

# **Environmental Assessment**

Pierce County Planning and Public Works

Flood Risk Reduction Structures

Maintenance and Operations

Habitat Conservation Plan and

Incidental Take Permits

**National Marine Fisheries Service**

**Cooperating Agency: US Fish and Wildlife Service**

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May 2026

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# List of Preparers

Art Campbell, Herrera Environmental Consultants, Inc.: Lead author; human environment sections of Environmental Assessment

M.S. Geological Sciences; B.S. Environmental Studies

35 years of experience in planning and preparation of environmental documentation

Sue Wall, Herrera Environmental Consultants, Inc.: Physical and biological sections of Environmental Assessment

M.S. Forestry; B.S. Botany

20 years of experience in biological sciences and environmental impact analysis

# Abbreviations and Acronyms

BMP	best management practice
CFR	Code of Federal Regulations
cfs	cubic feet per second
dB	decibel
DPS	Distinct Population Segment
EA	environmental assessment
Ecology	Washington State Department of Ecology
ELJ	engineered logjam
ESA	Endangered Species Act
ESU	Evolutionarily Significant Unit
FONSI	finding of no significant impact
HCP	habitat conservation plan
ISPG	Integrated Streambank Protection Guidelines
ITP	incidental take permit
LWM	large woody material
M&O	maintenance and operation
NEPA	National Environmental Policy Act
NMFS	United States Department of Commerce, National Marine Fisheries Service (also known as National Oceanic and Atmospheric Administration (NOAA) Fisheries)
OHWM	ordinary high water mark
PCC	Pierce County Code
ppm	parts per million
RM	river mile
RRMM	Regional Roads Maintenance Manual
RRMP	Regional Roads Maintenance Program
SWIF	System Wide Improvement Framework
TMDL	total maximum daily load
UGA	urban growth area
USFWS	United States Department of the Interior, Fish and Wildlife Service
USACE	US Army Corps of Engineers
USGS	United States Geological Survey
WAC	Washington Administrative Code
WDFW	Washington Department of Fish and Wildlife

# Glossary of Terms

**Best management practices (BMPs):** Schedules of activities, prohibitions of practices, physical structures, maintenance procedures and other management practices to reduce pollution or to provide habitat protection/maintenance.

**Channel:** Natural or artificial waterway long enough to periodically or continuously contain moving water. A channel has a definite bed and banks that serve to confine water.

**Clearing:** The removal of timber, brush, grass, ground cover, or other vegetative matter from a site, which exposes the ground surface on the site.

**Confluence:** The location where two streams meet.

**Conservation:** Protection, maintenance, and restoration of habitat characteristics to support the species of interest.

**Critical Habitat:** For species listed under the Endangered Species Act (ESA), critical habitat consists of (1) the specific areas within the geographical area occupied by the species, at the time it is listed in accordance with the provisions of Section 4 of the Act, on which are found those physical or biological features (constituent elements) (a) essential to the conservation of the species and (b) which may require special management considerations or protection; and (2) specific areas outside the geographical area occupied by the species at the time it is listed in accordance with the provisions of Section 4 of the Act, upon a determination by the Secretary that such areas are essential for the conservation of the species. [ESA §3 (5)(A)] Designated critical habitats are described in 50 CFR §17 and 226.

**Decibel:** A-weighted: an expression of the relative loudness of sounds in air as perceived by the human ear.

**Discharge:** Flow rate of a stream or stormwater system, usually measured in cubic feet per second.

**Endangered species:** Under the ESA, any species that is in danger of extinction throughout all or a significant portion of its range [ESA Section 3(6)].

**ESA:** The Endangered Species Act of 1973, as amended, 16 USC 1531 et seq.

**Flood:** An overflow or inundation that comes from a river or any other source, including but not limited to streams, tides, wave action, storm drains, or excess rainfall.

**Floodplain:** The total area subject to inundation by the base flood including the flood fringe and floodway. The low area adjoining a stream or river channel that overflows at times of high river flow.

**Habitat:** The total of all the environmental factors of a specific place that is occupied by an organism, a population, or a community.

**Habitat conservation plan:** Under Section 10(a)(2)(A) of the ESA, a planning document that is a mandatory component of an incidental take permit application, also known as a conservation plan or HCP.

**Incidental take:** Under the ESA, the take of listed fish or wildlife species that results from, but is not the purpose of, carrying out an otherwise lawful activity conducted by a federal agency or applicant [50 CFR Section 402.02].

**Large woody material (LWM):** Any piece of woody material, generally 4 inches or larger in diameter, that intrudes into a stream channel or nearby (e.g., logs or root wads) and that functions to form pools, regulate sediments, disperse stream energy, create channel complexity, stabilize channels, provide instream organic matter, and provide cover for fish.

**Levee:** A flood-control structure designed to protect an area from flooding. Levees are often rated by the level of protection they offer.

**Listed species:** Under the ESA, any species of fish, wildlife or plant that has been determined to be endangered or threatened under Section 4 of the ESA [50 CFR Section 402.02].

**Maintenance:** Routine activities such as repairing or cleaning assets during their useful life.

**Mitigation:** Offsetting the impacts of taking on a species (USFWS-NOAA. 2016).

**Operation:** Administration of activities implemented with the objective of keeping an asset working its best.

**Ordinary high water mark (OHWM):** The mark on all lakes, streams, and tidal water that can be found by examining the bed and banks and determining where the presence and action of waters has marked upon the soil a character distinct from that of the abutting upland, in respect to vegetation.

**Priority species:** An animal species of concern due to their population status and their sensitivity to habitat manipulation. Priority species include species of concern, monitor species, candidate species, and priority game species, as well as other game and non-game species.

**Reach:** A segment of a stream channel where the cross-section, slope, and roughness of the channel are constant. Simulation of the flow in streams is done by dividing the stream channel into reaches.

**Redd:** Salmonid nest within spawning gravel in streams where eggs are deposited by the female.

**Restoration:** The reestablishment of a viable wetland or critical fish or wildlife habitat area from a previously filled or degraded site.

**Retement:** Sloping structures placed on banks to absorb the energy of incoming water and prevent erosion.

**Riparian:** The area adjacent to aquatic systems with flowing water that contains elements of both aquatic and terrestrial ecosystems that mutually influence each other. Riparian habitat begins at the ordinary high water mark and includes riparian areas of wetlands that are directly connected to the stream course; it may include the entire extent of the floodplain.

**Riprap:** Broken stone placed on shoulders, slopes, or other such places to protect them from erosion. Stones typically range in size from 6 inches to several feet in diameter.

**Runoff:** Water originating from rainfall and other precipitation that is found in drainage facilities, rivers, streams, springs, seeps, ponds, lakes, and wetlands, as well as shallow ground water.

**Salmonids:** Fish of the family Salmonidae, including salmon, trout, char (salmon and steelhead stock inventory), whitefish, and grayling.

**Sediment:** Solid material settled from suspension in a liquid.

**Sedimentation:** The process of settling and depositing suspending matter carried by runoff, usually occurring by gravity when the velocity of the surface water is reduced below the point at which it can transport the suspended material.

**Services:** The National Marine Fisheries Service and US Fish and Wildlife Service.

**Setback levee:** A levee that is set away from the river in a manner to allow the river channel to migrate in the areas between levees.

**Stormwater:** The portion of precipitation that does not naturally percolate into the ground or evaporate, but flows via overland flow, interflow, channels, or pipes into a defined surface water channel or a constructed facility.

**Take:** Under the ESA, to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect or attempt to engage in any such conduct [ESA Section 3(19)]. Harm is further defined by USFWS to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing behavioral patterns such as breeding, feeding, or sheltering. Harass is defined by USFWS as actions that create the likelihood of injury to listed species to such an extent as to significantly disrupt normal behavior patterns, which include, but are not limited to, breeding, feeding, or sheltering [50 CFR §17.3].

**Thalweg:** The line of lowest elevation within a watercourse.

**Threatened species:** Under the ESA, any species that is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range [ESA Section 3(20)].

**Watershed:** The region drained by or contributing water to a stream, lake, or other body of water.

**Wetlands:** Areas that are inundated or saturated by surface water or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions.

# 1 Introduction, Purpose of and Need for Action

## 1.1 Introduction

The Pierce County Planning and Public Works, Surface Water Management Division (Pierce County, or County) seeks incidental take permits (ITPs) from the National Marine Fisheries Service (NMFS) and US Fish and Wildlife Service (USFWS) (collectively, “the Services”) pursuant to Section 10(a)(1)(B) of the Endangered Species Act (ESA) of 1973, as amended (ESA). The ESA defines “take” as “to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct.” The ITPs would authorize incidental take of the following species (hereafter referred to as *covered species*).

- Bull trout (*Salvelinus confluentus*)
- Puget Sound Evolutionarily Significant Unit (ESU) Chinook salmon (*Oncorhynchus tshawytscha*)
- Puget Sound/Strait of Georgia ESU coho salmon (*O. kisutch*)
- Puget Sound Distinct Population Segment (DPS) steelhead (*O. mykiss*)
- Pacific lamprey (*Entosphenus tridentatus*)
- River lamprey (*Lampetra ayresii*)
- Western brook lamprey (*L. richardsoni*)

The Bull trout is the only covered, ESA-listed species under USFWS jurisdiction. Covered species that are ESA-listed under NMFS jurisdiction are Puget Sound ESU Chinook salmon and Puget Sound DPS steelhead. The County is also including several species that are not ESA-listed (Puget Sound/Strait of Georgia ESU coho salmon, which is under NMFS jurisdiction, and Pacific lamprey, river lamprey, and western brook lamprey, which are under USFWS jurisdiction) to broaden the conservation benefits to related fish and wildlife, and to obviate later analyses if those species become ESA-listed and need to be added to the ITPs. Pierce County is seeking ITPs because of potential take associated with its maintenance and operation (M&O) of flood risk reduction structures and flood fighting activities.

The take associated with Pierce County activities would be incidental to, and not the purpose of, those activities. The County’s M&O program involves a range of activities that include maintaining and repairing an extensive infrastructure of levees and revetments, which entail projects that respond to imminent threats, as well as emergency flood-fighting projects (collectively, “flood risk reduction activities”). The program also includes vegetation management along levees and revetments. The County’s M&O program has the potential to affect species listed as threatened or endangered under the ESA and critical habitat for those species. The County has submitted a draft 30-year Habitat Conservation Plan (HCP) to the Services (Pierce County 2024). The federal action of issuing ITPs has the potential to affect the human environment. The Services’ decision of whether to issue the proposed ITPs, therefore, is an action subject to review under the National Environmental Policy Act (NEPA).

Pierce County, Washington, is on the western side of the Cascade Range and extends from the crest of the Cascade Range on the east to the shores of Puget Sound on the west. Mount Rainier, the tallest mountain in Washington State at 14,410 feet, is on federal land inside Pierce County near its eastern boundary. The county’s major river systems, consisting of the Puyallup River and its tributaries, the Nisqually River and its tributaries, and the White River and its tributaries, have their headwaters on Mount Rainier or on uplands near

the mountain. Periodic intense fall and winter precipitation events, some of which may be associated with substantial snowmelt, along with developments in historical floodplains can result in extreme flows in the rivers and flooding of adjacent land.

To reduce the potential for and effects of periodic flooding, the County prepared a comprehensive flood hazard management plan in 2013 and updated that plan in 2023 (Pierce County 2023). The Flood Plan, which updated and expanded previous County flood planning, included an acknowledgement that the flood risk reduction activities involved in implementing the Flood Plan could result in take of species protected by the ESA and included this recommendation: “Pierce County Surface Water Management (SWM) should seek incidental take authorization for its activities that affect species listed as threatened or endangered under the federal ESA.” The County’s 2023 Comprehensive Flood Hazard Management Plan (Pierce County 2023) describes the County’s efforts to implement an HCP since the 2013 Flood Plan.

The HCP that Pierce County developed in consultation with NMFS and USFWS addresses impacts on potentially affected covered species and habitats resulting from the County’s flood risk reduction activities over the next 30 years. With issuance of ITPs, NMFS and USFWS could authorize, under Section 10 of the ESA, the incidental taking of one or more of the covered species addressed in the HCP during the County’s flood risk reduction activities.

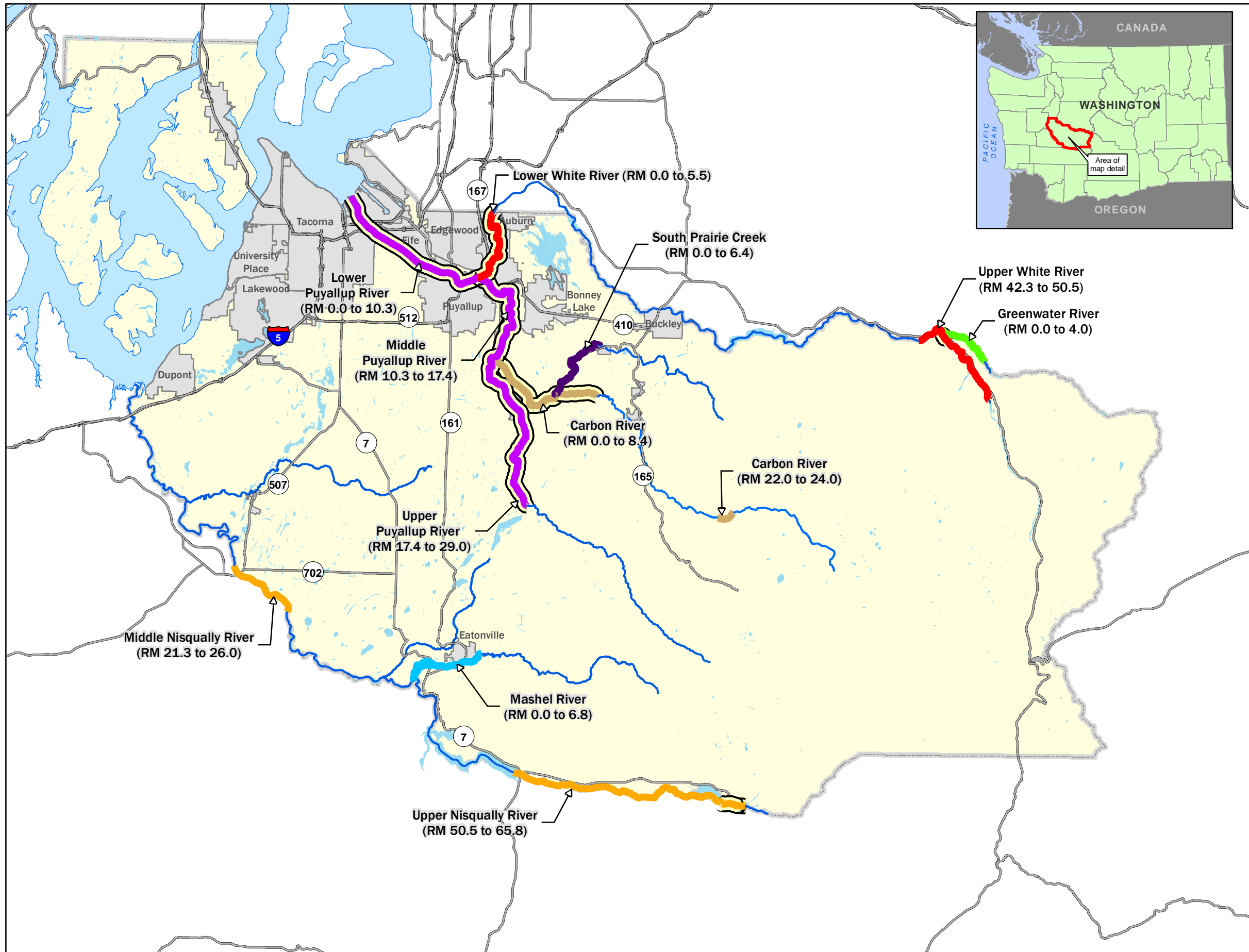
The lands covered by the HCP include portions of the Puyallup, White, Greenwater, Carbon, Nisqually, and Mashel River basins, as well as South Prairie Creek (Figure 1). The HCP covers levee and revetment maintenance and repair, levee vegetation management, and construction of restoration projects. This Environmental Assessment (EA) analyzes impacts resulting from these activities and projects on the lands covered by the HCP. This EA, prepared in compliance with NEPA, identifies and evaluates impacts that would result from issuance of ITPs by NMFS and USFWS, and from implementation of the HCP by Pierce County; determines the significance of identified impacts.

NMFS is the lead agency on this EA. USFWS is a cooperating agency and may adopt this EA if the EA meets their needs and is found sufficient.

On July 23, 2025, NMFS and USFWS published notices in the Federal Register notifying the public that they had received an incidental take permit application and invited the public to comment on the application, HCP, and draft EA. The public comment period closed on August 22, 2025. Two public comment letters were received. Appendix B provides these public comments and responses.

NOAA has considered the factors mandated by NEPA; this EA represents NOAA’s good-faith effort to prioritize documentation of the most important considerations required by the statute within the congressionally mandated page limits; this prioritization reflects NOAA’s expert judgment; and any considerations addressed briefly or left unaddressed were, in NOAA’s judgment, comparatively not of a substantive nature that meaningfully informed the consideration of environmental effects and the resulting decision on how to proceed.

This EA represents NOAA’s good-faith effort to fulfill NEPA’s requirements within the congressionally mandated timeline; the effort is substantially complete; in NOAA’s expert opinion, it has thoroughly considered the factors mandated by NEPA; and in NOAA’s judgment, the analysis contained in this EA is adequate to inform and reasonably explain NOAA’s final decision regarding the proposed action.

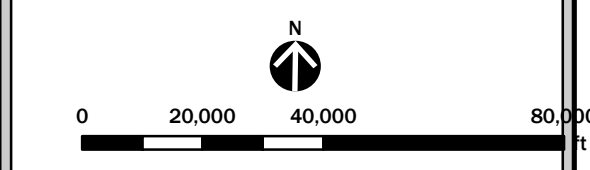


**Figure 1.**  
**Covered Areas – Pierce County Flood Risk Reduction Structures Maintenance and Operations Habitat Conservation Plan.**

**Legend**

**Study Area**

- █ Mashel River
- █ Nisqually River
- █ South Prairie Creek
- █ Greenwater River
- █ Carbon River
- █ Puyallup River
- █ White River
- River segment with levees or revetments
- Highway
- River
- City
- Pierce County boundary



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## 1.2 Purpose and Need

The federal action considered in this EA is the USFWS and NMFS issuance of ITPs and subsequent implementation of the HCP by Pierce County.

### 1.2.1 Purpose

The purpose of the proposed Federal action is to fulfill the Services' Section 10(a)(1)(B) conservation authorities and obligations and to render decisions on the ITP applications, accompanied by an HCP, requesting authorization of incidental take of the Covered Species.

### 1.2.2 Need

The need is to provide broad protection and conservation for Covered Species, while responding to the Applicant's request for ITPs to determine if they meet permit issuance criteria pursuant to ESA Section 10(a)(1)(B).

## 1.3 Regulatory Environment

### 1.3.1 Legislation Governing HCP/ITP Process

#### 1.3.1.1 Endangered Species Act (16 USC §1531 et seq. [1973])

The ESA provides protection for species (and their habitat) that are considered endangered (in danger of extinction throughout all or a significant portion of the species' range) or threatened (likely to become an endangered species within the foreseeable future). Specifically, Section 9(a)(1)(B) of the ESA prohibits taking of endangered and threatened species "within the United States or the territorial sea of the United States," unless a special exemption has been issued. Under Section 3(19) of the ESA, take is defined as "to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct." Under Section 10(a)(1)(B) of the ESA, the Services may authorize, under certain terms and conditions, any take otherwise prohibited by Section 9(a)(1)(B), "if such taking is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity." Such an authorization is referred to as an incidental take permit (ITP).

Under Section 10(a)(2)(A), no ITP may be issued unless the applicant prepares "a conservation plan that specifies— (i) the impact that will likely result from such taking; (ii) what steps the applicant will take to minimize and mitigate such impacts, and the funding that will be available to implement such steps; (iii) what alternative actions to such taking the applicant considered and the reasons why such alternatives are not being utilized; and (iv) such other measures that the Secretary may require as being necessary or appropriate for purposes of the plan." The HCP addressed in this EA is intended to fulfill the requirements of Section 10(a)(2)(A).

Under HCP guidelines (USFWS-NOAA 2016) mitigation is included as one of the conservation measures that usually take one of the following forms:

- Avoiding the impact through project design
- Minimizing the impact through best management practices (BMPs)
- Minimizing the impacts of the taking by reducing or eliminating other threats
- Mitigating (offsetting) impacts of taking on a species, by:
  - a. restoration of degraded habitat

- b. enhancement of functional habitat
- c. preservation of habitat
- d. creation of new habitat
- e. translocating or repatriating species

In the remainder of this document the terms mitigate/mitigation will be used in the context of the HCP handbook.

Issuance of an ITP requires each Service to prepare findings described in Section 10(a)(2)(B), one of which is equivalent to Section 7 of the ESA. Under Section 7(a)(2) of the ESA, a federal agency is required to engage in internal consultation to “insure that any action authorized, funded, or carried out by such agency ... is not likely to jeopardize the continued existence of any endangered species or threatened species or result in the destruction or adverse modification of habitat of such species ...” Pierce County’s preparation and submittal of the draft HCP, together with a request for an ITP, will be the basis for each Service to prepare its findings.

### 1.3.1.2 National Environmental Policy Act (42 USC §4321 et seq. [1969])

Issuance of an ITP is a federal action requiring compliance with NEPA. NEPA’s underlying policy requirement is that federal agencies consider effects on the human environment before they undertake any major action. Federal agencies are specifically required to evaluate whether environmental impacts from their major actions are significant, and to identify reasonable mitigation for any impacts determined to be significant.

Measures such as impact avoidance and minimization are described in this document as “Measures to Avoid and Minimize Take” in Section 2.2.2. As mentioned above, use of the term “mitigation” is reserved for measures that the applicant has included in the HCP as part of a conservation strategy to offset unavoidable impacts of the incidental take of covered species and are included in Section 2.2.3 “Measure to Mitigate Unavoidable Take”.

When the significance of impacts of a federal action, such as issuance of an ITP, is uncertain, agencies may prepare an EA to assist in resolving the uncertainty. If, after completing the EA, it is determined that the federal action would not result in significant impacts on the environment, a finding of no significant impact (FONSI) would be issued to conclude the NEPA process. If it is determined that significant impacts are likely, then an environmental impact statement must be prepared.

## 1.3.2 Permits Required to Implement Flood Risk Reduction Activities and Proposed Restoration Projects

### 1.3.2.1 Federal

**Section 404 of the Clean Water Act:** Regulates ground-disturbing activities in waters of the United States, including wetlands; the jurisdictional agency is the US Army Corps of Engineers (USACE).

**Section 10 of the Rivers and Harbors Act of 1899:** Regulates work in, over, or under navigable waters of the United States; the jurisdictional agency is the USACE.

**Section 401 of the Clean Water Act:** Requires certification to ensure compliance with state and federal water quality standards and other aquatic resources protection requirements; issued by the Washington Department of Ecology (Ecology) on non-tribal lands in Washington State; by the Puyallup Tribe of Indians on Puyallup tribal

land; by the US Environmental Protection Agency on tribal lands where a tribe does not have treatment as a state.

**CZM Federal Consistency Under the 1972 Coastal Zone Management Act:** Requires consistency with applicable federally approved state Coastal Zone Management programs; in Washington State issued by Ecology.

### 1.3.2.2 State and Local

**Hydraulic Project Approval under RCW Chapter 77.55:** Regulates work that uses, diverts, obstructs, or changes the natural flow or bed of any water of the state; the jurisdictional agency is the Washington Department of Fish and Wildlife (WDFW).

**Aquatic Use Authorization under RCW 79.105:** Requires lease for most activities taking place on state-owned aquatic lands; the jurisdictional agency is the Washington Department of Natural Resources.

**Construction Stormwater General Permit Under Clean Water Act and RCW 90.48:** Requires construction site operators to prevent stormwater from degrading water quality in receiving water bodies; issued by Ecology.

**Floodplain Development Permit under CFR 44 (Emergency Management and Assistance) and RCW 86.16:** Requires projects proposed in mapped 100-year floodplains be designed and constructed to potential damage from floodwater (applies if local government participates in National Flood Insurance Program); the issuing agency is the local city or county.

**Shoreline Approval Under City or County Shoreline Master Program promulgated under RCW 90.58:** Various permits, one or more of which may be required, for project consistency with applicable city or county shoreline master program; the jurisdictional agency is the city or county.

**State Environmental Policy Act Under RCW 43.21C:** The Washington State analogue to NEPA that mandates a process to ensure that environmental values are considered during decision-making by state, regional, county, and municipal agencies.

## 1.4 Project Description: Habitat Conservation Plan Scope

### 1.4.1 Applicant

The applicant for the ITPs whose effects are evaluated in this EA is Pierce County Planning and Public Works.

### 1.4.2 Species Covered

Table 1 lists the species covered in the proposed ITPs.

**Table 1. Species Covered in the Pierce County Levee Maintenance and Operations Habitat Conservation Plan.**

Common Name	Scientific Name	Federal Status	Jurisdictional Agency
Bull trout (Coastal-Puget Sound DPS)	<i>Salvelinus confluentus</i>	Threatened	USFWS
Pacific lamprey	<i>Entosphenus tridentatus</i>	Species of Concern	USFWS
River lamprey	<i>Lampetra ayresii</i>	Species of Concern	USFWS
Western brook lamprey	<i>Lampetra richardsoni</i>	Species of Concern	USFWS
Chinook salmon (Puget Sound ESU)	<i>Oncorhynchus tshawytscha</i>	Threatened	NMFS
Coho salmon (Puget Sound/ Strait of Georgia ESU)	<i>Oncorhynchus kisutch</i>	None	NMFS
Steelhead trout (Puget Sound DPS)	<i>Oncorhynchus mykiss</i>	Threatened	NMFS

DPS = Distinct Population Segment  
 ESU = Evolutionarily Significant Unit

### 1.4.3 Geographic Area Covered by the HCP and Analyzed in this EA

The NEPA analysis area is the same as the plan area and permit areas in the HCP, and therefore also the area covered by the ITPs that may be subsequently issued by the Services. The plan area and permit area for the HCP are the same and are also referred to in this document as covered lands or covered area. Covered lands include all County flood risk reduction structures and areas immediately adjacent to them needed for equipment access, staging, and construction, as well as river reaches that could be affected by flooding, including the areas identified for habitat restoration under the proposed HCP. The actual planned levee work described in the HCP is determined by the location of infrastructure owned by Pierce County.

