Watershed Restoration and Enhancement Plan

WRIA 7
Snohomish Watershed

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Acronyms

Acronym	Definition
AE	Application Efficiency
AFY	Acre-Feet per Year
AU	Assessment Unit
CFS	Cubic Feet per Second
CU	Consumptive Use
CUF	Consumptive Use Factor
GPD	Gallons per Day
GIS	Geographic Information System
IR	Irrigation Requirements
LIO	Local Integrating Organization
MAR	Managed Aquifer Recharge
NEB	Net Ecological Benefit
PE	Permit-Exempt
RCW	Revised Code of Washington
WAC	Washington Administrative Code
WDFW	Washington Department of Fish and Wildlife
WRE	Watershed Restoration and Enhancement
WRIA	Water Resource Inventory Area
WWT	Washington Water Trust

Acknowledgements

Ecology based much of this plan on work conducted through numerous committee and workgroup meetings of the WRIA 7 Watershed Restoration and Enhancement Committee. While the committee was unable to approve their version of the plan, the committee's contributions were instrumental to the development of this plan.

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Thank you to King County and Snohomish County staff for providing resources to support the permit-exempt well projection and presentations during committee meetings.

Thank you to the Washington State Conservation Office and the Salmon Recovery Funding Board for providing a technical review of the final draft watershed plan prior to adoption.

Executive Summary

In January 2018, the Washington State Legislature passed the Streamflow Restoration law (Revised Code of Washington (RCW) 90.94) to help support robust, healthy, and sustainable salmon populations while ensuring rural communities have access to water. The law directs the Department of Ecology to develop a Watershed Restoration and Enhancement Plan in the Snohomish watershed (Water Resource Inventory Area (WRIA) 7) that identifies projects to offset potential consumptive impacts of new permit-exempt domestic groundwater withdrawals on instream flows over 20 years (2018 – 2038), and provides a net ecological benefit to the watershed.

Following the provisions of the law, the Department of Ecology (Ecology) collaborated with a committee composed of tribes, counties, cities, state agencies, and special interest groups in WRIA 7 to prepare a committee draft plan. The law requires all members of the committee to approve the plan prior to Ecology considering plan adoption. However, the committee's plan was not approved by all members of the committee ahead of the legislative deadline. The Streamflow Restoration law recognizes that some committees may not complete their plan preparation process. It establishes an alternative pathway for plan preparation, adoption, and rulemaking.

Therefore, as directed by the law, Ecology completed this watershed plan without additional committee input. As Ecology developed the final watershed plan, Ecology followed the law, the NEB guidance (Ecology 2019a), and POL 2094 (Ecology 2019b). Ecology also considered all available information, including draft materials developed by the committee. The Salmon Recovery Funding Board reviewed this plan and submitted recommendations, which Ecology considered, and incorporated as appropriate, prior to finalizing the watershed plan.

This watershed plan projects 3,389 new permit-exempt domestic well connections (PE wells) over the planning horizon.[2] The estimated consumptive water use associated with the new PE wells in WRIA 7 is 797.4 acre-feet per year (AFY) (1.1 cubic feet per second) in WRIA 7. The projects and actions in this watershed plan will offset the 797.4 AFY of consumptive water use from those 3,389 new PE wells.

This watershed plan includes projects that provide an anticipated offset of 1,444.4 AFY to benefit streamflows and enhance the watershed. Additional projects in the plan provide benefits to fish and wildlife habitat through floodplain restoration, wetland reconnection, increase in availability of off-channel habitat for juvenile salmonids, reduction of peak flow during storm events, increase in groundwater levels and baseflow, and increase in channel complexity. As required by the law and to allow for meaningful analysis of the relationship between new consumptive water use and offsets, this plan divides the watershed into 16 subbasins. Subbasins help describe the

[2] The Final NEB guidance defines the planning horizon as: "The 20-year period beginning on January 19, 2018 and ending on January 18, 2038, over which new consumptive water use by permit-exempt domestic withdrawals within a WRIA must be addressed," (Ecology 2019a).

location and timing of projected new consumptive water use, the location and timing of impacts to instream resources, and the necessary scope, scale, and anticipated benefits of projects.

The estimated consumptive use associated with the new PE wells, the anticipated offsets, and the subbasins for this watershed plan are shown in Figure ES.1.

Based on the information and analyses summarized in this plan, Ecology finds that this plan, if implemented, would achieve a net ecological benefit, as required by RCW 90.94.030 and defined by the Final NEB Guidance (Ecology 2019a).

Ecology and the state of Washington are invested in the implementation of this watershed plan, including periodically assessing plan and project implementation and issuing competitive grants to local projects that demonstrably implement this watershed plan while benefiting streamflows and aquatic habitat.

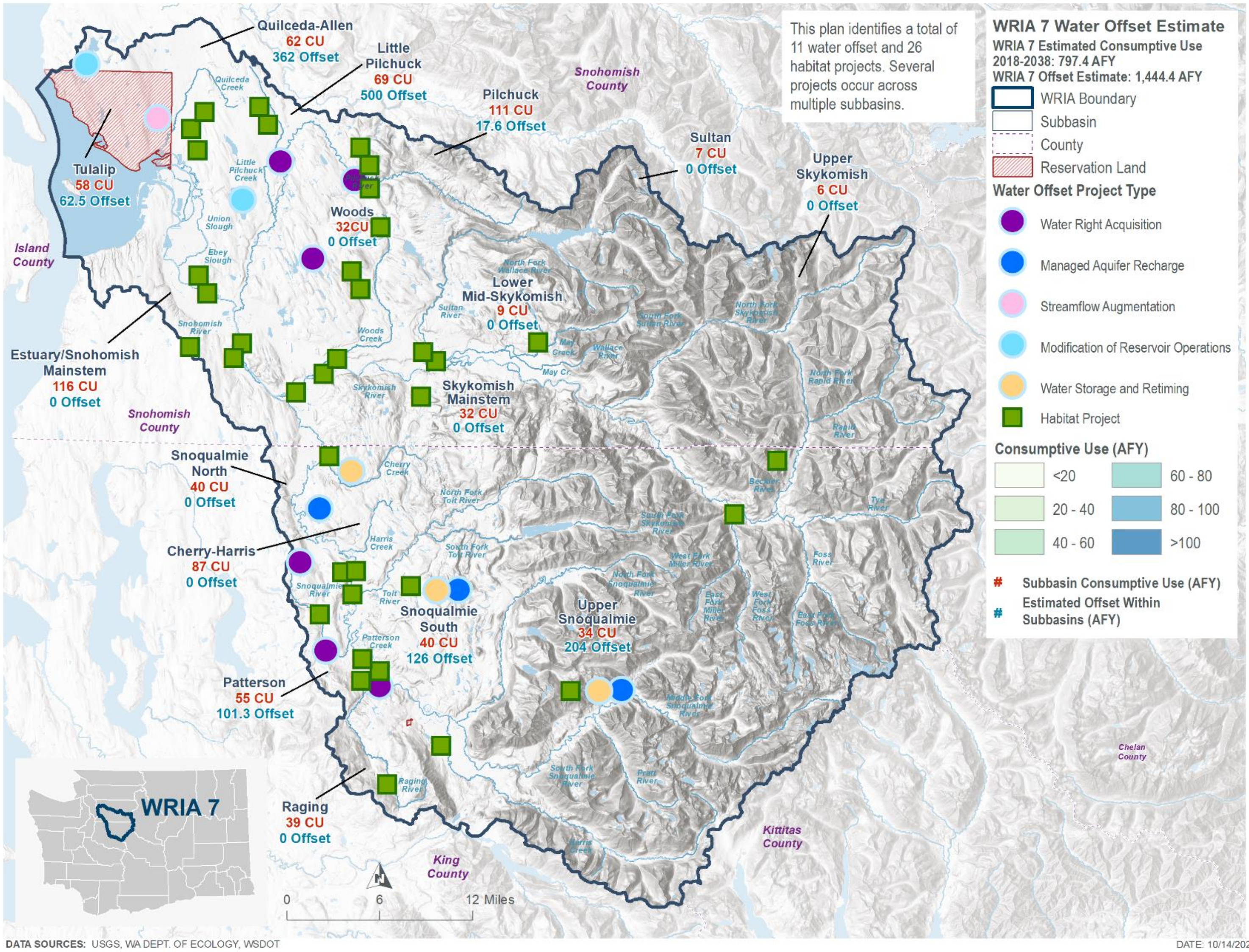

Figure ES 1: WRIA 7 Estimated Consumptive Use and Projects by Subbasin

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Chapter One: Plan Overview

1.1 Plan Purpose and Background

The purpose of this Water Resource Inventory Area (WRIA) 7 Watershed Restoration and Enhancement Plan (watershed plan) is to identify the projects and actions necessary to "offset potential impacts to instream flows associated with permit-exempt domestic water use"[3] and "result in a net ecological benefit (NEB) to instream resources within the [WRIA]."[4] This watershed plan achieves these purposes consistent with the requirements of RCW 90.94.030, the Streamflow Restoration Policy and Interpretive Statement (POL-2094)(Ecology 2019b) and Ecology's Final Guidance on Determining Net Ecological Benefit (GUID-2094, referred to as the Final NEB Guidance throughout this plan) (Ecology 2019a). This plan considered all available information including priorities for salmon recovery and watershed recovery and the draft materials prepared by the WRIA 7 Watershed Restoration and Enhancement Committee (Committee).[5] In order to accomplish its purpose, all eight of the watershed plans required by RCW 90.94.030, including this one, estimated the potential consumptive impacts of new domestic permit-exempt wells (referred to as PE wells throughout this plan) on instream flows over the planning horizon (January 2018 to January 2038) and identified the projects and actions necessary to offset those impacts and result in a NEB within the WRIA.

In January 2018, the Washington State Legislature passed Engrossed Substitute Senate Bill (ESSB) 6091 (session law 2018 c 1). This law was enacted in response to the State Supreme Court's 2016 decision in Whatcom County vs. Hirst, Futurewise, et al. (commonly referred to as the "Hirst decision"). The law, now primarily codified as RCW 90.94, clarifies how local governments can issue building permits for homes intending to use a PE well for their domestic water supply. Additionally, the law required the preparation of new local watershed plans for eight specified WRIAs, including this one.

To support local planning, the law required Ecology to establish a committee. The law tasked the committee with preparing a watershed plan approved by every member of the committee. Once the committee approved the draft watershed plan, the law required Ecology to review it and, presuming it met the requirements, adopt it no later than June 30, 2021. Despite working diligently over two and a half years, the WRIA 7 Committee did not submit an approved plan to Ecology for review before the mandated deadline.[6] Consequently, and as required by RCW 90.94.030 (3)(h), Ecology finalized this watershed plan and considered technical review and recommendations under an Inter-Agency Agreement with the Salmon Recovery Funding Board. Within six months of adopting this plan, Ecology will initiate the rulemaking required by this

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[3] RCW 90.94.030 (3)(b)

[4] RCW 90.940.030 (3)(c)

[5] The Final NEB guidance defines the planning horizon as: "The 20-year period beginning on January 19, 2018 and ending on January 18, 2038, over which new consumptive water use by permit-exempt domestic withdrawals within a WRIA must be addressed."

[6] Please see Section 1.2 of this watershed plan for more background on the WRIA 7 Committee and their planning process.

law. Ecology's rulemaking activities are a public process guided by the Washington Administrative Procedure Act (APA), chapter 34.05 RCW. Rulemaking will occur consistent with the requirements of the streamflow restoration law (RCW 90.94.030) and will be completed within two years of initiation of this rulemaking. [7]

1.1.1 Permit-Exempt Domestic Wells

As noted above, this watershed plan, the law that calls for it, and the Hirst decision are all focused on the potential impacts of new PE well use on streamflows. Pumping water from PE wells can reduce groundwater discharge to springs and streams, reducing streamflows (Barlow and Leake 2012). Several laws pertain to the management of PE wells in WRIA 7. This plan summarizes those laws below to provide context for this WRIA 7 watershed plan.

First and foremost, RCW 90.44.050, commonly referred to as "the Groundwater Permit Exemption," establishes that certain small withdrawals of groundwater are exempt from the state's water right permitting requirements, including small indoor and outdoor water use associated with homes. Although these withdrawals do not require a state water right permit, the water right is still legally established by the beneficial use.

Even though a water right permit is not required for small domestic uses under RCW 90.44.050, there is still regulatory oversight, including from local jurisdictions. Specifically, in order for an applicant to receive a building permit from their local government for a new home, the applicant must satisfy the provisions of RCW 19.27.097 for what constitutes evidence of an adequate water supply.

RCW 90.94.030 adds to the management regime for new homes using PE wells in WRIA 7 and elsewhere. For example, local governments must, among other responsibilities relating to new PE wells, collect an added $500 fee for each building permit and record withdrawal restrictions on the title of the affected properties. Additionally, this law restricts new PE wells in WRIA 7 to a maximum annual average of up to 950 gallons per days per connection, subject to the five thousand gallons per day and ½-acre outdoor irrigation of non-commercial lawn/garden limits established in RCW 90.44.050. Ecology, through working with the planning committee and finalizing this plan, has determined that these statutorily established fee amounts and water use restrictions are appropriate and will be considered in the rulemaking required in RCW 90.94.030(3h).

Ecology published its interpretation and implementation of RCW 19.27.097 and RCW 90.94 in Water Resources POL 2094 (Ecology 2019b), which provide comprehensive details and agency interpretations.

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[7] RCW 90.94.030(3)(h)

1.2 Watershed Restoration and Enhancement Committee Planning under RCW 90.94.030

As discussed above, RCW 90.94.030 directed Ecology to establish the WRIA 7Committee, invite the Committee participants, and chair the Committee.[8] As directed in RCW 90.94.030(3)(b) Ecology collaborated with the WRIA 7 Committee to prepare the watershed plan. In practice, the process of this collaboration and plan development was one of broad integration, collectively shared work, and a striving for consensus.

Ecology convened the WRIA 7 Committee in October 2018, and Ecology served as the Chair. The roster of Committee members is available in Table 1.1. Over the course of the following two and a half years and with the support of the Committee's consulting team, [9] the WRIA 7 Committee held formal monthly Committee meetings as well as periodic workgroup meetings.[10] Ecology distributed the WRIA 7 Committee's draft watershed plan in January, 2021 for Committee member review and official approval from the entities they represented. The WRIA 7 Committee voted on the draft watershed plan in April, 2021. This vote yielded 21 entities voting to approve, and 1 entity voting to disapprove. The final WRIA 7 Committee meeting summary, along with the voting record, is available in Appendix A. Because the law required that all Committee members approve the watershed plan, the Committee's draft watershed plan was not locally approved.[11] Therefore, the watershed plan was not available for Ecology's review, and the June 30, 2021 statutory deadline for adoption was not met. Consequently, Ecology then implemented its mandate under RCW 90.94.030(3)(h) by finalizing this watershed plan. Ecology prepared the final plan based on all available information including priorities for salmon recovery and watershed recovery, draft materials developed by the WRIA 7 Watershed Committee, and recommendations from the Salmon Recovery Funding Board.

[8] RCW 90.94.030 (2)(b) and (3)

[9] GeoEngineers and NHC were the primary technical consultants for WRIA 7. Funding for these consulting services was provided by Ecology through Legislative appropriations that accompanied the passage of RCW 90.94.

[10] The WRIA 7 Committee Operating Principles allow for the Committee to establish workgroups or subcommittees to support the efforts of the Committee and specifies that issues discussed by workgroups shall be communicated to the Committee as either recommendations or findings as appropriate.

[11] "…all members of a Watershed Restoration and Enhancement Committee must approve the plan prior to adoption" – RCW 90.94.030(3).

Table 0.1: WRIA 7 Committee Roster

Entity Name	Primary Representative	Alternates
Washington State Department of Ecology*	Ingria Jones	Stacy Vynne McKinstry Stephanie Potts
Snoqualmie Indian Tribe*	Matt Baerwalde	Cindy Spiry Ann House
Tulalip Tribes*	Daryl Williams	Anne Savery Kurt Nelson
King County*	Denise DiSanto	Janne Kaje Joan Lee
Snohomish County*	Terri Strandberg	Ann Bylin
City of Arlington*	Mike Wolanek	Josh Grandlienard Marc Hayes
City of Duvall*	Michael Remington	Jennifer Knaplund
City of Everett*	Jim Miller	Souheil Nasr
City of Gold Bar*	Rich Norris	Denise Beaston Bill Clem
Town of Index*	Kim Peterson	Norm Johnson
City of Lake Stevens*	David Leviton	Jon Stevens
City of Marysville*	Matthew Eyer	Karen Latimer Kari Chennault
City of Monroe*	Megan Darrow	Jordan Ottow Ben Swanson
City of North Bend*	Jaime Burrell	Rebecca Deming
City of Snohomish*	Glen Pickus	Brooke Eidem
City of Snoqualmie*	Steve Nelson	Andy Dunn Dan Malhum
Snoqualmie Valley Watershed Improvement District*	Cynthia Krass	Erin Ericson
Snohomish Public Utilities District*	Brant Wood	Keith Binkley
Washington Department of Fish and Wildlife*	Kirk Lakey	Lindsey Desmul
Washington Water Trust*	Emily Dick	Will Stelle

Entity Name	Primary Representative	Alternates
Master Builders Association of King and Snohomish Counties*	Dylan Sluder	Mike Pattison
Snohomish Conservation District*	Bobbi Lindemulder	Kristin Marshall
City of Seattle (ex officio)	Paul Faulds	Elizabeth Ablow
Snohomish Basin Salmon Recovery Forum (ex officio)	Morgan Ruff	Gretchen Glaub
Snoqualmie Watershed Forum (ex officio)	Elissa Ostergaard	Cory Zyla

Table Notes:
* Ecology was required to invite entities to participate in committee under RCW 90.94.030(2)(a). The law did not require invited entities to participate, and some chose not to participate on the Committee. Note that the City of Carnation withdrew from the Committee prior to the vote on the draft plan.

The WRIA 7 Committee invited the City of Seattle, Snohomish Basin Salmon Recovery Forum, and the Snoqualmie Watershed Forum to participate as "ex officio" members. Ex officio members were active but non-voting participants of the WRIA 7 Committee and are not identified in the law.

1.3 Plan Requirements and Overview

The law, Ecology's interpretation of the law, and the NEB Guidance set the structure of the watershed plan by describing the required elements. At a minimum, the watershed plan must include projects and actions necessary to offset potential impacts of new PE wells on streamflows and provide a NEB to the WRIA. The legislation requires the watershed plan to include the following elements:

- Recommendations for projects and actions that will measure and enhance instream resources and improve watershed functions that support the recovery of threatened and endangered salmonids (RCW 90.94.030(3)(a)).
- Actions determined necessary to offset potential impacts to instream flows associated with permit-exempt domestic water use (RCW 90.94.030(3)(b)).
- A cost evaluation or estimation of those actions (RCW 90.94.030(3)(d)).
- An estimate of the cumulative consumptive use impacts over the twenty-year period (2018-2038) (RCW 90.94.030(3)(e)).

This watershed plan includes six chapters:

- Plan overview.
- Overview of the watershed.

- Summary of the subbasins.
- PE well projections and consumptive use estimates.
- Description of the recommended projects and actions identified to offset the future permit-exempt domestic water use in WRIA 7.
- Determination of net ecological benefit.

Chapter Two: Watershed Overview

2.1 Brief Introduction to WRIA 7

The Snohomish watershed is one of the 62 designated major watersheds in Washington State, formed as a result of the Water Resources Act of 1971. The Snohomish watershed is approximately 1,856 square miles in area and includes all the lands drained by the Snohomish, Snoqualmie, and Skykomish Rivers, including marine nearshore areas that drain directly to Puget Sound and Quilceda Creek on the Tulalip Plateau.

Approximately half of the watershed is located within King County and the other half is located within Snohomish County. It is the second largest watershed (behind the Skagit River watershed) that drains to Puget Sound (Snohomish County 2005). WRIA 7 is bounded on the north by WRIA 4 (Upper Skagit) and WRIA 5 (Stillaguamish), on the west by Puget Sound, on the south by WRIA 8 (Cedar-Sammamish), and on the east by WRIA 39 (Upper Yakima) and WRIA 45 (Wenatchee) (Ecology 2020).

The Snohomish River has two main tributaries: the Snoqualmie and the Skykomish Rivers. The Snoqualmie River originates in the western Cascade Range near Snoqualmie Pass and flows in a generally northwest direction for approximately 45 miles before combining with the Skykomish River near the City of Monroe. The Skykomish River originates in the western Cascade Range near Stevens Pass and flows in a generally westward direction for approximately 29 miles before its confluence with the Snoqualmie River. The Snohomish River originates at the confluence of the Snoqualmie and Skykomish Rivers and flows northwest for approximately 20 miles before discharging to Possession Sound just north of the City of Everett (Earth Point 2020). Major tributaries within the system include the Tolt River, the Sultan River, and the Pilchuck River (Ecology 1995).

The watershed also contains the Tolt Reservoir and Spada Lake, which are operated for municipal water supply by the Cities of Seattle and Everett, respectively. The Snohomish Public Utility District (PUD) generates hydropower with water from the Spada Lake that flows through a pipeline to a powerhouse on the Sultan River (Snohomish County PUD 2020). The City of Seattle generates hydropower with water from the Tolt Reservoir, conveying it through a penstock approximately six miles downstream of the Tolt Dam to a powerhouse on the South Fork Tolt River (Seattle City Light 2020). The lower portion of the watershed contains Lake Stevens and Lake Goodwin. Numerous smaller lakes, ponds, and wetlands are present throughout the watershed.

2.1.1 Land Use in WRIA 7

The Snohomish watershed supports a variety of stakeholders vying for limited surface water and groundwater supplies. The stakeholders include:

- Industrial and commercial facilities
- Agriculture

- Municipal water supply
- PE well water supply
- Minimum instream flows associated with aquatic habitat and fish requirements

Out of stream uses compete with instream water needs, including providing water for salmon and other aquatic resources. There is not sufficient water available to meet all of these uses year-round in the basin. The Instream Resources Protection Program for the Snohomish River Basin (chapter 173-507 WAC) established minimum instream flows and closed specific watershed streams to appropriation, as described in Section 2.3.3 Hydrology and Streamflow of this plan. The instream flow rule was adopted in 1979 and is junior to many water rights in WRIA 7. Minimum instream flows in WRIA 7 are frequently not met for portions of the year.

The eastern or upland portion of the watershed generally consists of commercial forest land and public forest land associated with the Mt. Baker-Snoqualmie National Forest. Land uses shift to rural developments and small urban centers in the foothills of the Cascade Mountains. Agricultural development is widespread within the lower portion of the Skykomish River valley and the Snoqualmie and Snohomish River valleys. Extending from the City of Snohomish, the western portion of WRIA 7 is urbanizing and characterized by a combination of residential, industrial, commercial, transportation, communication, and utility land covers (See Figure 0.1). The most populated cities in the watershed are all within Snohomish County, including Everett, Marysville, Lake Stevens, Arlington, and Monroe (OFM 2020). The terminus of the watershed is located north of the urbanized and highly industrialized Port of Everett where the Snohomish River discharges to Possession Sound.

Many aquifers in WRIA 7 are connected to surface water. Groundwater pumping may diminish surface water flows by capturing water that would otherwise have discharged to springs and streams. Consumptive water use (that portion not returned to the aquifer) reduces streamflow, both seasonally and as average annual recharge. A well drawing from an aquifer connected to a surface water body either directly or through an overlying aquifer can either reduce the quantity of water discharging to the river or increase the quantity of water leaking out of the river (Ecology 1995). This watershed plan addresses impacts on groundwater discharge to streams due to withdrawals from permit-exempt domestic wells (PE wells). Projects to offset consumptive use associated with permit-exempt domestic water use have become a focus to minimize future impacts to instream flows and restore streamflow.

