



Upper Skagit Water Resource Studies

Introduction

The Skagit Watershed includes Water Resource Inventory Areas (WRIAs) 3 and 4. The Legislature included a proviso for the Department of Ecology (Ecology) in Section 3012 in the 2018 supplemental capital budget (ESSB 6095) intending to increase the information available to improve water resource management because information on water supply and demand in WRIA 4 is limited.

The proviso states:

(1)(a) \$500,000 of the appropriation is provided solely for the department of agriculture, the department of fish and wildlife, and the department of ecology to jointly pursue studies to evaluate instream flow needs and existing and future out-of-stream water use demands within Skagit river water resource inventory area 4 (Upper Skagit) regulated by chapter 173-503 WAC. These studies must be completed and reported to the appropriate legislative committees and task force by December 1, 2019.

(b) These studies must be based on best available science and peer-reviewed by those with demonstrated instream flow expertise.

Ecology contracted with technical consultants to complete three studies to implement the legislative directive. The scopes of the studies were developed in collaboration with the Department of Agriculture, the Department of Fish and Wildlife, and with input from watershed stakeholders and the Joint Legislative Task Force on Water Supply. Each study was peer-reviewed by the Washington Academy of Sciences. Ecology summarizes results from the three studies in this report:

- WRIA 4 Water Use
- Rural growth consumptive impact assessment
- Geologic mapping in the Upper Skagit River Basin

The complete studies submitted to Ecology are included in the Appendix.