The approximate geographic area covered by the HCP includes (see Figure 1):

- Puyallup River system: Lower, Middle, and Upper River reaches (from river mile [RM] 0.0 to Champion Bridge at RM 29.0)
  - The Lower Puyallup River from its mouth (RM 0.0) to the confluence of the White River (RM 10.3)
  - The Middle Puyallup River from the confluence of the White River (RM 10.3) to the confluence of the Carbon River (RM 17.4)
  - The Upper Puyallup River from the confluence of the Carbon River (RM 17.4) to Champion Bridge (RM 29.0)
- White River system: Lower and Upper White River, and Greenwater River
  - The Lower White River from its confluence with the Puyallup River (RM 0.0) to upstream of the King/Pierce County boundary (RM 6.24)
  - The Upper White River near the community of Greenwater, from RM 42.3 to RM 50.5
  - The Greenwater River from its confluence with the White River (RM 0.0) to RM 4.0

- Carbon River system: Carbon River and South Prairie Creek
  - The Carbon River from its mouth at the Puyallup River (RM 0.0) to approximately the intersection of Alward Road and 245th Avenue East (RM 8.4), and from RM 22.0 to RM 24.0
  - South Prairie Creek from its confluence with the Carbon River (RM 0.0) to the town of South Prairie (RM 6.4)
- Nisqually River system: Middle and Upper Nisqually River, and Mashel River
  - The Middle Nisqually River in the McKenna area (RM 21.3 to RM 26.0)
  - The Mashel River from its confluence with Nisqually River (RM 0.0) to the town of Eatonville (RM 6.8)
  - The Upper Nisqually River from the community of Elbe (RM 50.5) to Mount Rainier National Park (RM 65.8)

Within the covered area, levees are present only on the following river reaches:

- Puyallup River: RM 7.47 to RM 28.60
- Carbon River: RM 0.00 to RM 8.31
- White River: RM 0.00 to RM 6.24
- Nisqually River: RM 64.5 to RM 65.4

Within these reaches there are 46.39 miles of covered levees including right-bank and left-bank levees. The extent of levees and revetments is not continuous within those reaches. Appendix A of the HCP (Pierce County 2024) contains a list of maps showing, the specific flood risk reduction facilities within the covered area.

#### **1.4.4 Time Period Covered**

The County has applied for ITPs lasting for a 30-year term. The County selected a 30-year planning timeframe for their applications to enable enough time for the ecological outcomes of HCP minimization and mitigation measures to be begin to be developed, while being short enough to avoid the uncertainty inherent in longer planning horizons. The time frame is a reasonable planning timeframe that ensures beneficial HCP effects will minimize and mitigate the effects of take as required under the ESA. The timeframe is also consistent with other planning efforts, including the County’s Flood Plan.

#### **1.4.5 Activities Covered**

The HCP covers flood structure, repair, maintenance, and operation (M&O) activities of levees and revetments described in the HCP. The HCP defines maintenance as “routine activities such as repairing or cleaning assets during their useful life.” The HCP defines operation as “administration of activities implemented with the objective of keeping an asset working its best.”

The HCP also covers levee vegetation management, as well as three restoration projects: construction of a proposed setback levee at the Upper Puyallup River/SW Quadrant restoration site; and construction to setback the levees at the Needham Road and Carbon River Ski Park restoration sites. Finally, the HCP covers property acquisition of parcels at a fourth site where the County will acquire properties to remove them from future development. The M&O activities and restoration sites are summarized below.

#### 1.4.5.1 Flood Risk Reduction Structure Inspection Process

M&O staff perform routine annual inspections to evaluate and prioritize levee repairs. The staff also perform inspections during high water events. The inspection process is described in Section 5.3 of the Pierce County System Wide Improvement Framework (SWIF), Surface Water Management Operations and Maintenance Protocols (Pierce County 2017a).

#### 1.4.5.2 Interim Risk Reduction Measures

The County's interim risk reduction measures are actions and good practices aimed at reducing risk of flood inundation of leveed areas. Interim risk reduction measures consist of both structural and nonstructural components. These components are described in Section 6.4 of the SWIF (Pierce County 2017a).

#### 1.4.5.3 Levee and Revetment Maintenance and Repair

Levee and revetment maintenance and repair include actions taken to preserve and restore the designed function of levees or revetments, plus construction of the setback levees and removal of portions of existing levees that the County will perform as part of the restoration projects. In general, projects under the maintenance and repair categories involve the County replacing rock that has been displaced and/or washed away and re-grading the face of the levee or revetment (Figure 2). Actions may vary in scale from minor repairs to full reconstruction.



The HCP distinguishes between levee and revetment maintenance, which is planned work that can be forecast, and during which the County can implement all applicable BMPs; and levee and revetment repair, which is generally unplanned, may occur outside prescribed in-water work windows, and during which the County may not implement all BMPs. Levee and revetment repair refers specifically to projects that restore damaged structures to pre-damaged conditions.

### ***Levee and Revetment Maintenance***

The County conducts maintenance work using heavy equipment such as trucks, excavators, bulldozers, and loaders. Staging of equipment and supplies takes place on existing access roads or other developed areas upland of levees and revetments. The County accesses maintenance sites from existing roads that run on top of or adjacent to levees and revetments, or waterward of the repair location such as exposed gravel bars. Using waterward access routes can be beneficial when dry gravel bars become accessible to construction equipment, and in-water work and water quality impacts can be avoided. Such routes can also improve the reach of an excavator, allowing better placement of large woody material (LWM) when required, reducing impacts to the tree canopy and riparian vegetation due to less tree removal or trimming, and making it easier to control and isolate groundwater from the work area. Before waterward access routes are constructed, the County conducts a site visit with tribes, resource agencies, and County biologists to determine if access route construction would result in less impact to biological resources than other site access methods. The County only conducts waterward access routes if all parties concur with the decision. The County currently, and in the future will continue to, plan equipment access routes to minimize impacts by implementing the BMPs outlined in Section 2.2.2, in addition to:

- Adhering to existing permit conditions.
- Monitoring stream flows by working during periods of seasonal low flows.
- Inspecting work sites prior to repair activities. If an active channel is “drying up” due to declining flows and appears to be trending towards disconnection with the active channel, appropriate permit agencies and tribes will be contacted to discuss performing work outside of the fish window.

Under certain rare circumstances, the County might need to construct temporary construction access roads to complete the underlying maintenance activities. Such roads are stabilized rock pads consisting of angular rock ranging in size from crushed gravel to quarry spalls and may have geotextile fabric under-liner placed beneath the rock pad if conditions require it. This configuration allows stable vehicle access from uplands to the construction site and eliminates sediment track-out on the permanent road.

Maintenance of levees and revetments often involves excavation and placement of fill below the OHWM. Fill is placed within the pre-damaged footprint of the structure. In-water work may require the County to isolate and dewater the work area as described below, and could include fish handling for isolation, removal, and relocation. The County’s levee and revetment maintenance procedures involve:

- Conducting site assessment to determine and plan the project
- Installing erosion control measures and other BMPs
- Isolating the in-water work area and removing fish (if necessary; fish removal is rarely required for these projects)

- Removing vegetation and debris (includes relocating woody material and gravel from within the work area) to facilitate construction
- Retrieving and reusing dislodged toe rocks to re-establish the alignment of the levee or revetment prism to the extent practicable<sup>1</sup>. The alignment is re-established within the pre-damaged footprint
- Adding supplemental rock to re-establish the integrity of the levee or revetment prism
- Grading and re-establishing the waterward prism face to create a stable surface on which to place face rock
- Reconstructing the entire structure in its pre-damaged footprint
- Restoring the site both above and below the OHWM to pre-flood-damage conditions, including planting native plants along the repaired segment, installation of LWM, or both.

All steps include work necessary to re-establish a structurally sound levee or revetment and to tie in with the existing upstream and downstream tie-in points. Tie-in points may be either high ground or an existing adjacent levee or revetment.

Levee and revetment maintenance may include repositioning or relocating LWM or other natural debris in the work zone. Under this HCP, the County will reposition woody material in the river rather than remove it. In situations where LWM is hung up on the levee and causing a debris jam, scour, or other damage, the County will dismantle the jam and reposition LWM in the channel. The County will place woody material in the river in the same location as the jam unless the jam is directly upstream of a bridge or other sensitive infrastructure or there are other safety concerns (such as public access or the facility itself). In such cases, the County will place wood either in the channel immediately downstream of the infrastructure or in a nearby location that maximizes potential ecological function.

### ***Levee and Revetment Repair***

Levee and revetment repair refers specifically to projects that restore damaged structures to pre-damaged conditions. Pierce County commits to the continued practice of conducting repairs within the pre-damaged footprint of the levee or revetment. In some cases, the County will lay back repaired sections, increasing channel section at the site, but, under the HCP, the County will never intentionally repair a levee in a manner that exceeds the levee's pre-damaged height, length, or waterward extent. If repair is needed beyond the pre-damaged footprint height or length, the County will seek ESA compliance through an individual Section 7 consultation. In such cases, the County will still implement all applicable BMPs described in the HCP. Additional BMPs and mitigation measures may be developed in coordination with the Services during the Section 7 process. The restoration sites described in the HCP will not be used to provide compensatory mitigation for projects that undergo a separate Section 7 consultation.

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<sup>1</sup> Elements that affect practicability include the following considerations:

- Can the rock be retrieved without placing worker or equipment in danger?
- Can the rock be retrieved without causing significant environmental damage?
- Will permitting agencies allow retrieval of the rock without additional mitigation?
- Is retrieving the rock cost effective?

### ***Levee and Revetment Repair under Imminent Threat***

Imminent threat work consists of preventive actions to reinforce existing levees that are in degraded conditions to avoid or minimize impacts of an oncoming event. An imminent threat is typically a situation that, if not resolved, is reasonably likely to result in harm to people or infrastructure, such as a levee damaged to a point that it would likely fail in a subsequent high-water event and result in flooding if not repaired. Where time permits, the County will adhere to the methods described in Section 2.2.2 to the maximum extent practicable. The County will also follow an expedited permitting process prior to repair actions as necessary. Where time is of the essence and conditions require, the County will follow the emergency approaches described in the *Flood Fighting and Emergency Response* section, below.

When an imminent threat has been identified, the County contacts the USACE, the Services, WDFW, the Puyallup and Muckleshoot tribes, and Pierce County Planning and Land Services. County biologists are included as part of the response team.

### ***Flood Fighting and Emergency Response***

Flood fighting and emergency response are actions to reduce flood damages and to prevent or mitigate the impacts of floodwaters before, during, or after a flood event to protect human life, reduce flood damages, and prevent or mitigate the impacts of floodwaters. Most actions taken to combat flooding are levee or revetment repair and are very similar to the activities described in *Levee and Revetment Maintenance*. Actions may also include berm and barrier construction and emergency sandbagging. There are two types of emergency bank protection projects. The first is flood fighting, which entails actions taken during a flood to address the immediate threat of erosion. The second activity is bank repair after the flood, often with the risk of additional floods in the near future.

Most emergencies involving bank failure along streams and rivers occur during periods of high water that may result in flooding. Inundation and poor weather reduce visibility and complicate access for people and equipment. To minimize impacts of flood fighting activities on covered species, the County's M&O staff will follow protocols set forth in the RRMP 4(d) guidance.

The County's flood fighting and emergency response activities typically occur between October 1 and April 1. Most activities occur between November and January, but flood fighting and emergency response could occur during other times of the year, depending on weather and river conditions. Therefore, work below the OHWM typically cannot be conducted during the standard in-water work window.

The County has developed a flood risk assessment reporting process to reduce flood risk and prioritize corrective actions, thereby minimizing the number of flood fighting/emergency responses and limiting in-water work that takes place outside the standard in-water work window. The County's risk assessment summarizes the existing conditions of levees and revetments based on review and findings from previous existing condition assessments, reports, studies, and analyses; identifies vulnerabilities of the levee structures that contribute to potential failure and flooding; reviews past performance, damage susceptibility, and consequences of structure failure; and identifies and recommends actions to correct identified deficiencies and reduce flood risk.

#### **1.4.5.4 Vegetation Management**

The County manages vegetation on levees and revetments to provide access and allow for visual inspection of the structures, and to minimize the potential for negative impacts on the structures caused by the presence of unmaintained vegetation. The County mows, trims, and/or thins vegetation. Mowing consists of clearing

access roads to levees and revetments and along the top of the structures and is typically performed using a tractor outfitted with a mower attached to an articulating arm or a deck mower. Thinning entails cutting and removal of brush and other vegetation from the levee face, using a combination of mechanical equipment and hand equipment. All the County flood risk reduction structures will be managed consistent with the strategy in the SWIF (Pierce County 2017a). Prior to developing the SWIF, Pierce County operated under an intergovernmental agreement with the Puyallup Tribe governing vegetation management within the Puyallup River basin. The agreement specifies allowable vegetation removal related to levee maintenance activities. The County prepared the SWIF in recognition of this agreement. The SWIF (Pierce County 2017a) provides additional restrictions and guidelines on levee vegetation management. The portion of the SWIF that applies to levee vegetation management is provided in Appendix G of the HCP.

#### 1.4.5.5 Restoration Projects

As described in Section 2.2.3, the County will construct three floodplain restoration projects in the Carbon and Puyallup River basins to offset unavoidable impacts from covered activities. The County will also purchase property at the confluence of the Puyallup and White Rivers to remove that property from development and to facilitate future restoration at that site.

## 2 Alternatives, Including the Proposed Action

This EA evaluates two alternatives:

1. No Action; NMFS and USFWS would not issue ITPs
2. Proposed Action/Preferred Alternative; NMFS and USFWS would issue ITPs and County would implement Flood Risk Reduction Structures Maintenance and Operations HCP

Presently, Pierce County operates using BMPs derived from a portion of the County's Regional Road Maintenance Manual (RRMM) (Pierce County 2017b). The goal of the Tri-County Road Maintenance ESA Technical Working Group that developed the RRMM was to develop a regional road maintenance program (RRMP) that would contribute to the conservation of salmonids and other fish species and would meet federal agencies' requirements under Section 4(d) of the ESA. A subset of the BMPs in the RRMM directly address certain activities that minimize or avoid upland sediment transport to nearby waters of the US, culvert maintenance, and maintenance and repair of other utility infrastructure maintained as part of the County road system. Those measures appropriately minimize adverse effects of construction and maintenance on water quality, habitat access and quality, and the quality of function of the processes that make and maintain habitat in the covered area. Pierce County is a member of the RRMP Regional Forum and has been operating under the RRMP since 2003, making Pierce County one of the most experienced participants in that program, in which the County continues to operate, in good standing.

The NMFS assessed the expected implementation of the RRMP in 2002 and 2003 Biological Opinions prepared to assess NMFS's action of qualifying the RRMP under Limit 10ii of the July 2000 4(d) special rule (for two groups of local government participants). This EA compares the environmental effects of a No Action Alternative and the Preferred Alternative. To clarify the distinction between the alternatives, NMFS notes that although both alternatives use a subset of the RRMP BMPs, No Action makes no requirement of those BMPs beyond Pierce County's present, narrow use of RRMP measures in the maintenance of flood structures. In contrast, the Preferred Alternative requires Pierce County to choose from the entire menu of RRMP BMPs, the SWIF for vegetation management, and the processes and measures for streambank protection under the Integrated Streambank Protection Guidelines (ISPG) (WSAHGP 2003), along with monitoring, reporting, and adjusting usage as Pierce County receives new information from monitoring. This distinction from the No Action Alternative applies throughout the analysis, later in the document. The EA provides greater detail in the Preferred Alternative section below.

Under the Preferred Alternative, the County would implement floodplain restoration to mitigate unavoidable take that could occur despite implementation of the RRMP BMP selection process and other measures designed to avoid and minimize take. This EA also evaluates impacts resulting from that floodplain restoration.

### 2.1 No Action: NMFS and USFWS Would Not Issue ITPs

This alternative is hereafter referred to as the No Action Alternative.

Under the No Action Alternative, the Services would not issue ITPs and there would be no County commitments through an HCP. Pierce County would continue current flood hazard management practices, programs, and projects, but would not implement the proposed HCP. As such, the use of BMPs under the No

Action Alternative is specific to measures intended to reduce the risk of damage or failure of flood control structures. As such, the No Action Alternative would be limited to a narrow subset of water quality protection and minimization measures. However, particularly during maintenance activities that require rapid responses, there is a potential for implementation of BMPs to be ad hoc and focused primarily on reducing liability for potential violations of the ESA Section 9 prohibition against take. Because of this potential, there would be a higher likelihood, under the No Action Alternative, of causing actual take. The negative environmental impacts of this alternative include a higher likelihood of incidental take due to a narrower subset of avoidance and minimization measures, ad-hoc BMP implementation and the absence of 193 acres of restored floodplain habitat that would otherwise offset M&O impacts.

To facilitate comparison among alternatives, and particularly to assess and disclose the benefits of implementing conservation measures included in the HCP, the No Action Alternative includes the assumption that the County would not implement BMPs included under the Preferred Alternative during emergency repairs, flood fighting, and imminent threat projects that often require rapid responses. Also, under the No Action Alternative, the County would not implement any of the restoration projects described for the Preferred Alternative.

## 2.2 Preferred Alternative: NMFS and USFWS Issuance of ITPs and County's Subsequent Implementation of the Flood Risk Reduction Structures Maintenance and Operations HCP (Proposed Action)

The Preferred Alternative includes the specific measures that Pierce County would implement for the conservation of covered species under the proposed HCP and ITPs. The following sections describe biological goals and objectives of the HCP, measures to avoid, minimize and mitigate for take of covered species, and adaptive management. Section 2.4 of this document describes elements common to both alternatives, in addition to the measures that will only occur under the proposed HCP.

### 2.2.1 Biological Goals and Objectives

The biological goals and objectives stated in the HCP are as follows:

#### **Biological Goals:**

The overarching biological goals of the HCP are to contribute to the conservation of covered aquatic species by protecting and restoring important floodplain functions such as floodwater storage, water quality maintenance, and fish and wildlife habitat, and to minimize demographic threats (low abundance and productivity) by promoting diverse life history strategies and conserving genetic diversity. Specific biological goals are to:

- Avoid and minimize impacts on fish and aquatic habitat
- Restore natural floodplain function
- Increase edge habitat
- Reestablish riparian forests

## **Biological Objectives:**

Biological objectives are specific, measurable steps that Pierce County will take to meet the biological goals. To meet the biological goals, the County will:

- Implement BMPs that reduce construction impacts
- Reduce or eliminate the need for continued levee maintenance at restoration sites
- Remove and set back levees
- Redirect river flow toward accessible floodplain
- Decrease the presence of riprap edge
- Abandon roads within the floodplain
- Remove blockages in relict channels
- Install LWM
- Allow the rivers to access floodplain
- Allow the rivers to access presently forested portions of floodplain at restoration sites

The County will achieve these objectives by implementing BMPs at individual M&O activity locations, as well as by constructing the floodplain restoration projects. The restoration projects will increase floodplain connectivity, activate side channels, and provide other important habitat features for covered species.

### **2.2.2 Measures to Avoid and Minimize Take**

The HCP incorporates a variety of measures into the design, construction, and management of M&O activities to avoid and minimize take of listed species. The measures in the HCP and listed below include BMPs from the Regional Road Maintenance Guidelines Part 2 (RRMP 2002) that are also applicable to flood risk reduction structure M&O activities, BMPs from the Flood Plan Final Environmental Impact Statement (Pierce County SWM 2012), conservation recommendations from the USFWS (2015a) biological opinion on emergency revetment repairs in Pierce County, and other BMPs and impact minimization measures that the County will implement according to conservation objectives.

#### **Project Design BMPs**

- Planned projects will be prioritized over other projects to minimize the need for imminent threat and emergency work.
- Non-emergency levee and revetment maintenance involving streambank protection will use the interagency ISPG (WSAHGP 2003) and be designed to maximize the protection of habitat according to that analysis, consistent with USFWS (2015a). Emergency repairs, flood fighting, and imminent threat projects that often require more rapid responses will be conducted according to the general design, construction techniques, and other considerations in the ISPG.
- Rock will be keyed into the riverbed below scour depth (and below existing grade) where possible. Rock will be keyed together with smaller rocks to provide stability. These two measures minimize future levee failure and exposure of the rock (and, thus, interaction with fish) during low-flow conditions.
- Toe rock will be sized to maximize the stability and longevity of the repair, thereby minimizing the risk of future levee failure and associated repairs.

- Toe rock will be used as a localized flow deflector to minimize impacts during in-water work. The flow deflector creates a quiescent area of low velocity flow immediately downstream, allowing the operator to place the rock in a more controlled fashion, thus reducing impacts such as downstream sedimentation and water turbidity.
- Where practicable, slopes will be reduced to increase channel capacity and stability of the levee or revetment.
- Bioengineering techniques that provide habitat functions will be incorporated into project designs where practicable, consistent with USFWS (2014 and 2015b) recommendations, and consistent with the ISPG.
- A qualified biologist will evaluate all projects that involve sandbagging and berm and barrier construction. The County will not implement these methods if they increase the risk of fish stranding.

### **Water Quality BMPs**

- Projects will be designed to, at a minimum, comply with the Washington Department of Ecology's State Water Quality Standards (Chapter 173 201A WAC) or permit modifications.
- Activities covered under this HCP will adhere to Washington State water quality standards (WAC 173-201A-400) that limit turbidity mixing zones to 300 feet downstream and 100 feet upstream.
- All excavated materials will be removed to an upland location where they cannot enter the water body.
- Equipment will be used to ensure that no foreign material such as oil or fuel from construction equipment will enter any wetlands, flowing water, or standing water.
- Spill containment equipment will be kept on all project sites to protect water quality.
- BMPs will include those in the conditions of Hydraulic Project Approvals (HPAs) issued by the state for M&O projects.

### **In-Water Work BMPs**

- Maintenance work that is not emergency or flood fighting in nature, and that is conducted within or below the OHWM, will adhere to in-water work timing restrictions and requirements of the HPA and Water Quality Standards for Surface Waters of the State of Washington (Chapter 173201A WAC).
- Non-emergency work and non-flood fighting work outside the in-water work window will only be performed in the dry. These instances will be coordinated with the WDFW and the affected Tribes.
- The duration of in-water work will be minimized as much as practicable for all M&O activities. Flood fighting/emergency repair activities and imminent threat projects are often conducted outside of the in-water work window but the duration of in-water work will be limited to the minimum amount necessary to complete the activity.
- Construction equipment will not enter any water body without permit authorization. Equipment will be operated as far from the water's edge as safely possible.
- Equipment will be checked daily for leaks and will be maintained to prevent lubricants and any other deleterious materials from entering surface waters. Prior to entering the water or below the OHWM, all equipment will be made free of any external petroleum products, hydraulic fluid, coolants, and other

deleterious materials to the extent possible. Wash water will not be discharged to any water body without pretreatment.

- Vehicles and machinery operating below the OHWM will use biodegradable hydraulic fluids and lubricants to reduce the potential impacts associated with an oil spill or leak. However, for flood fighting, emergency repairs, and imminent threat projects, there may not be time to switch to biodegradable fluids and lubricants; and they may not be used.
- If planned activities involve in-water work, a qualified biologist will evaluate the site to determine if and how fish handling will occur. The work area will be isolated, and fish will be removed unless the act of isolating and fish exclusion will cause more harm than the work activity itself. Fish exclusion and fish handling activities will follow the most recent WDFW, NMFS, and USFWS protocols for those activities, as well as Appendix E of the RRMP 4(d) manual. Flood fighting and emergency response may occur without isolating the work area.
- If in-water work is near potential spawning gravels and fish are within the river system, inspections by a qualified biologist will occur daily, in the morning, prior to the start of work. A second inspection shall be conducted at the end of the day to be sure fish are not returning once construction has ceased. Evidence of fish spawning in the work area shall result in suspension of work until biologists provide additional impact analysis; biologists from WDFW, Services, and Tribes will be contacted to assist. Pierce County biologists will continuously track fish presence by conducting site visits. County biologists will notify WDFW and Tribal biologists if any fish are observed.
- Any turbid water pumped out of the isolated project area will be discharged to a temporary storage and treatment site, upland areas, or filtered through vegetation prior to re-entering the stream channel. Treatment methods will be determined on a project basis to minimize impacts based on site- and project-specific conditions.
- All intake pumps within fish-bearing streams will have a fish screen installed, operated, and maintained. Screening techniques will follow specifications in the HPA and comply with RCW 77.55.010, RCW 77.57.040, and RCW 77.57.070, or the specifications in the NMFS (1997) Fish Screening Criteria for Anadromous Salmonids.
- Temporary bypass structures will have energy dissipaters at the outflow to prevent erosion.
- Upon completion of all in-water work, all stream diversion devices, equipment, pipe, and conduits will be removed in a manner that minimizes downstream sediment impacts. Disturbed soil will be regraded and revegetated to restore the area after diversions are removed.

#### **Vegetation Removal BMPs**

- Removal of riparian vegetation will be minimized to the extent possible. Native seed mix or riparian vegetation will be replanted in temporarily cleared areas.
- Vegetation removal and replanting will follow the standards outlined in the SWIF (Chapter 4.8) (Pierce County 2017a). These standards address:
  - Vegetation removal
  - Targeted invasive species removal
  - Mature tree preservation

- Hazardous trees
  - Riparian habitat protection/enhancement
  - Upland zone long term tree preservation and conservation
  - Large woody debris placement
- Vegetation will only be grubbed from areas undergoing repair. No grubbing will occur outside the designated and clearly marked work area.
  - Temporarily disturbed areas will be restored to pre-work conditions to the extent possible. Revegetation to restore the site will include planting native trees, shrubs, or herbaceous plants that are endemic to the project vicinity and region of the state where the activity is occurring.
  - Revegetated areas will be monitored for at least 3 years to ensure adequate plant survival rates (typically 80 percent).
  - Construction impacts will be confined to the minimum area necessary.
  - Boundaries of clearing limits will be clearly flagged to prevent disturbance outside of the limits.

#### **Site Access BMPs**

- Site access will be selected to minimize ground disturbance and impacts to vegetation, particularly to large trees or snags that are potentially important habitat features for covered species.
- Sites will be accessed using existing roads to the extent possible. The establishment and use of temporary access roads will meet the following conditions:
  - Existing roadways or travel paths will be used whenever they provide the needed access.
  - Vehicles and machinery will cross riparian areas and streams perpendicular to the main channel unless site-specific conditions require an alternate approach.