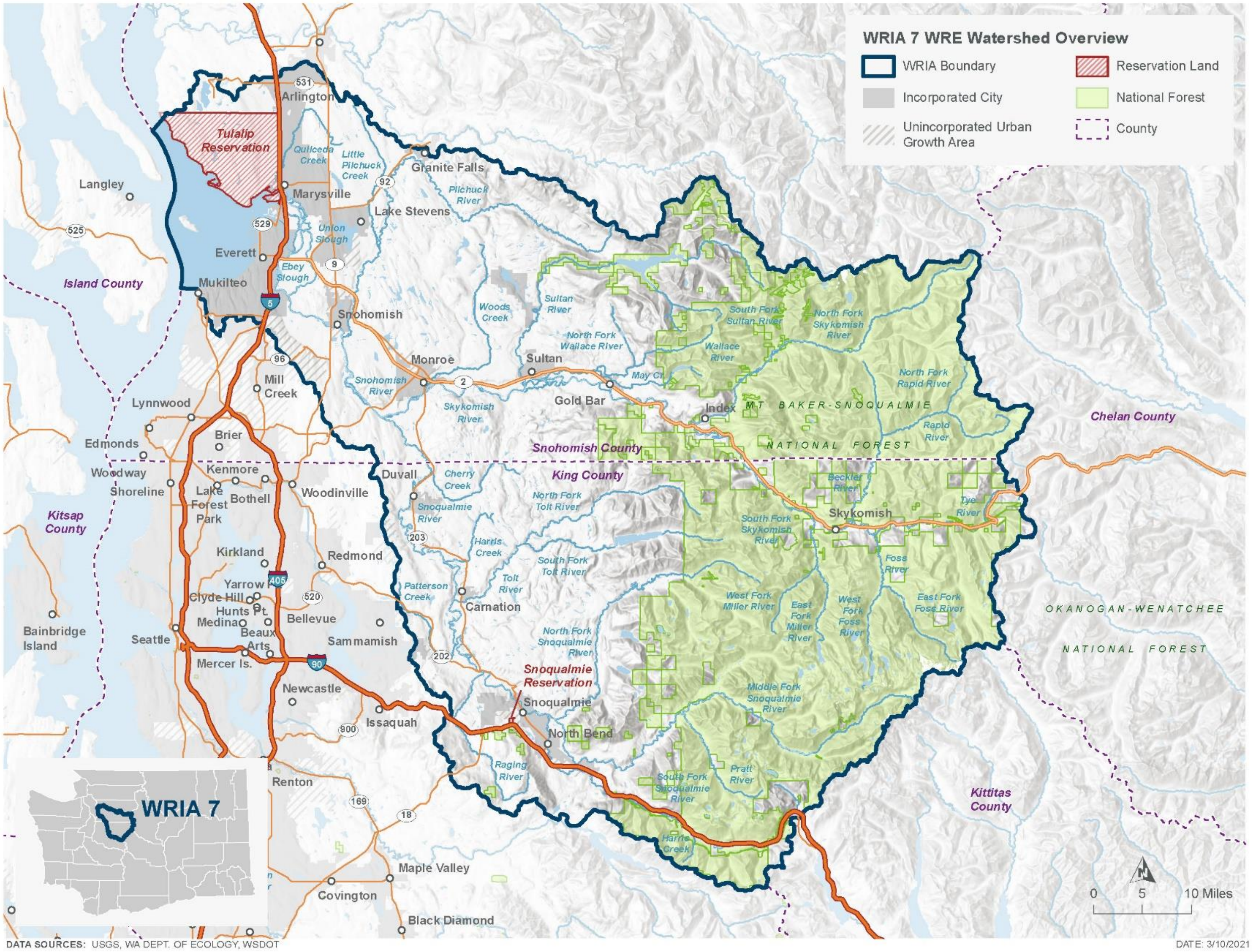

Figure 0.1: WRIA 7 Watershed Overview

2.1.2 Tribal Reservations and Usual and Accustomed Fishing Areas

Indian people have always relied on the natural resources of this land. Their personal, cultural, and spiritual survival depends on the ability to fish, hunt, and gather the bountiful natural resources that once blessed this country (NWIFC 2014). Salmon are one of those resources that is critical to the cultural, spiritual and economic wellbeing of tribes. Tribes depend upon salmon that originate from the waters found in the Snohomish River and its tributaries.

WRIA 7 is located within the ancestral homelands of Indian tribes and bands that occupied this area since time immemorial. Tribes hold reserved treaty rights to fish, hunt and gather throughout the watershed (Treaty of Point Elliott). Tribal claims to reserved water rights include the earliest (most senior) priority rights to water within the Snohomish Watershed. While they have not been confirmed and quantified through an adjudication in federal or state court, these federally reserved water rights, intended to serve current and future uses, may be reserved by and protected in treaties, executive orders, federal court decisions, and state court adjudication decrees. Tribal water rights may extend to instream flows and minimum lake levels necessary to protect resources in all areas where Tribes have reserved rights. Treaty rights to fish may support claims for fish habitat, including water rights for instream flows. Nothing in this plan can alter tribal rights.

Both the Snoqualmie Indian Tribe (Snoqualmie Tribe) and Tulalip Tribes of Washington (Tulalip Tribes) have reservation lands in WRIA 7. The Snoqualmie Tribe reservation is located in the upper Snoqualmie Valley near Snoqualmie Falls and the Tulalip Tribes reservation is located on the Tulalip Plateau, north of the Snohomish River.

2.1.3 Salmonids in WRIA 7

The Snohomish watershed is an important and productive system for salmonids. Streams in WRIA 7 provide spawning and rearing habitat for salmon species unless they are blocked to migration. Salmon bearing streams throughout the Snohomish basin that provide spawning and rearing habitat for salmonids often experience low streamflows during critical migration and spawning times. In addition, levees, dams and other flood control measures have further limited habitat along primary watershed rivers and tributaries. The quality and quantity of spawning and rearing habitat, water quality, including water temperature, adult fish passage barriers, low streamflows, hatchery management, and harvest all affect local salmon populations (Snohomish County 2005). Species interactions like predation may also have significant effects on salmonid populations, and help shape the Pacific Northwest aquatic and upland landscapes (Cederholm et al. 2000).

Salmon Presence (Fish Population and Life Histories)

The Snohomish River Watershed has anadromous salmonid runs that include five Pacific salmon species that migrate in and out of the Snohomish watershed from Puget Sound (SWIFD 2020):

- Chinook Salmon (Oncorhynchus tshawytscha)
- Coho Salmon (Oncorhynchus kisutch)

- Chum Salmon (Oncorhynchus keta)
- Sockeye Salmon (Oncorhynchus nerka)
- Pink Salmon (Oncorhynchus gorbuscha)

Steelhead Trout (Oncorhynchus mykiss), rainbow (Oncorhynchus mykiss), Coastal Cutthroat Trout (Oncorhynchus clarki clarki), and Bull Trout (Salvelinus confluentus) also inhabit the watershed. There are two distinct Chinook Salmon populations: the Skykomish population and the Snoqualmie population. Both populations are thought to be at less than 10 percent of historic levels. There are four Bull Trout populations and five steelhead populations (Snohomish County 2019). The Washington Department of Fish and Wildlife (WDFW) also stocks hatchery-produced kokanee (Onchorynchus nerka), resident Sockeye, in Lake Stevens.

Three species are currently protected under the Endangered Species Act (ESA): Chinook, steelhead, and Bull Trout. Coho are listed as a species of concern.

Table 0.1 lists the species present in the Snohomish watershed and their regulatory status. Further detail is provided below:

- The Puget Sound evolutionarily significant unit (ESU) of Chinook Salmon was designated as threatened under the ESA on May 24, 1999 (64 FR 14308, 1999). Critical habitat for Chinook was designated in 2005 and includes select marine nearshore and freshwater habitats within WRIA 7 (70 FR 52629, 2005).

- The Puget Sound distinct population segment (DPS) of steelhead trout was designated as threatened under ESA on May 11, 2007 (72 FR 26722, 2007). Designated critical habitat (DCH) for Puget Sound steelhead was finalized in 2016 and includes freshwater tributaries to and estuarine habitat in Puget Sound, Washington (81 FR 9251, 2016) including select areas within WRIA 7.

- The Coastal-Puget Sound Distinct Population Segment (DPS) of Bull Trout was designated as threatened under ESA on December 1, 1999 (64 FR 58910, 1999). Critical habitat has been designated for Bull Trout and includes both select freshwater and saltwater aquatic habitat within WRIA 7 (75 FR 63897, 2010).

Table 0.1: Salmonids Present Within the Snohomish Watershed

Common Name	Scientific Name	Evolutionary Significant Unit	Designated Critical Habitat	Regulatory Agency Status
Chinook Salmon	*Oncorhynchus tshawytscha*	Puget Sound chinook	Yes/2005	NMFS/Threatened/ 1999
Chum Salmon	*Oncoryhnchus keta*	Puget Sound Chum	No	No listing
Coho Salmon	*Oncorhynchus kisutch*	Puget Sound/Strait of Georgia Coho	No	NMFS/Species of Concern/1997
Pink Salmon	*Oncorhynchus gorbuscha*	No listing	No listing	No listing
Sockeye Salmon	*Oncorhynchus nerka*	No listing	No listing	No listing
Steelhead Trout	*Oncorhynchus mykiss*	Puget Sound steelhead	Yes/2016	NMFS/Threatened/ 2007
Bull Trout	*Salvelinus confluentus*	Puget Sound Dolly Varden/Bull Trout	Yes/2010	USFWS/Threatened/ 1999
Coastal Cutthroat Trout	*Oncorhynchus clarki clarki*	No listing	No listing	No listing

Table 0.2 below lists the run timing and life stages of anadromous salmon and trout present throughout the watershed. The species list was derived from data downloaded from the Statewide Washington Integrated Fish Distribution database. Watershed specific data concerning salmonid life history and timing was summarized from the 2002 Washington State Conservation Commission Salmonid Habitat Limiting Factors Analysis (Haring 2002).

Table 0.2: Salmonid Life History Patterns within the Snohomish Watershed

Species	Freshwater Life Phase	Jan		Feb		Mar		Apr		May		Jun		Jul		Aug		Sep		Oct		Nov		Dec		Subbasin Presence
Sockeye[1]	Upstream migration												■	■	■	■	■									-Estuary/Snohomish Mainstem -Pilchuck -Quilceda-Allen
	Spawning																		■	■	■	■	■	■	■	
	Fry emergence	■	■	■	■	■	■	■	■	■	■	■	■													
	Juvenile rearing	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	
	Smolt outmigration								■	■	■	■	■	■												
Chinook (fall)[2]	Upstream migration																■	■	■	■	■					-Cherry-Harris -Estuary/Snohomish Mainstem -Lower mid-Skykomish -Patterson -Pilchuck -Quilceda-Allen -Raging -Skykomish Mainstem -Snoqualmie North -Snoqualmie South -Sultan -Upper Skykomish -Woods
	Spawning																	■	■	■	■	■	■			
	Incubation	■	■	■	■	■													■	■	■	■	■	■	■	
	Juvenile rearing	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	
	Juvenile outmigration	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■									
Chinook (summer)[2]	Upstream migration																■	■	■							-Estuary/Snohomish Mainstem -Lower mid-Skykomish -Pilchuck -Quilceda-Allen -Skykomish Mainstem -Sultan -Woods
	Spawning																	■	■	■	■					
	Incubation	■	■	■	■	■													■	■	■	■	■	■	■	
	Juvenile rearing	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	
	Juvenile outmigration	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■									

Species	Freshwater Life Phase	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Subbasin Presence
Coho	Upstream migration													-Cherry-Harris -Estuary/Snohomish Mainstem -Little Pilchuck -Lower mid-Skykomish -Patterson -Pilchuck -Quilceda-Allen -Raging -Skykomish Mainstem -Snoqualmie North -Snoqualmie South -Sultan -Tulalip -Upper Skykomish -Woods
	Spawning													
	Incubation[3]													
	Juvenile rearing													
	Smolt outmigration[3]													
Chum	Upstream migration													-Cherry-Harris -Estuary/Snohomish Mainstem -Lower mid-Skykomish -Patterson -Pilchuck -Quilceda-Allen -Raging -Skykomish Mainstem -Snoqualmie North -Snoqualmie South -Sultan -Upper Skykomish -Woods
	Spawning													
	Fry emergence													
	Juvenile rearing													
	Juvenile outmigration													

Species	Freshwater Life Phase	Jan		Feb		Mar		Apr		May		Jun		Jul		Aug		Sep		Oct		Nov		Dec		Subbasin Presence
Pink (odd)	Upstream migration															■	■	■	■							-Cherry-Harris -Estuary/Snohomish Mainstem -Lower mid-Skykomish -Patterson -Pilchuck -Quilceda-Allen -Raging -Skykomish Mainstem -Snoqualmie North -Snoqualmie South -Sultan -Upper Skykomish -Woods
	Spawning																		■	■	■					
	Fry emergence			■	■	■	■	■	■																	
	Juvenile rearing			■	■	■	■	■	■	■																
	Juvenile outmigration					■	■	■	■	■	■															
Pink (even)	Upstream migration															■	■	■								-Skykomish Mainstem
	Spawning																	■	■							
	Fry emergence			■	■	■	■	■	■																	
	Juvenile rearing			■	■	■	■	■	■	■																
	Juvenile outmigration					■	■	■	■	■	■															
Bull Trout	Upstream migration[4]														■	■	■	■	■							-Cherry-Harris -Estuary/Snohomish Mainstem -Little Pilchuck -Lower mid-Skykomish -Patterson -Pilchuck -Quilceda-Allen -Raging -Skykomish Mainstem -Snoqualmie North -Snoqualmie South -Sultan -Upper Skykomish -Woods
	Spawning																■	■	■	■	■	■				
	Incubation[4]	■	■	■	■	■	■	■	■										■	■	■	■	■	■	■	

Species	Freshwater Life Phase	Jan		Feb		Mar		Apr		May		Jun		Jul		Aug		Sep		Oct		Nov		Dec		Subbasin Presence
Coastal Cutthroat Trout[5]	Upstream migration	X	X	X	X	X	X	X					X	X	X	X	X	X	X	X	X	X	X	X	X	-Cherry-Harris -Estuary/Snohomish Mainstem -Little Pilchuck -Lower mid-Skykomish -Patterson -Pilchuck -Quilceda-Allen -Raging -Skykomish Mainstem -Snoqualmie South -Sultan -Tulalip -Upper Skykomish -Upper Snoqualmie -Woods
	Spawning	X	X	X	X	X	X	X	X	X	X	X													X	
	Incubation		X	X	X	X	X	X	X	X	X	X	X	X												
	Juvenile rearing	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
	Smolt outmigration						X	X	X	X	X	X	X	X	X											
Steelhead Trout (winter)	Upstream migration	X	X	X	X	X	X	X														X	X	X	X	-Cherry-Harris -Estuary/Snohomish Mainstem -Little Pilchuck -Lower mid-Skykomish -Patterson -Pilchuck -Quilceda-Allen -Raging -Skykomish Mainstem -Snoqualmie North -Snoqualmie South -Sultan -Upper Skykomish -Woods
	Spawning					X	X	X	X	X	X	X														
	Incubation[6]								X	X	X	X	X	X												
	Juvenile rearing	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
	Smolt outmigration[6]					X	X	X	X	X	X	X	X													

Species	Freshwater Life Phase	Jan		Feb		Mar		Apr		May		Jun		Jul		Aug		Sep		Oct		Nov		Dec		Subbasin Presence
Steelhead Trout (summer)	Upstream migration									■	■	■	■	■	■	■	■	■	■	■	■					-Cherry-Harris -Estuary/Snohomish Mainstem -Little Pilchuck -Lower mid-Skykomish -Patterson -Pilchuck -Quilceda-Allen -Raging -Skykomish Mainstem -Snoqualmie North -Snoqualmie South -Sultan -Upper Skykomish -Woods
	Spawning					■	■	■	■	■	■	■														
	Incubation[6]								■	■	■	■	■	■												
	Juvenile rearing	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	
	Smolt outmigration[6]					■	■	■	■	■	■	■	■													
Rainbow[7]	Spawning						■	■	■	■	■	■	■													-Lower mid-Skykomish -Pilchuck -Skykomish Mainstem -Snoqualmie South -Sultan -Tulalip -Upper Skykomish -Upper Snoqualmie
	Incubation							■	■	■	■	■	■	■	■											

Table Notes:

1. Observed Sockeye are likely stray adults per the habitat limiting factors report. Information on Sockeye life history specifically within the Snohomish watershed is either unavailable or extremely limited. Sockeye life history patterns for the Puget Sound Region were used within this report (Gustafson et al. 1997).
2. Snohomish watershed has individuals that rear within the basin for a full year (Haring 2002)
3. Information on Coho incubation and outmigration timing specifically within the Snohomish watershed is unavailable. Coho incubation and outmigration timing for the adjacent WRIA 8 Region were used within this report (Kerwin 2001)
4. Information on Bull Trout incubation and migration timing specifically within the Snohomish watershed is either unavailable or extremely limited. Bull trout life history patterns for the Puget Sound Region were used within this report (King County 2000).
5. Information on Coastal Cutthroat Trout life history specifically within the Snohomish watershed is either unavailable or extremely limited. Coastal Cutthroat Trout life history patterns for the Puget Sound Region were used within this report (Johnson et al. 1999).
6. Information on steelhead incubation and migration timing specifically within the Snohomish watershed is unavailable. Steelhead incubation and out-migration timing for the Puget Sound Region were used within this report (Blanton et al. 2011).
7. Information on rainbow trout life history specifically with the Snohomish watershed is unavailable. Rainbow life history patterns for the Puget Sound Region were used within this report (Blanton et al. 2011).

Limiting Factors for Salmon

WRIA 7 includes approximately 25 miles of marine shorelines and 720 miles of streams that support anadromous salmon and trout populations. Stream systems within WRIA 7 range from pristine to highly degraded aquatic habitat. The watershed is characterized by a wide range of activities and impacts including residential development, commercial forestry, agriculture, wilderness, and urbanization. The Salmonid Habitat Limiting Factors Analysis (Haring 2002) identifies the following habitat limiting factors within WRIA 7:

- Fish habitat access
- Floodplain modifications
- Channel conditions
- Substrate conditions
- Riparian conditions
- Water quality
- Water quantity
- Lakes
- Biological processes

The Snohomish River Basin Salmon Conservation Plan (Snohomish County 2005) also identifies rearing habitat as a limiting factor for Chinook juveniles.

2.2 Watershed Planning in WRIA 7

Residents and local, state, federal, and tribal governments have collaborated on watershed and water resource management issues in WRIA 7 for decades. This section provides a brief summary of broad watershed planning efforts as they relate to the past, present, and future water availability in the Snohomish watershed. This watershed plan builds on many previous and current planning efforts.

There are several planning efforts in WRIA 7 to coordinate salmon recovery. These include the Snohomish-Stillaguamish Local Integrating Organization (LIO), the Snohomish Basin Salmon Recovery Forum, and the Snoqualmie Watershed Forum.

- The **Snohomish-Stillaguamish Local Integrating Organization (LIO)** developed an ecosystem recovery plan as part of the Action Agenda for Puget Sound Recovery. The ecosystem recovery planning process is community based, with engagement from local, state and federal agencies. The approach is holistic—addressing needs from salmon and orca recovery, to stormwater runoff, to farmland and forest conservation. The Snohomish-Stillaguamish LIO has engaged the community in a collaborative planning process to help understand ecosystem recovery priorities and support the health and sustainability of the watershed.
- The **Snohomish Basin Salmon Recovery Forum (Snohomish Forum)** leads the overall salmon recovery efforts in WRIA 7, including habitat protection and restoration. The Snohomish Forum works in partnership with the co-managers (Washington Department

of Fish and Wildlife and Tulalip Tribes) in harvest and hatchery management. Snohomish County performs the administrative process and lead functions of the lead entity in the Snohomish watershed. The Snohomish Forum acts under a board of directors type model, where the Technical and Policy Development Committees vet and bring forward options for decision-making.

  - In 2005, the Snohomish Forum developed the *Snohomish River Basin Salmon Conservation Plan* (Salmon Plan) (Snohomish County 2005).
  - The Snohomish Basin Salmon Recovery Forum developed the *Snohomish Basin Protection Plan* in 2015 to identify protection strategies that prevent the degradation of hydrologic processes that support salmon or salmon habitat. Appendix B of the Protection Plan is an adopted addendum to the 2005 Salmon Plan (Snohomish Basin Salmon Recovery Forum 2015). The Snohomish Forum is developing a chapter update to the Salmon Plan.
  - The *Snohomish River Basin Salmon Conservation Plan Status and Trends Report* (2019 Status and Trends Report) provides additional information about the status on implementation of the Snohomish River Basin Salmon Conservation Plan (Snohomish County 2019).

- The **Snoqualmie Watershed Forum** coordinates among stakeholders and tribes to support implementation of the Salmon Plan. The Snoqualmie Watershed Forum was formed in 1998 and is a partnership between the Snoqualmie Tribe, the Tulalip Tribes, King County, the Cities of Duvall, Carnation, North Bend, and Snoqualmie, and the Town of Skykomish. These entities have an interlocal agreement to work together on watershed issues and coordinate implementation of water resource and habitat projects in the Snoqualmie and South Fork Skykomish watersheds (King County 2020).

There are several collaborative processes in WRIA 7 working to balance the needs of agriculture, streamflow, and communities. Among these are the Sustainable Lands Strategy in Snohomish County, the Snoqualmie Fish Farm Flood Advisory Committee, and the Agriculture Resilience Plan developed by the Snohomish Conservation District.

- **Sustainable Lands Strategy (SLS)** was convened in 2010 by Snohomish County, Tulalip and Stillaguamish Tribes, state and federal agencies, and agricultural and environmental stakeholders to improve coordination and generate progress for fish, farm, and flood management interests. Snohomish County is the facilitator of the SLS and provides a forum where agencies and stakeholders can bring technical information, design support, and other resources to coordinate priorities and implement projects. SLS' mission is to generate net gains in agricultural, tribal culture, and ecological productivity (Snohomish County 2020).

- **Fish Farm Flood (FFF):** The 2012 King County Comprehensive Plan directed the county's Department of Natural Resources and Parks to create a collaborative, grass-roots effort to determine how to move forward toward achieving the goals of these sometimes competing priorities. In 2017, the FFF Advisory Committee transmitted a set of recommended actions to the County Executive and Council and the FFF Implementation Oversight Committee (IOC) was created to ensure balanced implementation of those actions. The FFF recommendations are intended to assist the Executive and Council to advance and balance three important county goals of restoring habitat to aid salmon recovery, supporting farmers and preserving farmland, and reducing flood risk for farmers and other Snoqualmie Valley residents (King County 2019).

- **Agriculture Resilience Plan:** Snohomish Conservation District, in collaboration with farmers representing various types, sizes, and locations of farms in Snohomish County to develop the Agriculture Resilience Plan, finished at the end of 2019. The Agriculture Resilience Plan was developed to help farmers in Snohomish County plan for future changes and risk, and build a resilient agricultural community into the future through a combination of information gathering and sharing, creation of online planning tools, project scoping and design, project implementation, and farmland protection. It identifies priority needs for farmers in Snohomish County and actions to address those needs (SCD 2019).

In addition to these collaborative planning efforts, King County and Snohomish County have adopted **Coordinated Water System Plans (CWSPs)**, which are mandated by the Public Water System Coordination Act of 1977. King County passed ordinances ratifying four CWSPs (East King County, Skyway, South King County, and Vashon). Water purveyors within northern and eastern Snohomish County updated their CWSP in 2010. These plans ensure that water system service areas are consistent with local growth management plans and development policies. The location of new homes in relation to and within designated retail water system service areas and related policies determine if homes connect to a water system, or rely on a PE well. Within their designated retail service area(s), water purveyors are given first right of refusal for new connections. The purveyor may decline to provide service if water cannot be made available in a ‘reasonable and timely’ manner.

2.2.1 Coordination with Existing Plans

Throughout the development of this watershed plan, Ecology streamflow restoration staff have engaged with staff from the Snohomish-Stillaguamish LIO, the Snohomish Forum, the Snoqualmie Watershed Forum, and the Puget Sound Partnership, providing briefings on the Streamflow Restoration law, scope of the watershed plan, and plan development status updates. Throughout the committee phase of the planning process, the WRIA 7 Committee coordinated closely with the Snohomish Forum and the Snoqualmie Watershed Forum. Both entities actively participated in the WRIA 7 Committee as ex-officio members. Many of the habitat projects included in this watershed plan align with the Salmon Plan and the *Snohomish Basin Protection Plan*.

During the committee plan drafting process, Snohomish and King County planning staff helped ensure consistency with Comprehensive Plans. County Comprehensive Plans set policy for development, housing, public services and facilities, and environmentally sensitive areas, among other topics. The Comprehensive Plans identify Snohomish and King Counties' urban growth areas, set forth standards for urban and rural development, and provide the basis for zoning districts.

2.3 Description of the Watershed – Geology, Hydrogeology, Hydrology, and Streamflow

2.3.1 Geologic Setting

The geologic setting of WRIA 7 influences the surface and groundwater flow through the watershed. The relationships between surface water flow and groundwater are important to understanding how to manage surface water resources and can be helpful in identifying strategies to offset the impacts of pumping from PE wells.

Within WRIA 7, bedrock forms mountain ranges and uplands and generally consists of igneous and sedimentary rocks. Within drainages and lowland areas, bedrock is overlain by glacial and alluvial sediments. A minimum of four major glaciations covered the lower portion of the watershed during the Pleistocene Epoch (about 11,700 years to 2.5 MA), the most recent occurrence being the Vashon Stade of the Frasier Glaciation (Jones 1952). The advance and retreat of the Vashon ice sheet shaped the present topography and drainage network in WRIA 7. These processes resulted in glacially-derived ridges and lakes linked by drainage channels (Booth and Goldstein 1994).

Pleistocene-age glacial and interglacial processes resulted in the deposition of a complex assemblage of sedimentary deposits in lowland areas. These glacial deposits consist of glacial till, recessional and advance outwash, and glaciolacustrine deposits. Glacial till deposits generally consist of dense, silty sand with gravel and silt lenses. Outwash deposits generally consist of sand and gravel with locally abundant wood debris and peat. Glaciolacustrine deposits generally consist of silt and clay. This sequence of glacial deposits is over 1,500 feet thick within the lower portions of the watershed (Vaccaro, Hansen, and Jones 1998).

Recent alluvial deposits are generally associated with channel and overbank deposits from the modern Snoqualmie, Skykomish, and Snohomish Rivers and their tributaries. These sediments generally consist of stratified silt, sand, gravel, with minor clay (DNR 2020).

2.3.2 Hydrogeologic Setting

Groundwater within WRIA 7 primarily occurs within: (1) relatively coarse-grained glacial and alluvial aquifers overlying bedrock; and (2) primary and secondary porosity within bedrock aquifers. The U.S. Geological Survey (USGS) identified six hydrogeologic units within the sequence of Puget Sound glacial and alluvial sediments in WRIA 7. The hydrogeologic units typically alternate between aquifer units and semi-confining to confining layers (non-water-bearing units) (Vaccaro, Hansen, and Jones 1998).

