



Cultus Mountain Watershed Management Plan



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CULTUS MOUNTAIN WATERSHED MANAGEMENT PLAN

The technical material and data contained in the report were prepared under the supervision and direction of the undersigned, whose seal as professional engineer licensed to practice as such, is affixed below.



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- A Skagit PUD Resolutions Related to the Cultus Mountain Watershed
- B Memorandum of Agreement Regarding Utilization of Skagit River Basin Water Resources for Instream and Out of Stream Uses
- C Soil Resource Report for the Cultus Mountain Watershed
- D Cultus Mountain Watershed Property Ownership and Easement Information

ACRONYMS AND ABBREVIATIONS

cfs	cubic feet per second
DOH	Washington State Department of Health
DNR	Washington State Department of Natural Resources
Ecology	Washington State Department of Ecology
°F	degrees Fahrenheit
FPA	Forest Practice Application
Forest Practices	Forest Practices Department/DNR
ID team	Interdisciplinary Team
Judy System	Judy Reservoir Group A Water System
Weyerhaeuser	Weyerhaeuser Company
MCL	maximum contaminant level
MGD	million gallons per day
MOA	Memorandum of Agreement Regarding Utilization of Skagit River Basin Water Resources for Instream and Out of Stream Purposes
RCW	Revised Code of Washington
RMAP	Road Maintenance and Abandonment Plan
SCA	Sanitary Control Area
Skagit PUD	Public Utility District No. 1 of Skagit County
Skagit River Instream Flow Rule	Skagit River Basin Instream Resources Protection Rule (Chapter 173-503 WAC)
SRD	Skagit River Diversion Pump Station
THM	trihalomethane
TOC	Total Organic Carbon
U.S.C.	U.S. Code
USGS	U.S. Geological Survey
WAC	Washington Administrative Code
Watershed	Cultus Mountain Watershed
WDFW	Washington State Department of Fish and Wildlife
WRIA	Water Resource Inventory Area
WTP	water treatment plant

EXECUTIVE SUMMARY

The Cultus Mountain Watershed (Watershed) is valuable to a variety of stakeholders. Streams flowing from the hills east of the city of Mount Vernon in northwest Washington State merge with the Skagit River, contributing to one of the most diverse river systems in North America. Fish and wildlife associated with forests and streams in the Watershed are cherished by the public and local Native American tribes. The Watershed's mountainous terrain is often used for recreation and industrial timber production, providing enjoyment and jobs to the nearby communities, and building materials for the nation's residents. The aesthetic qualities of the Watershed contribute to the overall appeal and unique character of the area.

Water is another important product of the Watershed, used by the urban, residential, business, and agricultural sectors of the lower Skagit Valley. Public Utility District No. 1 of Skagit County (Skagit PUD) uses surface water from the Skagit River and four streams in the Cultus Mountains to supply potable water to the Judy Reservoir (DOH Public Water System Identification 79500E) Group A Water System (Judy System). Water is collected from these sources for storage in Judy Reservoir prior to processing by the Skagit PUD's water treatment plant. The Skagit PUD takes pride in meeting the potable water needs of Skagit County's residential and commercial customers since 1936 under the following overarching guidance:

The **Vision** of the Skagit PUD is to be an outstanding regional leader and innovative utility provider.

The **Mission** of the Skagit PUD is to provide its customers with high quality water services at an affordable price.

As the Skagit PUD pursues the Vision and advances the Mission, the following Core Values are to be demonstrated and maintained in balance:

- **Quality:** The Skagit PUD seeks to exceed customer expectations by providing exceptional service.
- **Environmental Stewardship:** The Skagit PUD acts to preserve the regional's natural resources.
- **Financial Prudence:** The Skagit PUDs strives to keep rates as low as possible while making wise capital investments and strategic business decisions.

The Judy System serves the cities of Mount Vernon, Burlington, and Sedro-Woolley and surrounding rural and suburban areas of Skagit County. To protect the source water for the Judy System, the Skagit PUD has implemented a vigorous watershed control program. In conjunction with the Skagit River Watershed Control Plan sponsored by the Skagit PUD and the City of Anacortes, this Watershed



Management Plan documents the Skagit PUD’s watershed control program for the Judy System in accordance with requirements of the Washington State Department of Health (DOH) and Washington State Regulations (Chapter 246-290 WAC).

The Cultus Mountain Watershed Management Plan describes the Watershed and identifies circumstances that may affect water quality. The Skagit PUD’s watershed control measures are detailed, and their effectiveness is examined to determine opportunities for improved watershed control. The final chapter of the plan identifies opportunities for improving watershed protection and control.

1 INTRODUCTION

1.1 Background

Public Utility Skagit PUD No. 1 of Skagit County (Skagit PUD) provides drinking water to a large portion of Skagit County, Washington. The Skagit PUD is a municipal corporation of the State of Washington, established as a result of the general election of November 3, 1936. A public utility Skagit PUD's purpose is to provide efficient and reliable service to its local customers at the lowest possible cost. The Skagit PUD is authorized to acquire, construct, and operate water systems and to furnish water service to the inhabitants of the area and other persons.

The Skagit PUD operates the most extensive water system in Skagit County. The majority of the Skagit PUD's services are within the Judy Reservoir Group A Water System (Judy System), serving the cities of Mount Vernon, Burlington, and Sedro-Woolley as well as surrounding rural and suburban areas. The public water system ID (PwsID) for the Judy System assigned by DOH is 79500E. The Judy System provides an average of 9 million gallons per day (MGD) (based on 2019 records) of drinking water to over 70,000 people, through over 24,000 service connections. The Judy System has the largest service area in Skagit County.

Source water for the Judy System is diverted from the Skagit River and four streams originating in the Cultus Mountains of central Skagit County. The Skagit PUD has been diverting water from the Cultus Mountains since 1939, when existing water systems using these sources were acquired. An area of approximately 5,840 acres drains into the stream diversion sites and has been designated by the Skagit PUD as the Cultus Mountain Watershed (Watershed). For the purpose of this Watershed Management Plan, the Watershed also includes an additional 182 acres consisting of Judy Reservoir and adjacent uplands. The Skagit PUD owns approximately 7.96 percent of the Watershed, Mid Valley Resources, Inc. (Hampton Lumber) owns 66.44 percent, and the State of Washington Department of Natural Resources (DNR) owns 25.3 percent. The remaining 0.3 percent of the Watershed consists of public roadways and parcels owned by private individuals. Figure 2-1 depicts the location of the Watershed in relation to the cities of Mount Vernon, Burlington, and Sedro-Woolley.

In 2010, the Skagit PUD began operation of a newly constructed diversion and pump station along the banks of the Skagit River near Sedro-Woolley. The facility provides a secondary source of water to the Judy System and will allow the Skagit PUD to adequately satisfy increasing demand for water from the system's service area.

The diverted surface water travels through underground pipelines to Judy Reservoir prior to processing by the Skagit PUD's multi-media direct filtration water treatment plant located adjacent to the reservoir. Judy Reservoir has allowed for the storage of source water since 1947. The existing storage capacity of 1.45 billion gallons enables the Skagit PUD to operate the treatment plant at full capacity during times when diversions from the streams and river fall below peak demand or are

suspended due to minimum instream flow levels set by the Washington State Department of Ecology (Ecology).

1.2 Purpose

The Skagit PUD's watershed control program for the Judy System consists of the Cultus Mountain Watershed Management Plan and the Skagit River Watershed Control Plan.

The Skagit PUD's watershed control program is used to maintain a safe water supply and was most recently documented in the Skagit PUD's 2013 Water System Plan Update. The Skagit River Watershed Control Plan², sponsored the Skagit PUD and City of Anacortes, documents the Skagit PUD's efforts to protect source water entering Judy Reservoir from the Skagit River. The Skagit River Watershed Control Plan was most recently updated by the City of Anacortes in 2010.

This Watershed Management Plan documents watershed control measures related to the Cultus Mountain Watershed and has been prepared for inclusion in the Skagit PUD's 2020 Limited Water System Plan Update.

1.3 Watershed Control Program Requirements

The Safe Drinking Water Act of 1974, and later amendments, regulate the nation's public drinking water supplies and give states the primary enforcement responsibility¹. Washington State Department of Health (DOH) regulates Washington State's public drinking water supplies to achieve protection and improvement of surface water sources by requiring²:

- The purveyor to exercise surveillance over conditions and activities in the watershed affecting source water quality; and
- Development and implementation of a DOH-approved Watershed Control Program.

This Watershed Management Plan will be submitted to DOH for the purpose of meeting the requirement for a watershed control program. The watershed control program must contain the following elements:

- Watershed description
- Identification and inventory of activities and land uses detrimental to water quality
- Watershed management and control measures including documentation of ownership and relevant written agreements
- Monitoring of water quality and activities within the watershed

¹ Chapter 246-290 Section 668 WAC

² Chapter 246-290 Section 135 WAC

- System operations
- Watershed control program evaluation and updates every 6 years

1.4 Document Organization

This document is organized in a manner that generally follows Chapter 5 of the DOH Water System Planning Handbook (Source Water Protection), Washington Administrative Code (WAC) 246-290-135 (Source Water Protection), and WAC 246-290-668 (Watershed Control). Chapters 2 through 5 address the first five major elements identified by DOH (listed above). Chapter 6 provides an overall evaluation of the watershed control program, demonstrates improvement since submittal of the last watershed control program evaluation, and identifies recommendations for future improvements.

2 WATERSHED DESCRIPTION

DOH guidance requires a description of the watershed's location, boundaries, hydrology, critical areas, water system components, land ownership, and access. The identification of sources and activities that may adversely affect source water quality is also required. Chapter 2 details these features and includes a history of the Cultus Mountain Watershed.

2.1 Watershed History

Table 2-1 provides a chronological summary of major events and milestones that have affected the Cultus Mountain Watershed.

On November 3, 1936, Public Utility Skagit PUD No. 1 of Skagit County was formed by voters with an approval of 6,173 in favor to 4,971 against. In 1939 and 1940, the Skagit PUD purchased the private water systems that served Mount Vernon, Burlington, and Sedro-Woolley, and consolidated them into one large water system. These purchased water systems included diversions on the Skagit River, local springs, and streams in the Cultus Mountains south of Sedro-Woolley.

After construction of impoundment dams in Janicki Basin in 1947, the Skagit PUD was able to collect and store water from the Cultus Mountain streams. Judy Reservoir (named after L.B. Judy, the Skagit PUD's first general manager) brought a dependable supply of high-quality, gravity-fed water to the Skagit Valley.

Water from Judy Reservoir is treated at the Skagit PUD's water treatment plant (WTP) adjacent to Judy Reservoir and served by gravity through transmission pipelines to the Skagit PUD's customers. Until 1990, source water was disinfected and delivered unfiltered to the distribution system. In March 1990, the Skagit PUD upgraded the WTP to include multi-media direct filtration.

Following the implementation of the Memorandum of Agreement Regarding Utilization of Skagit River Basin Water Resources for Instream and Out of Stream Purposes in 1996 (MOA), the Skagit PUD was able to begin plans for a new surface water diversion facility on the Skagit River. The MOA established agreement between the Skagit PUD, City of Anacortes, Skagit County, Upper Skagit Indian Tribe, Swinomish Indian Tribal Community, Sauk-Suiattle Indian Tribe, Ecology, and Washington State Department of Fish and Wildlife (WDFW) related to water rights and the protection of surface water flows to benefit fish and wildlife. The MOA included construction of a new diversion facility on the Skagit River and processing of new water rights that would allow the Judy System to provide adequate water supply to the area's growing number of customers.

The Skagit River Basin Instream Resources Protection Rule (Skagit River Instream Flow Rule), established by Ecology in 2001 (Chapter 173-503 WAC), specifies the instream flows³ for the Cultus Mountain streams and the Skagit River. In accordance with the MOA and the Skagit River Instream Flow Rule, the Skagit PUD's diversions from the Cultus Mountain streams and a portion of diversions from the Skagit River are subject to instream flow rules.

Today, the Skagit PUD's customer base has grown to approximately 70,000 people served through over 625 miles of pipeline. The majority of these customers are served by the Judy System, which provides retail water service to an area of approximately 142 square miles in Skagit County. Figure 2-1 shows the service area for the Judy System.

³ The term "instream flow" is used to identify a specific stream flow needed to protect and preserve instream resources and values such as fish, wildlife, and recreation. An instream flow rule is, in essence, a water right for fish and other instream resources. While an instream flow rule does not affect existing water rights, water rights issued after the rule adoption are junior to the instream flow and can only be exercised when the instream flow is being met.

