

Laurel Watershed Improvement District ¹ Management Plan



Version 3 (April 2018) ²

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Explanatory notes ⁴

Explanatory notes in grey boxes are intended to help readers to understand more about the content and purpose of ⁵ this document.

The purpose of this document is to assist the WID board in the process of developing and implementing their ⁶ comprehensive Management Plan. Detailed content for this Management Plan will be developed by the WID board over time, as resources allow.



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Contains maps and a summary table showing the agricultural and watershed enhancement priorities based on the February 2016 work session with Laurel WID members and on additional technical analysis by the Ag-Watershed Project team. The full WID mapping report can be downloaded from the Laurel WID website <https://www.laurelwid.com/> [Alternative download here]

Appendix B: Agricultural and watershed characterization tables for the Laurel WID	5
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Contains the detailed tables listing and describing agricultural and watershed enhancement priorities as discussed at the February 2016 work session of the Laurel WID. The tables are included in the full Agriculture-Watershed Characterization and Mapping Report (2016) but are presented in this appendix for easy reference.

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Contains a selection of reference maps related to the Laurel watershed and various WID priorities. ⁸
Maps in Appendix C were also included in the 2016 Agriculture-Watershed Characterization and Mapping Report and are appended here for readers' convenience. In future technical work associated with the WID's Management Plan, these maps might be updated or refined to include more detail as required for baseline studies and development of an action plan.

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Reproduced from the Laurel WID mapping report with updates added in March 2018.

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ACRONYMS USED IN THIS DOCUMENT¹

AU	Assessment Unit	²
BMP	Best Management Practice	
CDID	Consolidated Drainage Improvement District	
DID	Drainage Improvement District	
NRCS	Natural Resource Conservation Service	
RSA	Rural Study Area	
SSURGO	Soil Survey Geographic Database	
TMDL	Total Maximum Daily Load	
USDA	United States Department of Agriculture	
USGS	United States Geological Survey	
WDFW	Washington Department of Fish & Wildlife	
WCD	Whatcom Conservation District	
WID	Watershed Improvement District	
WRIA 1	Water Resource Inventory Area 1	
WSDA	Washington State Department of Agriculture	

VERSION HISTORY³

Version	Date	
Version 1	February 2018	Draft for discussion by the WID board.
Version 2	March 2018	Draft for review by the WID board at their April 2018 meeting. Includes additional material from the March 1 Tenmile Creek watershed forum. Updated agricultural priority actions map. Updated water quality reference maps and tables in Appendices B and C.
Version 3	April 2018	Updated draft with minor revisions following discussion at the April 2018 WID board meeting. Accepted as draft by the board.

Editing notes:

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Yellow highlights are queries for board consideration or review

Blue highlights are items added after the April 2018 board meeting

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Disclaimer⁶

This document has been prepared for informational purposes only. The information and data contained in this document have been compiled from multiple sources and may not have been prepared for, or be suitable for legal, engineering, or surveying purposes. Users of this document should review or consult the primary data and information sources to ascertain the status and usability of the information and data to obtain updated information and data where necessary.

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1 INTRODUCTION AND OVERVIEW OF THE PLANNING PROCESS ¹

Explanatory notes ²

For this version of the management plan, we have relied heavily on information from the recent work with the Watershed Improvement Districts to characterize and map both agricultural and watershed priorities in the six WIDs. ³

In this document, we have included text, maps and tables contained in the Laurel WID Agriculture-Watershed Characterization and Mapping Report (2016: the "WID mapping report")¹ as reference materials. By including the actual information here where possible rather than cross-referring out to separate reports, we hope to make this document easier to use. Wherever necessary, we have noted the sources for text, maps and tables that have been copied into this document. ⁴

The focus in this version of the Management Plan will be on clarifying the WID's priority issues and goals. These priorities and goals should be the basis for further development of the Management Plan to include actions, budgets and timelines as this information becomes available. Where WID actions have already been initiated, these have been included in this version of the Management Plan. ⁵

1.1 Process for developing a Management Plan for the WID ⁶

We envisage three main stages in the planning process: ⁷

- First, preparing an outline for a Management Plan, that includes an overview of initial WID priorities and of the available background information (see Tables 1 and 2 particularly). ⁸
- Second, preparing a Management Plan (this document) to include agreed near-term actions to advance the WID's priorities. The Plan is based on available information generated in recent and current efforts, including:
 - the all-WID planning session in March 2017, ¹⁰
 - work sessions for the Ag-Watershed Characterization and Mapping in 2016,
 - ongoing water quality monitoring by the WID and the Conservation District, and
 - ongoing drainage management work within the WID.

Where additional baseline technical studies might be needed, the scope of work and estimated costs ¹¹ for these studies will be included in successive versions of the Management Plan.

- Third, refining the Management Plan over time as resources and funding are secured to undertake ¹² the necessary baseline technical studies for each component of the Plan.

¹ Whatcom County Agriculture-Watershed Pilot Project (2016). *Agriculture-Watershed Characterization and Mapping Report for the Laurel Watershed Improvement District*. Whatcom County Planning & Development Services. <https://www.laurelwid.com/> [Alternative download [here](#)]

1.2 Purpose and content of this document ¹

The purpose of this document is to assist the WID board in developing and implementing their ² comprehensive Management Plan over time.

This document contains the first Management Plan for the Laurel Watershed Improvement District (WID). ³ Successively more detail and technical information will be added to sections of the Plan over time as resources allow.

In preparing this document, we have collated recent and current information on WID management ⁴ priorities and concerns from a number of sources. Where technical and background information was readily available and could be provided without additional analysis or processing, we have included it in the relevant sections and appendices of this document. Other sections in this document are limited to a description of the content that might be included in a comprehensive Management Plan but for which additional work might be needed to prepare such content.

Section 2 contains a list of priority issues and objectives for the WID, stated as "desired outcomes". A ⁵ summary list is shown in Table 1, and the process for coming up with the initial suggested list of issues is described. A more detailed list of priority issues, suggested goals against which to measure progress, and initial actions for consideration by the WID board is shown in Table 2.

Sections 3 and 4 provide a summary of available background and baseline information about the ⁶ watershed and agricultural systems within the Laurel WID.

Section 6 contains supporting information on additional work and baseline studies that might be needed ⁷ to prepare an action plan to achieve the WID's priorities. Actions might include:

- actions that the WID board is already undertaking or that could be initiated in future in collaboration ⁸ with farmers in the WID, without the need for extra resources or expertise;
- actions that the WID is already undertaking or could undertake in future with the assistance and collaboration of key partners such as the Conservation District and drainage districts;
- actions that will require additional technical resources and for which the WID and partners will probably need to seek grant funding.

Appendices contain additional reference information, some which is reproduced from other sources but ⁹ which has been included with this document for readers' convenience.

2 STRATEGIC PRIORITIES AND DESIRED OUTCOMES ¹

2.1 Process for developing the list of suggested priorities ²

The project team used the following process to develop the list of suggested priorities in Tables 1 and 2 ³ for discussion by the WID board.

1. We began with the set of priorities that were previously listed on the Laurel WID website² (water quality and water rights).
2. We reviewed all Laurel WID board meeting minutes back to January 2015³ to collect relevant statements and decisions made by the WID board and grouped those statements or decisions into priority topics (comprehensive planning; drainage; flood management; habitat; outreach; representation; water quality; water quantity; water rights).
3. We added priorities identified in the February 2016 work session and described in the Laurel WID Agriculture-Watershed Characterization and Mapping Report⁴ (habitats and species; water flow processes; agricultural land protection).
4. The list of priorities and potential priority actions was revised after the WID Work Session held in Lynden on March 20th, 2017.
5. We built a master spreadsheet listing the main priorities that had been identified and discussed by the WID in all of the various processes mentioned above. Where the WID board had also discussed or decided on near-term actions associated with a priority, we included those in the spreadsheet. The master spreadsheet is available as an electronic document and provides the raw material for the suggested priorities described in this section.
6. We generated a set of suggested priorities (see Table 1 below), and then added desired outcomes and near-term actions using draft wording drawn from previous WID documents, statements and decisions (see Table 2 below). The material in these tables serves as a starting point around which the WID board could build their Management Plan and associated actions.
7. We also compared the list of WID priorities to relevant policy statements and goals in two related planning documents, namely the Whatcom County Comprehensive Plan (2016 update)⁵ and the WRIA1 Watershed Management Project's statement of goals (2008).⁶ The goal statements in these two planning documents offer additional context for the Laurel WID's own priorities, and are shown alongside the suggested WID priorities in Appendix D.
8. We attended the Tenmile Watershed Forum held at the Whatcom Conservation District on 1 March 2018, and added information from that event to the tables of suggested priorities, and to the section in this Plan on previous and current watershed management efforts in the Tenmile watershed.

2.2 Suggested priorities and desired outcomes for the Laurel WID ⁴

Each agreed strategic priority should ideally have one or more desired outcomes attached to it, which⁵ would then be used to:

- establish measurable goals against which progress can be measured and reported regularly, and ⁶
- identify actions, an implementation schedule, scope of work and resources needed for implementation (see Table 2).

² See <https://www.laurelwid.com/projects>

³ See <https://www.laurelwid.com/minutes>

⁴ See Appendix A of this document (WID mapping report executive summary)

⁵ Whatcom County Comprehensive Plan, adopted August 2016. <http://wa-whatcomcounty.civicplus.com/DocumentCenter/View/21056>

⁶ WRIA1 Watershed Management Project (2008). *Goals of the WMP*.

<http://wria1project.whatcomcounty.org/About-The-Project/Goals-Of-WMP/17.aspx> [accessed January 27, 2017]

Explanatory notes 1

The wording in Tables 1 and 2 below is based on statements drawn from WID meeting minutes, WID work session notes in the mapping report, the March 2017 WID planning session, and other WID documents.

The WID board will continue to review and update the goals and actions listed in the tables and will develop the detail of planned actions over time.