Within the upper portion of the watershed, glacial and alluvial sediments occur within the Snohomish River and Skykomish River valleys and drainages associated with area tributaries (DNR 2020). Glacial and alluvial sediments are widespread within the lower portion of the watershed. Glacial and alluvial aquifers are characterized by a shallow depth to the groundwater table and, where applicable, a direct hydraulic connection with adjacent surface water (Vaccaro, Hansen, and Jones 1998).

Bedrock aquifers underly the entire watershed. However, within the lower portions of the watershed, glacial and alluvial sediments are frequently hundreds of feet thick and bedrock aquifers are seldom targeted by water supply wells. In the upper watershed, the glacial and alluvial units are generally thinner. Much of the watershed southeast of Monroe is underlain by relatively shallow and frequently outcropping bedrock. Therefore, bedrock aquifers increase in importance, from a water supply perspective, within the upper portions of the watershed.

Bedrock aquifers do not allow for much groundwater flow or storage. Wells completed within bedrock aquifers typically do not have high enough capacities for municipal use. However, they can be valuable aquifers for residential water uses, and in specific areas are an important target aquifer for PE wells.

Recharge to glacial, alluvial, and bedrock aquifers within WRIA 7 is primarily associated with precipitation, applied irrigation, septic systems, leakage from surface water within losing reaches (where streamflow infiltrates to groundwater), and through leakage from adjacent aquifers. Watershed aquifers discharge to water supply wells, adjacent aquifers, gaining reaches of streams, and Puget Sound. Summer base flows in WRIA 7 rivers and tributaries are sustained by groundwater (baseflow) on most of the lower-elevation tributaries.

Regionally, groundwater flow direction within watershed aquifers largely parallels the western slopes of the Cascade Range, although groundwater flow in shallow aquifers is generally influenced by surface topography and streamflow within the watershed and is directed to the northwest. This groundwater flow paradigm is complicated throughout the watershed by aquifer boundaries, aquifer heterogeneities, topography, the influence of gaining and losing stream reaches, well pumping, and other factors.

2.3.3 Hydrology and Streamflow

Most WRIA 7 rivers and tributaries are located in a snowmelt transition region where the rivers are fed by both snowmelt and rainfall; however, a few streams in the lower portions of the watershed are predominantly rain-fed. Within low elevation portions of the watershed, mean annual precipitation ranges from about 30 to 40 inches per year. Mean annual precipitation increases with topographic elevation and can exceed 120 inches within the Cascade Range (Western Regional Climate Center 2020). Most precipitation occurs during the late fall and winter. Precipitation is lowest during the summer when water demands are highest. During these low-flow periods, streamflow is highly dependent upon groundwater inflow (baseflow).

Several factors contribute to streamflow: snowpack and rate of melt, rainfall, surface water runoff, and groundwater discharge. In addition to environmental factors, surface water withdrawals and groundwater pumping from wells in hydraulic continuity with surface water affect streamflow. Water use from new permit-exempt domestic wells represents only a very small portion of all water use and factors affecting streamflow in the watershed.

Instream Resources Protection Program

The Instream Resources Protection Program (IRPP) for the Snohomish River Basin is the basis for the instream flow levels set and other regulations described in chapter 173-507 WAC. The intent of the rule is to protect stream flows within the watershed to protect flow levels and minimize impacts resulting from future water appropriations. Chapter 173-507 WAC sets minimum instream flows within reaches for 11 stream management units, sets low flow limitations on 21 streams, and closes eight streams and their tributaries in the watershed to further appropriation of surface water.[12]

Streamflow Conditions and Anticipated Climate Impacts

Streamflow conditions within primary WRIA 7 rivers are summarized by the following 90% exceedance flows, which can be used to represent base flows (USGS 2020)[13]:

- USGS stream gage 12150800 (Snohomish River near Monroe): 90% exceedance flows in the second half of August are approximately 1,422 cfs for the period of record from 1964 - 2016.
- USGS stream gage 12149000 (Snoqualmie River near Carnation): 90% exceedance flows in the second half of August are approximately 532 cfs for the period of record from 1930 – 2016.
- USGS stream gage 12134500 (Skykomish River near Gold Bar): 90% exceedance flows in the second half of August are approximately 561 cfs for the period of record from 1929 – 2018.

Anticipated future climate impacts within the watershed include rising temperatures, changes in precipitation, and continued loss of snow and glacial volumes in the Cascade Range. Earlier spring snowmelt, lower snowpack, increased evaporative losses, and warmer and drier summer conditions will intensify summer drought conditions and low flow issues in WRIA 7. These climate impacts are expected to drive changes in seasonal streamflows, increasing winter flooding, while intensifying summer low flow conditions:

- **Skykomish River:** Climate modeling predicts average minimum flows to be 18 percent lower (range: -22 to -8 percent) by the 2080s for a moderate warming scenario, relative to 1970 to 1999 (Mauger et al. 2015).

[12] Additional information on the instream flow and associated rules for the Snohomish watershed is available in Chapter 173-507 WAC.
[13] These amounts are typically below the instream flows established in Washington Administrative Code (WAC) 173-507 for the same time period at their respective gages.

- **Snohomish River**: Climate modeling predicts average minimum flows to be 26 percent lower (range: -33 to -17 percent) by the 2080s for a moderate warming scenario, relative to 1970 to 1999 (Mauger et al. 2015).
- **Snoqualmie River**: Climate modeling predicts that mean monthly mainstem streamflow during summer months can be expected to decrease by as much 50 – 66% in 2087-2099 as compared to 1993-2005 under a moderate warming scenario (Yan et al. 2021).

2.4 Watershed Characterization

The Puget Sound Watershed Characterization Project is a tool used in Puget Sound by planners and resource managers to identify areas to prioritize for habitat protection and restoration, and areas more suitable for development. The project covers the entire Puget Sound drainage area — from the Olympic Mountains to the Cascades.[14]

The characterization results may help:

- Achieve a more functional and resilient natural watershed ecosystem.
- Identify and resolve areas of conflict between proposed land use actions and protection of watershed resources.
- Identify the root cause of watershed issues and develop appropriate solutions.

For the purpose of this watershed plan, the characterization tool can help Ecology understand if identified projects are likely to achieve an ecological benefit. A component of the characterization project is a study by WDFW of the relative conservation value of freshwater habitat conducted at the small drainage area Assessment Unit (AU)[15] scale (Wilhere et al. 2013).[16] This freshwater habitat index has three components: the density of hydro-geomorphic features, local salmonid habitats, and the accumulative downstream habitats. Quantity and quality of habitats were assessed for eight salmonid species. The index is the relative value of the freshwater habitat in an Assessment Unit based on an average of:

- The density of wetlands and undeveloped floodplains inside the AU.
- The quantity and quality of salmonid habitats inside the AU.
- The quantity and quality of salmonid habitats outside and downstream of the AU.

An analysis of projects in this plan in relation to the freshwater habitat index is presented in Chapter 6.2.4.

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[14] For more information on the watershed characterization project, visit: [Watershed characterization project - Washington State Department of Ecology]

[15] Assessment units are sub-watershed units from the Salmon and Steelhead Habitat Inventory and Assessment Program. They are based primarily on gradient and confinement and reflect the processes that form and maintain stream segments.

[16] This index is called the "Freshwater Lotic Habitats Assessment" (GIS layer A3ns_avg) in the WDFW study and the "Sum of Freshwater Index Components" on the Puget Sound Watershed Characterization Project web map.

Chapter Three: Subbasin Delineation

3.1 Introduction

WRIAs are large watershed areas formalized under the Washington Administrative Code for the purpose of administrative management and planning. WRIAs encompass multiple landscapes, hydrogeologic regimes, levels of development, and variable natural resources.

To allow meaningful analysis of the relationship between new consumptive use and offsets per Ecology's Final NEB Guidance,[17] this plan divides WRIA 7 into suitably sized subbasins. Ecology concurs with the approach used by the WRIA 7 Committee and used the subbasin delineations developed by the committee. These delineations were helpful in describing the location and timing of projected new consumptive water use, the location and timing of impacts to instream resources, and the necessary scope, scale, and anticipated benefits of projects. In some instances, subbasins may not correspond with hydrologic or geologic basin delineations (e.g., watershed divides) (Ecology 2019a).

3.2 Approach to Develop Subbasins

This plan divides WRIA 7 into 16 subbasins for purposes of assessing consumptive use and project offsets.[18] This plan used the subbasin delineation developed by the WRIA 7 Committee. The Committee based subbasin delineations on existing subwatershed units, the interim growth projections Snohomish County and King County developed, and the following guiding principles:

- Use U.S. Geological Survey (USGS) hydrologic unit code subwatershed (HUC-12) boundaries in the Snohomish County portion of the watershed (USGS 2013, 2016).
- Use King County drainage basin boundaries in the King County portion of the watershed (King County 2018).
- Combine HUC-12s and King County drainage basins with lower projected growth of new homes using permit-exempt (PE) wells.
- Keep distinct subbasins for HUC-12s and King County drainage basins with higher projected growth of new homes using PE wells.
- Align subbasins as closely as possible with Protection Planning Units identified in the Snohomish Basin Protection Plan (Snohomish Basin Salmon Recovery Forum 2015).

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[17] "Planning groups must divide the WRIA into suitably sized subbasins to allow meaningful analysis of the relationship between new consumptive use and offsets. Subbasins will help the planning groups understand and describe location and timing of projected new consumptive water use, location, and timing of impacts to instream resources, and the necessary scope, scale, and anticipated benefits of projects. Planning at the subbasin scale will also allow planning groups to consider specific reaches in terms of documented presence (e.g., spawning and rearing) of salmonid species listed under the federal Endangered Species Act." (Ecology 2019a).

[18] Consistent with Final NEB Guidance that defines subbasins as a geographic subarea within a WRIA. A subbasin is equivalent to the words "same basin or tributary" as used in RCW 90.94.020(4)(b) and RCW 90.94.030 (3)(b).

- Consider important salmon habitat and potential location of offset projects and actions.
- Consider streams with known low flow issues.
- Consider streams with year-round closures.[19]

3.3 WRIA 7 Subbasins

The WRIA 7 subbasin delineation is summarized below in Table 0.1 and shown on Figure 0.1. A more detailed description of the subbasin delineation is in the technical memo available in Appendix B. The technical memo also describes a few other adjustments the WRIA 7 Committee made to align the subbasins with relevant planning boundaries.

Table 0.1: WRIA 7 Subbasins

Subbasin Name	Primary Rivers and Tributaries	County
Tulalip	Streams draining directly to Puget Sound, including Tulalip Creek	Snohomish County
Quilceda-Allen	Allen Creek and Quilceda Creek	Snohomish County
Estuary/Snohomish Mainstem	Snohomish River, Evans Creek, French Creek, and streams draining directly to Puget Sound between the City of Mukilteo and the City of Everett	Snohomish County
Little Pilchuck	Little Pilchuck Creek	Snohomish County
Pilchuck	Upper and Lower Pilchuck River	Snohomish County
Woods	Woods Creek	Snohomish County
Sultan	Upper, Middle and Lower Sultan River	Snohomish County
Lower Mid-Skykomish	Wallace River and Olney Creek	Snohomish County
Skykomish Mainstem	Skykomish River	Snohomish and King Counties
Upper Skykomish	South Fork and North Fork Skykomish River tributaries, including Foss River, Miller River, Tye River, South Fork Skykomish River, Beckler River, Rapid River, Upper Beckler River, Lower South Fork Skykomish River, Lower North Fork Skykomish River, Middle North Fork Skykomish River, and Upper North Fork Skykomish River	Snohomish and King Counties

[19] Streams closed year-round to further consumptive appropriation as identified in WAC 173-507-030 (2).

Subbasin Name	Primary Rivers and Tributaries	County
Cherry-Harris	Cherry Creek and Harris Creek	Snohomish and King Counties
Snoqualmie North	Northern half of the Snoqualmie River Mainstem drainage basin, Tuck Creek, Cathcart drainages, and Ames Lake	Snohomish and King Counties
Snoqualmie South	South Fork Tolt, North Fork Tolt, and Lower Tolt River tributaries, Tokul Creek, Griffin Creek, and the southern half of the Snoqualmie River Mainstem drainage basin	Snohomish and King Counties
Patterson	Patterson Creek	King County
Raging	Raging River	King County
Upper Snoqualmie	North, Middle, and South Fork Snoqualmie River	King County

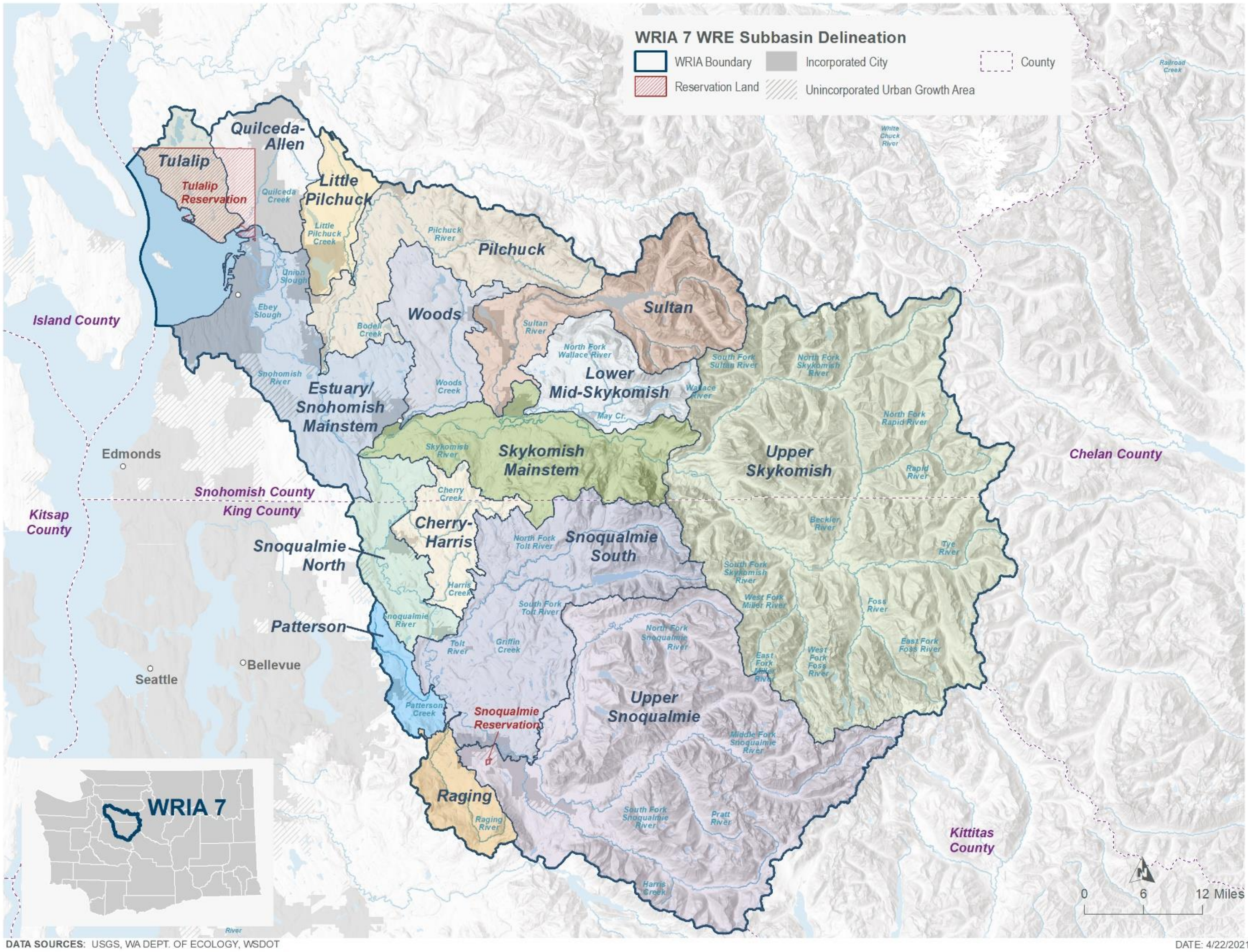

Figure 0.1: WRIA 7 Subbasin Delineation

Chapter Four: New Consumptive Water Use Impacts

4.1 Introduction to Consumptive Use

The Streamflow Restoration law requires watershed plans to include "estimates of the cumulative consumptive water use impacts over the subsequent 20 years, including withdrawals exempt from permitting under RCW 90.44.050" (RCW 90.94.030(3)(e)). The Final NEB Guidance states that, "watershed plans must include a new consumptive water use estimate for each subbasin, and the technical basis for such estimate" (pg. 7). This chapter provides the projections of new permit exempt domestic well connections (PE wells) and their associated consumptive use for the planning horizon. [20]

This plan uses the analysis completed by the technical consultants for the WRIA 7 Committee and the results are consistent with the WRIA 7 Committee's draft watershed plan. Additional information on the methods used to project new PE wells and consumptive use is available in Appendix B.

Addressing Uncertainties, Assumptions, and Limitations Associated with Projections for PE Wells and Consumptive Use. Uncertainties and limitations are inherent with any planning process. Appropriate data are not always available, so analyses rely on the best available information and often require assumptions to fill the gaps. Ecology based the PE well projections and consumptive use estimates in this chapter on the best information available at the time and presents assumptions associated with the projections. The technical memos in Appendix B provide more detail on the assumptions that Ecology used in this plan.

4.2 Projection of New Permit-Exempt Well Connections (2018 – 2038)

This plan projects 3,389 new PE wells over the planning horizon.[21] Most of these wells are likely to be installed in the following subbasins: Tulalip, Quilceda-Allen, Estuary/Snohomish Mainstem, and Snoqualmie North.

The method used to project the number of new PE wells over the planning horizon, referred to as the PE well projection method, is based on recommendations from Appendix A of Ecology's Final NEB Guidance (Ecology 2019a). The following sections provide the planning horizon projections of

[20] New consumptive water use in this document is from projected new homes connected to PE domestic wells associated with building permits issued during the planning horizon. Generally, new homes will be associated with wells drilled during the planning horizon. However, new uses could occur where new homes are added to existing wells serving group systems under RCW 90.44.050. In this document the well use discussed refers to both these types of new well use. PE wells may be used to supply houses, and in some cases other Equivalent Residential Units (ERUs) such as small apartments. For the purposes of this document, the terms "house" or "home" refer to any PE domestic groundwater use, including other ERUs.

[21] The PE well projection in this plan (3,389 new PE wells) is consistent with the PE well projection in the WRIA 7 Committee's draft plan.

new PE wells for each subbasin within WRIA 7 and the methods used to develop the projections (PE well projection method).

4.2.1 PE Well Connections Projection by Subbasin

This watershed plan uses the Snohomish County and King County PE well projection data at both the WRIA scale and by subbasin. Table 0.1 and Figure 0.1 show projections for new PE wells in WRIA 7 by subbasin.

Table 0.1: Number of PE Wells Projected between 2018 and 2038 for the WRIA 7 Subbasins

Subbasins	King County	Snohomish County	UGAs	Total PE Wells per Subbasin
Tulalip	--	468	0	468
Quilceda-Allen	--	330	8	338
Estuary/Snohomish Mainstem	--	322	9	331
Little Pilchuck	--	289	5	294
Pilchuck	--	278	2	280
Woods	--	224	0	224
Sultan	--	53	2	55
Lower Mid-Skykomish	--	60	0	60
Skykomish Mainstem	0	183	2	185
Upper Skykomish	48	53	2	103
Cherry-Harris	200	11	3	214
Snoqualmie North	240	98	0	338
Snoqualmie South	169	0	0	169
Patterson	104	--	0	104
Raging	73	--	2	75
Upper Snoqualmie	146	--	5	151
Totals	**980**	**2,369**	**40**	**3,389**

The total projection for WRIA 7 is 3,389 new PE wells over the planning horizon. King County projects approximately 980 new PE wells within WRIA 7 portions of unincorporated King County. Snohomish County projects approximately 2,369 new PE wells within WRIA 7 portions of unincorporated Snohomish County (including a projection of 35 PE wells on tribal owned lands provided by Tulalip Tribes). The King and Snohomish County projections do not account for potential PE wells in cities or Urban Growth Areas (UGAs). Therefore, this plan includes a projection of 40 new PE wells within city limits and UGAs based on an analysis completed by the technical consultants (UGA Well Log Spot Check).

4.2.2 Methodology

King and Snohomish Counties used historical building data to predict potential PE well growth, assuming the rate and general location of past growth will continue over the planning horizon. Using past building permits to predict future growth is one of Ecology’s recommended methods

(Ecology 2019a). In this final plan, Ecology deferred to and incorporated the information provided by King and Snohomish Counties to determine PE well growth estimates.

Due to data availability, which differed for the two counties, King and Snohomish County used different methods to estimate the number of homes that would be served by community water systems and municipalities and remove those from the PE well growth estimates. Snohomish County considered distance to existing water lines, whereas King County considered historical rates of connection to water service within water service area boundaries.[22] King and Snohomish Counties completed their analyses internally and their methods are described in detail in Appendix B.

This plan also uses the WRIA 7 Committee's evaluation of potential PE wells within city limits and UGAs using data from Ecology's Well Report Viewer database.

King County completed a PE Well Potential Assessment which identified potential parcels where development could occur within rural King County. Snohomish County completed a similar assessment which they have referred to as a Rural Capacity Analysis. The PE Well Potential Assessment and Rural Capacity Analysis results were used to assess whether a subbasin has the capacity to accommodate the number of PE wells projected over the planning horizon.

The sections below summarize growth projection methods. A more detailed description of the analysis and methods used by both counties is included in Appendix B.

King County Permit-Exempt Well Projection Methodology

King County used historical residential building permit and parcel data from 2000 through 2017 to project the number of new PE wells for the planning horizon in unincorporated King County (referred to as the past trends analysis). This data set considers economic and building trends over an 18-year period and the method assumes that past trends will continue.

King County followed the steps below to estimate the number of new PE wells over the planning horizon:

1. Gathered historical building permit and parcel data (2000–2017) for new residential structures.[23]
2. Assessed the total number of permits and average number of permits per year for WRIA 7.

[22] Water service area boundaries include areas currently served by existing water lines and may also include areas not yet served by water lines. King County used historic rates of connection to water service to predict future rates of connection because King County does not have county-wide information on the location of water lines.
[23] King County selected the time period 2000-2017 based on data availability. The building permit data for 2000-2017 includes both periods of high growth and periods of low growth. After comparing the permit data to the Vision 2040 regional plan and population data, King County is confident in using the average over this time period to project into the future.

3. Linked building permit and parcel data to determine water source for each building permit/parcel and separate into public, private, and other water source categories. Considered a building permit with water source listed as “private” as a PE well.
4. Calculated the number and percentage of building permits for each type of water source (public, private, or other) inside and outside water services areas, by subbasin and for the WRIA overall.

The technical consultants used the King County past trends analysis and followed the steps below to develop PE well projections by subbasin:

1. Calculated the projected number of PE wells per year for each subbasin by multiplying the average number of building permits per year by the percentage of building permits per subbasin, and percentage of building permits using a private water source (well) per subbasin.
2. Multiplied the projected number of PE wells per year per subbasin by 20 to calculate the total of PE wells projected over the planning horizon for each subbasin.
3. Added 6 percent to 20-year PE well projection per subbasin to account for gaps in the building permit and parcel data (6 percent error is based on the percentage of building permits with “other” as the water source).
4. Tabulated the total PE wells projected over the planning horizon, including the 6 percent error, for each subbasin and sum to get the total of PE wells projected over the planning horizon in rural unincorporated King County.

Snohomish County Permit-Exempt Well Projection Methodology

Snohomish County developed three PE well projection scenarios based on development trends and population projections, which are described in Appendix B. This plan uses the scenario that reviewed past development trends within WRIA 7 to estimate the number and location of potential new homes over the planning horizon (referred to as the past trends analysis).[24] Snohomish County’s past trends analysis methodology differed from King County’s.

Snohomish County used a geographic information system (GIS) model to identify areas where homes are likely to connect to water service, based on proximity to existing water distribution lines (referred to as public water service areas). Areas that were not proximal to existing water distribution lines were assumed to be served by a PE well (referred to as PE well areas).[25] Snohomish County used this spatial model, in combination with analysis of year-built data from 2008-2018 for recently built single-family residences, to develop PE well projections. The method assumes that past trends will continue, that existing water lines are representative of future

[24] The past trends analysis is also the method that the WRIA 7 Committee used in their draft watershed plan.
[25] PE well areas are more than 100 feet from a water main for homes that are not part of a subdivision and more than ¼ mile from a water main for homes that are part of a subdivision. See Snohomish County Growth Projections and Rural Capacity Analysis Methods in Appendix F for additional information.

water lines, and that homes built close to existing water lines will connect to public water service, not PE wells.

Snohomish County followed the steps below to estimate the number of new PE wells over the planning horizon:

1. Gathered year-built data for single-family residences (i.e., housing units or "HUs") built between 2008–2018.
2. Assigned HUs to "public water service areas" or "PE well areas" based on the distance to existing water mains. Assume HUs in "PE well areas" will use a PE well for the water source.
3. Estimated the number of HUs per subbasin for each type of water source (public water service or PE well) and calculate the percentage of HUs per subbasin for each type of water source.
4. Calculated the average number of HUs per year (2008-2018) and multiply by 20 to calculate the estimated total of HUs projected over the planning horizon for rural unincorporated Snohomish County.
5. Applied HU projections to WRIA 7 subbasins based on the past percentage of growth per subbasin and past percentage of HU for each type of water source per subbasin.
6. Tabulated the total PE wells projected over the planning horizon for each subbasin and sum to get the total of PE wells projected over the planning horizon in rural unincorporated Snohomish County.

