction of individual caterpillars. Specifically, direct injury to butterflies and caterpillars could occur when a response included off road vehicle use; soil disturbance from construction of barriers pits and trenches; creating or use of new access points; or foot traffic in the Action Area. Also, i*n situ* burning could result in thermal injuries to individual adult butterflies or early life stages that are less mobile than adults.

Change in Behavior – Adult butterflies may be disturbed by responders, resulting in reduced feeding efficiency and added energy expenditure.



- Petroleum Pipeline
- Taylor's Checkerspot Butterfly
- Action Area
- State

Data Sources:
USFWS 2013;
EPA 2018; ESRI 2014

Figure 4-10
Taylor's Checkerspot Butterfly Critical Habitat

0 10 20 40
Miles

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Habitat Degradation – A spill response has the potential to degrade or destroy necessary habitat for Taylor's checkerspot butterflies via the destruction of prairie plants. Loss of habitat is the key stressor for this species, so minor alterations of remnant prairie habitat could affect individual butterflies (e.g., by removing plants necessary as hosts for caterpillars or as nectar sources for adults). Compaction of soils by heavy machinery or vehicles could reduce the ability of nursery plants to germinate and grow. *In situ* burning could temporarily destroy necessary plant life.

Conclusion

Should a spill occur at JBLM or in the South Puget Sound, it is possible that Taylor's checkerspot could be impacted by spill response actions. The action agencies therefore conclude that the effects of spill response actions on Taylor's checkerspot butterfly are neither insignificant nor discountable and are therefore measureable and potentially adverse.

Taylor's Checkerspot Butterfly Critical Habitat

The USFWS designated critical habitat for the Taylor's checkerspot butterfly in areas occupied by the subspecies at the time of listing, as well as unoccupied area that were historically occupied and are considered essential for the conservation of the subspecies. The PBFs of designated critical habitat include:

- Patches of early seral, short-statured, perennial bunchgrass plant communities composed of native grass and forb species in a diverse topographic landscape ranging in size from less than 0.4 up to 40 ha (1 to 100 ac) with little or no over-story forest vegetation that have areas of bare soil for basking;
- Primary and secondary larval host plants;
- Adult nectar sources for feeding that include several species found as part of the native (and one nonnative) species mix on northwest grasslands; and
- Aquatic features such as wetlands, springs, seeps, streams, ponds, lakes, and puddles that provide moisture during periods of drought, particularly late in the spring and early summer

The action agencies identified two locations (i.e., south Puget Sound and JBLM) where, if a spill occurred, the effects of a response action on Taylor's checkerspot butterfly would be neither insignificant nor discountable. Because JBLM has an Integrated Natural Resources Management Plan in place, which provides for the conservation of the species, the Service did not designate critical habitat on these military lands. Therefore, if a spill response were to take place on JBLM, the activities would not affect critical habitat.

However, it is likely that PBF would be affected by spill response actions in south Puget Sound. Particularly, PBFs would be affected if vehicles were to drive off-road or equipment was staged in the prairie habitat; habitat was disturbed by constructing ditches, berms; or vegetation and soil was removed. The PBF for aquatic features, specifically small isolated features, could be impacted if they were altered by the response activities. This affect could be particularly acute if these water features were limited during the dry season months.

Conclusion
The action agencies conclude that, because of the potential for certain activities associated with spill responses (e.g., use of vehicles, excavation of soils, or removal of vegetation), to impact critical habitat PBFs, the effects of spill response actions on Taylor's checkerspot butterfly critical habitat are neither insignificant nor discountable and are therefore measureable and potentially adverse.

4.3.2.4 Fish

Bull Trout (*Salvelinus confluentus*)
Resident and migratory bull trout occur in the Action Area throughout the year. Bull trout, which are iteroparous, spawn each year from August to November in cold, low-turbidity headwater streams. Fry emerge from April to May. Bull trout either reside in their natal streams or migrate to lakes, rivers, or nearshore marine habitats (e.g., estuaries).

The following spill responses have the potential to impact bull trout: use of vessels (due to anchoring); staging area establishment and use (particularly the construction of points of access); foot traffic; booming (due to anchoring); skimming/vacuuming; use of culvert blockages or dams; construction of berms, trenches, pits, or other barriers; manual or mechanical removal of oiled substrate; cutting/removal of vegetation, and *in situ* burning (in marine nearshore habitats only).

Direct Injury – Displacement or entrainment of early-life-stage bull trout could occur as a result of vacuuming oil at the surface of freshwater streams. The result of the entrainment of early-life-stage bull trout in vacuums would be death (highest magnitude and longest duration of effect). Often, duckbills are placed over vacuum hoses to maximize the amount of oil and minimize the amount of water collected (thereby reducing unnecessary liquid waste) (EPA 2017); these hose attachments are also expected to decrease the entrainment of fish by decreasing the size of objects that can be entrained. However, a fish picked up by a vacuum would no doubt be injured in the process.

Anchoring of vessels or equipment (e.g., booms or sorbent materials) may result in the disturbance or destruction of bull trout redds. Due to the remoteness and elevation of streams where bull trout typically spawn, such streams are unlikely to be exposed to a spill of oil, and it is very unlikely that responders would be able to use vessels in shallow, high-elevation streams.

Foot traffic in streams may occur in the course of spill response actions. Foot traffic could disrupt redds, so it will be minimized to the extent possible, and consistent paths through streams will be used by personnel to reduce the footprint of potential substrate disturbance. The EU will provide responders with information on spawning times and locations (e.g., streams), which will inform the response and which actions should be taken, including those that may require foot traffic in streams.

In situ burning does not result in the transfer of significant heat through water (Bryner et al. 2003), so the intense heat produced by burning will not affect bull trout.

Change in Behavior – Light disturbance is not expected to significantly adversely impact bull trout. Rather, bull trout will likely avoid lights in response areas, which may reduce bull trout exposures to other spill response and baseline-associated (e.g., oil) stressors (low-magnitude, short-duration, potentially beneficial effect).

Exclusion from Resources – Booming is not likely to exclude bull trout from necessary resources, because booms cannot effectively be placed in very shallow streams or across fast-flowing streams. In order to ensure boom success, booms need to be set at angles to the current and staggered through a stream to either collect oil or deflect it away from a resource. Bull trout will therefore be able to swim under or around booms in streams. In very shallow streams (where booming will be ineffective), oil may be allowed to wash out into higher-order streams and rivers, where booming is possible, or underflow dams may be used.

The use of dams or culvert blockages has the potential to exclude the upstream or downstream migration of bull trout, which could have a significant effect on the growth, development, and reproductive success of bull trout (high-magnitude, long-term effects). The purpose of either response would be to protect more sensitive, downstream habitats or resources, so dams and culvert blockages should have an overall benefit relative to the baseline condition (i.e., unrestricted movement of oil). In order to minimize the exclusion of bull trout from resources, dams and culvert blockages will be removed as soon as the threat of oiling has ended. These blockages tend to be used for only a few days, so effects should generally be minimal. However, individual bull trout may be excluded from upstream or downstream resources at critical time periods (e.g., spawning), resulting in high magnitude, long term impacts (e.g., natural death prior to spawning). The EU will provide responders with information about spawning and migration times, which should further reduce the potential for impacts.

Toxicity – *In situ* burning could produce residues in bull trout habitat, but those residues will not be toxic (NOAA 2017b). Exposures of bull trout in marine nearshore environments to chemical dispersants and dispersed oil is possible but unlikely. Dispersants and dispersed oil would need to move from open marine water into the nearshore environment. Exposures would be only to highly dilute dispersed oil and dispersant chemicals, which are likely to be insufficient to cause acute toxicity in salmonids (Appendix B). Salmonids are relatively insensitive to chemically dispersed oil.

Habitat Degradation – Destruction of riparian vegetation in order to construct a staging area may cause increased water temperatures and siltation rates and decreased terrestrial prey inputs (high-magnitude, long-term effects). Bull trout are particularly sensitive to changes in water temperature. However, the amount and type of vegetation cleared would be expected to not have an effect on water temperature. Staging areas will be established in the least sensitive areas possible (e.g., areas already cleared of vegetation) away from riparian habitat, and riparian vegetation will not be cleared unless necessary to gain access to oiled rivers, lakes, or nearshore marine habitats. Given the remoteness of headwater spawning streams from areas of high oil spill risk, it is fairly unlikely that bull trout spawning habitat will be exposed to oil or subsequent response actions. Additionally, engineered controls will be put in place to minimize soil erosion and siltation of streams.

Other terrestrial responses, such as the creation of berms, pits, trenches, or other barriers, and the manual or mechanical removal of oiled soils, could impact bull trout habitat. Like the establishment of a staging area, these response actions will result in the removal of vegetation, compaction of sediment, and increased erosion of soils into bull trout streams. Increased sediment load can impact spawning habitat and water quality (potentially high-magnitude, long-term effects). Engineered controls will be put in place to minimize soil erosion and siltation of streams resulting from construction actions.

In situ burning will generate burn residues that may sink and smother benthic habitat. These habitats support invertebrate communities, which in turn support bull trout in marine nearshore habitats. Residues will affect a small area, so the effect on the overall community of bull trout prey species will be low-magnitude. Due to the persistence of residues in the environment, the effects may be long-term.

Conclusion

The potential for impacts to spawning habitats is low relative to other salmonids, given that bull trout exclusively spawn in headwater streams, where a spill is unlikely to occur. However, in the event that a spill were to affect headwater streams or along streams and estuaries where bull trout were present, there is the potential for significant effects. Entrainment of larvae in vacuums is possible. The blocking of culverts and construction of dams will be short term (i.e., several days), and will be done with information on spawning times from the EU; however, blocking streams during critical time periods could impede individual bull trout. Alterations to riparian or floodplain habitats have the potential to result in significant impacts on bull trout and their habitat through siltation and other related effects, though such effects will be minimized to some extent by the implementation of engineered controls on siltation. The action agencies therefore conclude that the effects of spill response actions on bull trout are neither insignificant nor discountable and are therefore measureable and potentially adverse.

Bull Trout Critical Habitat

The 32 critical habitat units designated for bull trout consist of freshwater (riverine/lacustrine), estuarine, and marine (shoreline) habitat and span Washington, Oregon, and Idaho, as well as areas well outside of the Action Area in Nevada and Montana (FR 75 200 63898). Critical habitat units within the Action Area include the Olympic Peninsula and Puget Sound (freshwater, estuarine, and marine), the mainstem UCR and LCR (freshwater and estuarine), the mainstem Snake River (freshwater), and the Upper Willamette River (freshwater), as well as numerous other freshwater basins.

The PBFs of bull trout critical habitat include:

- Springs, seeps, groundwater sources, and subsurface water connectivity to contribute to water quality and quantity and provide thermal refugia;
- Migration habitats with minimal physical, biological, or water quality impediments among spawning, rearing, overwintering, and foraging habitats;
- An abundance of food (e.g., terrestrial organisms of riparian origin, aquatic macroinvertebrates, and forage fish);

- Complex shorelines with features providing a variety of depths, gradients, velocities, and structures; water temperatures ranging from 2 to 15°C (36 to 59°F), with adequate thermal refugia;
- Sufficient and appropriate substrate in spawning and rearing areas; and
- Water flows approximating natural timing for peak, high, low, and base flow; sufficient water quality and quantity to sustain normal reproduction, growth, and survival; and low occurrence of nonnative predatory, interbreeding, or competing species.

Degradation of bull trout critical habitat (i.e., impacted PBFs) could occur as a result of staging area establishment and use (particularly the construction of points of access); construction of berms, trenches, pits, or other barriers; manual or mechanical removal of oiled substrate; use of dams or culvert blockages; use of booms or other anchored equipment, and *in situ* burning.

In freshwater critical habitat for bull trout, food, water, air (dissolved oxygen), and light may be impacted by increased siltation resulting from the clearing of vegetation and compaction of soils when creating a points of access; excavation of oiled soils; or construction of berms, dams, trenches, pits, or other barriers (high-magnitude, long-term effects). Increased soil erosion can result in increased turbidity, which reduces light penetration. Particles suspended in water absorb sunlight and give off heat, resulting in increased water temperatures. Removal of oiled riparian vegetation can result in decreased prey delivery from the terrestrial environment, and decreased shade after plant removal can cause increased water temperatures. The clearing of oiled riparian vegetation would also reduce inputs of terrestrial prey items (e.g., insects) that live in vegetation but periodically enter streams.

The use of dams or culvert blockages has the potential to block the ability of bull trout to migrate within single streams. Culvert blockages and dams will be removed within several days, resulting in a low-magnitude, short-term effect on bull trout critical habitat (though impacts on individual fish may be significant). These blockages will be left in place for only a few days. Prior to constructing dams, responders will coordinate with the USFWS and the EU. As noted above, engineered controls will be put in place to minimize soil erosion and siltation of streams associated with the construction of dams.

The use of booms or other anchored equipment could have a temporary and localized impact on water and sediment quality and prey availability during the placement of anchors. Placing anchors could temporarily suspend sediments and destroy benthic invertebrates over a small area (low-magnitude, short-term effects). Invertebrate communities living in coarse substrates will likely recolonize those substrates quickly (within a month), particularly when considering the small area impacted by an anchor. The use of booms and vessel anchors in the most sensitive bull trout habitat (i.e., spawning habitat) is not likely, due to the remoteness of these areas and the velocity and depth of headwater streams, which may limit the usefulness of booms or other equipment in those habitats. Booms in areas of deeper, flowing water will likely be staggered and angled to collect oil without failing, and they will typically affect only the upper foot of the water column.

In situ burning in marine nearshore areas (estuarine critical habitat) will generate residues that may smother benthic habitats and disturb prey populations. The area affected by residues will be small (low-magnitude), but residues may persist in the environment (long-term).

Conclusion
Based on the overlap of the Action Area with critical habitat designated for bull trout, and the rationale provided above regarding the potential for alterations to riparian or floodplain habitat, there is the potential for lasting impacts on local habitat quality, though BMPs and conservation measures (Table 2-2) will minimize impacts to some extent. Alterations to riparian or floodplain habitats have the potential to result in significant impacts on the riverine habitat of bull trout through siltation, increased water temperatures, and other related effects. Such effects will be minimized by the implementation of engineered controls on siltation. Destruction of riparian habitats (e.g., to establish a point of access) is highly unlikely. The blocking of culverts and construction of dams will be short-term responses (typically lasting no more than four days) and will be performed while taking into account information from the EU on spawning times; still, individual trout may be significantly impacted by barriers to migration. The action agencies therefore conclude that the effects of spill response actions on bull trout critical habitat are neither insignificant nor discountable and are therefore measureable and potentially adverse.

Kootenai River White Sturgeon (*Acipenser transmontanus)*
Kootenai sturgeon are present in the Action Area throughout the year. Spawning occurs between May and July within an 18-km (11.2-mile) reach of the Kootenai River. Juvenile rearing occurs in the Kootenai River and in Kootenay Lake.

The following responses have the potential to impact Kootenai sturgeon: use of vessels (due to anchoring, grounding, or prop wash), establishment and use of staging areas (including points of access), booming (due to anchoring) construction of berms or other barriers, manual or mechanical removal of oiled substrate, and cutting/removal of vegetation.

Direct injury – The use of anchors to secure booms, vessels, or other equipment has the potential to disrupt or destroy larval Kootenai sturgeon that live within the interstices of sediment. The use of anchors to secure booms in rivers is not typically done because booms are most often anchored to shorelines.

Change in Behavior – Intense light conditions are thought to adversely impact larval white sturgeon (Gadomski and Parsley 2005). Avoidance of light in response areas may reduce exposures to oil (baseline condition) or other spill response-related stressors, but more light may also increase the predation of larvae by other fish, a high-magnitude, indirect effect. Light-related effects will be short term, limited to the duration of the spill response activities. Overall, the effect of lights used during spill response actions is expected to be insignificant primarily because of the short duration of use (i.e., several days).

Exclusion from Resources – Spill response actions are not expected to exclude Kootenai sturgeon from necessary resources.

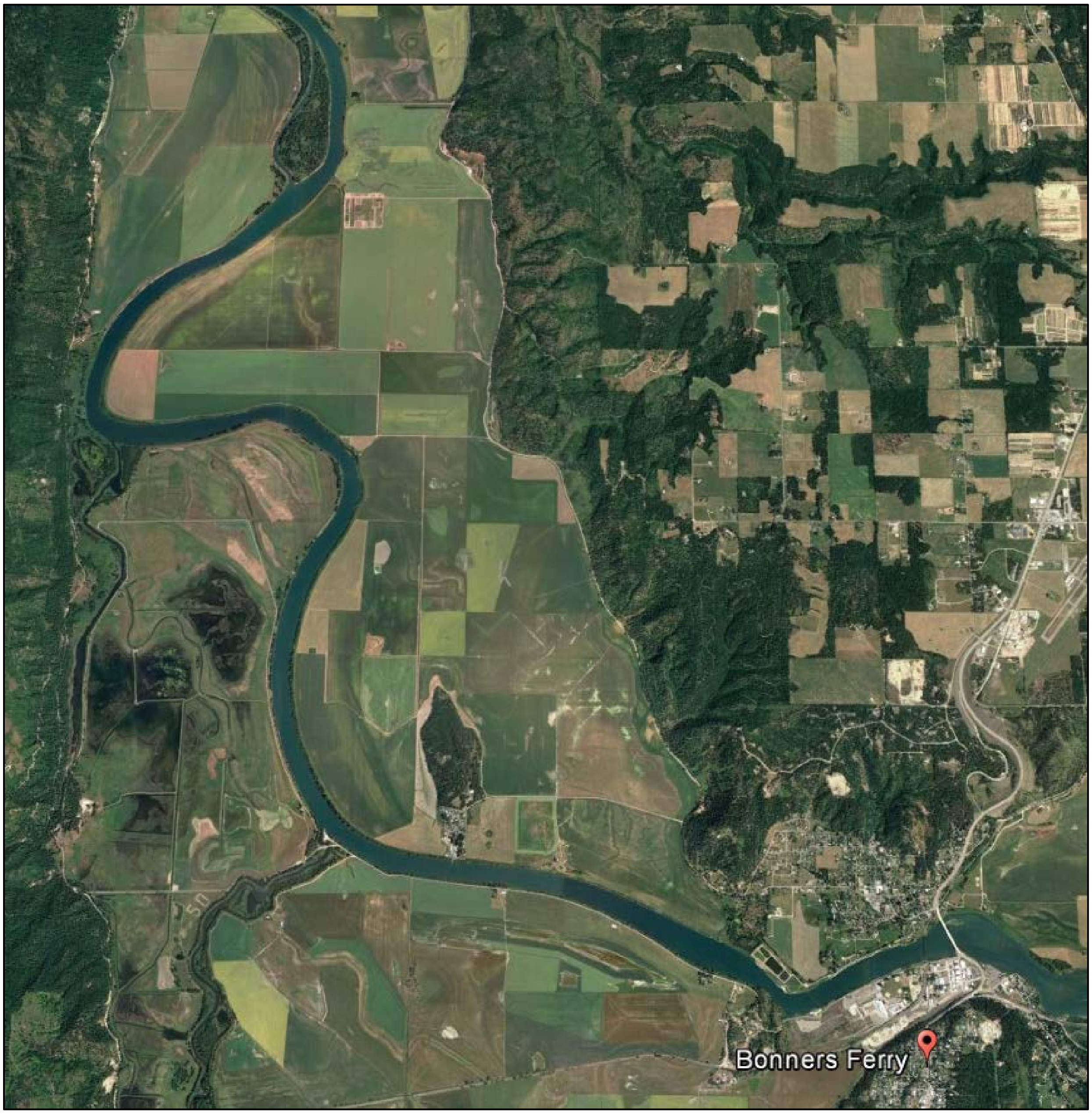
***Toxicity* –** Spill response actions are not expected to have toxic effects on Kootenai sturgeon.

***Habitat Degradation* –** Clearing of vegetation to establish staging areas or points of access, excavation of oiled sediments, or the construction of earthen barriers could impact Kootenai sturgeon, though it is expected that such impacts will be insignificant. Upon hatching, white sturgeon yolk-sac larvae undergo yolk-sac depletion, after which they begin to feed externally; the timing of yolk-sac depletion is dependent on ambient water temperature, which may be impacted if response activities cause increased siltation and turbidity.[48] Decreased dissolved oxygen and delivery of terrestrial prey may also negatively impact Kootenai sturgeon. However, the Kootenai River is a large body of water and any decrease in dissolved oxygen or increase in water temperature would not be discernable from a localized spill response. At the same time, increased turbidity resulting from increased sediment runoff may have the beneficial effect on Kootenai sturgeon of reducing predation of larvae (Gadomski and Parsley 2005). In general, it is not expected that vegetation will need to be cleared in order to establish staging areas or to conduct other response actions. Staging areas can be placed in previously cleared areas (e.g., in Bonner's Ferry, Idaho) in order to minimize the impact of spill response actions. Existing points of access (e.g., roads and boat launches) will be used. Figure 4-11 shows the range of Kootenai sturgeon critical habitat and several areas that have been previously cleared of vegetation or developed (either for urban or agricultural use). If construction activities will be conducted, then engineered controls will be put in place to minimize siltation of streams. Also, the EU must approve the removal of vegetation. These conservation measures and BMPs will minimize the impacts of potential construction activities associated with a spill response.