Table 1. Suggested Laurel WID priorities and desired outcomes, based on previous WID statements and documents.³

Version 3

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	Priority issue	Desired Outcome(s): suggested text.	Action Priorities (see Table 2 for more details)
<i>WID board: Add new 2018 priorities here from lists in Table 2</i>			
1	Water quantity: water availability for agricultural use (irrigation, livestock, processing)	Farmers in the Laurel WID have secure (legal) access to sufficient water for agricultural uses.	<ul style="list-style-type: none"> 2017: Support & coordinate with Ag Water Board for efforts in legal negotiations and actions related to water rights 2017: Provide education about water rights to WID members
2	Agricultural field drainage	Drainage infrastructure and ditches in the Laurel WID are actively and effectively maintained.	<ul style="list-style-type: none"> (Done) 2017: Develop a 5-year plan for drainage
3	Water quality	Agricultural activities in the Laurel WID do not cause water quality standards to be exceeded in surface water and groundwater bodies within the WID area	<ul style="list-style-type: none"> (Done) 2017: Set up the DNA testing for water quality
4	Flood management & protection	Agricultural lands in the Laurel WID are protected from flooding due to surface water runoff at critical times in the growing season.	
v	Communication, outreach and education	<u>Internal:</u> WID members are aware of and understand the WID's priority issues and they participate actively in WID planning and implementation of priority actions. <u>External:</u> Non-agricultural residents in the WID area, other external stakeholders and relevant bodies & agencies are aware of, understand and support the Laurel WID's priority actions.	<ul style="list-style-type: none"> 2018: Prepare a Comprehensive Plan for the Laurel WID
vi	Water flow processes; Habitats & species	The Laurel WID's plans and actions help to protect and enhance water flow processes as well as fish and wildlife habitats in the Laurel watershed.	
vii	Agricultural protection (Protecting the agricultural industry)	The Laurel WID's plans and actions contribute to the recognition, protection and strengthening of the agricultural base in the WID area.	

Notes for WID board

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- Priority actions column: At the March 2017 planning session, the actions currently in the right-hand column for 2017 were the top 4 overall priorities listed for this year. The board may wish to add more near-term priority actions into this column over time, drawing from those listed in the right-hand column in Table 2. Note that some actions will need additional external resources or assistance (see section 5 of the Management Plan: discussion on preliminary scope of work for such tasks).*
- Ordering: Items numbered 1 through 4 in Table 1 are ordered by priority according to the results of the March WID planning sessions. Items (v) through (vii) are in no particular order of priority.*

Table 2. Consolidated list of Laurel WID priorities, goals, and possible actions.

	Desired outcome(s):	Measurable goals	Actions
1	Water quantity: Water for agricultural uses (irrigation, livestock, processing) Version 3 (April 2018)		
	<p><i>Farmers in the Laurel WID have secure (legal) access to sufficient supplies of water for agricultural uses.</i></p> <p><u>Goal statements:</u></p> <p>(a) Sufficient supply of water is available for agricultural uses.</p> <p>(b) All agricultural water use in the WID is secured through water right, certificate, water lease or water supplier (such as water association or water bank).</p> <p><u>Progress could be measured by:</u></p> <p>(a) Extent of shortfall (if any) between water demand and water availability.</p> <p>(b) % of total agricultural water use in the WID that is secured through certificate, water lease or water supplier (such as water association).</p>	<p><u>Recently completed or ongoing:</u></p> <ul style="list-style-type: none"> i. Identified water supply priority areas for Ag-Watershed Characterization and Mapping report (Feb 2016 work session and May 2016 board meeting) – see agricultural enhancement tables in Appendix B of this document, also Table 5 and map in Figure 8 of this Plan. ii. Support for organizing and sponsoring the Water Supply Symposium (Dec 2017) through the Ag Water Board <p><u>Priority actions for Management Plan:</u></p> <ul style="list-style-type: none"> iii. Support & coordinate with Ag Water Board for efforts in legal negotiations and actions related to water rights (March 2017 work session, 4/2017, 6/2017) iv. Support & coordinate with Ag Water Board in: <ul style="list-style-type: none"> a. development of drainage-based management plans (11/2017, 01/2018); b. development of a Water Supply Strategy (1/2017, 2/2017); c. participation in the Water Supply Work Group and in the Whatcom Water Supply Coalition (11/2016, 2/2017) v. Expand hydrological analysis to include surface water, climate, and evapotranspiration, to assess overall water use and water availability and to identify shortfalls – possibly coordinate with other WIDs on the analysis* vi. Pursue and test feasibility within the WID of options such as water exchange or water banking (2/2017, 6/2017), changes in place of use, change to groundwater, aquifer recharge etc. * vii. Support & coordinate with Ag Water Board to communicate water rights concerns with legislators (noted from March 2017 work session) viii. Foster task force pilot: identify WID members who might participate with other WIDs and the AWB, and prioritize locations where transfers might be feasible and practical & would benefit surface flows (board meeting 4/2018) ix. Participate in workshop on water right tools planned for early June (board meeting 4/2018). <p><u>Additional actions that might be considered for inclusion here (from meeting discussions & other WID documents):</u></p> <ul style="list-style-type: none"> x. Provide education about water rights to WID members, possibly through a workshop (4/2017, 9/2017) <p>* denotes actions that may need additional resources, and more detailed scope & description (see section 6 of this Plan)</p>	

	Desired outcome(s):	Measurable goals	Actions
2	<i>Agricultural field drainage Version 3 (April 2018)</i>		
	<p>Drainage infrastructure and ditches in the Laurel WID are actively and effectively maintained.</p> <p><u>Goal statement (a):</u> Regular, scheduled drainage maintenance in the Laurel WID area occurs under programmatic permits, in collaboration with DID#3, #5, #6 and #30A, with mitigation as required and using approved Best Management Practices.</p> <p><u>Progress could be measured by:</u> % of agricultural land requiring field drainage in the Laurel WID: - that is covered by programmatic permits for drainage maintenance; where drainage infrastructure and ditches have been maintained and repaired as needed.</p>	<p><u>Recently completed or ongoing:</u></p> <ul style="list-style-type: none"> i. Identified priority drainage problem areas for Ag-Watershed Characterization and Mapping report (Feb 2016 work session and May 2016 board meeting) – see agricultural enhancement tables in Appendix B of this document, also Table 5 and map in Figure 7 of this Plan. ii. Appel culvert project completed with NRCS, Diking District and County Flood support (10/2017) iii. Work already done by/with Drainage Improvement Districts #3, #5, #6, #30A: In 2017, Drainage District #3 dredged approximately 4,200' of Fourmile Creek west of Hannegan Road. iv. Developed a 5-year programmatic drainage plan and permit application, with assistance from the Conservation District. Includes several mitigation actions and some voluntary fish passage projects that would count as mitigation credit. (4/2018) v. Chasteen/Tenmile drainage problem discussed in Feb 2018 – obstructions to flow are currently being removed (beaver dam and fallen trees). (Board meeting 4/2018) <p><u>Priority actions for Management Plan:</u></p> <ul style="list-style-type: none"> vi. Prioritize ditch maintenance actions and coordinate with Whatcom County and drainage districts (DID#3, #5, #6 and #30A) for ditch cleaning and mowing. In addition to sites in Table 5, sites needing attention include: western segment of Tenmile Rd. (2/2016); north ditch along Tenmile Rd. east of Chasteen Rd. (1/2018); Eldred/Megard and on Fourmile near Roger's farm (8/2016); locate on map? Fourmile upstream of Guide Meridian (1/2017); Deer Creek near Chasteen Rd. (11/2017) vii. Proactively identify locations for mitigation sites and mitigation actions to be addressed in a programmatic drainage permit, that could also contribute to advancing watershed & habitat priorities (see sections 5.3 and 5.5 of this Plan). Culvert replacements could be an alternative to tree planting & maintenance (2/2017) 	
	<p><u>Goal statement(b):</u> Ad hoc actions (such as beaver management or sediment removal after a storm) and/or emergency repairs to drainage infrastructure are completed in a timely manner, in collaboration with DID#3, #5, #6 and #30A and Whatcom County.</p> <p><u>Progress could be measured by:</u> Number of ad hoc emergency repairs/actions that are completed in a year, compared to the number reported as needing attention.</p>	<p><u>Recently completed or ongoing:</u></p> <p>Any to list here?</p> <p><u>Priority actions for Management Plan:</u></p> <ul style="list-style-type: none"> viii. Document the specific procedures for responding to situations requiring ad hoc or emergency actions. Include these procedures in the management plan and in WID communications/website. 	