Urban Growth Area Permit-Exempt Well Projection Methodology

The King County and Snohomish County PE well projection methods do not account for potential PE wells within cities or UGAs. The technical consultants completed an analysis of potential PE well growth within city limits and UGAs using data from Ecology's Well Report Viewer database (referred to as the UGA well log spot check).

The general method included using Ecology's Well Report Viewer database (1998–2018) to query water wells with characteristics of a domestic well[26] within UGAs. The technical consultants randomly reviewed a subset of the water well reports and calculated the number and percentage of each type of well (domestic, irrigation, other and incorrect) located within the UGAs. They multiplied the percentage of wells identified as domestic (assumed to be PE wells) by the total number of wells located within UGAs to estimate the number of PE wells installed in the UGAs over the past 20-year period. The technical consultants also verified the physical address of the wells with the UGA boundaries to determine the subbasin where the domestic wells were located. The technical consultants used the total number of domestic wells

[26] Ecology's complete Well Report Viewer database was filtered for water wells 6 to 8 inches in diameter and greater than 30 feet deep, which are typical dimensions and depths for domestic wells. Ecology does not have the ability to filter for permit-exempt domestic wells.

per subbasin over the past 20 years to project the number of PE wells located within the UGAs over the planning horizon for each WRIA 7 subbasin. A more detailed methodology is included in Appendix B.

King County Permit-Exempt Well Potential Assessment

King County assessed parcels available for future residential development in unincorporated King County to determine whether there were sufficient available parcels to accommodate projected growth in each subbasin (referred to as the PE well potential assessment).

King County screened parcels with potential for future residential development by subbasin using criteria such as parcel size, zoning district, and appraised improvements. The County determined the total number of parcels and dwelling units[27] (DUs) and labeled them as either inside or outside the water district service boundaries. King County then projected the water source for each parcel or DU (public water or PE well) based on historic rates of connection to water service. The technical consultants compared the 20-year PE well projection to the PE well potential assessment. In areas where the number of projected PE wells exceeded the potential parcels available, the technical consultants reallocated those PE wells to the nearest subbasin with parcel capacity and similar growth patterns. They reallocated 22 projected PE wells from the Upper Snoqualmie subbasin to the Snoqualmie South subbasin in the King County portion of WRIA 7. A more detailed methodology and list of assumptions is included in Appendix B.

Snohomish County Rural Capacity Analysis

In 2011, Snohomish County completed a Rural Capacity Analysis and assigned future residential development capacity to each parcel in the rural area. Snohomish County updated their 2011 analysis to determine capacity to accommodate the 20-year PE well projection at the WRIA and subbasin level.

Snohomish County identified parcels with potential for future residential development by subbasin using screening criteria. For each parcel, Snohomish County calculated residential development capacity based on development status, parcel size, density, and other attributes. The County assigned parcels to “public water service areas” or “PE well areas” per the past trends analysis method and aggregated the residential development capacity by subbasin and water source. Snohomish County compared the 20-year PE well projection with the rural capacity analysis and calculated the shortfall or surplus of available parcels to be sourced by PE wells. Snohomish County did not identify any areas where the number of projected PE wells exceeded the potential parcels available. A more detailed methodology and list of assumptions is included in Appendix B.

[27] A dwelling unit is a rough estimate of subdivision potential based on parcel size and zoning (e.g., a 22-acre parcel zoned RA-5 is assumed to have 4 dwelling units). King County’s dwelling unit is comparable to Snohomish County’s Housing Unit.

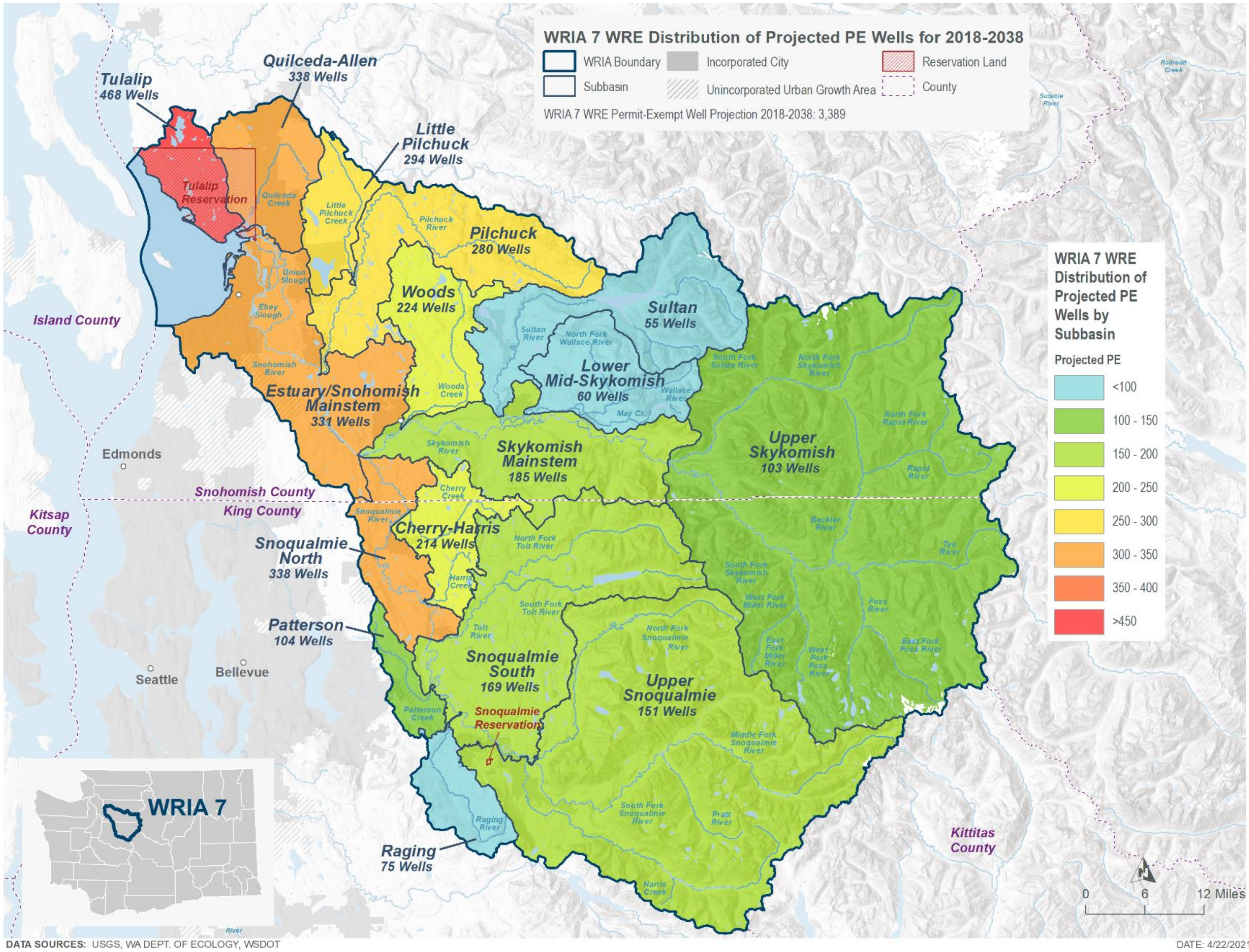

Figure 0.1: WRIA 7 Distribution of Projected PE Wells for 2018 – 2038

4.3 Impacts of New Consumptive Water Use

This plan uses the 20-year projection of new PE wells for WRIA 7 (3,389) to estimate the new consumptive water use (consumptive use) that this watershed plan must address and offset. The plan estimates 797.4 acre-feet per year (AFY) (1.10 cubic feet per second) of new consumptive water use in WRIA 7.[28]

This section provides an overview of the methods used to estimate new consumptive use and an overview of the anticipated impacts of new consumptive use in WRIA 7 over the planning horizon. The WRIA 7 Consumptive Use Estimates Technical Memorandum provides a more detailed description of the analysis and alternative scenarios considered (Appendix C).

4.3.1 Methods to Estimate Indoor and Outdoor Consumptive Water Use

Indoor water use patterns differ from outdoor water use. Indoor use is generally constant throughout the year, while outdoor use occurs primarily in the summer months. The portion of water that is consumptive varies for indoor and outdoor water use. Appendix A of the Final NEB Guidance describes a method (referred to as the Irrigated Area Method) which assumes average indoor use per person per day and reviews aerial imagery to provide a basis to estimate irrigated area of outdoor lawn and garden areas. The Irrigated Area Method accounts for indoor and outdoor consumptive use variances by using separate approaches to estimate indoor and outdoor consumptive use.

To develop the consumptive use estimate, the plan used the Irrigated Area Method and relied on assumptions for indoor use and outdoor use from Appendix A of the Final NEB Guidance (Ecology 2019a). This chapter provides a summary of the technical memo which is available in Appendix B.

Consistent with the Final NEB Guidance (Appendix B, pg. 25), the plan assumes impacts from consumptive use on surface water are steady-state, meaning impacts to the stream from pumping do not change over time. Household water use will likely vary seasonally, with higher water use and well pumping during the summer months. This assumption is based on the wide distribution of future well locations and depths across varying hydrogeological conditions, and because empirical data to support the assumption is not locally available. While consumptive use impacts are assumed to be steady-state, they represent a larger percentage of surface flow during low flow periods in summer and early fall.

New Indoor Consumptive Water Use

Indoor water use refers to the water that households use in kitchens, bathrooms, and laundry (USGS, 2012). This plan used the Irrigated Area Method and the following assumptions, recommended in Appendix A of the Final NEB Guidance (Ecology 2019a), to estimate household consumptive indoor water use:

[28] The consumptive use estimate in this plan (797.4 AFY) is consistent with the consumptive use estimate in the WRIA 7 Committee's draft plan.

- 60 gallons per day (gpd) per person of indoor daily water use.
- 2.73 and 2.75 persons per household assumed for rural portions of King and Snohomish County, respectively.[29] For areas spanning both counties, a weighted value was estimated based on the number of projected PE wells in each County.
- 10% of indoor use is consumptively used (or a consumptive use factor (CUF) of 0.10), based on the assumption that homes on PE wells are served by onsite sewage systems. Onsite sewage systems return most wastewater back to the immediate water environment; a fraction of that water is lost to the atmosphere through evaporation in the drainfield.

The equation used to estimate household consumptive indoor water use is:

60 gpd x 2.73 to 2.75 people per house x 365 days x .10 CUF

This results in an annual aggregated average of 0.0184 AF[30] (0.000025 cfs[31]) indoor consumptive water use per day per well.

New Outdoor Consumptive Water Use

Most outdoor water is used to irrigate lawns, gardens, and landscaping. To a lesser extent, households use outdoor water for car and pet washing, exterior home maintenance, pools, and other water-based activities. Water from outdoor use does not enter onsite sewage systems; instead, it typically infiltrates into the ground or is lost to the atmosphere through evapotranspiration (Ecology 2019a).

The technical consultants used aerial imagery to measure the irrigated areas of 393 randomly selected parcels in the 16 subbasins to develop an average outdoor irrigated area per subbasin. The technical consultants selected these parcels from a pool of approximately 1600 recent (2006-2017) building permits for new single-family residential homes not served by public water. Each subbasin contained at least 20 of these parcels as a statistically representative sample size, which ensured the sample mean was representative of the WRIA. The average irrigated area for the 393 randomly selected parcels, when aggregated across the 16 subbasins, was 0.20 acres per parcel.

This plan used the following assumptions, as recommended in Appendix A of the NEB Guidance, to estimate outdoor consumptive water use:

- The amount of water needed to maintain a lawn varies by subbasin due to varying temperature and precipitation across the watershed. The technical consultants used Washington Irrigation Guide (WAIG) (NRCS-USDA 1997) stations in Everett, Monroe, and

[29] Data on average household size was provided by King County and Snohomish County.
[30] Acre-foot is a unit of volume for water equal to (1) a sheet of water one acre in area and one foot in depth and (2) 325,851 gallons of water. 1 acre-foot per year is equal to 893 gallons per day.
[31] Cubic feet per second (CFS) is a rate of the flow in streams and rivers. It is equal to a volume of water one foot high and one foot wide flowing a distance of one foot in one second. 1 cubic foot per second is equal to 646,317 gallons per day.

Snoqualmie Falls to develop a weighted average crop irrigation requirement (IR) for turf grass in each subbasin (the WRIA average IR is 10.66 inches). This value represents the amount of water needed to maintain commercial turf grass.

- Irrigation application efficiency (AE) value of 75% to account for water that does not reach the turf. This increases the amount of water used to meet the crop's irrigation requirement.
- Consumptive use factor (CUF) of 0.8, reflecting 80% consumption for outdoor use. This means 20% of outdoor water is returned to the immediate water environment.
- Outdoor irrigated area per subbasin based on the irrigated footprint analysis: 0.20 acres per PE well.

The equation used to estimate outdoor consumptive indoor water use is:

$$10.66 \text{ IR (inches)} \div 12 \text{ (inches per foot)} \div 0.75 \text{ AE} \times 0.20 \text{ (acres)} \times 0.80 \text{ CUF}$$

First, water loss is accounted for by multiplying the crop irrigation requirement (total water depth used to maintain commercial turf) by the application efficiency. Next, that number is multiplied by the area which is irrigated. Finally, the volume of water is multiplied by 80 percent to produce the outdoor consumptive water use. To convert the equation from inches to acre-feet, divide the result by 12.

The outdoor consumptive use varies by subbasin due to different irrigation requirements across the watershed. The WRIA's average annual consumptive water use per PE well is 0.24 AFY (0.000331 cfs). This is an average for the year; however, the expectation is that more water use will occur in the summer than in the other months.

4.4 Summary of WRIA 7 Consumptive Use Estimate

The total consumptive use estimate for WRIA 7 is 797.4 AFY. The total consumptive use estimate for WRIA 7 is the PE well projection (see section 4.2) multiplied by the total indoor and outdoor consumptive use per PE well.

Table 0.2 summarizes the estimated indoor and outdoor consumptive use by subbasin. The highest consumptive use is expected in the subbasin with the largest irrigated area per PE well and the most anticipated new PE wells, as presented in Figure 0.2.

Table 0.2: Estimated Indoor and Outdoor Consumptive Use by Subbasin

Subbasin	Projected PE wells	Average lawn size (acres)	Indoor CU per well (AFY)	Outdoor CU per well (AFY)	Total CU/year per well (AFY)	Total CU 2018-2038 (AFY)
Tulalip	468	0.09	0.0185	0.11	0.12	58.1
Quilceda-Allen	338	0.15	0.0185	0.17	0.18	62.1
Estuary/Snohomish Mainstem	331	0.29	0.0185	0.33	0.35	115.8
Little Pilchuck	294	0.2	0.0185	0.22	0.24	69.5
Pilchuck	280	0.37	0.0185	0.38	0.40	111.0
Woods	224	0.12	0.0185	0.12	0.14	31.5
Sultan	55	0.11	0.0185	0.10	0.12	6.5
Lower Mid-Skykomish	60	0.14	0.0185	0.13	0.15	8.8
Skykomish Mainstem	185	0.16	0.0185	0.16	0.17	32.1
Upper Skykomish	103	0.05	0.0184	0.04	0.06	6.0
Cherry-Harris	214	0.16	0.0184	0.17	0.19	40.4
Snoqualmie North	338	0.21	0.0184	0.24	0.26	87.4
Snoqualmie South	169	0.21	0.0183	0.22	0.24	40.3
Patterson	104	0.41	0.0183	0.51	0.53	55.0
Raging	75	0.43	0.0183	0.50	0.52	38.8
Upper Snoqualmie	151	0.23	0.0183	0.21	0.23	34.2
WRIA 7 Aggregated	**3,389**	**0.20**	**0.00184**	**0.22**	**0.24**	**797.4**

Table Note:

Values in table have been rounded.

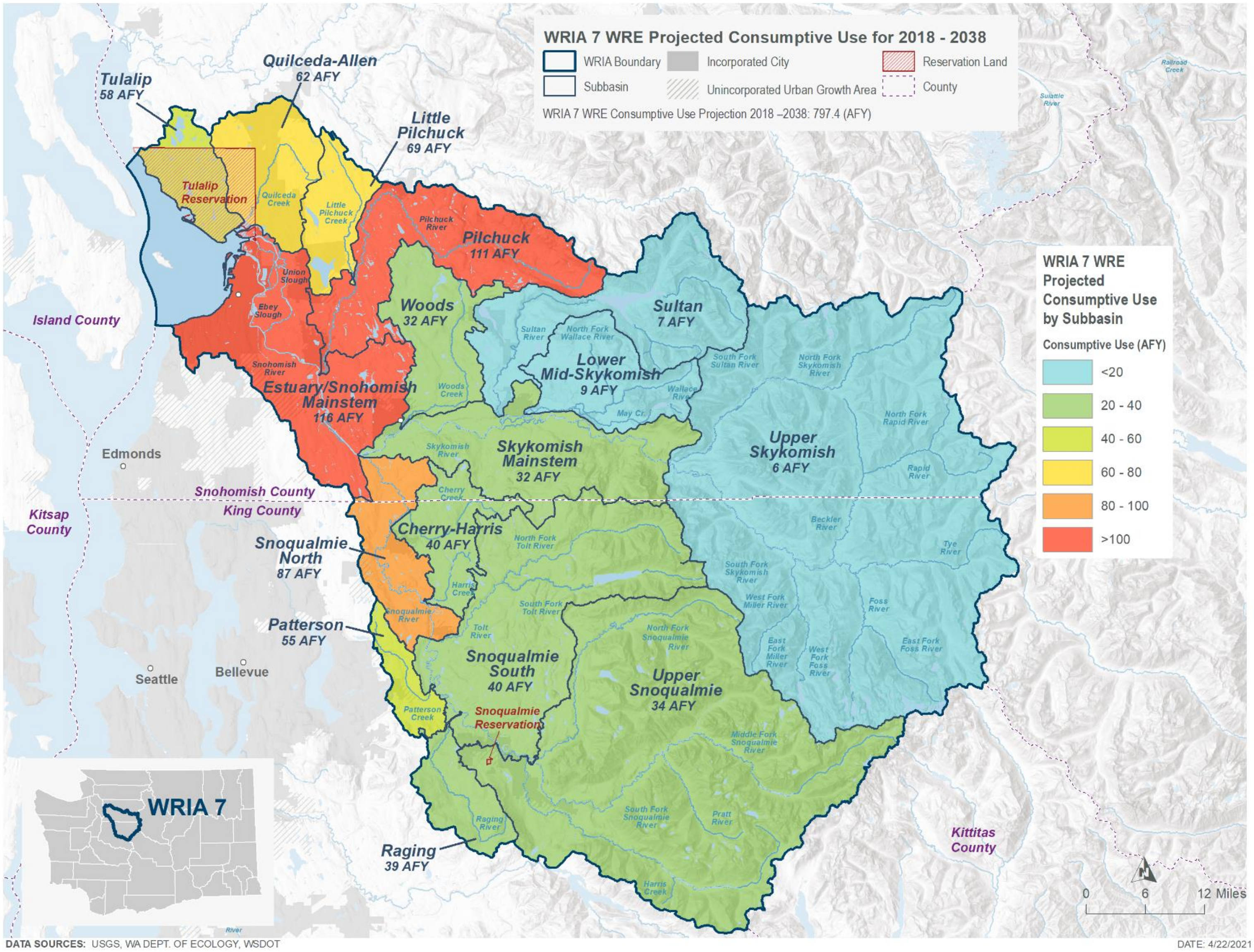

Figure 0.2: WRIA 7 Projected Consumptive Use for 2018 - 2038

Chapter Five: Projects and Actions

5.1 Description and Assessment

Watershed plans must identify projects that offset the potential impacts future permit-exempt (PE) wells will have on streamflows and provide a net ecological benefit (NEB) to the WRIA.

Ecology relied on the project information generated during the WRIA 7 Committee process. The approach used to identify and selecting projects is described in Section 5.1.1. Ecology considered the WRIA 7 Committee's project list as a starting point in order to develop the final list of projects and actions that, once implemented, achieve the water offset and meet the NEB criteria outlined in RCW 90.94.030. Ecology revised the WRIA 7 Committee's project list to focus on projects with long-term benefits and reflect new information available prior to the adoption of the plan. Only one project, which did not provide a reasonable assurance of long-term benefits, was removed.[32] Ecology and the technical consultants reached out to all identified project sponsors to confirm interest prior to including the projects in the watershed plan and to reflect new information available prior to adoption of this plan.

Projects are categorized as either "water offset" or "habitat" projects:

- **Water offset projects** have a quantified streamflow benefit and are projected to contribute to offsetting consumptive use.
- **Habitat projects** are projected to contribute to achieving NEB by focusing on actions that improve the ecosystem function and resilience of aquatic systems, support the recovery of threatened or endangered salmonids, and protect instream resources including important native aquatic species. Habitat projects may also result in an increase in streamflow, but the water offset benefits for these projects is difficult to quantify with a high degree of certainty. Therefore, this plan does not rely on habitat projects to contribute toward offsetting consumptive use. Because these projects still contribute to NEB, they are included in the plan.

Ecology included 37 projects in the plan with an estimated 1,444.4 AFY water offset. The 11 water offset projects are described in Section 5.2.1 and the 26 habitat projects are described in section 5.2.2. Additional information is included in Appendix C.

5.1.1 Approach to Identify and Select Projects

Technical consultants and partners reviewed project lists developed by the Snohomish Forum and the Snoqualmie Watershed Forum and their partners, and the 2018 WRIA 7 Near-Term Actions related to habitat. The consultants also researched project concepts, estimated water offset for projects, contacted project sponsors, and developed project descriptions. The WRIA 7 Committee also solicited projects from local project sponsors.

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[32] Project 7-P-H9, Small Farm Storage Initiative, was included in the WRIA 7 Committee's draft plan. However, it is not included in this plan because it is not naturally maintained nor does it provide for long term maintenance. As such it does not provide long-term benefits.

In addition, Ecology contracted with Washington Water Trust (WWT) to identify opportunities for water right acquisition water offset projects within WRIA 7. WWT developed water right selection criteria based on the unique local nature of water rights and water use in WRIA 7. The water rights assessment consisted of four categories of potential projects: irrigation water rights in priority subbasins, irrigation water rights near existing reclaimed water infrastructure, water rights in the Trust Water Rights Program as a temporary donation, and specific water right acquisition opportunities identified by the WRIA 7 Committee.

In finalizing this plan, Ecology evaluated projects based on their feasibility and likelihood of implementation. This plan contains projects that Ecology has identified as having a high likelihood of implementation based on their technical merit and project sponsor support.

Additional detail on the WRIA 7 Committee's project prioritization is included in Appendix D.

5.2 Projects and Actions

The projects presented below have water offset and/or ecological benefits. Ecology identified these projects as contributing toward offsetting consumptive use and achieving NEB.

5.2.1 Water Offset Projects

Table 0.1 provides a summary of the 11 water offset projects included in this plan to offset consumptive use and contribute toward NEB. The total offset potential of these 11 projects for WRIA 7 is 1,444.4 acre-feet per year (AFY). Offset benefits are anticipated in the subbasins listed in Table 0.1 as well as downstream of the respective project locations. The watershed map in **Error! Reference source not found.** shows the location of the water offset projects listed in Table 0.1, while the watershed map in **Error! Reference source not found.** shows the location of the habitat projects listed in Table 0.2.

For the water right acquisition projects included in this watershed plan, Ecology relied on the WWT evaluations to estimate water offsets shown in Table 5.1. WWT estimated the consumptively used portion of the water right. Ecology will conduct a full extent and validity analysis to determine the actual quantity of water available for acquisition before water rights are transferred to the Trust Water Rights Program. This analysis generally happens after the water right holder has agreed to sell. See Section 5.3.2 for more detail on cost estimates.

In addition to the water right acquisition projects summarized in this section, Ecology supports further development of projects that acquire water rights from willing sellers to increase streamflows and offset the impacts of PE wells. Water rights should be permanently transferred to the Trust Water Rights Program to ensure that the benefits to instream resources are permanent.

The Managed Aquifer Recharge (MAR) projects presented in this watershed plan are the known opportunities at the time of publication, and calculations are based on the best available site information. These projects represent well-formed project concepts, but they do not provide design or feasibility study elements. WRIA 7 partners may identify future MAR projects that are consistent with those presented in this plan and which will support offset benefits. Ecology encourages project partners to undergo a feasibility study for all MAR projects to identify any water quality, permitting, and design requirements. MAR projects funded through Streamflow Restoration grant funding are required to complete a feasibility study prior to any other phases of the MAR project being eligible for funding.

Water offset amounts for each project identified in this plan are based on calculations developed by project sponsors and technical consultants. In finalizing this plan, Ecology deferred to projects developed by the WRIA 7 committee, and provided further evaluation to include projects that have a high certainty of providing the estimated water offset. More information on the certainty of project implementation is described in Section 5.3.3 below. A summary description for each project is provided below. More detailed water offset project descriptions, including water offset calculations and assumptions, are provided in Appendix C.[33]

[33] With the exception of Lochaven Source Switch, water right acquisition projects do not have detailed project descriptions in Appendix C.