Table 2-1. History of the Cultus Mountain Watershed

Year	History
1936	Public Utility Skagit PUD No. 1 of Skagit County formed by voters.
1939	Skagit PUD purchases water systems from People's Water and Gas Company including water systems for the Cities of Mount Vernon, Burlington, and Sedro Woolley. Surface water sources include Cultus Mountain diversions at Mundt Creek and Turner Creek.
1940	Skagit PUD purchases water system from Clear Lake Water Corporation including Cultus Mountain diversions at Gilligan, Salmon, and Turner Creeks.
1947	Construction of Judy Reservoir completed to allow storage of 450 million gallons. Spillway elevation is 435'.
1958	Construction of the existing intake structure at Gilligan Creek.
1960	Skagit PUD Board of Commissioners passes Resolution 634 establishing the Cultus Mountain Watershed.
1961	Skagit PUD Board of Commissioners passes Resolution 677 instructing Skagit PUD staff to enter into cooperative agreements with Watershed landowners and initiate negotiations to acquire property within the Watershed for the protection of water quality.
1965	Judy Reservoir dam elevations increased to 451' allowing for storage of 1.01 billion gallons.
1967	Construction of existing intakes and pipelines at Mundt Creek and Turner Creek.
1979	10-year watershed agreement executed with Georgia Pacific Corporation covers over 70% of the Cultus Mountain Watershed.
1987	Skagit PUD purchases the 40-acre parcel surrounding the Salmon Creek intake.
1990	Construction of the existing pipeline from the Gilligan Creek intake to Judy Reservoir. Construction completed for a new 12 MGD multi-media direct filtration water treatment plant at Judy Reservoir.
1996	MOA executed between the Skagit PUD, City of Anacortes, Skagit County, Upper Skagit Indian Tribe, Swinomish Indian Tribal Community, Sauk-Suiattle Indian Tribe, Ecology, and WDFW to address utilization of Skagit River water resources for instream and out of stream purposes. The agreement allows for the future construction of a diversion facility on the Skagit River and facilitates processing of pending water right applications.
1997	Construction of the existing intake structure at Salmon Creek.
2001	Raising of Judy Reservoir dams allows for storage of 1.45 billion gallons of water and an increased spillway elevation of 465.1'. Skagit River Instream Flow Rule established by Ecology.
2007	Construction begins at the Skagit River Diversion Pump Station. Weyerhaeuser Timberlands LLC acquires Weyerhaeuser Fiber (approximately 4,276 acres within the Watershed).
2009	Major storm event causes significant damage to the Gilligan Creek Diversion and a portion of the pipeline from the Mundt Creek Diversion. Sediment loads bury the Turner Creek Diversion during this storm event.
2010	Skagit River Diversion Pump Station begins to supply water to Judy Reservoir. Completed upgrade of water treatment plant allows for a peak capacity of 30 MGD.
2011	Sediment loads from winter storms bury the Turner Creek Diversion intake.
2013	Weyerhaeuser Company acquires Weyerhaeuser Timberlands LLC (approximately 4,276 acres within the Watershed). Weyerhaeuser Timberlands LLC is anticipated to become a subsidiary of Weyerhaeuser.
2014	Gilligan Creek Intake Rehabilitation project improves the facility's reliability and ability to withstand debris and storm events
2017	Skagit PUD purchases 250 acres surrounding the Gilligan Creek intake.
2017	Mundt Creek Intake Rehabilitation project improves the facility's reliability and ability to withstand debris and storm events.

2.2 Watershed Location and General Description

Located 70 miles north of Seattle on the western slopes of the Cascade Mountain Range, the Cultus Mountain Watershed encompasses approximately 9 square miles (6,022 acres) within Water Resource Inventory Area (WRIA) 03 (Lower Skagit-Samish)⁴. The Watershed includes the areas draining to the Skagit PUD's surface water diversion facilities at four streams (Gilligan, Mundt, Turner, and Salmon Creeks). The diversion points range in elevation from 800 feet to 1,000 feet and the highest elevation in the Watershed is 4,000 feet.

Gilligan Creek and Salmon Creek eventually flow into the Skagit River. Turner Creek and Mundt Creek flow into Nookachamps Creek, a major tributary to the Skagit River.

The Watershed boundaries also include Judy Reservoir and the areas that drain to the reservoir. Approximately 142 acres in size, Judy Reservoir is located approximately 2 miles northwest of the stream diversion facilities and has a maximum surface water elevation of 465.1 feet. Figure 2-1 and Figure 2-2 show the locations of the Watershed, topography, diversion facilities, and pipelines.

In 1960, the Skagit PUD's Board of Commissioners established the "Public Utility District's Cultus Mountain Watershed" for the promotion of "orderly and proper use of the property within the watershed and to preserve the future domestic water supply of Skagit County". This action by the Skagit PUD was recorded in Resolution 634 and Resolution 677, which are included in Appendix A. The watershed boundaries established in these resolutions included areas beyond the hydrologic watershed boundary for the existing stream diversion facilities. For the purposes of this document, the extent of the Cultus Mountain Watershed is defined as the hydrological boundaries above the existing points of stream diversion and surrounding Judy Reservoir⁵.

⁴ Washington State Department of Ecology, 2020 (www.ecy.wa.gov)

⁵ Hydrological boundaries determined with the Skagit PUD's use of Geographic Information System (GIS) software and topographic information provided by the Puget Sound LIDR CONSORTIUM.

2.3 Watershed Hydrology

2.3.1 Climate

The climate in the Watershed is temperate with cool and comparatively dry summers and mild, wet and cloudy winters. Average monthly temperatures collected at a climate station in nearby Sedro-Woolley ranged from 40.5 degrees Fahrenheit (°F) in January to 64.5 °F in August. With elevations approaching 4,000 feet, temperatures in the Watershed are lower than these averages, and areas with elevations above 2,000 feet are regularly covered in snow during the winter months. Typical rainfall and temperature data collected at climate stations located in Mount Vernon and Sedro-Woolley are summarized in Table 2-2.

Table 2-2. Average Rainfall and Temperature for Areas Near the Cultus Mountain Watershed (1990-2019)

	Mean Temperature (°F)												
	Jan	Feb	Mar	April	May	June	July	Aug	Sept	Oct	Nov	Dec	Annual
Mount Vernon, WA*	40.2	41.3	45.0	49.4	55.4	59.6	64	64.3	59.1	51.0	44.1	39.2	51.0
Sedro-Woolley, WA*	40.5	41.9	45.7	50.00	55.8	59.9	64.1	64.5	59.06	51.6	44.6	39.4	51.5
	Mean Maximum Temperature (°F)												
	Jan	Feb	Mar	April	May	June	July	Aug	Sept	Oct	Nov	Dec	Annual
Mount Vernon, WA*	45.8	48.3	52.8	58.2	64.7	69	74.8	75.3	69.2	58.8	50.1	44.5	59.3
Sedro-Woolley, WA*	46.5	49.0	53.6	58.7	65.1	69.3	75.1	75.7	69.9	59.9	50.7	44.8	59.9
	Mean Minimum Temperature (°F)												
	Jan	Feb	Mar	April	May	June	July	Aug	Sept	Oct	Nov	Dec	Annual
Mount Vernon, WA*	34.6	34.3	37.2	40.6	46.1	50.3	53.3	53.3	48.9	43.1	38.0	34.0	42.8
Sedro-Woolley, WA*	34.5	34.8	37.9	41.4	46.5	50.6	53.2	53.2	49.3	43.3	38.5	33.9	43.1
	Mean Precipitation (inches)												
	Jan	Feb	Mar	April	May	June	July	Aug	Sept	Oct	Nov	Dec	Annual
Mount Vernon, WA*	3.8	2.5	2.8	2.3	2.2	1.7	0.8	1.2	1.6	3.3	4.9	3.5	30.5
Sedro-Woolley, WA*	5.9	4.0	4.7	4.2	3.2	2.8	1.4	1.6	2.8	5.0	7.3	5.3	48.3
Judy Reservoir, WA**	6.6	4.6	5.3	4.7	3.7	3.0	1.4	1.7	2.9	5.7	7.9	6.0	53.5

*Data from Western Regional Climate Center (www.wrcc.dri.edu)

**Data from Public Utility District No. 1 of Skagit County

2.3.2 Terrain, Geologic Features, and Soils

The terrain of the Cultus Mountain Watershed is mountainous and consists primarily of steep slopes. The Cultus Mountain Range is oriented north to south and is located in the center of the Watershed area. Of the streams diverted to Judy Reservoir, the Gilligan Creek drainage is located on the east side of the mountain range, Salmon Creek is located on the north side, and the Turner Creek and Mundt Creek drainages are located on the west side. Judy Reservoir is located northwest of the Cultus Mountains on a plateau adjacent to a transition area where the topography drops steeply to the Skagit River (Figure 2-2).

The geology of the Watershed is primarily represented by surficial deposits that overlie bedrock. Bedrock has been identified as Darrington Phyllite and the surficial deposits are composed of glacial sediments, soil, and colluvium. Darrington Phyllite is a highly folded and faulted rock, is mechanically weak, and easily weathers into small chips and clay-rich residues. As a consequence of these physical properties, the bedrock is prone to developing unstable soils. Surficial deposits are less than 3 meters thick in the majority of the Watershed. Most soils in the area are geologically young and primarily consist of gravelly silt loam with some rocky outcrops. Appendix C includes additional information related to soils of the Watershed.

2.3.3 Vegetation

The climate supports a predominantly coniferous forest that is currently in various states of regeneration following a long history of industrial logging practices. In the early part of the twentieth century, clear-cut areas were left to natural regeneration. Since the latter part of the twentieth century, clear-cut areas have been planted with conifer tree species such as Douglas fir (*Pseudotsuga menziesii*), Western hemlock (*Tsuga heterophylla*), Western redcedar (*Thuja plicata*), and Pacific silver fir (*Abies amabilis*). Red alder (*Alnus rubra*) and other true fir tree species often naturally regenerate among the planted trees.

As a result of intensive logging of the original native forests in the early twentieth century, most of the Watershed was covered in maturing “second-growth” forests during the last quarter of the twentieth century. During the first decade of the twenty-first century, logging activity began to significantly increase. As a result of this increased logging activity over the last twenty years, the landscape is dominated by recent clear-cuts and young tree plantations, with a minor amount of naturally regenerated forests with ages over 50 years. Consequently, logging activity has decreased significantly over the last few years.

2.3.4 Stream Flows

As a signatory to the MOA in 1996, the Skagit PUD agreed to operate its source water collection in a manner that was protective of instream flows in the Skagit River and the Cultus Mountain Watershed. These instream flows were established in the Skagit River Instream Flow Rule. With the exception of diversions of up to 42.59 cubic feet per second (cfs) (27.52 MGD) from the Skagit River, diversions from the sources for the Judy System are subject to instream flow rules. The minimum instream flows are listed in Table 2-3, a summary of the Skagit PUD's water rights related to these sources is provided in Table 2-4, and a copy of the MOA is located in Appendix B. A detailed description of the Skagit PUD's water rights can be found in the Skagit PUD's current Water System Plan⁶.

Stream flows in the Watershed generally follow the annual rainfall patterns with higher flows in the fall, winter, and spring months and very low flows during the summer. The Skagit PUD operates gauging stations at all four streams directly below the points of diversion. Recent stream flow patterns for these streams are shown in Figure 2-5. Because these stream flows are measured below the points of diversion, they do not include the water volumes diverted to Judy Reservoir.

The stream gauging stations transmit information wirelessly to a satellite data collection system operated by the U.S. Geological Survey (USGS). This information is collected by the Skagit PUD for calculation of estimated flow rates. The estimated flow rates are then displayed on the Skagit PUD's website. To allow for the determination of Skagit River flow rates, the USGS operates a gauging station near Mount Vernon and flow information can be found by viewing a USGS website. These sources of information are monitored by Skagit PUD staff to ensure that diversion facilities are operated in compliance with instream flow rules.

By managing surface water diversions according to instream flow rules and existing water rights, source water from the Watershed and Skagit River is provided to Judy Reservoir throughout the calendar year. Diverted flows from Gilligan Creek, Mundt Creek, and the Skagit River currently provide the majority of source water to the reservoir. Figure 2-4 shows the proportion of water from each source diverted to Judy Reservoir in 2017. Figure 2-5 and Figure 2-6 show the typical annual changes in elevation at Judy Reservoir, source water inflows to the reservoir, and outflows to the distribution system following processing by the WTP.