	Desired outcome(s):	Measurable goals	Actions
3	Water quality Version 3 (April 2018)		
	<p><i>Agricultural activities in the Laurel WID do not cause water quality standards to be exceeded in surface water and groundwater bodies within the WID area.</i></p> <p><u>Goal statement:</u> Relevant water quality standards are met for surface and groundwater within agricultural lands</p> <p><u>Progress could be measured by:</u> Achievement of required water quality standards</p>	<p><u>Recently completed or ongoing:</u></p> <ul style="list-style-type: none"> i. Continued with the ongoing water quality monitoring program, and developed a consistent approach for responding to water quality concerns (March 2017 work session notes, 2/2016, 4/2016). ii. Contacts with WID landowners to resolve water quality concerns that arose in the monitoring program (March 2017 work session notes, and as reported at regular WID board meetings) iii. Partnered with the Conservation District and NRCS on a survey of the effectiveness of water quality programs (from draft newsletter) iv. Workshop with Whatcom Conservation District on horse management to reduce water quality impacts (12/2016). v. Identified water quality priority areas for Ag-Watershed Characterization and Mapping report (Feb 2016 work session and May 2016 board meeting) – see agricultural enhancement tables in Appendix B of this document, also Table 5 and map in Figure 8 of this Plan. vi. Coordinated with other WIDs in supporting work to fund and test DNA source tracking technology for tracking fecal pollution to its origins. (March 2017 work session notes, 10/2016, 11/2016, 01/2017, 02/2017, 4/2017, 6/2017, 9/2017, 10/2017, 11/2017). vii. Partnerships with other groups: <ul style="list-style-type: none"> a. <u>Ecology:</u> Partnered with WA Dept. of Ecology on communicating with landowners in the Tenmile drainage, in order to support a planning process leading towards water quality improvements (5/2016, 6/2016, 10/2016, 1/2017) b. <u>Tenmile Group:</u> Cooperated with the Tenmile Group on water quality sampling and reporting, including bracket sampling and storm event sampling (1/2017, 4/2017, 6/2017). The WID is receiving regular sampling reports from the Tenmile Group 8/2016, 11/2016, 11/2017, 01/2018. Received Tenmile Group reports on work with septic tank owners (8/2016, 11/2016). Coordinating with Tenmile Group on outreach to landowners about water quality issues (5/2016, 2/2017, 6/2016) c. <u>Tenmile NWQI Watershed Assessment:</u> Allowed the Conservation District to use the WID's water quality data and helped write and cosign a cover letter on the project to area landowners. (6/2017, 9/2017, 10/2017) viii. Maintained a watching brief on installation of ZAPS technology for real-time monitoring of fecal coliforms/E. Coli in water, after Whatcom Conservation District & County Department of Health installed several ZAPS units in the area waterways. <p><u>Priority actions for Management Plan:</u></p> <ul style="list-style-type: none"> ix. Continue to invest in water quality monitoring by the WID as well as in partnership with the Tenmile group (from draft newsletter) x. Continue to develop relationships with other groups working on water quality (March 2017 work session notes) <p><u>Additional actions that might be considered for inclusion here (from meetings, other WID documents):</u></p> <ul style="list-style-type: none"> xi. Coordinate with Ag Water Board and other WIDs on water quality programs and responses, the Portage Bay Partnership, implementation of best management practices. 	

Water quality (continued from previous page)	<p><i>The items below were added to the table after the March 1 Tenmile forum. Board to advise on which should be incorporated into the WID Plan as possible future actions.</i></p> <p>Ongoing actions:</p> <ul style="list-style-type: none"> i. Continue to work with Whatcom County Public Works to access and report shared bacteria data from multiple partners who are sampling in the WID area (WCD, WID, WCPW) <p>Possible future actions:</p> <ul style="list-style-type: none"> i. Work with local partners and agencies to establish an integrated data repository that can provide a full suite of watershed information for the WID (WCD, Laurel WID, Ag Water Board and other WIDs) ii. Extend the more detailed Tenmile Watershed Assessment (2018) to the remainder of the Laurel WID area, primarily the Wiser Lake/Cougar Creek sub-watersheds (WCD, WID) iii. <u>Conservation practices</u> <ul style="list-style-type: none"> a. Identify the most effective conservation practices for each land use based on current practices by the landowner (WCD?). b. Define and track measurable metrics for progress related to: <ul style="list-style-type: none"> - location & level of implementation of NRCS conservation practices (NRCS, WCD) - water quality at or near implementation sites (local PIC partners & others) - improvements/changes in downstream water quality at station T1 and lower Nooksack mainstem stations (PIC partners, DOH, LNNR) c. Track implementation of conservation practices (NRCS Protracts program, WCD) d. Continue edge-of-field monitoring in Whatcom County for various land use types and conservation practices (WCD) iv. <u>Conservation planning/Farm planning</u> <ul style="list-style-type: none"> a. Encourage farmers and landowners in the WID to draw up farm plans, in order to support implementation, evaluation and adaptation of a broader watershed management plan. (WCD, WID) v. <u>Ongoing water quality monitoring (need to identify partners for each case below)</u> <ul style="list-style-type: none"> a. Conduct surface water monitoring of 10 ambient stations for fecal coliforms, plus additional source identification or storm event monitoring. b. Conduct regular sampling of nitrogen, phosphorus and sediment in surface water at T1 station, quarterly. c. Collect flow measurements at T1 and additional ambient monitoring stations in order to estimate flows and loads based on measured pollutant concentrations.
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	Desired outcome(s):	Measurable goals	Actions
4	<i>Flood management & protection Version 3 (April 2018)</i>		
	<p>Agricultural lands in the Laurel WID are protected from flooding due to surface water runoff at critical times in the growing season.</p> <p><u>Goal statement (a):</u> Regular, scheduled maintenance is completed for flood protection infrastructure in the Laurel WID area.</p> <p><u>Progress could be measured by:</u> Number of projects, repairs or actions that are completed in a year, compared to the number reported as needing attention.</p> <p><u>Goal statement (b):</u> Ad hoc or emergency repairs to flood protection infrastructure are completed in a timely manner, in collaboration with Whatcom County.</p> <p><u>Progress could be measured by:</u> Number of ad hoc emergency repairs that are completed in a year, compared to the number reported as needing attention.</p>	<p><u>Recently completed or ongoing:</u></p> <ul style="list-style-type: none"> i. Identified flood management and dike maintenance priority actions as part of Ag-Watershed Characterization and Mapping work session in February 2016 (see agricultural enhancement tables in Appendix B, also Table 5 and map in Figure 8 of this Plan) ii. Appel culvert repaired & fish barrier removed (Whatcom County Public Works) <p><u>Priority actions for Management Plan:</u></p> <ul style="list-style-type: none"> iii. Review and update priority actions identified at the February 2016 work session (see list in Table 5 and map in Figure 8 of this Plan) iv. Devries Levee – widen & flatten backslope. Included in SWIF plan by Whatcom County Public Works <p><u>Recently completed or ongoing:</u> Any to list here?</p> <p><u>Priority actions for Management Plan:</u> Any to list here?</p>	

	Desired outcome(s):	Measurable goals	Actions
v	<i>Communication, outreach, education and reporting Version 3 (April 2018)</i>		
	<p><u>Internal:</u> WID members are aware of and understand the priority issues and participate actively in WID planning & implementation of priority actions.</p> <p><u>External:</u> Non-agricultural residents and other stakeholders outside the WID are aware of, understand and support the Laurel WID's priority actions.</p>	<p><u>Internal</u> <u>Progress could be measured by:</u> Number of direct personal contacts to resolve concerns or raise awareness; information shared (e.g. newsletters, website); landowner concerns/priorities addressed; feedback received (informal or through surveys)</p> <p><u>External</u> <u>Progress could be measured by:</u> External contacts: information shared (e.g. newsletters, website); feedback received (informal or through surveys); evidence of support for WID priorities (e.g. in media coverage)</p>	<p><u>Internal:</u> The WID board will need to communicate with WID members and engage with them on agreed priority issues, and also to communicate with neighboring landowners, other stakeholders and relevant agencies. <u>Recently completed or ongoing:</u></p> <ul style="list-style-type: none"> i. Set up the WID website www.laurelwid.com (2015) ii. Published Ag Water Board introductory story map with general information about the WIDs http://www.agwaterboard.com/storymap iii. Work sessions in 2016 to map and characterize priorities for the WID (Mapping Report produced with the Ag-Watershed Project team) iv. Published story map as part of Ag-Watershed Characterization and Mapping project http://arcg.is/29qsplX (Oct 2016) v. Outreach by the AWB (booth) on behalf of the WIDs at the Small Fruit Conference (Nov 30 – Dec 1, 2016) vi. Sponsored Whatcom Conservation District speaker series (Jan 2017) vii. Sponsored WSU Water Workshop (Feb 2017) viii. Participated in Baker to Bay Symposium (Sep 2017) and supported organization & sponsoring of the Water Supply Symposium (Dec 2017) ix. Distributed newsletters summarizing WID activities x. Contacted additional landowners to discuss annexation into the WID (4/2017, 6/2017) <p><u>Priority actions for Management Plan:</u></p> <ul style="list-style-type: none"> xi. Prepare a Management Plan for the Laurel WID xii. Establish a template for tracking and regular reporting of WID progress on priority issues, based on a set of simple indicators of progress.* xiii. Continue to distribute newsletter to WID members summarizing WID progress. xiv. Coordinate with other WIDs to help members build skills for effective engagement and communication (3/2017 work session). <p>* denotes actions that may need additional resources, and more detailed scope & description (see section 6)</p> <p><u>External:</u> While external communication and engagement could be coordinated through the Ag Water Board and Whatcom Family Farmers, Laurel-specific information and inputs will be needed to support these efforts. <u>Recently completed or ongoing:</u></p> <ul style="list-style-type: none"> xv. Developed a working partnership with the Tenmile Clean Water Project, focused on water quality & watershed improvements. xvi. Reviewed & submitted comments on County Critical Areas Ordinance Update via the Ag Water Board (04/2016). xvii. Provided feedback on Whatcom Conservation District's 2017 work plan (Sep 2016). xviii. Tracked progress, noted comments and concerns regarding the State's proposed CAFO permit (6/2016, 2/2017) xix. Tracked water bills in the State Legislature where these are of interest to farmers (2/2017) <p><u>Priority actions for Management Plan:</u></p> <ul style="list-style-type: none"> xx. Coordinate with other WIDs to share what farmers are doing to benefit water quality and habitat (March 2017 work session notes) xxi. Coordinate with other WIDs to track legislation, rule-making, agendas and impacts on agriculture at County, State, Federal levels (March 2017 work session notes; Whatcom County Agricultural Advisory Committee & Whatcom County Planning Commission were mentioned) xxii. Added after Tenmile forum on March 1: coordinate with the WCD and the Tenmile Clean Water Project to integrate planning and implementation for WID outreach and Tenmile Watershed outreach efforts (WID, WCD) xxiii. Added after April 2018 board meeting: coordinate with the Drainage Improvement Districts to resolve sharing of costs, permitting and mitigation for work on drainage infrastructure.