Table 0.1: WRIA 7 Water Offset Projects

Project Number	Project Name	Project type	Subbasin(s)	Water Offset (AFY)	Project Sponsor	Estimated project cost
7-T-W1	Lake Shoecraft Outlet Modification Project	Water storage and retiming	Tulalip	62.5	Tulalip Tribes and WDFW	Design, permitting and construction = $175,000 (Feasibility funding secured) O&M = $7,000/year

Tulalip Subbasin Subtotal **62.5 AFY**

Project Number	Project Name	Project type	Subbasin(s)	Water Offset (AFY)	Project Sponsor	Estimated project cost
7-QA-W2	Coho Creek Relocation and Streamflow Enhancement Project	Streamflow augmentation and floodplain restoration	Quilceda-Allen	362	Tulalip Tribes	Design, permitting, and construction = $950,000 (Feasibility funding secured) O&M = $10,000/year

Quilceda-Allen Subbasin Subtotal **362 AFY**

Project Number	Project Name	Project type	Subbasin(s)	Water Offset (AFY)	Project Sponsor	Estimated project cost
7-LP-W3	Lake Stevens Outlet Structure & Lake Level Management Project	Water storage and retiming	Little Pilchuck	500	City of Lake Stevens	Design, permitting and construction = $1.4 million O&M = $7,000/year

Little Pilchuck Subbasin Subtotal **500 AFY**

Project Number	Project Name	Project type	Subbasin(s)	Water Offset (AFY)	Project Sponsor	Estimated project cost
7-P-W4	Lochaven Source Switch	Water right acquisition	Pilchuck	12.7	Snohomish PUD	Water right purchase = $108,000 Water system transfer and upgrades = $400,000 to $1.6 million
7-P-W5	Lower Pilchuck No. 1	Water right acquisition	Pilchuck	2.8	Snohomish PUD	Water right purchase = $14,000
7-P-W6	Lower Pilchuck No. 11	Water right acquisition	Pilchuck	2.1	Washington Water Trust	Water right purchase = $5,000

Pilchuck Subbasin Subtotal **17.6 AFY**

Project Number	Project Name	Project type	Subbasin(s)	Water Offset (AFY)	Project Sponsor	Estimated project cost
7-SS-W7	Raging River No. 1	Water right acquisition	Snoqualmie South	126	Washington Water Trust	Water right purchase = $324,000

Snoqualmie South Subbasin Subtotal **126 AFY**

Project Number	Project Name	Project type	Subbasin(s)	Water Offset (AFY)	Project Sponsor	Estimated project cost
7-PA-W8	Patterson No. 1	Water right acquisition	Patterson	29.7	Washington Water Trust	Water right purchase = $72,000
7-PA-W9	Patterson No. 4	Water right acquisition	Patterson	71.6	Washington Water Trust	Water right purchase = $184,000

Patterson Subbasin Subtotal **101.3 AFY**

Project Number	Project Name	Project type	Subbasin(s)	Water Offset (AFY)	Project Sponsor	Estimated project cost
7-USQ-W10	MAR in Snoqualmie Watershed; Potential Sites: North Bend, Three Forks, NF 5700	Water storage and retiming – MAR	Upper Snoqualmie, Snoqualmie North, Snoqualmie South	198	Washington Water Trust	Feasibility, design, permitting and construction = $1.1 million O&M = $10,000/year
7-USQ-W11	Snoqualmie River Watershed Surface Water Storage	Water storage and retiming	Upper Snoqualmie; Snoqualmie South, Cherry-Harris	77	SVWID	Feasibility, design, permitting and construction = $1.2 million to $112 million (Site identification and initial feasibility funding secured)

Upper Snoqualmie Subbasin Subtotal **275 AFY**

WRIA 7 Total Water Offset (Cumulative from Above) **1,444.4 AFY**

WRIA 7 Consumptive Use Estimate **797.4 AFY**

Table Note: All project cost estimates are planning level cost estimates and may not reflect real costs.

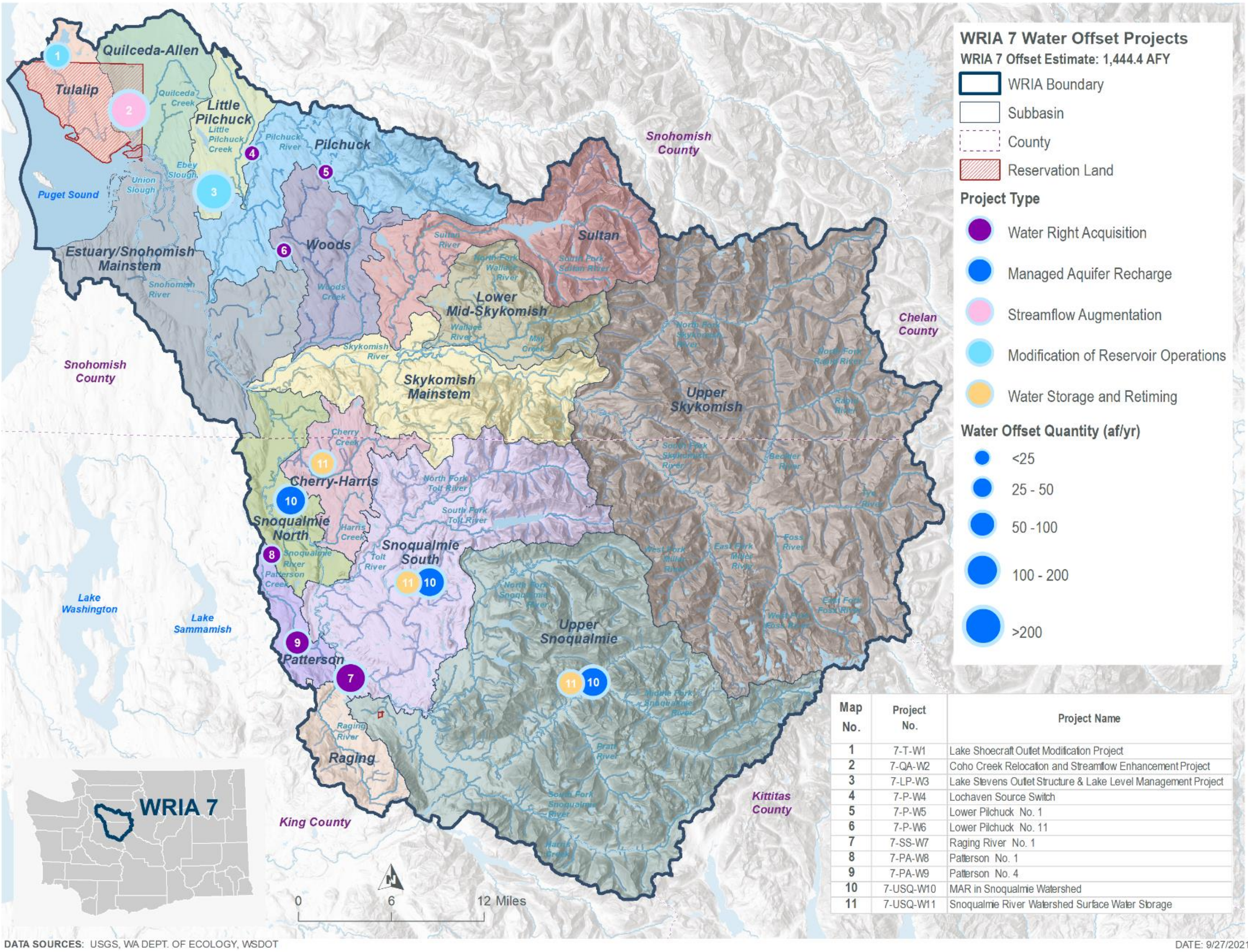


Figure 0.1: WRIA 7 Water Offset Projects

Tulalip Subbasin

Project Name: Lake Shoecraft Outlet Modification Project [7-T-W1]

Project Description: Lake Shoecraft is an approximately 125-acre lake located in the Tulalip Plateau west of Arlington. The lake outlet is currently controlled by a weir with removable stop logs (eight-inch height per log). Boards are removed in the winter to pass higher flows and prevent flooding and installed in the summer to increase storage and maintain lake levels.

The Lake Shoecraft Outlet Modification project proposes replacing the existing stop log control structure with an adjustable slide-gate weir to add more flexibility in outlet control. This modification would benefit the downstream Bernie Kai-Kai Gobin Hatchery by targeting higher releases to align with hatchery needs, which vary from year to year. Spring and summer releases could be more tightly controlled to maintain higher lake levels and allow more consistent streamflow releases through the summer.

Although a feasibility analysis has not yet been conducted for this project, initial calculations indicate the project could provide a 62.5 AFY increase in summer storage. Additional information is included in the project description in Appendix C.

Quilceda-Allen Subbasin

Project Name: Coho Creek Relocation and Streamflow Enhancement Project [7-QA-W2]

Project Description: This project includes restoration of fish habitat within Coho Creek, a Type 3 tributary to Quilceda Creek, located on the Tulalip Reservation. Tulalip Tribes proposes this work to relocate and restore stream habitat conditions within Coho Creek and to augment summer low flows using effluent from a Membrane Bioreactor (MBR) Wastewater Treatment Plant adjacent to Coho Creek.

In 1999, a culvert that blocked fish passage just below the project area was replaced, improving fish access to over two miles of ditch and stream channels. This current project proposes restoring a ditched section of the stream system with a natural channel configuration and reusing water from the Tribe's MBR plant to increase Coho and Chum salmon production within the stream system.

This project will include restoration of up to 1,300 feet of Coho Creek. In addition to channel restoration, this project will augment flows year-round, including during the summer low flow period, by an estimated 0.5 cubic feet per second (cfs) for a total of 362 AFY. Additional information is included in the project description in Appendix C.

Little Pilchuck Subbasin

Project Name: Lake Stevens Outlet Structure & Lake Level Management [7-LP-W3]

Project Description: This project would replace an outdated weir structure in the Lake Stevens outlet channel that manages the elevation in Lake Stevens to maximize flood storage availability in the winter and maintain summer flows in the channel while keeping lake elevations high for summer recreation. The replacement weir would allow for more precise management of lake levels, resulting in increased lake levels and increased streamflow coming out of the lake during the summer and early fall months into Catherine Creek, a tributary to the Little Pilchuck River.

Based on preliminary modeling, modification of the weir structure and operations could increase summer (July through October) lake levels by nearly half a foot. This would provide approximately 500 AFY of additional summer storage for the 1,000-acre lake and increased summer streamflow releases into Catherine Creek. Additional information is included in the project profile in Appendix C.

Pilchuck Subbasin

Project Name: Lochaven Source Switch [7-P-W4]

Project Description: The Lochaven Estates Community (Lochaven) is located approximately two miles northeast of the City of Lake Stevens. The 83-home community is situated between State Route 92 (Granite Falls Highway) and the Pilchuck River. Lochaven's water source is a shallow (23 feet deep) dug groundwater production well. The shallow completion depth suggests it may be hydraulically connected to the Pilchuck River.

This project would involve retirement of the water right associated with the Lochaven Water System to increase flows within the Pilchuck River and downstream areas. Water supply for this community would be transitioned to the Snohomish Public Utility District (PUD) system and Lochaven's existing water right would be protected instream through Ecology's Trust Water Rights Program. The Lochaven water right certificate authorizes year-round use for community domestic supply. The estimated water offset to the Pilchuck River is 12.7 AFY, based on the estimated consumptive use. An extent and validity determination by Ecology would be required to determine the actual quantity available for acquisition.

Snohomish PUD and Lochaven Water System representatives have discussed the source switch, and the Lochaven Water System supports further conversations about making the water rights available for transfer into the Trust Water Rights Program for permanent streamflow benefit. Additional information is included in the project profile in Appendix C.

Project Name: Lower Pilchuck No. 1 [7-P-W5]

Project Description: The Lower Pilchuck No. 1 water right acquisition project proposes acquiring one groundwater right in the Pilchuck subbasin for an estimated 2.8 AFY of consumptively used water. The water right certificate authorizes year-round use of up to 5.4 AFY for multiple domestic supply. This water right previously supplied water to nine homes until the domestic water needs covered under this water right were transferred to Snohomish PUD in 2011. Snohomish PUD has temporarily donated the water right to the Trust Water Rights Program, which expires in 2023.

The Lower Pilchuck 1 water right has a priority date of 11/14/1991, which is junior to the establishment of chapter 173-507 WAC in 1979. WWT identified that the water rights appear to have been put to continuous beneficial use. The consumptive use estimate is 2.8 AFY. WWT has had initial conversations with the water right holder, who expressed interest in selling if offered fair market value and transaction costs were covered.

Project Name: Lower Pilchuck No. 11 [7-P-W6]

Project Description: The Lower Pilchuck No. 11 water right acquisition project proposes acquiring one groundwater right in the Pilchuck subbasin for an estimated 2.1 AFY of consumptively used water. The water right certificate authorizes year-round use of up to 2.6 AFY for irrigation.

The land, and underlying water right, was previously used for a golf course which closed in 2013. The parcels that comprise the property have been under the same family ownership since 1946. Since the golf course closed, Ecology has received metering records that indicate water use on the property has continued although the purpose is unknown.

The Lower Pilchuck 11 water right has a priority date of 7/23/1947, which is senior to the establishment of chapter 173-507 WAC in 1979.

WWT estimated consumptive water use based on the estimated size of irrigated area derived from aerial imagery and assumed water application efficiency and return flow. The estimated water offset is 2.1 AFY, based on the estimated consumptive use. An extent and validity determination by Ecology would be required to determine the actual quantity available for acquisition.

Snoqualmie South Subbasin

Project Name: Raging River No. 1 [7-SS-W7]

Project Description: The Raging River No. 1 water right acquisition project proposes acquiring two water rights in the Raging River subbasin for up to 126 AFY of consumptively used water. While the water rights are located in the Raging River subbasin, Ecology anticipates that offset occur primarily in the Snoqualmie South subbasin and lists the project in Snoqualmie South.

The water right certificate authorizes up to 60 AFY for irrigation during irrigation season. The water right claim listed year-round use of up to 60 AFY for domestic, commercial-campground, and stock water uses. The land, and underlying water rights, were previously used to support irrigation, domestic supply, commercial-campground, and stock watering. According to online sources, the campground has been recently closed.

The Raging River 1 water rights have listed priority dates of 1/1/1910 (claimed) and 1/22/1992 (certificated) which are respectively senior and junior to the establishment of chapter 173-507 WAC in 1979.

WWT estimated consumptive water use based on the estimated size of irrigated area derived from aerial imagery and assumed water application efficiency and return flow. The estimated water offset is 126 AFY, based on the estimated consumptive use. An extent and validity determination by Ecology would be required to determine the actual quantity available for acquisition.

Patterson Subbasin

Project Name: Patterson No. 1 [7-PA-W8]

Project Description: The Patterson No. 1 water right acquisition project proposes acquiring two groundwater rights (one certificate and one claim) in the Patterson subbasin for an estimated 29.7 AFY of consumptively used water. The water right certificate authorizes year-round use of up to 64 AFY for fish propagation. The water right claim authorizes use of up to 110 AFY for domestic, stock, and irrigation uses. The land, and underlying water rights, were previously used to support fish propagation, domestic water supply, stock watering, and irrigation.

The Patterson 1 water right has priority dates of 4/6/1942 (claimed) and 5/11/1964 (certificated), which are both senior to the establishment of chapter 173-507 WAC in 1979.

WWT estimated consumptive water use based on the estimated size of irrigated area derived from aerial imagery and assumed water application efficiency and return flow. The estimated water offset is 29.7 AFY, based on the estimated consumptive use. An extent and validity determination by Ecology would be required to determine the actual quantity available for acquisition.

Project Name: Patterson No. 4 [7-PA-W9]

Project Description: The Patterson No. 4 water right acquisition project proposes acquiring three groundwater rights in the Patterson subbasin for an estimated 71.6 AFY of consumptively used water. The water right certificates authorize up to 86.8 AFY for irrigation during irrigation season. The land, and underlying water rights, were previously used to support a farm and then later a golf course.

The Patterson 4 water rights have priority dates of 11/8/1946, 7/14/1939, and 7/31/1939—all senior to the establishment of chapter 173-507 WAC in 1979.

WWT estimated consumptive water use based on the estimated size of irrigated area derived from aerial imagery and assumed water application efficiency and return flow. The estimated water offset is 71.6 AFY, based on the estimated consumptive use. An extent and validity determination by Ecology would be required to determine the actual quantity available for acquisition.

Upper Snoqualmie Subbasin

Project Name: Snoqualmie Watershed MAR [7-USQ-W10]

Project Description: WWT proposes pursuing feasibility studies and construction of one or more MAR facilities in the Snoqualmie Watershed. The Snoqualmie Watershed MAR project concept includes diverting surface water annually from the Snoqualmie River or a tributary in the Snoqualmie North, Snoqualmie South and/or Upper Snoqualmie subbasins. Water would only be diverted during the high flow periods between November 1 and June 30 of each year, when excess water is available.

Diverted water would be conveyed from a collector well adjacent to the river (e.g., Ranney Collector well) or through an instream surface water intake and piped to a constructed MAR facility. This diverted surface water infiltrates into the shallow aquifer, is transported down-gradient, and ultimately discharges back to surface water as re-timed groundwater baseflow. The goal of the project is to increase baseflow to the Snoqualmie River or tributaries nearest to the project location by recharging the aquifer adjacent to the river and providing additional groundwater discharge to the river from the MAR. Any new diversion of surface water will be junior to chapter 173-507 WAC.

This plan is considering four potential sites for a future MAR facility and recognizes that there may be additional sites that have not yet been identified. Additional feasibility studies are required to verify site feasibility and the amount and timing of streamflow benefits.

Ecology assumes at least one site is developed and estimates 198 AFY of water offset based on the following assumptions:

- 1 cfs of water will be available to be diverted for 100 days each year.
- Water will be diverted during the 242-day window between November 1st and June 30th of each year.
- Water will only be diverted when flows in the river are above the minimum instream flows established in chapter 173-507 WAC.

It is possible that diversion could occur for more than 100 days. In this case, the offset volume would be larger than 198 AFY.

Ecology is crediting the entire quantity of recharged water from MAR projects because the quantity of streamflow benefits realized from these projects directly correlates to the quantity of water placed into the ground. MAR projects help to offset consumptive uses and provide water quality benefits on a year-round basis.

Additional information on these potential sites is included in the Three Forks MAR, Middle Fork MAR, North Bend MAR, and NF-5700 MAR project descriptions in Appendix C.

Project Name: Snoqualmie River Watershed Surface Water Storage Project [7-USQ-W11]

Project Description: The Snoqualmie Valley Watershed Improvement District (SVWID) proposes developing at least one surface water storage project in the Upper Snoqualmie, Snoqualmie South, and/or Cherry-Harris subbasin. The SVWID has completed a comprehensive storage study to assess the potential for a wide range of surface water storage projects, including small to large storage opportunities, throughout the watershed.

Ten potential water storage projects, ranging in capacity from 77 to 3,331 AFY, were selected for further analysis. These sites include off-channel storage reservoirs, on-channel storage reservoirs, and projects that would result in raising the level of an existing lake to create additional storage capacity. Water would be released during critical low-flow periods to sustain streamflows in critical reaches of the Snoqualmie River and its tributaries and offset future domestic water uses.

Ecology conservatively estimates 77 AFY of water offset, assuming at least one of these projects will be constructed in WRIA 7.[34] Analysis of potential sites is in progress, including landowner outreach and more detailed analysis of hydrology and capacity. Additional information on the potential storage sites is included in the project description in Appendix C.

5.2.2 Habitat Projects

Table 5.2 summarizes the 26 habitat projects included in this plan that provide ecological benefits to WRIA 7. More detailed habitat project descriptions are provided in Appendix C.

Although many of these habitat projects have potential streamflow benefits, quantifying water offsets from habitat projects is difficult to do with a high degree of certainty. More detailed habitat project descriptions are provided in Appendix C.

All project sponsors agreed to have their projects listed here. Although project sponsors noted a willingness to proceed, the listing of a project in this plan does not obligate Ecology to fund a project or the project sponsor to carry out the project (see Ecology's POL-2094). Therefore, this plan does not guarantee that sponsors will complete these projects or that expected benefits will occur.

The total offset benefits surpass the consumptive use estimate, which provides a reasonable assurance that the plan will offset the estimated consumptive use from new PE wells and achieve NEB. Ecology encourages project sponsors to complete the projects, and provides incentives through the streamflow restoration grant program.

[34] Ecology based its water offset on the smallest capacity of the 10 projects identified for further analysis by the Snoqualmie Watershed Irrigation District, assuming at least one site is developed.

Table 0.2: WRIA 7 Habitat Projects

Project Number	Project Name	Project Description	Subbasin(s)	Anticipated Ecological Benefits	Project Sponsor	Estimated Cost
7-QA-H1	Jones Creek Relocation and Wetland Enhancement	Channel creation, installation of LWD and riparian reforestation, and wetland depression restoration	Quilceda-Allen	Fish refuge, higher quality fish and macroinvertebrate habitat, more resilient channel to handle effects of urbanization, increase hyporheic interaction	City of Marysville, Sound Salmon Solutions, and Adopt-A-Stream Foundation	$769,044
7-QA-H2	Marysville Stormwater Retrofits (Quilceda Stormwater Project)	Green stormwater infrastructure, retrofits of stormwater ponds, rainfall capture, & outreach and education	Quilceda-Allen	Enhanced infiltration will return stormwater runoff to the ground, improve water quality, and increase groundwater discharge to streams	Snohomish Conservation District	$426,000
7-QA-H3	Quilceda 8 Restoration & Potential Water Right Acquisition	Property acquisition	Quilceda-Allen	Acquisition will facilitate future restoration actions	Tulalip Tribes	Unknown

Project Number	Project Name	Project Description	Subbasin(s)	Anticipated Ecological Benefits	Project Sponsor	Estimated Cost
7-ES-H4	Silver Firs Stormwater Pond Retrofits (Little Bear Stormwater)	Expand existing stormwater ponds by deepening and increasing pond infiltration capacity	Estuary/Snohomish Mainstem	Enhanced infiltration will return stormwater runoff to the ground, improve water quality, and increase groundwater discharge to streams	Snohomish County	Design and Construction = $1.4 million for CIP Sites 10 and 16 (Feasibility funding secured)
7-ES-H5	Thomas' Eddy Hydraulic Reconnection	Levee and revetment removal, floodplain restoration and riparian planting	Estuary/Snohomish Mainstem	Off-channel habitat for salmon and improvement of floodplain connection and riverine processes	Snohomish County	Design, permitting, & construction = $3.5 million
7-P-H6	Snohomish Floodplain Acquisitions Phase 1 (Lund Acquisition)	Acquisition of up to 57 acres and 1.43 miles of riparian and floodplain property adjacent to the Pilchuck River	Pilchuck	Acquisition will facilitate future restoration actions	Tulalip Tribes	Acquisition = $900,000 Restoration = $300,000

Project Number	Project Name	Project Description	Subbasin(s)	Anticipated Ecological Benefits	Project Sponsor	Estimated Cost
7-P-H7	Pilchuck River Armoring Removal	Removal or “softening” of approximately 2,000 linear feet of bank armoring within the Middle Pilchuck subbasin	Pilchuck	Armoring removal will improve floodplain/riparian function, in-stream habitat, and water quality for adult and juvenile salmon	Tulalip Tribes	Planning = $200,000 Restoration = $500,000
7-P-H8	Living with Beavers Program	Outreach to educate landowners and encourage them to allow beavers to remain on the landscape.	Multiple (Pilchuck, Woods, Estuary/Snohomish Mainstem, Little Pilchuck)	Increased water storage, groundwater recharge, summer flows and climate change resiliency; decreased surface water temperatures	Snohomish Conservation District	Implementation: $100,296 (secured)

Project Number	Project Name	Project Description	Subbasin(s)	Anticipated Ecological Benefits	Project Sponsor	Estimated Cost
7-P-H10	Wetland Restoration	Complete eighteen acres of wetland restoration planting on degraded wetlands on privately owned land with the goal of improving water storage and groundwater recharge	Multiple (Pilchuck, Woods, Estuary/Snohomish Mainstem, Little Pilchuck, Skykomish Mainstem)	Improved surface water storage, increased groundwater recharge, summer streamflows, and resilience to climate change; decreased surface water runoff	Snohomish Conservation District	Planning, design, and construction: $220,240 (secured)
7-W-H11	Woods Creek Riparian Restoration Partnership	Plant native trees and shrubs 45 acres of riparian forest along the mainstem of Woods Creek and correct between 3 and 5 fish passage barriers to improve juvenile and adult access to spawning and rearing habitat	Woods	Increased shade, decreased water temperatures, improved habitat for juvenile salmonids	Snohomish Conservation District	$650,000 (secured through DOE/NOAA and SRFB). Planting, LWD installation, & Barrier Removal = $950,000

Project Number	Project Name	Project Description	Subbasin(s)	Anticipated Ecological Benefits	Project Sponsor	Estimated Cost
7-S-H12	Expansion of Sultan River Side Channel Network (Sultan River Floodplain Activation)	Expansion of an existing side channel network to provide structural complexity and hydraulic diversity in the main channel	Sultan	Increased diversity in spawning habitat important for building resiliency in existing and future salmonid populations	Snohomish PUD	Design, permitting and construction = $1.1 million Maintenance and monitoring for first 5 years = $10,000/year
7-SM-H13	Haskel Slough Connectivity	Modifying the inlet dike to enhance juvenile salmon rearing and flood refuge in Haskel Slough	Skykomish Mainstem	Floodplain water storage, increase salmonid rearing habitat, and provide flood refuge habitat in a key area of the Snohomish River Basin	Tulalip Tribes	Outreach/prelimina ry-final designs: $400,000 Planning costs Implementation cost = $3 million