Anchoring of equipment and vessels in Kootenai sturgeon habitat has the potential to cause highly localized (low-magnitude) disturbance of benthic habitat. Benthic invertebrate communities that support sturgeon may be affected in these areas. It is expected that anchoring in coarse substrates (e.g., gravel and cobbles) throughout the sturgeon habitat will have a fairly short-term effect on invertebrate communities (e.g., less than one month), directly, and on Kootenai sturgeon, indirectly.

Conclusion
Based on the rationale provided above regarding the potential effects from anchors (direct injury), light (changes in behavior potentially leading to death), and construction activities (siltation of streams), there is the potential for lasting impacts on Kootenai sturgeon. However, various conservation measures and BMPs will be implemented that will minimize such impacts (Table 2-2). The action agencies therefore conclude that the effects of spill response actions on Kootenai River white sturgeon are insignificant.

[48] Sediment particles absorb more heat from sunlight than water, and the heat given off by particles is then transferred to surface waters.



Source: (Google Earth 2014)

Figure 4-11 Satellite Imagery of Kootenai Sturgeon Critical Habitat Area

Kootenai River White Sturgeon Critical Habitat

For the 17.7-km (11-mile) reach of the mainstem Kootenai River, Kootenai sturgeon critical habitat PBFs are specifically focused on adult migration, spawning site selection, and survival of embryos and yolk-sac larvae, the latter two of which are the life stages now identified as limiting the reproduction and abundance of the Kootenai sturgeon. Critical habitat degradation could occur as a result of establishment and use of new staging areas or points of access, excavation of oiled soils, or construction of barriers near the Kootenai River (due to removal or destruction of terrestrial and riparian vegetation).

During the spawning season, PBFs for Kootenai sturgeon include an adequate flow regime during the spawning season (May through June); 1) that approximates natural variable conditions and is capable of producing depths of 7 m (23 ft) or greater when natural conditions, and 2) that approximates natural variable conditions, and is capable of producing mean water column velocities of 1.0 meters per second (3.3 feet per second) or greater when natural conditions, 3) water temperatures between 8.5 and 12 °C (47.3 and 53.6 °F), with no more than a 2.1 °C (3.6 °F) fluctuation in temperature within a 24-hour period, 4) at all times that limits sediment deposition and maintains appropriate rocky substrate and inter-gravel spaces for sturgeon egg adhesion, incubation, escape cover, and free embryo development, and 5) submerged rocky substrates in approximately 8 continuous river km (5 RM) to provide for natural free embryo redistribution, behavior, and downstream movement.

Flow regime is the primary characteristic in the PBFs of critical habitat. Flow regime that affects depth, velocity, temperature, and sediment delivery are particularly meaningful during the spawning season (May through June). The primary response activities used on a large rivers such as the Kootenai River including the use of vessels, booming, establishment and use of staging areas, and manual or mechanical removal of oiled substrate are not expected to affect the flow regime within critical habitat. Nor are they expected to affect submerged rocky substrates. The action agencies conclude that the effects of spill response actions on Kootenai River white sturgeon critical habitat are insignificant.

Lost River Sucker (*Delistes luxatus*)

Lost River sucker are present throughout the year in a limited geographic ranged within the Action Area, specifically the Upper Klamath Lake and Iron Gate and J.C. Boyle Reservoirs. Lost River sucker spawn in streams and rivers from February to May; larval suckers emerge by mid-July and drift into lakes or rivers.

The following responses have the potential to impact the Lost River sucker: use of vessels (due to anchoring, grounding, or prop wash), establishment and use of staging areas (including points of access), booming (due to anchoring) construction of berms or other barriers, and manual or mechanical removal of oiled substrate, and cutting/removal of vegetation.

***Direct Injury* –** Entrainment of larval sucker during vacuuming of oil could result in death; however, vacuums will be used at the immediate water surface, where oil pools, which may reduce the potential for entrainment of suckers in the water column.iThe use of flat-head nozzle hose attachments would further reduce the potential for entrainment of fish by decreasing the size of objects that could be entrained.

The anchoring of vessels, booms, or other equipment has the potential to impact spawning habitats, potentially resulting in the mortality (highest magnitude and longest term effect) of early-life-stage Lost River sucker. Anchoring of booms is not typically done because booms can be anchored to shore. The area affected by anchors will be small. Anchoring in general is, therefore, expected to have an insignificant effect on Lost River sucker.

***Change in Behavior* –** The use of lights at the response site during nighttime has the potential to affect early-life-stage sucker, which may be attracted to lights (Mueller et al. 1993). Suckers may be drawn to the surface, where exposures to oil or to response actions occurring at night (and associated effects) (e.g., entrainment in vacuums) may be exacerbated. Therefore, the magnitude and duration of effects resulting from other spill response actions may be modified by the use of lights during a response action.

***Exclusion from Resources* –** Culvert blocking and dams have the potential to disrupt migration of fish; however, the use of either tactic in the Upper Klamath Basin is unlikely. Most streams will be too large or have too strong a flow to make either method feasible. Using either method in Upper Klamath Lake is likewise unfeasible. Therefore, neither spill response action is expected to exclude Lost River sucker from their resources.

***Toxicity* –** Though *in situ* burning may produce burn residues in Lost River sucker habitat, these residues are non-toxic (NOAA 2017b).

***Habitat Degradation* –** Disturbance or destruction of riparian and shoreline habitat may occur as a result of the construction of berms, trenches, pits, or other barriers; manual or mechanical excavation of soils; and the establishment of a new staging area or points of access. This may, in turn, cause increased water temperature and siltation rates and decreased terrestrial prey inputs. Impacts to water quality could further result in reduced growth, reproduction, and survival of Lost River sucker (long-term, high-magnitude effects). It is not expected that a staging area will need to be constructed in the Upper Klamath Lake Basin, which is surrounded by development (Figure 4-12). There are several boat launch sites (points of access) around Upper Klamath Lake and developed roads leading to and from the lake and its tributaries. Also, much of the basin has already been cleared for agricultural use. Therefore, it should not be difficult to determine points of access that will minimize environmental damage (even though a GRP for the region does not currently exist). In order to minimize the impacts of siltation and erosion of Lost River sucker habitat, engineered controls will be put into place (e.g., silt curtains). Prior to construction activities, responders will coordinate with the EU and USFWS as necessary. Construction activities will be closely monitored. Traffic associated with the response will be restricted to durable surfaces to the extent possible. Engineered controls will be put in place to minimize soil erosion and siltation of streams and lake substrates.

The anchoring of vessels, booms, or other equipment has the potential to cause low-magnitude, localized impacts on benthic habitat. This may result in the loss of a small portion of the Lost River sucker's prey. This impact is expected to be short term (e.g., invertebrates recolonizing within days or weeks) in areas where substrates are dominated by gravels (e.g., riverine habitat) and longer term (e.g., invertebrates recolonizing after one year) where substrates are dominated by soft sediments (e.g., lacustrine habitat).

Conclusion

Because of the close proximity of an oil railway to Upper Klamath Lake, it is possible that a spill and associated spill response will occur in Lost River sucker habitat. A spill response has the potential to impact Lost River sucker habitat and to cause direct injuries to individual fish. Conservation measures (Table 2-2) will minimize potentially high-magnitude and/or long-term effects to individuals and their habitat. The action agencies therefore conclude that the effects of spill responses actions on the Lost River sucker are insignificant.

Lost River Sucker Critical Habitat

Critical habitat designated for Lost River suckers is distributed in Klamath and Lake Counties, Oregon, as well as Modoc County, California (77 FR 73739). In southern Oregon, freshwater critical habitat includes the Upper Klamath Lake; the Williamson, Sprague, and Wood Rivers and Crooked Creek upstream of Upper Klamath Lake; and the Link and Klamath Rivers and Lake Ewauna downstream of Upper Klamath Lake. The Action Area overlaps with these freshwater critical habitats along the east side of Upper Klamath Lake, intersecting with portions of the aforementioned rivers.

The PBFs for Lost River sucker critical habitat include sufficient water quantity, complexity, depth, quality, and connectivity for survival including multiple water depths for various life stages, water temperatures <28°C (82.4°F), water pH <9.75; dissolved oxygen concentrations >4 milligrams per liter, low levels of microcystin,[49] and unionized ammonia <0.5 milligrams per liter. Other PBFs include natural (or like-natural) flow regimes; substrates suitable for spawning (e.g., gravel and cobble), adequate stream velocity, and emergent vegetation in spawning and rearing habitats; and an adequate supply of food items (e.g., insects and crustaceans). Critical habitat degradation may occur as a result of manual or mechanical removal of oiled substrate, construction of berms, trenches, pits, or other barriers, booming (due to anchoring), and the use of vessels and heavy equipment.

The clearing of vegetation in order to manually or mechanically remove oiled substrates, or to construct berms, trenches, pits, or other barriers could result in increased siltation, water temperatures, and nutrient loads (potential influencing ammonia and algal productivity, which in turn affect microcystin levels), and decreased dissolved oxygen (all potentially high-magnitude, long-term effects). Prior to clearing vegetation, responders will need to obtain approval from the EU, and coordination with the USFWS may be requested. Only moderately to heavily oiled materials will be removed. Excavation of substrates and clearing of plants will be closely monitored to prevent excess erosion and the destruction of plant root structures. When doing construction, engineered controls will be put in place to further limit erosion and siltation. Altogether, these conservation measures will minimize the impacts of construction responses in Lost River sucker critical habitat.

[49] Microcystins are a group of toxic chemicals produced naturally by cyanobacteria.

Source: (Google Earth 2014)
Note: yellow line indicates major highway (Oregon Route 140)

Figure 4-12 Satellite Imagery of Upper Klamath Lake and Vicinity

Habitat complexity, benthic prey availability, and water quality (e.g., turbidity, dissolved oxygen, and temperature) could be impacted by the destruction of aquatic vegetation or sediment disturbance caused by anchoring of vessels or response equipment (e.g., booms), vessel prop wash. These response actions will be localized to a small area and will have low-magnitude, temporary effects on Lost River sucker critical habitat. Plants will be able to regrow, and benthic invertebrate communities will recolonize disturbed sediments within a fairly short time frame (e.g., one year);

invertebrate community recovery may be slower (less than one year) in lacustrine sediments, though the magnitude of effects on sucker will still be minimal. Last, suspended sediments will settle to the bottom over a short time frame.

Conclusion
Lost River sucker critical habitat overlaps with the Action Area, and there is the potential for impacts on critical habitat from a spill response. However, impacts will be temporary and insignificant, or conservation measures (Table 2-2) will minimize significant impacts. The action agencies therefore conclude that the effects of spill response actions on Lost River sucker critical habitat are insignificant.

Shortnose Sucker
Shortnose sucker are present in the Action Area throughout the year, specifically in Upper Klamath Lake and the Iron Gate and J.C. Boyle Reservoirs. Spawning occurs from February to May, primarily over gravel substrates in Upper Klamath Lake, Williamson River, and in sections of the Sprague River.

Due to the many similarities in habitat (e.g., Figure 4-12) and life history between shortnose and Lost River suckers, the potential effects on shortnose sucker of spill response actions are assumed to be the same as for Lost River sucker (see previous sections).

Conclusion
Because of the close proximity of an oil railway to Upper Klamath Lake, it is possible that a spill and associated spill response will occur in shortnose sucker habitat. A spill response has the potential to impact shortnose sucker habitat and to cause direct injuries to individual fish. Conservation measures (Table 2-2) will minimize long-term and/or high-magnitude effects to individual shortnose suckers and their habitat. The action agencies conclude therefore that the effects of spill response actions on shortnose sucker are insignificant.

Shortnose Sucker Critical Habitat
There are two units of critical habitat designated for shortnose sucker in Klamath and Lake Counties in southern Oregon. The first unit includes Upper Klamath Lake, the Wood, Sprague, Williamson, Link, and Klamath Rivers, Crooked Creek, and Lake Ewauna; the second unit is entirely outside of the Action Area (around the Gerber Reservoir). PBFs for shortnose sucker critical habitat are the same as those described above for Lost River sucker freshwater critical habitat. Due to the similarities in habitat type, critical habitat PBFs, and geographic range between the shortnose and Lost River suckers, the potential effects of response actions on PBFs for shortnose sucker critical habitat are assumed to be the same as those for the Lost River sucker critical habitat, described above.

Conclusion
Shortnose sucker critical habitat overlaps with the Action Area, and there is the potential for impacts on critical habitat from a spill response. However, the most likely impacts will be temporary and insignificant, or conservation measures (Table 2-2) will minimize significant

impacts. The action agencies therefore conclude that effects of spill response actions on shortnose sucker critical habitat are insignificant.

4.3.2.5 Herptiles

Oregon Spotted Frog (*Rana pretiosa*)

The Oregon spotted frog is found in wetland, freshwater shoreline, and terrestrial habitats along rivers and streams throughout central Oregon and Washington (Figure 3-32). Extant populations of the species that overlap with the Action Area occur along the Deschutes River in Oregon and in Thurston County, Washington. The habitat associated with Oregon spotted frog within the Action Area is likely to be dominated by shallow wetlands with low or negligible flow, extensive emergent vegetation, and nearby terrestrial habitats with dense vegetation (Pearl and Hayes 2004). Riverine habitat is not typically used by the Oregon spotted frog, though river-fed backwaters and sloughs with negligible flow or river fringes with slow-moving water and extensive vegetation may be used.

The following types of response actions have the potential to impact the Oregon spotted frog : use of vessels, aircraft, vehicles, or heavy machinery, establishment and use of new staging areas, booming (due to anchoring), skimming/vacuuming, construction of trenches, berms, pits, or other barriers, passive collection of oil with sorbents, cutting/removal of oiled vegetation, physical herding, ambient temperature, low pressure flooding/flushing, and *in situ* burning.

Direct Injury – *In situ* burning in wetlands and along the banks of rivers or in terrestrial habitat could have a significant impact on the Oregon spotted frog. Fire is accompanied by intense heat, which could kill frogs in close proximity to the flame (highest-magnitude, longest-term effect). Prior to burning, responders will coordinate with the EU to understand the resources at risk, a site survey will be conducted to evaluate if Oregon spotted frogs are present, and the RRT will need to give approval. Implementation of these measures will minimize injuries to the Oregon spotted frog that could result from an *in situ* burn. Though possible, there is a low likelihood that wildlife monitors will detect frogs during the site survey.

Impacts on the Oregon spotted frog from vacuuming may include the entrainment of frog larvae (tadpoles), which may result in death (highest-magnitude, longest-term effect). Tadpoles may avoid anthropogenic activity (e.g., disturbance of water surface), similar to a predator avoidance response. Impacts on frogs from vacuuming are expected to be minimized by close monitoring of operations in sensitive areas and the proper use of vacuum equipment (e.g., keeping the intake hose at the water surface); the use of a flat-head nozzle may further reduce the potential for entraining tadpoles and metamorphosed frogs.

Change in Behavior – Traffic is expected to increase in the Action Area during a spill response (for the purpose of spill tracking and wildlife monitoring at a minimum), but it is not expected that noise generated by vessels, vehicles, or heavy machinery will have a high-magnitude effect on the behavior or fitness of Oregon spotted frogs. Kruger and Du Preez (2014) found that increases in anthropogenic noise, specifically noise generated by air traffic, caused some species of frog to alter call frequencies and rates to overcome the resultant signal disruptions. Therefore, increases in anthropogenic noise may cause Oregon spotted frogs to alter call frequencies or styles to overcome the noise generated by vessels or air traffic. Noise associated with response actions will be limited in both duration and area and will have low-magnitude impacts on frogs.

Physical herding and flushing in wetlands may be used to force oil in stagnant waters into containment areas. The use of water at high volumes will disturb the surface of the water, likely causing behavioral avoidance in Oregon spotted frogs. The disturbance caused by physical herding will be localized to the response area and will last only as long as the response, typically no more than four days. Overall, this action is expected to result in a low-magnitude behavioral effect (due to the localized area) over a short time period. The alternative to physical herding (i.e., baseline condition) would be to leave the oil in place, allowing frogs and their habitat to possibly be exposed. Disturbing frogs from oiled areas may reduce their overall exposures to oil (a potentially beneficial effect).

Exclusion from Resources – Culvert blocking is not expected to significantly affect Oregon spotted frogs because culvert blockages will be temporary and will not significantly affect the hydrology of permanent or semi-permanent wetlands or streams. Oregon spotted frogs do not typically move between breeding sites and other habitats through culverts; even without blockages, culverts pose a hindrance to movement (Cushman and Pearl 2007).

Toxicity – Smoke generated by *in situ* burning may cause respiratory injuries to Oregon spotted frogs (high-magnitude, potentially long-term effect). In order to avoid smoke-related exposures, responders must implement the SMART protocol and gain approval from the RRT. As part of SMART, responders will monitor the area for the presence of wildlife as well as local weather conditions (e.g., wind direction), although due to the small size of Oregon spotted frogs, this will not likely provide adequate protection for the species. *In situ* burning will also generate burn residues that could sink to the bottom of waterbodies, where Oregon spotted frogs could be exposed. The small amount of burn residue generated would have little potential to cause toxicity due to the low bioavailability of contaminants (e.g., metals and PAHs) within the residue matrix (NOAA 2017b) (low-magnitude, long-term effect due to persistence of residues in the environment). Responders must have a plan in place to recover residues, although the collection of sunken residues in wetlands may not be practicable; the effort expended to collect residues (either manually or mechanically) could force residues deeper into soft sediments. Collection will likely involve the use of hand tools or nets to capture floating residues. Regardless, the toxicological effects of residues on the Oregon spotted frog are expected to be minimal.

Habitat Degradation – Anchoring booms, other equipment, or vessels in soft, freshwater sediments could have a very minor, localized impact on Oregon spotted frog habitats. Benthic invertebrate communities (e.g., emergent insect larvae) could be disturbed by anchors being placed or dragged, but this effect will be localized. Such an impact on the overall prey base of Oregon spotted frogs will be very low magnitude and short-term because emergent invertebrate communities (i.e., insects) will likely recover after a short time (e.g., less than one month). Algae and other dietary items of tadpoles will not likely be measurably impacted by anchors.

The loss of vegetation and compaction of soils caused by increased foot, vehicle, and heavy machinery traffic; the construction of berms, trenches, dams, or other barriers; the excavation of oiled sediment; or the establishment of a new staging area are not expected to impact Oregon spotted frog. The species is predominately aquatic rather than terrestrial, so the removal of terrestrial vegetation will not significantly reduce their habitat. Though these response actions may increase siltation in aquatic habitat, conservation measures (Table 2-2) will be used to reduce this effect. For example, engineered controls will be put into place to control erosion and siltation.

Removal of oiled aquatic vegetation may reduce the amount of areas that are utilized by the frogs for basking. Impacts to vegetation will be temporary because plants will regrow over time. The magnitude of impacts related to vegetation removal will likely be low, though they could be long-term if vegetation is entirely removed (including root structures).

Ambient temperature, low pressure flushing may be used in marshes and wetlands to refloat oil on the surface of soft sediments or to move oil out of thick emergent vegetation. The use of ambient temperature, low pressure flushing could re-suspend sediments at the same time as oil, resulting in increased turbidity, water temperature, and decreased dissolved oxygen. These impacts on water quality could temporarily affect Oregon spotted frog during the egg and tadpole life stages. In order to minimize this impact, flushing will be done using a low pressure. It is not likely that flooding will be applied in Oregon spotted frog habitat, which is dominated by soft sediments; flooding is only appropriate for coarse substrates (e.g., along marine shorelines).

In situ burning in wetlands or in terrestrial habitat could have a significant impact on Oregon spotted frog habitat. Fire is accompanied by intense heat, which will destroy vegetation in close proximity to the flame. However, saturation of soils and standing water provides a substantial barrier against the transfer of heat, thereby protecting the root structures of wetland plants from fire (Bryner et al. 2003). Regrowth of vegetative cover may take several months. Therefore, the effect of burning will be temporary but long-term. The magnitude of the effect will depend on the areal extent of the burn. Prior to burning, a site survey will be conducted to evaluate if Oregon spotted frog are present, the EU will be consulted, and the RRT will need to give approval. These measures will reduce impacts to Oregon spotted frog habitat; however, the ability of wildlife monitors to detect Oregon spotted frog will be limited by their size and cryptic behavior.