⁶ Skagit PUD, 2020, Public Utility Skagit PUD No. 1 of Skagit County 2020 Water System Plan

Table 2-3. Minimum Instream Flows for the Skagit River and Cultus Mountain Streams

Dates	Skagit River*	Gilligan Creek*	Mundt Creek*	Turner Creek*	Salmon Creek*
January	10,000	19.8	6.4	7.9	4
February	10,000	19.8	6.4	5.4	4
March 1-15	10,000	19.8	6.4	5.4	4
March 16-31	10,000	27.7	9.4	5.4	4
April	12,000	31.7	9.4	7.9	4
May	12,000	31.7	9.4	7.9	1.4
June	12,000	31.7	9.4	4.9	1.4
July	10,000	39.6	7.6	4.9	1.4
August	10,000	39.6	7.6	4.9	1.4
September	10,000	39.6	7.6	4.9	4
October	13,000	23.8	7.6	7.9	4
November 1-15	13,000	27.7	9.4	7.9	4
November 16-31	11,000	27.7	9.4	7.9	4
December 1-15	11,000	27.7	9.4	7.9	4
December 16-31	10,000	27.7	9.4	7.9	4

*minimum instream flow in cubic feet per second (cfs)

Table 2-4. Summary of Skagit PUD Water Rights Related to the Cultus Mountain Watershed

Source	Instantaneous Water Right (cfs)*	Instantaneous Water Rights Exempt from Instream Flows (cfs)*
Skagit River	55.39	42.59
Gilligan Creek	22.04	0
Mundt Creek	26.56	0
Turner Creek	17.1	0
Salmon Creek	5.8	0

*maximum withdrawal from all sources is 55.39 cfs / 35.8MGD

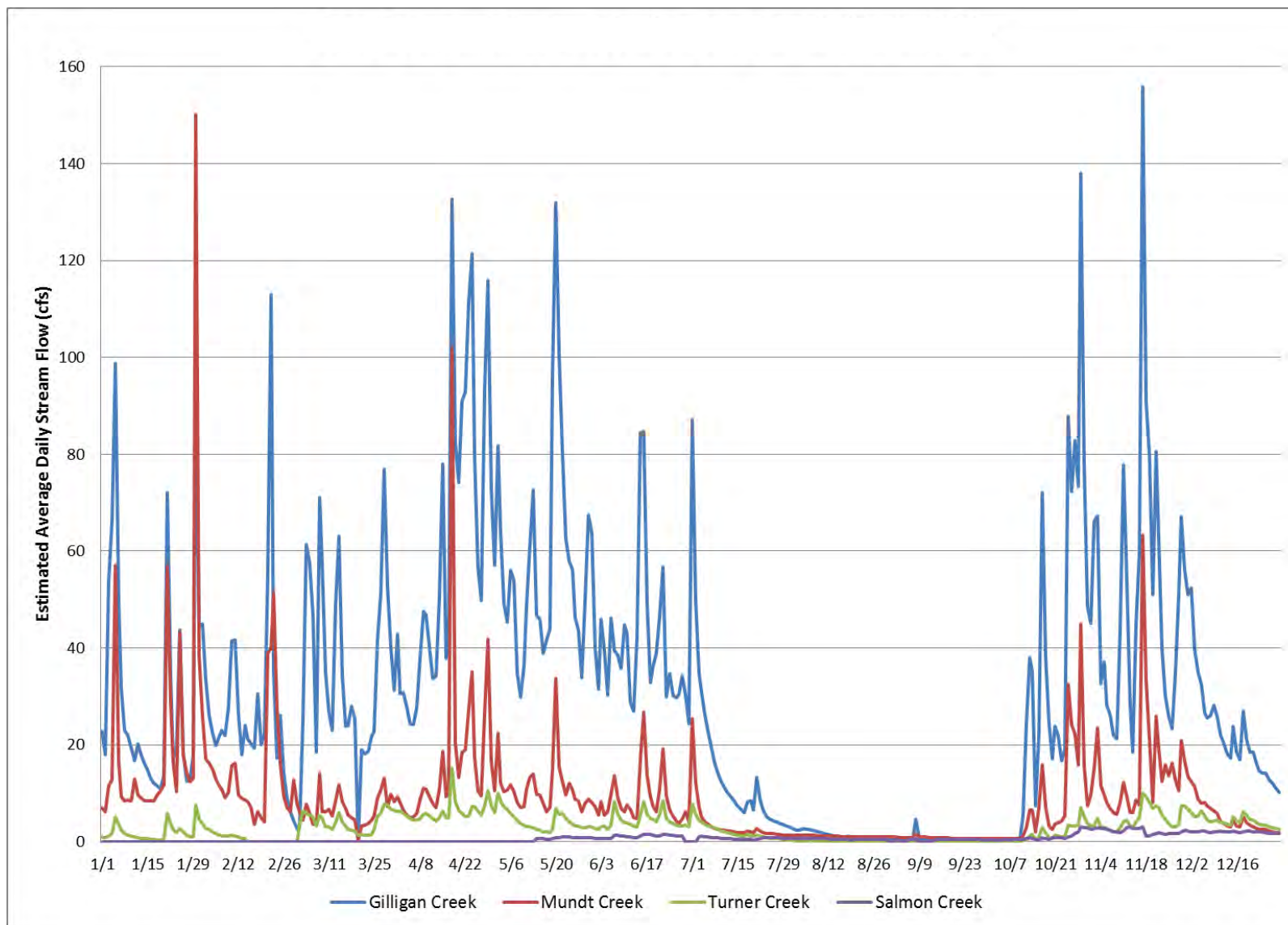


Figure 2-3. Representative Stream Flows in the Cultus Mountain Watershed (2012)