	Desired outcome(s):	Measurable goals	Actions
vi	<i>Water flow processes; Habitats & species Version 3 (April 2018)</i>		
	<p><i>The Laurel WID's plans and actions help to protect and enhance water flow processes and fish and wildlife habitats in watersheds within the Laurel WID area</i></p> <p><u>Goal statement:</u> <i>Water flow processes (surface storage, discharge, recharge, delivery) are enhanced or protected as necessary in areas that are important for the watershed (see Figures 14 and 15 in the WID mapping report: contained in Appendix C of this Plan).</i></p> <p><u>Progress could be measured by:</u> <i>Some options for measuring progress:</i></p> <ul style="list-style-type: none"> - Status of water flow process degradation (H, MH, M, L) in assessment units within the Laurel WID area. - % effective shade cover along fish-bearing streams and ditches. - Acres of wetland or wildlife habitat enhanced, restored and/or protected 	<p><u>Recently completed or ongoing:</u></p> <ol style="list-style-type: none"> i. Watershed assessment for the Ag-Watershed Project (Feb 2016) identified priority areas where water flow processes – especially storage and discharge - could be enhanced through wetlands, ground water recharge and planting of riparian vegetation (see watershed characterization tables in Appendix B of this Plan and maps in Appendix C). ii. Appel culvert project completed with NRCS, Diking District and County Flood support (10/2017) ix. Participated in the Fish/Flood meeting with Ned Currence (Nooksack) and Alan Chapman (Lummi) (01/2018) x. Developed a 5-year programmatic drainage plan and permit application, with assistance from the Conservation District. Includes several mitigation actions and some voluntary fish passage projects that would count as mitigation credit. (4/2018) <p><u>Priority actions for Management plan:</u></p> <ol style="list-style-type: none"> iii. Review possible actions to enhance or protect water flow processes in specific locations within the Laurel WID area, as listed in the watershed characterization tables prepared during the WID work session in February 2016 (see tables in Appendix B of this Plan)* <ul style="list-style-type: none"> · Suggested actions in specific parts of the WID include, for example, enhancing surface water storage, reducing or preventing additional impervious cover, protecting and/or restoring riparian and forest cover, reducing subsurface drainage rates. · Consider action at South Fork of Deer Creek culvert, access road east of Aldrich Rd. This would provide benefit for habitat and water quality (04/2016) iv. Make a list of possible habitat-related actions (5/2016) and coordinate this with development of programmatic drainage permits, in order to utilize opportunities such as culvert replacement (4/2017) to "bank" mitigation that might be required for drainage permits. * v. Consider request from Fourmile DID #3 to assist with mitigation planting in the spring (01/2018) <p>* denotes actions that may need additional resources & more detailed scope & description (see section 6 of this Plan)</p>	

	Desired outcome(s):	Measurable goals	Actions
vii	Agricultural protection (Protecting the agricultural industry)	Version 3 (April 2018)	
	The Laurel WID's plans and actions contribute to the recognition, protection and strengthening of the agricultural base in the WID area.	<p><u>Goal statement (a):</u> Important agricultural land in the WID is protected from conversion through appropriate zoning and/or voluntary agricultural conservation easements. <u>Progress could be measured by:</u> Acres of land in the Laurel WID protected by voluntary agricultural conservation easements</p>	<p>Note that WID actions could contribute to this priority issue, but there are also external factors influencing it, such as land prices, agricultural markets & policies etc.</p> <p>"Preserving the land base" is a stated priority from the mapping report (2016), but the board meeting minutes do not include detailed discussion of this issue.</p> <p><u>Recently completed or ongoing:</u></p> <ul style="list-style-type: none"> i. Identified agricultural land protection priorities as part of Ag-Watershed Characterization and Mapping work session in February 2016 (see agricultural enhancement tables in Appendix B, maps in Appendix C, also Table 5 and map in Figure 8 of this Plan) <p><u>Priority actions for Management Plan:</u> Any to list here?</p>
		<p><u>Goal statement (b)</u> Land use conflicts with neighboring non-agricultural landowners are reduced. <u>Progress could be measured by:</u> Number of complaints received from non-ag landowners by the WID or by Whatcom County.</p>	<p><u>Recently completed or ongoing:</u> Any to list here?</p> <p><u>Priority actions for Management Plan:</u></p> <ul style="list-style-type: none"> ii. engage and communicate with non-ag landowners in the WID area about WID priorities and programs, normal farming operations, right-to-farm etc. (include specific actions in the communication strategy)*
		<p><u>Goal statement (c):</u> Suggestions from WID board for goal statements? <u>Progress could be measured by:</u> For example - adoption of the County Council resolution on preserving 100,000 acres for the ag land base, which recognizes the importance of agriculture and associated industries for the local economy.</p>	<p><u>Recently completed or ongoing:</u> Any to list here?</p> <p><u>Priority actions for Management Plan:</u></p> <ul style="list-style-type: none"> iii. coordinate with Whatcom Family Farmers to address legal challenges and preserve "one voice outreach" on behalf of agriculture (from March 2017 work session) <p>* denotes actions that may need additional resources, and more detailed scope & description (see section 6 of this Plan)</p>

3 GENERAL OVERVIEW OF THE WID 1

Explanatory note 2

The following text describing watershed and agricultural characteristics in the Laurel WID area is copied from the 2016 characterization & mapping report,⁷ with some modifications and additions. Additional sources are cited in footnotes.

The purpose of this section is to briefly inform readers about the history and characteristics of the Laurel WID area, provide summary descriptions of the sub-watersheds and agricultural activities, and introduce some of the issues that have informed the WID's stated priorities for management. In subsequent versions of the Management Plan:

- more detail could be added to the overview section, with additional maps and tables providing a synthesis of readily available information on land use, cropping patterns, hydrology, water quality;
- the sections on baseline conditions could be expanded, to include results of new analyses and possibly new field measurements.

4

Additional background information about the Laurel WID can be found online:

- WID website <https://www.laurelwid.com/> 7
- Agriculture-Watershed Characterization & Mapping Report for the Laurel WID (2016). <https://www.laurelwid.com/> [Alternative download [here](#)]
- Story map showing results of WID work sessions and the Agriculture-Watershed Characterization & Mapping work (2016) <http://arcg.is/29qspLX>
- Ag Water Board introductory story map with general information about the WIDs

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3.1 Location and hydrology 8

The Laurel Watershed Improvement District (see location map in Figure 1) is located in the central lowland area of Whatcom County, within the catchment area of the main Nooksack River. The City of Ferndale (pop. 12,700) lies across the Nooksack River to the west of the WID area, while the City of Bellingham (pop. 83,600) is located to the south.

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The total calculated area within the Laurel WID boundary is 8,307 acres. Within this boundary, the area of land currently on the Laurel assessment roll is 8,430 acres.⁸ The assessment roll includes only parcels over 5 acres in size, parcels outside urban areas and parcels enrolled in the Agricultural Open Space taxation program (see map in Figure 4).

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The WID area includes portions of the Ten Mile Creek, Four Mile Creek and Deer Creek drainages. These tributaries and other drainages are included in Water Resource Inventory Area 1 (WRIA 1: see Figure 1). The Laurel WID also includes portions of other special districts, including several Drainage Improvement Districts (DID#3, #5, #6 and #30A: see Figure 7) and Diking District #3 (see Figure 9).

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The Sumas-Blaine aquifer underlies part of the WID area (see map in Figure 2). This aquifer is characterized by its shallow depth to water (less than 10 feet in most areas), limited thickness (mostly less

⁷ See: Laurel WID mapping report (2016) Download from <http://www.laurelwid.com/> [Alternative download [here](#)]

⁸ As of October 9, 2017. Parcel data provided by the Ag Water Board.

than 50 feet) and high rainfall during the winter, which combine to make groundwater recharge fairly rapid but also to make the groundwater vulnerable to contamination from surface pollution.⁹

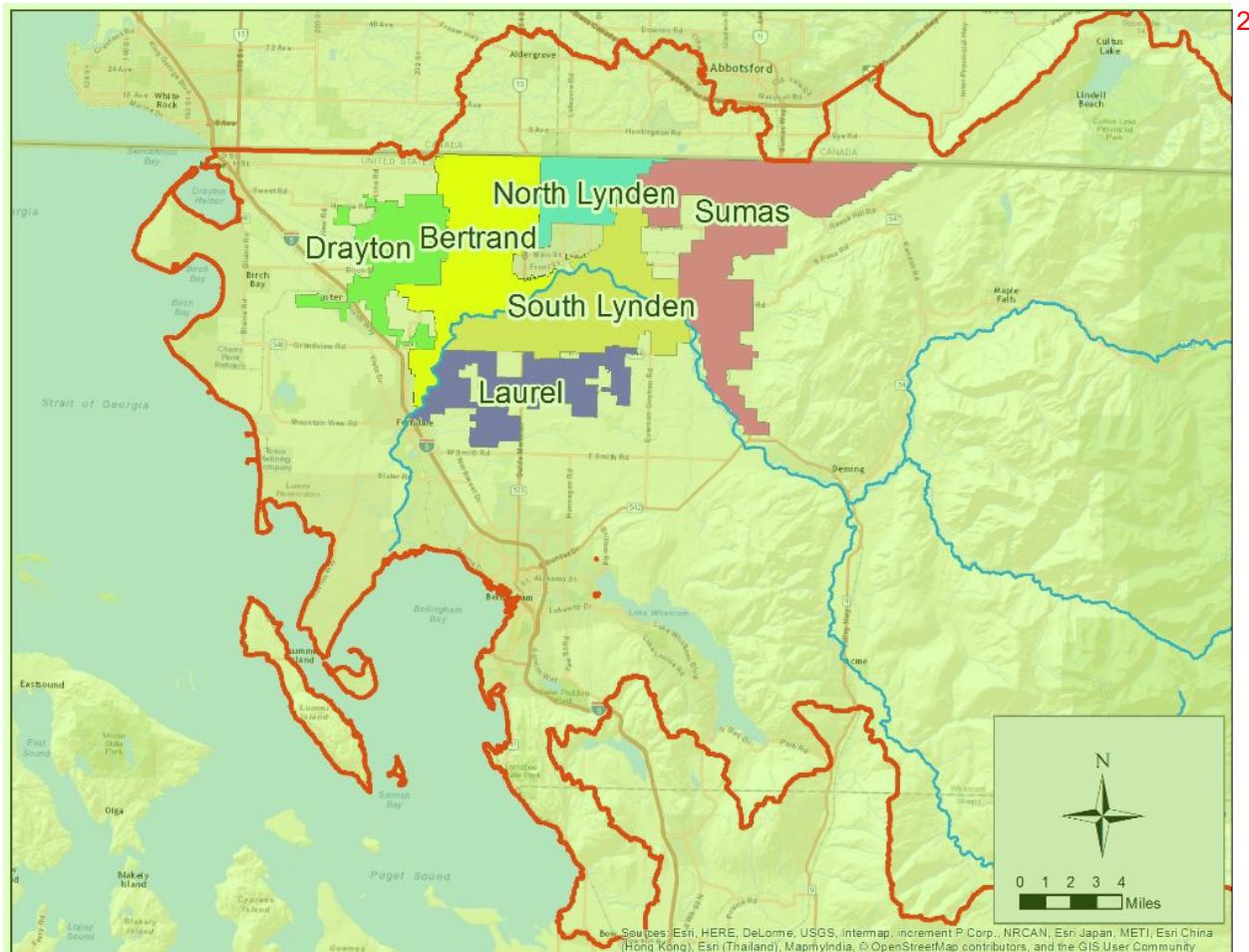


Figure 1. Map showing location of the Laurel WID, with Water Resource Inventory Area 1 outlined in red. Reproduced from the Laurel mapping report (2016).