Conclusion

If response activities took place in occupied Oregon spotted frog habitat, the potential impact could be significant. Wildlife monitoring of the species will be challenging due to their small size, therefore avoidance of the species may be difficult. Response actions such as *in situ* burning, construction of staging areas or barriers, or vegetation clearing could have immediate impacts on individual frogs and their habitat. Particular care should be taken when conducting any type of construction around wetlands, where frogs may hide among vegetation. *In situ* burning should be limited to fully inundated areas, where impacts on frogs and habitat will be minimized. Based on these considerations, the action agencies conclude that effects of spill response actions on Oregon spotted frog are neither insignificant nor discountable and therefore measurable and potentially adverse.

Oregon Spotted Frog Critical Habitat

There are 14 critical habitat units for the Oregon spotted frog spanning western Washington and Oregon. The majority of critical habitat for this species lies well outside of the Action Area; two critical habitat units in northwestern Washington (Whatcom and Thurston Counties) and two units in southern Oregon (Deschutes and Klamath Counties) overlap with the Action Area. In Oregon, the critical habitat areas for the Oregon spotted frog that overlap with the Action Area are found along the Upper Deschutes River and its tributaries, from Bend, Oregon, to Long Pine Slough, south of La Pine, Oregon. In Washington, critical habitat exists in the upper stretches of Beaver Creek, a tributary of the Black River in Washington (south of Olympia), and in the Sumas River immediately south of Nooksack, Washington.

The PBFs for the Oregon spotted frog are ephemeral or permanent freshwater breeding, rearing, nonbreeding, and overwintering habitats; each if these habitat types have specific characteristics. Freshwater breeding and rearing critical habitat should be hydrologically connected by surface water flow to a permanent water body that is inundated for a minimum of 4 months per year, with a gradual topographic gradient (<3% slope) from shallow water toward deeper in permanent water, herbaceous wetland vegetation or structurally similar, shallow water areas with high solar exposure or short canopy cover, and the absence or low density of nonnative predators. Overwintering habitat should be inundated from October through March. Nonbreeding habitat includes wetland habitat with a <50% (total surface area) vegetative cover. Another PBF for Oregon spotted frog is ephemeral or permanent freshwater bodies with a <5 km (3.1 miles) linear distance from breeding areas and with impediment-free aquatic movement corridors. There must also be refuge habitat including sufficient dense vegetation and/or an abundance of woody debris in breeding, rearing, nonbreeding, and overwintering habitat to provide refuge from predators.

The following responses have the potential to impact critical habitat for the Oregon spotted frog: new staging area establishment and use; foot, vehicle, and heavy machinery traffic; manual or mechanical excavation of oiled substrate; construction of trenches, berms, pits, or other barriers; removal of oiled, vegetation; booming and passive collection; skimming/vacuuming; and *in situ* burning.

The construction of new staging areas near Oregon spotted frog critical habitat will not typically be needed due to the location of their habitats relative to the Action Area (e.g., near major roadways). In the rare instance that a new staging area would need to be established, upland vegetation will likely be cleared, but aquatic vegetation will not. It will not be possible to place a staging area in or very near wetlands habitat, so the potential for vegetation required by Oregon spotted frog (aquatic vegetation) to be removed is low.

As noted in the previous section, foot, vehicle, and machinery traffic and spill responses requiring construction (e.g., of berms, trenches, or other barriers) or the excavation of soil are not expected to have a significant impact on Oregon spotted frog habitat. These actions, though they may result in the destruction of terrestrial habitats fringing aquatic areas where Oregon spotted frog live, these terrestrial habitats are infrequently used by Oregon spotted frog.

Prior to removing vegetation, the EU must give its approval, and input from the USFWS may be requested. The removal of vegetation will focus on heavily oiled material, so that long-term exposures of critical habitat to oil do not occur. Ideally, root structures will be left in place when removing vegetation, so that regrowth is possible. Cleared vegetation may take several years to regrow; however, the purposeful removal of oiled vegetation will be localized, and spotted frogs will be able to seek out cover beyond the response site.

Booming and passive collection may be used in wetlands, though these methods are not expected to significantly impede the movement of frogs within critical habitat areas (or affect other PBFs); frogs will be able to move under and around booms or sorbent materials. If booms or passive collection methods are not used, then significant exposures of frogs to oil could be expected (though this is not an impact of responses activities on critical habitat PBFs), so booming and passive collection will have a beneficial effect overall on the Oregon spotted frog. Placement or dragging of anchors will not affect PBFs of Oregon spotted frog critical habitat.

Skimming and vacuuming or monitored natural recovery may be practicable options for wetland areas. Monitored natural recovery may be selected for wetlands habitats to avoid the working of oil deeper into soft sediments. Skimming and vacuuming would not likely result in impacts on vegetation or other PBFs of Oregon spotted frog critical habitat.

In situ burning in wetlands could have a significant impact on Oregon spotted frog habitat. Fire is accompanied by intense heat, which will destroy vegetation in close proximity to the flames. Wetlands plants are not likely adapted to fire, though it is possible that regrowth of plants will occur after the burn. Marsh plant regrowth after burning is not inhibited when soils are inundated (due to the low transfer of heat from flames through water), but vegetation elevated above inundation will be destroyed (Bryner et al. 2003). Regrowth will likely require more than a month. Therefore, *in situ* burning is expected to have a high-magnitude, long-term (non-permanent) impact on emergent aquatic plants. The magnitude of the effect on critical habitat will also depend on the areal extent of the burn; a large burn could remove substantial vegetation, whereas a small burn would have a smaller effect. Prior to burning, the RRT will need to give approval, and a site survey will be conducted to evaluate if Oregon spotted frog are present. Additionally, prior to burning any vegetation, the EU needs to give approval. These measures will ideally preclude impacts to Oregon spotted frog critical habitat.

Conclusion

The removal of oiled vegetation and *in situ* burning have the potential to cause high-magnitude and long-term (but non-permanent) effects on Oregon spotted frog critical habitat by eliminating aquatic vegetative cover used by the species. However, conservation measures (e.g., seeking approval from the RRT prior to burning and reviewing materials made available by the EU) may reduce the potential for such impacts by informing responders of the appropriateness of certain response actions in Oregon spotted frog critical habitat. Regardless, it is the conclusion of the action agencies that potential long-term and high-magnitude effects of spill response actions on Oregon spotted frog critical habitat are neither insignificant nor discountable and therefore measurable and potentially adverse.

4.3.2.6 Mammals

Columbian White-tailed Deer (*Odocoileus virginianus leucurus)*

The CWTD is found in forested areas along the Columbia River (in Columbia and Clatsop Counties of Oregon and Cowlitz, Clark, and Wahkiakum Counties of Washington) and generally selects areas that offer both food (e.g., grasses, forbs, and low shrubs) and cover (Figure 3-35). The most-important aspect of CWTD habitat appears to be the available food supply within or close to escape cover. Habitat loss is the primary stressor for CWTD. Vehicle strikes also pose a significant threat, particularly to translocated individuals. The Lower Columbia River GRP provides useful information regarding the presence of CWTD and response strategies for areas in which CWTD are present. There is both a rail line and a petroleum pipeline extending along the Columbia River from Longview, WA (and continuing north) toward Portland, OR (and continuing south [pipeline] and east [railway]); a spill from either source could enter the Columbia River upstream of CWTD habitat (e.g., near Cottonwood Island shown in Figure 3-35). Because the pipeline and railway do not appear to pass directly through areas occupied by CWTD, it is most likely that CWTD would be exposed to spill response actions in the Columbia River intended to contain oil as it floats downstream. Upland terrestrial habitats in which CWTD are mostly found are, thus, not likely to be the location of spill response actions.

The following response actions have the potential to impact the CWTD: the use of vehicles or aircraft, foot traffic, and establishment of access points. Shoreline cleanup actions (e.g., flushing) and on-water actions (e.g., booming and skimming) may be used to respond to a spill near CWTD habitat, but they will not, in themselves, cause unique impacts on CWTD. Rather those actions will be associated with the operation of vehicles (including planes and vessels), presence of personnel, and lights and noise, which are discussed below.

Direct Injury – It is possible that CWTD could be struck by vehicles accessing a spill location. Spill reponders will not intentionally drive toward deer, and they will slow or stop their vehicles if deer are spotted along access points to the spill response area. Vehicles will be limited to previously cleared points of access to the extent possible, limiting the potential for interaction with deer that might result from reduced visibility. Vehicle strikes of CWTD tend to occur on major highways (Cowlitz Indian Tribe 2010, as cited in 80 FR 60850), so it is not expected that a strike will occur along access roads.

Change in Behavior – Human presence and the noise generated by humans, vehicles, and heavy machinery have the potential to cause avoidance behaviors in CWTD in excess of what they already exhibit (i.e., in response to predators). This could result in decreased foraging on plants, in turn influencing individual growth, reproduction, and survival. Because spill response actions will be temporary, the effect of human presence and noise is expected to be short term (lasting no more than four days) and low magnitude. Responders are not expected to move into terrestrial or riparian CWTD habitat to respond to a spill but may use CWTD habitat to access a spill, if necessary. Access to a spill response area will be limited to established access points (e.g., roads) to the extent possible.

Exclusion from Resource – Spill response actions will not permanently exclude CWTD from their habitat. As noted above, behavioral changes in response to human presence and the operation of vehicles or heavy machinery may cause CWTD to avoid forage habitat close to response activities. This may be seen as a short-term and low-magnitude exclusion from resources (lasting no more than four days). The magnitude is low because of the wide range over which CWTD forage, and responders are not expected to move into terrestrial or riparian CWTD habitat to respond to a spill but may use CWTD habitat to access a spill, if necessary.

Toxicity – *In situ* burning, which could potentially be used in riverine systems, is very unlikely to be used in the Columbia River. The Lower Columbia River GRP indicates that *in situ* burning (as well as chemical dispersant use) is not an option for spill response except in marine open water (>3 miles from population centers), which is well away from CWTD habitat.

Habitat Degradation – The removal or destruction of vegetation resulting from the establishment of access points through riparian habitat has the potential to degrade CWTD habitat. In particular, this action could impact plants that provide forage or cover for CWTD. Soil compaction by vehicles or foot traffic could also reduce vegetative cover over the long term, resulting in reduced food for CWTD. Established access points will be used to the extent possible to limit the potential effects of establishing a new access point on CWTD habitat. If a spill were to occur in the Columbia River, it is not likely that a significant amount of oiling of downstream terrestrial vegetation (in uplands of islands and/or riparian habitat) would occur, so the intentional removal of oiled vegetation or substrate is unlikely.

Conclusion

Because CWTD are unlikely to be exposed to many spill response actions, and those actions will largely be limited to shoreline and on-water actions, the potential for exposures and magnitude of effects on CWTD individuals are low. The primary stressor on CWTD posed by spill response is behavioral disturbance resulting from noise and human presence. However, these effects will be short-term (limited to the duration of the spill response) and limited to areas near shorelines or Columbia River waters (rather than terrestrial uplands or riparian habitats). The Lower Columbia River GRP provides important information for responders that will minimize any impacts on CWTD or their habitat resulting from a spill response action. The action agencies therefore conclude that the effects of spill response actions on the CWTD are insignificant.

Mazama Pocket Gopher (*Thomomys mazama*)

Listed subspecies populations of the Mazama pocket gophers (Olympia, Roy Prairie, Tenino, and Yelm pocket gophers) are found in Thurston and Pierce Counties of Washington in well-drained, friable soils of prairie habitats (and some alpine and sub-alpine meadows or meadow-like habitat) east of the Black River and south of Interstate-5 and State Highway 101. These habitats are terrestrial, and pocket gophers obtain water entirely from their diet. Therefore, although the Action Area overlaps with where the species are found and with critical habitat, it is very unlikely that the

Mazama pocket gopher would be exposed to federal spill response actions.[50] Under these circumstances there would not be a federal response to an oil pipeline rupture. However, if a train carrying hazardous materials (other than oil) spilled, the EPA would respond to the spill regardless of the proximity to a water body. Therefore, Mazama pocket gopher could be exposed to a spill response in locations where it occurs in the vicinity of rail lines.

Subspecies populations are present near the airport in Olympia, Washington (Olympia pocket gopher); JBLM (Roy Prairie pocket gopher); near the Rocky Prairie Natural Area Preserve (Tenino pocket gopher); and near the Washington towns of Ground Mound, Littlerock, Rainier, Rochester, and Vail (Yelm pocket gopher). Pocket gophers spend the majority of their time burrowing and foraging underground on plants and tubers, though they also forage above ground within a small distance from their tunnels. Mazama pocket gopher habitat overlaps with Action Area in several places, most prominently in the areas of Olympia (including the nearby towns of Vale and Rainier) and JBLM. One unit train railway runs from north to south through Olympia and the Rocky Prairie Natural Area Preserve. Populations living in areas near Littlerock, Grand Mound, and Rochester are outside the Action Area, and populations on JBLM and in Rainier and Vale, Washington, are only in close proximity to a petroleum pipeline; as noted above, a pipeline rupture in Mazama pocket gopher habitat is unlikely to trigger a federal spill response action.

The following responses have the potential to impact the Mazama pocket gopher: the use of vehicles or heavy machinery, foot traffic, construction of trenches, berms, pits, or other barriers (due to excavation of soils), manual or mechanical removal of oiled substrates, and *in situ* burning.

Direct Injury – It is possible that pocket gophers could be crushed by foot or vehicle traffic or by heavy machinery, resulting in death (highest magnitude, longest term effect); however, this is unlikely; pocket gophers spend most of their time underground and they will quickly flee underground to avoid humans and machinery.

The excavation of soils to create trenches, berms, pits, or other barriers (or to remove oiled soils) has the potential to destroy gopher burrows, possibly killing individuals. When conducting these actions, responders will coordinate with the USFWS and the EU to ensure that permits are obtained and that the response will not impact listed species, and the actions will be closely monitored. These conservation measures will minimize the potential for Mazama pocket gophers to be impacted by construction actions associated with a spill response.

In situ burning has the potential to cause significant thermal injuries to Mazama pocket gophers, if they are directly exposed to flames. It is likely that Mazama pocket gopher will be able to avoid flames by fleeing to or remaining in their burrows. In order to prevent potential impacts of *in situ* burning, SMART protocol are implemented (including wildlife monitoring prior to burning), and approval must be provided by the RRT. Wildlife monitoring will ideally minimize the potential for exposures of pocket gophers to an *in situ* burn. However, it is likely that, even if wildlife

[50] An oil spill must threaten a body of water in order for a federal response to take place. A spill response taken by agencies at another level of government (e.g., state) may still occur, but such a response is outside the scope of this BA.

monitoring is conducted, pocket gophers will not be easily observed because they live almost entirely underground.

Change in Behavior – Human presence and the noise generated by humans, vehicles, aircraft, and heavy machinery have the potential to cause avoidance behaviors in pocket gophers in excess of what they already exhibit (i.e., in response to predators). This could result in decreased foraging on plants for food or nest materials. Either effect could influence individual growth, reproduction, and survival. These effects will be exacerbated during winter or the breeding season, when adequate fat stores and nest materials likely provide greater thermoregulation of burrows and for young. Because spill response activities will be temporary and because Mazama pocket gopher spend only a small amount of time foraging outside of burrows (USFWS 2017c), the effect of human presence and noise is expected to be short term (likely lasting no more than four days) and low magnitude.

The accidental excavation of pocket gopher habitat to remove oiled soil or construct berms, pits, or trenches could result in abandonment of burrows, leading to high levels of stress, abandonment of young, and increased predation. In this extreme circumstance, the excavation of soil or the use of berms, trenches, pits, and other barriers could have a high-magnitude, long-term effect on Mazama pocket gophers. As noted above, conservation measures (Table 2-2) will ideally minimize this extreme circumstance, but the cryptic behavior of pocket gophers will likely prevent them from being spotted by wildlife observers.

Exclusion from Resource – Spill response actions will not permanently exclude Mazama pocket gophers from their habitat. As noted above, behavioral changes in response to human presence and the operation of vehicles or heavy machinery may cause pocket gophers to remain in burrows when they would otherwise forage outside. This may be seen as a short-term and low-magnitude exclusion from resources (likely lasting no more than four days). The magnitude is low because pocket gophers seldom forage outside of their burrows.

Toxicity – *In situ* burning has the potential to cause smoke-related respiratory injuries in Mazama pocket gopher. Smoke would most likely impact gophers while they are foraging outside of burrows or dispersing, though small amounts of smoke could enter burrows (likely low-magnitude, short-term effects due to their ability to escape into burrows if exposed to smoke). Potential exposures would last a matter of hours. In order to prevent potential impacts of *in situ* burning, SMART protocol are implemented (including wildlife monitoring prior to burning), and approval must be provided by the RRT. Wildlife monitoring will ideally minimize the potential for exposures of pocket gophers to smoke from an *in situ* burn. However, it is likely that, even if wildlife monitoring is conducted, pocket gophers will not be easily observed because they live almost entirely underground.

Habitat Degradation – The temporary degradation of pocket gopher habitat could occur as a result of the excavation of soils in areas where gopher have built burrows during the removal of oiled soil or the construction of berms, pits, trenches, or other barriers. Although the result of destroying burrows on individuals could be catastrophic (e.g., resulting in mortality), the overall change to Mazama pocket gopher habitat (i.e., composition of soils) is expected to be negligible. For example, burrows can be reestablished in remaining soils after spill response actions have ended so long as individuals have not been killed or abandoned the affected area. The excavation of significant amounts of soil could result in a long-term impact on pocket gopher habitat. To reduce this effect, excavation will be closely monitored so that an unnecessary volume of soil is not removed. Emergency consultation may be required in instances where extensive soil removal is required in Mazama pocket gopher habitat.

The response actions listed above will also likely result in the clearing of vegetation, which may affect gopher diet and nest building. Prior to clearing vegetation, approval will be sought from the EU, and coordination may be requested from the USFWS. Vegetation will not be removed if it is unnecessary to do so.

Conclusion

The removal of soils, the construction of berms, trenches, pits or other barriers, and the use of *in situ* burning have the potential to impact Mazama pocket gopher. However, conservation measures that includes identifying the locations of pocket gopher burrows will minimize the potential for exposure. The action agencies therefore conclude that the effects of spill response actions on the subspecies of Mazama pocket gopher (Olympia, Roy Prairie, Tenino, and Yelm pocket gophers) are insignificant.

Mazama Pocket Gopher Critical Habitat

A total of 650 ha (1,606 acres) of critical habitat is designated in Thurston County, Washington for three of the subspecies of Mazama pocket gopher: Olympia, Tenino, and Yelm (79 FR 19711); all of these terrestrial critical habitat areas overlap with the Action Area, within 1.6 km (1 mile) of a pipeline or a railroad. As noted in the previous section, federal spill response actions are unlikely in proximity to petroleum pipelines due to the lack of a nexus to surface water; however, a hazardous materials spill along a railroad may trigger a federal response in Mazama pocket gopher critical habitat.

PBFs for terrestrial critical habitat for these subspecies are soils supporting burrowing habits (usually friable, loamy, and deep soils), and areas that are ≥20 ha (50 acres) sufficient for breeding, foraging, and dispersal activities with <10% woody vegetation cover. Also included are vegetative cover suitable for foraging and few barriers to dispersal (e.g., forest edges, roads, abrupt elevation changes, inhospitable soil types or substrate, development of buildings, or open water). Critical habitat degradation could occur as a result of new staging area establishment and use; the manual or mechanical excavation of oiled substrate; and the construction of berms, pits, trenches, or other barriers.

A spill response action will not alter the soil characteristics or woody vegetation cover of Mazama pocket gopher habitat. The establishment of a new staging area (unlikely), the manual or mechanical excavation of soils, and the construction of berms, pits, trenches, or other barriers could result in the removal of vegetation suitable for forage and the creation of temporary barriers to dispersal. Berms, trenches, and pits could block or trap Mazama pocket gophers as they attempt to disperse to new habitat. The magnitude of these impacts will depend on the size of constructed barriers (or excavated pits) and their proximity to active burrows. The dispersal of pocket gophers tends to be within 40 m (43.7 yards) of their natal den, sometimes occurring laterally within the same den (Stinson 2013). Barriers will be removed after the threat of oiling has ended, so the impacts on habitat will be temporary. Prior to excavation of oiled soils or constructing barriers, responders will coordinate with the USFWS and the EU to ensure that needed permits are obtained and that the response will not impact critical habitat, and the actions will be closely monitored. These conservation measures will ensure that Mazama pocket gopher critical habitat is not impacted by construction actions associated with a spill response. The construction of new staging areas in Mazama pocket gopher critical habitat is very unlikely due to the setting of those habitats (e.g., near military bases, airports, freeways, and county roads).

Conclusion
Because it is unlikely that spill response actions will impact the PBFs of Mazama pocket gopher critical habitat (particularly if responders coordinate with the USFWS and the EU when conducting construction-related actions), the action agencies conclude that the effects of spill response actions on Mazama pocket gopher critical habitat are insignificant.