#### **Bank Protection BMPs**

- Where site specific conditions allow, bioengineering methods will be incorporated into bank protection projects per the ISPG. In those situations, fish habitat will be improved. Sites are reviewed on a case-by-case basis to determine the appropriate BMP.
- Installation of riprap and other materials will occur from the banks or outside the wetted perimeter to the maximum extent practicable.

#### **Air Quality BMPs**

- Standard BMPs to control dust, such as straw or mulch, matting, wetting, or hydroseeding, will be implemented according to the Regional Road Maintenance Guidelines (RRMP 2002) to minimize air quality impacts during activities.

#### **Noise BMPs**

- Engineering controls, such as mufflers on heavy equipment exhausts or on air-release valves, will be required, used, and maintained on all construction equipment and vehicles according to manufacturer's specifications.

## **Marbled Murrelet and Northern Spotted Owl**

- All planned work within 328 feet of suitable marbled murrelet nesting habitat, or within 200 feet of suitable spotted owl habitat will take place outside the nesting season.
- For unplanned work or work with time constraints, if heavy equipment operation occurs within 328 feet of suitable marbled murrelet nesting habitat, or within 200 feet of suitable spotted owl habitat during the nesting season, the County will conduct occupancy surveys to ensure adequate distance is provided between occupied habitat and sources of significant disturbances in addition to implementing avoidance and minimization measures.
- No potentially suitable nest trees for either species will be removed.

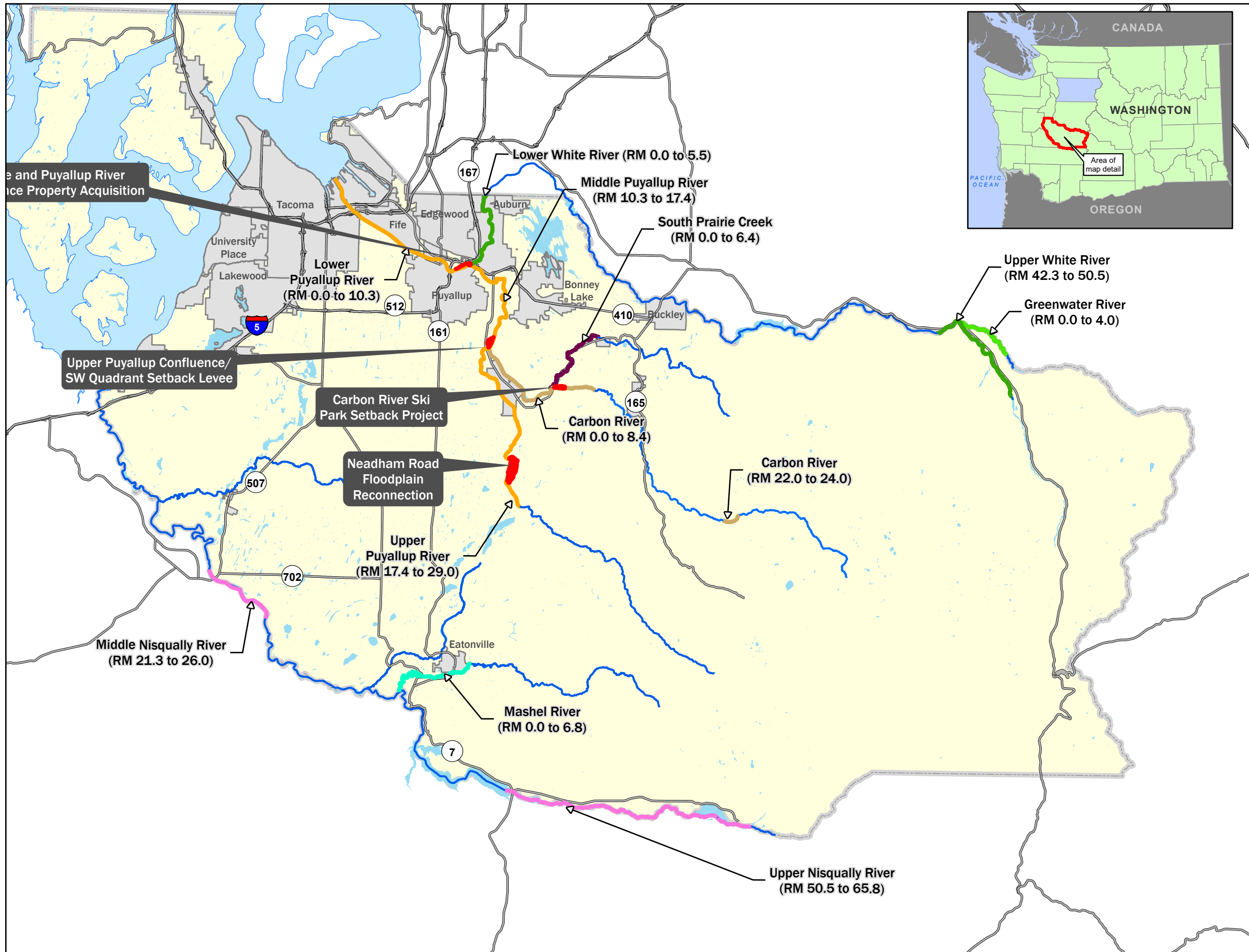
### **2.2.3 Measures To Mitigate Unavoidable Take**

In addition to the prescriptive aspects of the HCP described above, the HCP commits the applicant to three acquisition and restoration projects and land acquisition in a fourth location for future restoration. These projects are intended to offset the unavoidable effects of covered activities during the permit term and into the foreseeable future.

Under the HCP, Pierce County would acquire land and restore local conditions in the three restoration locations in ways that reconnect the river to an acreage of historical floodplain habitat that exceeds the estimated acreage of aquatic habitat impacts from the County's levee and revetment M&O activities. The County would reconnect river flow to previously disconnected areas by setting levees back (where they presently separate flow and floodplain) or installing structures (or both) to ensure a portion of the river flows into previously disconnected areas.

The Preferred Alternative includes three floodplain restoration projects and one property acquisition project in the Carbon and Puyallup River basins (Figure 3). The County would complete the restoration and property acquisition projects, described below, during the requested 30-year permit term, in compliance with all applicable local, state, and federal laws.

The type, geographic location, and extent of the restoration projects were determined based on the analysis of salmon habitat limiting factors described in the HCP and consideration of factors in the Pierce County Capital Facilities Plan (Pierce County 2020a), the Pierce County Comprehensive Flood Hazard Management Plan (Pierce County 2023), and the Puyallup River Basin chapters (Volume II) of the Puget Sound Salmon Recovery Plan (NOAA 2007). Pierce County identified, ranked, and prioritized levee setback and restoration projects in the Puyallup and Carbon River systems. The three HCP restoration sites (and the land acquisition) are in areas that increase floodplain connectivity, activate side channels, or provide other important habitat features presently missing or greatly diminished in the covered area. Furthermore, the HCP restoration sites are in the watersheds where Pierce County conducts most of its levee maintenance and repair actions. Pierce County sited the restoration in those basins with the intent to offset likely future impacts in similar locations. The sites were also chosen to reduce the need to implement future repairs in those locations. The restoration projects are part of a larger, comprehensive approach to address flooding and habitat throughout the entire watershed as outlined in the 2023 Flood Plan. Finally, in developing the planned restoration projects, Pierce County coordinated with the tribes and resource agencies regarding restoration site selection. Over the course of two workshops with tribes, the Services, and the Pierce County steering committee and staff, the County revised its restoration projects to the current three projects and added a property acquisition project near the confluence of the Puyallup and White Rivers.



**Figure 3.**  
**Restoration Sites – Pierce County**  
**Levee Maintenance and Operations**  
**Habitat Conservation Plan.**

**Legend**

- Project area
- Restoration site
- City
- Pierce County boundary
- Highway
- River

**Covered Area**

- Mashel River
- Nisqually River
- South Prairie Creek
- Greenwater River
- Carbon River
- Puyallup River
- White River

N

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ft

**HERRERA**

NAD 1983 HARN  
 Washington State Plane South FIPS 4602 Feet

K:\Projects\Y2020\20-07524-000\Pro\RevisedMitigationProject\_HCP\_mxd\import1\RevisedMitigationProject\_HCP\_mxd\import.aprx (9/9/2024)

In addition to implementing BMPs listed above during construction of restoration projects, the County would implement the following additional measures to protect water quality:

- Establish locations of sensitive areas (e.g., wetlands, fish and wildlife habitat) on work sites and restrict work to areas outside of sensitive areas wherever possible.
- Temporary erosion control and sedimentation measures provided under the Pierce County Stormwater Management Manual (Pierce County 2015).
- Conduct work in streams during seasonal work windows established by WDFW, USFWS, and NMFS.
- Retain trees and other vegetation where possible.

On acquired properties, the County would remove residences and other structures to avoid potential mobilization of waste from structures and septic systems during floods.

The County may need to construct new access roads at the proposed restoration sites. The site access BMPs listed above would apply to any temporary and/or permanent access roads constructed for this purpose.

The County intends to acquire all property from willing sellers. However, if necessary, the County's may use its eminent domain power to effect property transfers. The County participates in several restoration programs and efforts to enhance habitat within the covered area, including the work described in the HCP and aquatic restoration projects unrelated to the HCP. In doing so, the County seeks to coordinate its HCP implementation with other watershed restoration efforts to realize greater benefits for covered species, and to leverage the effect of available restoration dollars through coordinated restoration projects. As part of its conservation planning efforts, the County will continue to pursue additional conservation projects in coordination with other planning efforts that enhance habitat or conditions on covered lands.

To acquire land, Pierce County typically relies on a variety of funding sources, including non-County sources. Pierce County already possesses individual parcels at the restoration sites, which were purchased using funding from non-County sources. Pierce County will acquire 193 total acres under the HCP using only Pierce County funding. Only those parcels acquired exclusively by county funding will be counted towards HCP restoration commitments. Therefore, while the restoration sites will total 332 acres, the analysis focuses on the 193 acres needed to complete restoration and excludes 139 acres previously acquired using non-County funding. Doing so avoids overvaluing HCP-required restoration and avoids unfairly crediting Pierce County for those 139 acres.

### 2.2.3.1 Upper Puyallup Confluence/SW Quadrant Setback Levee

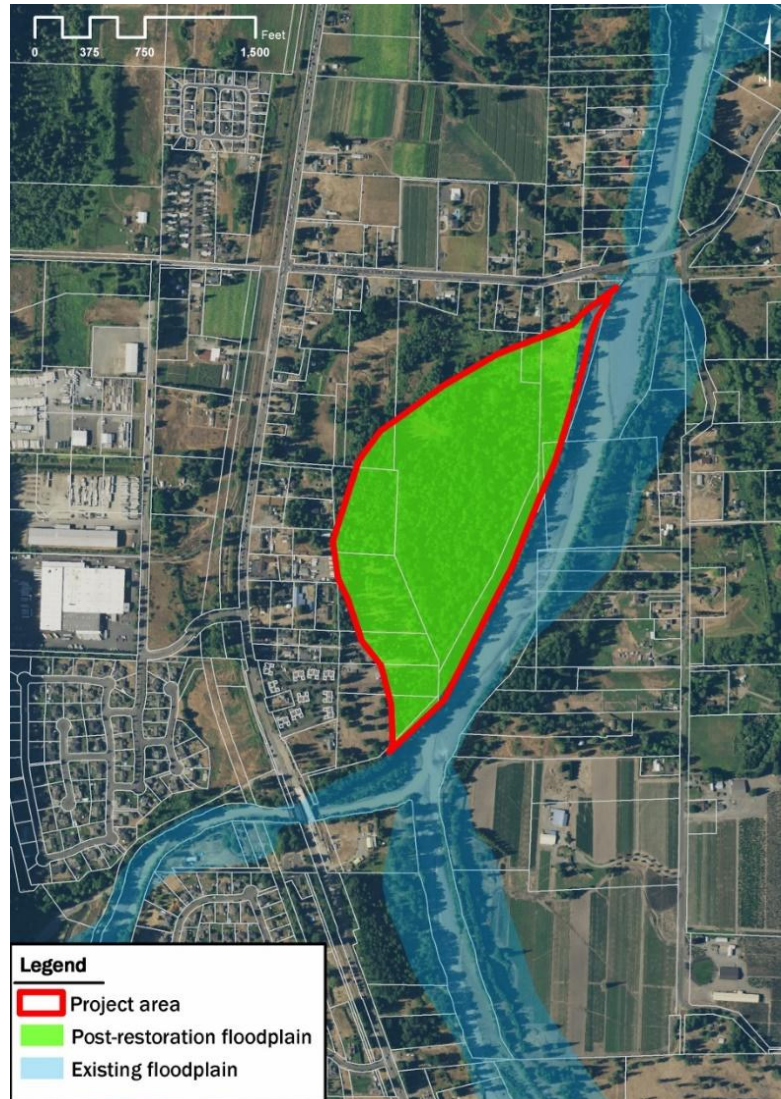
The Upper Puyallup Confluence project site is located on the left bank of the main stem Puyallup River between RM 16.7 and RM 17.4. Pierce County has acquired two of the 13 parcels at the restoration site (42 acres of the needed 60 acres).

The proposed restoration project will remove approximately 3,500 linear feet of existing levee face rock along the left bank of the Puyallup River between the McMillan Bridge and Carbon River confluence. The County will notch levee fill material at several locations along the levee, and if needed, will remove fill segments to match existing adjacent land grade.

Pierce County will build a new setback levee structure (approximately 4,200 linear feet) or a combination of setback levee structure and other bank protection measures conducive to fish habitat along the red line to the left of the riparian forest in the figure. The new setback feature will be closely aligned along the Puyallup River west floodplain fringe area.

Setting this levee back reconnects the river to approximately 60 acres of floodplain and will increase the space in which natural channel migration can occur. The setback will increase the potential extent of non-main-stem edge habitat for juvenile salmonids. The prevalence of riparian trees, tributary habitat, and remnant side channels at the site will support natural shade, streambank stability, a source of LWM, and formation of pools and other structures. These results will increase the extent of aquatic habitat and diversity in the restoration reach.

**Figure 4. Upper Puyallup River Confluence/SW Quadrant Setback Levee Project Area (red) and FEMA Mapped Floodplain (blue).**

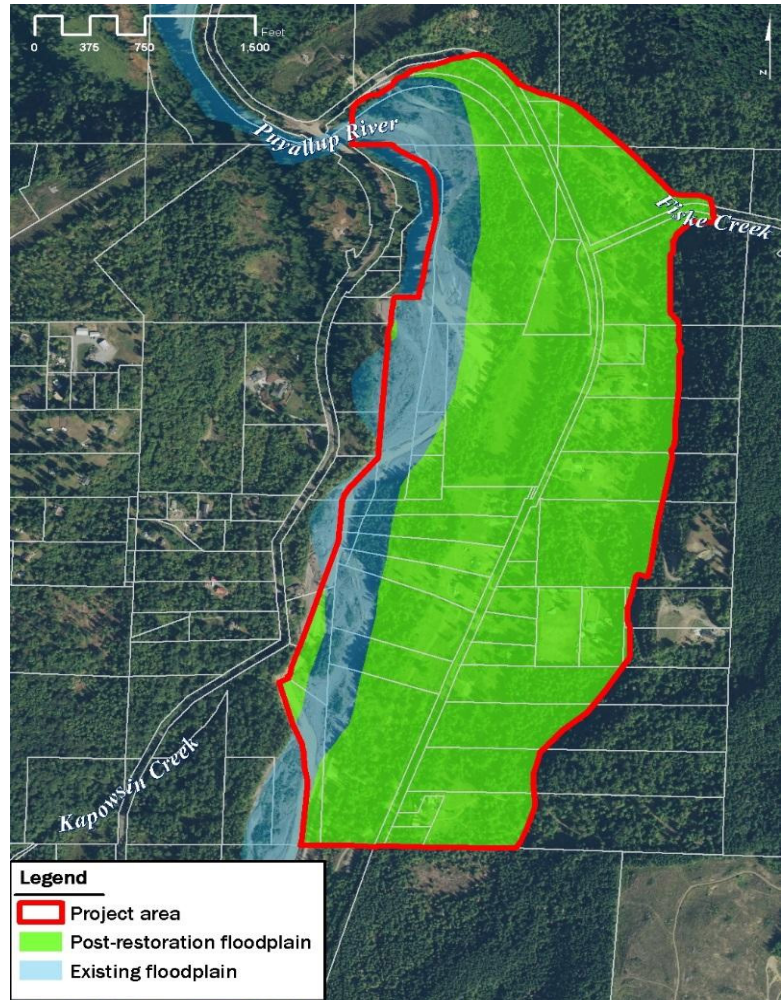


### 2.2.3.2 Neadham Road Floodplain Reconnection

The Neadham Road Floodplain Reconnection project will reconnect approximately 220 acres of floodplain on the right bank of the upper Puyallup River between RM 25.6 and RM 26.7. Project construction will not activate the left bank. Pierce County will remove approximately 3,700 linear feet of existing levee. As of the September 2024, one privately held vacant parcel and one single-family residence remain to be purchased by the County. Rainier Resources, a private quarry operator, also owns five parcels in the floodplain area of the project. The County anticipates that it will exchange parts of County-owned properties in adjacent upland areas for parts of the Rainier Resources parcels that lie within the floodplain.

This river reach is actively evolving and reclaiming its floodplain. Strategies for achieving the restoration objectives include removing the existing levee segments, abandoning Neadham Road, and removal of other blockages in the relic channels to allow the river full access to the historical floodplain as it had before construction of Neadham Road. The project will not include any work on Brooks Road, which will be retained in its current configuration. Post-construction, the edge of the channel migration zone will be close to Brooks Road. County engineers involved in conceptual design of the project have concluded that the threat of flooding damage to Brooks Road would be minimal. However, to increase confidence that the threat would be minimized, during future design stages project designers will evaluate the area adjacent to the current intersection of Neadham Road and Brooks Road, where split flood flows will rejoin the main stem of the Puyallup River, and, if necessary, slightly modify project design to increase floodplain capacity in the area. In addition, after construction is completed, the County will monitor the project area as it evolves, and, as needed, apply BMPs to adaptively manage flood risk to Brooks Road. Construction of this restoration project will likely reduce future levee maintenance needs in this reach of the river. The project will also allow for greater flood storage capacity and encourage reactivation of existing side channels, which will provide flood refugia for fish as well as increased habitat. The County expects to construct this project within 8 years of permit issuance. The County is striving to advance the project timeline by continuing property acquisitions, pursuing property

**Figure 5. Neadham Road Floodplain Reconnection Project Area (red) and FEMA Mapped Floodplain (blue).**



exchanges with the Rainier Resources quarry, planning an alternatives analysis for certain project elements to address stakeholder concerns, and developing project funding details to ensure complete funding.

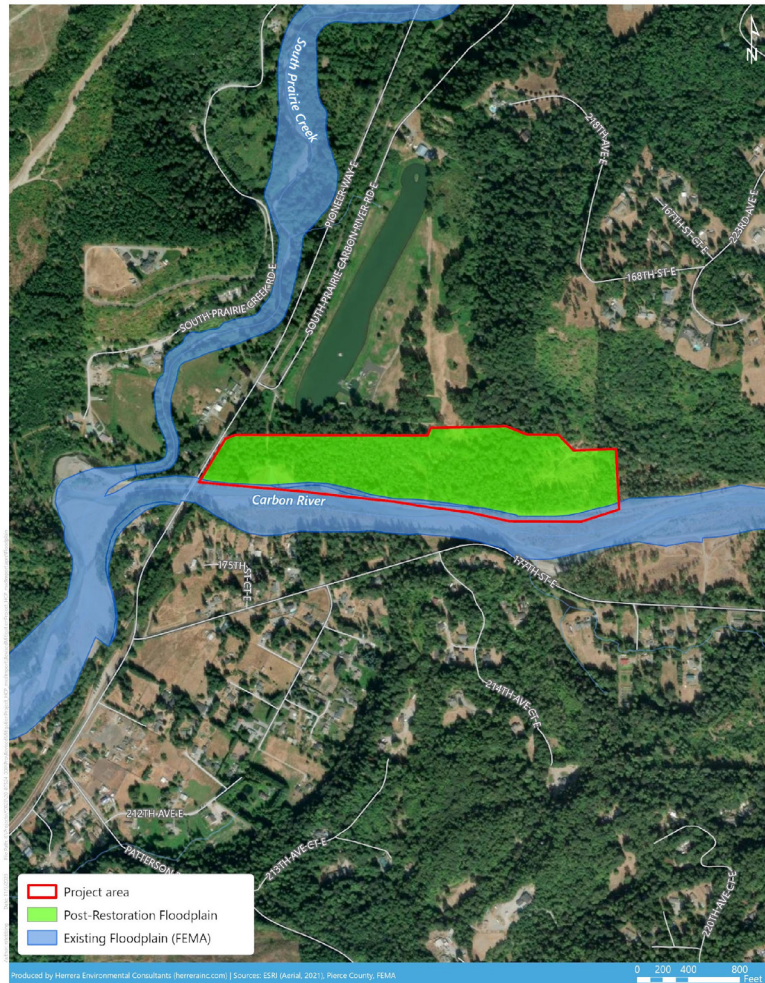
### 2.2.3.3 Carbon River Ski Park Setback Project

The Carbon River Ski Park Setback Project will remove approximately 3,900 linear feet of levee between RM 6.0 and 6.6 and establish a setback area that will reconnect approximately 35 acres of floodplain habitat. The primary goal of the project is to restore the natural flow dynamics, biota, and ecosystem processes in this reach of the Carbon River. Removing sections of the existing levee will recreate a more natural configuration of the river channel and floodplain. This restoration effort will enable the river to access and utilize its historical floodplain, resulting in improved habitat conditions for listed salmonids and other aquatic organisms. The inclusion of a setback within the channel migration zone aligns with the principles of sustainable river management and assists with restoring those natural processes.

Beyond the ecological benefits, the project also brings practical advantages. By reducing reliance on traditional levees for flood risk reduction and flow channel management, future levee maintenance needs along the Ski Park reach are anticipated to be reduced significantly.

Constructing the setback area will increase the river's flood storage capacity and promote the reactivation of existing remnant side channels, providing vital refugia for fish during floods and expanding overall habitat availability. Property acquisition and construction is estimated to occur within 15 years from issuance of the ITPs.

**Figure 6. Carbon River Ski Park Setback Project Area (red) and FEMA Mapped Floodplain (blue).**



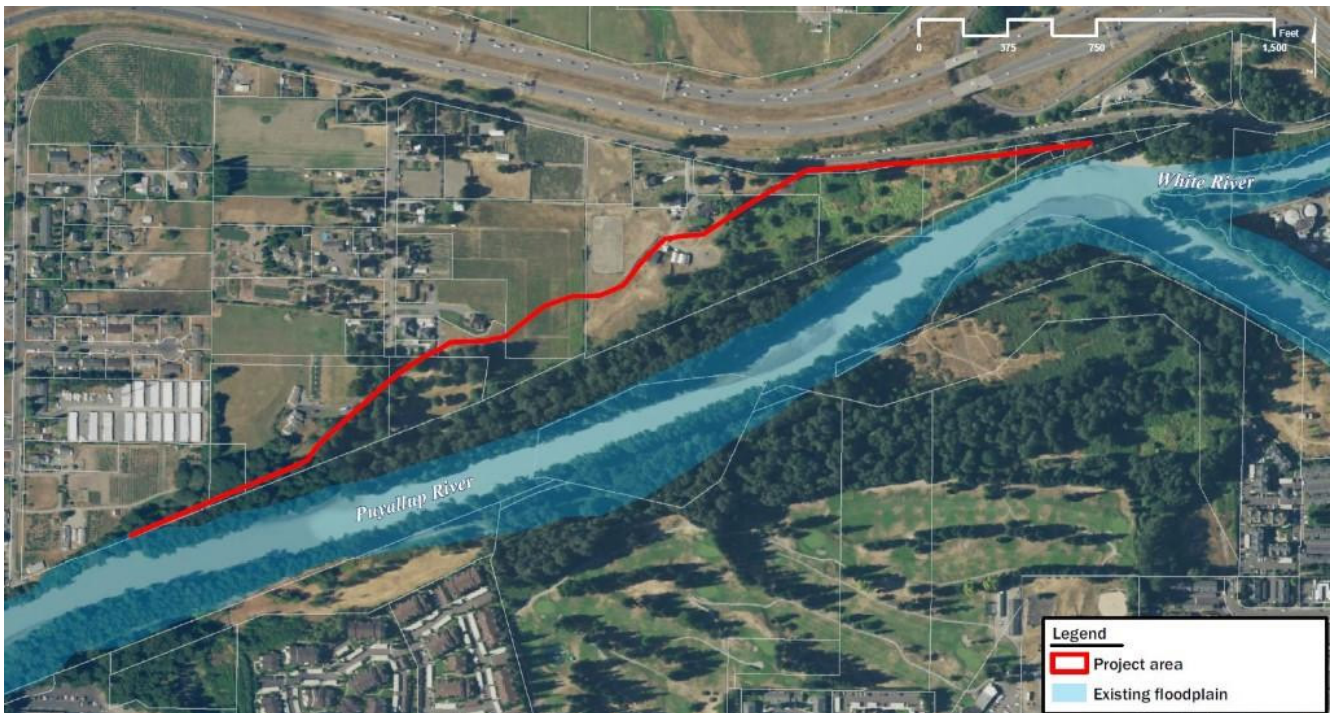
### 2.2.3.4 White and Puyallup Rivers Confluence Property Acquisition

During HCP scoping, the Natural Resources departments of both the Puyallup Tribe of Indians and Muckleshoot Indian Tribe articulated the value of a restoration site in the lower White River, despite the infrequency of Pierce County levee maintenance activity in that system. Considering the value of the lower White River to the White River Spring Chinook salmon, NMFS brought this recommendation to Pierce County. Although Pierce County cannot commit to carrying out a floodplain restoration project during the proposed permit term, the County will ensure funding for property acquisition during the HCP, ensuring the floodplain

will not be subject to any form of development. Acquisition sets the stage for future restoration that benefits White River Chinook as well as other covered species that would use the site.

The White and Puyallup Rivers Confluence site is located on the right (north) bank of the Puyallup River between RM 9.4 and RM 10.3, just downstream of its confluence with the White River. This reach of the Puyallup River is completely confined by reinforced revetments. The County will acquire approximately 16 parcels totaling 30.2 acres, removing those properties from future development. The existing levee will remain in place. The County does not propose any other restoration activities at this site under this HCP. Pierce County expects to acquire all 16 parcels within 30 years.