⁹ Carey B. & Cummings R. (2013). *Sumas-Blaine Aquifer Nitrate Contamination Summary*. Washington State Department of Ecology Publication No. 12.03.026.

<https://fortress.wa.gov/ecy/publications/documents/1203026.pdf> [last accessed February 5, 2017]

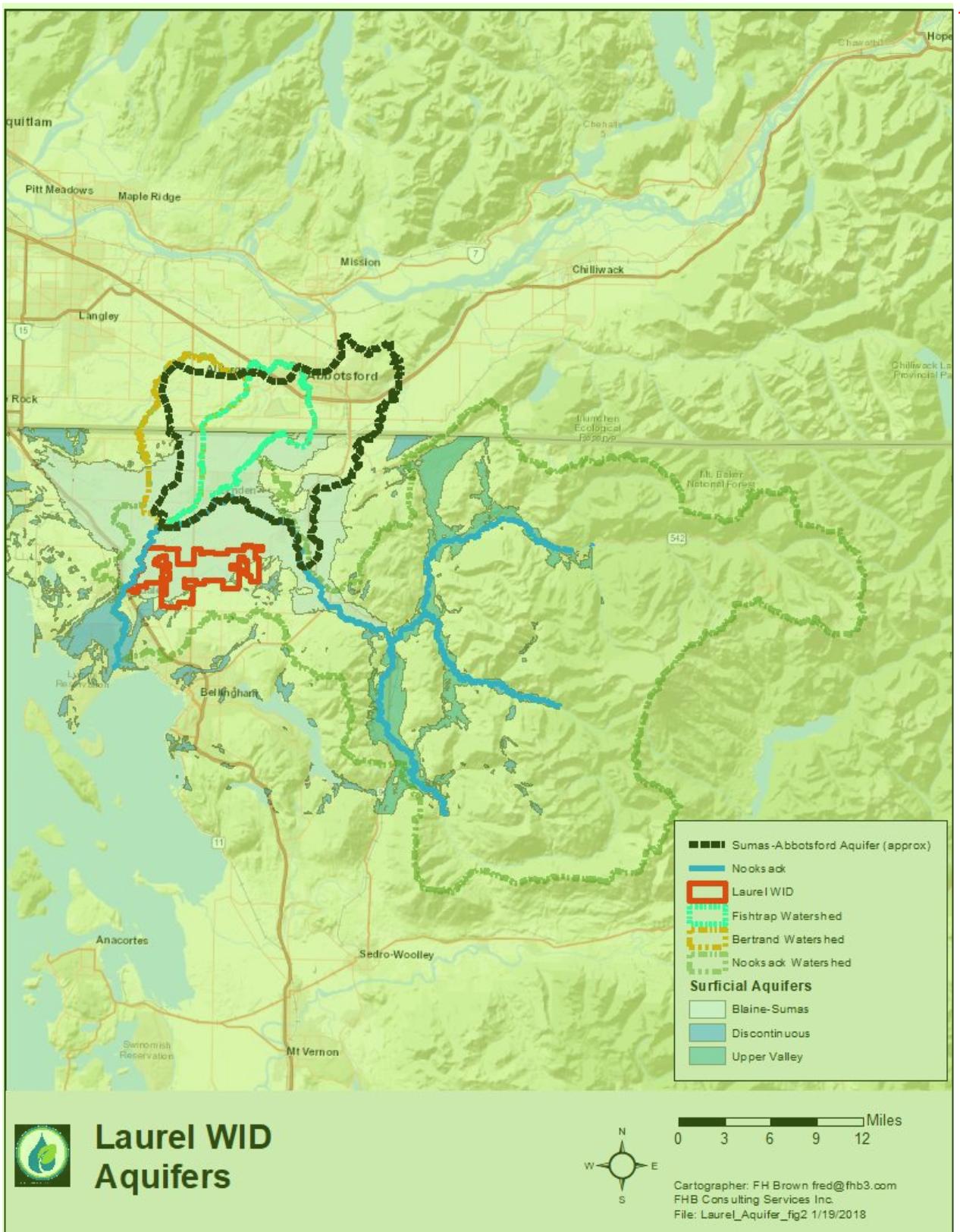


Figure 2. Map showing aquifers in the vicinity of the Laurel WID. 2

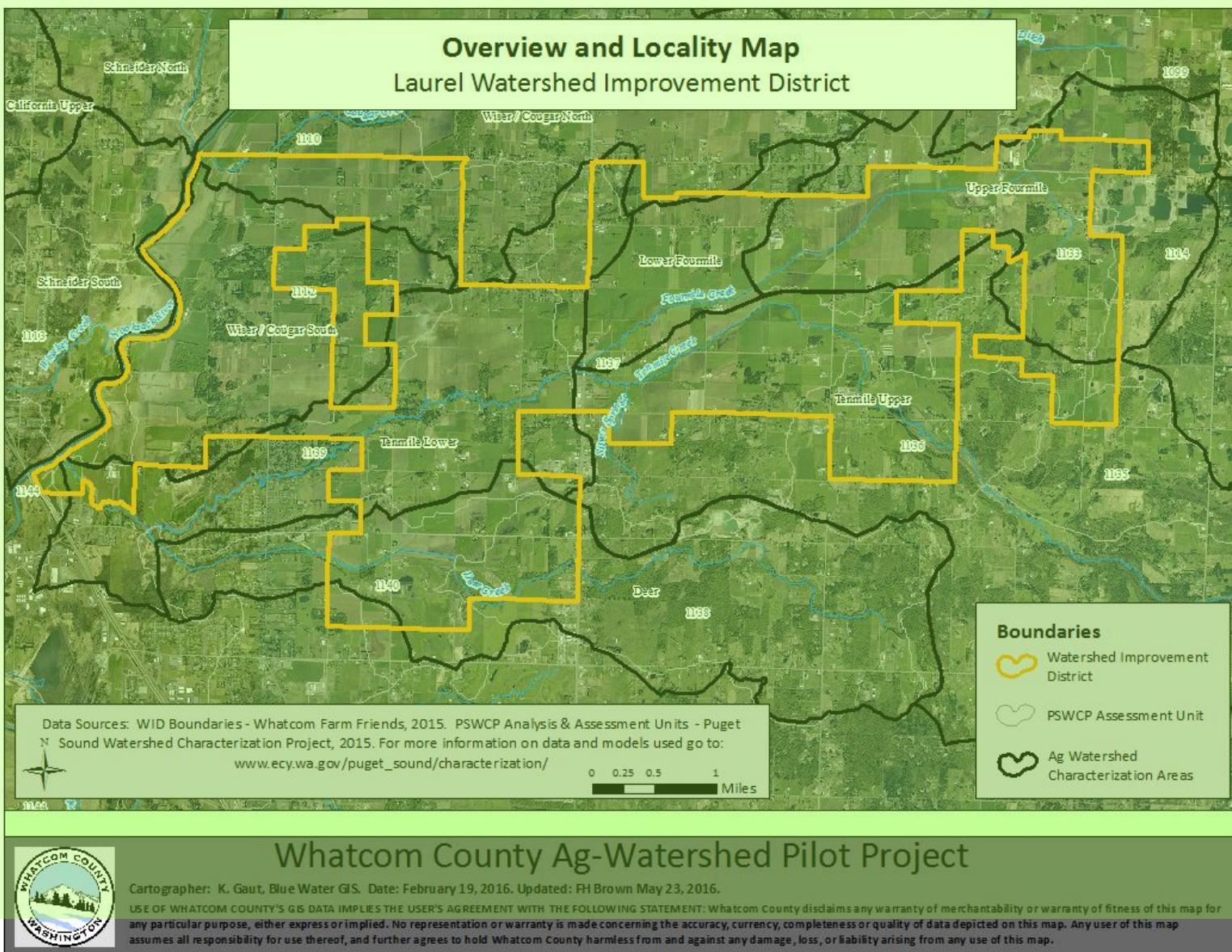


Figure 3. Laurel WID overview map. Reproduced from the Laurel WID mapping report (2016). 2
Version 3 (April 2018)