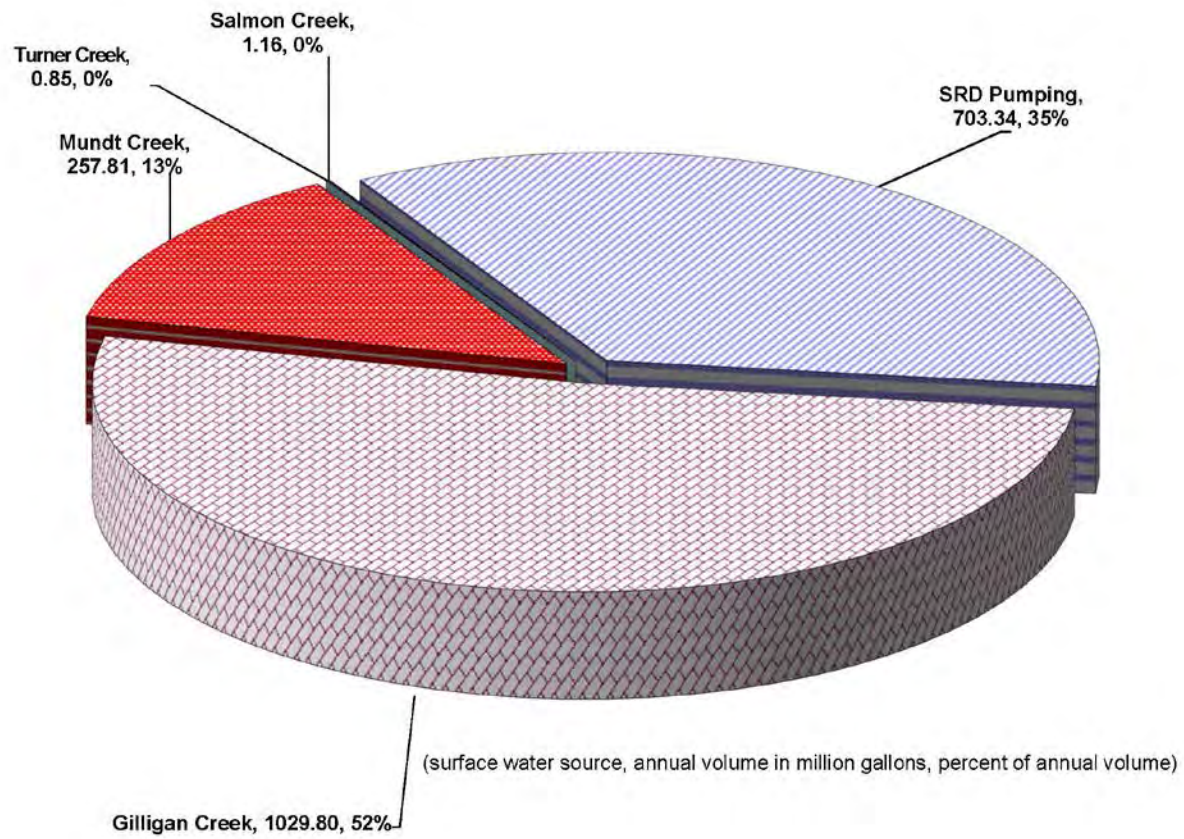


Figure 2-4. 2017 Judy Reservoir Source Water Allocation

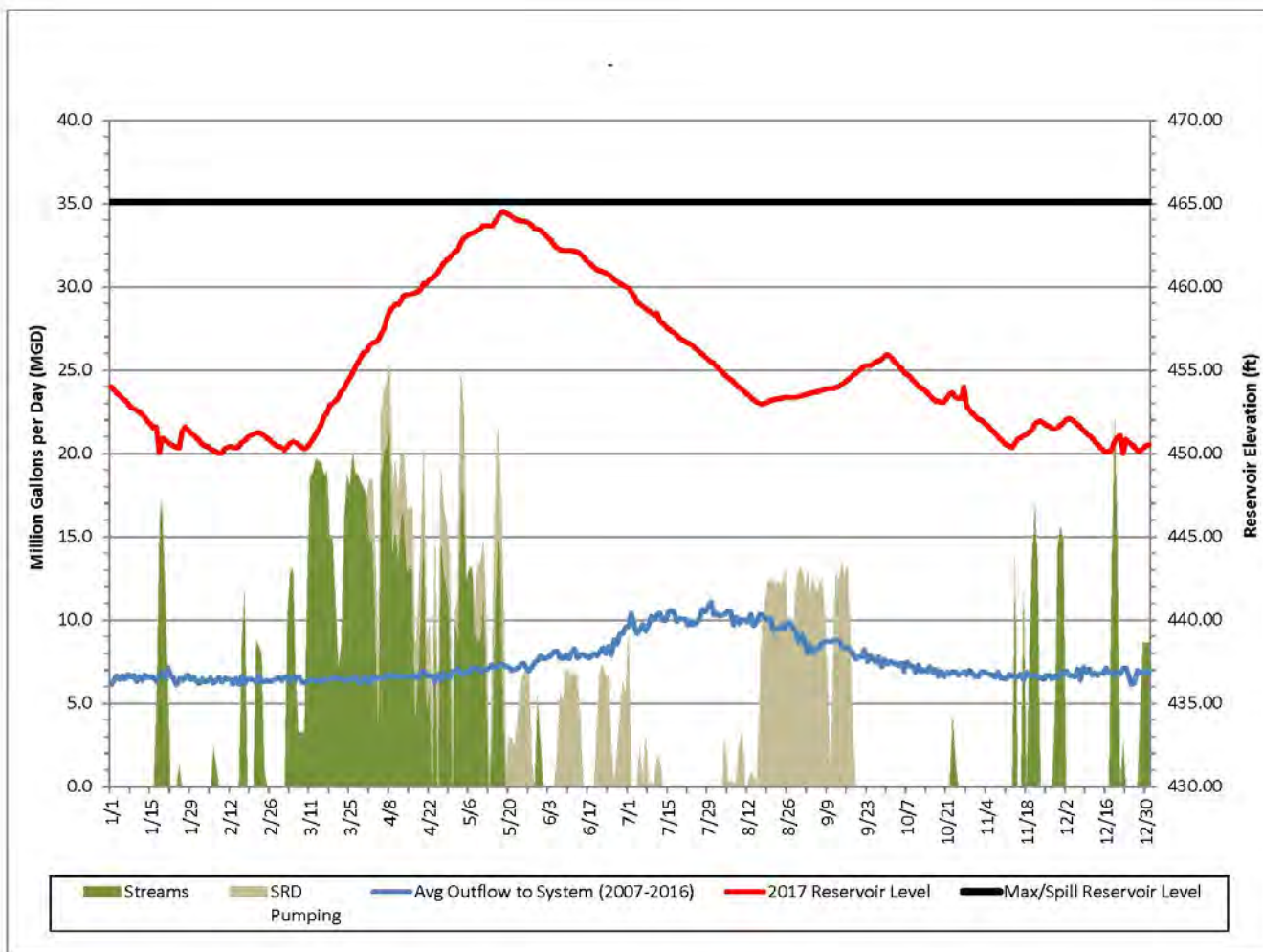


Figure 2-5. 2017 Judy Reservoir Inflows and Outflows

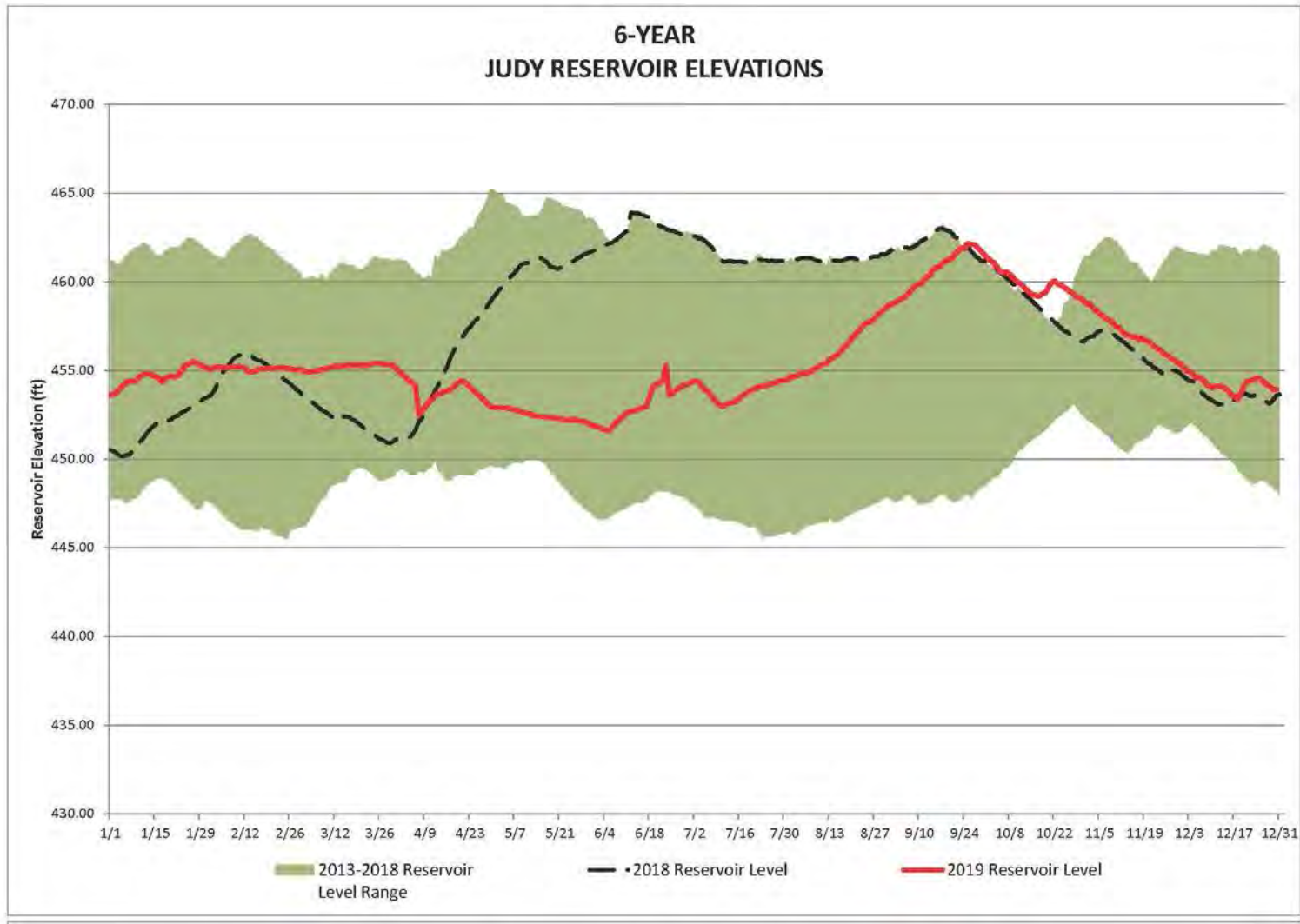


Figure 2-6. 2013–2019 Judy Reservoir Elevations

2.4 Water System Components

Water system components associated with the Cultus Mountain Watershed include Judy Reservoir, the Gilligan Creek Diversion, Salmon Creek Diversion, Turner Creek Diversion, Mundt Creek Diversion, and the source water pipelines from the diversions to Judy Reservoir. As mentioned previously, a surface water diversion and pump station facility on the Skagit River also provides source water to Judy Reservoir. These components are shown in Figure 2-7 and are discussed in the following sections. Pictures of each diversion facility are provided in Figures 2-8 through 2-12.

2.4.1 Judy Reservoir

Judy Reservoir was constructed in 1947. Its capacity has been increased by raising the surrounding dams in 1965 and 2001. The current capacity of the reservoir is approximately 1.45 billion gallons. The reservoir is formed by two earth-fill dams located in the Janicki Creek basin. Janicki Creek was diverted around the eastern edge of the reservoir during past construction activities and is separated from the reservoir by a man-made stream channel. The Skagit PUD's water treatment plant is located on the north side of Judy Reservoir. Water is pumped from the reservoir, processed at the treatment plant in compliance with DOH regulations, and flows through gravity pipelines to the distribution system. If water levels in the reservoir rise above an elevation of 465.1 feet, the excess water flows into Janicki Creek and eventually into the Skagit River.

A portion of the suspended sediment and organic material carried by source water to Judy Reservoir settles and remains in the reservoir. While this removes a portion of these compounds from source water prior to the treatment process, the resulting sediment levels in the reservoir will eventually result in increased maintenance activities and costs to ensure adequate storage.

2.4.2 Skagit River Diversion Pump Station (SRD)

Located 1 mile northwest of Judy Reservoir, the Skagit River Diversion Pump Station (SRD) is used to supply source water from the Skagit River to the Judy System. Commissioned in 2009, the facility uses five 900-horsepower electric pumps to transfer water from the Skagit River to Judy Reservoir through a 36-inch-diameter underground pipeline. The intake structure is constructed of concrete and the surrounding riverbanks are protected with large riprap.

SRD is used as an alternate and supplemental source of water to the Cultus Mountain streams. Flows are diverted from the streams to the maximum extent possible given the constraints of water rights and instream flows. If these flows are inadequate to achieve desired levels in Judy Reservoir, SRD is used to provide the necessary water volumes. In addition, SRD has the capability to provide the full cumulative water right of 35.8 MGD to Judy Reservoir if stream diversions are suspended due to emergency events such as storm damage.

Sediment deposits from the Skagit River can accumulate inside of and on the top of the concrete intake structure at SRD. Periodic maintenance is required to remove these deposits and reduce operational difficulties related to the pump station.

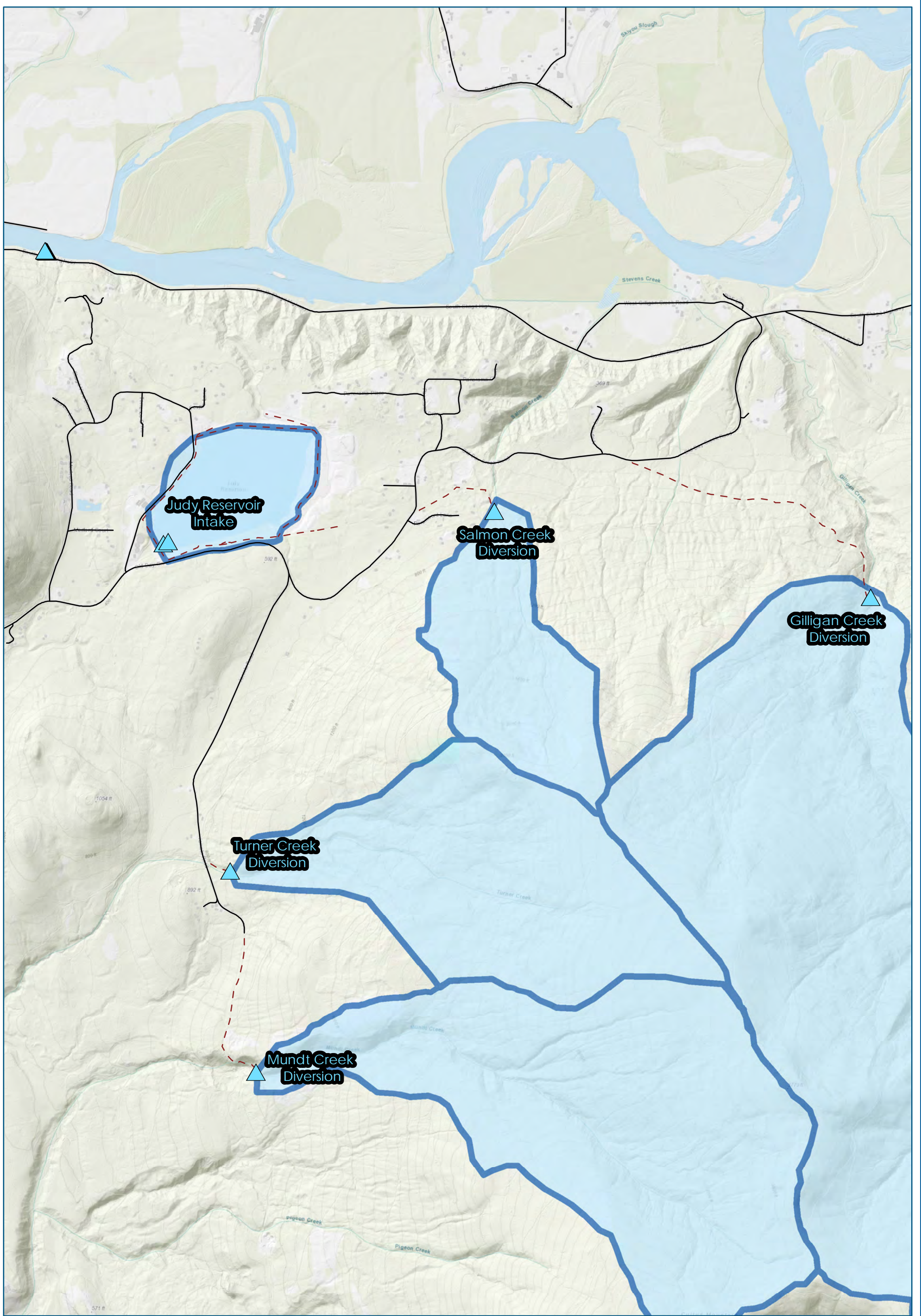






Figure 2-7. Water System Components of the Cultus Mtn Watershed

- Legend**
-  wIntake
 -  Dirt Road
 -  County Road
 -  Watershed

This map was created from available public records and existing map sources, not from field surveys. While great care was taken in this process, maps from different sources rarely agree as to the precise location of geographic features. The relative positioning of map features to one another results from combining different map sources without field verification.

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0 0.125 0.25 0.5 Miles

NAD 1983 StatePlane Washington North FIPS 4601 Feet
 Author: zemp
 2/25/2020

SEC: TWP: RGE: C.O. P.N.



Figure 2-8. Skagit River Diversion Pump Station (SRD)

2.4.3 Gilligan Creek Diversion

The diversion at Gilligan Creek was constructed in 1958. While minor changes have occurred over the years, the basic function of the diversion has remained consistent. An underground pipeline was constructed within bedrock to access an intake screen located along the bottom of the stream channel. Stream flows drop through the screen, into the pipeline, and enter a vertical box-shaped structure. By manipulating the volumes of water passing through this structure, operators manage the amount of water that enters the source water pipeline to Judy Reservoir.

The Gilligan Creek Diversion can be affected by winter storms, and a major storm in January 2009 resulted in significant damage and an extended loss of the ability to divert water to the reservoir. The screen was susceptible to blockages caused by rock and gravel transported by the stream. Access is difficult and maintenance activities usually require the use of an aerial work platform (“man lift”). In 2014, the Skagit PUD completed the replacement of the screen with a design intended to minimize malfunctions due to debris and improve resistance to winter storms. These improvements increased protection of a large portion of the source water provided to the Judy System. The Skagit PUD will be repairing the access road to Gilligan in summer of 2020 to prevent any future failure.



Figure 2-9. Gilligan Creek Diversion

2.4.4 Mundt Creek Diversion

Similar in design to the Gilligan Creek Diversion, the Mundt Creek Diversion collects water through a screen located on the streambed. The diversion was constructed in 1967 along with the Turner Creek Diversion and the combined source water pipelines to Judy Reservoir.

The Skagit PUD completed a major rehabilitation of the intake structure in 2017. The intake screen was replaced with a design similar to that installed at Gilligan Creek in 2014, damaged concrete walls were repaired, operating mechanisms were replaced to better protect workers, and a new stream gauging weir was incorporated into the structure. Sediments and debris traveling through the stream system now pass across the new intake screen without causing significant damage or operational difficulties.



Figure 2-10. Mundt Creek Diversion

2.4.5 Turner Creek Diversion

The Turner Creek Diversion includes a concrete structure that functions as a dam to divert water into the source water pipeline. Constructed in 1967, the diversion connects to the pipeline from Mundt Creek for eventual discharge to Judy Reservoir.