**Figure 7. White and Puyallup Rivers Confluence Project Area (red) and Federal Emergency Management Act Mapped Floodplain (blue).**



### 2.2.3.5 Design Refinements and Post-construction Adaptive Management

The three floodplain restoration projects are in early stages of design. As the County moves toward completing project design, it will refine each design and, as part of that process, consider alternatives for specific limited design elements. Following completion of design and construction, the County will monitor each project to assess its effectiveness and based on that monitoring, may implement BMPs to achieve intended effectiveness. None of these design refinements or adaptive management actions are expected to result in substantive changes to the Proposal’s impacts that would require supplementing this EA.

## 2.2.4 Adaptive Management Strategy

Pierce County will use an adaptive management approach to determine if the HCP’s operating conservation strategy is producing the desired results. The County would review monitoring data to confirm: 1) whether the monitoring is accurately measuring the desired biological changes within the context of the stated biological objectives and 2) if the objectives are being achieved. If necessary, the County would adjust monitoring

methods and, if biological objectives are not being achieved, would adapt management techniques to improve restoration success and the effectiveness of the HCP's ongoing species and habitat conservation program.

The County will make any necessary engineering adjustments in implementing the restoration actions, including alternate locations for certain restoration elements on a local scale, such as specific locations of levee breaches or vegetation planting areas within the general restoration area; control of invasive species; supplemental vegetation plantings; erosion control or repair; or other activities to respond to unanticipated issues or changing conditions, as necessary.

The County would periodically assess standard BMPs applicable to the conservation of covered species and covered activities, as well as the success of impact minimization measures and BMPs. Based on this periodic assessment, the County may improve those measures if more effective techniques for the conservation of species and their habitat are identified over the duration of the ITPs. For example, it is expected that, over time, results of post-construction monitoring would be useful in determining changes to improve the onsite minimization measures for covered activities. New methods, procedures, or analysis for monitoring studies are likely to be developed over the 30-year term of the ITPs that provide more accurate results for determining appropriate management actions for the covered activities to minimize impacts. Using the adaptive management approach, the County would develop and evaluate new or improved techniques to minimize impacts on covered species and may incorporate these new or improved techniques into the HCP.

In addition to fine tuning restoration project design and implementation to achieve biological objectives, adaptive management would also ensure achievement of these objectives through improving, if necessary, site-specific flood risk reduction activities and associated minimization measures. The County would monitor native plant success and apply an adaptive management approach to those activities. As a result, the County may apply and improve upon specific techniques based on the results of monitoring, new information, and/or conservation standards as they become available. Adaptive management actions for restoration projects may also include developing a plan to monitor and eradicate invasive species. The County would monitor flood risk reduction structures undergoing maintenance for erosion and structural integrity. The County would also monitor implementation of BMPs designed to minimize impacts and use the results to evaluate a project's success in terms of structural integrity, BMP effectiveness, and whether additional conservation measures or construction BMPs should be undertaken to minimize impacts. This adaptive management strategy would achieve the biological goal of avoiding and minimizing impacts on fish and aquatic habitat.

## 2.3 Summary of Actions by Alternatives

As mentioned above, Section 2.4 describes the activities common to the No Action and Preferred Alternatives. Under No Action, those activities would focus solely on flood risk reduction activities with ad hoc use of a narrow set of the BMPs. In contrast, the Preferred Alternative, would implement the basic flood risk reduction measure in the No Action Alternative, but adds BMPs and habitat restoration measures to *minimize and mitigate* the environmental effects of those activities, including those on ESA-listed species and their habitat

The differences between the alternatives are:

- Under the No Action Alternative, the County would not implement the full suite of protections available through BMPs from the RRMP, the ISPG, the SWIF, described in the HCP. There would be no assurance of habitat restoration and property acquisition to head off development in the flood plain.

- Under the Preferred Alternative, the county would implement the full suite of BMPs in the HCP and restoration projects to mitigate take of covered species and reconnect 193 acres of floodplain.

## 2.4 Elements Common to All Alternatives

Under both alternatives, Pierce County will continue to conduct various flood risk reduction activities, as described below. Under all alternatives the county would implement erosion control and sediment management BMPs.

### 2.4.1 Levee and Revetment Maintenance and Repair

The County estimates that, on average, approximately 10 planned levee and revetment maintenance projects, 5 flood fighting and emergency response projects, and 8 imminent threat projects could occur every year, for a total of approximately 690 projects over the 30-year duration of the ITPs (Table 2). These estimates are based on historical references plus anticipated increases due to environmental variation which is expected to increase winter rainfall and associated flooding, as well as increase sediment loads in rivers as glaciers on Mount Rainier recede, exposing formerly glaciated slopes to rainfall and runoff. Estimates were also increased to account for temporal impacts to aquatic habitat resulting from the delay between levee and revetment repair projects and restoration site construction. Hydraulic and sediment modeling conducted by Pierce County in the White River basin indicates that these estimates likely overestimate the number of planned projects over the term of the ITPs (Herrera 2024).

**Table 2. Estimated Future M&O Activities.**

Covered Activity	Scheduled and Planned	Average Per Year	Total over HCP
Levee and Revetment Maintenance	Yes	10	300
Imminent Threat	Yes (expedited timeline)	8	240
Flood Fighting and Emergency	No	5	150
Vegetation Management	Yes	As needed	As needed
Restoration Sites	Yes	n/a	3

#### 2.4.1.1 Planned Projects

The County may complete as many as 300 levee and revetment maintenance and non-urgent repair projects over the duration of the ITPs, an average of 10 per year. Maintenance activities generally occur between mid-July and mid- to late August.

When fish exclusion from work areas is required for in-water work, the County will isolate the in-water work zone with ecology blocks, bladder bags, or other appropriate methods. The typical area of the temporary in-water work zone is 0.5 acre.

Rarely, the County may need to construct temporary construction access roads to complete maintenance activities. The County would stabilize such roads with rock pads consisting of angular rock ranging in size from crushed gravel to quarry spalls and may have geotextile fabric under-liner placed beneath the rock pad if conditions require it. After completing the maintenance activities, the County would remove the geotextile and rock, scarify the roadway, revegetate the roadway with native species, and implement erosion control BMPs.

#### 2.4.1.2 Imminent Threat Projects

The County may complete as many as 240 imminent threat projects over the life of the ITPs, an average of eight per year. As with other activities under the HCP, the County will replant riparian vegetation on the upper, waterward face of the levee, and in temporarily disturbed areas once construction is complete. Under the Preferred Alternative, all replanting will follow process described in Appendix G of the HCP.

#### 2.4.1.3 Flood Fighting and Emergency Response

The County may conduct as many as 150 flood fighting and emergency response efforts over the duration of the ITPs, an average of five per year. Such projects would include actions to reduce flood damage and to prevent or mitigate the impacts of floodwaters before, during, or after a flood event to protect human life, reduce flood damage, and prevent or mitigate the impacts of floodwaters.

For each project, the County may place as much 0.15 acre of fill below the OHWM. The County would place this fill within the existing levee or revetment footprint to minimize aquatic habitat impacts. The County typically does not remove vegetation for flood-fighting projects because riparian vegetation in the project footprint is often washed out by flood waters prior to construction; however, the County may remove vegetation if it interferes with flood fighting/emergency activities. The County may remove as much as 2,000 square feet (0.05 acre) of vegetation during each flood fighting project. When practicable, the County will retain vegetation.

#### 2.4.1.4 Vegetation Management

The County manages vegetation on levees and revetments to provide access and allow for visual inspection of the structures. Most of the County's vegetation management activities are limited to underbrush, such as shrubs and herbaceous vegetation, particularly nonnative invasive species. Tree clearing is generally confined to the cutting of hazard trees on levees' faces; in a typical year the County cuts only five to seven trees. Cut trees are left on site to enhance habitat.

## 2.5 Alternatives and Concepts Considered and Eliminated from Analysis

### 2.5.1 NMFS and USFWS Issuance of ITPs and County's Subsequent Implementation of an HCP with Enhanced Restoration

An enhanced restoration alternative that included restoration in excess of the Preferred Alternative was considered. The additional restoration would involve implementing one to several levee setback projects identified as potential projects by the Pierce County Lead Entity for the Puyallup/White watershed (Pierce County 2004) and the Flood Plan (Pierce County 2018). Because planning for those projects has not proceeded sufficiently, specific projects to implement under an enhanced restoration alternative were not determined. In general, impacts associated with restoration site construction would be greater than the Preferred Alternative, while habitat benefits would also be greater.

This alternative was eliminated from further analysis because the availability of funding for planning, design, and implementation of additional restoration within the 30-year horizon of the ITPs is highly uncertain, and Pierce County has concluded that it would not be able to commit to implementing the additional restoration.

## 2.5.2 Other Alternatives

Early in the HCP preparation process, other alternatives were considered and, after assessment, rejected. Those other alternatives and the reasons for their rejection are listed in Table 3.

**Table 3. Other Alternatives Considered for NMFS and USFWS Issuance of ITPs and Pierce County Subsequent Implementation of Flood Risk Reduction Structures Maintenance and Operations Habitat Conservation Plan.**

Alternative	Reason for Rejection
Reduction of maintenance activities to reduce impact on listed species	Infeasible because County is required to maintain adequate level of service for flood protection and to implement the Flood Plan. In addition, the County must adhere to construction standards so that flood hazard reduction infrastructure is sufficiently robust and durable.
Inclusion of additional geographic areas or exclusion of geographic areas currently included in the HCP	The proposed geographic coverage includes areas with the highest level of impact and is consistent with the area covered by the approved Flood Hazard Management Plan (Pierce County 2023).
Inclusion of more restrictive measures, such as increasing levee setbacks, or increasing mitigation levels	The additional measures considered were inconsistent with the County’s obligations as a public entity to make the best use of public resources while conserving listed species. The HCP developed by the County in coordination with the Services meets permit issuance criteria in a manner that balances the County’s financial obligations, while at the same time providing species conservation.
Shorter duration for the ITPs	A duration for the ITPs of less than the proposed 30 years would not provide sufficient certainty of ESA compliance for the County over the flood hazard planning horizon.
ITPs for fewer listed species	Inclusion of fewer species in the requested ITPs would not provide adequate certainty of comprehensive compliance with ESA requirements to avoid or mitigate take.

## 3 Affected Environment and Environmental Effects

This section describes existing environmental conditions and environmental effects for the elements of the natural and built environment that could be affected by approval of the Preferred Alternative (NMFS and USFWS would issue ITPs and County would implement Flood Risk Reduction Structures Maintenance and Operations HCP), or the No Action Alternative.

Air quality effects, which primarily relate to vehicular emissions during construction, are limited and temporary, and measures to limit the effects that would occur are typically implemented as standard practice. Therefore, effects of the project on air quality would be minor and not significant, and air quality is not addressed in this document.

Similarly, terrestrial noise impacts would be limited to construction and therefore would be temporary at any one location. Construction activities would occur primarily in rural areas where potentially impacted receptors are limited and typically at sufficient distances from noise sources that impacts would be limited. Noise impacts would be minimized using mufflers on vehicles. Therefore, effects of the project on terrestrial noise would be minor and not significant; only underwater noise is addressed in this document.

### 3.1 Environmental Setting

Environmental conditions and species ecology in the covered area have been shaped by the geomorphology of the river systems, water resources (hydrologic cycles and water quality) and riparian vegetation. Human development within the covered area, has tended to concentrate in river valleys from prehistoric times up to the present and the rivers have great cultural significance for the Tribes. Modern development has encroached on river floodplains, leading to efforts to contain and confine the rivers and resulting in loss of functional floodplain habitat for listed salmon and other aquatic species. Intensive development adjacent to rivers is one of the leading contributors to excessive sedimentation due to erosion and runoff.

Functional floodplains create a dynamic and variable landscape. They provide settings for sediment deposition and erosion, and unique habitat-forming processes. Where floodwaters can overtop riverbanks and distribute organic matter onto the floodplain, they create a pattern of continually shifting vegetation communities and habitat niches.

Flood risk reduction in the form of dams, channelization and levees has changed erosion and deposition processes that create floodplains and distribute sediment. Sediment is beneficial for aquatic ecosystems through nutrient replenishment and creation of benthic habitat and spawning areas, but excessive sediment can bury habitats. Dams affect the water flow and trap sediment. The restricted flow can cause the channel downstream of the dam to become “sediment-starved”, while the sediment load behind the dam builds up. Channelization and levee construction affect river systems by increasing in channel gradient affecting flow velocity and erosion upstream, while downstream deposition may occur from constricted flow and high sediment loads (Hupp 2010).

Environmental variation is modifying precipitation and weather patterns, in turn affecting flooding, habitat and species productivity, distribution and abundance. With global environmental variation, the transition to rain-

dominance is projected to increase the magnitude of wintertime floods due to increases in rainfall intensity (Dominguez et al. 2012; Muschinski and Katz 2013). The transition will also reduce spring and summer snowmelt peaks and lower summertime base flows (Elsner et al. 2010). Glacial retreat will further reduce summer flows and increase sediment loads to the rivers (Beason and Kennard 2007).

The *Environmental Effects* subsections focus on the effects of the proposed BMPs and restoration that are specific to the HCP, compared to the No Action Alternative.

## 3.2 Geomorphology and Soils

### 3.2.1 Affected Environment

The following subsections include an overview of the geomorphology and soils of Pierce County's major river basins, followed by a more detailed discussion of the geomorphology of the rivers that would be affected by the restoration proposed in the HCP.

#### 3.2.1.1 Geomorphology

All rivers in Pierce County originate on Mount Rainier. The Puget Lowland, where most of the County infrastructure exists, is a basin between the Cascade Range to the east and the Olympic Mountains to the west. The Nisqually and Puyallup Rivers drain the southern, western, and northern portions of the Puget Lowland; the White and Carbon Rivers drain the north and northeast portions. The lower Nisqually and Puyallup Rivers are still adjusting to the retreat of the Cordilleran Ice Sheet in the Puget Lowland. The rivers are incising where they cross glacial till deposits and aggrading where river slope decreases in former embayments of Puget Sound (Beason and Kennard 2007; Collins and Montgomery 2011; Czuba et al. 2012). In addition to their continued adjustment to continental deglaciation and aggradation, the rivers are adjusting to a series of lahars that have occurred since glaciation.

The alignments of many rivers in the County are controlled by surficial faulting, meaning the rivers occupy straight, linear, lengths along crustal weak spots. The consequences of the rivers being fault-controlled are that the river channels often can be quite straight and lack floodplain extent in many locations. Also, people have historically influenced the river systems in the County by constructing levees and revetments, dredging, and straightening channels, and redirecting the White River into the former Stuck River channel. As a result of these natural and human-caused factors, many rivers in the County lack functional floodplains.

More detailed description of the geomorphology of the Puyallup, Carbon, White, and Nisqually Rivers can be found in Appendix C.

#### 3.2.1.2 Soils

Soils in the covered area consist of fluvial sediments and overbank flood deposits as well as mudflows originating from the flanks of Mount Rainier. Soils in the valleys are silt loams, fine sandy loams, and loams, while soils on the valley walls are generally gravelly loams and gravelly sandy loams.

### 3.2.2 Environmental Effects

#### 3.2.2.1 No Action Alternative

Under the No Action Alternative, adverse impacts on geomorphology and soils from M&O activities would include erosion and sedimentation from ground disturbance and site access for levee repair and maintenance.

Levee and revetment maintenance repair activities can suspend sediment, increasing turbidity levels, but because background turbidity levels can be high during the fish window, project-related increases in suspended sediment would not be discernible from background levels.

The No Action Alternative would not require Pierce County to use sediment management and erosion control BMPs from the ISPG or SWIF that specifically minimize the effects of flood risk reduction on covered species and their habitat.

### 3.2.2.2 Preferred Alternative

As described above in the No Action Alternative, adverse impacts to soils would occur due to levee repair and maintenance. In contrast to the No Action Alternative, the Preferred Alternative incorporates BMPs to avoid, reduce, and minimize the effects of covered activities on covered species and their habitat.

The levee setbacks and levee removals at restoration sites proposed in the HCP would result in short-term soil disturbances due to earthwork adjacent to streams and wetlands. Because most soils in the restoration sites are well drained, no permanent effects on soil physical and biological properties are expected. With implementation of BMPs, such as confining the work area to the minimum extent possible and using existing roads for site access when possible, impacts on soils would be minimized. Once construction activities are complete, soils would be stabilized with plantings.

The proposed restoration projects would promote greater floodplain connectivity for high flows to spread and reduce the erosive forces of the rivers. Substantial erosion and deposition on the floodplains are expected and are desirable outcomes of restoration site construction.

Secondary channels would likely scour these reconnected floodplains in some areas. Sediment mobilized by scour during high flow events would not likely result in measurable increased turbidity downstream because turbidity is already high during those events.

The Upper Puyallup Confluence and Neadham Road restoration sites are in steep, narrow valleys with forested riparian zones in the Middle and Upper Puyallup River reaches. Development of mature riparian forest at these sites would provide large wood to the rivers over the long term, provided that channel migration is allowed to occur and a dynamic flow regime capable of eroding forested floodplains is present. Logjams and individual pieces of large wood would influence the routing of water and sediment and would help create pools. If floodplains remain stable, vegetative succession often leads to forests dominated by conifers that produce wood that is more durable in logjams.

As part of the Carbon River Ski Park Setback project the County proposes removing sections of the existing levee to recreate a more natural configuration of the river channel and floodplain enabling the river to access and utilize its historical floodplain and improving habitat conditions for listed salmonids and other aquatic organisms.

The proposed property acquisition in the Lower Puyallup River valley would protect the parcels from future development and ensure that they would be available for a future floodplain reconnection project.

In summary, M&O activities under the Preferred Alternative would not have significant impacts on geomorphology and soils with implementation of the proposed BMPs. The proposed restoration projects would result in short term adverse impacts on soils due to temporary disturbance, but long term beneficial impacts on geomorphology in the covered area due to improved floodplain connectivity.

## 3.3 Water Resources

### 3.3.1 Affected Environment

All rivers in Pierce County drain from Mount Rainier. As a result, groundwater and glacial melt from Mount Rainier sustains late summer and autumn discharge, while heavy rain and rain-on-snow events in the fall, winter, and spring are the primary generators of flood events. The Puyallup River system (including the White and Carbon Rivers) is classified as “transitionally rain dominant,” while the Nisqually River basin is classified “rain dominant” (Mantua et al. 2010). Even within the Puyallup River system, the degree of rain dominance and transition is variable, with the south- and west-draining rivers on Mount Rainier being more rainfall-driven than the north- and east-draining rivers.

Environmental variation is likely to increase the frequency and intensity of floods within Pierce County and was factored into the estimated number of maintenance projects likely to occur over the term of the ITPs.

Specific information on hydrology and water quality for each river reach covered in the HCP is included in Appendix C.

### 3.3.2 Environmental Effects

#### 3.3.2.1 No Action Alternative

With No Action, areas experiencing chronic flooding problems would be at continued and increased risk due to projected increases in winter rainfall frequency and intensity with effects on flood timing, frequency, and magnitude (Mantua et al. 2010; Dominguez et al. 2012; Muschinski and Katz 2013). Flood-fighting actions and imminent threat projects including sand-bagging, levee repair, and berm and barrier construction, would continue to occur during flood events. Flood fighting actions and imminent threat projects could become increasingly necessary during flood events due to projected stream flow and temperature changes caused by environmental variation.

Levee and revetment maintenance projects may fill up to 1.5 acres of aquatic habitat per year. Flood fighting/emergency response may fill as much as 0.75 acre of aquatic habitat per year, and imminent threat projects may fill roughly 1.2 acres per year, for a total of 103.5 acres over 30 years, which would be the life of the ITPs. The County would place fill within the existing levee or revetment footprint to minimize aquatic habitat impacts. Fill placement and other Levee and revetment maintenance repair activities can suspend sediment, increasing turbidity levels in aquatic habitats. Pierce County would follow Washington State water quality standards (WAC 173 201A 200), which allow for mixing zones of up to 300 feet for turbidity. Turbidity could, therefore, extend as far as 300 feet downstream of the project footprint, but because background turbidity levels can be high during the fish window, project-related increases in suspended sediment would not be discernible from background levels.

#### 3.3.2.2 Preferred Alternative

During M&O activities under the proposed HCP, implementation of the prescribed BMPs would minimize the risk of future levee failure at individual sites treated according to the HCP’s requirements. Lowering the risk of failure also decreases the need for repairs, thus minimizing adverse effects on water quality, protecting habitat quality and quantity. For example, using toe rock as a flow deflector would create a quiescent area of low velocity flow immediately downstream of repair sites, allowing the contractor to place the rock in a more controlled fashion, thus reducing temporary construction impacts such as downstream sedimentation and

water turbidity. As authorized by WAC 173-201A-400, maintenance and repair activities could increase turbidity as far as 300 feet downstream of the project footprint. In low-energy environments, turbidity could also extend as far as 100 feet upstream of the project footprint. Linear projects, like planned repair and maintenance of streambank protection will average 325 feet in length, meaning they may increase turbidity over 725 feet of stream length before turbidity returns to background levels. Sediment delivery to water bodies will be minimized by implementing BMPs designed to achieve desired conservation outcomes listed in the RRMP (described in Chapter 2 of the HCP) and by designing projects according to the ISPG.

At the proposed restoration sites some temporary water quality impacts may occur during work adjacent to rivers. Increases in turbidity could occur during and shortly after levee removal during high-flow events in the following year. Implementing the HCP-required BMPs described in this EA would reduce those temporary impacts. Success of the BMPs would depend on design, implementation, monitoring, and rapid response to failures.

Restoration sites that include levee setbacks and property acquisition would be subject to flooding, which could mobilize waste from existing structures and septic systems. Preparation for use as a restoration site typically involves demolition and removal of structures, utilities, and other systems that supported the structures. These activities would be conducted in compliance with County regulations to prevent adverse water quality impacts.

Over the long term, the HCP restoration projects would improve stream temperatures at the local scale through the formation of side channels, which can reduce water temperature near the confluences of side channel and streams and create localized refugia for salmonids (Roni et al. 2013). The proposed property acquisition site at the confluence of the Puyallup and White rivers would provide opportunities for future restoration that would address the high-water temperatures in the Lower Puyallup. In years to decades, the proposed restoration projects would improve and maintain water quality by slowing transport of sediment through the river system and by adding areas of slow water for deposition of fine particles. As riparian and wetland vegetation develops, the floodplains would act as nutrient sinks. Implementing restoration projects could improve temperature and sediment 303(d) listing parameters on a local scale.

The proposed restoration sites were selected because they are in areas with chronic flooding problems that will increase as the river systems transition to rain dominated systems. Levee setback projects would be expected to lower flood surface elevations in their immediate vicinity, provide enhanced flood storage, and reduce damaging high flow velocities. In addition, the restoration projects would likely reduce the need to implement additional emergency repairs or imminent threat projects which would reduce water quality effects in the project reaches.

In summary, M&O activities under the Preferred Alternative would not have significant impacts on hydrology or water quality with implementation of the proposed BMPs. The proposed restoration projects would result in short term adverse impacts on water quality (turbidity) during construction, but these impacts would not be significant. Over the long term the restoration projects would have beneficial impacts on turbidity and temperature in the vicinity of each project.

## 3.4 Vegetation

### 3.4.1 Affected Environment

Existing levees have moderate cover of native and nonnative vegetation, which provides minimal shade and wood/leaf litter recruitment to the river. The County manages vegetation on levees and revetments to provide access, allow for visual inspection of the structures, and minimize the potential for negative impacts on the structure caused by the presence of vegetation. Thinning and trimming on levees and revetments is minimized as much as possible and is generally limited to understory shrubs, herbaceous vegetation, and invasive species. Tree limbs overhanging access roads are trimmed to provide vehicular access for County equipment.

#### 3.4.1.1 Puyallup River and Tributaries

The riparian area in the lower Puyallup River watershed is discontinuous; less than 5 percent of the lower Puyallup River reach contains high quality riparian habitats, and they are often separated from each other by more than a mile by dikes, levees, and revetments (Kerwin 1999a; Simenstad 2000).

The lower Puyallup River watershed contains abundant wetlands. The low river gradient and confluences of several streams in the valley provide physical conditions conducive to wetland formation. Wetlands, such as those at the confluence of Squally Creek and Clear Creek, tend to be large and complex, providing a variety of habitat types (Pierce County 2005). Significant native riparian vegetation exists within the lower White River riparian corridor, but development and channelization of the river have led to habitat conversion and fragmentation (Dvornich and Burgess. 2016).

The upper reaches of the Puyallup River and its major tributaries, the White and Carbon Rivers, flow through relatively undeveloped forest land, much of which is owned by private timber companies and has been harvested in cycles since the early 1900s. Timber harvesting and agriculture have increased sedimentation, affecting water quality in the downstream reaches within the HCP-covered areas. Nevertheless, fish spawning, rearing, and migration habitat are still in good condition in the river main stems and in smaller tributary streams in the upper reaches of the Puyallup, White, and Carbon Rivers (Pierce County 2023).

Current vegetation along the lower Carbon River consists primarily of willows (*Salix* spp.), red alder, maples (*Acer* spp.), and black cottonwood (*Populus trichocarpa*), along with grasses and dense patches of blackberries. Vegetation conditions are severely degraded in terms of habitat function for covered species. There are limited patches of second-growth conifer/hardwood forest in the riparian zone. Vegetation in the upper Carbon River watershed is primarily second-growth coniferous forests with deciduous trees in the riparian corridor. Most land in the watershed and in the affected environment is privately managed commercial tree farms (Kerwin 1999a).

There are no known sensitive plants or habitats in any of the three restoration sites proposed in the HCP (WDNR 2016).

#### 3.4.1.2 Nisqually River

Native vegetation in the lower elevations of the Nisqually River watershed were formerly native prairies defined by a mosaic of grasslands, oak and conifer savannas, and various types of wetlands. The area occupied by native grasslands and oak woodlands with a native understory has been dramatically reduced due to multiple influences: altered fire regimes, invasion of nonnative species, grazing, and urban and agricultural conversion (Chappell and Crawford 2005).

The Middle Nisqually and Mashel River watersheds are primarily Douglas-fir forest and woodland/prairie complexes (NRC 2016). Riparian habitat in those areas varies considerably, with long forested stretches of medium-sized hardwood stands. Forests have been cleared for agriculture, especially on the left bank (Pierce County 2023). The Nisqually River basin is much less developed than the Puyallup River basin.