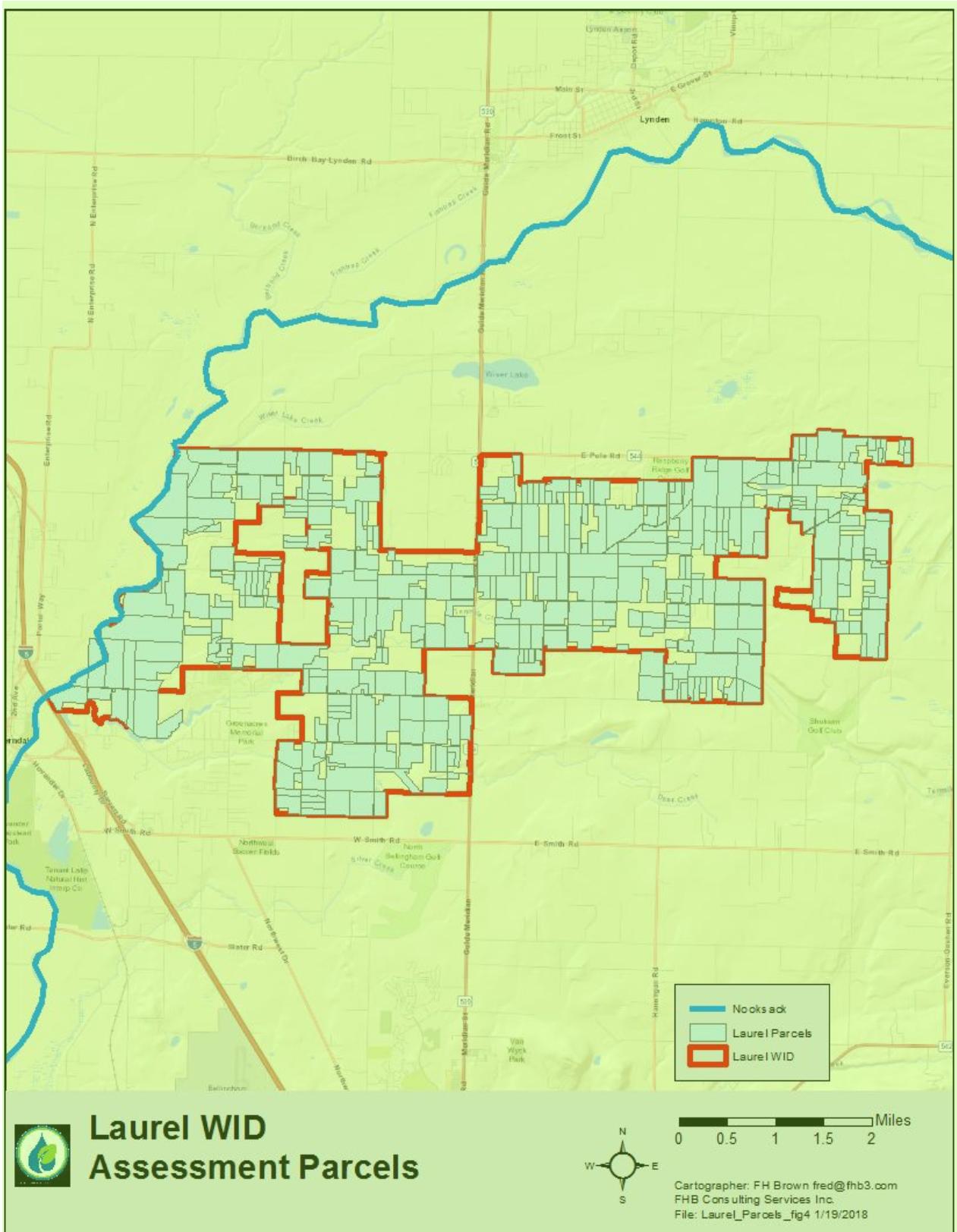


Figure 4. Map of parcels included in the Laurel WID assessment roll (October 2017). Data provided by Ag Water Board.

3.2 Historic conditions in the Laurel WID area ¹

Explanatory note ²

Understanding the historic conditions in the watershed helps us to understand how the watershed system has ³ changed over time. This informs the discussion about what actions are needed for both agriculture and watersheds, which actions are practical and feasible in the landscape given the topography, soils and hydrology, and where specific actions would be most effective in achieving both agricultural and watershed priorities.

Before European settlement, there were major Nooksack Indian Tribe settlements concentrated near the ⁴ present cities of Lynden and Everson, and at the forks of the Nooksack River. The Tribe's territory included the major part of the Nooksack lowland. Many well-defined trails northward facilitated their trade with the Sumas, Chilliwack, and Matsqua bands of British Columbia, as well as The Hudson's Bay Company at Fort Langley. The Nooksacks also conducted more limited trade with tribes to the south and west, the Semiahmoo, Lummi, and Skagit.¹⁰ A trail from Bellingham to present-day Everson known as the Whatcom Trail was used to access clamping areas, and other shellfish grounds, on Bellingham Bay and also to conduct trade between tribal communities on Birch Bay and in Canada.¹¹ Another trail stretched from Dakota Creek in Semiahmoo territory east to the Kamm Creek watershed and then roughly north to Canada.¹² Native Americans also used the extensive waterways of a huge wetland complex between Fishtrap Creek and the Fraser River to travel.¹³

The map shown in Figure 5 was prepared in 1858 and shows local topography and wildlife "of special ⁵ interest" to the tribes in the area at the time.¹⁴

In addition to relying on salmon, gathered fruits and vegetables, shellfish, and wild game for food, the Nooksack people utilized prairie land to cultivate "Indian carrots," a prized food item,¹⁵ and also to harvest fern roots and camas bulbs. After the potato was introduced to the Tribe by the Hudson's Bay Company sometime after the establishment of Fort Langley in 1828, the Nooksack people began cultivating and trading it as well.¹⁶

¹⁰ Jeffcott, P R. 1949. Nooksack Tales and Trails. (Ferndale: Sedro-Woolley Courier Times), cited in Tremaine, D.G. 1975. Indian & Pioneer Settlement of the Nooksack Lowland, Washington to 1890. Occasional Paper #4. Center for Pacific Northwest Studies, Western Washington State College

¹¹ Oakley, J. 2004. "Construction begins on the Whatcom Trail in September 1857" *History Link.org* <http://www.historylink.org/File/7112>

¹² Richardson, A., B. Galloway, 2011. *Nooksack Place Names. Geography, Culture and Language*. Vancouver, CA: UBC Press

¹³ Luginbill, T. 2017 [personal communication February 21, 2017].

¹⁴ Wells, Oliver (1858). Map of Indian Territory 1858 showing tribal areas, topography, village sites, Indian trails, historic sites and wildlife of special interest to Natives. PR Jeffcott Map#1-15, PR Jeffcott Papers, Center for Pacific Northwest Studies, Western Libraries Heritage Resources, Western Washington University, Bellingham.

¹⁵ Smith, M.W. 1950 "The Nooksack, Chilliwack, and Middle Fraser," *Pacific Northwest Quarterly* 41 (1950):330-41, cited in Tremaine, D.G. 1975. Indian & Pioneer Settlement of the Nooksack Lowland, Washington to 1890. Occasional Paper #4. Center for Pacific Northwest Studies, Western Washington State College.

¹⁶ Edson, The Fourth Corner and Smith, M.W. 1950 "The Nooksack, Chilliwack, and Middle Fraser," *Pacific Northwest Quarterly* 41 (1950):330-41, cited in Tremaine, D.G. 1975. Indian & Pioneer Settlement of the Nooksack Lowland, Washington to 1890. Occasional Paper #4. Center for Pacific Northwest Studies, Western Washington State College.

Some prairie land occurred in the Laurel WID area. *Nooksack Place Names, Geography, Culture, and Language* (Richardson and Galloway, 2011)¹⁷ provides information about named places in historic Nooksack territory. Nek'iyéy is the name given to "Ten Mile Prairie," located where the Whatcom trail crossed Tenmile Creek (the authors state that the name also applies to Tenmile Creek). This was the site of a Nooksack village¹⁸ and the Hudson Bay Company established a Trading Post at this location, as well.¹⁹ According to Richardson and Galloway, the location of the prairie is indicated today by the low wet area crossed by Hemmi Road from ½ to ¾ mile east of Hannegan Road.²⁰

Just south of the WID, there was a prairie called Sq'eláxen. This name also refers to a group of people who occupied the area in the early to mid-19th century. Percival Jeffcott wrote in *Nooksack Tales and Trails: Historical Stories of Whatcom County*, "a small band of Indians had their homes on a small prairie that extended from the east bank of the Nooksack back to near Nu-klus-kum (Barrett Lake) and Deer Creek . . . also it was the natural habitat of the camas and shu-guack or wild carrot."²¹ Jeffcott also stated that John Tennant claimed a portion of this prairie which implies that it extended further south to Tenant Lake.²²

Prairie areas intermixed with wetlands were described in a letter written by a William Smith and published in the Northern Light on July 2, 1858. Smith, who traveled northeast along the Whatcom Trail, which ran through the eastern portion of the Laurel WID area, described the land as follows: "The first water and grasses are on Six Mile Prairie. Five miles on, water. Two small streams between that and Lummy [Nooksack] River. Prairie for 18 miles to the base of mountain, with plenty of water."²³ Another account, however, emphasizes the forests along the trail. Janet Oakley in her *HistoryLink.org* article "Construction begins on the Whatcom Trail" writes of Nekiyéy [sic] (Ten Mile Prairie mentioned above), the trail "wandered through beaver ponds and heavy forests and crossed the creek."²⁴

Of the historic prairies near present-day Lynden, Collins and Sheikh, in their 2004 report *Historical riverine dynamics and habitats of the Nooksack River* state that "indigenous populations may have created and maintained this forest opening (and likely other, small, unmapped openings) as was common in other Pacific Northwest environments ... , or they may have been natural openings created by wet soils."²⁵

¹⁷ Richardson, A., B. Galloway, 2011. *Ibid.*

¹⁸ Wayne Suttles ethnographic and linguistic field notes, 1949-1952, 1958. Cited in Richardson, A., B. Galloway, 2011. *Nooksack Place Names. Geography, Culture and Language*. Vancouver, CA: UBC Press

¹⁹ Hawley, R. E., 1971. *Skqee Mus or Pioneer Days on the Nooksack*. Bellingham, WA: Whatcom Museum of History and Art. Originally published in 1945. Cited in Richardson, A., B. Galloway, 2011. *Nooksack Place Names. Geography, Culture and Language*. Vancouver, CA: UBC Press

²⁰ Richardson, A., B. Galloway, 2011. *Nooksack Place Names. Geography, Culture and Language*. Vancouver, CA: UBC Press

²¹ Jeffcott, P. R., 1949. *Nooksack Tales and Trails*. Ferndale, WA: Author. Cited in Richardson, A., B. Galloway, 2011. *Nooksack Place Names. Geography, Culture and Language*. Vancouver, CA: UBC Press

²² Richardson, A., B. Galloway, 2011. *Nooksack Place Names. Geography, Culture and Language*. Vancouver, CA: UBC Press

²³ Tremaine, D.G. 1975. Indian & Pioneer Settlement of the Nooksack Lowland, Washington to 1890. Occasional Paper #4. Center for Pacific Northwest Studies, Western Washington State College.