4.3.2.7 Birds

Marbled Murrelet (*Brachyrampus marmoratus*)

The marbled murrelet is found in terrestrial, riverine/lacustrine, shoreline, and marine nearshore habitats (including the Salish Sea) from California to Alaska. Marbled murrelets spend >90% of their time at sea. Their preferred marine habitat includes sheltered, marine nearshore waters within 1 to 2 km (0.6 to 1.2 miles) of shore where they forage in relatively shallow waters (typically either at the surface or <10 m [33 ft]) (USFWS 1997). Foraging occurs diurnally (in the morning and evening). During the non-breeding season (late September through March in Washington and Oregon), murrelets disperse and can be found farther from shore (Strachan et al. 1995). In terrestrial habitats, marbled murrelets are dependent upon mature forests, or forests with a mature tree component, for nesting habitat up to 113 km (70 miles) from the coast (81 FR 51348).

The major factor for the decline in marbled murrelet is loss of older forests with the associated nesting sites and poor reproductive success in the habitat that does remain (57 FR 45328). At the time of listing the species, the USFWS noted that oil spills and gill-net fisheries were also a threat to the species. Marbled murrelet are among the most vulnerable of seabirds to nearshore oil spill because they spend such a large portion of their life in nearshore areas near shipping lanes, are flightless for up to two months during the pre-breeding molt, and form feeding aggregations of tens to hundreds of birds where prey are concentrated (EPA and USCG 2015). Stress during the flightless molt stage is expected to be greater than during times of the year when murrelet can fly.

Only a small portion of the marbled murrelet nesting habitat overlaps with the coastal buffer portion of the Action Area. These areas are in a few places on the Washington and Oregon Coasts: in the Bone River Natural Area Preserve in Willapa Bay, north of Manzanita, at Tillamook Bay, and south of Cape Lookout State Park (Figure 4-13). It is unlikely that the marbled murrelet would be exposed to spill response actions in these few areas. The species is most likely to be exposed to response actions while in the marine nearshore environments, including the Salish Sea. They will be most sensitive to spill response actions during the molting season, beginning in late summer and ending in December (Ralph et al. 1995); individual birds will be flightless during this period. Most adults appear to leave the marine area prior to molting, though there are many who stay in marine nearshore habitats during that time (Ralph et al. 1995).

If a spill were to occur in the marine nearshore environment, the following types of response actions could be used that may adversely impact the marbled murrelet: the use of vessels and aircraft, *in situ* burning, chemical dispersants, and physical herding in open water; use of vehicles and heavy machinery, ambient temperature low pressure flooding/flushing, woody debris or shoreline vegetation removal, and the construction of berms or other barriers in marine shoreline habitats. Both *in situ* burning and chemical dispersant use will be limited in nearshore environments to the case-by-case zone.

***Direct Injury* –** Vessels and aircraft associated with spill response actions could strike individual murrelets, resulting in injuries and potentially death (highest magnitude and longest duration effects). However, murrelets will likely be deterred from the area of response activities by the noise of equipment and the presence of responders. The potential effects from encounters with vessels and aircraft will be further minimized by monitoring for wildlife to allow responders to avoid murrelets while in transit, even during the molting season.

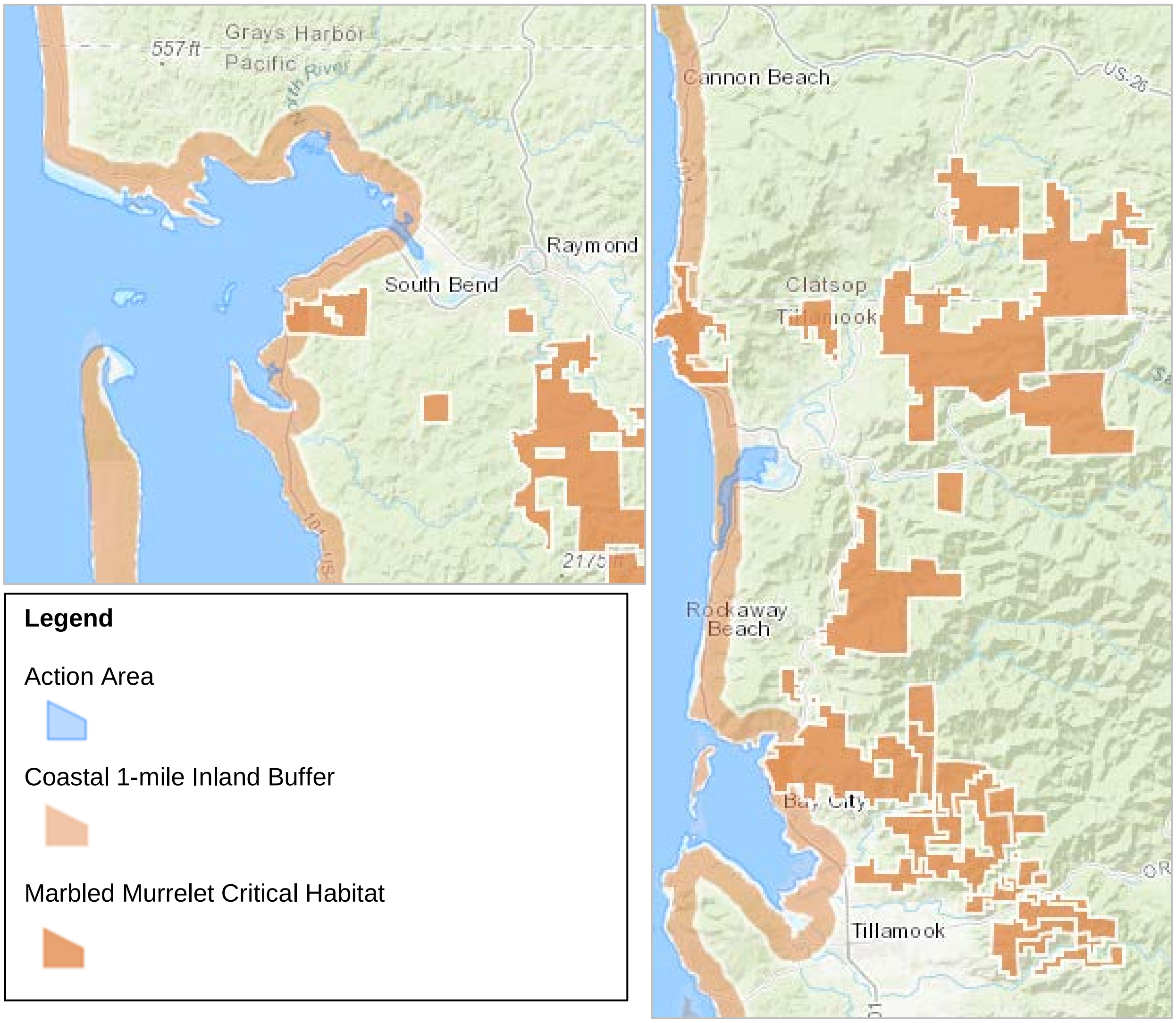


Figure 4-13 Areas of Marbled Murrelet Critical Habitat Overlapping with the 1-mile Inland Coastal Buffer of the Action Area

Change in Behavior – Courtship, foraging, loafing, molting, and preening occur in the nearshore marine environment. During a spill response, noise associated with human activities and the operation of equipment, aircraft, vessels, and vehicles may affect these types of behaviors (USFWS 2006c). Loud noises and the presence of vessels, humans, or aircraft may cause murrelets to dive, take flight (flush), or abandon a foraging area, and communication between murrelets may be temporarily impeded. These effects may reduce the fitness of murrelets by increasing their energy expenditure and reducing their ability to avoid predators. Flight is not possible during the pre-breeding molt, so diving and rapid swimming behaviors are more likely during that time. Abandonment of forage habitat may not occur if murrelets are able to habituate to noise and human activity, though, in that case, other behavioral effects of noise (e.g., diving, avoidance of vessels and personnel) may continue (USFWS 2011a). Although flushing of murrelets from marine nearshore and open water foraging habitat could reduce feeding efficiency and the amount of food delivered to nestlings, marbled murrelets will be able to fly to other areas to forage. Recent studies using telemetry and modeling have concluded that although human activities may affect the distribution and abundance of the marbled murrelet in the marine nearshore environment, the strongest influence over the distribution and abundance of murrelets is a foraging area's proximity to quality nesting habitat (Raphael et al. 2015; Lorenz et al. 2016). Overall, behavioral effects on marbled murrelet resulting from increased noise and human presence are both low-magnitude and short-term (limited to the duration of the spill response; days to weeks). Flight during the molting season is not possible, so the level of stress on marbled murrelets near a spill response may be greater during that time. In addition, studies by Raphael et al. (2015) indicate that human activities in the Salish Sea during breeding season appear to influence the distribution and abundance of the murrelet more than in other parts of their range. Wildlife monitors will continually observe for wildlife in the response area and appropriate measures will be taken to avoid interactions with marbled murrelet (e.g., halting a response or hazing and deterring wildlife from the area). Alternatively, if no action is taken to limit interactions with murrelets in the spill response area, then significant exposures to oil (associated with the baseline condition) may occur, resulting in significant adverse impacts. Therefore, there is expected to be a net benefit relative to the baseline condition to marbled murrelet from responding to an oil spill. Due to the short duration of response activities (often most intense within the first 96 hours), it is expected that behavioral effects related to noise and human presence during a spill response will be insignificant (USFWS 2010d).

Exclusion from Resources – Spill response actions are not expected to exclude marbled murrelet from resources. However, short-term behavioral effects (likely lasting no more than four days) may dissuade marbled murrelets from certain areas where they could forage. Murrelet, though potentially able to forage in other areas, may also remain in areas where food is highly abundant, particularly during the pre-breeding molt (when they are flightless) (USFWS 2011d). If murrelets do not abandon foraging habitat, then the quality of habitat will be diminished due to noise, but they will not be excluded from resources in that case.

Toxicity – Smoke generated by *in situ* burning may cause respiratory injuries to marbled murrelet (high-magnitude, potentially long-term effect). In order to avoid smoke-related exposures, responders must implement the SMART protocol and gain approval by the RRT. As part of SMART, responders will monitor the area for the presence of wildlife as well as local weather conditions (e.g., wind direction).

In situ burning may generate small quantities of burn residue, which could be ingested by murrelet while feeding. The toxicity of burn residues appears to be negligible (NOAA 2017b), so ingestion is not likely to cause significant toxicological impacts on murrelets.

The majority of marine nearshore habitat occupied by marbled murrelet is closer to shore than the dispersant pre-authorization zone, which extends between 3 and 200 nautical miles from the coast. However, the use of dispersants could be approved closer to shore on a case-by-case basis. In either case, dispersants use during a response action may impact murrelets. Specifically, direct exposures of marbled murrelets to dispersants (e.g., as a result of overspray or wind-transport away from the oil spill area) may cause the loss of the insulating properties of feathers (Duerr et al. 2011). The loss of insulating properties could result in hypothermia and mortality of murrelets (high-magnitude, long-term effects). In order to effectively apply chemical dispersants in an oil spill response action, SMART protocol are followed. Based on information collected during monitoring, responders may know whether marbled murrelet are in the area and whether wind conditions are appropriate for spraying chemical dispersants; the ability of monitors to detect birds on the water will depend on the sea state and wind conditions (USFWS 2011d). Chemical dispersants will not be applied if conditions are not appropriate or if wildlife will be exposed. Therefore, conservation measures associated with chemical dispersion (Table 2-2) will minimize the potential impacts of chemical exposures on marbled murrelet. It is expected that exposures of murrelets to dispersants and dispersed oil already in the water will be negligible because dispersants rapidly dilute into the water column after application (Appendix B; EPA and USCG 2015).

Habitat Degradation – Although marbled murrelets use the marine nearshore environment to forage and those habitats may be adversely impacted by chemical dispersion (i.e., decreased water quality below the ocean surface), the removal of oil from the ocean surface will have a significant beneficial effect on the overall habitat quality of marbled murrelet. Murrelets rest on the surface of the ocean, where oiling will be significant under the baseline condition, likely resulting in significant exposures to oil and acutely toxic effects (e.g., death). The removal of oil from the surface by dispersing the oil into the water column will reduce the potential for significant exposures of murrelets to oil. When diving, chemical dispersant and dispersed oil exposures will increase, resulting in direct exposures of diving murrelets as well as murrelet prey to dispersed oil. The impact of chemically dispersed oil on marine fish species and invertebrates will generally be low due to the short duration of exposures (e.g., hours rather than days or weeks), rapid dilution of oil into the water column, and wide distribution of prey species across murrelet foraging areas (Appendix B; EPA and USCG 2015).

The use of *in situ* burning could result in residues entering the water column, potentially affecting aquatic prey species. As noted, the toxicity of residues is negligible, suggesting that effects on murrelet habitat (via impacts on their prey) will also be negligible.

Shoreline response actions that may disturb or result in the erosion of surface sediments (e.g., physical herding, ambient temperature low pressure flooding/flushing, woody debris or shoreline vegetation removal, and the construction of berms or other barriers) could impact beach-spawning, forage fish prey of marbled murrelet (e.g., surf smelt and sand lance). It is not clear whether the loss of some early-life-stage forage fish will have a notable impact on those populations of fish and a subsequent effect on the ability of murrelet to forage on a broader scale. Localized response efforts are not expected to significantly affect prey populations. Removing oil from shorelines is expected to have a net benefit for beach-spawning fish over the long-term because they will be exposed to less oil for a shorter duration after the oil has been removed; leaving the oil in place on shorelines could result in significant exposures to oil, potentially lasting multiple spawning seasons.

Conclusion

The likelihood that marbled murrelet will be exposed to spill response actions in their nesting habitat is very unlikely because only a few areas overlap with the coastal buffer of the Action Area. In the marine nearshore environment, murrelet may be exposed to response actions, and exposures during pre-breeding molt seasons are expected to increase the level of stress on murrelets resulting from a spill response. It is possible that direct injury could occur from a vessel strike, in particular when a bird is molting, though much less likely when they are able to fly away from responders. Monitoring for the presence of murrelet will help avoid direct injury, though monitoring may be limited during high winds and sea state. In addition, an increase in noise during spill response from human activities and use of aircraft, vessels, and heavy equipment may disturb important behaviors such as courtship, feeding, and foraging for food for their young, though such disturbance will be of short duration (i.e., days to weeks, depending on the size of the spill). The action agencies conclude that, because of the potential to directly injure molting individuals and to disrupt the feeding of young by adults, the effects of spill response actions on marbled murrelet are neither insignificant nor discountable and are therefore measureable and potentially adverse.

Marbled Murrelet Critical Habitat

As previously stated, marbled murrelets spend the majority of their time in open marine water and nearshore habitat. Inland, they depend on mature forests for nesting habitat. Currently, there are approximately 1.5 million ha (3.7 million acres) of designated critical habitat in Washington, Oregon, and California, which does not include open marine water habitat. Only a few areas of the critical habitat overlap with the Action Area. These areas occur along the Oregon coast, within the 1-mile coastal inland buffer. PBFs for marbled murrelet critical habitat are individual trees with potential nesting platforms and forested areas within 0.8 km (0.5 miles) of individual trees with potential nesting platforms, and with a canopy height of at least one-half the site-potential tree height (average maximum height, given the habitat). Mature forests that are suitable for marbled murrelet nesting would not be destroyed or altered as a result of any spill response action, and the likelihood of a spill response occurring in mature coastal forests is very low.

Conclusion

As noted above, spill response actions will not impact the PBFs of marbled murrelet habitat. The action agencies therefore conclude that the effects of spill response actions on marbled murrelet critical habitat are insignificant**.**

Northern Spotted Owl (*Strix occidentalis caurina*)

Northern spotted owl are present in the Action Area throughout the year inhabiting forests consisting predominantly of Douglas-fir, western hemlock, grand fir, white fir, ponderosa pine, Shasta red fir, mixed evergreen, mixed conifer hardwood, and redwood. The upper elevation limit at which spotted owls occur corresponds to the transition to subalpine forest. Spotted owl primary overlap with the Action Area along lowland areas where rail lines or pipelines run near (within 1 mi) spotted owl habitat (e.g., along the LCR, northwest of Hood Canal, or along the Deschutes River) (77 FR 71876). Designated critical habitat and state management areas have small areas of overlap with the Action Area relative to the overall area used by northern spotted owl.

Direct Injury – Direct injury from spill response to the northern spotted owl is unlikely.

Change in Behavior – The presence of responders, vehicles, vessels, or machinery could adversely impact Northern spotted owl by causing stress or introducing short-term nighttime lights. In extreme cases, owls could be disturbed from nests or foraging areas; however, this is unlikely due to the expected habitat for nests compared with the areas where spill response will take place. Humans and equipment will not likely go into densely wooded areas to respond to a spill, rather they will stay near the rail lines that define the Action Area near spotted owl habitat. Therefore, the potential behavioral disturbance of owls is unlikely. Also, the area of overlap between the Action Area and owl habitat is very small, limiting the potential for a spill response to affect individual owls.

Exclusion from Resources – Northern spotted owl will not be physically excluded from their nesting or roosting habitat by spill response actions, though they may avoid foraging in the vicinity of spill responders and equipment. Given that spill responders are unlikely to move into densely wooded areas to respond to a spill, the magnitude of such an effect would be low (and limited to the duration of the spill response).

Toxicity – There is limited to no potential for northern spotted owl to be exposed to chemicals resulting from spill response actions. *In situ* burning, though unlikely along major waterways such as the Columbia and Deschutes Rivers, could produce smoke and particulates that would impact owls. Owls are not expected to be exposed to burn residues. Based on their habitat use, they would not be exposed to chemical dispersants.

Habitat Degradation – There is some overlap along the Columbia River within the 1-mile buffer. This area is covered in part of the Middle Columbia River Bonneville Pool GRP. This GRP lists 14 boat launches in this area, eliminating the need to create a new access points that would affect owl habitat. It unlikely that the construction of a staging area will impact the owl or its critical habitat in this location. Staging areas will likely be established in existing developed areas and where GRPs are available to guide their placement. Trees will not be cut down during a spill response.

Conclusion

Based on the small overlap of the Action Area with northern spotted owl habitat and the unlikely exposure of owls to significant noise, lights, or presence of humans and equipment during a spill response, the action agencies conclude that the effects of spill response actions on northern spotted owl are insignificant.

Northern Spotted Owl Critical Habitat

Designated critical habitat for the northern spotted owl overlaps with the Action Area along the LCR, northwest of Hood Canal, and potentially along the Deschutes River (77 FR 71876). PBFs essential for the northern spotted owl include mixed forests with sufficient old growth trees, nesting and roosting habitat, and appropriate foraging habitat.

Designated critical habitat and state management areas have small areas of overlap with the Action Area relative to the overall area used by northern spotted owl. There is some overlap along the

Columbia River within the 1-mile buffer. The largest threat to spotted owl habitat is likely the development of new access points and staging areas. Spotted owl critical habitat along the Columbia River is covered in the Middle Columbia River Bonneville Pool GRP. This GRP lists 14 boat launches in the area near the spotted owl critical habitat, eliminating the need to create a new access points that would affect owl habitat. It unlikely that the construction of a staging area will impact the owl or its critical habitat in this location. Staging areas will likely be established in existing developed areas and where GRPs are available to guide their placement.

Conclusion

Based on the limited overlap of the Action Area with northern spotted owl critical habitat and the unlikely need to remove old-growth trees or the destruction of nesting, foraging, or roosting habitat in critical habitat areas. In the locations where critical habitat and the Action Area overlap, there are multiple locations within developments for staging areas.

Based on the limited overlap of the Action Area with northern spotted owl critical habitat and the Middle Columbia River Bonneville Pool GRP available to guide selection of access points and staging areas, the action agencies conclude that effects of spill response actions on northern spotted owl critical habitat are insignificant.

Short-tailed Albatross (*Phoebastria albatrus*)

The short-tailed albatross is a large pelagic seabird with long, narrow wings adapted for soaring above the water's surface. The species ranges over most of the North Pacific Ocean, but its current breeding distribution is restricted to just two locations: the Japanese island of Torishima (a small island 370 mi [595 km] south of Tokyo) and the Senkaku Islands near Taiwan. Relocation efforts are underway—seemingly successfully—to re-establish a breeding colony on Mukojima, a former colony site located south of Torishima (USFWS 2017e).

Although the highest concentrations of short-tailed albatross are found in the Aleutian Islands, Bering Sea (primary outer shelf) regions of Alaska, and northern Gulf of Alaska, post-fledging juvenile birds forage throughout the North Pacific and are observed feeding in the open marine waters of the Action Area. According to recent studies, juvenile birds are distributed along the U.S. West Coast in greater numbers than previously reported (Guy et al. 2013; O'Connor 2013). Figures 3-34 and 3-35 show where short-tailed albatross have been observed along the US West Coast.

If a spill were to occur in open marine water, the following types of response actions could adversely impact short-tailed albatross: use of vessels, use of aircraft, skimming/vacuuming, chemical dispersion, and *in situ* burning. The type of response activities to which short-tailed albatross could be exposed would be restricted primarily to responses to very large spills in open marine water.