Vegetation in the Upper Nisqually watershed consists of woodlands, prairies, and forests dominated by mountain hemlock and silver fir. The Nisqually River flows through national forest and private forest land to its confluence with the Mashel River (NRC 2016). In that area, the Nisqually River is surrounded by extensive forestlands in varying stages of regrowth from recently harvested to mature (Brooks et al. 2004).

### **3.4.2 Environmental Effects**

#### **3.4.2.1 No Action Alternative**

Under the No Action Alternative, vegetation clearing and maintenance would continue under existing programs and regulations. The County would clear as much as 67.5 acres of vegetation (Table 4.15 HCP) as a result of levee and revetment repairs over 30 years, which would be the duration of the ITPs. The County will replant cleared areas with native vegetation once construction is complete. The County will conduct selective thinning, generally limited to herbaceous and nonnative species, over another 624 acres (Table 4.16 HCP). Impacts on vegetation include mowing, thinning, and trimming for levee repair and maintenance. Riparian vegetation removal can degrade aquatic habitat by eliminating shade and cover and by reducing organic inputs and LWM.

The No Action Alternative would not require Pierce County to use BMPs from the SWIF that specifically minimize the effects of vegetation clearing and maintenance on covered species and their habitat.

#### **3.4.2.2 Preferred Alternative**

The same impacts to vegetation would occur due to levee repair and maintenance as under the No Action Alternative. Local vegetation within the proposed restoration sites may be affected in the short term by clearing for levee removal and temporary access related to construction of levee setbacks. The HCP's BMPs from the SWIF would reduce these impacts, such as minimizing riparian vegetation removal, clearly marking work areas, restoring and revegetating disturbed areas, and monitoring to ensure survival of planted vegetation. Following the SWIF protocols, the County will plant native riparian vegetation within the levee vegetation management zone to address the removal of hazard trees and removal of vegetation necessary for M&O activities (HCP Appendix G).

Because the riverward levee face is a dynamic space, the County will direct long-term riparian tree preservation to the area on the upland side of the levee, with a focus upon the first 200 feet of property (from OHWM) contained within the riparian area, as described in the SWIF, Chapter 4.8.4. The County will generally prioritize efforts to retain the largest mature trees that provide shade (thermal cooling), as well as other habitat benefits. The County will replace trees removed for levee maintenance or repair with trees planted upon the upland side of the levee structure for long-term preservation. HCP implementation includes revegetating floodplains and riparian areas, which would promote greater diversity and structure of wetland and riparian vegetation and increase large wood production and recruitment to streams over the long term.

Through HCP implementation, Pierce County would collect data on vegetation and riparian conditions that would be used to inform riparian management, consistent with USFWS conservation recommendations

(USFWS 2015a). Pierce County would use its monitoring data to identify areas, both with and without levee setbacks, where riparian trees and LWM can be established (Pierce County 2024).

The Upper Puyallup Confluence and Neadham Road restoration projects would have short term impacts on vegetation due to the removal of riparian vegetation growing on the existing levees. However, the proposed restoration and property acquisition projects would benefit native riparian vegetation in the long term. The County would maintain properties acquired under the HCP for restoration as open space. The properties would likely revegetate naturally with native shrubs and trees. Pierce County would monitor and manage invasive species using hand or mechanized removal or other techniques to support re-establishment of native riparian vegetation.

The County does not currently use herbicides to control invasive species on flood risk management structures but may need to use herbicides in the future to control certain invasive species, such as Japanese knotweed (*Reynoutria japonica*) and tansy ragwort (*Jacobaea vulgaris*). If the County does need to use herbicides, they will develop an Integrated Vegetation Management Plan to minimize potential environmental impacts of herbicide application. The County would carefully regulate any herbicide application to follow all applicable regulations and policies and to be protective of aquatic habitats.

Connected floodplains with native vegetation would support high levels of biological production and diversity. In addition, floodplain reconnection would create sites for natural recruitment of black cottonwood, willows, and other riparian species. Deposition and side-channel formation would be re-initiated by the floodplain reactivation. Erosion may destroy some riparian plantings, and other sites may lack planted vegetation where deposition occurs after plantings are completed.

In summary, M&O activities under the Preferred Alternative would not have significant adverse impacts on vegetation with implementation of the proposed BMPs or restoration projects. The proposed restoration would result in some short-term adverse impacts but overall, beneficial long-term impacts on vegetation in the covered area.

## 3.5 Fish and Wildlife, Including HCP-Covered Species

### 3.5.1 Affected Environment

The following subsections describe terrestrial habitats, aquatic habitats, and the fish and wildlife species in the HCP-covered areas.

#### 3.5.1.1 Terrestrial Habitats

Terrestrial habitat in the Puyallup River basin includes westside lowland conifer-hardwood forests, montane mixed conifer forests, grasslands, wetlands, agriculture, pastures, and urban/suburban mixed habitats (Johnson and O'Neil 2001). Timber harvesting and agriculture have degraded the riparian areas, decreased the availability of LWM, and increased sedimentation within the adjacent rivers. Riparian forests remaining in the Puget Lowland provide important habitat for invertebrates and amphibians; roost sites for bats; perching and nesting sites for bald eagle (*Haliaeetus leucocephalus*), osprey (*Pandion haliaetus*), belted kingfisher (*Megaceryle alcyon*), and other birds; and travel corridors for wildlife (for example, black-tailed deer [*Odocoileus hemionus*] and migratory birds).

The middle and upper reaches of the Puyallup River, the upper White River, the Carbon River, lower South Prairie Creek, and most of the Nisqually River have been designated by WDFW as biodiversity areas and

terrestrial wildlife corridors (WDFW 2024). The Pierce County Biodiversity Network has mapped biologically rich habitats and their interconnected network and has included them in the Comprehensive Plan Open Space Corridors map based on its 2004 report (Brooks et al. 2004). Those areas provide nesting, foraging, cover, and resting habitat for numerous wildlife species. Wetlands within the river floodplains, particularly where shallow, open water areas are present, provide wintering habitat for large waterfowl concentrations. WDFW (2016) and the Pierce County Biodiversity Network designate most of the upper reaches of the White River, Puyallup River and Nisqually River and their tributaries as elk migration and wintering habitat.

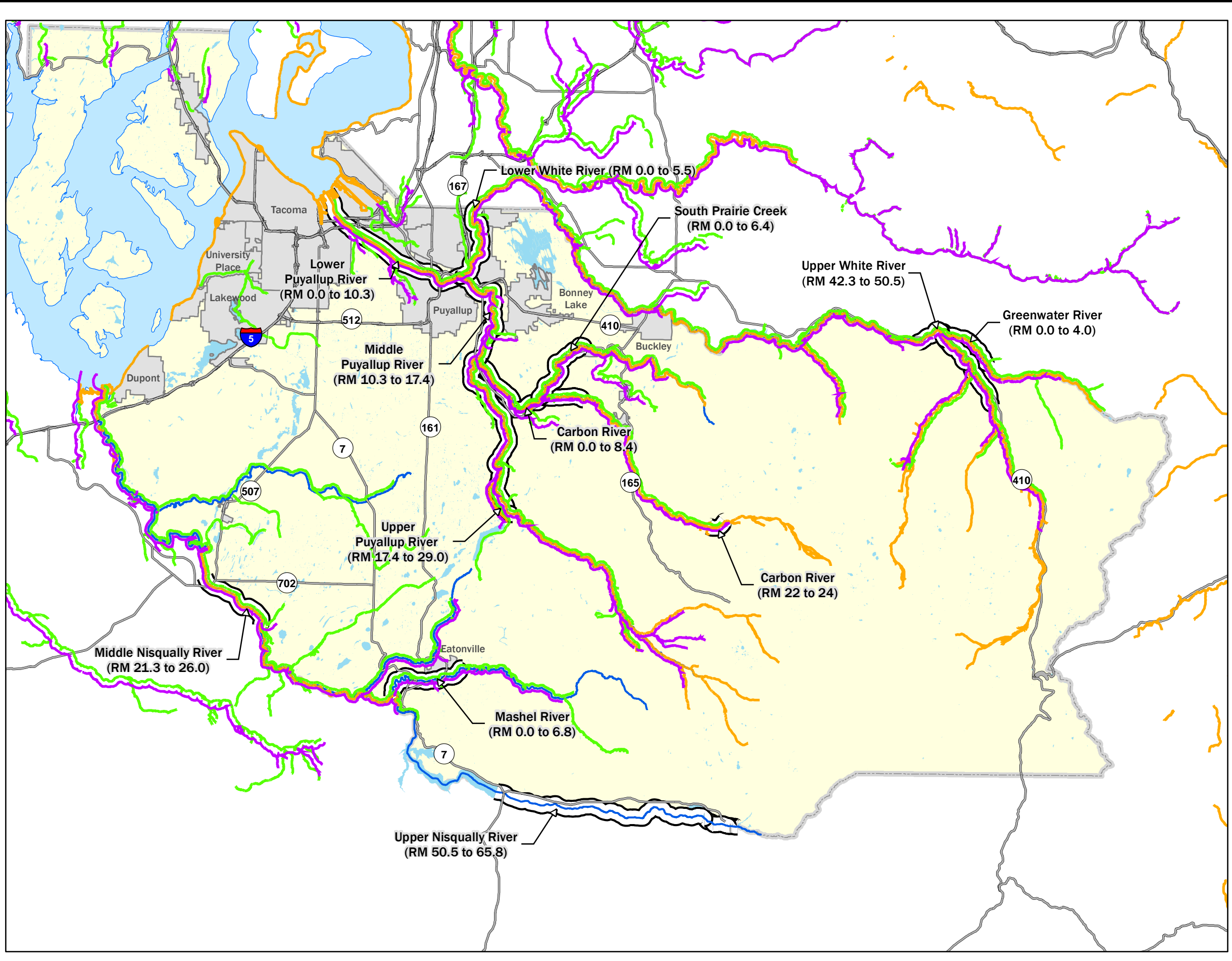
The HCP and ITPs do not cover marbled murrelets (*Brachyramphus marmoratus*) or northern spotted owls (*Strix occidentalis caurina*). However, the covered lands include areas along the Mashel and upper Nisqually Rivers where suitable habitat for marbled murrelet or northern spotted owl exists or is likely to develop during the permit term. The HCP includes measures to minimize project effects on those species.

### 3.5.1.2 Aquatic Habitats

Over the past 150 years, rivers in Pierce County have been systematically separated from their floodplains by dams, levees, estuary filling, and floodplain development. The resulting simplified river systems have lost channel complexity and off-channel aquatic and riparian habitat for fish and wildlife (Pierce County 2012). The County has engaged in dozens of floodplain restoration projects since the 1990s that have improved the environmental baseline. Aquatic habitats in the HCP-covered rivers are described in Appendix C.

### 3.5.1.3 HCP-Covered Species

The distribution and presence of species and designated critical habitat of HCP-covered species is shown on Figure 8 and in Table 4. Little is known about the distribution of lamprey species within each river system; it is assumed lamprey species could occur at any location in the above-described river systems.

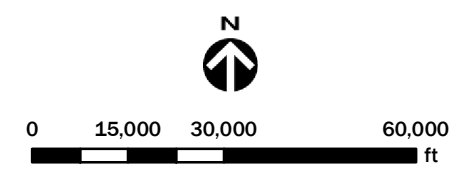


**Figure 8.**  
**Critical Habitat for Fish in the Geographic Area.**

**Legend**

- Chinook salmon critical habitat
- Steelhead critical habitat
- Bull Trout critical habitat
- Highway
- River
- Covered area
- City
- Pierce County boundary

Notes: Some areas shown as critical habitat are excluded from the critical habitat designation but the scale of the figure does not support their display.



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**Table 4. Distribution of and Critical Habitat for Species Covered in the HCP.**

Common Name	Distribution Within HCP-Covered Areas	Critical Habitat Within HCP-Covered Areas
<b>Species Under USFWS Jurisdiction</b>		
Bull trout (Coastal-Puget Sound DPS)	Puyallup River (L, M, U) White River (L, U) Carbon River South Prairie Creek (L, U) Nisqually River (L) <sup>a</sup>	Same as known distribution (75 FR 63898)
Pacific lamprey	Unknown, likely present in all river systems	None designated
River lamprey	Unknown, likely present in all river systems	None designated
Western brook lamprey	Unknown, likely present in all river systems	None designated
<b>Species Under NMFS Jurisdiction</b>		
Chinook salmon (Puget Sound ESU)	Puyallup River (L, M, U) White River (L, U) Carbon River South Prairie Creek (L) Nisqually River (L) Mashel River	Same as known distribution (70 FR 52685, September 2, 2005)
Coho salmon (Puget Sound/ Strait of Georgia ESU)	Puyallup River (L, M, U) White River (L, U) Carbon River Nisqually River (L)	None designated
Steelhead trout (Puget Sound DPS)	Puyallup River (L, M, U) White River (L, U) Greenwater River Carbon River South Prairie Creek (L, U) Nisqually River (L) Mashel River	Designated Same as known distribution (81 FR 7214, February 24, 2016)

<sup>a</sup> Documented bull trout presence in the Nisqually River, although not a spawning population (USFWS 2015b; WDFW 2016).

DPS = Distinct Population Segment

ESU = Evolutionarily Significant Unit

FR = Federal Register

L = Lower, M = Middle, U = Upper

#### 3.5.1.4 Other Fish and Wildlife Species and Habitats

The highly varied topography, soils, and vegetation communities in the areas covered by the HCP support a wide variety of fish and wildlife including marbled murrelet and northern spotted owl. With implementation of the BMPs under the Preferred Alternative effects on these species would be negligible and they are not addressed further in this document.

Under the No Action Alternative BMPs specifically designed to minimize effects on covered species would not be implemented; therefore, these species may experience increased adverse effects during M&O activities.

### 3.5.1.5 Species and Habitats at Proposed HCP Restoration sites

Salmonid species critical habitat and documented presence at the proposed restoration sites are shown in Table 5.

**Table 5. Salmonid Species Critical Habitat and Use of Proposed Restoration Sites.**

Species	Site	Habitat Use <sup>a</sup>
Bull trout	Upper Puyallup Confluence	Migration
	Neadham Road	
	Carbon River	
Chinook salmon	Upper Puyallup Confluence	Rearing and migration
	Neadham Road	Migration
	Carbon River	Spawning and rearing
Coho salmon	Upper Puyallup Confluence	Rearing and migration
	Neadham Road	Spawning and rearing
	Carbon River	Spawning and rearing
Steelhead	Upper Puyallup Confluence	Spawning and rearing
	Neadham Road	
	Carbon River	

<sup>a</sup> Priority Habitats and Species data (WDFW 2016).

## 3.5.2 Environmental Effects

The environmental effects section focuses on the effects of the alternatives on the covered species and their terrestrial and aquatic habitats that are the subject of the HCP.

### 3.5.2.1 No Action Alternative

With No Action, M&O activities will result in both temporary and permanent adverse effects on salmonids and lamprey. Assuming future projects have the same distribution as previous M&O projects that formed the basis for analysis in the HCP, most impacts would occur in the Puyallup and Carbon River basins. Flood fighting actions and imminent threat projects could become increasingly necessary during flood events due to projected stream flow and temperature changes caused by environmental variation. The rivers' energy and sediment load would continue to be focused between the current levee alignments, and flood hazards will continue to be frequent and intense. Main channel habitat complexity and access by fish to and quality of spawning and rearing habitat in side channels would continue to be low. Without the programmatic approach proposed in the HCP, water quality and habitat trends of high temperatures, lack of refugia, lack of riparian vegetation, and lack of LWM would be likely to continue and become worse.

M&O activities will generate stressors that may affect listed species and critical habitat. Work area isolation and fish handling can elevate stress levels in fish and cause injury or mortality. Elevated levels of suspended sediment can cause fish to avoid the immediate area, reduce foraging efficiency and ability to avoid predators, and even be high enough to injure or kill fish. Fish may be displaced from areas with noise and visual disturbance and may experience delayed foraging and increased predation. Loss of aquatic and riparian habitat can reduce habitat complexity and prey availability, thereby increasing predation risk and lowering fitness of individual fish (Pierce County 2024).

The No Action Alternative would not require Pierce County to use BMPs from the RRMP menu that were developed along with participating public service agencies and NMFS to specifically minimize the effects of M&O activities on covered species and their habitat.

### ***Work Area Isolation and Fish Handling***

Isolating the in-water work area involves operating equipment and placing the isolation techniques in water. Those activities can increase suspended sediment levels, disturb riverbed sediments, and reduce the abundance and diversity of macroinvertebrates that provide a food source for covered species. Such impacts will be localized and temporary, and macroinvertebrates are expected to rapidly recolonize disturbed areas (within approximately 2 weeks to 2 months) (Merz and Chan 2005).

Fish exclusion is generally not required due to the dynamics of the river system and/or conditions such as velocity, depth, lack of visibility (naturally high sedimentation), lack of ability to isolate the site from the main stem, or lack of fish presence. If the decision is made to conduct fish exclusion it is typically done through a combination of seine and dip nets and electrofishing. Fish handling stresses fish and electrofishing can cause physical injuries such as internal hemorrhage and spinal damage or can kill fish outright. Although fish exclusion is potentially harmful to fish, it is intended to prevent certain injuries if fish remain in the in-water work area (Pierce County 2024).

For work conducted during the in-water work window (levee and revetment repair projects), most salmonids captured would be juveniles. Adults are more likely to be captured during imminent threat projects. For bull trout and lamprey species, both adults and juveniles could be present year-round.

### ***Suspended Sediment***

In-water work may result in elevated suspended sediment levels. Elevated sediment levels will be largely localized and temporary. Sediment loads during covered activities are often naturally elevated. Sediment levels are high during high-water events as well as during summer low flows, when glacial melt results in high sediment loading. However, fish may still experience adverse effects of exposure to suspended sediment above background levels, even when levels are naturally high.

Fish typically avoid waters with high suspended sediment levels, potentially displacing themselves from preferred habitat. Elevated turbidity can also reduce fishes' ability to detect prey and avoid predators. Sediments can also smother redds, increase embeddedness of spawning gravels, reduce habitat complexity, and reduce the abundance and diversity of prey (Bash et al. 2001).

### ***Underwater Noise and Disturbance***

The M&O activities will not include impact pile driving but noise and disturbance from M&O activities may disrupt foraging and migration patterns by instilling behavioral responses such as "fright" or "start" responses (Moore and Newman 1956; Knudsen et al. 1992). Fish may avoid the area, increasing energy expenditure and causing physiological stress.

### ***Loss or Degradation of Aquatic Habitat***

Flood fighting and emergency response projects sometimes place riprap and other fill material below the OHWM and/or use berms and barriers to contain flood waters. Fill placed in rivers and streams can degrade or eliminate aquatic habitat for both fish and the aquatic macroinvertebrates on which they feed and can interfere with habitat-forming processes and prevent the formation of side channels and undercut banks. Fill can eliminate spawning habitat, degrade migration habitat for juvenile and adult salmonids and lamprey, and limit foraging opportunities for juveniles.

### ***Riparian Vegetation Removal***

Levee and revetment maintenance repair may also require selective riparian vegetation clearing or thinning. Riparian vegetation removal may eliminate shade, thereby increasing water temperatures; reduce leaf litter and organic material for aquatic insect production; reduce LWM recruitment; and reduce streambank stability, increasing the potential for streambank erosion and sedimentation (Spence et al. 1996). Elevated water temperatures can adversely affect salmonid physiology, growth, and development, life history patterns, competitive and predator-prey interactions, and disease. Loss of invertebrate production reduces the prey base for listed salmonids (Spence et al. 1996). LWM serves several important ecological functions and limiting LWM recruitment can reduce food sources for stream macroinvertebrates and reduce the formation of pools that provide fish habitat (Bilby and Bisson 1998).

#### **3.5.2.2 Preferred Alternative**

Under the Preferred Alternative, the County commits to methods and measures of success required to meet the conservation needs of covered species that could be impacted by the County's M&O activities. These commitments apply to all the County's flood risk reduction infrastructure within the HCP-covered area.

The HCP requires Pierce County to incorporate the process for selecting BMPs from the RRMP menu, based on project type. That menu was developed by a coalition of Public Works Departments from each of the RRMP member counties and cities in Washington, with technical assistance from NMFS (NMFS 2003). Under the RRMP, the participating agencies worked with NMFS to develop systematic assessment and selection of BMPs oriented to addressing and minimizing the effects of several categories of road maintenance activities. The RRMP measures were derived to achieve specific desired conservation outcomes, such as preventing overland transport of soil prone to erosion. Those conservation outcomes include keeping water from the work area; reducing the potential for soil particles in the work area to become waterborne or airborne, reduce soil particles and contaminants before the water discharges from the job site by filtering and providing perimeter protection, allow sediment to settle out of water to reduce soil particles and contaminants from leaving the job site, reduce water velocity and erosive forces to create energy dissipation and reduce erosion, contain water and soil particles/contaminants on the job site, maintain or protect habitat, and reduce the potential for contaminants falling in the water.

Avoiding and minimizing the adverse effects of covered activities reduces the risk that adverse environmental effects will cause take of covered species. Pierce County will select those measures for each covered activity to minimize the impacts of the taking to the maximum degree practical. However, small amounts of negative impacts to covered species are unavoidable while conducting covered activities, primarily through the loss of aquatic and riparian habitat during levee repair projects when Pierce County responses must be rapid or immediate. Therefore, the HCP also includes habitat restoration and a land acquisition project (to support future habitat restoration) with the intent of offsetting the unavoidable adverse effects of the covered activities.

The restoration and property acquisition projects are intended to improve main stem river habitat and remove floodplain property from future development. The three restoration projects along 2.3 miles of river channel in the Puyallup and Carbon River basins will allow more channel migration and increase instream and riparian habitat complexity, creating side channels, and reconnecting the river to 193 acres of historically connected floodplain habitat, and restore approximately 21.5 acres of historical riparian area. The three projects would address factors limiting salmon habitat and restore or re-establish physical and biological features (PBFs) of critical habitat in places where they have not functioned for the past 15 years or more. The County would also

acquire 16 parcels near the confluence of the Puyallup and White Rivers to remove them from future development.

Beechie et al. (2013) maintains that restoring floodplain connectivity is one of the actions most likely to ameliorate stream flow and temperature changes caused by environmental variation, and to increase habitat diversity and population resilience. Reconnecting rivers to their floodplains by removing levees or bank armoring restores the river system's ability to create and sustain diverse habitats and to allow migration of salmon into those habitats. Removing levees or increasing channel sinuosity can ameliorate temperature rises by increasing the length of hyporheic flow paths beneath the floodplain, which can cool water during the summer (Beechie et al. 2013). By including these projects as part of the HCP, the County ensures those projects will be constructed within the duration of the ITPs; otherwise, restoration site construction would be dependent on available funding and property acquisition.

The County anticipates covered activities will result in impacts to approximately 103.5 acres of aquatic habitat, as shown in Table 4.13 of the HCP. Area of aquatic habitat impacts per basin was determined by assuming future projects would have the same distribution as previous projects: 41 percent in the Puyallup River basin, 44 percent in the Carbon River basin, 3 percent in the White River basin, and 13 percent in the Nisqually River basin. Construction activities would follow established protocols to avoid take of listed species. Table 6 summarizes the habitat functions and life stages that would benefit from the proposed restoration projects.

The HCP also includes property acquisition at the confluence of the White and Puyallup Rivers, thereby protecting the parcels from future development and ensuring that they would be available for future restoration at that location that would provide ecological benefits to all covered species that might use the site, particularly White River Chinook.

Implementation of the restoration projects could have short-term negative impacts on individual fish due to sediment generation, in-water noise and disturbance from nearby construction activities, and potential in-water work zone isolation and fish handling. Sediment could extend as far as 100 feet upstream and 300 feet downstream of the in-water work footprint. The total river length impacted by elevated suspended sediment for the three restoration sites would be 9,096 linear feet. Because restoration projects are larger projects that would involve more in-water work, aquatic noise and disturbance would extend the length of the levee setback and could encompass as much as 1 acre of instream habitat. Impacts would occur sporadically because the County would construct the three projects over an extended time, between IPT issuance and 2034.

The Preferred Alternative would support the implementation of restoration activities that are consistent with USFWS guidelines through bioengineering techniques and LWM placement, as well as levee setbacks to support the restoration described in the HCP (Pierce County 2019). Although no restoration projects are proposed in the White and Nisqually River basins, incorporating bioengineering techniques that provide habitat functions into project design would help offset impacts of County M&O activities.

**Table 6. Habitat Gain and Functional Lift for Proposed Restoration Projects.<sup>a</sup>**

Habitat Type	Upper Puyallup Confluence/ SW Quadrant Setback Levee	Neadham Road Floodplain Acquisition and Reconnection	Carbon River Ski Park Setback	Total Area Gained per Project <sup>a</sup>	Habitat Function Improvements
River Main Stem	3,613 linear feet	3,755 linear feet	3,900 linear feet	11,268 linear feet (2.13 miles)	Bull trout juvenile, sub-adult, and adult foraging, migration, and overwintering habitat Chinook and steelhead spawning, rearing, and migration habitat
Riparian <sup>b</sup>	12.0 acres	6.1 acres	3.4 acres	21.5 acres	Water temperature moderation <sup>c</sup> Source of LWM Increased source of food for all covered species
Floodplain	60 acres	98 acres	35 acres	193 <sup>d</sup> acres	Flood refugia (all covered species) Overwintering Juvenile rearing habitat (all salmonid life stages) Lamprey ammocoete rearing habitat

<sup>a</sup> Areas are estimates based on current restoration plans.

<sup>b</sup> Estimated based on 150-foot Pierce County regulated buffer width.

<sup>c</sup> The effect of riparian vegetation on water temperature moderation may be limited to local areas in the floodplain where there are wetlands, pools, or side channels that may be influenced by the effect of riparian vegetation on ambient temperatures. Near-stream vegetation shades the ground from solar radiation and creates a microclimate that maintains cooler air temperatures, higher humidity, and lower wind speeds (Leinenbach 2003). Riparian vegetation restricts air movement and insulates the stream from higher ambient air temperatures associated with adjacent developed areas or areas without shade.

<sup>d</sup> 193 acres is the total amount of acreage that Pierce County would fund using Flood Control Zone District funding and SWM fees. Acreage purchased with restoration grant dollars is not included in this total.