Project Number	Project Name	Project Description	Subbasin(s)	Anticipated Ecological Benefits	Project Sponsor	Estimated Cost
7-SM-H14	East Monroe Heritage Site Acquisition	Land acquisition along the main stem of the Skykomish River to preserve as an open space and use the site for flood water storage and displacement	Skykomish Mainstem	Acquisition of the property would sustain critical surface water and groundwater networks from being endangered or depleted. This project also protects off-channel habitats not currently protected	City of Monroe	Acquisition of 5 parcels = $3 million
7-SM-H15	Shinglebolt Slough	Reconnect the eastern, filled upstream section of Shingle Bolt Slough, remove riprap and berm along Skykomish River and create side channel habitat accessible during spring out-migration flows, install log wood jams and riparian vegetation	Skykomish Mainstem	Increase flood storage more frequently across 15 acres of floodplain. Floodplain side channels and ponded off-channel habitat areas will provide rearing habitat for salmon	Snohomish County	Design and Construction = $3,234,544 O&M = $250,000

Project Number	Project Name	Project Description	Subbasin(s)	Anticipated Ecological Benefits	Project Sponsor	Estimated Cost
7-SM-H16	Snohomish Confluence Project + Left Bank Floodplain reconnection at RM 1.5	Planning and property acquisition request to restore and enhance floodplain connection, abandoned side channels and connections to Riley Slough just upstream of junction of Skykomish and Snoqualmie Rivers	Skykomish Mainstem	Future opportunity to increase rearing and spawning habitat for salmon	Tulalip Tribes	Design, permit and construct = $900,000

Project Number	Project Name	Project Description	Subbasin(s)	Anticipated Ecological Benefits	Project Sponsor	Estimated Cost
7-USK-H17	Miller River Alluvial Fan Restoration	Riprap removal, floodplain reconnection, side channel reactivation	Upper Skykomish	Additional annual storage through floodplain reconnection, improve overall watershed hydrology which will restore habitat forming hydrologic processes for salmon downstream	King County	Three phases of design and construction = $4.6 million Fourth phase (revetment removal, revetment setback and side channel reactivation) = $2.6 million in construction costs
7-USK-H18	Tulalip Tribes Beaver Reintroduction Program	Protect hydrologic processes and function through relocation of beavers to improve fish rearing habitat and freshwater storage	Multiple (Lower Mid-Skykomish, Upper Skykomish, Raging, Upper Snoqualmie)	Increase instream and riparian habitat, improve stream temperature, reduce bank erosion, improve bank and floodplain connectivity	Tulalip Tribes	$80,000 annually (secured through 2021)

Project Number	Project Name	Project Description	Subbasin(s)	Anticipated Ecological Benefits	Project Sponsor	Estimated Cost
7-CH-H19	Cherry Creek and Stossel Creek Climate Resilient Watershed	Suite of actions in Cherry and Stossel Creek watersheds including removal of bank armoring, riparian restoration, levee improvements and levee setbacks, culvert replacements, LWD placement, side channel excavation, and small-scale natural storage.	Cherry-Harris, Snoqualmie South	Floodplain reconnection, restoration of riparian areas.	Snoqualmie Valley Watershed Improvement District	Total cost unknown (Feasibility and design funding secured for small-scale storage)
7-SN-H20	Camp Gilead Levee Removal Phase 2	Levee removal on the left bank of the Snoqualmie River to reconnect floodplain habitat.	Snoqualmie North	Floodplain reconnection, restoration of riparian areas and providing additional rearing and spawning habitat.	King County	Design, permit, construct and monitor = $1.5 million

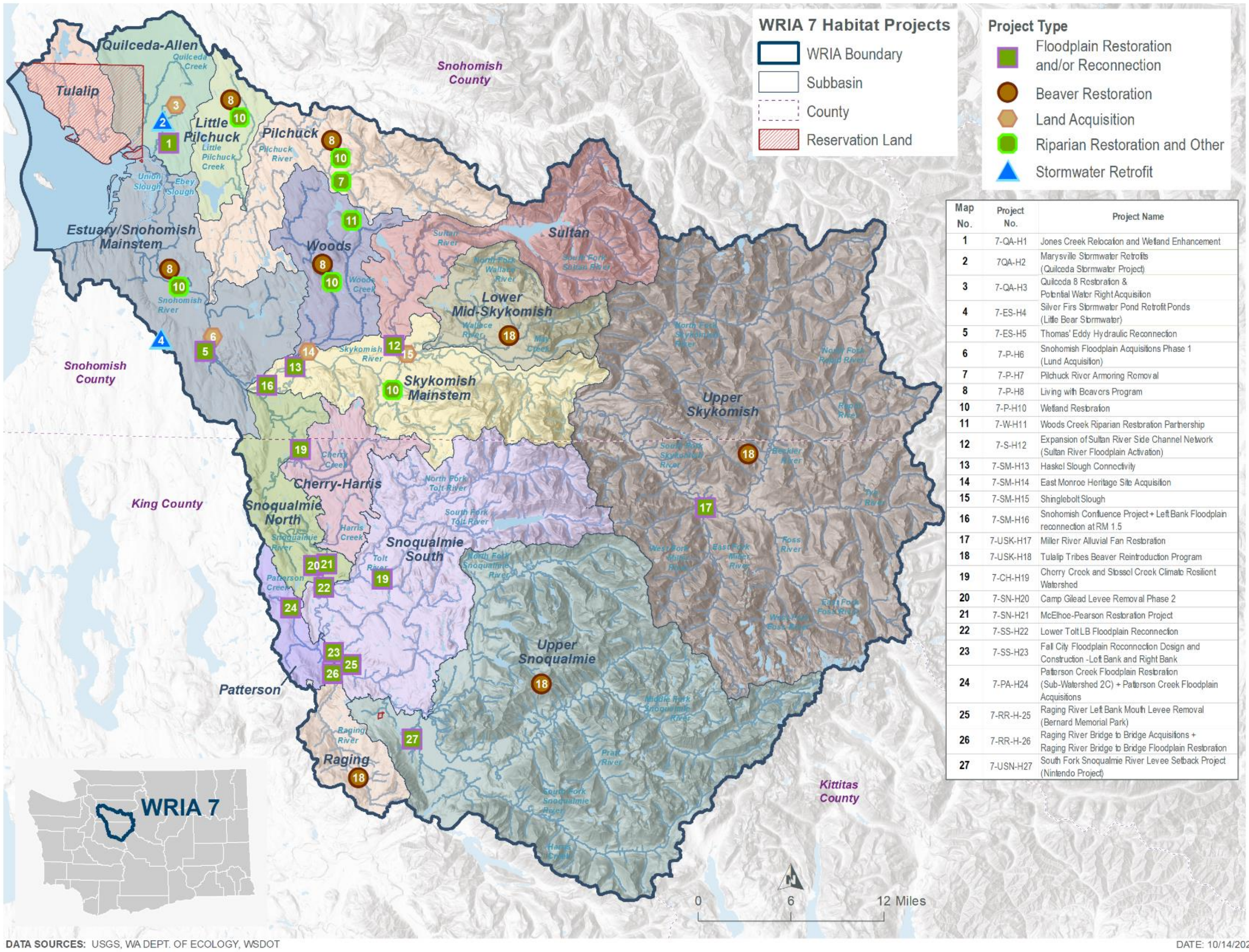
Project Number	Project Name	Project Description	Subbasin(s)	Anticipated Ecological Benefits	Project Sponsor	Estimated Cost
7-SN-H21	McElhoe-Pearson Restoration Project	Removal of the McElhoe Pearson levee or creation of a flow through channel to improve habitat connectivity.	Snoqualmie North	Floodplain reconnection, restoration of riparian areas and providing additional rearing and spawning habitat.	King County	$918,000
7-SS-H22	Lower Tolt LB Floodplain Reconnection (SR 203 to Confluence)	Feasibility study to determine options for fully or partially removing existing levee/revetment to improve floodplain connection.	Snoqualmie South	Future restoration actions will provide salmon access to off channel habitat.	King County	Feasibility = $250,000
7-SS-H23	Fall City Floodplain Reconnection Design and Construction – Left Bank and Right Bank	Project includes 2 adjacent floodplain reconnection projects: Barfuse Project and Hafner Project.	Snoqualmie South	Floodplain restoration will improve juvenile rearing and adult spawning habitat.	King County	$15,250,000 ($550,000 secured)

Project Number	Project Name	Project Description	Subbasin(s)	Anticipated Ecological Benefits	Project Sponsor	Estimated Cost
7-PA-H24	Patterson Creek Floodplain Restoration (Sub-Watershed 2C) + Patterson Creek Floodplain Acquisitions	Property acquisition to perform floodplain restoration through riparian restoration and channel complexity.	Patterson	Floodplain restoration will improve juvenile rearing and adult spawning habitat.	King County Department of Natural Resources	Acquire parcels and perform restoration actions = $1,625,000
7-RR-H25	Raging River Left Bank Mouth Levee Removal (Bernard Memorial Park)	Levee removal at Bernard Memorial Park and reconnect 6 acres of floodplain habitat.	Raging	Floodplain restoration will improve juvenile rearing and adult spawning habitat.	Mountains to Sound Greenway Trust	Design, permitting, and construction = $3.5 million
7-RR-H26	Raging River Bridge to Bridge Acquisitions + Raging River Bridge to Bridge Floodplain Restoration	Property acquisitions for future floodplain restoration projects. Proposed restoration actions include removal and setback of levee along right bank of Raging River.	Raging	Floodplain restoration will improve juvenile rearing and adult spawning habitat.	King County Department of Natural Resources	$15.5 million

Project Number	Project Name	Project Description	Subbasin(s)	Anticipated Ecological Benefits	Project Sponsor	Estimated Cost
7-USN-H27	South Fork Snoqualmie River Levee Setback Project (Nintendo Project)	Levee setback and creation of floodplain and riparian habitat.	Upper Snoqualmie	Improve watershed hydrology to benefit downstream water quality, summer flows, water temperature, etc.	City of North Bend	$8.6 million

Table Note:

Ecology maintained project numbers from the WRIA 7 Committee’s draft plan. Project numbers in Table 5.2 jump from H8 to H10 because project 7-P-H9 is not included in this plan.



Map No.	Project No.	Project Name
1	7-QA-H1	Jones Creek Relocation and Wetland Enhancement
2	7QA-H2	Marysville Stormwater Retrofits (Quilceda Stormwater Project)
3	7-QA-H3	Quilceda 8 Restoration & Potential Water Right Acquisition
4	7-ES-H4	Silver Firs Stormwater Pond Retrofit Ponds (Little Bear Stormwater)
5	7-ES-H5	Thomas' Eddy Hydraulic Reconnection
6	7-P-H6	Snohomish Floodplain Acquisitions Phase 1 (Lund Acquisition)
7	7-P-H7	Pilchuck River Armoring Removal
8	7-P-H8	Living with Beavers Program
10	7-P-H10	Wetland Restoration
11	7-W-H11	Woods Creek Riparian Restoration Partnership
12	7-S-H12	Expansion of Sultan River Side Channel Network (Sultan River Floodplain Activation)
13	7-SM-H13	Haskel Slough Connectivity
14	7-SM-H14	East Monroe Heritage Site Acquisition
15	7-SM-H15	Shinglebolt Slough
16	7-SM-H16	Snohomish Confluence Project + Left Bank Floodplain reconnection at RM 1.5
17	7-USK-H17	Miller River Alluvial Fan Restoration
18	7-USK-H18	Tulalip Tribes Beaver Reintroduction Program
19	7-CH-H19	Cherry Creek and Stossel Creek Climate Resilient Watershed
20	7-SN-H20	Camp Gilead Levee Removal Phase 2
21	7-SN-H21	McElhoe-Pearson Restoration Project
22	7-SS-H22	Lower Tolt LB Floodplain Reconnection
23	7-SS-H23	Fall City Floodplain Reconnection Design and Construction -Left Bank and Right Bank
24	7-PA-H24	Patterson Creek Floodplain Restoration (Sub-Watershed 2C) + Patterson Creek Floodplain Acquisitions
25	7-RR-H-25	Raging River Left Bank Mouth Levee Removal (Bernard Memorial Park)
26	7-RR-H-26	Raging River Bridge to Bridge Acquisitions + Raging River Bridge to Bridge Floodplain Restoration
27	7-USN-H27	South Fork Snoqualmie River Levee Setback Project (Nintendo Project)

Figure 0.2: WRIA 7 Habitat Projects

5.3 Project Implementation Summary

5.3.1 Summary of Projects and Benefits

Per RCW 90.94.030(3), this watershed plan must include actions necessary to offset potential impacts to instream flows associated with new PE well water use and result in a NEB to instream resources within the WRIA.

As specified in 0, this plan estimates 797.4 acre-feet per year (AFY) of consumptive use from new PE wells over the planning horizon. This plan includes two lake level management projects, one streamflow augmentation project, six water right acquisitions projects, one water managed aquifer recharge project, and one surface water storage project to offset consumptive use. The water offset projects included in Table 0.1 provide an estimated offset of 1,444.4 AFY and exceed the estimated consumptive use.

This plan includes a total of 26 habitat projects, shown in Table 0.2. Ecological benefits associated with these projects include:

- Floodplain restoration.
- Wetland reconnection.
- Availability of off-channel habitat for juvenile salmonids.
- Reduction of peak flow during storm events.
- Increase in groundwater levels and baseflow.
- Increase in channel complexity.

These habitat projects will contribute to addressing limiting factors for salmonids in WRIA 7 by returning floodplain, riparian, and wetland areas to a more natural state. Floodplain reconnection and beaver restoration projects will also contribute to restoring hydrologic processes.

While many of these projects have potential streamflow benefits, water offsets from habitat projects are not accounted for in this plan. The ecological and streamflow benefits from habitat projects are supplemental to the quantified water offsets.

5.3.2 Cost Estimate for Offsetting New Domestic Water Use Over 20 Year Planning Horizon

Per RCW 90.94.030(3)(d), this watershed plan must include an evaluation or estimation of the cost of offsetting new domestic water uses over the subsequent 20 years. To satisfy this requirement, Ecology developed planning-level cost estimates for each of the water offset projects listed in Table 0.1. This plan also includes cost estimates for habitat projects in Table 0.2 when that information was provided by the project sponsor.

Cost estimates for water offset projects included in the plan are planning level only. Ecology used costs from the project sponsor, from recently completed water right acquisitions, or from recent streamflow restoration grant applications for similar projects types as a funding template. Ecology based the cost estimate for the Snoqualmie Watershed MAR project on estimated cost per acre-foot, assuming the largest of four identified potential sites is developed. Cost may vary for each of the potential MAR sites and will depend on the number of MAR projects constructed.

Cost estimates for water right acquisition projects are also based on estimated cost per acre-foot and the offset estimate (irrigation water rights) or authorized volume (municipal water rights). Costs range widely for water right acquisitions; these estimates may not reflect actual costs. For all water right acquisitions, an extent and validity determination will establish how much water can be permanently protected before transferring the water right into Ecology’s Trust Water Rights Program. Final costs for these water right acquisitions will be negotiated between the willing seller and the willing buyer.

The estimated cost for implementing individual water offset projects range from $5,000 for the Lower Pilchuck No. 11 water right acquisition project to $3.5 million for the SVWID surface water storage project. The total estimated cost for implementing the water offset projects described in this plan is approximately $7 million.

The estimated cost for implementing individual habitat projects ranges from $20,000 (per lined storage pond) for the Snohomish Conservation District Small Farm Storage Initiative project to $15.5 million for the Raging River Bridge to Bridge Acquisitions + Raging River Bridge to Bridge Floodplain Restoration project.

Project sponsors will further refine these cost estimates during their project scoping and development processes.

5.3.3 Certainty of Implementation

Certainty of implementation depends on many factors, including identification and support of project sponsors, readiness to proceed/implement the project, and identification of potential barriers to completion. Each of the water offset projects listed in Table 0.1 have project sponsors who are ready to proceed with project development. The City of Lake Stevens is pursuing the Lake Stevens outlet structure and lake level management project and has conducted preliminary engineering studies. Tulalip Tribes is sponsoring the Coho Creek streamflow enhancement project and has been restoring Coho Creek flows and habitat since 2001. The SVWID is sponsoring the Snoqualmie Valley storage project, funded in part by a 2019 Ecology grant. WWT is sponsoring the MAR and water right acquisition projects to pursue implementation. This increases certainty of implementation of these projects.

One of the largest barriers or challenges to implementation is funding. Willingness of landowners to sell existing water rights is one very uncertain component of this plan. Other significant potential barriers include land ownership and willingness to sell or allow development of project footprints, technical feasibility (e.g., amenable soil characteristics for MAR or water storage projects), and legal feasibility (e.g., ability to acquire new water rights for MAR and water storage; land use permitting to construct in floodplains, wetlands, or other critical areas).

Many of the projects included in this plan have not yet secured landowner approval. While landowner acknowledgement and approval are not required for projects to be included in this watershed plan, some projects will need landowner approval prior to construction.

The types of water offset projects proposed in this plan have been successfully implemented within Washington State and the technology to implement these types of projects is proven. Purchasing existing water rights for incorporation into the Trust Water Rights Program has been occurring throughout the state since the early 1990s.

All 26 of the habitat projects listed in this plan have project sponsors with experience implementing similar projects and are dedicated to implementing these projects and improving instream resources. The habitat projects listed in this plan are similar to projects being implemented throughout the state to help restore and enhance instream resources. Having sponsors who will advocate for these projects helps provide reasonable assurance that this plan can be implemented.

The water offset projects included in this plan will are likely to be implemented and provide benefits during the planning horizon. Once lake outlet structures are replaced and lake management operational procedures are implemented, those offset benefits will persist. The source water for the Coho Creek enhancement project will be generated indefinitely as it comes from regional growth served by a reclaimed water facility. Benefits from water rights transferred into the Trust Water Rights Program will persist in perpetuity. Water storage and retiming projects are expected to provide long-term benefits. These examples provide reasonable assurances that the water offset benefits will persist for as long as the new uses.

Chapter Six: Net Ecological Benefit

6.1 Overview

Watershed Restoration and Enhancement Plans must identify projects and actions to offset the potential consumptive impacts of new permit-exempt domestic groundwater withdrawals on instream flows over the planning horizon and provide a net ecological benefit to the WRIA. The Final NEB Guidance establishes Ecology's interpretation of the term "net ecological benefit" as "the outcome that is anticipated to occur through implementation of projects and actions in a plan to yield offsets that exceed impacts within: a) the planning horizon; and, b) the relevant WRIA boundary" (Ecology 2019a). This chapter provides Ecology's analysis of the WRIA 7 watershed plan's reasonable assurance in meeting NEB.

6.2 Net Ecological Benefit Analysis

The WRIA 7 watershed plan provides a path forward for offsetting an estimated 797.4 AFY of new consumptive water use in WRIA 7. The plan primarily achieves this offset through eleven water offset projects with a total estimated offset of 1,444.4 AFY. This total offset yields a surplus offset of 647 AFY above the 797.4 AFY consumptive use estimate. This plan also includes 26 habitat projects, which provide numerous additional benefits to aquatic and riparian habitat. The ecological and streamflow benefits from these habitat projects are supplemental to the quantified water offset projects and will contribute to achieving a NEB.

6.2.1 Review of PE Well Projection and Consumptive Water Use Estimate

This plan divides WRIA 7 into 16 subbasins (see Figure 3.1), then distributes the number of projected PE wells across the subbasins based on historic building trends.

This plan projects 3,389 new PE wells installed in WRIA 7 over the planning horizon. Based on this projection, the plan estimates 797.4 AFY of new consumptive water use from new PE wells in WRIA 7.

The method for estimating outdoor water use (outlined in Ecology's NEB Guidance) was designed to be protective of instream resources. The outdoor water use component was based on the assumption that every new PE well homeowner will water their lawn at rates equal to those of commercial turf grass in the Washington Irrigation Guide (NRCS-USDA 1997). Commercial turf grass irrigation rates are much higher than typical domestic applications. Therefore, the 797.4 AFY is a conservative estimate of consumptive water use.

6.2.2 Quantity and Spatial Distribution of Water Offset Project Benefits

Table 6.1 provides a summary of the eleven water offset projects listed in the plan to offset consumptive use and contribute toward achieving NEB in WRIA 7. The potential water offset of these eleven projects is 1,444.4 AFY, a surplus of 647 AFY above the consumptive use estimate. Therefore, the plan succeeds in offsetting consumptive use impacts at the WRIA scale. Water offset benefits are anticipated in the subbasins listed in Table 6.2 as well as downstream of the respective project locations.

All of the water offset projects have identified project sponsors. If funded, Ecology expects projects will be implemented within the planning horizon and provide benefits beyond the planning horizon and as long as new PE well use continues. Ecology finds that the offset amounts are reasonable, and that these projects, once implemented, will meet the requirements of RCW 90.94.030.

Table 6.1: Summary of WRIA 7 Water Offset Projects included in NEB analysis

Project Number	Project Name	Project Short Description	Subbasin	Estimated Water Offset Benefits (AFY)
7-T-W1	Lake Shoecraft Outlet Modification Project	Replacement of the existing stop log control structure with an adjustable slide-gate weir to allow more consistent streamflow releases during summer	Tulalip	62.5
7-QA-W2	Coho Creek Relocation and Streamflow Enhancement Project	Restoration of stream habitat conditions within Coho Creek and augmentation of summer low flows using effluent from an MBR Wastewater Treatment Plant adjacent to Coho Creek	Quilceda-Allen	362
7-LP-W3	Lake Stevens Outlet Structure & Lake Level Management Project	Replacement of an outdated weir structure in the Lake Stevens outlet channel that manages the elevation in Lake Stevens to maximize flood storage availability in the winter and maintain summer flows in the channel	Little Pilchuck	500
7-P-W4	Lochaven Source Switch	Retirement of the water right associated with the Lochaven Water System as a basis for increasing flows within the Pilchuck River and downstream areas	Pilchuck	12.7
7-P-W5	Lower Pilchuck No. 1	Acquisition of one groundwater right previously used for domestic supply	Pilchuck	2.8
7-P-W6	Lower Pilchuck No. 11	Acquisition of one groundwater right previously used for golf course irrigation	Pilchuck	2.1
7-SS-W7	Raging River No. 1	Acquisition of two water rights used for irrigation, domestic supply, commercial-campground, and stock watering	Snoqualmie South	126
7-P-W8	Patterson No. 1	Acquisition of two groundwater rights previously used to support fish propagation, domestic supply, stock watering, and irrigation	Patterson	29.7
7-P-W9	Patterson No. 4	Acquisition of three groundwater rights previously used to support a farm and, subsequently, a golf course	Patterson	71.6

Project Number	Project Name	Project Short Description	Subbasin	Estimated Water Offset Benefits (AFY)
7-USQ-W10	MAR in Snoqualmie Watershed; Potential Sites: North Bend, Three Forks, NF 5700	Diversion of streamflow from the Snoqualmie River or tributary for infiltration at a constructed MAR facility	Upper Snoqualmie, Snoqualmie South, Snoqualmie North	198
7- USQ-W11	Snoqualmie River Watershed Surface Water Storage	Diversion of streamflow from the Snoqualmie River or tributary for detention at a surface water storage reservoir for later release to the subject stream	Upper Snoqualmie; Snoqualmie South, Cherry-Harris	77
			Total	**1,444.4**

Table 6.2 provides a summary of estimated water offset and consumptive use by subbasin, including surplus or deficit. This plan anticipates that eleven water offset projects will be developed in seven subbasins. Collectively, all eleven projects will generate 1,444.4 AFY of offset water across WRIA 7. Nine subbasins do not contain water offset projects. WRIA-wide, the plan anticipates ten subbasins will experience water offset deficits that total 460.7 AFY. All ten subbasins with a water offset deficit have habitat projects. WRIA-wide, the water offset projects will generate a net surplus of 647 AFY above the plan's projected PE well consumptive use. Several of the subbasins that do not have water offset projects will benefit from water offset projects that are located upstream in the watershed.

Table 6.2 Subbasin Water Offset Totals compared to Subbasin Consumptive Use Estimate

Subbasin	Offset Project Totals (AFY)	Consumptive Use (AFY)[1]	Surplus/Deficit (AFY)[2]
Tulalip	62.5	58.1	+4.4
Quilceda-Allen	362	62.1	+299.9
Estuary/Snohomish Mainstem	0	115.8	-115.8
Little Pilchuck	500	69.5	+430.5
Pilchuck	17.6	111.0	-93.4
Woods	0	31.5	-31.5
Sultan	0	6.5	-6.5
Lower Mid-Skykomish	0	8.8	-8.8
Skykomish Mainstem	0	32.1	-32.1
Upper Skykomish	0	6.0	-6.0
Cherry-Harris	0	40.4	-40.4
Snoqualmie North	0	87.4	-87.4
Snoqualmie South	126	40.3	+85.7
Patterson	101.3	55.0	+46.3
Raging	0	38.8	-38.8
Upper Snoqualmie	275	34.2	+240.8
WRIA 7 Total	**1,444.4**	**797.4**	**+647**

Table Notes:

[1] Totals may differ due to rounding.