The Turner Creek Diversion is susceptible to operational difficulties if large amounts of sediments build-up behind the structure. This situation can inhibit diversion of water into the source water pipeline until the debris is removed. The Skagit PUD removed built up sediment in the summer of 2020.



Figure 2-11. Turner Creek Diversion

2.4.6 Salmon Creek Diversion

The diversion at Salmon Creek was constructed in 1997. A steel structure is located across the stream channel and functions as a dam. A spillway is manipulated to control the amount of water that enters the source water pipeline to Judy Reservoir. Salmon Creek is a relatively low velocity stream and is not significantly affected by debris or storm damage.



Figure 2-12. Salmon Creek Diversion

2.4.7 Source Water Pipelines

Underground pipelines used to convey source water from the stream diversion facilities to Judy Reservoir are primarily located along public roadways or gravel logging roads. The existing concrete and ductile-iron pipelines were constructed in two phases in 1967 and 1990 with an average depth of 3 feet to the top of a pipeline.

2.5 Land Ownership and Activities

2.5.1 Ownership

The Cultus Mountain Watershed includes property owned by the Skagit PUD, Washington State Department of Natural Resources (DNR), Mid Valley Resources, Inc. (Hampton Lumber), and five private individuals. The Skagit PUD owns 97% of the property surrounding Judy Reservoir, two 40-acre parcels surrounding the Salmon Creek and Mundt Creek diversions, including 250 acres around the Gilligan Creek Diversion. The Turner Creek Diversion is located on DNR property. In the 6,022 acres of watershed area, DNR and Hampton Lumber own 25% and 66%, respectively. Private individuals own 8.8 acres of the Salmon Creek Watershed and 1.6 acres of the Judy Reservoir

Watershed. Figure 2-15 and Table 2-5 provide details about the location and extent of property ownership in the Watershed.

The majority of the Watershed is zoned by Skagit County as Industrial Forest-Natural Resource Lands. Skagit County land use regulations zone the area surrounding Judy Reservoir as a Public Open Space Area of Regional-State Importance and other minor portions of the Watershed are zoned as Secondary Forest-Natural Resource Lands and Rural Reserve. Public Open Space Areas of Regional-State Importance are dedicated for public purposes such as recreation, scenic amenities, and the protection of environmentally sensitive areas⁷.

⁷ Skagit County Government (www.skagitcounty.net)

Table 2-5. Land Ownership in the Cultus Mountain Watershed

Ownership	Acres	Percentage
Judy Reservoir Watershed		
Skagit PUD	176.7	97.0%
Private Individuals	1.6	0.9%
Public Roads	63.9	2.1%
Subtotal Judy Reservoir Watershed	182.2	100.0%
Gilligan Creek Watershed		
Skagit PUD	206	5.6%
Hampton Lumber	2,569.7	69.9%
Washington DNR	897.8	24.4%
Subtotal Gilligan Creek Watershed	3676.5	100.0%
Mundt Creek Watershed		
Skagit PUD	8.6	0.8%
Hampton Lumber	960.0	86.8%
Washington DNR	137.9	12.5%
Subtotal Mundt Creek Watershed	1,106.5	100.0%
Salmon Creek Watershed		
Skagit PUD	21.2	6.4%
Hampton Lumber	73.1	22.1%
Private Individuals	8.8	2.7%
Washington DNR	228.1	68.9%
Subtotal Salmon Creek Watershed	331.2	100.0%
Turner Creek Watershed		
Skagit PUD	0.0	0.0%
Hampton Lumber	462.7	63.9%
Washington DNR	261.7	36.1%
Subtotal Turner Creek Watershed	724.4	100.0%
Cultus Mountain Watershed (all sub-basins combined)		
Skagit PUD	412.5	3.4%
Hampton Lumber	4,065.5	71.0%
Washington DNR	1,525.5	25.3%
Public Roads	3.9	0.1%
Private Individuals	10.4	0.2%
Total Cultus Mountain Watershed	6,017.8	100.0%

2.5.2 Access and Activities

Industrial forestry and logging activities have dominated the landscape of the Watershed for at least a century with a long period of reduced logging activity and relatively stable forest characteristics from the middle to the end of the twentieth century (approximately 1950–2000), followed by significant increases in logging and logging road construction over the last twenty years. Within the last several years, there has been a noticeable reduction in logging and logging road construction.

Forest maintenance activities will be the focus in the watershed for years to come as the rest of the stands mature. Maintenance activities include access road maintenance and forest plantation management activities such as tree planting and thinning of undesirable tree species. Minor amounts of clear-cut logging will likely continue.

The Skagit PUD management team is not aware of historic herbicide or fertilizer use within the Watershed. Discussions with Weyerhaeuser (prior to recent sale to Hampton Lumber) and DNR indicate that herbicide and fertilizer use is not currently occurring within the Watershed.

The small amount of property owned by the Skagit PUD in the Watershed has been managed with an exclusive goal of water quality protection. Activities on Skagit PUD property such as brush control and maintenance of gravel access roads have been limited to the minimum amount necessary for operation of the diversion, impoundment, and water treatment infrastructure. These activities are planned to also occur on the new property purchased by the Skagit PUD along Gilligan Creek. The Skagit PUD has established a specific land management plan for the Gilligan Creek property.

With the exception of the public roads near Judy Reservoir, vehicular access to all areas of the Watershed is limited to a small number of locations and all access points are controlled with the use of gates. Judy Reservoir is surrounded on two sides with chain-link fencing and access gates are managed by Skagit PUD staff stationed at the nearby WTP. Access to the remaining areas of the reservoir is hindered by steep topography and thick vegetation. Access roads to the stream diversion sites are gated and managed cooperatively by the Skagit PUD and other landowners such as DNR and Hampton Lumber. Figure 2-14 shows access points and measures such as fencing, gates, and signage used to control entry to the Watershed.

Two forest roads provide access to the upland areas of the Watershed. A gate controlling access to the eastern and higher elevations of the Gilligan Creek Watershed is managed by Hampton Lumber. Another gate controlling access to the western portion of the Gilligan Creek Watershed and the Salmon, Turner, and Mundt Creek watersheds is managed by DNR. Current signs at these gates stipulate that motorized vehicle access by the public is prohibited. The gates are often left open during weekdays due to active logging operations, resulting in the potential for unauthorized vehicular access by the public. Non-motorized recreational access by the public for activities such as hiking, and hunting is commonly observed.

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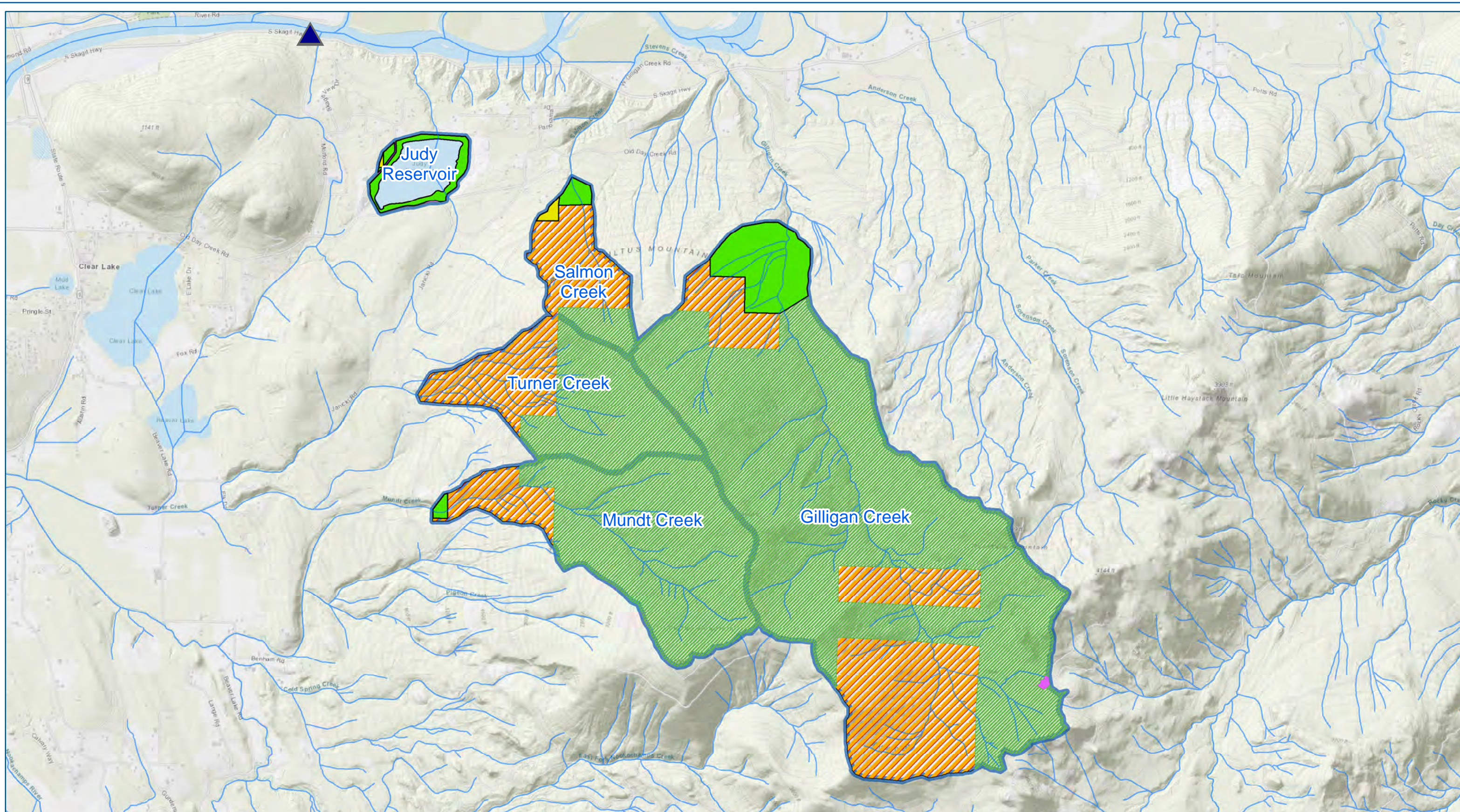
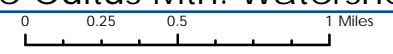


Figure 2-13. Land Ownership In the Cultus Mtn. Watershed



Legend

SRD	PUD	WA DNR
Streams	Residential	Hampton Lumber

SEC: TWP: RGE: C.O. P.N.