Direct Injury – Short-tailed albatross may be directly injured by becoming entangled in response equipment or being struck by a vessel or aircraft. Like many seabirds, albatross are attracted to commercial fishing activities and can become hooked or entangled in gear (USFWS 2008b).

Albatross will be less likely to be attracted to spill response actions because no food will be present. Wildlife monitors will be present during response activities to large spills and will watch for the presence of albatross.

Change in Behavior – During response to a large oil spill in open marine water, response activities may continue into the night. Nighttime operations in open marine water are dangerous and will only be conducted for very large spills. If nighttime operations are necessary, the use of lights may attract short-tailed albatross to the spill response area, increasing their potential for exposure to other response activities or to spilled oil. Because large spills in open marine water are very rare, the potential for the species to be drawn to spill response actions is low.

Exclusion from Resources – Short-tailed albatross breed outside the Action Area and will not be excluded from resources related to breeding. Juveniles travel widely to forage for food, so the potential for intersection between food resources and spill response actions is low.

Toxicity – Observations of juvenile short-tailed albatross in the open marine water of the Action Area are still infrequent but increasing. Individuals could be directly affected by dispersant spray during its application, or by chemically dispersed oil within the approximate footprint of the treated oil. However, because of the infrequent occurrence of short-tailed albatross in the Action Area and the infrequent use of chemical dispersants, the possibility of a bird's presence in an area treated by chemical dispersants is very low. Use of dispersants will lower the risk of the species' exposure to floating oil.

Habitat Degradation – Critical habitat has not been designated for short-tailed albatross, and the birds do not breed in the Action Area. The primary means of habitat degradation is through the reduction in prey, which could occur as a result of the use of chemical dispersion and *in situ* burning. However, juvenile short-tailed albatross forage widely throughout the North Pacific Ocean to feed, and localized activities associated with spill response have a low probability of affecting short-tailed albatross habitat.

Conclusion

The wide-ranging habitat of juvenile short-tailed albatross overlaps with the open marine water habitat of the Action Area. However, the species does not breed in the Action Area, and the highest concentration is found feeding further north in the highly productive areas of the Aleutian Chain, Bering Sea, and the northern edge of the Gulf of Alaska. The type of response activities to which short-tailed albatross could be exposed would primarily be restricted to responses to very large spills in open marine water. Because spills large enough to necessitate the use of nighttime lights in open marine water—which might draw in albatross—are very rare, and because chemical dispersion and *in situ* burning are not likely to affect the species, the action agencies conclude that the effects of spill response actions on short-tailed albatross are insignificant.

Short-tailed Albatross Critical Habitat

Critical habitat has not been designated for short-tailed albatross

Streaked Horned Lark (*Eremophila alpestris strigata*)

The streaked horned lark is found in terrestrial habitats along shorelines and in open grasslands in the south Puget Lowlands in Washington, the Washington coast and LCR islands, and the Willamette River Valley in Oregon. The streaked horned lark is most likely to be impacted by spill response actions in terrestrial environments (the majority of known habitats), but they could also be impacted by a response in the LCR or in Grays Harbor, Washington.

The following responses have the potential to impact the streaked horned lark: use of vehicles, heavy machinery, and aircraft; foot traffic; manual or mechanical removal of oil substrates; the establishment of staging areas (and access points); construction of berms, trenches, or pits; *in situ* burning; and removal of vegetation.

Direct Injury – The use of vehicles, heavy machinery could result in vehicle strikes or the crushing of nests on the ground. Foot traffic may also result in the crushing of nests. Impacts from vehicle strikes include mortality and severe injury (highest magnitude and longest duration of effects); however, these impacts are expected to be very improbable; it is expected that larks will avoid vehicles. Because streaked horned larks are ground-nesting, the use of vehicles and heavy machinery in locations with sparse vegetation and substantial bare ground could result in the death of nestlings. The manual or mechanical excavation of oiled soils will have a similarly damaging effect on nestlings. Inland nesting areas are present around Olympia, Washington, and along the Willamette River Valley; there is an oil pipeline that runs through that area, so a response to a pipeline spill in that area could possibly result in the crushing of nests. Similarly, there is marine oil traffic in Grays Harbor, and a marine (and shoreline) spill response could result in the crushing of nests along the upper portion of beaches (above the high tide line) and in coastal dunes. This is of particular concern for the establishment of staging areas (and access points), if needed, because areas of sparse vegetation and cleared ground are ideal for staging. Also, access points to shoreline response activities tend to be located above the high tide line. Wildlife monitoring in the spill response area (and avoidance of wildlife) will minimize the potential impacts on streaked horned lark associated with foot traffic and the use of vehicles and heavy machinery; however, crushing of nests could still occur. Staging areas will to the extent possible be established in previously developed areas (e.g., paved ground), which will minimize such injuries.

Change in Behavior – During a spill response, air traffic is expected to increase in the Action Area (for the purpose of spill tracking and wildlife monitoring) especially during the first few days of a spill. There are several known lark populations located at airports throughout Willamette Valley, near Portland, Oregon, and near Olympia, Washington. Increased take-offs and landings at these airports may cause additional stress to larks inhabiting these areas, including increased auditory disturbance and altered behaviors (e.g., flushing from foraging habitat or nests). Given that streaked horned larks are commonly observed in close proximity to airfields, they can clearly habituate to noise. As a result, it is expected that airplane noise will have negligible impact on the lark that are nesting near airports. Lark also nest along coast lines and on islands of the LCR. In these areas, where baseline aircraft noise is not elevated, the presence of additional aircraft could have a slightly more pronounced effect; however, such effects are expected to be low-magnitude and short-duration (limited to the first few days of a response). Aircraft will not intentionally approach birds or nests and will fly at high elevations, where they can survey spill trajectories or spot large, marine wildlife (e.g., whales) but where small birds will not likely be behaviorally affected.

Exclusion from Resources – Spill response actions could temporarily cause streaked horned lark to abandon nesting habitats, which would separate nestlings from parents, the nestlings' source of food. Prolonged avoidance of nests by adults or nest abandonment will result in reduce nestling growth or death (high-magnitude, long-term effects). Behavior effects, as noted above, should be limited in terms of magnitude (due to noise habituation in many circumstances) and duration (limited to the duration of spill response actions).

Toxicity – Smoke generated by *in situ* burning may cause respiratory injuries or disorientation to larks flying through smoke plumes (high magnitude, potentially long-term effect). In order to avoid smoke-related exposures, responders must implement the SMART protocol and gain approval by the RRT. As part of SMART, responders will monitor the area for the presence of wildlife as well as local weather conditions (e.g., wind direction). Residues generated by burning oil will be collected to the extent practicable to avoid exposures of wildlife to residues.

Habitat Degradation – Habitat degradation could occur as a result of the removal or destruction of vegetation (forage habitat) when constructing berms, trenches, or pits; establishing a staging area; using heavy machinery; or conducting an *in situ* burn. This could have a "long-term" effect (i.e., longer than one month), because short grasses and forbs may require some time to regrow; however, it is expected that these types of plants will reestablish relatively quickly after soil and vegetation disturbances. It is expected that impacts to habitat will be of a low-magnitude, given that bare ground is also preferred by larks (e.g., for nesting).

Conclusion

Based on the rationale provided above regarding potential impacts on nesting sites used by streaked horned lark, the action agencies conclude that effects of spill response actions on streaked horned lark are neither insignificant nor discountable and are therefore measureable and potentially adverse.

It is recommended that spill responders working on terrestrial spills within the Willamette River Valley or near Olympia, Washington, conduct wildlife monitoring in advance of entering any area of cleared or sparsely vegetated ground that could be used as nesting habitat. This is particularly true if there are not paved surfaces on which to establish a staging area.

Streaked Horned Lark Critical Habitat

Critical habitat for streaked horned lark is designated for two units in Oregon and Washington, which are further subdivided (78 FR 61505). Subunits of critical habitat that overlap with the Action Area include coastal marine/estuarine shoreline and riparian habitat, most of which is located in the LCR corridor and estuary. There is also a small portion of terrestrial critical habitat in the Willamette River Valley that overlaps with the 1-mile buffer around the Willamette River in Marion County, Oregon.

PBFs for streaked horned lark critical habitat are areas having a minimum of 16% bare ground that have sparse, low-stature vegetation composed primarily of grasses and forbs <22 cm (13 inches) in height. Critical habitat degradation could occur as a result of the removal or destruction of vegetation (forage habitat) when manually or mechanically excavating soils; constructing berms, trenches, or pits; establishing a new staging area (unlikely); using heavy machinery; or conducting an *in situ* burn.

Generally, these response actions are expected to have a "long-term" effect because short grasses and forbs may require more than one month to regrow. However, it is expected that these types of plants will become reestablished relatively quickly after soil and vegetation disturbances. It is expected that impacts to habitat will be of a low-magnitude, given that bare ground is also preferred by larks (e.g., for nesting). Prior to construction or *in situ* burning, responders will coordinate with the EU and USFWS to ensure the safety of streaked horned lark and their critical habitat, and response actions will be closely monitored. These conservation measures will reduce the potential impacts of a spill response to streaked horned lark critical habitat.

Conclusion

Based on the limited overlap of the Action Area with streaked horned lark critical habitat and the low potential to have lasting (i.e., permanent) negative impacts on PBFs (assuming that conservation measures [Table 2-2] will be successfully applied), the action agencies conclude that the effects of spill response actions on streaked horned lark critical habitat are insignificant.

Western Snowy Plover Pacific Coast DPS (*Charadrius alexandrinus*)

The Pacific Coast DPS of western snowy plover consists of individuals that nest within 80 km (50 miles) of the Pacific Ocean on the mainland coast, peninsulas, offshore islands, bays, estuaries, or rivers of the US. The western snowy plover primarily breeds above the high tide line on coastal beaches, sand spits, dune-backed beaches, sparsely-vegetated dunes, beaches at creek and river mouths, and salt pans at lagoons and estuaries. Less common nesting habitat includes bluff-backed beaches, dredged material disposal sites, salt pond levees, dry salt ponds, and river bars (USFWS 2007).

The primary reason for the decline in snowy plover is poor reproductive success stemming from human disturbance, predation, and long-term loss of nesting habitat resulting from encroachment of non-native European beachgrass and urban development (58 FR 128646). The western snowy plover is likely to be impacted by spill response actions if spills occur in occupied habitat during the nesting season (mid-March through mid-September). GRPs are available to responders for the coastal areas of Washington and Oregon that have identified existing areas to locate staging areas and access points.

The following responses have the potential to impact the western snowy plover: the use of vehicles and heavy machinery; manual or mechanical removal of oil substrates; air, vessel, and foot traffic; *in situ* burning; removal of woody debris and vegetation; construction of berms and other earthen barriers; ambient temperature, low pressure flooding/flushing; and physical herding.

Direct Injury **–** The use of vehicles or heavy machinery could result in vehicle strikes or the crushing of individual snowy plovers or their nests, which could cause high-magnitude, long-term effects (e.g., injury or mortality). Generally, vehicles are used on sand beaches and restricted to areas along the upper part of the beach, where western snowy plover typically establish their nests. Impacts from the use of heavy machinery or vehicles will be minimized by adhering to conservation measures, including evaluating the need to restrict access to sensitive (e.g., nesting) habitats and reviewing GRPs (Table 2-2). GRPs provide an indication of snowy plover nesting locations or provide methods targeted at avoiding shorebird impacts.

The manual or mechanical removal of oiled substrates or the construction of barriers such as trenches or berms has the potential to destroy nest habitat. Nests could be crushed or removed with excavated substrates, resulting in the death of nestlings (high-magnitude, long-term effect). Prior to and during excavations, responders will monitor for wildlife in the area. Therefore, it is unlikely that nests or individual birds will be injured during the removal of oiled substrates or construction of earthen barriers.

Intense heats are generated by in *situ burning*, and plover nesting habitat and individuals (e.g., nestlings) could be injured. Prior to conducting a burn in potential plover nesting habitat, the area will be monitored for wildlife, and approval will be sought from the RRT. This process will reduce the potential for impacts on plover.

Change in Behavior **–** During a spill response, vehicle and vessel traffic as well as human presence (including foot traffic) and heavy machinery operation may increase in or near snowy plover habitat (as a component of most spill response actions). It is possible that noise generated by air or vessel traffic or vehicles and heavy machinery will affect the behavior and fitness of the snowy plover (low-magnitude, short-term effect). The baseline sources of noise within snowy plover habitats are wind and waves, recreational activity on the beaches, traffic on adjacent roadways, and periodic aircraft noise. Response actions will increase the noise levels above the baseline condition for the duration of the response actions (typically most intense in the first 96 hours). The effect will likely be the avoidance by plover of shoreline response actions for the duration of the spill response. Although the benefits of removing oil from snowy plover habitat will strongly benefit the species, the impact of disturbance and loss of nesting habitat is a concern.

Auditory disturbance associated with response actions may cause nest abandonment or avoidance by snowy plovers, which subsequently may cause missed feeding cycles for offspring and result in decreased fitness in the offspring and potentially starvation (high-magnitude, long-term effect). Noise associated with response actions, including aerial reconnaissance, vacuuming, vessel and vehicle traffic, and the use of heavy machinery will be limited to a short duration (days to weeks) and a limited area and will have limited impacts to snowy plover in the Action Area. Additionally, some GRPs (e.g., North and South Oregon Coast GRPs) provide an indication of snowy plover nesting locations, so responders will be able to avoid nesting areas and minimize potentially significant behavioral impacts. Other GRPs (e.g., Washington Outer Coast) provide response strategies aimed at protecting shorebird populations.

Exclusion from Resources – Spill response actions will not physically exclude snowy plover from their resources, though behavioral modifications in response to a spill response (i.e., avoidance) may exclude plovers from accessing foraging beaches or nesting habitat. Behavioral effects are discussed above.

Toxicity – Smoke generated by *in situ* burning may cause toxic effects or disorientation to snowy plovers, if they fly through the smoke plume (Barnea 1999). In order to avoid smoke-related exposures, responders must implement the SMART protocol and gain approval by the RRT. As part of SMART, responders will monitor the area for the presence of wildlife as well as local weather conditions (e.g., wind direction). *In situ* burning operations in the marine environment can be moved to avoid downwind snowy plover habitat along marine shorelines.

Habitat Degradation – Removal of woody debris and vegetation from occupied snowy plover nesting areas could reduce the suitability of the habitat. Similarly, removing driftwood from targeted unoccupied snowy plover nesting areas would reduce the likelihood that individuals would nest in those areas. The removal of wood debris or vegetation from nesting sites is very unlikely because plovers nest above the high tide line, where oiling of debris will not occur (during a marine spill scenario); therefore the effect of removing debris from plover habitat would be negligible. The removal of debris from below the high tide line could temporarily impact the stability of shoreline sediments, resulting in the loss of shallow benthic invertebrate communities (low-magnitude, short-term effect). After the threat of oiling has ended, preemptively removed debris can be replaced on beaches to provide stability. Alternatively, if moderately- to heavily-oiled substrates are removed (lightly oiled or unoiled debris will likely be left in place), then long-term exposures of shoreline habitats to oil will be minimized and debris will not impede cleanup operations. Shallow benthic invertebrate communities that are displaced after removing debris are expected to become reestablished fairly quickly (e.g., within a month).

Ambient temperature, low pressure flooding/flushing could also result in the loss of surface sediments from snowy plover foraging habitats; however, the use of low pressures (sufficient to remobilize oil but not cause significant shoreline erosion) will largely minimize such losses. The use of ambient temperatures will limit thermal stress on invertebrate communities (plover prey). Additionally, flooding will be limited to coarse substrate shorelines. The benefit gained by refloating and capturing oil from shorelines (reducing exposures of plover and prey to oil) will outweigh the cost of disturbance of benthic invertebrate habitat (a low-magnitude, short-term effect).

While physical herding also has the potential to dislodge fine sediments and flush benthic invertebrates off beaches, as noted, those effects will likely be short term and low magnitude; benthic invertebrate communities are expected to recolonize beaches within days or weeks. During this time plovers will be forced to forage elsewhere rather than go without a sufficient prey. The area affected by physical herding will be fairly small, and the benefit to the habitat resulting from the removal of oil will outweigh any potential effect on plover habitat quality (e.g., prey availability).

Conclusion

Western snowy plovers nest along beaches that fall within the Action Area, where they could be impacted by responders moving along beaches to or from an active response site or by airplanes and boats in the vicinity of plover habitat. These impacts have the potential to cause significant direct injury or behavioral effects. Though wildlife monitoring will be conducted throughout a spill response, snowy plover are cryptic and, therefore, may be difficult to spot while monitoring. Additionally, the removal of large woody debris from shorelines has the potential to reduce habitat complexity by eliminating places of refuge from predators. The action agencies therefore conclude that the effects of spill response actions on the Pacific Coast western snowy plover DPS are neither insignificant nor discountable and are therefore measureable and potentially adverse.

Extensive wildlife monitoring should be conducted prior to entering areas where snowy plover is known or expected to nest. Extreme care should be taken when using motor vehicles along the high-tide line and through beach grasses, where nests could be established but not immediately visible to wildlife monitors. Though noise may cause significant behavioral effects, it will be limited in duration.

Western Snowy Plover Pacific Coast DPS Critical Habitat

Critical habitat areas designated for the western snowy plover that overlap with the Action Area span the Oregon Coast (i.e., Clatsop, Tillamook, Lane, Douglas, Coos, and Curry Counties) and the southern Washington Coast (i.e., Grays Harbor and Pacific Counties) (77 FR 36727). Critical habitat units in these areas are located along marine shorelines within the 1-mile coastal buffer of the Action Area, and they consist of key breeding habitat. GRPs exist for the entirety of this coastal area, and the GRPs for Oregon detail known locations of snowy plover.

PBFs for western snowy plover critical habitat are: areas below heavily vegetated or developed areas and above the daily high tides; shoreline areas for feeding, with no or very sparse vegetation that are subject to tidal inundation but not constantly under water and support small invertebrates (e.g., crabs, worms, flies, beetles, spiders, sand hoppers, clams, and ostracods) that are essential food sources; surf- or water-deposited organic debris (seaweed, driftwood) to attract prey and provide cover or shelter from predators and weather; and areas minimally disturbed by the presence of humans and human-related activities. Spill response actions along marine shoreline habitat are meant to be protective of those habitats by reducing long-term exposures of sediments and invertebrate communities (as well as wester snowy plover) to oil. Critical habitat degradation could occur as a result of the removal of woody debris and vegetation; ambient temperature, low pressure flooding/flushing; and physical herding.

The removal of woody debris, including driftwood and vegetation, from occupied snowy plover nesting areas could reduce the suitability of the critical habitat for nesting. The removal of debris or vegetation from nesting sites is very unlikely because plovers nest above the high tide line, where debris will not become oiled (during a marine spill). The removal of debris from below the high tide line could temporarily impact the stability of shoreline sediments, potentially resulting in disturbance of shallow benthic invertebrate communities (low-magnitude, short-term impact); these communities will likely recover within a month of low-magnitude disturbance. Habitat complexity could also be impaired by removing oiled debris, which provides shelter to plover (potentially high-magnitude, long-term effect). Below the high tide line, removal will focus on heavily oiled debris, which will minimize shoreline instability as well as long-term exposures of the shoreline habitat to oil. If possible, clean debris can be moved above the high tide line prior to oil coming ashore; after the oil has been removed from the shoreline, then the clean debris can be replaced. Driftwood will naturally accumulate on shorelines over time, replacing what was removed during the spill response.

While response actions such as ambient low-temperature flooding/flushing and physical herding may disturb fine sediments on shoreline areas used for feeding or temporarily exclude plover from accessing these areas, the impact of these actions would be short term (days to weeks) and low magnitude relative to the baseline condition. Flushing and physical herding tend to be done with low-pressure in order to minimize the loss of shoreline sediments. Physical herding also tends to be used in areas with stagnant water or physical obstructions (e.g., piers), neither of which will be present in western snowy plover critical habitat. Flooding is used on coarse substrates, which will not be significantly affected in terms of erosion. If these actions are selected for use, then conservation measures will further minimize effects. For example, either action will be closely monitored, booms will be used to collect refloated oil, the flow of water will be directed in such a way that the action does not force oil deeper into sediments, and monitors will keep watch for wildlife.

Conclusion

Though spill response actions are intended to protect shorelines from being exposed to significant amounts of oil, they also have the potential to cause significant (but temporary) disturbances of plover habitat. Noise and human presence during a spill response have the potential to impact a PBF for Pacific Coast DPS of western snowy plover (areas minimally disturbed by the presence of humans and human-related activities). Also, the removal of oiled debris from shorelines has the potential to temporarily degrade habitat complexity and prey availability; the presence of debris is one of the plover’s critical habitat PBFs as well. Based on these potential impacts, the agencies conclude that the effects of spill response actions on the critical habitat of the Pacific Coast DPS of western snowy plover are neither insignificant nor discountable and are therefore measureable and potentially adverse.