In the long term, levee setbacks would reconnect the floodplain and restore fluvial processes important for channel complexity and availability, including formation of spawning riffles, pools with wood, and off-channel habitat. Retention of sand, gravel, and cobble would improve and create spawning areas for steelhead and salmon. Improved habitat would improve rearing conditions, and reconnected floodplain wetlands would provide refugia for juveniles as well as overwintering and rearing habitat. Levee setbacks would enhance protection of wetlands and riparian corridors, which would also benefit terrestrial wildlife.

HCP implementation would help Pierce County to comply with the Services and Federal Emergency Management Agency requirements for the conservation of ESA-listed species (Pierce County 2019) and is expected to have no significant adverse effects.

## **3.6 Noise**

### **3.6.1 Affected Environment**

#### **3.6.1.1 Underwater Noise**

The baseline noise level in the Puyallup and Carbon Rivers at the proposed restoration sites is likely around 135 decibels (dB), which is the typical ambient noise level in deep, slow-moving rivers. In shallow (1 foot deep or less) rivers and streams, ambient underwater noise is around 140 dB due to water moving over rocks and wave action at the surface (WSDOT 2020).

### **3.6.2 Environmental Effects**

#### **3.6.2.1 No Action Alternative**

Under the No Action Alternative, levee repair and maintenance could cause underwater noise impacts due to placement of fill below the OHWM. Underwater noise generated by rock placement activities is mainly because of the splash, tumble and grinding of rocks during the placement process.

#### **3.6.2.2 Preferred Alternative**

As described above in the No Action Alternative, underwater noise impacts could occur due to levee repair and maintenance. The County would use BMPs to minimize underwater noise impacts, such as conducting work in accordance with in-water work timing restrictions and requirements of the HPA, performing work in the dry, and minimizing the duration of in-water work if necessary so that no work occurs within the in-water work window. No maintenance or repair activities will generate underwater noise and disturbance extending beyond the in-water work zone (typically about 0.5 acres per site).

The proposed restoration projects could produce underwater noise through a variety of mechanisms, which include construction-related noise impacts from impulsive sources (i.e., short duration, high intensity noise), as well as continuous noise sources from equipment operation. Potentially, the only impulsive sources at restoration sites would be from pounding of vertical wooden logs (used to anchor ELJs) with the bucket of a backhoe or excavator; however, the County would conduct this work in dewatered conditions (WDFW 2009).

The restoration projects are not expected to result in significant adverse noise impacts to aquatic species.

## 3.7 Cultural Resources

This section addresses the project's potential effects on rivers and salmon as important cultural resources for the tribes, and effects on sites listed on Washington's Historic Register and the National Register of Historic Places.

### 3.7.1 Affected Environment

The original inhabitants of the Puget Sound region developed a marine-oriented, hunter-fisher-gatherer culture that took advantage of the region's abundant natural resources. Much of the culture's economic, social, and political life became associated with the coasts and major rivers of the region, and this strong association continues today for the region's native peoples. Salmon and steelhead have always been and will continue to be a core symbol and foundation of tribal identity, individual identity, health, and play an important role in cultural practices among Indian tribes in the covered area. Salmon evoke sharing, gifts from nature, responsibility to the resource and connection to the land and water. The Puyallup Tribe of Indians (Puyallup Tribe), the Muckleshoot Indian Tribe (Muckleshoot Tribe), and the Nisqually Indian Tribe (Nisqually Tribe) have federally recognized treaty rights along certain segments of the rivers in the covered area.

The Washington State Department of Archaeology and Historic Preservation (DAHP) maintains a database of sites listed on Washington's Historic Register and the National Register of Historic Places. Results of the database search did not reveal any historic properties at the Upper Puyallup Confluence SW Quadrant Setback Levee site or the Neadham Road Floodplain Reconnection site, but did reveal potential or listed historic features near two of the restoration sites, described below.

Each of the three restoration projects would be in riverine areas where Tribal or state cultural resources could be encountered and disturbed during construction. To minimize the risk of adversely impacting cultural resources, each restoration project would include the following measures:

- Prior to the start of construction, the County would conduct a cultural resource field assessment to determine the presence or absence of cultural resources in the area to be affected by construction.
- Through consultation with the Washington State Historic Preservation Office and local tribes, the County would develop and implement a plan for the appropriate handling of identified cultural sites and any unanticipated discoveries.

In accordance with the National Historic Preservation Act (NHPA; 54 USC 300101 et seq. [2014]), the Services take into account the effects of a proposed undertaking on cultural resources listed or eligible for listing on the National Register of Historic Places. The purpose of Section 106 is to ensure federal agencies consult with state and local groups before non-renewable cultural resources, such as archaeological sites and historic structures, are affected. This coordination process is also intended to ensure compliance with the American Indian Religious Freedom Act (1978) and Consultation and Coordination with Indian Tribal Governments (Executive Order 13175 [2000]). Under both alternatives, as described above, the Applicant would comply with all state and federal laws and regulations pertaining to cultural and historic resource protection. The ITP will not enable or impose ground/site-disturbing activities that differ from those occurring under the No Action alternative. The Services initiated the NHPA Section 106 compliance process and will complete the process before completing the NEPA process.

### 3.7.1.1 Carbon River Ski Park Setback

There are no residences on the Ski Park Setback site. The DAHP website does not list any historic structures or properties (DAHP 2024).

### 3.7.1.2 White and Puyallup Rivers Confluence Property Acquisition

The Puyallup/White River Levees at the White and Puyallup Rivers Confluence Property Acquisition site are listed on the National Register as of 2018 due to their location in a potential historic district and their potential contribution to a historic district. The levees were constructed at least by 1897, with modifications around 1919 and through the mid-twentieth century. Built as part of flood-control efforts, the levees are related to community planning and development throughout the Puyallup Basin and engineering efforts related to flood control. The levees are linear structures and were individually evaluated for eligibility to the National Register of Historic Places. The levees contributed to events significant in history, specifically flood-control actions in the Puyallup Basin from the late nineteenth through the mid-twentieth centuries (DAHP 2024).

## 3.7.2 Environmental Effects

### 3.7.2.1 No Action Alternative

Planned M&O activities would typically involve minimal ground disturbance and would occur in a highly dynamic riverine environment where the likelihood of encountering in-place unknown cultural resources is low. If cultural resources are found during M&O activities, Pierce County would consult with the Tribes and DAHP to determine the appropriate actions to prevent further impacts on these resources. The effects of M&O activities due to impacts on salmon, a cultural resource for the Tribes, are discussed in the Fish and Wildlife Section above.

### 3.7.2.2 Preferred Alternative

Implementation of the BMPs included under the Preferred Alternative would not substantively alter the type or extent of ground-disturbing activities associated with the County's flood risk reduction activities. Therefore, those BMPs would not increase the likelihood of encountering cultural artifacts or sites.

The County engaged natural and cultural resources staff from the Tribes in the development of the HCP. The engagement considered tribal agreements, tribal treaty rights, and concerns related to tribal resource and fishing rights extending up each of the rivers associated with the levee systems addressed in the HCP. The BMPs specific to the HCP afford more protection for salmon and steelhead than under the No Action Alternative, as discussed in the Fish and Wildlife section above, therefore they are a benefit to Tribal cultural resources.

Constructing the restoration projects has the potential for disturbing cultural artifacts and sites because of historic and prehistoric use of the region's river valleys by native peoples. The specific locations of Tribal cultural resource sites, if any exist on the restoration project sites, is unknown. The County would conduct a structured process of investigation and collaboration (described above in the description of the Preferred Alternative) prior to the construction of each of the restoration projects. With this structured process in place, significant adverse impacts to cultural resources are unlikely to occur.

Property acquisition would not adversely impact the historic levees at the White and Puyallup Rivers Confluence site. If any future restoration projects proposed at the site would potentially affect the levees the project would undergo Section 106 review.

## 3.8 Land Use and Recreation

### 3.8.1 Affected Environment

The three proposed restoration sites are in rural areas of Pierce County. Table 7 lists existing land use information for the restoration sites. Land uses on developed portions of all three restoration sites are predominantly single-family residential.

Pierce County Shoreline Management Use Regulations (PCC Title 20) and associated policies regulate and promote development while protecting the shoreline environment and its related resources consistent with the Washington State Shoreline Management Act of 1971. Shorelines of the State include streams and rivers with a mean annual flow greater than 20 cfs and, therefore, include the reaches of the Puyallup and Carbon Rivers that are adjacent to the three restoration sites. The Shoreline Management Act established a broad policy regarding the use of Shorelines of the State, giving preference to uses that:

- Preserve the natural character of the shoreline
- Result in long-term over short-term benefit
- Protect the resources and ecology of the shoreline
- Increase public access to publicly owned areas of the shoreline
- Increase recreational opportunities for the public in the shoreline

Pierce County's shoreline regulations are specific to the designation (environment) of the shoreline segment in which a project is located. The County's shoreline master program designates a variety of environments: high intensity, shoreline residential, conservancy, natural, and aquatic. In general, the County's policies and regulations within the various environments allow for and promote habitat restoration.

The property acquisition site at the confluence of the White and Puyallup rivers is in unincorporated Pierce County, and the County designates the site as an unincorporated urban area. The site is within the Urban Growth Boundary of the City of Puyallup. The site's location within the City's Urban Growth Area indicates that the City is likely to annex the site and the properties adjacent to the north. However, the timeline for that annexation is not specified. The City of Puyallup designates the site and its adjacent properties to the north as Low Density Residential. The City of Puyallup's Shoreline Master Program states that the acquisition site would be designated Urban Conservancy when the site and its surroundings are annexed to the city.

Recreational sites are located near some of the restoration sites, and recreational boating and fishing occur along the Puyallup and Carbon Rivers on and near all three restoration sites. An informal, but well-known, put-in and pullout location for rafters is at the east end of 177th Street East. On the left bank across the Puyallup River from the site of the White and Puyallup Rivers Confluence property purchase, the Puyallup Riverwalk Trail extends adjacent to the shoreline. The City of Puyallup is planning to connect this trail to the regional Pierce County Foothills Trail. The Linden Country Club golf course is located south of and adjacent to the Riverwalk Trail. The 2020 Pierce County Regional Trails Plan proposed a trail to connect the existing Foothills Trail to a potential future Train to the Mountain Trail. A portion of the proposed trail on the east side of the Puyallup River passes through an area of extreme flood danger. In response to NMFS inquiry, Pierce County Public Works Department, HCP project manager informed NMFS that Pierce County Parks senior planner and trails coordinator recommended removing this section of the trail from the 2020 Regional Trails Plan and that the former plan would not be affected by the proposed HCP because of its removal from that plan.

**Table 7. Existing Land Use Information for Restoration Sites.**

Restoration Site	Size (acres)	Zoning	Number of Non-County Owned Parcels Remaining Within Project Site	Land Use at Site	Agricultural Land on Site	Nearby Recreation Facilities/Activities	County Shoreline Environment Designation <sup>a</sup>
Upper Puyallup Confluence/ SW Quadrant Setback Levee	60	Rural 10 Acre	11	Residential and open space; 5 residences	None	Fishing and boating in river adjacent to site.	Conservancy
Neadham Road Floodplain Reconnection	220	Rural 20 Acre with Rural 10 Acre at north end	7 (County will exchange property outside the project limits in whole or in part for 5 of the 7 remaining parcels in project area)	Residential and open space; originally 6 residences	None	Ohop Trail planned to be extended to north of site; fishing and boating in river adjacent to site.	Conservancy A small area of High Intensity designation may exist in the northwest corner of the site
Carbon River Ski Park Setback	35	Rural 10 Acre	3	Open space; no residences	None	Fishing and boating in river adjacent to site. Orting to South Prairie Trail.	Shoreline Residential
White and Puyallup Rivers Confluence Property Acquisition	30	Moderate Density Single Family	16	Residential and open space; 1 residence	None	Puyallup Riverwalk trail and Linden Country Club golf course along opposite shoreline of Puyallup River; fishing and boating in river adjacent to site.	Shoreline Residential

<sup>a</sup> Shoreline environment is from County’s Shoreline Master Program update that received final approval from the Washington Department of Ecology in May 2018.

## 3.8.2 Environmental Effects

### 3.8.2.1 No Action Alternative

The No Action Alternative would not result in any adverse land use or recreation impacts. The County's M&O activities would continue under current policies, which would limit damage to properties and structures adjacent to levees. This would be a beneficial land use effect as it would help to preserve the County's existing stock of infrastructure. These activities would not affect land use designations and recreation opportunities.

### 3.8.2.2 Preferred Alternative

Implementation of the M&O activities and associated BMPs under the Preferred Alternative would not result in any adverse land use or recreation impacts, but would have the beneficial effect of limiting damage to properties and structures adjacent to levees. The proposed restoration projects could, however, adversely affect land use and recreation.

The zoning and shoreline designations on each of the four restoration/property acquisition sites allow for the proposed restoration structures and activities. County zoning and other regulations already place substantial limitations on development in the floodplains of major rivers, Pierce County's Comprehensive Plan reflects the rural character and desired future land use for the area encompassing the three restoration sites. Goals of the plan include land uses that are consistent with the rural lifestyle and are within the carrying capacity of the natural environment (Goal LU-63) (Pierce County 2020b). Restoring and acquiring the sites would be consistent with these policies.

The proposed restoration would result in the acquisition of up to 36 parcels, which together with parcels previously purchased or already owned by Pierce County on the four sites, would comprise a total of about 66 parcels covering about 321 acres of property. Most of the land at the four sites is zoned for residential use. Under Washington State's Growth Management Act, Pierce County and the cities within the County are required to periodically assess the capacity to accommodate expected growth within the County's Urban Growth Area (UGA). No such assessment is required for the County's rural areas located outside of the UGA because, under the state's Growth Management Act, no targets are set regarding housing and buildable land in areas outside urban growth areas. Overall, the County (in its 2014 assessment of buildable land [Pierce County 2014a]) has concluded that there is considerably more residential capacity (184,962 existing and potential units) within its urban and unincorporated urban areas than the expected need for housing in 2030 (115,483 units needed). Although the County's 2014 assessment did not break down capacity and need geographically within the unincorporated portion of the County, the assessment did provide capacity and need by individual cities. This breakdown by city is used below to assess the degree of impact locally from the loss of residential land (Table 8).

Population trends indicate that population growth in cities and urban growth areas is increasing faster than growth in rural areas (OFM 2023). Housing in the south portion of unincorporated Pierce County is expected to increase by 46 percent by 2030 (Pierce County 2020c). As of May 10, 2021, the average days on market of listed properties in Pierce County encompassing the three restoration projects was between three and four weeks, and the average days on market of listed properties in the area of the White and Puyallup Rivers Confluence site acquisition project was over two weeks. These figures for days on market indicate that residential demand is currently not outstripping supply.

**Table 8. Residential Acquisition at Restoration sites and Nearby Available Residential Capacity.**

Restoration/ Property Acquisition Site	Total Parcels Acquired (existing and future)	Nearest City(ies)	Needed Additional Residential Units in Nearest City(ies) by 2030	Capacity for Additional Residential Units in Nearest City(ies)	Overcapacity for Needed Additional Residential Units in Nearest City(ies)
Upper Puyallup Confluence/ SW Quadrant Setback Levee	13	Orting	792	1,200	408
Neadham Road Floodplain Reconnection	35	Orting and Eatonville	1,216	2,643	1,427
Carbon River Ski Park Setback Project	7	Orting	792	1,200	408
White and Puyallup Rivers Confluence Property Acquisition	16	Sumner, Puyallup, and Bonney Lake	10,624	11,721	1,097

Comparison of the number of parcels acquired for each restoration/property acquisition site with the overcapacity for residential units in nearby cities indicates that the loss of residential property resulting from site restoration under this alternative could be locally accommodated. The numbers of residences affected is relatively small: the Upper Puyallup Confluence site will affect five residences, all of the residents at the Neadham Road site have already relocated or will be relocated by the time construction starts, there are no residences at the Carbon River Ski Park site and one residence will be affected at the White and Puyallup River Confluence property acquisition site.

The loss of 16 parcels at the White and Puyallup River Confluence property acquisition site would negatively affect the supply of buildable land within the City of Puyallup’s Urban Growth Boundary. However, the City’s comprehensive plan (City of Puyallup 2015) indicates that with implementation of measures set forth in the comprehensive plan, housing capacity in the City in 2035 is expected to exceed the needed supply. The effect of the loss of properties at the White and Puyallup Rivers confluence site, therefore, would be insignificant.

Based on the above, the loss of residentially zoned land and the removal of 11 residences, six of which have already been removed, at the restoration /property acquisition sites would not be significant.

None of the restoration/property acquisition sites are land zoned Rural Farm or Agricultural Resource Land. Therefore, no significant impacts on agriculture would result from this alternative.

Construction at the three restoration sites would have limited, temporary impacts on nearby formal recreational facilities. Impacts would be associated with construction noise, equipment emissions, and related activity, and are unlikely to be significant because of their temporary nature (one or two construction seasons at any one location), and distance from any facilities in the area. Property purchase at the restoration /property acquisition sites would not result in any acquisition of recreation/park property.

As stated above, the county has no plans to extend a formal trail through the project area. Flooding would impact any informal walking trails that exist at the restoration sites. If public access is allowed, walkers would

probably reestablish these trails during low water, and informal trail locations may change yearly as the floodplain adjusts to seasonal flows. This impact would not be significant.

Table 9 breaks down land use effects by restoration /property acquisition site to facilitate comparison of effects across the four sites.

**Table 9. Human Environmental Effects and Benefits by Restoration Site.**

	Upper Puyallup Confluence/ SW Quadrant Setback Levee	Neadham Road Floodplain Reconnection	Carbon River Ski Park Setback	White and Puyallup Rivers Confluence Property Acquisition
Restoration Allowed by Zoning and Shoreline Designation?	Yes	Yes	Yes	Yes
Future Parcel Acquisitions	11	6 (including 5 parcels to be acquired through a land swap)	3	16
Total Parcel Acquisitions	13	35	7	16
Total Number of Residences Displaced	5	6	0	1
Estimated Total Number of People Displaced <sup>a</sup>	13	16	0	3
Adequate Residential Land Capacity in Nearby Communities for Displaced Residences	Yes	Yes	Yes	Yes
Impacts to Recreation Facilities/Activities	No direct loss of recreation facilities/activities; potential proximity impacts from construction	No direct loss of recreation facilities/activities; potential proximity impacts from construction	No direct loss of recreation facilities/activities; potential proximity impacts from construction.	None
Road Abandonment?	No	Yes, Neadham Road	No	No

<sup>a</sup> Based on average Pierce County household size of 2.60 from 2010 Census results.

Construction at the three restoration sites would have limited, temporary impacts on traffic on neighboring roads during the construction period, typically during the summer months: July through October. Certain projects may require multiple construction phases or a longer duration construction period. Examples of impacts may include; temporary lane closures or slow-down areas to facilitate construction equipment ingress/egress. New access roads may be needed at the proposed restoration sites. The site access BMPs listed in Section 2.2.2 above would apply to any temporary and/or permanent access roads constructed for this

purpose. Following the construction period, impacts would be minor and may include intermittent site access in support of monitoring and/or operation and maintenance activities.

At the Neadham Road site, Neadham Road would be permanently eliminated, and all properties taking access from Neadham Road would be purchased. Brooks Road, which skirts the north and northeast side of the Neadham Road project site, would remain, and properties currently using that road for access could continue to do so. As indicated earlier in this document, the Neadham Road project is not expected to increase the risk of flood damage to Brooks Road and the project would incorporate adaptive design and post-construction management, if necessary to maintain a minimal level of risk.

In summary, implementation of the M&O BMPs under the Preferred Alternative would not result in any significant land use or recreation impacts.

## 3.9 Socioeconomics

### 3.9.1 Affected Environment

An economic study conducted in 2010 (Entrix 2010) estimated that economic losses within Pierce County from a 100-year flood event could range from about \$200 million up to about \$750 million (2010 dollars), with costs affecting transportation, agriculture, business, utilities, tourism, and private property. With continuing land development along river corridors together with the effects of environmental variation, future losses from flooding may increase and losses from major flooding could occur more frequently.

Existing development on the three proposed restoration sites plus one property acquisition site is primarily residential (see Table 7 above). Transportation infrastructure on the proposed three restoration sites and one property acquisition site do not provide essential transportation access to or between social services or facilities.

### 3.9.2 Environmental Effects

#### 3.9.2.1 No Action Alternative

In general, Pierce County would implement similar flood risk management measures under both alternatives. For this reason, socioeconomic impacts due to flooding are likely similar amongst the two alternatives. Overall, the socioeconomic effect of the County's M&O activities, which would be the same under both alternatives, would be beneficial as these activities reduce effects of flooding by maintaining protection infrastructure.

With no action there is a current and future cost to the County of projected 30 years of maintenance and operations. The annual cost of maintaining these flood risk reduction facilities fluctuates between \$1.5 million and \$5.25 million, with an average expenditure being approximately \$3 million depending on preventative maintenance needs and in response to damage from weather events (Pierce County 2014b). the continued maintenance of flood risk reduction facilities would have an overall beneficial effect on residents and the County, but taxpayers would incur a limited cost and the taxpayer funds used for maintenance of the flood risk reduction facilities would not be available for funding other County facilities and services.

#### 3.9.2.2 Preferred Alternative

Implementation of RRMP BMPs, ISPG assessments and erosion prevention measures, and vegetation management under the SWIF will not significantly affect socioeconomics in the areas covered by the proposed HCP. The annual cost of M&O related to flood risk reduction facilities would be the same as stated above for

the No Action Alternative. The cost of implementing the restoration and acquisition projects would be \$17.5 million.

Implementation of the four proposed restoration/property acquisition projects would affect approximately 12 residences, some of which have already been acquired by the county. To date, property purchases have been voluntary on the part of sellers, and the County intends that future purchases be voluntary as well. In the unlikely event that the County needs to exercise its eminent domain power to complete property acquisition through condemnation, it is extremely unlikely that more than one to several properties would be affected.

As part of the Neadham Road project, the County would abandon Neadham Road, 250th Street East, and 176th Avenue East, and would acquire the adjacent parcels that necessarily take access from those roads. Brooks Road from Orville Road E to Fisk Road E would be retained. The roads to be abandoned are dead-end roads that do not provide through-access within the area road network.

Overall, the County's implementation of the proposed restoration and property acquisition projects, and the likely resultant reduction of maintenance and repair activities needed in the vicinity of these projects, would incrementally reduce the adverse socioeconomic impacts of flooding that would otherwise occur to residents and businesses without the increased flood capacity provided by these projects.

Based on the above, no significant impacts on social services or facilities would occur as a result of the HCP and Services' issuance of ITPs.

### **3.9.3 Cultural Resources/Fish and Wildlife**

Implementation of BMPs under all alternatives would not substantively alter the type or extent of ground-disturbing activities associated with the County's present or proposed flood risk reduction activities. Since Pierce County Department of Public Works conforms field practices to identification and protection of Cultural Resources, M&O activities would not adversely affect cultural artifacts or sites.

As stated above, constructing the restoration projects has potential for disturbing cultural artifacts and sites because of historic and prehistoric use of the region's river valleys by native peoples, and salmon and steelhead are of central cultural importance to Native American Tribes. Before disturbing the ground, Pierce County would conduct a cultural resource field assessment to determine the presence or absence of cultural resources in the area to be affected by construction. Through consultation with the Washington State Historic Preservation Office and local tribes, the county would develop and implement a plan for the appropriate handling of identified cultural sites and unanticipated discoveries. Therefore, the project would not result in disproportionate adverse effects on Tribal cultural resources.

The Preferred Alternative could benefit salmon and steelhead habitat through implementation of the full suite of protections available through BMPs from the RRMP, the ISPG, the SWIF, and restoration projects described in the HCP. Therefore, there may be a positive effect on salmon and steelhead habitat compared to the No Action Alternative.

## **3.10 Summary of Environmental Effects by Alternative**

### **3.10.1 No Action Alternative**

Under the No Action Alternative, the County would continue to engage in flood hazard management activities without developing an HCP and would not receive incidental take coverage for its management activities. The

County's flood hazard management activities would continue in accordance with existing state and federal regulations, several of which prohibit the take of listed species. The County would operate to avoid take of the covered species but may not implement many of the proposed conservation measures described in this HCP, including construction of the proposed restoration sites. Pierce County would implement measures specifically addressing flood risk reduction and a limited suite of BMPs from the RRMP, but the No Action Alternative would not require Pierce County to use BMPs from the ISPG or SWIF that specifically minimize the effects of flood risk reduction on covered species and their habitat while limiting the likelihood of chronic need for environmental repair. While flood risk reduction could incidentally reduce certain adverse effects of flood risk reduction on listed species, it would not specifically do so.

The No Action Alternative would not result in any of the potential adverse impacts resulting from construction and property acquisition for the restoration sites. At the same time, the No Action Alternative does not seek to offset environmental effects through habitat restoration as Pierce County cannot ensure construction of restoration sites, or even funding for property acquisition. The No Action Alternative would not provide the long-term environmental benefit of restored floodplain habitat and increased flood capacity.

### **3.10.2 Preferred Alternative**

In general, if the HCP is approved and the Services issue ITPs, the impacts of the County's expected flood risk reduction actions would be mitigated by the proposed BMPs and restoration, including a contingency for greater-than-projected impacts.

Implementation of the BMPs prescribed in the HCP would not result in adverse environmental impacts but would help mitigate potential adverse water quality, vegetation, and aquatic habitat impacts.

Restoration activities at the proposed restoration sites could result in adverse impacts during construction; however, the HCP includes measures that adequately mitigate for the potential impacts. Temporary disturbance to fish and wildlife on and near the site from construction activities can be limited through BMPs such that they would not be significant.

Over the long term, implementation of the Preferred Alternative would result in a substantial environmental benefit, including 193 acres of restored floodplain habitat and increased flood capacity within the Carbon River and Puyallup River drainages. Restoration would directly address habitat-limiting factors that depress salmonid populations in the HCP-covered areas. In the long term, levee setbacks would reconnect the floodplain and restore fluvial processes important for channel complexity and availability, including formation of spawning riffles, pools with wood, and off-channel habitat. Retention of sand, gravel, and cobble would improve and create spawning areas for steelhead and salmon. Restoring riparian forests would support high levels of biological production and diversity and provide a source of large wood to the rivers in the long term.

Table 10 summarizes the effects of the Preferred Alternative for each element of the environment.