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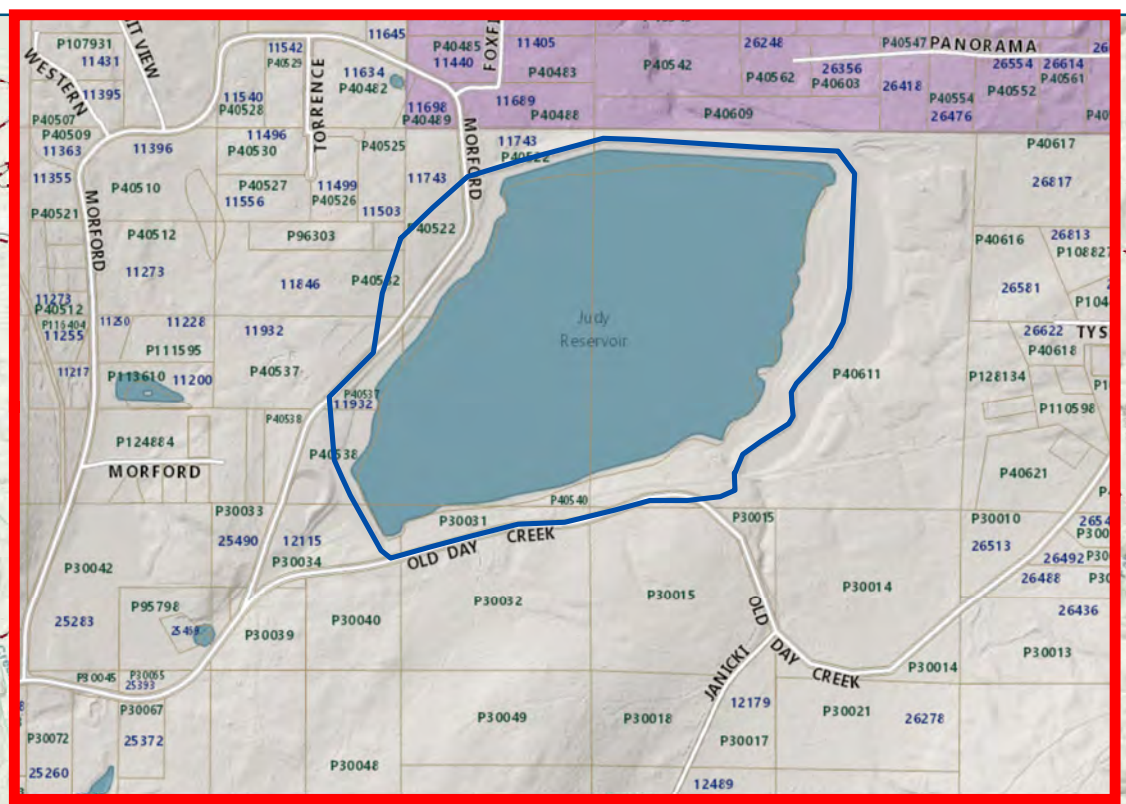
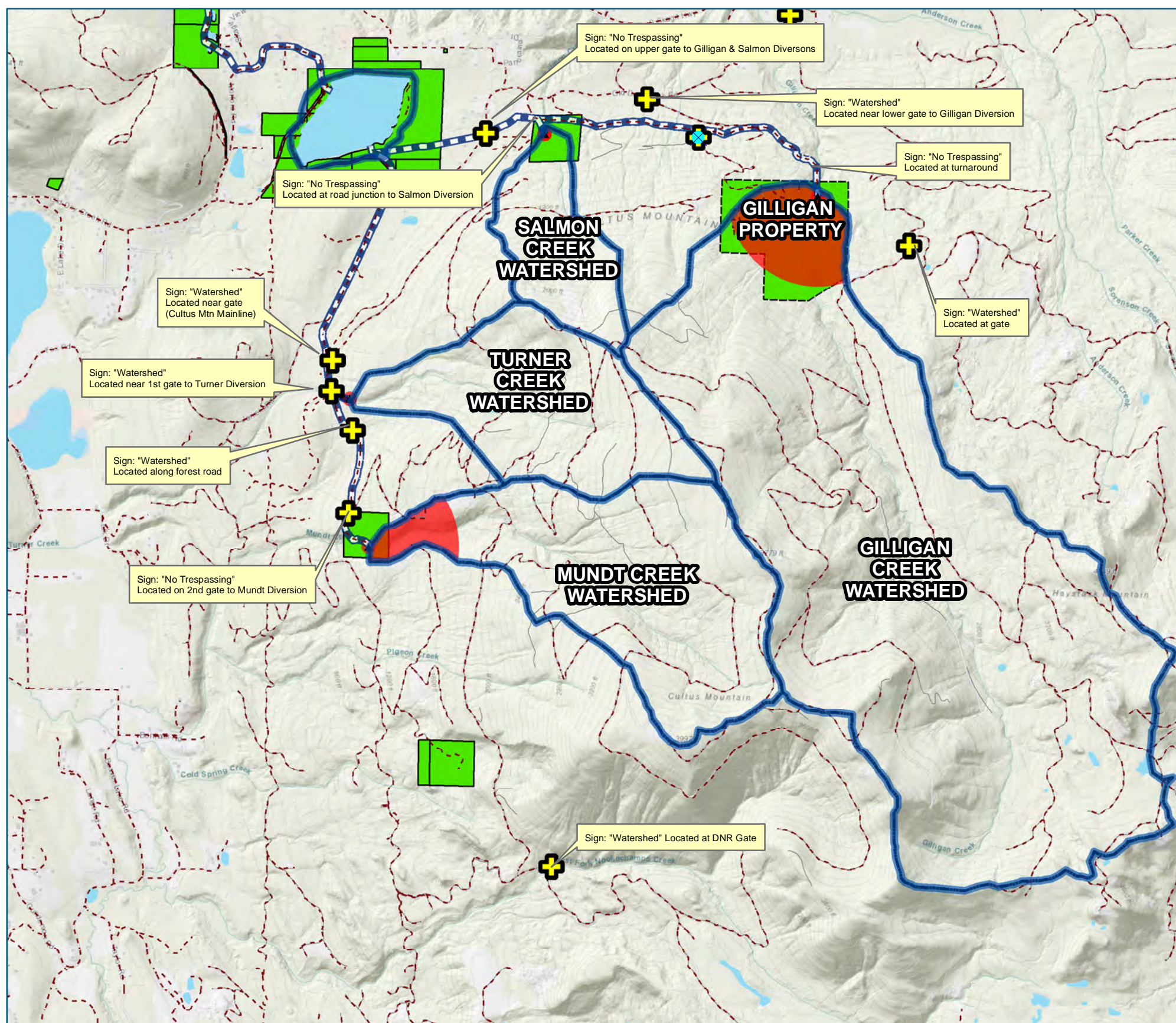
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 Author: zemp, edited by LaRocque
 11/19/2021

Increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, StreetMap contributors, and the GIS User Community

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Sanitary Control Area Designations

Judy Reservoir	Watershed areas around the reservoir except for existing public roadways
Gilligan Creek Diversion	200-foot radius around the intake and watershed areas within 1/2-mile upstream of the intake
Mundt Creek Diversion	200-foot radius around the intake and watershed areas within 1/2-mile upstream of the intake
Turner Creek Diversion	200-foot radius around the intake
Salmon Creek Diversion	200-foot radius around the intake

"Watershed" Sign

Cultus Mountain Watershed

Protected for
Public Drinking Water Supply

No Unauthorized Motorized Vehicles
Monitored by Landowners & Skagit PUD
Spill Reporting Call (360) 424-7104

Skagit
PUD

"No Trespassing" Sign

NO
TRESPASSING

SKAGIT PUD
CONTACT 24 HOURS
(360) 424-7104

Figure 2-14. Access and Sign Map
Cultus Mountain Watershed

0 0.25 0.5 1 Miles

NAD 1983 StatePlane Washington North FIPS 4601 Feet
Author: zemp
3/27/2020

	SRD		District Intake
	Road		District Source Water Pipeline
	Gate		District Ownership
			District Level 1 Critical Area / Sanitary Control Area

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Skagit
PUD

PUBLIC UTILITY DISTRICT

SEC: TWP: RGE: C.O. P.N.

Two public roads under the jurisdiction of Skagit County (Morford Road and Old Day Creek Road) are located within the Watershed in proximity to Judy Reservoir. These roads are surfaced with “chip-seal” and maintenance activities performed by the Skagit County Public Works Department commonly include the following:

- Periodic replacement of the “chip-seal” surfacing and pavement markings
- Drainage ditch maintenance
- Vegetation management

With the exception of a private surface water diversion on Turner Creek, the Skagit PUD management team is unaware of private structures existing within the Watershed. The private surface water diversion is located approximately 1,600 feet upstream of the Turner Creek Diversion and is used to supply domestic water to a nearby residence outside of the Watershed boundaries.

3 IDENTIFICATION OF CONDITIONS, ACTIVITIES, AND LAND USES DETRIMENTAL TO WATER

A variety of contamination sources and activities within a watershed can affect source water quality. Impacts may result from physical, microbiological, and chemical sources of contamination. Increased levels of sediment and organic material can decrease efficiency of the water treatment process, damage infrastructure, contribute to long-term sediment maintenance issues at Judy Reservoir, and contribute to potentially harmful byproducts in drinking water. Toxins and viruses introduced to drinking water sources can be harmful to human consumption. Both naturally occurring characteristics of the watershed and human activities have the potential to cause or affect these types of contamination. This chapter discusses the different sources of contamination that have the potential to occur in the Cultus Mountain Watershed and describes known site locations and circumstances that may adversely impact source water quality. The final section of the chapter defines critical areas where contaminants have the highest potential to degrade source water used by the Skagit PUD's WTP.

3.1 Naturally Occurring Watershed Characteristics

3.1.1 Precipitation and Terrain

The mountainous conditions of the Watershed naturally affect the quality of source water diverted for the Skagit PUD's use. Steep and unstable slopes can increase the rate of erosion, and high levels of precipitation can adversely impact water quality by causing erosion in areas with naturally unstable soils. Water quality testing in the Watershed has identified increases in turbidity and organic compounds during the periods of runoff following high precipitation.

3.1.2 Fish and Wildlife

Because wild animals such as deer, bear, and beaver are common in the Watershed, there is the potential for contamination of water sources by disease-causing parasites such as *Giardia* and *Cryptosporidium*. Also, trout and waterfowl such as the Canada goose and Trumpeter swan are regularly observed in the waters of Judy Reservoir. If infected, feces from these species can contaminate drinking water⁸. The direct contact of these species with source water in the reservoir has the potential to detrimentally affect water quality⁹.

3.1.3 Other Aquatic Organisms

The presence of certain microscopic plants, animals, and bacteria can cause disruptions to source water quality. For example, blue-green algae (cyanobacteria) can produce toxins or poisons harmful to drinking water supplies. During the water treatment process, sources with high organic levels can

⁸ U.S. Environmental Protection Agency, 2000, *Giardia: Drinking Water Fact Sheet*

⁹ U.S. Environmental Protection Agency, 2001, *Cryptosporidium: Drinking Water Health Advisory*

also contribute to the formation of compounds known as disinfection byproducts. Disinfection byproducts may cause health problems when present in drinking water supplies and are regulated by DOH¹⁰. Numerous species of algae, including blue-green algae, have been identified in Judy Reservoir.

3.1.4 Forest Fires

Catastrophic forest fires pose a significant risk to water quality in the Watershed because of the potential for damaging trees and other vegetation. The loss of vegetation and soils can lead to increased sediment delivery to streams¹¹. The major causes of forest fires in this region are lightning, logging operations, and unattended campfires.

3.2 Watershed Activities and Land Uses

Numerous human activities and land uses have the potential to contaminate source water. Activities related to agricultural, livestock, and wastewater operations do not currently occur in the Watershed and do not pose a threat to water quality. The activities and land uses described below that can affect water quality are currently present or occurring within the Watershed. These activities are listed in terms of decreasing potential to degrade source water quality in the Watershed.

3.2.1 Industrial Forest Management

As the dominant type of land use in the Cultus Mountain Watershed, certain activities commonly implemented by industrial forest managers have the potential to degrade source water quality. These activities range from intensive practices such as clear-cut logging to non-point policy decisions on topics such as public access for recreation.

3.2.1.1 Logging

As described in previous sections, clear-cut logging is a common practice that decreased in the Watershed over the last several years. This type of logging practice consists of the complete removal of trees in a forested area with the exception of riparian buffers and leave areas required by forestry regulations. Clear-cut logging can increase rates of runoff in a watershed¹², resulting in increased erosion and sediment delivery to streams¹³. Increased runoff can result in higher stream flows, increased bed scour, and increased erosion of exposed or unstable stream banks. Increased sediment transport negatively affects diversion intake structures and the water treatment process.

Clear-cut logging has occurred in locations throughout the Watershed and is anticipated to continue. DNR and Weyerhaeuser (prior to Hampton Lumber) have conducted clear-cut logging operations in

¹⁰ Washington Department of Health (www.doh.wa.gov)

¹¹ Southwest Hydrology-Meixner and Wohlgemuth, 2004, Wildfire Impacts on Water Quality

¹² Wegmann, 2004, Landslide Hazard Zonation Project Level II Assessment, Nookachamps Watershed, Skagit County, WA

¹³ Moore and Wondzell, 2005, Physical Hydrology and the Effects of Forest Harvesting in the Pacific Northwest: a Review, Journal of the American Water Resources Association

the recent past. Proposals have been submitted for future logging activities by DNR and Hampton Lumber. As the majority of mature stands were cleared over the last twenty years, most of the Watershed activities in the coming years will consist of silviculture and road maintenance. Informal correspondence with DNR has indicated that logging activities are not likely to occur on DNR property in the upper Gilligan Creek drainage in the foreseeable future. This assumption is due to DNR's self-imposed minimum forest age criteria for logging.