²⁴ Oakley, J. 2004. "Construction begins on the Whatcom Trail in September 1857" *History Link.org* <http://www.historylink.org/File/7112>

²⁵ Collins, B. D., and A. J. Sheikh, 2004. *Historical riverine dynamics and habitats of the Nooksack River; May 2003 (revised August 2004)*. Deming, WA: Nooksack Indian Tribe.

Wetlands were prevalent here. The General Land Office (GLO) survey map for Township 39N, Range 3E (from Guide Meridian to the east) dated 1884 shows extensive wet areas around upper and lower Fourmile Creek (the area falls within Drainage District #3) and upper Tenmile Creek as well as areas labeled "cranberry marsh" at the headwaters of Tenmile Creek (southeast of the WID boundaries) and in the lower Tenmile Creek area.²⁶ The GLO survey map for Township 39N, Range 2E (from Guide Meridian to the west) shows wet areas near Deer Creek, and north of Tenmile Creek: One area near the Woodlawn Cemetery and two more a little north of that (in and around section 15).²⁷

The cadastral survey notes taken by Smith in 1859, Cornelius in 1871, and Tennant in 1874, suggest the Laurel WID area was very wet.^{28 29 30} The surveyors frequently mention entering "marshes," "swamps," and "wet bottoms." Their notes include some information about the wetland vegetation as well: They mention "willow and hardhack swamp," "spruce and hardhack swamp," "grassy marsh," "marsh prairie grass and hardhack," "crabapple and hardhack marsh," "spruce and cedar swamp," "spruce and crabapple bottom. Very wet," "alder and hardhack marsh," "hardhack swamp," and "willow and hard hack swamp, water 18 inches deep." They also noted a "beaver swamp . . . very wet, water 2ft deep," some "sloughs," a "shallow lagoon," and some "lakes." These descriptions of water on the land occur in the notes over the whole area of the present-day WID area but are noted much more frequently in the area to the east of Guide Meridian. Tennant describes the generally wet nature of the land in Township 39N, Range 3E (east of Guide Meridian) in his summary, "General Description. The soil in this township is considerably above average. There are no large streams or lakes and a great amount of good bottom land of 1st quality. Large track of low wet bottom marshes & swampy land easily drained & would then prove of the very best quality. Much of the timber in the township has been destroyed by fire but there are still remaining some good bodies especially in sections 1 & 31."³¹

Historical riverine dynamics and habitats of the Nooksack River (Collins and Sheikh, 2004),³² tells a similar story about the pre-European settlement conditions on the Nooksack River floodplain – a band up to approximately 3 km wide on either side of the Nooksack River. The river bed and its meander belt had been built up by post-glacial deposits to about 3-4 feet above the valley bottom and the authors state that extensive freshwater wetlands, primarily with scrub-shrub vegetation and having numerous beaver dams, occupied the low areas close to the meander belt of the lower Nooksack.

²⁶ US Department of the Interior Bureau of Land Management, n.d. *General Land Office Records: Survey Plats and Field Notes*. <https://www.blm.gov/or/landrecords/survey/ySrvy1.php>

²⁷ US Department of the Interior Bureau of Land Management, n.d. *ibid.*

²⁸ Smith, I. W., 1859. "Field notes of the survey of the Puget Sound Guide Meridian between the 9th and 10th Standard Parallels (sic) North of the base line and Ranges 2 and 3 East of the Willamette Meridian in the Territory of Washington, by Isaac W. Smith, and Jared S. Hurd, Deputy Surveyors, under their contract no. 45 bearing date the 21st day of April 1859. Commenced June 20th, 1859. Finished September 26, 1859." General Land Office Records; Survey Plats and Field Notes. US Department of the Interior Bureau of Land Management <https://www.blm.gov/or/landrecords/survey/ySrvy1.php>

²⁹ Cornelius, J. A., 1871. "Field Notes of the Subdivisional and Meander lines of Township 39N R2E Will. Mer. J.A. Cornelius Dep. Sur. 1871." General Land Office Records; Survey Plats and Field Notes. US Department of the Interior Bureau of Land Management <https://www.blm.gov/or/landrecords/survey/ySrvy1.php>

³⁰ Tennant, J. A., 1874. "Transcript of the Field Notes of the Survey of Township 39 North Range 3 East, Township 40 North Range 4 East, & Township 38 North Range 3 East and Secs. 25, 26, 35 & 36 in T39N, R1 East of the Willamette Meridian Washington Territory, John A. Tennant, Deputy Surveyor." General Land Office Records; Survey Plats and Field Notes. US Department of the Interior Bureau of Land Management <https://glorecords.blm.gov/default.aspx>

³¹ Cornelius, J. A., 1871. *Ibid.*

³² Collins, B. D., and A. J. Sheikh, 2004. *Ibid.*

*Nooksack Place Names, Geography, Culture, and Language*³³ provides some information about named water resources in historic Nooksack territory. Nuxwq'échqsem is the Nooksack name given to Barrett Lake. Richardson and Galloway report this swampy expansion of Tenmile Creek was caused by a beaver dam half a mile above the mouth.³⁴ The authors report that the upper portions of Nek'iyéy (referring to Tenmile Creek not Tenmile Prairie in this case) were fished for silver salmon.³⁵ Louise Johnson in her book *Tales of Tenmile* reports the salmon in Tenmile were abundant in the early 1900s. She writes "as [salmon] came up the creek through our place, they would be so thick, Father would take a pitchfork and pitch a few onto the creek bank. He would try to find one that was firm of flesh so we could have fresh salmon to eat," and goes on to say that the carcasses were plowed into the fields "or the odor would have been unbearable."³⁶

In addition to these Nooksack named places, there are two describing water resources just north of the Laurel WID. Lhelhókw'ey, the Nooksack name for what is now called Wiser Lake, means "many-flying place." The shallow lake had a marshy border that was good for waterfowl.³⁷ And Kwíshilwalh, now known as Fountain Lake, was a small lake with a marshy border where Indian potatoes were gathered. Wild cranberries and Labrador (swamp) tea used to grow in a bog off the east side of the lake.³⁸

Richardson and Galloway catalogue two more named places in the area of the Laurel WID about which little is known. Spelcoke is the name Henry Custer used to describe a stream believed to be one of the upper branches of Deer Creek. When traveling southwest on the Whatcom Trail in 1858 he wrote "crosse a little stream, Spelcoke." This is the only recorded use of the name.³⁹ Sqeláw7 is the name given to Green Lake. No specific Nooksack use of the lake is recorded, but beaver and waterfowl could have been hunted, and useful plants could have been gathered there.⁴⁰

Tales of Ten Mile: 1888 to 1940 offers insights into the wildlife in the area in the late 1800s. The author relates a story about her grandfather Marion Myer's conversations with a Nooksack man named Mr. Johnson. Mr. Johnson would spend the night with her grandfather on occasion when on his way to New Whatcom (the towns of Whatcom and Sehome merged to become New Whatcom in 1891, and the name was changed to Whatcom in 1901). According to the author, Mr. Johnson told Mr. Myers that before Europeans settled the area deer and elk were plentiful and the Nooksacks "trapped muskrats, mink, otter and beaver. The creek was much bigger than it is now. Beaver, which were plentiful, built many dams across the creek, so the lowlands were flooded. . . The furs were sold to buyers for the Hudson Bay

³³ Richardson, A., B. Galloway, 2011. *Nooksack Place Names. Geography, Culture and Language*. Vancouver, CA: UBC Press

³⁴ Richardson, A., B. Galloway, 2011. *Ibid.*

³⁵ Richardson, A., 1974. "Traditional Fisheries and Traditional Villages, Camps, and Fishing Sites of the Nooksack Indians." In *Nooksack Tribal Planning Project: Phase I Report*, 50-72. Deming, WA: Nooksack Indian Tribe. Cited in Richardson, A., B. Galloway, 2011. *Nooksack Place Names. Geography, Culture and Language*. Vancouver, CA: UBC Press

³⁶ Johnson, L. 1981. *Tales of Ten Mile, 1888 to 1940*. Bellingham, Washington: Texttype Publishing

³⁷ Richardson, A., B. Galloway, 2011. *Ibid.*

³⁸ Richardson, A., B. Galloway, 2011. *Ibid.*

³⁹ Custer, Henry. 1858. "Report of Henry Custer of Survey of Shore Line from Camp Simiahmoo to Whatcom and of Reconnaissances of Mouth of Lummi River; Whatcom Lake & Vicinity and Trail Leading Thence to the Nooksahk River; and of Whatcom & Nooksahk Trail. Camp Simiahmoo, July 18, 1858." Unpublished field report of the United States Northwest Boundary Survey, US National Archives, RG 76, E 196. Cited in Richardson, A., B. Galloway, 2011.