**Table 10. Summary of Effects of the Preferred Alternative.**

Environmental Element	Effect of M&O Activities	Effect of Restoration Projects
Geomorphology and Soils	No significant effect with implementation of BMPs	Beneficial effect
Water Resources	No significant effect with implementation of BMPs	Potential short-term effect on turbidity; long term beneficial effect
Vegetation	No significant effect with implementation of BMPs	Long term beneficial effect
Fish and Wildlife	Beneficial effect due to prescriptive BMPs	Short term disturbance; beneficial long term effect
Noise	No significant effect with implementation of BMPs	No significant effect with implementation of BMPs
Cultural Resources	No significant effect	No significant effect because of measures incorporated into the project
Land Use and Recreation	No significant effect	No significant effect
Socioeconomics	No significant effect	Long term beneficial effect

### 3.11 Cumulative Effects

Cumulative effects are those that result from the incremental effects of an action when added to other past, present, and reasonably foreseeable future actions regardless of what agency or person undertakes those actions.

#### 3.11.1 Past Actions

The first residents settled in the Puget Sound area more than 10,000 years ago. Those First Americans, ancestors of today’s Muckleshoot, Nisqually, Puyallup, Squaxin, and Steilacoom Indians, used the area’s natural resources for food and material. While tribal activities probably resulted in some adverse environmental impacts on plants, animals, and fish and wildlife habitat, those impacts were undoubtedly dwarfed by periodic natural events, such as mud flows originating on Mount Rainier that dramatically altered the landscape.

During the late 19th century and early 20th century, timber harvest nearly eliminated the native forests in the region’s lower river valleys. Agriculture also developed and contributed to large-scale changes in the region’s lowland landscape. From the late 19th century to the mid-20th century, hydrologic projects were constructed that substantially affected the regions’ river systems. These projects included the permanent diversion of the White River into the Stuck River/Puyallup Rivers system and the construction of the Mud Mountain Dam on the upper White River, the Electron Diversion Dam on the Puyallup River, and the construction of the Alder and LaGrande dams on the Nisqually River. These dams, together with road crossings and other structures and projects physically affecting streams and rivers, have cumulatively adversely affected fish passage and the extent and suitability of fish habitat along the region’s waterways. Residential and related human development began in earnest in the late 19th century and has continued to the present day. Resource extraction and land development have resulted in major environmental changes, including a nearly wholesale transformation of the floodplains of the region’s lower river valleys. Much of the area has been converted to agricultural and urban land uses, river channel migration zones have been constricted, flood conveyance capacity has been lost, and fish and wildlife populations and habitats have declined substantially from pre-European levels.

### 3.11.2 Restoration and Land Acquisition Projects

Pierce County's annual M&O program has historically conducted limited site-scale willow planting and wood placement into levees as well as small restoration and land acquisition activities to improve habitat and reduce flood hazards. . These efforts have some localized benefits when successful, but do not address larger scale flooding issues and habitat loss.

Major projects, as described in the *Pierce County Flood Management Plan* (Pierce County 2013) and the *Comprehensive Flood Hazard Management Plan* (Pierce County 2023) are listed below.

#### Lower Puyallup River

- The Sha Dax Restoration Project, completed in 2008, by the Puyallup Tribe, created off channel habitat including riparian buffers with a connection to the Puyallup River.
- In 2009, Pierce County SWM constructed 200 linear feet of bank and toe protection along the right bank of the lower Puyallup River near RM 5.3, along North Levee Road in the City of Fife. Known as the "silt bench" project, the project consisted of constructing a matrix of logs and precast concrete structures to add river complexity and improve fish habitat.
- The Ball Creek Project, completed in 2018, which replaced a fish barrier culvert, restored over 1,400 feet of creek channel, and reconnected over 10 acres of Ball Creek with historic Puyallup River floodplain.
- Twenty-one parcels totaling 16.24 acres have been purchased by Pierce County in the Clear Creek area of the lower Puyallup.
- The Clear Creek Habitat Restoration Project improved access to salmon habitat and increased flood storage capacity by removing sections of an existing road separating Clear Creek from an adjacent wetland.
- The Clear Creek Flood Gate Restoration Project replaced a wooded flap gate on one of two culverts that convey Clear Creek to the Puyallup River, improving fish passage and reducing impacts from flooding along Clear Creek.
- A total of 65 acres of property was acquired between 2018 and 2021.

#### Middle Puyallup River

- Acquisitions of homes and properties in flood-prone areas totaling 246 acres.

#### Upper Puyallup River

- The Ford Levee Setback Project consisted of constructing a new 8,400-foot levee setback up to 600 feet from the main channel of the Puyallup River, reconnecting 125 acres of floodplain with the river.
- The Soldiers Home Levee Setback Project consisted of constructing a new 5,000-foot levee which was set back 900 feet from the main channel of the river. reconnecting 67 acres of floodplain with the river.
- The Orville Road Revetment Setback consisted of approximately 250 lineal feet of setback revetment along Orville Road to replace a Puyallup River levee that had been washed out from the November 1995 and February 1996 flood events. The last phase of this project was constructed in 2022 and reconnected approximately 70 acres of floodplain.

- The South Fork Floodplain Restoration Project reconnected 42 acres of floodplain and constructed a 4,200-foot-long side channel with ELJs, pools, riffles, and other natural wood features.
- 685.5 acres of land and homes in flood-prone areas have been purchased.

#### Carbon River

- Pierce County SWM acquired 193 acres of land divided into 43 parcels, 16 of which contained structures, after 2006 flooding.

#### South Prairie Creek

- The South Silver Springs Project, installed by Pierce County, consisted of restoring a 12.8-acre site adjacent to South Prairie Creek and a cool water tributary. There is improved floodplain connection, wetland and tributary enhancement, and placement of LWM.
- Approximately 142 acres have been purchased, and four flood-prone homes were purchased and removed.

#### White River

- The Butte Pit Wetlands Mitigation project near the City of Pacific relocated Government Ditch and installed weirs within wetlands cells to raise the water elevation and create a variety of saturated, seasonally inundated, and permanently inundated areas.
- The Countyline Levee Setback Project was constructed in 2017 to address loss in channel capacity and reduce flood elevations in the City of Pacific by removing 4,500 linear feet of existing levee and reconnecting the river with 121 acres of off-channel aquatic habitat (King County 2020).

#### Nisqually River

- 25 parcels totaling 42.5 acres were acquired along the middle Nisqually River in the McKenna vicinity following the 1996 flood.

#### Mashel River

- The Mashel River Restoration Project installed numerous engineered log jam structures to rehabilitate degraded in-stream and riparian habitat to restore geomorphic and ecological functions beneficial to native salmonid species.

### 3.11.3 Reasonably Foreseeable Future Actions

Reasonably foreseeable future actions are independent of the alternatives assessed in this EA but could result in cumulative effects when combined with the effects of those alternatives. They are actions that have been approved, are included in planning and budget documents prepared by government agencies or other entities or are likely to occur over the 30-year HCP term given current trends. Reasonably foreseeable future actions that could result in cumulative effects include:

- Continued rural and urban residential and non-residential development in Pierce County as population continues to increase

- Continued increase in atmospheric concentrations of greenhouse gases and consequent environmental variation
- Future levee setback projects proposed in the Flood Plan (Pierce County 2018)
- Electron Hydro Project HCP – The owners of this private hydroelectric project have hired contractors to assist in the development of an HCP governing operation and maintenance of that project. The draft HCP is currently under review.

### 3.11.4 No Action Alternative

Under the No Action Alternative, the adverse effects of continued development, emissions of greenhouse gases, resource extraction, and other human activities would continue to have a cumulative adverse impact on geomorphology, water resources, vegetation, fish and wildlife, cultural resources, land use and recreation, and socioeconomics in the regions' river systems. The projected future M&O activities conducted by the County over the term of the ITPs (see Section 2.4.1 Table 2) are likely to impact fish and aquatic habitat as described in Section 3.5.2.1. The estimated 23 projects per year will contribute incrementally to adverse effects on fish and wildlife. The voluntary BMPs and restoration efforts, conducted by the County and others, will likely improve conditions, but adverse effects would still occur.

### 3.11.5 Preferred Alternative

The proposed restoration projects in the HCP would contribute 193 acres of restored floodplain to past efforts (approximately 655 restored acres since 1998) to restore ecological processes and address threats to salmonids in the HCP-covered areas. However continued development and other human activity would result in continuing adverse impacts on river systems as described for the No Action Alternative. Terrestrial noise impacts from M&O activities will be minor and locally contained by BMPs, therefore they will not contribute in any measurable way to cumulative effects and are not discussed in this section.

#### 3.11.5.1 Geomorphology

Short-term adverse impacts associated with soil disturbance and erosion during construction of the three restoration projects could accumulate with impacts from other construction projects if those other construction projects occur simultaneously with the restoration projects. These potential adverse short-term cumulative impacts are uncertain because the timing of construction is known only within broad parameters. However, they are not likely to contribute to significant cumulative effects because the restoration projects and any other construction project in the County would be required to implement BMPs to limit impacts.

Since 1998 the County has acquired more than 1,257 acres of floodplain property to protect habitat and reduce flood risk. Restoration projects have reconnected river main stems to nearly 655 acres of floodplain, and setback levees or levees left unrepaired have allowed rivers to reoccupy areas along more than 34,000 linear feet (6.4 miles) of river. Long-term beneficial impacts of the proposed BMPs and restoration projects on geomorphology would accumulate incrementally with beneficial impacts from past projects and future proposed floodplain reconnection and aquatic habitat restoration projects in the covered area and continued refinement of BMPs through adaptive management.

#### 3.11.5.2 Water Resources

Over the long term, the water quality benefits stemming from implementation of the proposed BMPs in the HCP would contribute incrementally to other efforts to protect water quality in the covered area, such as the

RRMP. The long-term benefits could also help minimize the impacts on water quality from continued development and other human activity. Water quality (sedimentation) impacts of construction at the proposed restoration sites would temporarily accumulate with impacts that would occur from continued development and human activity but would not cause a significant cumulative impact. These temporary adverse water quality impacts would be minimized by the long-term benefits of floodplain expansion by promoting greater floodplain connectivity for high flows to spread and reduce the erosive forces of the rivers.

Temporary water quality impacts (suspending sediment increasing turbidity) and sediment deposition may occur in either case and would contribute to the cumulative effects of sediment releases from all other disturbances in the covered area.

### 3.11.5.3 Vegetation

Short term adverse impacts of vegetation clearing for covered activities and the restoration projects would lightly reduce vegetation in places where Pierce County Public Works needs access to levees for inspection and maintenance, and in areas where Pierce County will set back levees for the restoration projects. These removals come with tree planting and will follow the guidelines in the SWIF (Pierce County 2017a). Furthermore, Pierce County estimates the removal of consists of five to seven trees per year over the term of the ITPs, based on past experience. Furthermore, vegetation clearing at the restoration sites would be short term until plantings and natural recruitment occur and therefore would not contribute measurably to significant direct or cumulative impacts on vegetation.

Under the HCP, covered areas will accrue the benefits of operating according to the provisions of the SWIF. Beneficial impacts on vegetation would accumulate incrementally with each area managed under the SWIF. These activities would contribute to improvements in floodplain vegetation due to ongoing and future planned floodplain reconnection projects in the covered area that support re-establishment of native riparian vegetation.

### 3.11.5.4 Fish and Wildlife

Adverse impacts of the Preferred Alternative on aquatic habitat would contribute incrementally to past and future impacts from continued development and M&O activities. Estimated future M&O activities per year include ten levee and revetment maintenance projects, eight imminent threat projects, and five flood fighting and emergency response projects.

Over the long term, actions carried out under the HCP's requirements and the restoration projects would benefit aquatic habitats and reduce or avoid the contribution of the effects of M&O activities to cumulative effects. These long-term benefits could also contribute incrementally to minimizing the impacts on aquatic habitat from continued development and other human activity. The Preferred Alternative therefore would not contribute in a meaningful way to adverse cumulative impacts on fish and wildlife.

### 3.11.5.5 Cultural Resources

Cultural resources in the region have been and continue to be lost or otherwise adversely affected by past and continued development and other human activity. Such impacts would likely continue. Construction of the three restoration projects, which would occur in riverine environments, has potential for encountering cultural resources and contributing to cumulative impacts, but measures included in each project would minimize this potential and, therefore, the restoration projects would not contribute in a meaningful way to cumulative impacts.

### 3.11.5.6 Land Use and Recreation

The proposed floodplain acquisition and restoration projects would contribute to cumulative effects of Pierce County regulations that limit development in floodplain areas and protect wetlands and other environmentally sensitive areas and resources. In general floodplain acquisitions convert residential land into protected open space. Recreational uses of these lands are generally for passive recreation, such as walking and bird watching.

During construction of the Neadham Road restoration site truck traffic on Brooks Road would add to truck traffic from the Rainier Resources quarry. Truck traffic would likely involve a few trips per day resulting in traffic impacts during the construction period but would not cause a significant cumulative increase in traffic.

### 3.11.5.7 Socioeconomics

The cost to the County of past and future M&O activities in the covered area contributes to the cumulative impact of flood protection M&O throughout the county. The restoration projects proposed in the Preferred Alternative would lead to less future maintenance on flood control structures in the vicinity of the restoration projects. The restoration projects would contribute to other future levee setback and property acquisition projects proposed in the Flood Plan (Pierce County 2018) that are beneficial to the local economy by reducing future disaster-relief and maintenance costs. The cost to the County of implementing the Preferred Alternative would be outweighed by these benefits and would not contribute in a meaningful way to cumulative impacts.

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## **Appendix A**

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# **Amending Regional Trails Plan – Neadham Road Area**

## MEMORANDUM

### Memorandum

From: Tiffany Odell, Senior Planner & Brianne Blackburn, Trails Coordinator

Through: Kimberly Freeman, Resource Stewardship Superintendent

To: Roxanne Miles, Director

Date: August 10, 2021

Subject: Amending Regional Trails Plan—Neadham Road Area

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### Summary

The adopted 2020 Regional Trails Plan includes proposed routing for a future Foothills Trail link to Train to the Mountain trail along the Puyallup River near Neadham Rd. This area experiences significant flood hazards and has been prioritized by Pierce County Planning & Public Works, Surface Water Management division for relocation of people and infrastructure. Due to significant risks, the Regional Trails Plan is being amended to remove the trail section from the Brooks Road East bridge over the Puyallup River to the bridge north of the intersection of Electron Road East and Orville Road East adjacent to Neadham Road.

### Background

The 2020 Regional Trails Plan includes proposed trails, some of which are planned for near term implementation, and others that represent a long-term vision for trail connections across the County. Most of the long-term trails have not received significant vetting, and are considered conceptual routes.

The Foothills Trail link to Train to the Mountain trail is a proposed long-term trail, which was identified as a possible route to connect the existing Foothills Trail to a potential future Train to the Mountain Trail.

A portion of this trail on the east side of the Puyallup River exists in an area of extreme flood danger, where numerous flooding events have caused significant damage and stranded residents in recent years. Pierce County Rivers Flood Management Plan (2013) identifies a goal to remove all residences within this area and minimize or eliminate Pierce County's infrastructure responsibility. Planning & Public Works, Surface Water Management division has spent significant time and funding purchasing property in this area to remove people and infrastructure from harm's way. Planning a trail in this area would go

against current Pierce County recommendations to reduce infrastructure in this flood risk area and would likely be met with significant feasibility challenges.

The regional connection between Foothills Trail and the proposed Train to the Mountain Trail could still be achieved through other nearby proposed trails.

### **Findings and Facts**

- The proposed trail is within a significant flood hazard area that has experienced significant damage.
- The 2013 Pierce County Rivers Flood Hazard Management Plan identifies this area as a highly dynamic and actively migrating area of the Puyallup River and is actively purchasing properties with the ultimate goal of removing all residences and minimizing or eliminating Pierce County's maintenance responsibilities in this corridor.
- Pierce County Planning and Public Works, Surface Water Management Division has spent significant time and money purchasing property in this area to remove people from harm's way.
- The proposed trail is conceptual, and no study of feasibility of a trail has taken place.
- The proposed trail is not identified for study or construction in the Pierce County 6-year Capital Facilities Plan or the 2020-2030 Parks, Recreation, and Open Space Plan.
- A comparable Regional connection could be achieved through other nearby proposed trails.
- Planning and constructing a trail would go against Pierce County recommendations to reduce infrastructure in this flood risk area and would likely be met with significant feasibility challenges.

### **Recommendation**

Pierce County should remove the proposed trail routing from the 2020 Regional Trails Plan for the section of trail known as "Foothills Trail link to Train to the Mountain RTW (S. section)" between approximately the Brooks Road East bridge over the Puyallup River to the bridge over the river just north of the intersection of Electron Road East and Orville Road East.

cc: Angela Angove, Planning & Public Works, Surface Water Management

## **Appendix B**

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# **Public Comments & Responses**

## Puyallup Comments

Comment #	Topic	Comment	Comment response
P - 1	Mitigation timeline/White River mitigation	While a number of elements to the plan will provide habitat lift over current conditions, the fact that no date certain is provided as to when these components will be offered and the fact that other components are missing or simply inadequate in providing meaningful maintenance projects, renders the plan unacceptable. For instance, levee repairs are frequently made along the White River yet no mitigation is provided anywhere along the White.	<p>Mitigation site construction dates are listed in Section 2.1.5 of the HCP. The County has added a table (Table 2.1) to the HCP to highlight that information.</p> <p>Section 10(a)(1)(B)(ii) of the Endangered Species Act requires applicants to minimize and mitigate the impacts of the taking to the maximum extent practicable. Implementing regulations at 50 CFR 17.22(b)(2)(ii) and 222.307(c)(2)(ii) also require the applicant to minimize and mitigate the impacts of the taking to the maximum extent practicable. Thus, the County is required to minimize and mitigate the impacts of the taking to the maximum extent practicable. In determining whether these issuance criteria are met, the Services evaluate the conservation strategy in the HCP as a whole. In evaluating the conservation strategy, the Services consider the biological needs of the species, and have determined that, while take will occur on the White River, the impact of that taking on the covered species is minimized and mitigated adequately by the conservation strategy as a whole. The amount of take along the White River is a small portion of the total take of covered species that will occur as a result of covered activities, and the conservation strategy mitigates the impacts of takings in the entire plan area, including along the White River.</p>
P - 2	Levee maintenance strategy	Ideally, maintenance actions would evaluate the specific role of each levee segment toward its overall flood risk protection value and target such areas for maintenance in a prioritized fashion. The DEA and HCP are disappointing for their lack of clarity on this subject. This seems to fall into a pattern of routine behavior as opposed to objective analysis of what is really needed to provide optimal flood protection.	Comment noted. Please refer to Section 2.1.1 of the HCP for a description of how maintenance projects are prioritized.

Comment #	Topic	Comment	Comment response
P - 3	Temperature	<p>Despite years of imploring the county to consider tree height, solar aspect and shading function into levee vegetation management, this subject remains entirely absent from the HCP. The concept of incident solar input is essentially ignored despite the critical importance of water temperature to the life history of both listed and non-listed salmonid stocks and the plethora of recent scientific research as to its importance. Many miles of the Puyallup, Carbon and White Rivers have been artificially exposed to direct sunlight accelerating water temperature increases to stressful if not lethal levels. The very act of performing much of the levee maintenance in the Puyallup watershed requires the use of mechanized equipment whose first order of business is to eliminate the levee vegetation at or near the place of repair, depending upon tree size, age and perceived risk of toppling. Repairs typically involve the use of excavators working from the levee top or down in the river channel to install toe rock and or bolster design deficiencies of the original construction.</p> <p>Section 2.2.1 lists Biological Goals and Objectives within the HCP yet doesn't even mention the term "water temperature". Similarly, the issue of water temperature and solar exposure is not mentioned under Vegetation Removal or within anyone of the BMP's listed on pages 21 and 22. It's almost as if water temperature doesn't matter and PC has no intention of working toward lessening temperature impairment. This is astonishing as water temperature in the single most important variable in the life history of salmonid fishes.</p>	<p>The County's levee vegetation management strategy is taken from the System-Wide Improvement Framework (SWIF), which addresses water temperature. Section 2.1.4 of the HCP has been revised to clarify this point.</p>

Comment #	Topic	Comment	Comment response
P - 4	Injury to fish from in-water work	Levee toe repair and replacement work often times requires the machine operator to blindly manipulate rocks into position under flowing water and in high turbidity conditions common to our glacial rivers during the summer work window. The operator or any monitoring personnel present would be unlikely to see or detect any fish injury or losses related to the activity due to poor water visibility.	<p>Please refer to Section 2.2 of the HCP for a discussion of fish exclusion best management practices (BMPs). These BMPs exclude covered species from in-water work areas thereby minimizing impacts to such species.</p> <p>As discussed in Section 2.2, the number of covered species that could be affected during in-water work was determined based on several years of County project data.</p>
P - 5	Levee maintenance strategy	Many levee repair locations are the subject of repetitive efforts simply due to poor initial siting of the original levee. These levee segments that were improperly located in steep and or confined channels would require far less attention and repair by being setback in a configuration that would provide greater conveyance capacity. Such confined locations often require frequent repairs and are overlooked without consideration of the root cause of the failure. The right bank levee network downstream from the Calistoga Setback comes to mind as does the Carbon River levees, both left bank and right downstream of Voights Creek.	Comment noted.
P - 6	Mitigation timeline	PC has identified three restoration sites as part of the HCP mitigation strategy. The Upper Puyallup Confluence SW Quadrant Setback is wonderful project that will provide essential habitat lift in the form of 60 acres along a river segment long overdue for relief from its current criticism we have for this project proposal is the absence of any definite completion date much less a start date for construction.	Comment noted. Mitigation site construction dates are provided in Section 2.1.5 of the HCP. The County has added a table (Table 2.1) to the HCP to highlight construction dates.

Comment #	Topic	Comment	Comment response
P - 7	Mitigation timeline	Similarly, the Neadham Road area also provides significant functional lift in a once overly confined channel segment. However, given that this project is and has been completed for years but for the actual levee removal, it's difficult to understand how the site can be credited as mitigation for future maintenance work. Additionally, the levee removal project is not slated to start for at least another eight years so how will this site mitigate for all the levee repairs being performed this year as well as the interim period when levee removal is finally completed?	Comment noted. Mitigation site construction dates are listed in Section 2.1.5 of the HCP. The County has added a table (Table 2.1) to the HCP to highlight construction dates.
P - 8	Mitigation timeline	Lastly, the project area located on the right bank Carbon River near the Ski Park proposes removal of 3900 feet of levee and reconnection of 35 acres of land to the active floodplain. Again, a nice habitat addition for sure but for the fact that this is "estimated" not to occur for these time frames have any justification attached or explanation as to what exactly we are waiting for.	Comment noted. Mitigation site construction dates are listed in Section 2.1.5 of the HCP. The County has added a table (Table 2.1) to the HCP to highlight construction dates.
P - 9	Mitigation timeline	The fundamental disconnect with the HCP is that mitigation for ongoing activities will not get reconciled for years if it happens at all. PC is in effect asking the resource managers to accept an "I owe you" for impacts and harm incurred today while not delivering a mitigation date whereupon funding may or may not even exist. Furthermore, there is no mention as to the mechanism that will account for this temporal deficit and tabulate just how our fisheries resources will be made whole against numerous separate repair projects.	The commenter suggests that mitigation projects identified in the HCP are speculative and may not occur. The Services respectfully disagree. As noted in Section 3.2 of the HCP, Pierce County has a demonstrated history of developing and implementing conservation actions in the plan area. Pierce County has committed to acquisition and construction of mitigation sites in the HCP and has taken affirmative steps to implement such projects prior to receiving their permit during the development of the HCP. The HCP includes a process for committing and verifying the availability of funding for mitigation projects in Chapter 8 of the HCP. Finally, mitigation sites will be protected in perpetuity, whereas the impacts from covered activities are only calculated for the duration of the Incidental Take Permit.

Comment #	Topic	Comment	Comment response
P - 10	Mitigation timeline/water temperature	This DEA is disappointing for its lack of tangible habitat gains, avoidance of any water temperature planning approaches and the complete absence of a definitive timetable as to when and how the three showcased mitigation projects will deliver measurable credits to the affected environment. In the meantime, we have no effective mechanism for mitigating annual flood facility repair work which will continue to have a significant cumulative impact to fish and fish habitat.	Comment noted. See the responses to comments P - 1, P - 3, and P – 6-9 provided above. Appendix I of the HCP describes a further modeling analysis completed by the County to address comments concerning cumulative impacts of covered activities.
P - 11	Climate change	An HCP must provide for climate change and related adaptation especially when it is intended to protect and mitigate for a 30-year period. A lot can happen over 30 years. Looking back 30 years from today, we didn't have three ESA listed species, water temperature exceedances of state standards within our three glacial rivers were an unusual occurrence and opportunities for land acquisition to perform mitigation projects were much more prevalent.	Comment noted. The HCP address climate change in Sections 3.1.2, 4.1.2, 7.2.1, and 7.2.2. Section 7.2 of the HCP provides a process to address Changed Circumstances associated with potential climate change processes. Section 5.4 of the HCP also provides an adaptive management process to modify activities contained in the HCP.