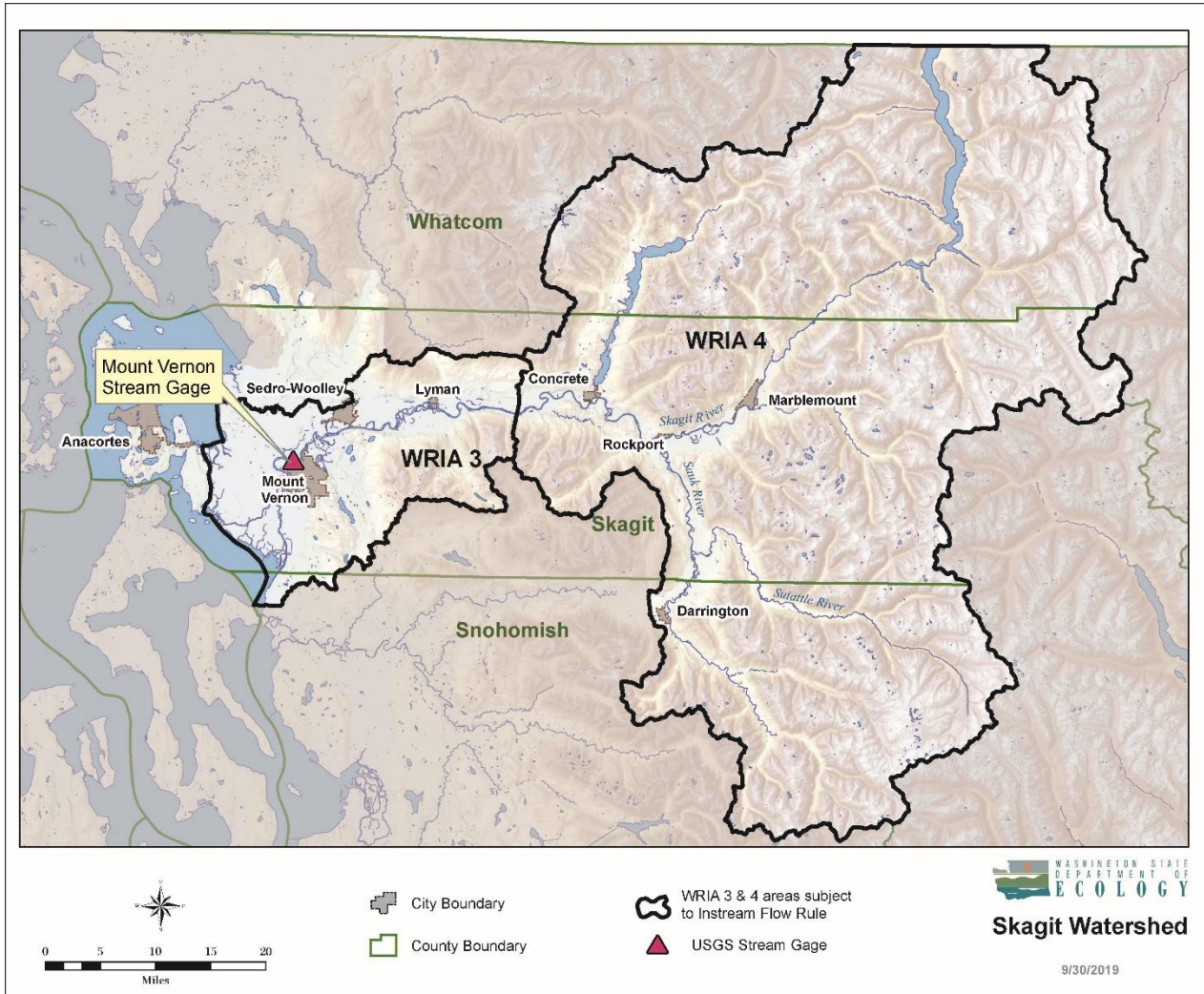


Figure 1. Skagit River Basin: WRIA 3 and WRIA 4.

WRIA 4 Water Use

The Water Use Study estimates existing out-of-stream water use based on state-issued water right documents in Ecology’s databases. The Water Use Study also estimates the state-issued water right quantities that are not currently being used. The quantified uses are documented by water right certificates and permits for consumptive water uses. Water use associated with water right claims cannot be quantified accurately because the legal validity of claims can be determined only by a court through an adjudication process.

In total, Ecology’s water right database contains 211 state-issued water right certificates, permits, and change authorizations. These documents identify municipal, group domestic, industrial,

agriculture or other uses which require a water right to be issued by Ecology. Ecology’s database also identifies 258 long form claims and 303 short form claims¹.

Single domestic uses that have water right documents in Ecology’s database are included in this study, and described as “Domestic Single” water uses (Table 1). Most single domestic water uses are permit-exempt. The water use estimated in this study does not include permit-exempt well uses. Permit-exempt wells, which typically serve rural homes, are quantified in the “Rural Growth Consumptive Impact” study summarized on page four and included in Appendix A.

The Water Use Study estimates a current water use of 1,883 acre-feet per year (afy)². Water right permits and certificates authorize a total of 4,965 afy. While Table 1 shows the WRIA 4 summary information, the full study includes these water use estimates broken down by sub-basin and purpose of use.

These total water use volumes are in the context of the average annual discharge of the Skagit River, measured at the gauge in Mount Vernon, of roughly 12 million acre-feet per year (afy).

Table 1. State-issued water rights in WRIA 4 with annual volume and estimated actual annual water use under those water rights (refer to Table 28 in Appendix A).³

Purpose of Use	Water Right Limit (afy)	Estimated Actual Use (afy)	Percent Used
Municipal	3,543	1,437	41%
Domestic Multiple	144	56	39%
Domestic Single	42	8	20%
Commercial and Industrial	188	0	0%
Irrigation	703	221	31%
Stockwater	3	10	369%
Recreation – Beautification	343	151	44%
Total⁴	4,965	1,883	38%

NOTE: Water use estimates contain substantial uncertainty (see Appendix A for more discussion).

¹ Short form claims typically have been used for claims for permit-exempt groundwater uses which began prior to 1945. Because the associated water use is small, these claims do not contain detailed information on the different purposes of use, instantaneous volume used, annual volume used, or irrigated acres. Long form claims are used for all other uses of water, and are often associated with irrigated agriculture.

² 1 acre-foot equals the volume of water that would fill one acre with water one foot deep.

³ Excludes state-issued water rights with no annual volume specified, non-consumptive uses, reservoir water rights, water use under claims, water use under permit-exempt wells, and water use occurring outside of a water right.

⁴ Totals may not add exactly due to rounding.

Rural growth consumptive impact assessment

The Rural Growth Impact Study estimates out-of-stream consumptive water use from permit-exempt wells, which primarily serve rural homes in the watershed, and how that use may impact streams during low flow conditions. Permit-exempt uses are usually not associated with state-issued water right permits or certificates, so the Rural Growth Impact Study provides additional water use information complementary to the Water Use Study summarized on page three.