[2] Surplus water offset is associated with a positive value and a deficit in water offset is associated with a negative value. Note that RCW 90.94.030 requires that offsets are met at the WRIA level, and not at the subbasin level.

The water offset projects listed in **Error! Reference source not found.** provide additional benefits to instream resources beyond those necessary to offset the impacts from new consumptive water use within the WRIA. These additional benefits for the project types planned in WRIA 7 include the following:

- Lake Stevens and Lake Shoecraft outlet modification/lake level management projects: Aquatic habitat improvements during key seasonal periods; flexibility in reservoir outlet control; flood control benefits; and/or improved coordination with downstream hatchery streamflow needs.
- Coho Creek Relocation and Streamflow Enhancement Project: Aquatic habitat improvements during key seasonal periods; stream habitat restoration; improved fish access; improved spawning and rearing habitat; and increased streamflow from reclaimed water provided for streamflow augmentation.
- Water right acquisitions and Lochaven Source Switch Project: Aquatic habitat improvements during key seasonal periods; reduction in groundwater withdrawals and associated benefit to aquifer resources; and/or increased groundwater availability to riparian and near-shore plants.
- MAR project(s): Aquatic habitat improvements during key seasonal periods; increased groundwater recharge; reduction in summer/fall stream temperature; increased groundwater availability to riparian and near-shore plants; and/or flood control benefits.
- Snoqualmie River Watershed Surface Water Storage Project(s): Aquatic habitat improvements during key seasonal periods and flood control benefits.

6.2.3 Quantity and Spatial Distribution of Habitat Project Benefits

The watershed plan presents a suite of 26 habitat projects that will provide ecological benefits to the watershed beyond those necessary to offset the impacts from new consumptive water use. Habitat improvement actions associated with these projects include a combination of land acquisition, creek relocation, wetland enhancement, floodplain restoration, floodplain reconnection, aquatic habitat restoration, riparian vegetation plantings, levee and/or bank armoring removal, levee setback, large woody debris (LWD) installation, beaver management, beaver colonization, small-scale water storage, side channel reconnection/expansion, inlet dike modification, and stormwater management. Many of the habitat improvement projects include more than one of these elements. Project descriptions are summarized in Table 6.3.

These projects target the salmonid habitat limiting factors identified for this watershed. Benefits include:

- Increased hydraulic/aquatic habitat diversity
- Restored native vegetation
- Restored water temperature
- Improved sediment processes
- Improved spawning and rearing habitat
- Water quality benefits

Table 6.3 provides additional detail on these benefits. Additionally, some of these habitat projects have potential streamflow benefits, but those quantities were not estimated due to uncertainties regarding magnitude, reliability, and timing of streamflow benefits. All 26 of the habitat projects have identified project sponsors, and if funded, are expected to be implemented within the planning horizon.

Table 6.3: Summary of WRIA 7 Habitat Improvement Projects included in NEB Analysis

Project Number[1]	Project Name	Project Short Description	River Reach Benefitted	Other Benefits with Quantifiable Metric (e.g., structures per mile)	Habitat Limiting Factor(s) Addressed
7-QA-H1	Jones Creek Relocation and Wetland Enhancement	Channel creation, installation of LWD and riparian reforestation, and wetland depression restoration	Jones Creek near the mouth of Snohomish River	-Increase in channel complexity (mapping) -Area of restored riparian buffer (3.6 acres) -Length of restored meandering channel (780 lineal feet) -Number of wetland surface infiltration ponds (4 ponds) -Number of off-channel rearing infiltration ponds (5 ponds) -LWD installation (65 structures)	-Fish habitat access -Floodplain modifications -Channel conditions -Substrate conditions -Riparian conditions -Water quality -Water quantity -Rearing habitat
7QA-H2	Marysville Stormwater Retrofits (Quilceda Stormwater Project)	Green stormwater infrastructure, retrofits of stormwater ponds, rainfall capture, & outreach and education.	Quilceda and Allen Creeks	-Number of stormwater pond retrofits (4 ponds) -Depave area (acres TBD) -Increased infiltration (AFY TBD) -Increase in recharge/ groundwater levels (monitoring) -Streamflow maintenance (monitoring)	-Water quality -Water quantity
7-QA-H3	Quilceda 8 Restoration & Potential Water Right Acquisition	Property and potential water right acquisition	Allen Creek on eastern border of the City of Marysville	-Property acquired (acres TBD) -Retirement of water right (16.8 AFY) -Area of restored riparian buffer (acres TBD)	-Floodplain modifications -Riparian conditions -Water quality -Water quantity

Project Number[1]	Project Name	Project Short Description	River Reach Benefitted	Other Benefits with Quantifiable Metric (e.g., structures per mile)	Habitat Limiting Factor(s) Addressed
7-ES-H4	Silver Firs Stormwater Pond Retrofit Ponds (Little Bear Stormwater)	Expand existing stormwater ponds by deepening and increasing pond infiltration capacity.	Snohomish River	-Number of stormwater pond retrofits (2 ponds) -Increased stormwater pond storage (3.09 AF) -Increased infiltration (27 AFY) -Increase in recharge/ groundwater levels (monitoring) -Streamflow maintenance (monitoring)	-Water quality -Water quantity
7-ES-H5	Thomas' Eddy Hydraulic Reconnection	Levee and revetment removal, floodplain restoration and riparian planting	Snohomish River at Bob Heirman Wildlife Park	-Levee/revetment removal length (1,400 lineal feet) -Floodplain reconnection (200 acres) -Increase in off-channel fish habitat access (1.5 miles) -Riparian planting (30 acres) -LWD, flood fence and beaver dam analog installation (number of structures TBD)	-Floodplain modifications -Channel conditions -Substrate conditions -Riparian conditions -Water quality -Water quantity -Rearing habitat
7-P-H6	Snohomish Floodplain Acquisitions Phase 1 (Lund Acquisition)	Acquisition of up to 57 acres and 1.43 miles of riparian and floodplain property adjacent to the Pilchuck River.	Middle Pilchuck River	-Property acquired (57 acres) -Length of protected stream channel (1.43 miles)	-Floodplain modifications -Channel conditions -Substrate conditions -Riparian conditions -Water quality -Water quantity -Rearing habitat

Project Number[1]	Project Name	Project Short Description	River Reach Benefitted	Other Benefits with Quantifiable Metric (e.g., structures per mile)	Habitat Limiting Factor(s) Addressed
7-P-H7	Pilchuck River Armoring Removal	Removal or "softening" of approximately 2,000 linear feet of bank armoring within the Middle Pilchuck subbasin.	Middle Pilchuck River	-Bank armoring removal length (2,000 lineal feet) -Riparian enhancement length (2,000 lineal feet) -Removal of transmission main under Pilchuck River mainstem -Increased connectivity to onsite wetland and off-channel habitat (acres TBD) -LWD installation (number of structures TBD)	-Floodplain modifications -Channel conditions -Substrate conditions -Riparian conditions -Water quality -Water quantity -Rearing habitat
7-P-H8	Living with Beavers Program	Landowner education on the importance of beaver ponds, assistance with large tree protection, providing wetland plants, protecting culverts from damming activities, and where appropriate, installing pond-leveler devices.	TBD	-Site visits for technical assistance (30 visits) -Beaver management devices installed (10 devices)	-Floodplain modifications -Channel conditions -Substrate conditions -Riparian conditions -Water quality -Water quantity -Rearing habitat

Project Number[1]	Project Name	Project Short Description	River Reach Benefitted	Other Benefits with Quantifiable Metric (e.g., structures per mile)	Habitat Limiting Factor(s) Addressed
7-P-H10	Wetland Restoration	Restoration of 18 acres of degraded wetland	TBD	-Wetland restoration (18 acres)	-Wetland modifications -Riparian conditions -Water quality -Water quantity
7-W-H11	Woods Creek Riparian Restoration Partnership	Plant native trees and shrubs 45 acres of riparian forest along the mainstem of Woods Creek and correct between 3 and 5 fish passage barriers to improve juvenile and adult access to spawning and rearing habitat	Woods Creek	-Riparian restoration (45 acres)	-Floodplain modifications -Riparian conditions -Water quality -Water quantity -Rearing habitat
7-S-H12	Expansion of Sultan River Side Channel Network (Sultan River Floodplain Activation)	Expansion of an existing side channel network to provide structural complexity and hydraulic diversity in the main channel.	Sultan River	-Increase in flow delivery to floodplain (5 to 8 cfs) -Expansion in active and side channel areas (50,000 square feet) -LWD installation (6 structures)	-Floodplain modifications -Channel conditions -Substrate conditions -Water quality -Water quantity -Rearing habitat

Project Number[1]	Project Name	Project Short Description	River Reach Benefitted	Other Benefits with Quantifiable Metric (e.g., structures per mile)	Habitat Limiting Factor(s) Addressed
7-SM-H13	Haskel Slough Connectivity	Modifying the inlet dike to enhance juvenile salmon rearing and flood refuge in Haskel Slough	Skykomish River near City of Monroe	-Modification of Haskel Slough inlet dike (as-built diagram) -Improved surface flow connectivity (monitoring)	-Floodplain modifications -Riparian conditions -Water quality -Water quantity -Rearing habitat
7-SM-H14	East Monroe Heritage Site Acquisition	Land acquisition along the main stem of the Skykomish River to preserve as an open space and use the site for flood water storage and displacement.	Skykomish River near City of Monroe	-Land acquisition (43 acres)	-Floodplain modifications -Riparian conditions -Water quality -Rearing habitat

Project Number[1]	Project Name	Project Short Description	River Reach Benefitted	Other Benefits with Quantifiable Metric (e.g., structures per mile)	Habitat Limiting Factor(s) Addressed
7-SM-H15	Shinglebolt Slough	Reconnect the eastern, filled upstream section of Shingle Bolt Slough. Remove riprap and berm along Skykomish River and create side channel habitat accessible during spring out-migration flows. Project will also install log wood jams and riparian vegetation.	Skykomish River at Shinglebolt Slough	-Excavation of remnant flood channel (12,500 cubic yards) -Removal of riprap and berm (600 to 900 lineal feet) -Increase in fish-accessible side channel (1,600 lineal feet) -Riparian restoration (20 acres) -LWD installation (16 structures)	-Floodplain modifications -Channel conditions -Substrate conditions -Riparian conditions -Water quality -Water quantity -Rearing habitat

Project Number[1]	Project Name	Project Short Description	River Reach Benefitted	Other Benefits with Quantifiable Metric (e.g., structures per mile)	Habitat Limiting Factor(s) Addressed
7-SM-H16	Snohomish Confluence Project + Left Bank Floodplain reconnection at RM 1.5	Planning and property acquisition request to restore and enhance floodplain connection, abandoned side channels and connections to Riley Slough just upstream of junction of Skykomish and Snoqualmie Rivers.	Riley Slough at and upstream of Skykomish/ Snoqualmie confluence	-Land acquisition (acres TBD) -Length of restored slough and side channel (5,000 lineal feet) -Reestablished connection between the Skykomish and Riley Slough (as -built diagram) -Riparian restoration (acres TBD) -Physical conditions of side channel and slough (monitoring)	-Floodplain modifications -Channel conditions -Substrate conditions -Riparian conditions -Water quality -Water quantity -Rearing habitat
7-USK-H17	Miller River Alluvial Fan Restoration	Riprap removal, floodplain reconnection, side channel reactivation.	Lower Miller River and South Fork Skykomish River	-Riparian restoration (18.5 acres) -Floodplain reconnection (20 acres) -Reactivation of side channel (2,700 lineal feet) -Improved aquatic habitat complexity in main channel complex (250 lineal feet) -Riprap removal (lineal feet TBD)	-Floodplain modifications -Channel conditions -Substrate conditions -Riparian conditions -Water quality -Water quantity -Rearing habitat

Project Number[1]	Project Name	Project Short Description	River Reach Benefitted	Other Benefits with Quantifiable Metric (e.g., structures per mile)	Habitat Limiting Factor(s) Addressed
7-USK-H18	Tulalip Tribes Beaver Reintroduction Program	Protection of hydrologic processes and function in the Snohomish Watershed through the relocation of beavers from areas of human conflict to headwater tributaries for the improvement of fish rearing habitat and freshwater storage.	TBD	-Beaver relocation (number of animals TBD)	-Floodplain modifications -Channel conditions -Substrate conditions -Riparian conditions -Water quality -Water quantity -Rearing habitat

Project Number[1]	Project Name	Project Short Description	River Reach Benefitted	Other Benefits with Quantifiable Metric (e.g., structures per mile)	Habitat Limiting Factor(s) Addressed
7-CH-H19	Cherry Creek and Stossel Creek Climate Resilient Watershed	Suite of actions in Cherry and Stossel watersheds including removal of bank armoring, riparian restoration, levee improvements and levee setbacks, culvert replacements, LWD placement, side channel excavation, and small-scale natural storage.	Cherry Creek and Stossel Creek	-Instream/riparian improvements (600 lineal feet) -Floodplain improvements (800 acres) -Floodplain reconnection (8 acres) -Stream restoration (lineal feet TBD) -Bank armoring removal (lineal feet TBD) -LWD installation (5 structures) -Riparian restoration (acres TBD) -Levee rebuilding (2,000 lineal feet) -Levee setback (lineal feet TBD) -Culvert removal (2 culverts) -Culvert replacement (2 culverts) -Water stored (53 AFY)	-Floodplain modifications -Channel conditions -Substrate conditions -Riparian conditions -Water quality -Water quantity -Rearing habitat
7-SN-H20	Camp Gilead Levee Removal Phase 2	Levee removal on the left bank of the Snoqualmie River to reconnect floodplain habitat.	Snoqualmie River at Camp Gilead	-Levee/revetment removal (1,675 lineal feet) -Floodplain reconnection (acres TBD) -Riparian restoration (acres TBD)	-Floodplain modifications -Channel conditions -Substrate conditions -Riparian conditions -Water quality -Water quantity -Rearing habitat

Project Number[1]	Project Name	Project Short Description	River Reach Benefitted	Other Benefits with Quantifiable Metric (e.g., structures per mile)	Habitat Limiting Factor(s) Addressed
7-SN-H21	McElhoe-Pearson Restoration Project	Removal of the McElhoe Pearson levee or creation of a flow through channel to improve habitat connectivity.	Snoqualmie River	-Floodplain restoration (acres TBD) -Riparian restoration (lineal feet TBD)	-Floodplain modifications -Riparian conditions -Water quality -Water quantity -Rearing habitat
7-SS-H22	Lower Tolt LB Floodplain Reconnection (SR 203 to Confluence)	Feasibility study to determine options for fully or partially removing existing levee/revetment to improve floodplain connection.	Lower Tolt River	-N/A – project is a feasibility study	-Floodplain modifications -Riparian conditions -Water quality -Water quantity -Rearing habitat
7-SS-H23	Fall City Floodplain Reconnection Design and Construction – Left Bank and Right Bank	Project includes 2 adjacent floodplain reconnection projects: Barfuse Project and Hafner Project.	Lower Snoqualmie River, River Mile 34.5	-Levee removal/setback (2,000 lineal feet) -Floodplain restoration (45 acres) -River edge restoration (2,600 lineal feet) -Floodplain reconnection (145 acres)	-Floodplain modifications -Channel conditions -Substrate conditions -Riparian conditions -Water quality -Water quantity -Rearing habitat

Project Number[1]	Project Name	Project Short Description	River Reach Benefitted	Other Benefits with Quantifiable Metric (e.g., structures per mile)	Habitat Limiting Factor(s) Addressed
7-PA-H24	Patterson Creek Floodplain Restoration (Sub-Watershed 2C) + Patterson Creek Floodplain Acquisitions	Property acquisition to perform floodplain restoration through riparian restoration and channel complexity.	Patterson Creek, River Mile 7	-Floodplain restoration (30 acres) -Land acquisition (18 acres) -Riparian restoration (24 acres)	-Floodplain modifications -Riparian conditions -Water quality -Water quantity -Rearing habitat
7-RR-H25	Raging River Left Bank Mouth Levee Removal (Bernard Memorial Park)	Levee removal at Bernard Memorial Park and reconnect 6 acres of floodplain habitat.	Raging River at Bernard Memorial Park	-Levee removal (lineal feet TBD) -Floodplain restoration (acres TBD) -Riparian restoration (acres TBD)	-Floodplain modifications -Channel conditions -Substrate conditions -Riparian conditions -Water quality -Water quantity -Rearing habitat

Project Number[1]	Project Name	Project Short Description	River Reach Benefitted	Other Benefits with Quantifiable Metric (e.g., structures per mile)	Habitat Limiting Factor(s) Addressed
7-RR-H26	Raging River Bridge to Bridge Acquisitions + Raging River Bridge to Bridge Floodplain Restoration	Property acquisitions for future floodplain restoration projects. Proposed restoration actions include removal and setback of levee along right bank of Raging River.	Raging River, River Mile 2	-Levee removal/setback (4,000 lineal feet) -Floodplain reconnection (35 acres) -Riparian restoration (acres TBD)	-Floodplain modifications -Channel conditions -Substrate conditions -Riparian conditions -Water quality -Water quantity -Rearing habitat
7-USN-H27	South Fork Snoqualmie River Levee Setback Project (Nintendo Project)	Levee setback and creation of floodplain and riparian habitat.	South Fork Snoqualmie River	-Levee removal/setback (2,500 lineal feet) -Floodplain reconnection (25 acres) -Riparian restoration (12 acres)	-Floodplain modifications -Channel conditions -Substrate conditions -Riparian conditions -Water quality -Water quantity -Rearing habitat

Table Notes:

[1] Totals may differ due to rounding.

[2] A range of 104 to 3,311 AFY is provided for this project in **Error! Reference source not found.**. The low end of the range (104 AFY) was used to develop the total estimated offset benefit.

Ecology maintained project numbers from the WRIA 7 Committee's draft plan. Project numbers in Table 6.3 jump from H8 to H10 because project 7-P-H9 is not included in this plan.

Projects H1, H4-H8, H10-H12, H14-H20, H23, H24, and H27 will provide a combined total of approximately 3.4 miles of stream restoration and channel reconnection, 149.6 acres of riparian and wetland restoration, 396.5 acres of floodplain reconnection, and 125.6 acres of upland conservation buffer. In addition, the projects install at least 36 log jams and other stream structures, improve passage at 6 to 8 locations, provide beaver recolonization, and provide for increased water storage and groundwater infiltration. These benefits are well distributed throughout the watershed will contribute to improving habitat for multiple salmonid species. Most of the habitat projects are in the middle to upper portions of their subbasin so their benefits will be felt locally and downstream. The habitat projects often address limiting factors and are expected to provide long-term benefits to the watershed. The habitat benefits from the remaining projects, while not quantifiable at this time, will also contribute to NEB.

Habitat projects are distributed across fifteen of the sixteen subbasins, including all four of the subbasins with the highest estimated consumptive use (see Figure 5.1 and Table 6.4). While the Tulalip subbasin does not have any habitat projects, 7-T-W1 is anticipated to provide improved aquatic habitat improvements during key seasonal periods and coordination with downstream hatchery streamflow needs.

Table 6.4: Summary of Habitat Projects by Subbasin

Subbasin	Habitat Projects	Benefiting Stream
Tulalip	None	
Quilceda-Allen	7-QA-H1; 7-QA-H2; 7-QA-H3	Quilceda and/or Allen Creeks.
Estuary/Snohomish Mainstem	7-ES-H4, 7-ES-H5, 7-P-H8 and 7-P-H10	Snohomish River
Little Pilchuck	7-P-H8 and 7-P-H10	Various streams within Little Pilchuck subbasin
Pilchuck	7-P-H6, 7-P-H7, 7-P-H8, and 7-P-H10	Various streams within the Pilchuck, including the Middle Pilchuck River
Woods Creek	7-W-H11, 7-P-H8, and 7-P-H10	Woods Creek
Sultan	7-S-H12	Sultan River
Lower-Mid Skykomish	7-USK-H18	TBD
Skykomish Mainstem	7-P-H10, 7-SM-H13, 7-SM-H14, 7-SM, H15, and 7-SM-H16	Skykomish River and Riley Slough
Upper Skykomish	7-USK-H17 and 7-USK-H18	Lower Miller River and South Fork Skykomish River
Cherry-Harris	7-CH-H19	Cherry Creek and Stossel Creek
Snoqualmie North	7-SN-H20 and 7-SN-H21	Snoqualmie River and Tolt River
Snoqualmie South	7-SS-W7, 7-SS-H23, 7-CH-H19, 7-SS-H22	Lower Raging River and/or the Snoqualmie River, and Stossel Creek
Patterson Creek	7-PA-H24	Patterson Creek
Raging River	7-RR-H25, 7-RR-H26 and 7-USK-H18	Raging River
Upper Snoqualmie	7-USN-H27 and 7-USK-H18	South Fork Snoqualmie River

Table Notes:
[1] Four habitat projects will be implemented in multiple subbasins. These include: 7-P-H8, 7-P-H10, 7-CH-H19, and 7-USK-H18.
[2] 7-SS-H22 is a feasibility project with no direct benefits.

6.2.4 Watershed Characterization Analysis

Ecology compared the spatial distribution of the watershed plan's water offset and habitat projects against the freshwater habitat index from the Puget Sound Watershed Characterization Project (Wilhere et. al. 2013), which is discussed in Section 2.4.

This comparison shows the relationship between projects in the watershed plan and the general state of salmon habitat in the watershed. Figure 6.1 shows the project locations with respect to the freshwater habitat index in WRIA 7. Red on the map indicates lower-valued habitat, yellow for moderate-valued habitat, and green for higher-valued habitat. The project map symbols correspond with those in Figure 5.1 and Figure 5.2, with circles indicating water offset projects listed in Table 5.1 and squares indicating habitat projects listed in Table 5.2.

As is evident on Figure 6.1, the watershed plan's water offset and habitat projects are located in areas with relatively higher-valued habitat (green and yellow), which means that projects are more likely to benefit fish and other instream resources. This provides added assurance that the watershed plan will result in a NEB.

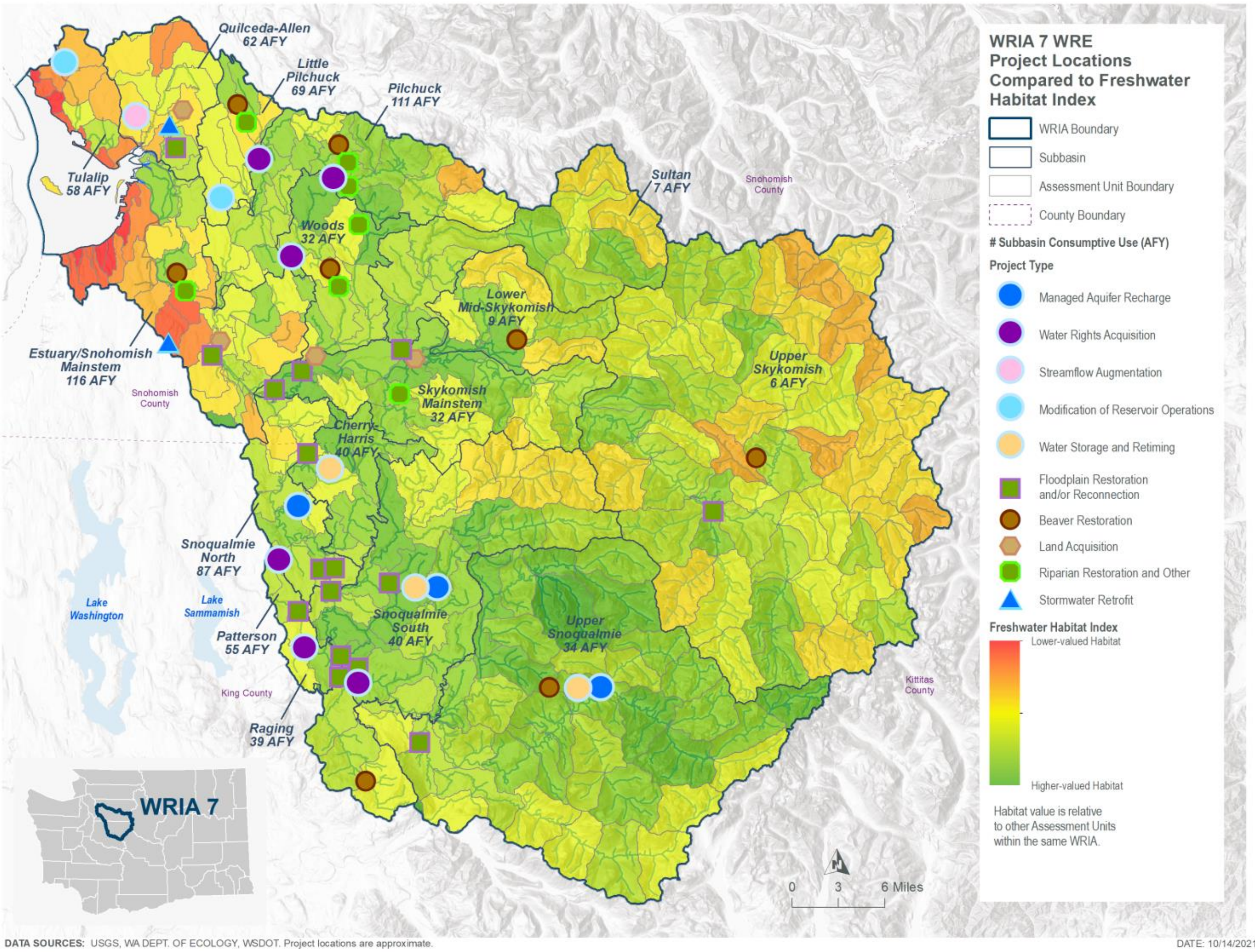


Figure 6.1 Map of Plan Project Locations Overlain on WDFW Assessment Unit Habitat Indices

6.3 Uncertainty and Adaptive Management

There is uncertainty associated with all of the analyses presented in the plan – including the projected number of new PE wells, the consumptive use estimates, the water offset benefits from the proposed projects, and the likelihood that all projects will be implemented and maintained. In addition, external factors like climate change and human migration patterns could influence the projections and estimates in this plan. Ecology relied on data available at the time of writing this plan and is transparent in the assumptions used in the analyses. Because of the large surplus in water offset, if some offset projects are not developed or benefits are less than expected, a subset of projects can still provide sufficient water to offset the estimated new consumptive use.