5 Cumulative Effects

This section provides an overview of the potential cumulative effects on listed species and their critical habitats that are related to future, non-federal (i.e., state, tribal, municipal, or private) actions reasonably certain to occur in the Action Area. As the NWACP is considered a federal action, spill response planning (by the action agencies) and response activities are not considered cumulative effects. The focus of this section is on species for which an effects analysis conclusion of "neither insignificant nor discountable and are therefore measureable and potentially adverse" was made in Section 4. These species include salmonids, Applegate's milk-vetch, golden paintbrush, Spalding's catchfly, water howellia, Oregon silverspot butterfly, Taylor's checkerspot butterfly, bull trout, Oregon spotted frog, marbled murrelet, streaked horned lark, and Pacific Coast DPS of western snowy plover. With the exception of the plants; each of these species also has designated critical habitat, aspects of which are also discussed in this section (regardless of the effects analysis conclusions for those critical habitats). Stressors identified for this BA that have the potential to cause cumulative effects to the aforementioned species include commercial, recreational, and subsistence fish harvest (including accidental bycatch); urban and agricultural development (including timber harvest); permitted discharges to surface water; and global climate change. There are many other stressors that exist in the region, which have a federal nexus, including the operation of dams and dredging; these stressors are outside the scope of this BA (75 FR 13012).

5.1 Urban and Agricultural Development

As urban populations and agricultural demands grow in the NW, urban and agricultural development is increasing. Loss and alteration of wetland habitat due to urbanization is a major stressor contributing to the decline in Oregon spotted frog occurrence and population size (Hallock 2013). Development has resulted in the fragmentation of habitat for t the Oregon spotted frog, limiting metapopulation dynamics including migration.

Urban and agricultural development has resulted in widespread depletion, fragmentation, and modification of plant and butterfly habitat. The species listed have narrow ecological requirements, which make them particularly vulnerable to changes or loss in their habitat. This is true for Taylor's checkerspot butterfly and golden paintbrush that are affected by the continued degradation, loss, and fragmentation of their native prairie ecosystem (USFWS 2010c). The degradation of habitat includes invasion by non-native plant species (Potter 2016).

Applegate's milk-vetch occurs at six locations around the city of Klamath Falls, Oregon. Two of the locations are on state-protected lands but the other four are threatened by continued development. For example, the largest occurrence of Applegate's mild-vetch is found at the Klamath Falls Airport, which is expanding into wetlands important for the species (USFWS 2009a).

The Oregon silverspot butterfly's primary habitat is salt-spray meadows. Good habitat has been in steady decline due to an increase in residential, business, and recreational development in the coastal prairie habitat (USFWS 2018c).

At the time of listing, water howellia habitats were threatened by destruction or modification by timber harvesting practices, livestock grazing, human-related development, altered hydrology, and invasive species (59 FR 35860). USFWS has updated the status of water howellia and concluded that water howellia is recovering and is more widely distributed than at the time of listing (USFWS 2013c).

Spalding's catchfly is threatened by habitat loss due to human development, habitat degradation associated with grazing and trampling by domestic livestock and wildlife, and invasions of aggressive nonnative plants (USFWS 2007a).

Timber harvest in the NW, particularly in Washington, has resulted in significant degradation of marbled murrelet nesting habitat. In Washington, there was a 29% net loss of potential murrelet nesting habitat between 1993 and 2012 as a result of timber harvest (Desimone 2016).

Increased human activity in the marine environment (e.g., increased vessel traffic, increased fishing, and shoreline alteration) has had a long-term influence on marbled murrelet populations in the Salish Sea (Desimone 2016).

Due to the location of western snowy plover populations, urban and agricultural development are less significant threats to the plover, aside from "human encroachment" due to increased recreational use of marine shoreline habitat. Human recreational activities may degrade important nesting and foraging habitat and disturb nesting, brooding, or foraging plovers (77 FR 36727).

Agricultural and urban development is one of the primary long-term threats to the streaked horned lark due to the conversion (i.e., loss) and degradation of lark habitats. In the Willamette Valley, Oregon, the human population is projected to double by 2050 (78 FR 61451), which will require increased development of urban infrastructure and, in turn, the potential loss of streaked horned lark habitat. Airports are a common habitat for streaked horned larks, and airport expansions have resulted in lost foraging habitat. While there are stressors associated with agricultural activities, agricultural lands also provide some important habitat features for the streaked horned lark. Permanent loss of farmland supporting the species may result from increased population growth and associated suburban development (78 FR 61451).

5.2 Permitted Discharges

Pollution is introduced into freshwater, estuarine, and marine habitats from private (e.g., industrial) and public (e.g., municipal wastewater) sources, and this pollution is regulated by a permitting process. Although the National Pollution Discharge Elimination System program is overseen by the EPA at the federal level, many states, including Washington and Oregon, have primacy over the permitting process for discharges of waste to surface waters within the respective states. Therefore, effects resulting from exposures to permitted discharges within Oregon and Washington can be considered cumulative for the sake of this BA.

By consuming either contaminated fish or invertebrates, marbled murrelet, western snowy plover, and streaked horned lark may in turn be exposed to and accumulate contamination in their bodies (Fry 1995). The accumulation of pollutants such as dioxins/furans, polychlorinated biphenyls, and mercury (among many others) in birds can cause toxic effects resulting in reduced growth, reproduction, and survival (e.g., Scheuhammer 1987; Henning et al. 2003; Augspurger et al. 2008; Burgess and Meyer 2008).

Oregon spotted frogs are not likely to be exposed to permitted discharges, or if they are, exposures will be highly diluted. Oregon spotted frog habitat tends to be ponds, wetlands, and fringes of slow-moving streams in areas of low human development, whereas discharges tend to be into larger streams and rivers or estuaries and marine waters, often in urban areas.

5.3 Climate Change

Climate change has the potential to cause significant adverse changes to freshwater and marine fish habitats in the Action Area (ISAB 2007), including but not limited to reductions in water quantity and quality and altered prey resources. Reduced snow pack and increased glacier and snow melt (as a result of extended warm periods) will eventually lead to less available water and warmer streams; this will be exacerbated by other stressors like water diversion. Warming waters are likely to reduce fish fitness by accelerating the development of embryos, the timing of hatching, and emergence of juveniles. Accelerating these processes too much could result in asynchrony between the emergence of fish and the availability of prey items in the marine environment, which would reduce feeding, growth, and survival (NMFS 2016a). Warming oceans tend to be more acidic and less productive with can lead to a decline in food availability (NOAA Fisheries 2015b).

Salmon physiology and behavior are adapted to local environmental conditions and long-term climate change are likely to influence the species long-term success (NOAA Fisheries 2015b). Possible effects on salmon from climate change include increase in mortality from heat stress, changes in growth and development rates, and disease resistance. Behavioral effects may include shifts in the timing of important life history events such as adult and juvenile migration, spawn timing, and fry emergence.

The fitness of marbled murrelet depends on their ability to obtain prey of sufficient quality and quantity, and the availability of specific prey items is driven by oceanic conditions (Becker et al. 2007). Cooler conditions favor high productivity along the eastern boundary upwelling system off the US West Coast, which in turn generates a greater biomass of murrelet prey items (e.g., rockfish larvae and euphausiids). Warming ocean temperatures could reduce productivity in the eastern Pacific Ocean, which would likely reduce marbled murrelet fitness.

Changes in precipitation patterns in the NW are predicted to impact Oregon spotted frog (Hallock 2013). Summers are projected to be warmer and drier than current conditions, and Oregon spotted frog habitat may desiccate, resulting in the death of eggs or tadpoles. Changes in the geographic distributions of potential predators may also exert pressure on frog populations.

Sea level rise and increased storm surge (resulting from more frequent and intense storms) are significant threats to birds that nest along the coast like western snowy plover and streaked horned lark (Galbraith et al. 2014). Shifting conditions in the polar regions of the Earth will continue to result in the melting of sea ice and an increasing elevation of sea levels. As sea levels rise, beach habitats will become inundated and exposed to wave action at higher elevations, thereby threatening nesting habitats along the high tide mark. These habitats will slowly be lost. Storm surge may speed the erosion of shorelines as well, which could also reduce the availability of suitable beach-nesting habitat.

Changes in weather and climate may also disrupt metapopulation dynamics (e.g., migratory behaviors) in western snowy plover and streaked horned lark (Galbraith et al. 2014). Often, migration is cued by changes in weather or temperature, and patterns in weather and temperature are subtly changing over time. Climate-driven asynchrony between migration timing of different bird populations could result in reduced interbreeding and reproductive success, and asynchrony between predator and prey population presence could result in reduced feeding, growth, and survival.

5.4 Commercial, Recreational, and Subsistence Fishing

Commercial, recreational, and subsistence fishing, which are managed by NW state agencies and tribes, are important activities for many people in the Pacific Northwest. For example, as of 2006, the fishing industry (excluding tribal harvest) in Washington State provided more than 16,000 jobs and contributed $540 million to personal income (TCW 2008). These jobs were mostly related to recreational fisheries. In 2006, 109.4 million pounds of non-tribal commercial fish and shellfish were harvested in Washington. Salmon are the most frequently targeted saltwater species among anglers, and trout are the most frequently targeted freshwater species among anglers. In Idaho, salmon fishing also contributes substantially to the economy, with approximately $90 million coming from recreational fishermen in 2001 (IDFG 2003). Commercial salmon fishing in Oregon generated $17.2 million in personal income on average between 2010 and 2014 (and $18.2 million in 2015) (The Research Group 2016). Commercial fishing provides approximately 15,000 jobs in Oregon. Fishing is also vitally important to NW Native American communities in terms of diet, personal income, and cultural identity.

Harvest of salmon has had a substantial adverse effect on salmon populations, particularly after the introduction of high-yield harvest methods such as gillnets, fish wheels, or horse seining in the late 19th century (Smithsonian 2018). In recent decades, harvest management has substantially reduced the impact of harvest on salmon populations (IMST 2000). Some populations are improving, while others are not (Section 3.2.1.1). These limitations are due in small part to continuing harvest and in large part to the lack of high-quality spawning and rearing habitat (Section 5.1).

6 Determination of Effects

This section provides the action agencies' determinations of effect for ESA-listed species and critical habitats in the NW (Table 6-1). Determinations were made based on the analyses provided in Section 4. Cumulative effects discussed in Section 5, in addition to the species-specific "current stressors and threats" discussed in Section 3, provide additional context to the Services for their biological opinion (BO) of the NWACP; however, cumulative effects and "current stressors and threats" are external to the NWACP (i.e., associated with baseline conditions) and, therefore, are outside the scope of the determinations of effect made in Table 6-1.

Three possible determinations were made: "no effect" (NE), "not likely to adversely affect" (NLAA), and "may affect, and is likely to adversely affect" (LAA). An NE determination indicates that the NWACP will have no foreseeable effect on the ESA-listed species or critical habitat, either in an adverse or beneficial way. An NLAA determination indicates that an effect may occur, but that adverse effects will be discountable or insignificant.[51] An LAA determination indicates that, based on the available evidence, there is a reasonable potential for adverse effects to occur as a result of an implementation of spill response actions in the NWACP. The determination of effects made here have implications for how the species and critical habitats are treated in the Services' BO of the NWACP, and the Services have the ability to concur with or alter the determinations prior to developing their BO.

Separate determinations were made for species and their critical habitat, although the rationales related to habitat degradation often apply to each entity; for this reason, the same rationales in Table 6-1 are often applied to both a species and its critical habitat. When the determinations of effect differ for a species and its critical habitat, then separate rationale are provided for each entity.

[51] "Discountable" and "insignificant" effects are discussed in Sections 4.1.1 and 4.1.2.

Table 6-1 Determination of Effects

Protected Species	Status	Critical Habitat in Action Area?	Determination	Rationale[a]
Responsible Agency – NMFS				
Fish				
Puget Sound Chinook salmon ESU (*Oncorhynchus tshawytscha*)	T	yes	LAA CH: LAA	• Species occurs in the marine and freshwater zones of the Action Area. • Direct injuries to salmon in freshwater streams could occur from entrainment of early-life stages from vacuuming oil at the water's surface. The effects will be minimized by the careful use of vacuums (with flat-head nozzle attachments to reduce intake), but entrainment is still possible. • Changes in behavior could occur from the use of lights during nighttime operations. The presence of responders and walking in streams could cause avoidance behavior. This will be minimized by utilizing GRPs and coordinating response activities with the Services. • Barriers to upstream or downstream migration will last no more than four days but may block migration during critical periods. • Nearshore response activities such as vegetation removal, beach cleaning, and booming could cause physical displacement of salmonids. • Chemical exposures associated with spill responses in open marine water will be of short duration (matter of hours); in the marine nearshore, exposure to dilute chemically dispersed oil is possible and could cause sublethal effects in salmon. Chemical dispersants will not be used in freshwater habitats. • Habitat degradation and alteration of the food web could result from changes in water quality caused by dispersant use, dispersed oil, or burn residues from *in situ* burning.
Snake River fall-run Chinook salmon ESU (*O. tshawytscha*)	T	yes	LAA CH: LAA	See Puget Sound Chinook salmon ESU, above.

Table 6-1 Determination of Effects

Protected Species	Status	Critical Habitat in Action Area?	Determination	Rationale[a]
Snake River spring/summer-run Chinook salmon ESU (*O. tshawytscha*)	T	yes	LAA CH: LAA	See Puget Sound Chinook salmon ESU, above.
Lower Columbia River Chinook salmon ESU (*O. tshawytscha*)	T	yes	LAA CH: LAA	See Puget Sound Chinook salmon ESU, above.
Upper Columbia River spring-run Chinook salmon ESU (*O. tshawytscha*)	E	yes	LAA CH: LAA	See Puget Sound Chinook salmon ESU, above.
Upper Willamette River Chinook salmon ESU (*O. tshawytscha*)	T	yes	LAA CH: LAA	See Puget Sound Chinook salmon ESU, above.
Hood Canal chum salmon ESU (*O. keta*)	T	yes	LAA CH: LAA	See Puget Sound Chinook salmon ESU, above. Freshwater critical habitat does not substantially overlap with the Action Area.
Columbia River chum salmon ESU (*O. keta*)	T	yes	LAA CH: LAA	See Puget Sound Chinook salmon ESU, above.
Lower Columbia River coho salmon ESU (*O. kisutch*)	T	yes	LAA CH: LAA	See Puget Sound Chinook salmon ESU, above.
Southern Oregon/Northern California Coastal coho salmon ESU (*O. kisutch*)	T	yes	LAA CH: LAA	See Puget Sound Chinook salmon ESU, above.

Table 6-1 Determination of Effects

Protected Species	Status	Critical Habitat in Action Area?	Determination	Rationale[a]
Oregon Coast coho salmon ESU (*O. kisutch*)	T	yes	LAA CH: LAA	See Puget Sound Chinook salmon ESU, above.
Lake Ozette sockeye salmon ESU (*O. nerka*)	T	yes	LAA CH: LAA	See Puget Sound Chinook salmon ESU, above. Freshwater critical habitat does not substantially overlap with the Action Area.
Snake River sockeye salmon ESU (*O. nerka*)	E	yes	LAA CH: LAA	See Puget Sound Chinook salmon ESU, above.
Snake River Basin steelhead trout DPS (*O. mykiss*)	T	yes	LAA CH: LAA	See Puget Sound Chinook salmon ESU, above.
Puget Sound steelhead trout DPS (*O. mykiss*)	T	yes	LAA CH: LAA	See Puget Sound Chinook salmon ESU, above.
Lower Columbia River steelhead trout DPS (*O. mykiss*)	T	yes	LAA CH: LAA	See Puget Sound Chinook salmon ESU, above.
Upper Columbia River steelhead trout DPS (*O. mykiss*)	T	yes	LAA CH: LAA	See Puget Sound Chinook salmon ESU, above.
Middle Columbia River steelhead trout DPS (*O. mykiss*)	T	yes	LAA CH: LAA	See Puget Sound Chinook salmon ESU, above.
Upper Willamette River steelhead trout DPS (*O. mykiss*)	T	yes	LAA CH: LAA	See Puget Sound Chinook salmon ESU, above.

Table 6-1 Determination of Effects

Protected Species	Status	Critical Habitat in Action Area?	Determination	Rationale[a]
Pacific eulachon, southern DPS (*Thaleichthys pacificus*)	T	yes	NLAA CH: NLAA	• Effects insignificant. • Spawns in lower portions of major rivers, with the primary run (in the NW) occurring in the Columbia River. • Entrainment in vacuums will be minimized through the use of flat-head nozzles on intakes. • GRPs, ERMA, and EU guidance will be available to responders to avoid impacts on spawning habitat (e.g., caused by anchoring). • Lights will be used only during the spill response, so behavioral effects will be short term (days). • Chemical exposures will be short term (less than 4 hours) in the top few meters of the water column (Bejarano et al. 2014). • Engineered controls (e.g., silt fences and fiber rolls) will minimize impacts on habitat potentially caused by construction-related responses (e.g., berms, trenches, dams, staging area establishment, and soil excavation).
Bocaccio rockfish, Puget Sound/Georgia Basin DPS (*Sebastes paucispinis*)	E	yes	NLAA CH: NLAA	• Effects insignificant. • Generally found in deep waters away from potential effects of response action. • Larvae could be exposed to response, but exposures and effects will be short term (matter of hours) and/or low magnitude. • Entrainment in vacuums will be minimized through the use of flat-head nozzles on intakes. • Lights will be used only during the spill response, so behavioral effects will be short term (days). • Chemical exposures will be short term (matter of hours) or of a low magnitude. • Habitat degradation, if it occurs, will be highly localized and potentially temporary.

Table 6-1 Determination of Effects

Protected Species	Status	Critical Habitat in Action Area?	Determination	Rationale[a]
Yelloweye rockfish, Puget Sound/Georgia Basin DPS (*S. ruberrimus*)	T	yes	NLAA CH: NLAA	See bocaccio rockfish, Puget Sound/Georgia Basin DPS, above.
Green sturgeon, southern DPS (*Acipenser medirostris*)	T	yes	NLAA CH: NLAA	• Effects insignificant. • Species is present in deep, open marine water and coastal embayments. • Species is present in the Action Area as late juveniles, subadults, and adults. • The species could come into contact with dispersants and dispersed oil; these life stages are expected to have low sensitivity to chemical dispersants and dispersed oil (Appendix B) (due to larger size). • Spawning habitat does not occur in the Action Area. • Habitat effects (including impacts to PBFs), if they occur, will be highly localized and temporary.
Sea Turtles				
Leatherback sea turtle (*Dermochelys coriacea*)	E	yes	NLAA CH: NLAA	• Effects insignificant. • Leatherback sea turtles are present in the Action Area to forage in marine nearshore and open water habitat during summer and fall. • The species does not nest in the Action Area. • On-water spill response operation time is typically short in duration (four days or less). • Wildlife monitoring during response action will minimize potential for vessel strikes and entanglement with equipment.

Table 6-1 Determination of Effects

Protected Species	Status	Critical Habitat in Action Area?	Determination	Rationale[a]
Green sea turtle, East Pacific DPS (*Chelonia mydas*)	T	no	NLAA	• Effects discountable. • Potential for exposure to spill response actions is extremely unlikely because: o the species is rarely present in the Action Area because of its intolerance for cold water; o the species does not feed or nest in the Action Area; and o on-water spill response operation is typically short in duration (four days or less).
Olive ridley sea turtle (*Lepidochelys olivacea*)	T	no	NLAA	• Effects discountable. • Potential for exposure to spill response actions is extremely unlikely because: o the species is rarely present in the Action Area because of its intolerance for cold water; o the species does not feed or nest in the Action Area; and o on-water spill response operation is typically short in duration (four days or less).
Loggerhead turtle, North Pacific Ocean DPS (*Caretta caretta*)	E	no	NLAA	• Effects discountable. • Potential for exposure to spill response actions is extremely unlikely because: o the species is rarely present in the Action Area because of its intolerance for cold water; o the species does not feed or nest in the Action Area; and o on-water spill response operation is typically short in duration (four days or less).

Table 6-1 Determination of Effects

Protected Species	Status	Critical Habitat in Action Area?	Determination	Rationale[a]
Marine Mammals				
Blue whale (*Balaenoptera musculus*)	E	no	NLAA	• Effects discountable. • Potential for exposure to spill response actions is extremely unlikely because: o the species is has an extensive home range and is rarely present in the Action Area; o the species does not feed or calve in the Action Area; and o on-water spill response operation is typically short in duration (four days or less).
Fin whale (*B. physalus*)	E	no	NLAA	• Effects discountable. • Potential for exposure to spill response actions is extremely unlikely because: o the species has an extensive home range and its use of the Action Area is thought to be limited; o the species does not calve in the Action Area; and • on-water spill response operation is typically short in duration (four days or less).
Humpback whale, Central America DPS (*Megaptera novaeangiliae*)	E	no	NLAA	• Effects insignificant. • Species is large and easily detected by wildlife monitors. • Conservation measures (e.g., the establishment of buffer zones) will minimize interactions with large whales in the Action Area. • Chemical exposures are not expected to have significant impacts on whales, particularly given the short duration of exposures (hours) and rapid dilution of chemicals. • Underwater noise generated during the response will last only as long as the response action, typically no more than four days. • On-water spill response operation time is typically short in duration (four days or less).