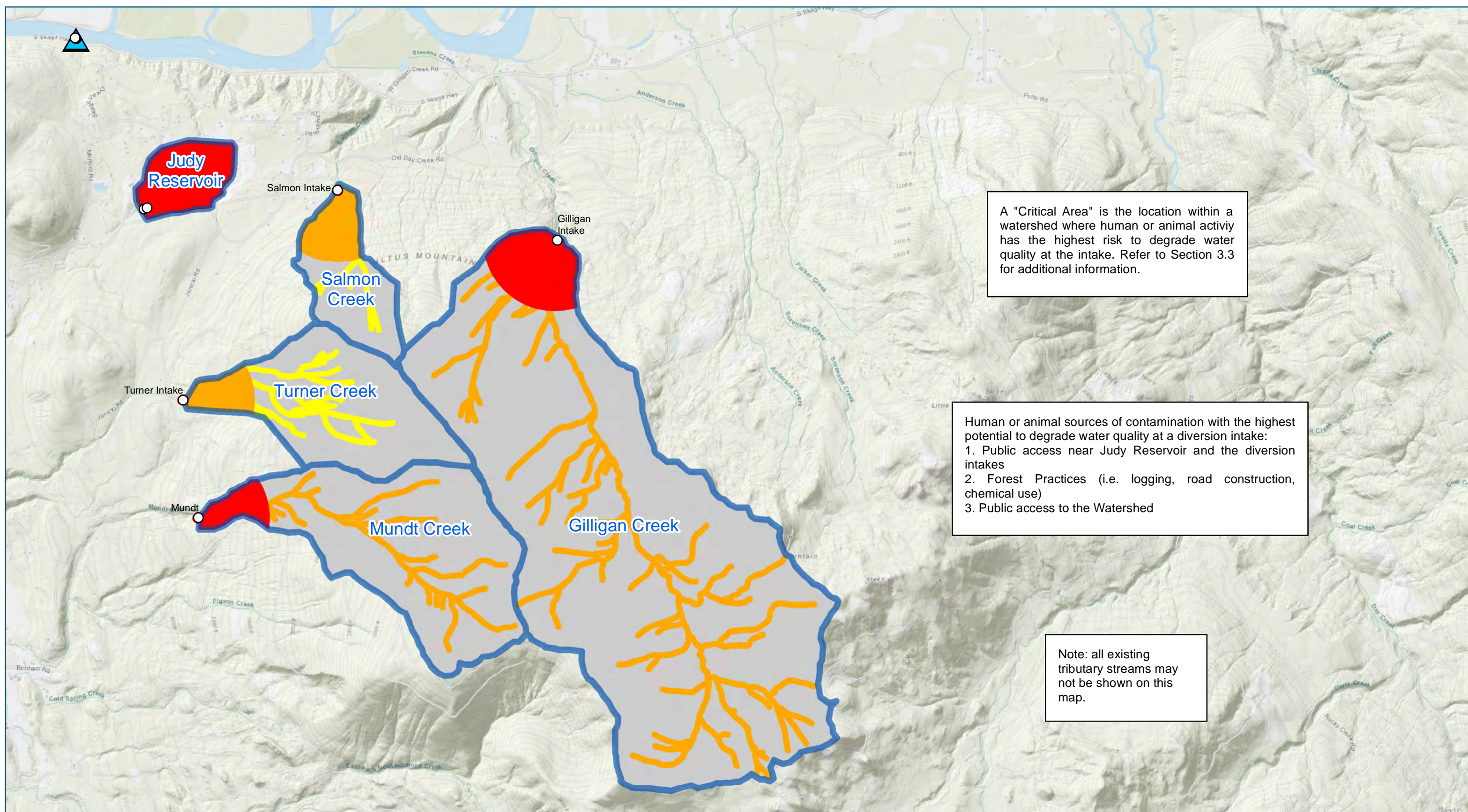
3.2.1.2 Forest Road Construction and Maintenance

Forest roads are used by industrial forest managers to access new logging areas, cultivate forest plantations, and provide forest fire protection. Usually surfaced with gravel or crushed rock, these roads are a potential source of contaminants to the nearby streams of a watershed. As a result of the high precipitation rates, steep topography, and wet soils found in the mountains of western Washington, the construction and maintenance of these roads can increase sediment delivery to streams as follows:

- Topsoil and forest duff is disturbed and removed during the road construction process.
- Road construction often includes activities within streams during installation of culverts and bridges.
- Natural drainage can be intercepted, collected, and discharged through culverts, resulting in a concentration of flow to a narrow location.
- Runoff from road surfaces, drainage systems, and soils exposed during construction can be delivered to streams.
- Exposed soils on cut-slopes and in ditches can result in a perpetual source of erosion and sediment delivery to the road drainage system.
- During periods of precipitation, the use of forest roads to haul logs and road surfacing material can increase rates of sediment delivery to streams.

A large and complex network of forest roads is currently present within the boundaries of the Watershed and it is anticipated that new roads will be constructed by the two major landowners. New road construction is usually proposed in conjunction with logging proposals. Figure 2-14 shows the locations of forest roads in the Watershed. The Skagit PUD also intends to focus on improvement and maintenance of the access roads related to the property acquired in the Gilligan watershed.

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A "Critical Area" is the location within a watershed where human or animal activity has the highest risk to degrade water quality at the intake. Refer to Section 3.3 for additional information.

- Human or animal sources of contamination with the highest potential to degrade water quality at a diversion intake:
1. Public access near Judy Reservoir and the diversion intakes
 2. Forest Practices (i.e. logging, road construction, chemical use)
 3. Public access to the Watershed

Note: all existing tributary streams may not be shown on this map.

Critical Areas of Cultus Mtn. Watershed

NAD 1983 StatePlane Washington North FIPS 4601 Feet
 Author: zemp
 3/27/2020

Legend

- Intake
- Level 1 Priority (Highest Risk of Contamination)
- Level 2 Priority
- Level 3 Priority
- Other Watershed Areas (Lowest Risk of Contamination)

SEC: TWP: RGE: C.O. P.N.

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3.2.1.3 Recreation

Human presence and activities in a watershed can degrade water quality by increasing the risk of microbiological contamination, fuel spills, garbage dumping, and domestic animal waste. The Skagit PUD is not aware of any permanent residences in the Watershed; however, recreation activities such as hiking, fishing, and hunting can result in human presence that would otherwise be nonexistent. The current policy of both forest landowners in the Watershed is to prohibit motorized access by the public. As a result of this policy, public entry to the Watershed is minimal and usually limited to the outer zones of the Watershed boundaries.

3.2.1.4 Chemical Application

Chemicals such as herbicides, insecticides, and fertilizers may be applied by industrial forest managers. These chemicals have the potential to negatively affect water quality by introducing toxins into source water used for potable purposes. The Skagit PUD is not aware of chemical application by forest landowners in the Watershed; however, herbicide use has been observed close to the Watershed boundaries. Historical herbicide and fertilizer use has not occurred in the Watershed. The Skagit PUD intends to address the use of chemicals during upcoming efforts to establish written agreements with Watershed landowners.

3.2.2 Public Transportation Routes

As with forest roads, contaminants such as petroleum products can be carried by surface water runoff from public roadways. The presence of humans and animals along public transportation routes also has the potential to provide a source for bacterial and viral contamination of this type of runoff.

Old Day Creek Road and Morford Road, both managed by Skagit County, are close to Judy Reservoir. The “chip seal” surfacing of these roads is relatively stable and resistant to erosion. Due to the location of these roads, there is a potential for contamination of source water from chemicals and bacteria carried from these roads during periods of precipitation. Figure 2-14 identifies the public roads in the Watershed.

3.2.3 Residential Land Uses

Wastewater and septic systems used by residential owners have the potential to affect water quality. Household chemical storage and use can also result in the introduction of contaminants to a watershed. With the exception of small parcels in the Judy Reservoir Watershed and Salmon Creek Watershed, residential activities and land uses are not known to occur in the Watershed. There is a potential for contamination to the Judy Reservoir Watershed and Salmon Creek Watershed from activities related to these privately-owned parcels. Figure 2-13 shows the location and extent of residential property in the Watershed.

3.3 Identification of Critical Areas

The previous sections described conditions, activities, and land use practices within the Watershed that are or have the potential to adversely affect source water quality. The following sources of potential contaminants are considered high priority for watershed protection in order of importance:

1. Public access to Judy Reservoir and surface water diversion facilities.
2. Forest Practices (logging, forest road construction and maintenance, chemical use).
3. Recreation and other public access in the Watershed (spills, garbage dumping, microbiological/ viruses/ pathogens from human and animal waste).
4. Algae levels in Judy Reservoir.

The following is a description of “critical areas” in the Watershed that are especially sensitive to these sources of contamination. DOH defines a critical area as the location within the watershed where human or animal activity could degrade water quality at the intake. While there is a potential for activities at any location in a watershed to result in water quality impacts, these critical areas are the locations where the potential for contamination is the highest. Often, varying levels of contamination have been observed in these areas, or upcoming activities indicate that increased risk to water quality is imminent. The critical areas for the Cultus Mountain Watershed are prioritized by the Skagit PUD as follows:

Level 1 Priority

- Judy Reservoir and areas tributary to the reservoir.
- Source water diversion sites and their respective Sanitary Control Areas.
- Lands within ½ mile upstream of the Gilligan and Mundt Creek diversions.

Level 2 Priority

- Streams tributary to the Gilligan and Mundt Creek diversions.
- Lands within ½ mile upstream of the Turner and Salmon Creek diversions.

Level 3 Priority

- Streams tributary to the Turner and Salmon Creek diversions.

Prioritization of critical areas was based on the large volume of source water stored in Judy Reservoir and the larger volumes of source water which are diverted from Gilligan and Mundt Creeks compared to Turner and Salmon Creeks. Diversions from Gilligan and Mundt Creeks occur on significantly more days throughout the year than Turner and Salmon Creeks and represent significantly more contribution to Judy Reservoir as detailed in Figure 2-4. Contaminants and debris can also be transported towards an intake facility by flowing streams. The risk of water quality contamination or damage to diversion infrastructure decreases as the distance to Judy Reservoir, a diversion facility, or a tributary stream to a diversion facility increases.

As a result of these circumstances, human or animal activity in areas near Judy Reservoir or the diversions on Gilligan and Mundt Creeks have the highest risk to degrade water quality at an intake compared to other areas of the Watershed. Figure 3-1 describes the location of critical areas within the Cultus Mountain Watershed.

The Skagit PUD's watershed control measures focus on these critical areas. The recommendations for improvement listed at the end of this document are also intended to minimize risk to water quality by minimizing the potential effects of sources of contamination in these areas.

4 WATERSHED CONTROL MEASURES

Public water purveyors are mandated to exercise surveillance over conditions and activities in a watershed that affect source water quality¹⁴. Combined with the requirements to implement watershed control measures and execute written agreements with landowners, the requirement for surveillance is a vital tool in reducing contamination of source water. As discussed in previous sections, certain activities and watershed conditions have been identified as high priorities for watershed protection:

1. Public access to Judy Reservoir and surface water diversion facilities.
2. Forest Practices (logging, forest road construction and maintenance, chemical use).
3. Recreation and other public access in the Watershed (spills, garbage dumping, microbiological/ viruses/ pathogens from human and animal waste).
4. Algae levels in Judy Reservoir.

This section describes the current watershed control measures used by the Skagit PUD to minimize or eliminate adverse impacts to source water quality. These measures focus on the activities and conditions listed at the beginning of this section as high priorities. Proper watershed control in these areas can reduce the risk of damage to infrastructure and minimize delivery of sediment, organic material, and toxins to Judy Reservoir. The Skagit PUD's Engineering and Operations Departments work closely together to implement the watershed control measures. Implementation of the watershed control program is administered by the Environmental Compliance Coordinator. Approximately 20 percent of this staff position's time is spent monitoring activities in the Watershed, building relationships with Watershed landowners, pursuing long-term objectives of the watershed control program, and working with the Operations department to maintain infrastructure used to supply source water to Judy Reservoir.

4.1 Documentation of Ownership

The most effective method of controlling watershed activities is through direct ownership of watershed properties. The Skagit PUD owns land surrounding Judy Reservoir and the diversion facilities at the Skagit River, Salmon Creek, Mundt Creek, and Gilligan Creek. Easements with Weyerhaeuser/Hampton Lumber, DNR, and several residential landowners have been established for the Turner Creek Diversion and source water pipelines to Judy Reservoir on property not owned by the Skagit PUD. DNR has issued an authorization to lease State-owned Aquatic Lands for the portion of SRD in the Skagit River. Appendix D includes property ownership and easement information.

¹⁴ WAC 246-290-668

4.2 Sanitary Control Areas (SCAs)

Public water purveyors are required by DOH to establish and maintain Sanitary Control Areas (SCAs) around all surface water sources. An SCA is intended to protect sources from contamination by requiring the following¹⁵:

- Prohibition of any sources of contamination within the SCA without Skagit PUD permission
- Skagit PUD ownership of an SCA or execution of a restrictive covenant controlling uses of the land related to water quality contamination

The Skagit PUD's minimum radius for an SCA around surface water diversions is 200 feet. The Skagit PUD has installed signage at the boundaries of the SCAs to increase awareness of the sanitary control plan. The locations of these signs is depicted on Figure 2-14. The Skagit PUD owns these areas around Gilligan, Mundt, and Salmon Creeks; and has not executed restrictive covenants related to the Turner Creek diversion located on property owned by DNR. The Skagit PUD plans to pursue restrictive covenants with Watershed landowners in conjunction with discussions related to written agreements.

Unauthorized access to Skagit PUD property is restricted by the use of gates, fencing, and signage. The extensive fencing around Judy Reservoir and gated access to the stream diversions provide a significant level of protection from human entry onto these properties. Surveillance activities conducted by the Skagit PUD and described in a later section are used to ensure protection of Sanitary Control Areas.