# Muckleshoot

Comment #	Topic	Comment	Comment response
M - 1	White River mitigation	The HCP remains insufficient because it fails to mitigate any direct, indirect, or cumulative HCP-covered impacts to White River fish habitat, despite years of related dialogue with Pierce County on this topic.	<p>Section 10(a)(1)(B)(ii) of the Endangered Species Act requires applicants to minimize and mitigate the impacts of the taking to the maximum extent practicable. Implementing regulations at 50 CFR 17.22(b)(2)(ii) and 222.307(c)(2)(ii) also require the applicant to minimize and mitigate the impacts of the taking to the maximum extent practicable. In determining whether these issuance criteria are met, the Services evaluate the conservation strategy as a whole. In evaluating the conservation strategy, the Services consider the biological needs of the species, and have determined that, while take will occur on the White River, the impact of that taking on the covered species is minimized and mitigated adequately by the conservation strategy as a whole. The impacts of the taking along the White River represent a small portion of the take of listed species that will occur during implementation of the HCP. There is no impact of the taking identified by the Services that requires mitigation specifically along the White River to address. See Section 4.4 of the HCP for a discussion about the benefits of the conservation strategy.</p> <p>The White and Puyallup Rivers Confluence Project was identified as an area of interest by the County after coordination between the County and the Muckleshoot and Puyallup tribes. While the County did not include the project in calculating the offset of the impact of the taking, this property acquisition by the County will limit further development in this area and allow for future levee setback projects. Once constructed, these levee setback projects would enable natural processes to occur in the area of such setback projects by avoiding constraints on the river channel.</p>

Comment #	Topic	Comment	Comment response
M - 2	White River mitigation	The HCP provides no mitigation for covered impacts to White River salmon apart for BMPs that harm salmon habitat. The activity types covered in the HCP extend vast unmitigated harm imposed at White River by Pierce County through the Inter-County River Improvement Commission, including river diversion, straightening, dredging, bank armoring, and wood removal.	See the response to comment M - 1 above regarding mitigation for impacts to White River salmon. The County has proposed a conservation strategy for its covered activities relating to the County's flood control actions. Activities noted by the commenter are outside the authority of the County's flood control program and are therefore not covered activities considered in the HCP. To be included as covered activities in the HCP, the activities must be under the direct control of the County.
M - 3	White River mitigation	As discussed previously, maintenance and repair of existing levees and revetments including vegetation management have caused long-term and significant impacts to White River salmon habitat. We do not agree with Pierce County's assessment that HCP impacts to White River salmon do not require mitigation. The HCP must reasonably improve salmon habitat at White River or near its mouth to mitigate HCP-covered impacts to White River salmon.	Comment noted. See the responses to comments M - 1 and M - 2, above.
M - 4	White River mitigation	The assessment for lower White River illustrated in Figure 2.7 of the HCP only accounts for damage from 2000 to 2015 and fails to address impacts from extensive repairs to levees and revetments documented by records of the Inter-County River Improvement Commission.	See the responses to comments M - 1, M - 2 and M - 3 above. Figure 2.7 in the HCP addresses the impacts of County flood control actions from 2000 to 2021. The HCP contains conservation actions that address the impacts of taking associated with covered activities contained in the plan.

Comment #	Topic	Comment	Comment response
M - 5	Lower White River	The HCP assessment does not consider whether damage during the assessment period was reduced by the effects of a deviation from the Mud Mountain Dam Water Control Manual that allowed lower managed outflows.	<p>In response to comments received, the County conducted an extensive modeling exercise to model the effects of covered activities over time. Based on the modeling results, recent project data, and future environmental variance related to climate change, the County concludes that it has overestimated impacts resulting from the County's covered activities.</p> <p>Impacts associated with covered activities will be monitored throughout the duration of the HCP. In the event monitoring indicates that impacts are greater than estimated, Section 5.4 of the HCP contains a process to address such activities through adaptive management and coordination with the Services.</p>
M - 6	White River mitigation	The plan to purchase land and hope for future funding to complete a mitigation project at White River merely offers the fortune of chance to mitigate real future HCP impacts to White River salmon. Pierce County manages its flood risks much differently, with assured funding and practical standards to maintain the designed level of protection afforded by its levees and revetments. Pierce County attends to those facilities when they need repair and where they need repair, not somewhere else. We request the Services not further advance an absent or wishful standard for mitigating HCP impacts to habitat that supports tribal fisheries at White River, but proceed instead with certain and timely mitigation for HCP mitigation at White River like mitigation provided for HCP impacts at Puyallup and Carbon rivers.	Regarding mitigation in the White River basin, see the response to comment M - 1 above. The Services have concluded that the County has an established, credible track record of funding and constructing restoration projects, and has dedicated funding to implement actions in the HCP. Please refer to Table 3.2 and Section 8 of the HCP.

Comment #	Topic	Comment	Comment response
M - 7	White River mitigation	<p>The HCP provides no mitigation for covered impacts at Upper White River. Pierce County repaired 1,050-feet of levee at Upper White River from 2000 to 2015 (HCP, p. 212) and Pierce County plans 850-feet of levee repair in 2025 (Figure 1). The 2025 repair plans at Upper White River comprise 80% of repair length from 2000 to 2015, and thus about 40% of HCP-covered take at Upper White River during the proposed 30-year Incidental Take Permit. So Pierce County plans to impose about 40% of its proposed HCP-take at Upper White River during 2025, before approval of an HCP. This implies Pierce County has underestimated its impacts to covered species at Upper White River during the proposed 30-year Incidental Take Permit.</p>	<p>See the response to comment M - 1 above. Sediment and hydraulic modeling conducted by the County in response to public comments, as well as project impacts since 2021, indicate the County has overestimated, not underestimated, the impacts of its flood control actions. The Services have evaluated the County's proposed conservation strategy and have determined that it mitigates the impacts of the taking associated with covered activities.</p>

Comment #	Topic	Comment	Comment response
M - 8	HCP communications	<p>HCP section 1.6.3 describes “Tribal Communications” about the draft HCP from 2016 to 2024. It implies diligent Pierce County attention to communication with MITFD staff about the draft HCP, when in practice Pierce County has not resolved the main concern raised by MITFD staff about the draft HCP since 2017, namely need for HCP mitigation in White River basin where the HCP covers levee maintenance and operations that harm aquatic habit supporting MIT fisheries. This deficiency is exemplified by the County’s inattention to our letter dated May 23, 2019, which states:</p> <p>Currently, the HCP is not offering any mitigation project for the White River and Greenwater levee areas proposed for HCP coverage. These areas currently comprise 17.7 miles of river. Figure 2.7 clearly shows impacts to these areas. The HCP needs to include mitigation for unavoidable adverse impacts to these waterbodies to ensure adequate protection for Spring Chinook, Steelhead trout, and coho that utilize these river systems for habitat and support the Tribe's fisheries.</p> <p>Therefore, we are resubmitting our previous recommendations sent via an email dated February 1, 2017 (attached). We request that mitigation sites/actions in these affected waterbodies be included in the HCP before it is approved.</p>	<p>See the response to comment M - 1 regarding mitigation in the White River basin.</p> <p>In coordination with the Services, the County modified the mitigation strategy contained in the HCP after extensive coordination with the MITFD and Puyallup Tribe. Given the limited mitigation opportunities in the White River, and the lack of impacts in this area associated with covered activities, the County developed mitigation projects in other locations within the plan area.</p>

Comment #	Topic	Comment	Comment response
M - 9	Sediment budget/hydraulic model	<p>MITFD sent comments to Pierce County about the draft “White River Sediment Budget and Hydraulic Model” on October 8, 2024 (see Attachment 1, below). Pierce County did not respond to MITFD about those comments, and the HCP does not consider those comments.</p> <p>The HCP states:</p> <p>At the request of representatives from the Muckleshoot Tribe, the County developed a sediment budget and hydraulic model in the White River to confirm that the estimate of future infrastructure repair projects in the HCP adequately captures projected impacts to covered species. Feedback from the Tribe was included in the final report.</p> <p>Please understand “Feedback from the Tribe” apparently is not included in the proposed HCP, because the “White River Sediment Budget and Hydraulic Model” in the HCP is still entitled “Draft TECHNICAL MEMORANDUM” and still dated “August 23, 2024,” like the draft MITFD reviewed in 2024, a year prior to public review of the proposed HCP.</p>	<p>Comment noted. The County addressed extensive comments provided by the commenter on the modeling effort. The revised modeling analysis has been appended to the final revised HCP as Appendix I.</p>

Comment #	Topic	Comment	Comment response
M - 10	Sediment budget/hydraulic model	Please note also MITFD staff did not request a sediment budget or hydraulic model to confirm that “the estimate of future infrastructure repair projects in the HCP adequately captures projected impacts to covered species.” MITFD staff had previously explained to Pierce County, National Marine Fisheries Service, and U.S. Fish and Wildlife Service staff that HCP drafts underestimate impacts to WR salmon habitat. Near the conclusion of a meeting on June 7, 2023, regarding “Pierce County HCP Check-in,” Pierce County staff offered that Pierce County would pay its consultants to evaluate future sediment deposition at Lower White River and assess associated relevance to HCP-covered levee repairs there. MITFD staff agreed to review the results of that study and did so (see Attachment 1, below).	Comment noted. The County voluntarily undertook an extensive modeling analysis in response to comments received from the commenter. As noted above, the results of this analysis are appended to the revised final HCP as Appendix I.
M - 11	White River mitigation	The slope and upstream drainage area of Middle Puyallup River most closely correspond to Lower White River (Table 1). The HCP provides 60 acres of habitat mitigation at Middle Puyallup River. Equivalent mitigation at Lower White River would restore at least 46.5 acres of aquatic habitat there during the proposed 30-year Incidental Take Permit (Table 1).	See the responses to comment M - 1 and M - 7 above. Please also see Section 4 of the HCP for a discussion of how impacts of covered activities were estimated.

## **Appendix C**

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# **Additional Information on the Affected Environment**

## C.1 Geomorphology and Soils

### C.1.1 Affected Environment

#### C.1.1.1 Geomorphology

##### ***Puyallup River***

The lower Puyallup River valley is a broad, low-gradient, alluvial plain. The river is largely confined by levees, and the threat of lateral channel migration is low. The river thalweg meanders across the river bottom between the levees throughout the lower river valley, resulting in a series of transient and alternating gravel bars that form and erode over time (Pierce County 2023). Bed materials are primarily medium and fine sands with minor amounts of gravel. Levee embankments are constructed of existing native deposits of sand, gravel, and silt with minor amounts of clay (TetraTech 2009).

The middle Puyallup River valley is a broad, low-gradient, alluvial plain in which the river meanders and periodically floods. The river is within a trough-like valley with steep valley walls that widen near the city of Orting (RM 17.4). The reaches immediately downstream of the Carbon River confluence (RM 14.2 to RM 17.4) are braided due to a significant decrease in channel gradient and the high influx of sediment load from the Carbon River (Pierce County 2023).

The upper Puyallup River valley is steeper and narrower than the lower and middle Puyallup River valley reaches. Upstream of the Carbon River confluence, the width of the Puyallup River channel migration zone is generally defined by the remnants of the Electron mudflow, which was deposited as a thick layer of mud that blanketed the Puyallup River valley bottom about 500 years ago (Pierce County 2012). In the lower portion of the upper reach, the river is confined by levees and revetments. Upstream of RM 25.0 there are few levees due to past flood damage and changes in flood risk reduction strategies (Pierce County 2023).

##### ***Carbon River***

The Carbon River, from the confluence with the Puyallup River to RM 8.5 is a confined and leveed system within a broad, relatively flat floodplain. The river has a glacial source that delivers large quantities of sediment. The braided active channels are quite unstable with bedload consisting of large rubble, boulders, and pockets of fine sorted materials (Kerwin 1999a). The Electron mudflow deposited a layer more than 15 feet thick of dense, clay-rich mud across the Orting valley. Prior to land development in the valley, the entire length of the Carbon River reach was a continuous complex of braided and multi-threaded meandering channels. As development occurred within valley, growing gravel bars within the braided river system forced the river to the sides of the valley, leading to erosion of large, scalloped, cut banks in the mudflow deposits and steep side walls (GeoEngineers 2003).

##### ***White River***

The White River, prior to its 1906 flood, flowed northward into the Green River and into Puget Sound via Elliott Bay. At that time, the Stuck River was a small, distributary channel that connected the White River to the Puyallup River. The flood triggered an avulsion of most of the White River flow to the Stuck River (now the White River), which was further reinforced by subsequent channelization and construction of levees (Pierce County 2012). The diversion starved the remaining Green River (and Duwamish Waterway) of sediment, while overloading the lower Puyallup and White Rivers, particularly in the reach of the White River near the present county line.

### ***Nisqually River***

Between 1945 and 2011, the Nisqually River delta transported approximately 630,000 ( $\pm 60,000$ ) cubic meters of sediment per year from Mount Rainier and deposited it in Alder Lake (Czuba et al. 2012). In recent years, the channel aggradation has led to flooding of surrounding areas as the sediment deposits decrease the amount of water storage in the reservoir (Beason and Kennard 2007), resulting in some flooding along the Upper Nisqually River that threatens infrastructure and public safety.

## **C.2 Water Resources**

### **C.2.1 Affected Environment**

#### **C.2.1.1 Puyallup River**

##### ***Hydrology***

Prior to European settlement the lower Puyallup River was a meandering system with forested floodplains, sloughs, wetlands and side channels, and frequent overbank flooding. Efforts to train and confine the river by straightening the channel and constructing levees began in the 1920s and continued through the 1970s to prevent migration of the river through agricultural land (PRWC 2014). Channelization and levees reduced river processes that form pools, side channels and other habitat features used by salmonids. Construction and maintenance of levees has degraded riparian habitats, decreasing the abundance of prey organisms for salmon and recruitment of small and large wood (Puyallup Tribe of Indians 2020).

The Puyallup River Watershed Council (2014) identified reduced habitat complexity as a limiting factor for salmonid rearing. Many small urban streams in the covered area have an overly simplified channel type as a result of frequent high-flow events resulting in increased bank erosion, channel incision, and the absence of LWM (Puyallup River Watershed Council 2014). Historically, the middle and upper Puyallup watershed was heavily forested, which contributed to large wood in streams that provided habitat complexity for salmon spawning, rearing and migration (Puyallup River Watershed Council 2014).

At the US Geological Service (USGS) gauge on the lower Puyallup River (USGS #12101500), mean monthly discharge for the period of record (1914 to 2015) ranges from 4,350 cubic feet per second (cfs) in December/January to 1,680 cfs in September (USGS 2016). Smaller peak-flow events usually occur in late spring and early summer with the seasonal snowmelt, but they are much smaller than fall and winter events.

The middle Puyallup river channel is a combination of large meander bends with segments that are straightened and confined by a combination of levees, revetments, and valley walls. The river's sediment transport capacity is exceeded in the middle Puyallup River reach, resulting in channel aggradation, widening, and braiding. Floodplain and riparian habitats have become disconnected from the river, limiting the amount of wood and salmon food sources entering the river (Pierce County 2023).

In the lower portion of the reach, the river is confined by a combination of levees and revetments. The middle portion is less confined, with two setback levees. The upper Puyallup River reach is steeper and narrower than the lower and middle Puyallup River reaches (Pierce County 2023). Peak flows are highly influenced by heavy autumn or winter precipitation related to atmospheric events originating from the Pacific Ocean. Because of the southwest aspect of the upper Puyallup River basin, peak flows are profoundly influenced by those events (Neiman et al. 2011). Mean monthly discharge measured at the river gauge near Orting (USGS #12093500) ranges from 933 cfs in December to 448 cfs in September. Since 1996, peak flows of over 15,000 cfs have

occurred four times. Prior to 1996, a peak flow over 15,000 cfs was recorded only once in 1963 (USGS 2016), illustrating the increased need for maintenance projects described above.

### **Water Quality**

Water quality in the Puyallup River watershed is directly and indirectly affected by land use, including development, forestry practices, stormwater runoff, and road use and protection. The lower Puyallup River is included on Ecology's approved 2016 Section 303(d) list of impaired water bodies because it exceeded the state water quality standards for two parameters: temperature and mercury.

Ecology's Draft 2018 Section 303(d) list did not include the Upper Puyallup reach, indicating the water quality in that reach was not impaired for any of the state's water quality standards (Ecology 2021).

Generally, the Puyallup River has extremely high suspended sediment concentrations because of the large sediment load being transported downstream from Mount Rainier. Background suspended sediment concentrations at low flows are estimated to be 100 parts per million (ppm) (McCool and Parsons 2004). During floods, depending on the flood level and intensity, the background suspended sediment levels can range from 1,000 ppm to 5,000 ppm.

#### **C.2.1.2 Carbon River and South Prairie Creek**

### **Hydrology**

The Carbon River watershed, including its major tributary, South Prairie Creek, is the smallest river basin in Pierce County. The Carbon River has relatively few large tributaries, so its hydrology is strongly influenced by its origin at the Carbon Glacier, rather than by inputs from other rivers or dam management. It is the only free-flowing river (i.e., not regulated by large dams) covered under the HCP (Pierce County 2024). Pierce County currently owns and maintains a combination of levees and revetments along approximately 10.5 miles of the Carbon River (Pierce County 2023).

Prior to European settlement, the Carbon River had a complex network of sloughs, ponds, wetlands, and tributary streams. The entire river system is complex and braided, and before European settlement it would have flowed through a forested valley with a largely unvegetated active floodplain. Channel straightening and levee confinement began in the 1960's with the goal of increasing conveyance of sediment and floodwaters (Puyallup River Watershed Council 2014). These changes caused a transition in large section of the channel from a highly complex braided and multi-thread meandering system to a straight, single thread channel with increased channel gradient, higher transport capacity and likely increased erosion of the streambed (Geo-Engineers 2003). Areas along the right bank that are not confined contain side channels and inputs of cool spring water from the adjacent valley wall (Pierce County 2023).

The Carbon Glacier is the lowest elevation glacier in the contiguous United States, so the Carbon River, like the White River, is more regulated by glacial retreat and snowmelt than the HCP-covered extents of the Puyallup and Middle Nisqually Rivers. The Carbon Glacier is melting very rapidly, faster than any other glacier on Mount Rainier (Sisson et al. 2011) which could lead to an overall increase in runoff, and a potential increase in the risk of future flash floods and rockslides. It is expected that the melting process will be important within the 30-year planning horizon of the ITPs, in terms of both water and sediment delivery to the Carbon River.

There are no Pierce County levees along the lower portion of the creek within the HCP-covered area (Pierce County 2023).

### **Water Quality**

Water quality in the Carbon River is generally good to excellent. No exceedances of water quality parameters are listed on Ecology's 303(d) list (Ecology 2021).

#### **C.2.1.3 White River and Greenwater River**

##### **Hydrology**

The lower White River is heavily modified with nearly continuous revetments and levees owned and operated by Pierce County from RM 0.0 to RM 6.24 upstream of the Pierce-King County line (Pierce County 2023). The Upper White River flows past the communities of Greenwater and Crystal Village. The river is largely unconfined within this reach, and surrounding land is relatively undeveloped. There is one levee on the right bank, owned and operated by Pierce County (Pierce County 2023).

The Greenwater River in northeastern Pierce County is a major tributary of the White River. There are no flood risk reduction facilities currently managed by Pierce County within the HCP-covered area (RM 0.0 to 4.0). King County maintains intermittent revetments and armoring exist between RM 0.1 and RM 1.27 (Pierce County 2023).

From the confluence with the White River to RM 4.0 the channel is primarily a single thread. The Greenwater River Basin historically was heavily forested with old growth stands and the river channel was a complex network of channels with numerous large and deep pools formed by abundant log jams. Timber harvesting began in the 1940's and logging access roads were constructed throughout the watershed, destabilizing the soil. The resulting instabilities caused landslides and rapid channel migration, destabilized natural logjams, and increased coarse sediment loading. A major flood occurred in 1977, where the channel widened nearly 180 feet and flooding impacted the town of Greenwater at the confluence with the White River (PRWC 2014). In the early 1980s, the US Forest Service removed all in-channel wood larger than three feet long and three inches in diameter from the main stems and major tributaries of the Greenwater River (PSP 2005).

##### **Water Quality**

The White River from RM 0.0 to the City of Auburn and segments of the White River upstream of the Muckleshoot Reservation are listed as impaired for temperature (Ecology 2021).

The White River generally has extremely high suspended sediment concentrations due to the large sediment load being transported downstream from Mount Rainier. Background suspended sediment concentrations at low flows are approximately 100 ppm (McCool and Parsons 2004). The Upper Whitewater River watershed, including the Greenwater River, has an approved total maximum daily load (TMDL) for sediment and temperature (Ecology 2021). Extensive forest management and recreational use have contributed to water quality impairments (Ecology 2003).

#### **C.2.1.4 Nisqually River and Mashel River**

##### **Hydrology**

Historically the Middle Nisqually River was free to migrate in a broad low-gradient valley, but channel migration is currently limited due to flood-control modifications mostly in Thurston County. There are no known flood risk reduction structures currently maintained by Pierce County in this reach (Pierce County 2023).

The Upper Nisqually generally flows from east to west through a U-shaped valley carved by glaciers. There is one levee/revetment in this reach at the entrance to Mount Rainier National Park, owned and maintained by Pierce County. Channel migration is generally confined due to bedrock outcrops. Historically, glacial outburst floods and lahars have shaped the river system. Recent glacial retreat has exposed more terminal and lateral moraines to erosion (Pierce County 2023).

The Mashel River is the longest tributary to the Nisqually River. The river begins near Mount Rainier, flows through the town of Eatonville, and joins the Nisqually River at approximately RM 41.4. The lower 3 miles flows through a natural canyon with room for the channel to migrate. A section of the river near Eatonville is unconfined but is lined with riprap, restricting channel migration. Mass wasting events caused by timber management practices in the 1940s resulted in increased sediment load to the channel (Pierce County 2023).

### ***Water Quality***

Water quality in the Middle and Upper Nisqually River is generally good to excellent. In areas where riparian habitat is lacking, instream temperatures may be elevated. Runoff from agricultural fields may contribute minor amounts of sediment, fertilizers, and herbicides to the river; An approximately 4-mile section of the lower Nisqually River is listed as impaired due to temperature exceedances (Ecology 2021). The Mashel River has had exceedances for temperature in the past, but it currently meets all state water quality criteria (Ecology 2021).

### **C.2.1.5 Aquatic Habitats**

#### ***Lower Puyallup River***

The revetments and levees in the lower Puyallup River (RM 0.0 to RM 10.3) eliminate the river's connection with side- and off-channel habitats and have reduced river processes that form pools, side channels, and other habitat features. Levees impede the development of functioning riparian habitats that contribute organic matter and provide future small and large wood (Kerwin 1999a). From RM 9.6 to 10.5, just downstream of the confluence with the White River, existing flood control facilities constrain the river channel within a narrow 300 to 350 feet wide corridor. The flood control facilities have eliminated much of the side channel habitat and flood plain connectivity. Levee placement has reduced the width of the active channel corridor by as much as 80 percent in the Lower Puyallup reach (GeoEngineers 2003). During periods of high flows, the channel banks are over topped (Pierce County 2023).

Bedload transport tends to be high throughout the lower river reach because of confinement-induced increases in water velocities. The rate of salmon survival from any spawning that occurs is believed to be low due to scour of redds (Kerwin 1999a). The structures that have modified aquatic habitat have been largely responsible for the habitat-driven portion of the declines of salmonid stocks over the last 100 years. Salmonid stocks continue to decline despite restoration efforts (Shared Strategy Development Committee 2007).

#### ***Middle Puyallup River***

The Middle Puyallup River is predominantly a single thread due to levee channelization that has disconnected the floodplain and associated habitats from the river. Numerous migration barriers prevent or limit the use of side channels by salmon. Flow velocities have increased during floods, increasing the risk that scour will destroy fish redds. In addition, the loss of functioning riparian habitat reduces the amount of wood and salmon food sources entering the river. The middle Puyallup River still provides valuable habitat for salmonid spawning and rearing at some locations within the reach (Pierce County 2023).

### **Upper Puyallup River**

The floodplain is narrow and the channel is constricted in most locations in the upper Puyallup River reach. Levees are less continuous in the upper portion of the reach (Pierce County 2012). The channel becomes progressively more braided upstream, and the substrate changes from gravel to cobble and boulders in the upper segment. Side channels flowing through immature stands of alder and habitat at the mouths of tributaries provide some of the best habitat within this reach, used by all species of salmonids. Large amounts of wood and sediment are delivered to the upper Puyallup River reach from the glacier and forests upstream (Pierce County 2023).

There is an existing levee along the left bank of the Puyallup River between the McMillan Bridge and Carbon River confluence, in the area that would be affected by the proposed Upper Puyallup Confluence restoration project. This section of the river is highly dynamic and is actively migrating towards the right bank, causing substantial damage from flood events since 2006. An emergency levee setback and cut-off levee were constructed in 2010 (Pierce County 2023).

Previous County levee setbacks and restoration projects have restored approximately 451 acres of floodplain habitat within the upper Puyallup River (RM 17.4 to RM 29.0). The amount of historical floodplain habitat restored with each restoration project or levee setback varies based on topography and adjacent land use.

### **Carbon River and South Prairie Creek**

The Carbon River contains the most productive main stem spawning habitat remaining in the Puyallup River watershed for all species of salmon. The most productive areas in that reach exist where the unconfined right bank, from RM 3.0 to RM 5.8, allows for meandering and creation of side-channel habitat. This segment offers excellent summer juvenile rearing habitat where cool spring water flows from the base of the valley wall. Its proximity to South Prairie Creek contributes to its potential as productive habitat (Pierce County 2023).

South Prairie Creek is the most productive tributary stream for salmonids in the Puyallup River watershed. Chinook, coho, chum (*Oncorhynchus keta*), and pink (*O. gorbuscha*) salmon, steelhead, and cutthroat trout (*O. clarkii*) all spawn and rear in South Prairie Creek. Bull trout and sockeye salmon (*O. nerka*) have been documented using the stream (Pierce County 2023).

South Prairie Creek has a gentle gradient and abundant, high quality, spawning gravel within the lower 6 river miles. That reach also contains numerous deep pools, but large wood that adds quality habitat to the pools is sparse. Logging practices and conversion of the floodplain to agriculture removed most of the wood from the stream. Prior to human development in the area, the stream was lined by a forest consisting primarily of western red cedar, Douglas-fir, and spruce (*Picea* spp.). Small streams enter South Prairie Creek and often provide connections to excellent spring-water rearing habitat at the base of the valley walls. Many of the small streams and wall-based channels have been ditched or drained to facilitate agriculture and residential development (Pierce County 2023).

### **White River and Greenwater River**

The lower White River is the most heavily modified reach in the HCP-covered areas. In the lower reach of the White River, fish access to tributaries is very limited. In addition, two dams on the White River create passage and rearing problems. The upper White River is relatively undeveloped when compared to most watersheds and is earmarked for preservation by salmonid recovery groups (Pierce County 2023).

The Greenwater River is the principal stream for spawning spring Chinook salmon in the Puyallup River watershed. The lower 4 miles of the Greenwater River is the prime spawning and rearing reach of the river because it contains abundant, high-quality spawning gravel and a pool-riffle configuration (Marks et al. 2009).

***Nisqually River and Mashel River***

The Nisqually River basin is much less developed than the Puyallup River basin. Many stream segments in the Nisqually River basin provide quality salmonid spawning and rearing habitat. For example, the Nisqually River reach below LaGrande Dam and the lower 3 miles of the Mashel River are some of the most productive salmonid spawning locations in Pierce County (Kerwin 1999b; NMFS 2008, WDFW 2016). WDFW uses the lower reach of the Mashel River as an index reach for Chinook spawning (Kerwin 1999b).

Streams in the Nisqually River basin have been adversely affected by dams, agriculture, timber harvesting, and levees, although to a lesser degree than in the Puyallup River watershed. Revetments and levees have been maintained since 1930 along the lower 5 miles of the Nisqually River, and there are two hydroelectric projects on the river.