Table 6-1 Determination of Effects

Protected Species	Status	Critical Habitat in Action Area?	Determination	Rationale[a]
Humpback whale, Mexico DPS (*M. novaeangiliae*)	T	no	NLAA	See humpback whale, Central America DPS, above.
North Pacific right whale (*Eubalena japonica*)	E	no	NLAA	• Effects discountable. • Potential for exposure to spill response actions is extremely unlikely because: o the species is rarely observed in the Action Area (only once in the past decade) and o on-water spill response operation is typically short in duration (four days or less).
Sei whale (*B. borealis*)	E	no	NLAA	• Effects discountable. • Potential for exposure to spill response actions is extremely unlikely because: o the species is rarely present in the Action Area; o the species is not known to feed or calve in the Action Area; and o on-water spill response operation is typically short in duration (four days or less).
Killer whale, Southern Resident DPS (*Orcinus orca*)	E	yes	NLAA CH: NLAA	• Effects insignificant. • Killer whales are large and often easy to spot by wildlife monitors. • Conservation measures (e.g., establishing buffer zones) will minimize direct interactions with whales. • Underwater noise will not exceed dangerous levels for killer whales or last longer than the duration of the spill response (typically no more than four days). • Rapid dilution of chemicals into the water column will make exposures short-term (matter of hours) and localized (primarily the upper few meters of the water column). • Chemical dispersant application and *in situ* burning will not be conducted if whales are detected in the area by wildlife monitors.

Table 6-1 Determination of Effects

Protected Species	Status	Critical Habitat in Action Area?	Determination	Rationale[a]
				• On-water spill response operation time is typically short in duration (four days or less).
Sperm whale (*Physeter macrocephalus*)	E	no	NLAA	• Effects discountable. • Potential for exposure to spill response actions is extremely unlikely because: o the species is very rarely present in the Action Area; o the species spends much of its time diving deeply; and o on-water spill response operation is typically short in duration (four days or less).
Gray whale, Western Pacific population (*Eschrichtius robustus*)	E(F)	no	NLAA	• Effects discountable. • Potential for exposure to spill response actions is extremely unlikely because: o the Western Pacific population of gray whale is rarely present in the Action Area and o on-water spill response operation is typically short in duration (four days or less).
Guadalupe fur seal (*Arctocephalus townsendi*)	T	no	NLAA	• Effects discountable. • Potential for exposure to spill response actions is extremely unlikely because: o the species is very rarely present in the Action Area preferring warmer water of Mexico and Southern California; o the species breeds almost entirely on Guadalupe Island, Mexico; and o on-water spill response operation is typically short in duration (four days or less).

Table 6-1 Determination of Effects

Protected Species	Status	Critical Habitat in Action Area?	Determination	Rationale[a]
Responsible Agency – USFWS				
Plants				
Applegate's milk-vetch (*Arctocephalus townsendi*)	E	no	LAA	• Limited range and isolated populations that overlap with the Action Area. • Individual plants are in relatively close proximity to rail lines. • Spill response could result in crushing, destruction, or removal of individual plants or seeds.
Bradshaw's desert-parsley (*Lomatium bradshawii*)	E	no	NLAA	• Effects discountable. • Potential for exposure to spill response actions is extremely unlikely because: o the only known occurrence of the species that overlaps with the Action Area is based on an observation from 1916; and o current presence of species in Action Area is unknown.
Golden paintbrush (*Castilleja levisecta*)	T	no	LAA	• Occur in sparse, isolated populations that overlap with the Action Area (e.g., near Rocky Prairie). • Population in Action Area is close to a rail line. • Spill response could result in crushing, destruction, or removal of individual plants or seeds.

Table 6-1 Determination of Effects

Protected Species	Status	Critical Habitat in Action Area?	Determination	Rationale[a]
Howell's spectacular thelypody (*Thelypodium howellii* ssp. *spectabilis*)	T	no	NLAA	• Effects discountable. • Potential for exposure to spill response actions is extremely unlikely because: o the species has limited overlap with the Action Area (only three populations are confirmed within the Action Area); o populations of the species occurs on the easternmost edge of the 1-mile buffer with the pipeline; o staging areas would be established in existing developed areas; and o Spill response actions would be conducted well away from thelypody populations.
Kincaid's lupine (*Lupinus sulphureus* var. *kincaidii*)	T	no	NLAA	• Effects discountable. • Potential for exposure to spill response actions is extremely unlikely because: o there are few current observations of Kincaid's lupine in the Action Area; o no designated critical habitat in the Action Area; o potential suitable habitat locations in the Action Area are not currently occupied by Kincaid's lupine; and o infrastructure exists near Kincaid's lupine populations for the establishment of staging areas.
Nelson's checkermallow (*Sidalcea nelsoniana*)	T	no	NLAA	• Effects discountable. • Potential for exposure to spill response actions is extremely unlikely because: o of the very limited spatial overlap of Nelson's checkermallow with the Action Area; o plants are located more than 1 km (0.6 miles) from a pipeline in Salem, Oregon; and o infrastructure exists for the establishment of staging areas.

Table 6-1 Determination of Effects

Protected Species	Status	Critical Habitat in Action Area?	Determination	Rationale[a]
Slickspot peppergrass (*Lepidium papilliferum*)	T	Yes (proposed)	NLAA CH: NLAA	• Effects discountable. • Potential for exposure to spill response actions is extremely unlikely because: o slickspot peppergrass occupy arid areas so a spill from the nearby pipeline is unlikely to affect water bodies that would trigger a federal response; and o infrastructure exists for the establishment of staging areas and it will not be necessary to clear vegetation.
Spalding's catchfly (*Silene spaldingii*)	T	no	LAA	• Small populations overlap with the Action Area near Spokane Airport, Fairchild Airforce Base, and Sprague, WA, each near an oil pipeline. The populations near the airport and base appear to be directly on the pipeline route. • Infrastructure is available near the airport and Air Force base to stage a response; infrastructure is also available near Sprague to an extent. • A spill response in Sprague would likely not affect Spalding's catchfly nearly a mile from the pipeline, but a spill response near the approximately 9–12 plants near more urban locations could have a significant adverse impact on individuals. • Spill response could result in crushing, destruction, or removal of individual plants or seeds.
Ute ladies'-tresses (*Spiranthes diluvialis*)	T	no	NE	• Species is not present in the Action Area.

Table 6-1 Determination of Effects

Protected Species	Status	Critical Habitat in Action Area?	Determination	Rationale[a]
Water howellia (*Howellia aquatilis*)	T	no	LAA	• Populations in the Action Area are 0.2 km (0.1 miles) or farther from a pipeline on JBLM in WA or 2 km (0.1 miles) from Cheney, WA. Water howellia populations are separated from the pipeline by a highway, which will likely stop oil from moving into water howellia habitat and prevent the need for staging in water howellia habitat. • Populations in the Action Area also north of Vancouver, WA, and south of Olympia, WA. These populations are located in parks that will likely not be used for staging areas; infrastructure exists near either location for staging a spill response to nearby waterbodies. Some actions and effects may only occur during a limited portion of the year (e.g., wet or dry periods). • Spill response could result in crushing, destruction, or removal of individual, emergent plants and/or root structures (in dry period).
Western lily (*Lilium occidentale*)	E	no	NLAA	• Effects discountable. • Potential for exposure to spill response actions is extremely unlikely because: o the Western lily has limited overlap with the Action Area, occurring in wooded areas along the coast; o spill response actions will be in response to marine spills and are not likely to affect the wooded areas where the species occurs; o staging areas would be established in existing developed areas (e.g., along Highway 101); and o Highway 101 provides a break between the marine zone and the wooded areas.
White Bluffs bladderpod (*Physaria douglasii* ssp. *tuplashensis*)	T	no	NE	o Species is not present in the Action Area.

Table 6-1 Determination of Effects

Protected Species	Status	Critical Habitat in Action Area?	Determination	Rationale[a]
Willamette daisy (*Erigeron decumbens* var. *decumbens*)	E	yes	NLAA	• Effects discountable. • Potential for exposure to spill response actions is extremely unlikely because the species is not currently present in the Action Area.
Snails				
Banbury Springs limpet (*Lanx* spp.)	E	no	NLAA	• Effects insignificant. • The species' distribution is limited to only four springs that are not located within the 1-mile buffer of the Action Area. • Limpets tend to be in springs that are upstream of the Snake River, away from areas that could be impacted by spilled oil (and therefore a response to oil). • Several of the springs are in or near parks, where staging areas could be established using existing infrastructure.
Bliss Rapids snail (*Taylorconcha serpenticola*)	T	no	NLAA	• Effects insignificant. • Limited distribution in the Snake River 0.4 km (0.25 miles) or farther from an oil pipeline, making it somewhat unlikely that oil would reach the Snake River; a spill directly into a tributary could carry oil to the river, but this is also a very specific and unlikely circumstance; if oil did not reach the river, then no federal response would occur. • Mostly present in tributaries, where oil spilled to the Snake River would not reach (making a response in those tributaries unnecessary); responses in the tributaries would be limited, given the shallow depth and small size of those waterbodies.
Bruneau hot springsnail (*Pyrgulopsis bruneauensis*)	E	no	NE	Species is not present in the Action Area.

Table 6-1 Determination of Effects

Protected Species	Status	Critical Habitat in Action Area?	Determination	Rationale[a]
Snake River physa (*Physa natricina*)	E	no	NLAA	• Effects insignificant. • Limited distribution in the Snake River. • Exposure would require that a pipeline spill would occur in a specific location near Glenns Ferry, Idaho, and travel several miles downstream to physa habitat (and that the associated spill response occurred in physa habitat). • Conservation measures will minimize impacts of a response to the physa.
Butterflies				
Fender's blue butterfly (*Icaricia icarioides fenderi*)	E	no	NE	Species is not present in the Action Area.
Island marble butterfly (*Euchloe ausonides insulanus*)	C[b]	P	NLAA CH: NLAA	• Effects insignificant. • Limited potential for exposure to spill response actions because marine spill of oil is the most likely scenario for San Juan Island; will affect shorelines and marine waters away from most of the species' habitat. • Species is currently limited to a small area of public land where they are being actively monitored. • Infrastructure exists, so construction in uplands is unnecessary. • Foot and off-road vehicle traffic could disturb butterflies or habitat, but knowledge of habitat and population will help minimize such effects, as will availability of roads

Table 6-1 Determination of Effects

Protected Species	Status	Critical Habitat in Action Area?	Determination	Rationale[a]
Oregon silverspot butterfly (*Speyeria zerene hippolyta*)	T	yes	LAA CH: LAA	• Seven extant populations are present along the Oregon coast in the Action Area (1-mile marine buffer). • Species is reliant on several key plant species, notably the early blue violet. Destruction of individual plants could have marked impacts on Oregon silverspot. • Spill response actions have the potential to destroy individual Oregon silverspot or the plants on which they rely. • Individuals from the population at Cascade Head is unlikely to be affected due to its elevation about sea level (away from potential response), but individuals from the populations at Rock Creek-Big Creek, Bray Point, or Clatsop Plain could be affected.
Taylor's checkerspot butterfly (*Euphydryas editha taylori*)	E	yes	LAA CH: LAA	• Extant populations in the south Puget Sound and JBLM overlap with the Action Area (near a rail line and pipeline, respectively). • Taylor's checkerspot is reliant on prairie habitat (vegetation), which is highly fragmented due to historical development. • Prairie habitat may be impacted locally by response actions, particularly those that involve earth moving or construction. Plant hosts may be crushed, and individual adults or caterpillars could be crushed at the same time.

Table 6-1 Determination of Effects

Protected Species	Status	Critical Habitat in Action Area?	Determination	Rationale[a]
Fish				
Bull trout (*Salvelinus confluentus*)	T	yes	LAA CH: LAA	• Vacuuming may entrain early-life-stage individuals. This will be minimized by the use of flat-head nozzles and by limiting vacuuming to the immediate water surface. • Anchoring of booms and foot traffic may disturb spawning trout and redds. Effects will be minimized by anchoring to shorelines as possible and using booming strategies from GRPs, as available. • Response activities that require some degree of construction or disturbance of upland soils and vegetation may result in siltation of streams, potentially leading to impaired water and spawning substrate quality. Engineered controls will be put into place to minimize erosion and siltation. • *In situ* burning will increase the temperature of shallow water causing thermal stress, and residues may be introduced, smothering small areas of benthic habitat. The Services will be consulted before performing an *in situ* burn. • Use of dams or culvert blockages, though limited to only a matter of days, could impact migration of bull trout. • Use of lights during nighttime activities may affect trout behavior (e.g., habitat avoidance). • Low potential for exposure to chemical dispersants that are carried into nearshore environment (after open marine water application). Exposures of large, later life stage.

Table 6-1 Determination of Effects

Protected Species	Status	Critical Habitat in Action Area?	Determination	Rationale[a]
Kootenai River white sturgeon (*Acipenser transmontanus*)	E	yes	NLAA CH: NLAA	• Effects insignificant. • Direct injuries to sturgeon will be minimized by anchoring to shorelines. • Lights will be limited to the duration of the spill response, so behavioral effects will be short term (days). • Habitat degradation caused by response action-related construction will be minimized by conservation measures (e.g., engineered controls on siltation and erosion). • Developed areas near critical habitat could be used to stage a response.
Lost River sucker (*Deltistes luxatus*)	E	yes	NLAA CH: NLAA	• Effects insignificant. • Direct injuries to suckers will be minimized by anchoring to shorelines. • Lights will be limited to the duration of the spill response, so behavioral effects will be short term (days). • Habitat degradation will be minimized by conservation measures (e.g., engineered controls on siltation and erosion). • Developed areas near critical habitat could be used to stage a response.
Shortnose sucker (*Chasmistes brevirostris*)	E	yes	NLAA CH: NLAA	See Lost River sucker, above.

Table 6-1 Determination of Effects

Protected Species	Status	Critical Habitat in Action Area?	Determination	Rationale[a]
Herptiles				
Oregon spotted frog (*Rana pretiosa*)	T	yes	LAA CH: LAA	• Small and cryptic species, difficult to survey and avoid during spill response. • *In situ* burning could result in exposures to extreme heat and smoke. • Aquatic vegetative cover could be lost as a result of *in situ* burning and oiled vegetation removal, though vegetation will likely recover over time. • Water quality could be temporarily impaired by sediment runoff associated with upland activities (e.g., construction of berms, trenches, or staging areas), flushing, or physical herding. Erosion controls will be used to minimize water quality degradation from upland activities. Low water pressure will be used to minimize erosion from flushing or herding. • Vacuuming could entrain larval frogs. Flat-head nozzles will be used to minimize entrainment. • Behavior may be affected by the presence of responders.
Mammals				
Canada lynx (*Felis lynx canadensis*)	T	yes	NE CH: NE	Species and its critical habitat do not meaningfully overlap with the Action Area, which is limited to relatively low elevation, developed areas. The likelihood of lynx presence in those areas is negligible.

Table 6-1 Determination of Effects

Protected Species	Status	Critical Habitat in Action Area?	Determination	Rationale[a]
Columbian white-tailed deer (*Odocoileus virginianus leucurus*)	T	no	NLAA	• Effects insignificant. • Distribution of the species is limited to a small area along the Lower Columbia River, overhalf occurring in wildlife refuges; • Spill response will be limited to shoreline and on-water actions, away from preferred habitats; • Deer will avoid areas of activity; and o the Lower Columbia River GRP provides information on deer populations and where to place spill response actions and access the Columbia River.
Grizzly bear (*Ursus arctos horribilis*)	T	no	NLAA	• Effects discountable. • Potential for exposure to spill response actions is extremely unlikely because: o very few grizzly bears are present in the Action Area; o the species is expected to avoid areas of human activity (spill response); and o response activities will not generate food waste that could attract bears.
Gray wolf (North Rocky Mountain) (*Canis lupus*)	E	no	NE	Species is not present in the Action Area.
North American wolverine (*Gulo gulo luscus)*	P(T)	no	NE	Species is not present in the Action Area.

Table 6-1 Determination of Effects

Protected Species	Status	Critical Habitat in Action Area?	Determination	Rationale[a]
Olympia pocket gopher (*Thomomys mazama pugetensis*)	T	yes	NLAA	• Effects insignificant. • Response to a spill in pocket gopher habitat is unlikely to result in a federal response due to the lack of nearby waterbodies. • Response to a hazardous materials spill is possible. • Gophers tend to remain underground throughout their lives, making direct interactions with responders or equipment unlikely. • Construction-related spill response actions could cause destruction of gopher burrows, leading to high magnitude, long-term effects.
			CH: NLAA	• Effects insignificant. • Critical habitat (PBFs) of the gopher will not be significantly altered by spill response actions.
Roy Prairie pocket gopher (*T. m. glacialis*)	T	yes	NLAA	See Olympia pocket gopher, above.
Tenino pocket gopher (*T. m. tumuli*)	T	yes	NLAA CH: NLAA	See Olympia pocket gopher, above.
Yelm pocket gopher (*T. m. yelmensis*)	T	yes	NLAA CH: NLAA	See Olympia pocket gopher, above.

Table 6-1 Determination of Effects

Protected Species	Status	Critical Habitat in Action Area?	Determination	Rationale[a]
Birds				
Marbled murrelet (*Brachyrampus marmoratus*)	T	yes	LAA	• Bird is small and difficult for wildlife monitors to see. • The species is especially vulnerable during molting, when the murrelet is flightless. • Vessel strikes are possible, particularly during molting. • Noise may impact behaviors (e.g., foraging), though this will be limited to the duration of the response; impediments to foraging could reduce delivery of food to nestlings and fledging success.
			CH: NLAA	• Effects insignificant. • Spill response actions will not result in the removal or alteration of forest habitat used by the marbled murrelet. • Coastal responses are very unlikely to occur (e.g., be staged) in forested areas used by murrelets.
Northern spotted owl (*Strix occidentalis caurina*)	T	yes	NLAA CH: NLAA	• Effects insignificant. • Preference for mature and old growth forests; response actions are unlikely to be conducted in this type of habitat. • Trees will not be affected by response actions.
Short-tailed albatross (*Phoebastria albatrus*)	E	no	NLAA	• Effects insignificant. • Extensive home range. • Relatively rare in the Action Area. • May be attracted to lights during nighttime operations in open marine water, but this type of response is very rare (only used for very large spills of oil).

Table 6-1 Determination of Effects

Protected Species	Status	Critical Habitat in Action Area?	Determination	Rationale[a]
Streaked horned lark (*Eremophila alpestris strigata*)	T	yes	LAA	• Ground-nesting bird; nests are difficult for wildlife monitors to detect. • Nests could be destroyed by foot, vehicle, or heavy machinery traffic at the site. • Activity in nesting sites could result in nest abandonment or temporary avoidance. • Smoke or extreme heat from *in situ* burning could affect birds.
			CH: NLAA	• Effects insignificant. • Overlap with Action Area is small and limited to terrestrial areas. • Spill response actions will not significantly alter the PBFs of streaked horned lark critical habitat.
Western snowy plover, Pacific Coast DPS (*Charadrius alexandrinus nivosus*)	T	yes	LAA CH: LAA	• Small and cryptic bird that tends to nest among vegetation along high-tide line. • May be difficult for wildlife monitors to detect. • Birds will be disturbed by presence of humans and equipment noise. • Vehicle and foot traffic along high-tide line should result in destruction of nests/nestlings and nesting habitat. • *In situ* burning could expose birds to extreme heat and smoke. • Removal of oiled debris would impact critical habitat PBF (though it would reduce exposures to oil).

Table 6-1 Determination of Effects

Protected Species	Status	Critical Habitat in Action Area?	Determination	Rationale[a]
Yellow-billed cuckoo (*Coccyzus americanus*)	T	no	NLAA	• Effects discountable. • Potential for exposure to spill response actions is extremely unlikely because: o the species has very limited overlap with the Action Area (currently believed to be extirpated from Washington and Oregon and only rarely occurring in Idaho) and o surveys will be conducted prior to developing staging areas and constructing access roads, if needed.

Notes to Table 6-1:

a Conservation measures are described in Tables 2-2 and 4-2.

b On April 12, 2018, the USFWS proposed to list the island marble butterfly and designate critical habitat for the butterfly; the final listing rule is scheduled to publish on or before April 12, 2019 (83 FR 15900).

Key:

CH	critical habitat	LAA	likely to adversely affect
DPS	distinct population segment	NE	no effect
E	Endangered	NLAA	not likely to adversely affect
F	Foreign	NMFS	National Marine Fisheries Service
ERMA	Environmental Response Management Application	NW	Northwest
ESU	evolutionary significant unit	P	pending
EU	Environmental Unit	PBF	physical and biological features
FR	Federal Register	Services	USFWS and NMFS
GRP	Geographic Response Plan	T	threatened
JBLM	Joint Base Lewis-McChord	USFWS	US Fish and Wildlife Service
km	kilometers	WA	Washington

7 Glossary of Key Terms Used in the NWACP Biological Assessment

Action agencies refers collectively to the federal agencies (i.e., the EPA and USCG) responsible for implementing the NWACP.