The Rural Growth Impact Study provided low, medium and high growth estimates, which results in an estimated range of 26 to 60 new homes using permit-exempt wells predicted to be developed in WRIA 4 over the next 20 years. The lower number aligns closely with a previous study conducted in 2015⁵, and is considered the best available estimate for population growth projections. The higher number is especially conservative from a planning standpoint, and represents the sum of high-growth scenarios across all of the subbasins.

The Rural Growth Impact Study estimates per-household water use for permit-exempt wells over a range of indoor use and outdoor use assumptions, based on recent studies. In total, the additional WRIA 4 consumptive water use from permit-exempt wells over the next 20 years is projected to range between 1.3 afy to 4.0 afy⁶.

The Rural Growth Impact Study also quantifies the impacts on stream flows for 35 separate subbasins, focusing on the impacts during the lowest flow periods in late summer and early fall.⁷ Few long-term stream gauging records are available for streams within the Upper and Lower Skagit subbasins. For this reason, the study calculates low flow estimates for a limited number of gauged creeks within the Skagit Basin and extrapolates these data to other ungauged subbasins lacking long-term flow records.

The complete Rural Growth Impact Study in Appendix B includes water use and cumulative impact estimates broken down by sub-basin.

Geologic mapping in the Upper Skagit River Basin

The Geologic Mapping Study characterizes geology of five sites in WRIA 4 (Figure 2). Ecology identified these five areas as most likely to experience future groundwater uses within this watershed and having a significant range of geologic composition. The areas of study are between Grandy Creek and Marblemount, and in the Sauk River valley north of Darrington,

The goal in each site evaluated was to more specifically characterize the geologic formations through creation of “cross-sections.” This information can then serve as the basis for additional data collection needed to determine whether or not aquifers exist that are completely disconnected from rivers and streams in the watershed, flowing directly into Puget Sound.

⁵ Ecosystem Economics (2015). Technical Memorandum: Skagit Demand Projections. July 17, 2015.

⁶ Consumptive water use is the net difference between the water withdrawn from a well minus the amount of water returned through household septic system and excess irrigation water that is not consumed.

⁷ The 7Q10 flow is the lowest flow that occurs for seven days that occurs once every ten years. As an estimate of low flows, the study calculates a 7Q10 estimate for the major stream in each of the 35 delineated subbasins.