Ecology and the state of Washington are invested in the implementation of this watershed plan, including periodically assessing plan and project implementation and issuing competitive grants to local projects that demonstrably implement this plan while benefiting streamflows and aquatic habitat. As required by RCW 90.94.050, Ecology will also prepare and deliver a report to the legislature in 2027 that includes:

- Watershed planning progress under this law.
- A description of current and potential program projects, costs, and expenditures; an assessment of the benefits from projects
- A listing of other directly related efforts
- The total number of, and estimates of consumptive water use impacts associated with, new withdrawals exempt from permitting under each WRIA by this law.

Ecology also acknowledges and supports the importance of adaptively managing the implementation of any-plan that covers a 20-year planning horizon. Ecology's periodic plan and project implementation assessments coupled with the availability of hundreds of millions of state appropriated dollars in competitive grant funding provide important catalysts for the necessary local action needed to coordinate project implementation and any associated adaptive management necessary as new information or changed circumstances arise. During the WRIA 7 Committee process, the Committee proposed a number of recommendations for adaptive management, and are provided for reference purposes in Appendix E.

6.4 NEB Determination

This watershed plan identifies 37 projects to offset 797.4 AFY of potential consumptive impacts from new permit-exempt domestic groundwater withdrawals on instream flows over 20 years (2018 – 2038), and provide a net ecological benefit to the watershed. The watershed plan provides a surplus of 647 AFY in water offset benefits from eleven water offset projects. Twenty-six habitat projects provide additional ecological and streamflow benefits that contribute to achieving a net ecological benefit at the WRIA scale. The surplus water offset and habitat improvement projects provide reasonable assurance that the plan will adequately offset new consumptive use from PE wells anticipated during the planning horizon and achieve a net ecological benefit.

Based on the information and analyses summarized in this plan, Ecology finds that this plan, if implemented, would achieve a net ecological benefit, as required by RCW 90.94.030 and defined by the Final NEB Guidance (Ecology 2019a).

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Glossary

Acre-feet (AF): A unit of volume equal to the volume of a sheet of water one acre in area and one foot in depth. (USGS)

Adaptive Management: An iterative and systematic decision-making process that aims to reduce uncertainty over time and help meet project, action, and plan performance goals by learning from the implementation and outcomes of projects and actions. (NEB)

Annual Average Withdrawal: RCW 90.94.030 (4)(a)(vi)(B) refers to the amount of water allowed for withdrawal per connection as the annual average withdrawal. As an example, a homeowner could withdraw 4,000 gallons on a summer day, so long as they did not do so often enough that their annual average exceeds the 950 gpd.

Beaver Dam Analogue (BDA): BDAs are man-made structures designed to mimic the form and function of a natural beaver dam. They can be used to increase the probability of successful beaver translocation and function as a simple, cost-effective, non-intrusive approach to stream restoration. (From Anabranch Solutions)

Critical Flow Period: The time period of low streamflow (generally described in bi-monthly or monthly time steps) that has the greatest likelihood to negatively impact the survival and recovery of threatened or endangered salmonids or other fish species targeted by the planning group. The planning group should discuss with Ecology, local tribal and WDFW biologists to determine the critical flow period in those reaches under the planning group's evaluation. (NEB)

Cubic feet per second (CFS): A rate of the flow in streams and rivers. It is equal to a volume of water one foot high and one foot wide flowing a distance of one foot in one second (about the size of one archive file box or a basketball). (USGS)

Domestic Use: In the context of Chapter 90.94 RCW, "domestic use" and the withdrawal limits from permit-exempt domestic wells include both indoor and outdoor household uses, and watering of a lawn and noncommercial garden. (NEB)

ESSB 6091: In January 2018, the Legislature passed Engrossed Substitute Senate Bill (ESSB) 6091 in response to the Hirst decision. In the Whatcom County vs. Hirst, Futurewise, et al. decision (often referred to as the "Hirst decision"), the court ruled that the county failed to comply with the Growth Management Act requirements to protect water resources. The ruling required the county to make an independent decision about legal water availability. ESSB 6091 addresses the court's decision by allowing landowners to obtain a building permit for a new home relying on a permit-exempt well. ESSB 6091 is codified as Chapter 90.94 RCW. (ECY)

Evolutionarily Significant Unit (ESU): A population of organisms that is considered distinct for purposes of conservation. For Puget Sound Chinook, the ESU includes naturally spawned Chinook salmon originating from rivers flowing into Puget Sound from the Elwha River (inclusive) eastward, including rivers in Hood Canal, South Sound, North Sound and the Strait of Georgia. Also, Chinook salmon from 26 artificial propagation programs. (NOAA)

Foster Pilots and Foster Task Force: To address the impacts of the 2015 Foster decision, Chapter 90.94 RCW established a Task Force on Water Resource Mitigation and authorized the Department of Ecology to issue permit decisions for up to five water mitigation pilot projects. These pilot projects will address issues such as the treatment of surface water and groundwater appropriations and include management strategies to monitor how these appropriations affect instream flows and fish habitats. The joint legislative Task Force will (1) review the treatment of surface water and groundwater appropriations as they relate to instream flows and fish habitat, (2) develop and recommend a mitigation sequencing process and scoring system to address such appropriations, and (3) review the Washington Supreme Court decision in Foster v. Department of Ecology. The Task Force is responsible for overseeing the five pilot projects. (ECY)

Four Year Work Plans: Four-year plans are developed by salmon recovery lead entities in Puget Sound to describe each lead entity's accomplishments during the previous year, to identify the current status of recovery actions, any changes in recovery strategies, and to propose future actions anticipated over the next four years. Regional experts conduct technical and policy reviews of each watershed's four-year work plan update to evaluate the consistency and appropriate sequencing of actions with the Puget Sound Salmon Recovery Plan. (Partnership)

Gallons per day (GPD): An expression of the average rate of domestic and commercial water use. 1 million gallons per day is equivalent to 1.547 cubic feet per second.

Group A public water systems: Group A water systems have 15 or more service connections or serve 25 or more people per day. Chapter 246-290 WAC (Group A Public Water Supplies), outlines the purpose, applicability, enforcement, and other policies related to Group A water systems. (WAC)

Group B public water systems: Group B public water systems serve fewer than 15 connections **and** fewer than 25 people per day. Chapter 246-291 WAC (Group B Public Water Systems), outlines the purpose, applicability, enforcement, and other policies related to Group B water systems. (WAC)

Growth Management Act (GMA): Passed by the Washington Legislature and enacted in 1990, this act guides planning for growth and development in Washington State. The act requires local governments in fast growing and densely populated counties to develop, adopt, and periodically update comprehensive plans.

Home: A general term referring to any house, household, or other Equivalent Residential Unit. (Policy and Interpretive Statement)

Hydrologic Unit Code (HUC): Hydrologic unit codes refer to the USGS's division and sub-division of the watersheds into successively smaller hydrologic units. The units are classified into four levels: regions, sub-regions, accounting units, and cataloging units, and are arranged within each other from the largest geographic area to the smallest. Each unit is classified by a unit code (HUC) composed of two to eight digits based on the four levels of the classification in the hydrologic unit system (two digit units are largest and eight digits are smallest). (USGS)

Impact: For the purpose of streamflow restoration planning, impact is the same as new consumptive water use (see definition below). As provided in Ecology WR POL 2094 "Though the statute requires the offset of 'consumptive impacts to instream flows associated with permit-exempt domestic water use' (RCW 90.94.020(4)(b)) and 90.94.030(3)(b)), watershed plans should address the consumptive use of new permit-exempt domestic well withdrawals. Ecology recommends consumptive use as a surrogate for consumptive impact to eliminate the need for detailed hydrogeologic modeling, which is costly and unlikely feasible to complete within the limited planning timeframes provided in chapter 90.94 RCW." (NEB)

Instream Flow: a designated flow (also in cfs) that is set by rule as the amount of water needed to protect beneficial uses and used for determining whether there is water available for appropriation. Flow levels set as Instream Flows do not reflect the actual amount of water flowing at a given time. They are designated, or administrative numbers (flow levels) that are set for periods of time (bi-weekly to several months) throughout the year. The instream flows vary by season and account for different instream resource needs (such as fish spawning, rearing and migration). When (actual) stream flow is lower than the Instream Flow, there is not water available for appropriation (Instream Flows are not being met) and water users whose water rights are junior to the Instream Flows must discontinue water use under that right.

Instream Flow Rule: An administrative rule that establishes Instream Flows.

Instream Resources Protection Program (IRPP): The IRPP was initiated by the Department of Ecology in September 1978 with the purpose of developing and adopting instream resource protection measures for Water Resource Inventory Areas (WRIAs) (see definition below) in Western Washington as authorized in the Water Resources Act of 1971 (RCW 90.54), and in accordance with the Water Resources Management Program (WAC 175-500).

Instream Resources: Fish and related aquatic resources. (NEB)

Large woody debris (LWD): LWD refers to the fallen trees, logs and stumps, root wads, and piles of branches along the edges of streams, rivers, lakes and Puget Sound. Wood helps stabilize shorelines and provides vital habitat for salmon and other aquatic life. Preserving the debris along shorelines is important for keeping aquatic ecosystems healthy and improving the survival of native salmon. (King County)

Lead Entities (LE): Lead Entities are local, citizen-based organizations in Puget Sound that coordinate salmon recovery strategies in their local watershed. Lead entities work with local and state agencies, tribes, citizens, and other community groups to adaptively manage their local salmon recovery chapters and ensure recovery actions are implemented. (Partnership)

Listed Species: Before a species can receive the protection provided by the Endangered Species Act (ESA), it must first be added to the federal lists of endangered and threatened wildlife and plants. The List of Endangered and Threatened Wildlife (50 CFR 17.11) and the List of Endangered and Threatened Plants (50 CFR 17.12) contain the names of all species that have been determined by the U.S. Fish and Wildlife Service (Service) or the National Marine Fisheries Service (for most marine life) to be in the greatest need of federal protection. A species is added to the list when it is determined to be endangered or threatened because of any of the following factors: the present or threatened destruction, modification, or curtailment of its habitat or range; overutilization for commercial, recreational, scientific, or educational purposes; disease or predation; the inadequacy of existing regulatory mechanisms; or other natural or manmade factors affecting its survival. (USFWS)

Local Integrating Organizations (LIO): Local Integrating Organizations are local forums in Puget Sound that collaboratively work to develop, coordinate, and implement strategies and actions that contribute to the protection and recovery of the local ecosystem. Funded and supported by the Puget Sound Partnership, the LIOs are recognized as the local expert bodies for ecosystem recovery in nine unique ecosystems across Puget Sound. (Partnership)

Low Impact Development (LID): Low Impact Development (LID) is a stormwater and land-use management strategy that tries to mimic natural hydrologic conditions by emphasizing techniques including conservation, use of on-site natural features, site planning, and distributed stormwater best management practices (BMPs) integrated into a project design. (ECY)

Managed Aquifer Recharge (MAR): Managed aquifer recharge projects involve the addition of water to an aquifer through infiltration basins, injection wells, or other methods. The stored water can then be used to benefit stream flows, especially during critical flow periods. (NEB)

National Pollutant Discharge Elimination System (NPDES): The NPDES permit program addresses water pollution by regulating point sources that discharge pollutants to waters of the United States. Created by the Clean Water Act in 1972, the EPA authorizes state governments to perform many permitting, administrative, and enforcement aspects of the program. (EPA)

Net Ecological Benefit (NEB): Net Ecological Benefit is a term used in ESSB 6091 as a standard that watershed plans (see below for definition) must meet. The outcome that is anticipated to occur through implementation of projects and actions in a plan to yield offsets that exceed impacts within: a) the planning horizon; and, b) the relevant WRIA boundary. See *Final Guidance for Determining Net Ecological Benefit - Guid-2094 Water Resources Program Guidance.* (NEB)

Net Ecological Benefit Determination: Occurs solely upon Ecology's conclusion after its review of a watershed plan submitted to Ecology by appropriate procedures, that the plan does or does not achieve a NEB as defined in the Net Ecological Benefit guidance. The Director of Ecology will issue the results of that review and the NEB determination in the form of an order. (NEB)

Net Ecological Benefit Evaluation: A planning group's demonstration, using NEB Guidance and as reflected in their watershed plan, that their plan has or has not achieved a NEB. (NEB)

New Consumptive Water Use: The consumptive water use from the permit-exempt domestic groundwater withdrawals estimated to be initiated within the planning horizon. For the purpose of RCW 90.94, consumptive water use is considered water that is evaporated, transpired, consumed by humans, or otherwise removed from an immediate water environment due to the use of new permit-exempt domestic wells. (NEB)

Office of Financial Management (OFM): OFM is a Washington state agency that develops official state and local population estimates and projections for use in local growth management planning. (OFM)

Offset: The anticipated ability of a project or action to counterbalance some amount of the new consumptive water use over the planning horizon. Offsets need to continue beyond the planning horizon for as long as new well pumping continues. (NEB)

Permit exempt wells: The Groundwater Code (RCW 90.44), identified four "small withdrawals" of groundwater as exempt from the permitting process. Permit-exempt groundwater wells often provide water where a community supply is not available, serving single homes, small developments, irrigation of small lawns and gardens, industry, and stock watering.

Permit-exempt uses: Groundwater permit exemptions allow four small uses of groundwater without a water right permit: domestic uses of less than 5,000 gallons per day, industrial uses of less than 5,000 gallons per day, irrigation of a lawn or non-commercial garden, a half-acre or less in size, or stock water. Although exempt groundwater withdrawals don't require a water right permit, they are always subject to state water law. (ECY)

Planning groups: A general term that refers to either initiating governments, in consultation with the planning unit, preparing a watershed plan update required by Chapter 90.94.020 RCW, or a watershed restoration and enhancement committee preparing a plan required by Chapter 90.94.030 RCW. (NEB)

Planning Horizon: The 20-year period beginning on January 19, 2018 and ending on January 18, 2038, over which new consumptive water use by permit-exempt domestic withdrawals within a WRIA must be addressed, based on the requirements set forth in Chapter 90.94 RCW. (NEB)

Projects and Actions: General terms describing any activities in watershed plans to offset impacts from new consumptive water use and/or contribute to NEB. (NEB)

Puget Sound Acquisition and Restoration (PSAR) fund: This fund supports projects that recover salmon and protect and recover salmon habitat in Puget Sound. The state legislature appropriates money for PSAR every 2 years in the Capital Budget. PSAR is co-managed by the Puget Sound Partnership and the Recreation and Conservation Office, and local entities identify and propose PSAR projects. (Partnership)

Puget Sound Partnership (Partnership): The Puget Sound Partnership is the state agency leading the region's collective effort to restore and protect Puget Sound and its watersheds. The organization brings together hundreds of partners to mobilize partner action around a common agenda, advance Sound investments, and advance priority actions by supporting partners. (Partnership)

Puget Sound Regional Council (PSRC): PSRC develops policies and coordinates decisions about regional growth, transportation and economic development planning within King, Pierce, Snohomish and Kitsap counties. (PSRC)

RCW 90.03 **(Water Code)**: This chapter outlines the role of the Department of Ecology in regulating and controlling the waters within the state. The code describes policies surrounding surface water and groundwater uses, the process of determining water rights, compliance measures and civil penalties, and various legal procedures.

RCW 90.44 **(Groundwater Regulations)**: RCW 90.44 details regulations and policies concerning groundwater use in Washington state, and declares that public groundwaters belong to the public and are subject to appropriation for beneficial use under the terms of the chapter. The rights to appropriate surface waters of the state are not affected by the provisions of this chapter.

RCW 90.44.050**(Groundwater permit exemption)**: This code states that any withdrawal of public groundwaters after June 6, 1945 must have an associated water right from the Department of Ecology. However, any withdrawal of public groundwaters for stock-watering purposes, or for the watering of a lawn or of a noncommercial garden not exceeding one-half acre in area, or for single or group domestic uses in an amount not exceeding five thousand gallons a day, or for an industrial purpose in an amount not exceeding five thousand gallons a day, is exempt from the provisions of this section and does not need a water right.

RCW 90.82 **(Watershed Planning)**: Watershed Planning was passed in 1997 with the purpose of developing a more thorough and cooperative method of determining what the current water resource situation is in each water resource inventory area of the state and to provide local citizens with the maximum possible input concerning their goals and objectives for water resource management and development.

90.54 RCW **(Water Resources Act of 1971):** This act set the stage for the series of rules that set instream flow levels as water rights, as well as a compliance effort to protect those flows.

RCW 90.94 **(Streamflow Restoration)**: This chapter of the Revised Code of Washington codifies ESSB 6091, including watershed planning efforts, streamflow restoration funding program and the joint legislative task force on water resource mitigation and mitigation pilot projects (Foster task force and pilot projects).

Reasonable Assurance: Explicit statement(s) in a watershed plan that the plan's content is realistic regarding the outcomes anticipated by the plan, and that the plan content is supported with scientifically rigorous documentation of the methods, assumptions, data, and implementation considerations used by the planning group. (NEB)

Revised Code of Washington (RCW**)**: The revised code is a compilation of all permanent laws now in force for the state of Washington. The RCWs are organized by subject area into Titles, Chapters, and Sections.

Salmon Recovery Funding Board (SRFB): Pronounced "surf board", this state and federal board provides grants to protect and restore salmon habitat. Administered by a 10-member State Board that includes five governor-appointed citizens and five natural resource agency directors, the board brings together the experiences and viewpoints of citizens and the major state natural resource agencies. For watersheds planning under Section 203, the Department of Ecology will submit final draft WRE Plans not adopted by the prescribed deadline to SRFB for a technical review (RCO and Policy and Interpretive Statement).

Section 202 or Section 020: Refers to Section 202 of ESSB 6091 or Section 020 of RCW 90.94 respectively. The code provides policies and requirements for new domestic groundwater withdrawals exempt from permitting with a potential impact on a closed water body and potential impairment to an instream flow. This section includes WRIAs 1, 11, 22, 23, 49, 59 and 55, are required to update watershed plans completed under RCW 90.82 and to limit new permit-exempt withdrawals to 3000 gpd annual average.

Section 203 or Section 030: Refers to Section 203 of ESSB 6091 or Section 030 of RCW 90.94 respectively. The section details the role of WRE committees and WRE plans (see definitions below) in ensuring the protection and enhancement of instream resources and watershed functions. This section includes WRIAs 7, 8, 9, 10, 12, 13, 14 and 15. New permit-exempt withdrawals are limited to 950 gpd annual average.

SEPA and SEPA Review: SEPA is the State Environmental Policy Act. SEPA identifies and analyzes environmental impacts associated with governmental decisions. These decisions may be related to issuing permits for private projects, constructing public facilitates, or adopting regulations, policies, and plans. SEPA review is a process which helps agency decision-makers, applications, and the public understand how the entire proposal will affect the environment. These reviews are necessary prior to Ecology adopting a plan or plan update and may be completed by Ecology or by a local government. (Ecology)

Streamflow: a specific flow level measured at a specific location in a given stream, usually described as a rate, such as cfs. Stream flow is the actual amount of real water at a specific place and at a given moment. Stream flows can change from moment to moment.

Subbasins: A geographic subarea within a WRIA, equivalent to the words “same basin or tributary” as used in RCW 90.94.020(4)(b) and RCW 90.94.030 (3)(b). In some instances, subbasins may not correspond with hydrologic or geologic basin delineations (e.g., watershed divides). (NEB)

Trust Water Right Program: The program allows the Department of Ecology to hold water rights for future uses without the risk of relinquishment. Water rights held in trust contribute to streamflows and groundwater recharge, while retaining their original priority date. Ecology uses the Trust Water Right Program to manage acquisitions and accept temporary donations. The program provides flexibility to enhance flows, bank or temporarily donate water rights. (ECY)

Urban Growth Area (UGA): UGAs are unincorporated areas outside of city limits where urban growth is encouraged. Each city that is located in a GMA fully-planning county includes an urban growth area where the city can grow into through annexation. An urban growth area may include more than a single city. An urban growth area may include territory that is located outside of a city in some cases. Urban growth areas are under county jurisdiction until they are annexed or incorporated as a city. Zoning in UGAs generally reflect the city zoning, and public utilities and roads are generally built to city standards with the expectation that when annexed, the UGA will transition seamlessly into the urban fabric. Areas outside of the UGA are generally considered rural. UGA boundaries are reviewed and sometimes adjusted during periodic comprehensive plan updates. UGAs are further defined in RCW 36.70.

WAC 173-566 **(Streamflow Restoration Funding Rule)**: On June 25, 2019 the Department of Ecology adopted this rule for funding projects under RCW 90.94. This rule establishes processes and criteria for prioritizing and approving grants consistent with legislative intent, thus making Ecology's funding decision and contracting more transparent, consistent, and defensible.

Washington Administrative Code (WAC): The WAC contains the current and permanent rules and regulations of state agencies. It is arranged by agency and new editions are published every two years. (Washington State Legislature)

Washington Department of Ecology (DOE/ECY): The Washington State Department of Ecology is an environmental regulatory agency for the State of Washington. The department administers laws and regulations pertaining to the areas of water quality, water rights and water resources, shoreline management, toxics clean-up, nuclear and hazardous waste, and air quality.

Washington Department of Fish and Wildlife (WDFW): An agency dedicated to preserving, protecting, and perpetuating the state's fish, wildlife, and ecosystems while providing sustainable fish and wildlife recreational and commercial opportunities. Headquartered in Olympia, the department maintains six regional offices and manages dozens of wildlife areas around the state, offering fishing, hunting, wildlife viewing, and other recreational opportunities for the residents of Washington. With the tribes, WDFW is a co-manager of the state salmon fishery. (WDFW)

Washington Department of Natural Resources (WADNR or DNR): The department manages over 3,000,000 acres of forest, range, agricultural, and commercial lands in the U.S. state of Washington. The DNR also manages 2,600,000 acres of aquatic areas which include shorelines, tidelands, lands under Puget Sound and the coast, and navigable lakes and rivers. Part of the DNR's management responsibility includes monitoring of mining cleanup, environmental restoration, providing scientific information about earthquakes, landslides, and ecologically sensitive areas. (WADNR)

Water Resources (WR): The Water Resources program at Department of Ecology supports sustainable water resources management to meet the present and future water needs of people and the natural environment, in partnership with Washington communities. (ECY)

Water Resources Advisory Committee (WRAC): Established in 1996, the Water Resources Advisory Committee is a forum for issues related to water resource management in Washington State. This stakeholder group is comprised of 40 people representing state agencies, local governments, water utilities, tribes, environmental groups, consultants, law firms, and other water stakeholders. (ECY)

Watershed Plan: A general term that refers to either: a watershed plan update prepared by a WRIA's initiating governments, in collaboration with the WRIA's planning unit, per RCW 90.94.020; or a watershed restoration and enhancement plan prepared by a watershed restoration and enhancement committee, per RCW 90.94.030. This term does not refer to RCW 90.82.020(6). (NEB)

Watershed Restoration and Enhancement Plan (WRE Plan): The Watershed Restoration and Enhancement Plan is directed by [Section 203 of ESSB 6091] and requires that by June 30, 2021, the Department of Ecology will prepare and adopt a watershed restoration and enhancement plan for WRIAs 7, 8, 9, 10, 12, 13, 14 and 15, in collaboration with the watershed restoration and enhancement committee. The plan should, at a minimum, offset the consumptive impact of new permit-exempt domestic water use, but may also include recommendations for projects and actions that will measure, protect, and enhance instream resources that support the recovery of threatened and endangered salmonids. Prior to adoption of an updated plan, Department of Ecology must determine that the actions in the plan will result in a “net ecological benefit” to instream resources in the WRIA. The planning group may recommend out-of-kind projects to help achieve this standard.

WRIA: Water Resource Inventory Area. WRIAs are also called basins or watersheds. There are 62 across the state and each are assigned a number and name. They were defined in 1979 for the purpose of monitoring water availability. A complete map is available here: https://ecology.wa.gov/Water-Shorelines/Water-supply/Water-availability/Watershed-look-up

Appendices

WRIA 7 Snohomish Watershed

The following appendices are linked to this report as an Appendices file at: https://apps.ecology.wa.gov/publications/SummaryPages/2211013.html

Appendix A – Final Meeting Summary of the WRIA 7 Committee

Appendix B – Technical Memos

Appendix C – Detailed Project Descriptions

Appendix D – Project Prioritization Guiding Principles used by the WRIA 7 Committee

Appendix E – Policy, Implementation, and Adaptive Management Recommendations Proposed by the WRIA 7 Committee