Action Area is defined in this BA as areas within the NW (e.g., Washington, Oregon, and Idaho) that have a high risk of large oil spills (>11,000 gallons), corresponding to petroleum pipelines, high-capacity rail lines (carrying unit trains of crude oil), and commercial shipping waterways, including the entire marine zone out to the extent of the EEZ and along the Columbia River downstream of its confluence with the Snake River. For this BA, the Action Area includes these high-risk oil transport corridors as well as 1-mile buffers around pipelines and oil railways and 20-mile downstream buffers where pipelines and oil railways cross rivers.

Adverse effects are those that directly impact species (e.g., injury, toxicity, or disturbance) or impact the viability of a habitat to support dependent species (e.g., reduced forage area, degraded spawning, or nesting habitat).

Ambient temperature, low pressure flooding/flushing refers to response actions that rely on hydraulic action to remove a spilled material from a solid or semi-solid surface (e.g., rocks, bulkhead, cobble beach), so that the material can be contained and collected. Flushing involves forcing large quantities of ambient or supplied water at pressure through sediment or across surfaces to move hydrophobic contaminants into a containment area. Flooding involves the use of very large quantities of water to flush a spilled product from the sediment to the surface into a containment area.

Baseline condition is the typical conditions (e.g., chemical, biological, and physical) under which a species or critical habitat exists prior to an initiation of the federal action under consultation. Within the context of this BA, the baseline condition assumes that a spill of hazardous substance (e.g., crude oil or diesel fuel) has occurred and federal responders have not intervened to contain and recover the spill.

Beneficial effects are those that may affect ESA-listed species or critical habitats but that will in no way adversely impact them.

Berms, dams, or other barriers; pits and trenches are physical barriers used to divert or contain spilled materials in terrestrial or riverine environments and, in most circumstances, are used in conjunction with skimming or other recovery techniques (e.g., sorbents or vacuuming).

Best management practices are components of spill response actions developed by industry to facilitate the spill response, for example by increasing the amount of oil contained and recovered and reducing the amount of waste generated.

Booming refers to the use of a floating barrier to contain buoyant spilled materials in aquatic environments (i.e., open water, nearshore, rivers, and lakes) until the oil can be removed, deflect oil away from sensitive areas, or divert oil toward recovery sites,. Fire booms are used to concentrate spilled oil during an *in situ* burn, and sorbent booms are used to collect oil using special materials.

Case-by-Case Authorization Zone is the area where each application of dispersants must be approved by the RRT 10. This zone includes all US marine waters in Puget Sound and the Strait of Juan de Fuca that are both within 3 nautical miles from the coastline or an island shoreline and greater than 18 m (60 ft) in depth; waters designated as a part of a National Marine Sanctuary and waters that are part of the Makah Tribe Usual and Accustomed marine area and that are also greater than 60 ft in depth; the Strait of Juan de Fuca and North Puget Sound from Point Wilson to Admiralty Head and north, and greater than 60 ft in depth; and waters within 3 miles of the border of the country of Canada or the Makah Tribe Usual and Accustomed marine area.

Changes in behavior are defined as any alteration of a species' normal behavior caused by an action, including, but not limited to, the presence of responders and operation of response equipment.

Coastal zone refers to "all United States waters subject to the tide, specified ports and harbors on inland rivers, waters of the contiguous zone, other waters of the high seas subject to the NCP, and the land surfaces or land substrate, and grounds waters, and ambient air proximal to these waters," as defined in the NCP (40 CFR 300.5).

Conservation measures are components common to all spill responses that are used by spill responders to minimize the potential effects of response activities. The majority of conservation measures presented in this BA are included in the NWACP.

Critical habitat is a specific geographic area with physical and/or biological features designated as essential to the conservation of an endangered or threatened species at the time of listing under the Endangered Species Act of 1973.

Culvert blocking refers to the placement of a temporary or permanent fixture (e.g., plywood, plug, plastic sheeting, sandbags) to block a culvert and eliminate the threat of spilled material entering unaffected areas.

Cumulative effects refer to the potential effects on ESA-listed species and their critical habitats from future, non-federal (i.e., state, tribal, municipal, or private) actions reasonably certain to occur in the Action Area.

Decontamination refers the process required to prevent reintroduction of oily wastes into the natural environment by personnel, hand tools, equipment, vehicles, and vessels. The decontamination process involves a multi-stage flushing procedure that removes and collects such wastes, which are then stored and treated in accordance with state and federal regulations.

Deflection and containment actions are activities that exclude oil from areas with sensitive resources (deflection) or into areas where oil can be recovered (containment).

Direct injury includes physical injury, extreme physiological stress, and/or the mortality of an individual organism as a result of interaction with spill response actions or workers.

Discountable effects are those that are highly unlikely to occur due to one or more of the following criteria: the species is rarely in the Action Area; the species range overlaps with the Action Area but is unlikely to be affected by response actions due to its behavior, population density, or habitat requirements; the range of that species overlaps with the Action Area only in a section that is unlikely to trigger a federal spill response because there is no nexus to a waterbody; the Action Area overlaps with a very small portion of the designated critical habitat, particularly in areas that would likely not be used by the species (e.g., along roadways and railroad rights-of way); and/or, designated critical habitat for a species overlaps with a small portion of the Action Area.

Dispersants are chemical agents that emulsify, disperse, or solubilize oil into the water column or promote the surface spreading of oil slicks to facilitate dispersal of the oil into the water column.

Distinct population segment is a significant (relative to the entire species) population or group of populations that is discrete from other populations of the species.

Emergency consultation is an informal consultation of the Services that is initiated if a spill occurs outside of the Action Area or if the RRT is activated to make a decision on use of a chemical countermeasure, following the emergency process defined in the interagency memorandum of agreement, which specifies when and how the Services will be engaged and addresses the roles and responsibilities of each agency during the pre-spill planning activities, spill response, and post-spill activities.

Engineered control refers to physical equipment (e.g., silt curtain, silt fence, or fiber rolls) put in place during a spill response to minimize soil erosion and siltation of streams/rivers.

Environmental Unit is the group within the Planning Section that determines how to best protect natural, cultural, and economic resources when responding to an oil or hazardous substance spill or release.

Evolutionary significant unit is a Pacific salmon population or group of populations that is substantially reproductively isolated from other conspecific populations and that represents an important component of the evolutionary legacy of the species.

Exclusive Economic Zone includes waters of the US up to 200 nautical miles offshore; the first 3 nm are under shared under federal and state jurisdictions.

Exclusion from resources is the prevention, directly or indirectly, of a species' ability to access necessary habitat (e.g., for breeding, forage, or refuge) by physically stopping the animal from using a habitat, or by causing the animal to avoid a habitat, either temporarily or long-term.

Federal On-Scene Coordinator means the federal official predesignated by the EPA or the USCG to coordinate and direct responses under subpart D of the NCP, or the government official designated by the lead agency to coordinate and direct removal actions under subpart E of the

NCP. This person represents the federal government in the Unified Command.

Formal consultation with the Services occurs when the action agencies determine that a proposed action is "likely to adversely affect" an ESA-listed species or designated critical habitat. The outcome of a BA determines whether formal consultation is necessary with the Services.

Geographic Response Plans) are plans developed for specific areas to guide oil spill response. The GRPs include tactical response strategies tailored to a given area. GRPs identify sensitive resources (e.g., natural, cultural or economic) at risk from oil spills and outline response strategies intended to minimize injury to these resources.

Habitat degradation occurs when physical or chemical perturbations result in alterations in the amount or quality of habitat (e.g., reduction in pelagic prey as a result of a toxic response to dispersed oil exposures, siltation of salmon spawning habitat)

Hazardous substances, as stated in the NWACP, are defined, under CERCLA, as "hazardous wastes" regulated under the Resource Conservation and Recovery Act, as well as hazardous substances regulated under the Clean Air Act, Clean Water Act, and the Toxic Substances Control Act. In addition, any element, compound, mixture, solution, or substance may also be specifically designated as a "hazardous substance"; this definition includes numerous hazardous chemicals, as well as chemical warfare agents and radionuclides. CERCLA hazardous substances are listed in 40 CFR 302.4. CERCLA also applies to "pollutants or contaminants" that may present an imminent or substantial danger to public health or welfare (e.g., biological warfare agents). Petroleum products such as diesel and gasoline are specifically excluded from CERCLA and are not considered to be "hazardous substances" under federal statute, but may be considered as such under state environmental statutes.

Hazing refers to deterrent methods (e.g., visual or auditory techniques) for disturbing wildlife species in order to minimize their injury from an oil spill or spill response actions.

Incident Command System (ICS) is the accepted organization system used by most federal, state, and local agencies that is intended to be used to manage emergency situations. The ICS is designed to expand and contract in terms of the number of agencies involved to meet the needs of the incident.

Incident Management Team refers to the personnel identified to staff the organizational structure identified in a response plan to manage response plan implementation.

Inland zone refers to "the environment inland of the coastal zone excluding specified ports and harbors on inland rivers," as defined in the NCP (40 CFR 300.5).

Insignificant effects are those that are undetectable, immeasurable, or so minor that they cannot be meaningfully evaluated.

In situ burning refers to process of burning spilled oil in the environment, which, on water, usually requires containment with a fire-resistant boom and on land usually requires some type of earthen containment barrier (e.g., a trench, berm, or pit).

Lacustrine habitats are defined as all fully inundated portions of still water bodies (e.g., lakes, ponds, or similar freshwater habitats, excluding wetlands).

Likely to adversely affect is the determination made if ESA-listed species or critical habitat PBFs are likely to be affected by a response action due to the sensitivity of ESA-listed entities to stressors associated with response actions and a high likelihood that an exposure to response action-related stressors will occur.

Local On-Scene Coordinator is the person representing a local agency (i.e., municipality or port) or tribe who works with the FOSC in the event of a spill, if the agency or tribe has authority over nearshore waters, including ports and harbors.

Manual removal of oil is the removal of oil-contaminated substrates using hand tools (e.g., rakes, shovels, scrapers).

Marine nearshore refers to the marine environment between mean lower low water and 60 ft deep, including estuaries and river deltas.

Open marine water is defined as the area adjacent to the coast that is more than 60 ft (18 m) deep (offshore to the extent of the EEZ, 200 nm); for the purposes of this consultation, open water is considered to include both coastal and inland marine waters (i.e., the Salish Sea/Puget Sound and the Strait of Juan de Fuca), as long as they exceed 60 ft deep.

Marine zone refers the zone of open marine water beyond the coastal zone, as defined in the NCP (40 CFR 300.5).

Mechanical countermeasures are primary response actions that are intended to deflect, or contain and recover oil or other spilled material before it can further impact ecological and cultural resources.

Mechanical removal of oil is the removal of oil-contaminated substrates using heavy equipment (e.g., bulldozers, backhoes). Mechanical removal is usually implemented when the spill area/debris size exceeds the capacity of manual removal.

Natural attenuation is the lessening of chemical impacts through evaporation, weathering, dispersal, or biodegradation, all of which may occur under natural conditions, without human intervention. Natural attenuation, as a response measure, will include monitoring of spill conditions

No Dispersant Use Zones are areas where chemical dispersants will not be applied, and include marine waters that are both less than 3 nautical miles from the coastline and less than or equal to 60 ft in depth; marine waters south of a line drawn between Point Wilson (48º 08' 41" N, 122º45' 19" W) and Admiralty Head (48º 09' 20" N, 122 40' 70" W); and all freshwater environments.

No effect is the determination made for ESA-listed or candidate species that do not occur within the Action Area.

Non-floating oil is submerged (i.e., not floating or near the surface) or sunken (i.e., with negative buoyancy) oil.

Non-mechanical countermeasures are actions that alter the physical or chemical properties of the spilled material (i.e., petroleum or oil-like materials), such that the overall impacts of spilled material are reduced.

Non-persistent oil, or Group 1 oil is a petroleum-based oil that, at the time of shipment, consists of hydrocarbons with the characteristics that at least 50% (by volume) distill at a temperature of 340°C (645°F) and at least 95% (by volume) distill at a temperature of 370°C (700°F).

Northwest Area Committee, as provided for by Clean Water Act sections 311(a)(18) and (j)(4), is the entity appointed by the President of the United States of America consisting of members from qualified personnel of federal, state, and local agencies with responsibilities that include preparing the NWACP. The NWAC is chaired by USCG Sector Columbia River, USCG Sector Puget Sound, and EPA, and vice chaired by Ecology, IOEM, and ODEQ; additional members include tribes, the United States Department of Defense, United States Department of the Interior (representing USFWS, Bureau of Land Management, Bureau of Ocean Energy Management, Bureau of Safety and Environmental Enforcement, Bureau of Indian Affairs, National Park Service and Office of Environmental Policy and Compliance), United States Department of Commerce (representing the NMFS and National Weather Service), Federal Emergency Management Agency, United States Department of Health and Human Services, United States Department of Justice, United States Department of Agriculture (United States Forest Service), United States Department of Labor (Occupational Safety and Health Administration), United States Department of Energy, United States Department of Transportation, General Services Administration, state health agencies, state emergency management agencies, industry, spill response contractors, environmental advocates, and the public.

Northwest Area Contingency Plan, as provided for by Clean Water Act sections 311(a)(19) and (j)(4), is the plan prepared by the NWAC, developed to be implemented in conjunction with the National Contingency Plan and Regional Contingency Plan. The NWACP provides a strategy for a coordinated, multi-jurisdictional emergency response to a discharge of oil or other hazardous substances within the NW, defined as the inland and coastal zones of Washington, Oregon, and Idaho.

Not likely to adversely affect is the determination made if the effect of the federal action on ESA-listed species or critical habitat PBFs would be wholly beneficial, insignificant, or discountable.

Oil as defined by section 311(a)(1) of the Clean Water Act, is oil of any kind or in any form, including, but not limited to, petroleum, fuel oil, sludge, oil refuse, and oil mixed with wastes other than dredged spoil (i.e., sediment). Oil, as defined by section 1001 of the Oil Pollution Act, is oil of any kind or in any form, including, but not limited to, petroleum, fuel oil, sludge, oil refuse, and oil mixed with wastes other than dredged spoil, but does not include petroleum, including crude oil or any fraction thereof, that is specifically listed or designated as a hazardous substance under subparagraphs (A) through (F) of section 101(14) of CERCLA and that is subject to the provisions of that Act. For the purpose of this BA, oil is assumed to comprise petroleum, fuel oil, sludge, oil refuse, and oil mixed with wastes other than dredged spoil; this definition does not exclude components of oil that are specifically listed under CERCLA and that will not be excluded from a spill response to spilled oil.

On-Scene Coordinators are the federal, state, tribal, and local government representatives designated to coordinate and direct their respective assets and authorities during an oil or hazardous materials response.

Passive collection of oil with sorbents refers to the deployment of natural or synthetic sorbents to collect spilled materials, particularly petroleum or similar products, through either adsorption (adherence to the sorbent surface) or absorption (penetration into the pores of the sorbent).

Persistent oil is a petroleum-based oil that does not meet the distillation criteria for a non-persistent oil. Persistent oils are classified into Groups II through V based on their specific gravities. Groups II through IV are denser than or similarly dense to fresh water, whereas Group V oil is denser than fresh water (and may sink).

Physical and biological features (PBFs) are characteristics of critical habitat that are essential to the conservation of a species and as such, may require special management considerations or protection.

Physical herding is the physical movement of oil using wind or mechanically generated currents (e.g., using a firehose or prop-wash) to concentrate oil along a shoreline or in a stationary boom attached to a shoreline.

Places of refuge are temporary locations for ships in need of assistance, such as ports, harbors, open water, and temporary beaching of a ship.

Pre-Authorization Zones are areas where the FOSC has the authority to apply dispersants without incident-specific RRT 10 approval, including United States marine waters 3 to 200 nautical miles from the coastline outside Puget Sound and the Strait of Juan de Fuca or an island shoreline, except for waters designated as a part of a National Marine Sanctuary and the Makah Tribe usual and accustomed fishing areas.

Pressure washing, steam-cleaning, or sandblasting are response actions that involve the use of high water pressure, hot water, and/or abrasion (with sand) to remove oil from durable substrates providing relatively low-quality habitat (e.g., rip-rap, bulkheads, or parking lots).

Proposed action refers to an implementation of the NWACP within the Action Area. Response activities that occur outside of the Action Area or from the methods described in this document are beyond the scope of this BA and will require emergency consultation.

Regional Materials Response Team means a team of local emergency responders trained, equipped, and organized to respond to oil and hazardous materials incidents in a given geographic area.

Regional Response Team consists of designated representatives and is responsible for planning and preparedness activities before a response action and provides support to the FOSC and SOCS.

Recovery actions are response actions involving the physical recovery of spilled oil, often carried out in conjunction with containment, diversion, deflection, and/or removal (e.g., soil excavation) actions. Several technologies or processes, including skimmers, vacuums, sorbent materials, and manual or mechanical removal, may be used in recovery, depending on the environment in which the spill occurred, the nature and amount of the material spilled, and the behavior of the material following release.

Removal/cleanup actions are response actions that include the manual or mechanical removal of spilled material, contaminated soil, sediment, vegetation, or debris in terrestrial, shoreline, and nearshore environments. Removal may also be augmented by flushing or otherwise washing surfaces (including large vegetation) to which spilled materials have adhered.

Response actions/activities are the potential approaches to addressing a spill (described in the NWACP), which are outlined in Section 2 of this consultation. The effects on ESA-listed species and critical habitats from an initiation of the NWACP would potentially result from response actions or activities.

Response community is every person who has a role in spill response.

Resources at risk are any natural, cultural, or economic resource that might be at risk from an oil spill and associated response.

Riverine habitats are defined as all fully inundated portions of flowing water bodies (e.g., streams and rivers), excluding wetlands.

Scientific Support Coordinator is the technical specialist from NOAA who acts as an independent advisor to the FOSC during a spill response.

The Services refers collectively to the United States Fish and Wildlife Service (USFWS) and the National Marine Fisheries Service (NMFS).

Shoreline refers to locations where aquatic and terrestrial habitats meet in either freshwater or marine environments, as defined in the NWACP (e.g., exposed rock shores; vertical, man-made seawalls; sand beaches; or steep, unvegetated river banks).

Skimming/vacuuming is a recovery action involving the use of skimmers, which are mechanical devices that collect oil or other floating contaminants at the water's surface through suction or sorption, and/or vacuums, which are small, portable units or truck/vessel-mounted units used to remove pooled or stranded material (typically oil).

Staging areas are locations where incident personnel and equipment are assigned awaiting tactical assignment, which may include on-site storage and transport of hazardous and non-hazardous materials.

State On-Scene Coordinator means the representative designated by the State to coordinate and direct state assets and authorities during an oil or hazardous materials response. This person represents the state in the Unified Command.

Stock refers to a group of a marine mammal species in a common spatial arrangement that interbreeds when mature. Stocks are defined by the Marine Mammal Protection Act.

Stressors are factors influencing species or their habitats in a negative way. Stressors may be associated with a spill response action or are part of the environmental baseline in the Action Area (e.g., commercial and recreational harvest or bycatch, predation, effects of oil exposures).

Terrestrial refers to habitats including forests, areas of exposed bedrock, rocky cliffs, coastal dunes, shrub-steppe, grasslands, and riparian habitats.

Toxicity refers to the chemical effects on organisms caused by exposures to contaminants.

Unified Command refers to the team of OSCs representing the Potentially Responsible Party and federal, state, tribal, and/or local agencies, as applicable, which jointly manages the spill incident.

Unit train means a train that is carrying a single commodity in all cars. For example, a unit train of crude oil would be one in which every car being transported by the engines contains crude oil.

Vegetation and woody debris removal and disposal refers to the manual or mechanical removal of heavily contaminated vegetation and/or woody debris that may be a continuing threat to organisms that either forage on that vegetation/debris or use it as habitat.

Vessel, means every description of watercraft or other artificial contrivance used, or capable of being used, as a means of transportation on water. For the purpose of this BA vessel refers to any watercraft used by spill responders during a spill response that conveys personnel, equipment, recovered oil, or other materials across the water.

Waste management refers to procedures put in place for the storage and transfer of all solid, hazardous, or petroleum wastes that may be generated during recovery and cleanup activities. The procedures must comply with state and federal regulations and are put in place to minimize the reintroduction of wastes into the environment and protect habitats, endangered species, and response workers.

Wetlands are defined as several types of seasonally or permanently inundated habitats with uniquely adapted plant communities, characterized by the size and type of adjacent waterbodies (e.g., estuarine or riverine wetlands) or water depth (e.g., palustrine wetlands).

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