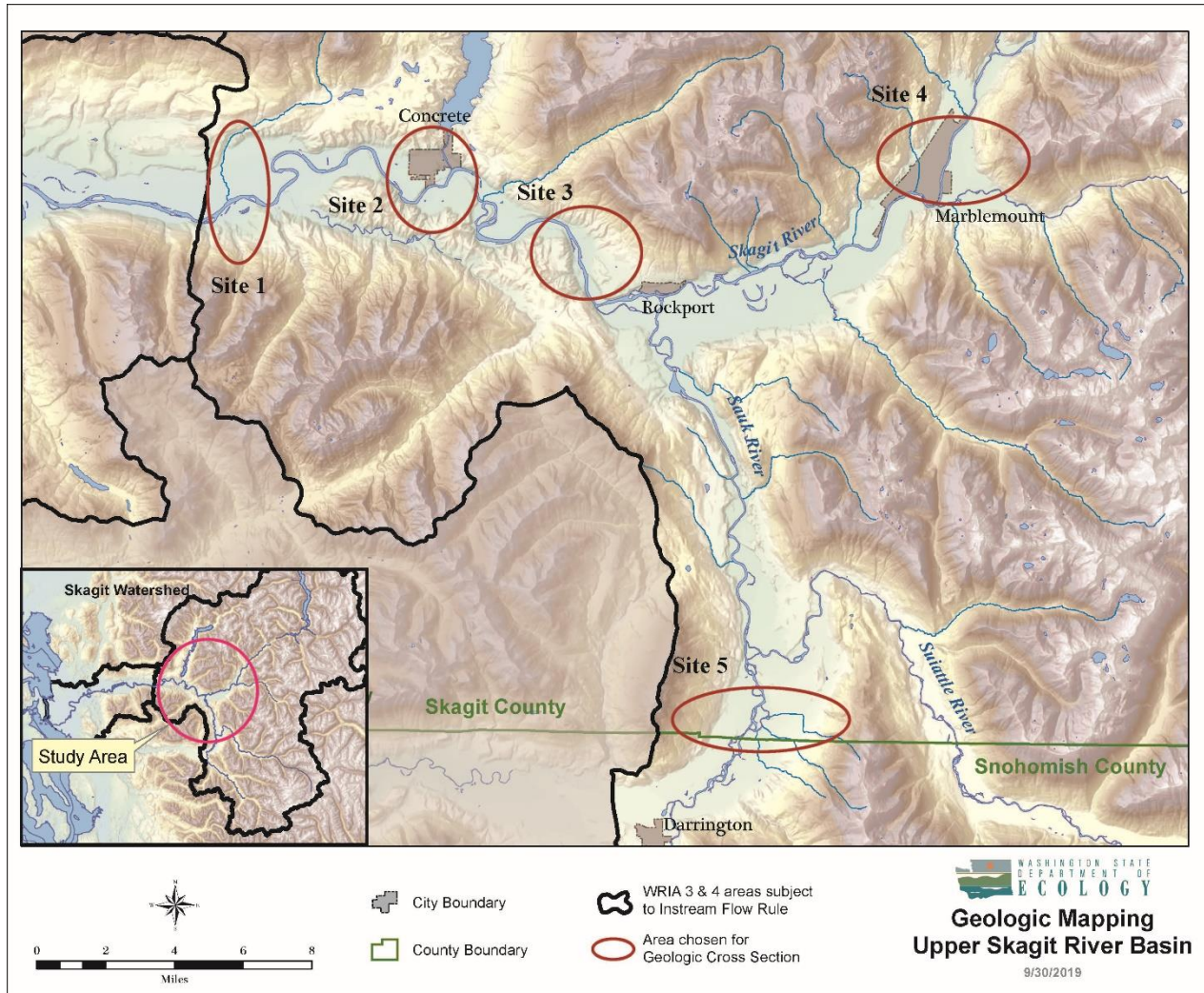


Figure 2. Specific sites where geologic information was used to develop cross-sections.

Cross-sections are an analytical tool used to evaluate the connections between ground water and surface water. These two dimensional maps show geologic formations that are of higher permeability (where aquifers are located) and lower permeability (formations that limit the ability of water to flow through). Cross-sections do not provide definitive “proof” that aquifers are disconnected from surface water. However, cross-sections provide a cost-effective tool to identify possible areas for further study. These maps can identify where aquifers are “confined” (lower permeability) or “unconfined” (higher permeability). Confined aquifers have the potential for being disconnected to surface waters; however, as the study describes, it is possible that pumping water from confined aquifers can have impacts on surface waters. The best use of cross sections is to identify areas for future study where monitoring and modeling (either conceptual or analytical) would be worthwhile to assess impacts of water withdrawals.

Overall, the Geologic Mapping study concludes that all five sites evaluated have a “moderate” or “moderate to high” potential for hydraulic connection between aquifers and adjacent surface waters. Specific areas were identified where the cross-sections indicate the greatest potential of confined aquifers being found. Pumping a well that draws from a confined aquifer could have relatively small impacts to nearby streams, but would likely impact the main stem of the Skagit River farther downstream in the basin.

The Geologic Mapping Study in Appendix C includes all cross sections that were developed and a more detailed analysis of each area.

Summary

Three studies were completed under proviso funding in the 2018 supplemental capital budget (ESSB 6095):

- WRIA 4 Water Use
- Rural Growth Consumptive Impact
- Geologic Mapping in the Upper Skagit Basin

Peer review was completed by the Washington State Academy of Sciences.

These three studies provide information for the Water Supply Task Force and the Legislature that inform water supply needs and water supply availability.

Publication information

This report is available on the Department of Ecology's website at <https://fortress.wa.gov/ecy/publications/SummaryPages/1911088.html>

Contact information

Author: Dave Christensen

Water Resources Program
P.O. Box 47600
Olympia, WA 98504-7600

Washington State Department of Ecology - <http://www.ecology.wa.gov/>

- Headquarters, Olympia (360) 407-6000
- Northwest Regional Office, Bellevue (425) 649-7000
- Southwest Regional Office, Olympia (360) 407-6300
- Central Regional Office, Union Gap (509) 575-2490
- Eastern Regional Office, Spokane (509) 329-3400

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