4.3 Landowner Agreements and Relations

4.3.1 Written Agreements

Written agreements related to watershed control have not been executed with the current landowners in the Watershed. DNR has issued a permit to the Skagit PUD that formally allows access to DNR property by Skagit PUD staff. This access is used during implementation of the monitoring and surveillance program. The Skagit PUD intends to propose written agreements to Weyerhaeuser and DNR.

4.3.2 Informal Agreements

Informal communication regularly occurs between the Skagit PUD and landowners in the Watershed. Annual meetings are held between the organizations to discuss upcoming activities and Skagit PUD concerns related to water quality. Representatives from DNR and Weyerhaeuser have verbally agreed to provide advance notification for logging and road construction proposals. Both landowners allow access to the Skagit PUD for the purpose of monitoring and surveillance.

¹⁵ WAC 246-290-135

4.4 Monitoring and Surveillance Program

Communication with Watershed landowners contributes to the success of the monitoring and surveillance program. Landowners have a diverse knowledge of the activities and conditions within the Watershed. Continued development of these relationships and outreach to improve landowner's knowledge of how activities and conditions affect water quality will increase the effectiveness of the monitoring and surveillance program. Landowner cooperation with Skagit PUD patrolling/surveillance and Forest Practice Application reviews is especially important and the Skagit PUD will work to improve these areas in the future.

4.4.1 Watershed Patrolling and Surveillance

The condition of the Watershed is monitored through semi-regular vehicular patrols. During the course of operating the diversion facilities, WTP operators visit the stream diversion intakes and inspect the source water pipelines and access roads on a daily basis. WTP operators also visit Judy Reservoir on a daily basis. Logging and road construction operations are monitored, and roads are inspected for damage following storms. These patrols are used to identify threats to the intakes and infrastructure, discover and report trespassers to the proper authorities, and observe changes in conditions that may affect source water quality.

4.4.2 Forest Practice Application Review

“Forest practices” include a variety of commercial forestry techniques including thinning, logging, road building and maintenance, pesticide/herbicide and fertilizer application and other related practices. Washington State Department of Natural Resources (DNR) regulates forest practices through the Forest Practices Act. Most forest practices require submitting a forest practices application to DNR and getting DNR approval. DNR processes forest practices applications and uploads them to a public database (FPARS) online where interested stakeholders have 30 days to review and comment. FPARS sends automated notices about proposed forest practices to landowners like the Skagit PUD if they sign up. The Skagit PUD reviews each application in detail to determine whether there are any potential threats to water quality. We then schedule field visits to verify and field check the concerns. If DNR's Forest Practices staff determines the need to coordinate an Interdisciplinary Team (ID team) meeting to review and discuss sensitive portions of a forest practices application, they invite the Skagit PUD to attend. Local tribes also review forestry proposals. In addition, tribes have a strong interest in water quality protection to protect salmon, which is usually consistent with drinking water source protection. For this reason, the Skagit PUD regularly coordinates field visits and shares water quality concerns with tribal representatives during review of forest practices applications.

While chemical use by the two major landowners is not currently occurring in the Watershed; herbicides have been used in close proximity to the Watershed boundaries. Recent proposals for the use of herbicides near the Watershed have been published through the FPARS system. The Skagit PUD has successfully worked with landowners to ensure that these activities remain outside of the Watershed and that contractors are aware of the Watershed boundaries and water quality concerns.

4.4.3 Water Quality Monitoring

The Skagit PUD water quality monitoring program for the Judy System includes voluntary and DOH required testing. Described in the Skagit PUD’s Water System Plan, the water quality monitoring program analyzes water quality from source water to the end of the distribution system.

Water quality monitoring in the Watershed is used to document trends in source water quality, determine the adverse impacts of various activities and land uses, and describe the effectiveness of control measures. The current water quality monitoring program for the Cultus Mountain Watershed, described in Table 4-1, closely follows DOH requirements for source water quality testing and reporting. Samples are taken at the stream diversion sites, SRD, and Judy Reservoir.

Improving the Skagit PUD’s ability to track and analyze historic water quality monitoring data over the long-term has been identified as an area for improvement. This would include centralizing data for secured storage and developing analysis procedures such as the charting of stream turbidity.

Table 4-1. Judy Reservoir Source Water Quality Monitoring Program

Parameter	Monitoring Location	Frequency	Collection Responsibility	Analysis	Comments
Judy Reservoir Source Water					
Turbidity	WTP	Daily	WTP Operators	WTP WQ Lab	Raw water test
True Color	WTP	Daily	WTP Operators	WTP WQ Lab	Raw water test
Temperature	WTP	Daily	WTP Operators	WTP WQ Lab	Raw water test
pH	WTP	Daily	WTP Operators	WTP WQ Lab	Raw water test
Nitrogen dioxide (NO ₂)	WTP	Annually	WQ Tech	WTP WQ Lab	Finished water test
Unregulated UCMR	WTP	Every 5 years	WQ Tech	Outside Lab	Finished water test
Chlorite (ClO ₂)	WTP	Monthly	WQ Tech	WTP WQ Lab	Finished water test
Disinfection Byproducts (DBP)	WTP	4 per year	WQ Tech	WTP WQ Lab	Finished water test
Total Organic Carbon (TOC)	WTP	Monthly	WQ Tech	Outside Lab	Raw water test
Fecal Coliform Bacteria	WTP	8 per month	WQ Tech	WTP WQ Lab	Raw water test
<i>Giardia</i>	WTP	Every 5 years	WTP Operators	Outside Lab	Raw water test.
<i>Cryptosporidium</i>	WTP	Every 5 years	WTP Operators	Outside Lab	Raw water test.
Heterotrophic bacteria	WTP	As needed	WTP Operators	WTP WQ Lab	Finished water test
Gross Alpha	WTP	Every 6 years	WQ Tech	Outside Lab	Finished water test
Gross Beta	WTP	Every 6 years	WQ Tech	Outside Lab	Finished water test

Parameter	Monitoring Location	Frequency	Collection Responsibility	Analysis	Comments
Radium-228	WTP	Every 6 years	WQ Tech	Outside Lab	Finished water test
Algae	Judy Reservoir	Weekly	WQ Tech	WTP WQ Lab	Raw water test
Cultus Mountain Stream Diversions and Skagit River Diversion Source Water					
Turbidity	All Diversions	Daily	WTP Operators	WTP WQ Lab	Weekly when not in use
True Color	All Diversions	Daily	WTP Operators	WTP WQ Lab	Weekly when not in use
pH	All Diversions	As needed	WTP Operators	WTP WQ Lab	
Total Organic Carbon (TOC)	Skagit River Diversion	Monthly-in use	WQ Tech	Outside Lab	
Total and Fecal Coliform Bacteria	Skagit River Diversion	Weekly-in use	WQ Tech	WTP WQ Lab	

4.5 Forest Fire Protection

The forested areas of the Watershed are protected from forest fire by DNR. In the event of a forest fire, DNR and the landowner (DNR or Weyerhaeuser depending on ownership in the fire’s location) would mobilize labor and equipment to contain the fire. State regulations have also been established and are enforced by DNR to require the staging of fire-fighting equipment at logging and road construction sites¹⁶. If a forest fire was observed by Skagit PUD staff during Watershed patrols, the Skagit PUD would immediately notify DNR and the landowner.

4.6 System Operation and Emergency Provisions

4.6.1 System Operation

As mentioned previously and shown in Figure 2-9, the system components of the Watershed include surface water diversions, a pump station, underground source water pipelines, and a man-made reservoir. A modern multi-media direct filtration water treatment plant is located close to Judy Reservoir. Source water from the Watershed is processed by the WTP for delivery to the Skagit PUD’s distribution system. The Skagit PUD’s Water System Plan describes the water treatment and distribution process in detail.

4.6.2 Emergency Provisions

The surface water diversion intakes and underground source water pipelines related to the Watershed are located in mountainous terrain prone to landslides, storm damage, and other threats. The Skagit PUD’s Water System Plan includes a description of the current Emergency Response

¹⁶ Chapter 76.04 RCW

Program. This program includes procedures used to address natural and man-made disasters, water source contamination, and water supply shortages.

A key component to the Judy System is the ability to supply source water from the Skagit River if an emergency situation results in the closure of the Cultus Mountain stream diversions. The Skagit PUD holds water rights at SRD which are capable of supplying the current water demands regardless of instream flows. In addition, approximately 3-5 months of source water can be stored in Judy Reservoir. This storage would provide an opportunity to repair damage to the diversion sites without a loss of source water to the Skagit PUD's water system.

5 WATER QUALITY TRENDS

As described in Chapter 4, the Skagit PUD has historically conducted an intensive water quality monitoring program for source water to the Judy System. Results from inorganic chemical analysis have been below the maximum contaminant levels (MCL) and fecal coliform levels have been historically below the maximum allowed by DOH.

Levels of turbidity and organic content vary throughout each year and can affect the Skagit PUD's ability to divert water from the Cultus Mountain streams and the Skagit River. Elevated levels of turbidity decrease the efficiency of the water treatment process and contribute to long-term sediment maintenance issues at Judy Reservoir. High organic levels can increase disinfection byproducts in treated water. The Skagit PUD regularly closes surface water diversions due to elevated levels of these parameters.

Trihalomethanes (THMs) are a group of organic compounds that are formed as byproducts when chlorine or bromine is contacted with naturally occurring organic matter present in source waters. Although there is no current conclusive evidence showing that THMs in water are associated with cancer or other health effects, there are some concerns given the research information and the large number of people drinking chlorinated water¹⁷. THMs usually consist primarily of chlorinated methanes because chlorine is most commonly used for disinfection at water treatment facilities, as is the case for the Judy System.

A detailed discussion of the Skagit PUD's water quality monitoring program and water quality trends is included in the Skagit PUD's Water System Plan. As discussed in the previous water quality monitoring section, the Skagit PUD is currently working to improve the processes used to track and analyze water quality trends.

¹⁷ Washington Department of Health (www.doh.wa.gov)

6 WATERSHED CONTROL PROGRAM EVALUATION

The Skagit PUD is required by DOH to conduct a Watershed Control Program Evaluation every 6 years and include the evaluation in the water system plan¹⁸. In accordance with these requirements, Chapter 6 describes the evaluation of the following components of the Skagit PUD's watershed control program:

- Watershed description and watershed control program
- Conditions and activities adversely affecting source water quality
- Monitoring program review and evaluation of recent sampling results
- Changes in the watershed since the last evaluation that may adversely affect source water quality
- Recommendations for improved watershed control

Chapters 1 through 5 of this Watershed Management Plan include written documentation of the Cultus Mountain Watershed characteristics, conditions, watershed control measures, and water quality monitoring. The following sections fulfill the balance of the evaluation requirements by analyzing recent changes in the Watershed and identifying opportunities for improvement to the updated watershed control program.

6.1 Recent Changes in the Cultus Mountain Watershed

Recent changes to the Watershed include decreases in clear-cut logging and forest road construction (as described elsewhere in this plan) by watershed landowners, and the purchase of 250 acres in the Gilligan Watershed by the Skagit PUD. Because of the decrease in clear-cut logging and forest road construction, monitoring of the status of projects related to logging and road construction is less of a priority and has been taken off of the recommendations Table 6-2. However, the Skagit PUD will continue to monitor the projects as they come through.

As mentioned previously, in an effort to explore opportunities to address impacts to diversions caused by sediment and debris, the Skagit PUD will be removing sediment from Turner Creek in the summer / fall of 2020.

¹⁸ Chapter 246-290 Section 668 WAC

6.2 Opportunities for Improved Watershed Control

This Watershed Management Plan documents the Skagit PUD’s efforts to meet DOH requirements for a watershed control program. Looking to the future, the Skagit PUD has identified recommendations to continue improvement of watershed control. These recommendations are listed in Table 6-2.

Progress in these areas would improve the protection of source water quality by strengthening watershed control measures, improving communication with and education outreach to landowners, increasing efficiency and durability of source water infrastructure, and protecting critical areas of the Watershed by exploring options for property acquisition and or easement.

Table 6-1. Recommendations for Improved Watershed Control in the Cultus Mountain Watershed

Area of Opportunity for Improved Watershed Control	Recommended Action Item (2021-2026)
Watershed description	Explore opportunities to update existing Skagit PUD resolutions defining the Watershed boundaries
Land ownership	Explore additional opportunities to increase Watershed protection through land acquisition or easements
Watershed activities and land uses	Research guidelines used by Skagit County Public Works for maintenance of County roads within the Watershed. Explore opportunities to increase protection in these areas
Written agreements with watershed landowners	Propose, negotiate, and execute written agreements with DNR and Weyerhaeuser
System operation	Continue to explore opportunities to address impacts to diversions caused by sediment and debris