⁴⁰ Richardson, A., B. Galloway, 2011. *Ibid.*

Company. Many salmon came up the creek to spawn. The fish we caught were smoked in smoke-houses near the creek." The author also states that "when the Myers family arrived in 1888 there were still black bear in the woods," but as the author grew up (she was born in 1914) there were no bear, deer, cougar or bobcat living in the nearby woods. However, there were muskrat living in the banks of the creek, and mink in the area as well. Cotton-tail rabbits were common. Raccoons, mountain beaver, fox, skunks, weasels, squirrels, and chipmunks also lived in the area. The author goes on to list the birds she commonly encountered at Tenmile. She reports kingfishers, great blue herons, meadowlarks, killdeer, yellow goldfinches, wild pigeons, barn swallows, cliff swallows, hawks, owls, woodpeckers, flickers, robins, sparrows, finches, wrens, blackbirds, crows, bluejays, chickadees, junco, towhee, thrush, ruffed grouse, and hummingbirds were all present as well as a few non-native species, namely Chinese pheasants, bobwhite quail, and Hungarian pheasants. She writes that English sparrows, house finches, and starlings were not found in the area.⁴¹

The record of Nooksack place names offers another glimpse into historic wildlife populations. On the western bank of the Nooksack, just across from the mouth of Tenmile Creek, Xwxách'tem was a camp and house historically used by elk hunters as well as people traveling to Bellingham Bay (the name Xwxách'tem is also used to describe the site of Ferndale).⁴²

Collins and Sheik (2004)⁴³ report that field notes from the GLO cadastral survey from 1859-1893 describe forests dominated by hardwoods. Red alder was the most common tree and was found at all elevations. Western red cedar was the most common conifer as well as the largest tree. Sitka spruce, Pacific crabapple, willow, and birch were found in the lower elevations, black cottonwood was found at moderate elevations, and western hemlock at the highest elevations. Adjacent to the river, black cottonwood and Sitka spruce were the largest-diameter trees and cottonwood was almost as abundant as alder. Further away from the river, Douglas fir and cedar were the largest trees. Within wetlands, the tree species composition was similar to streamside forest, except cottonwood was absent, few trees were large, and birch and crabapple were more common.⁴⁴ Within the area of the Laurel WID, the "timber" species mentioned most frequently in the cadastral survey notes were fir, cedar, alder, and spruce, and the undergrowth species mentioned most frequently were willow, alder, fir, hardhack, and vine maple.^{45 46 47}

⁴¹ Johnson, L. 1981. *Tales of Ten Mile, 1888 to 1940*. Bellingham, Washington: Texttype Publishing

⁴² Richardson, A., B. Galloway, 2011. *Ibid.*

⁴³ Collins, B. D., and A. J. Sheikh, 2004. *Ibid.*

⁴⁴ From Collins, B. D., and A. J. Sheikh, 2004. *Ibid.*

⁴⁵ Smith, I. W., 1859. "Field notes of the survey of the Puget Sound Guide Meridian between the 9th and 10th Standard Parallels (sic) North of the base line and Ranges 2 and 3 East of the Willamette Meridian in the Territory of Washington, by Isaac W. Smith, and Jared S. Hurd, Deputy Surveyors, under their contract no. 45 bearing date the 21st day of April 1859. Commenced June 20th, 1859. Finished September 26, 1859." General Land Office Records; Survey Plats and Field Notes. US Department of the Interior Bureau of Land Management

<https://glorecords.blm.gov/default.aspx>

⁴⁶ Cornelius, J. A., 1871. "Field Notes of the Subdivisional and Meander lines of Township 39N R2E Will. Mer. J.A. Cornelius Dep. Sur. 1871." General Land Office Records; Survey Plats and Field Notes. US Department of the Interior Bureau of Land Management <https://glorecords.blm.gov/default.aspx>

⁴⁷ Tennant, J. A., 1874. "Transcript of the Field Notes of the Survey of Township 39 North Range 3 East, Township 40 North Range 4 East, & Township 38 North Range 3 East and Secs. 25, 26, 35 & 36 in T39N, R1 East of the Willamette Meridian Washington Territory, John A. Tennant, Deputy Surveyor." General Land Office Records; Survey Plats and Field Notes. US Department of the Interior Bureau of Land Management <https://glorecords.blm.gov/default.aspx>

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The cadastral survey notes taken by Smith in 1859, Cornelius in 1871, and Tennant in 1874, also mention evidence of fire in numerous sections within the Laurel WID area.^{48 49 50} The notes include statements such as, "large timber killed by fire," "burnt lands," "burn overgrown with alder . . ." "timber on this line is mostly fallen caused by the fire," "enter old burn." A note about the area between sections 15 and 22 in T39N, R3E (E. Hemmi Rd, west of Noon Rd) is particularly descriptive, "Timber . . .mostly killed by fire & lying in piles 10 to 15 ft. high."⁵¹ Historically, forest fires were rather common in Whatcom County as a whole.⁵² In 1896, a major fire burned through most of southern lowland Whatcom County, from just east of Deming to almost Ferndale destroying almost 40% of Whatcom County's lowland forest.⁵³ That was the largest fire in written history of the area, though Nooksack oral histories state even larger fires burned at least a century prior to 1896.⁵⁴

European settlers began to clear the land, of both living and burned-over forest, and convert it to agriculture in the late 1800's. In *Tales of Ten Mile, 1888 to 1940*,⁵⁵ the author describes the process of clearing land for a farm in the Ten Mile area. The land purchased by Marion Myers and his wife Carrie in 1888, was adjacent to the Telegraph Road (which followed the Whatcom Trail) near what is now the intersection of Hannegan and E. Hemmi Roads.⁵⁶ The author writes, "the farm was covered with huge trees which had to be removed before the land could be put under cultivation. The cedar trees were of value..." as cedar wood was put to many uses but, "The value of the fir tree was so little that huge trees were burned in order to remove them from the land. There were other trees growing on the acreage that Marion Myers purchased, spruce, cottonwood, willow, hemlock, maple, vine maple, alder, birch and cascara. The bark of the cascara was peeled and sold, to be used for medicinal purposes."⁵⁷

Wood shingle production became a significant industry. Between 1892 and 1900, "the shingle reigned supreme in the Nooksack Valley."⁵⁸ In Ferndale, between 1892 and 1900, sawmills were erected on both sides of the Nooksack River and both timber and shingles were widely exported.⁵⁹

⁴⁸ Smith, I. W., 1859. "Field notes of the survey of the Puget Sound Guide Meridian between the 9th and 10th Standard Parallels (sic) North of the base line and Ranges 2 and 3 East of the Willamette Meridian in the Territory of Washington, by Isaac W. Smith, and Jared S. Hurd, Deputy Surveyors, under their contract no. 45 bearing date the 21st day of April 1859. Commenced June 20th, 1859. Finished September 26, 1859." General Land Office Records; Survey Plats and Field Notes. US Department of the Interior Bureau of Land Management <https://glorecords.blm.gov/default.aspx>

⁴⁹ Cornelius, J. A., 1871. *Ibid.*

⁵⁰ Tennant, J. A., 1874. *Ibid.*

⁵¹ Tennant, J. A., 1874. *Ibid.*

⁵² Luginbill, T. 2018. [personal communication February 7, 2018].

⁵³ Luginbill, T. 2017 *Finding our Place in History*. Bay to Baker Symposium, September 20, 2017. <http://whatcom.wsu.edu/nr/btb/videos.html>

⁵⁴ Luginbill, T. 2018. [personal communication February 7, 2018].

⁵⁵ Johnson, L. 1981. *Tales of Ten Mile, 1888 to 1940*. Bellingham, Washington: Texttype Publishing

⁵⁶ Johnson, L. 1981. *Ibid.*

⁵⁷ Johnson, L. 1981. *Ibid.*

⁵⁸ Roth, L. R., 1926. *History of Whatcom County*, 1926, Vol. 1, 825. Chicago: Pioneer Historical Publishing Company.

Cited in Moles, K. 2014. "Ferndale – Thumbnail History." *History Link.org* <http://www.historylink.org/File/10806>

⁵⁹ From Moles, K. 2014. "Ferndale – Thumbnail History" History Link.org <http://www.historylink.org/File/10806> Version 3 (April 2018)

By 1880 agricultural settlements were distributed throughout the Whatcom County region with a relatively large number of settlers in Ferndale, Lynden, and Everson.⁶⁰ The first agricultural efforts were simple subsistence farming, but by 1885 the settlers began large scale clearing of the land to support market agriculture.⁶¹ In *Tales of Tenmile*, the author relates stories about her father's childhood in the late 1800s. Her account describes the Myers family raising dairy cows, growing grass for pasture and hay; growing oats, wheat, barley, and strawberries; slaughtering pigs, "beef," and chickens; and eating beans and potatoes. Marion Myers, her grandfather, became one of the first chicken farmers in Whatcom County and, hoping to serve the market for fruit created when a cannery opened in Bellingham in 1887, planted nearly ten acres of fruit trees.⁶² The author's account of her maternal grandparents' farm in the Tenmile area, which they purchased in 1903, includes horses, cows, a pig, chickens, geese, and Belgian hares. Her grandfather, Hans Seiness, dug a well to keep milk, cream, and butter cool, and built a cellar to store "potatoes, apples, carrots, onions, or other garden produce."⁶³ In the 1890s, there were 30 to 40 orchards within a four-mile radius of Ferndale, and the cannery and condensery industries grew.⁶⁴

1

Jeffcott (1949) provides some insight into the rapid expansion of agriculture in the nearby Ferndale area with his brief account of David R. Henderson who arrived in Whatcom County in 1873. Predicting a future train route through Ferndale "he therefore sought for land in that section and found a claim one mile north of the present city. By dint of hard labor and frugality he cleared a large part of his land and set it to orchard, expecting to realize handsomely from his fruit when the population of the county increased as he figured it must. Unfortunately, too many other pioneers had the same dreams of quick returns from orchards and the scheme was overdone..."⁶⁵

2

The Nooksack valley's forests and wetlands were transformed within the first few decades of settlement. By the beginning of the 20th century, most of the native forest had been burned or logged, and most wetlands had been diked and ditched. By 1938, the burned or logged lands in the lower mainstem were almost entirely converted to agriculture.⁶⁶

3

⁶⁰ Tremaine, D.G. 1975. Indian & Pioneer Settlement of the Nooksack Lowland, Washington to 1890. Occasional Paper #4. Center for Pacific Northwest Studies, Western Washington State College.

⁶¹ Luginbill, T. 2017 [personal communication February 21, 2017] and Perry, R. 2017 [personal communication February 14, 2017]

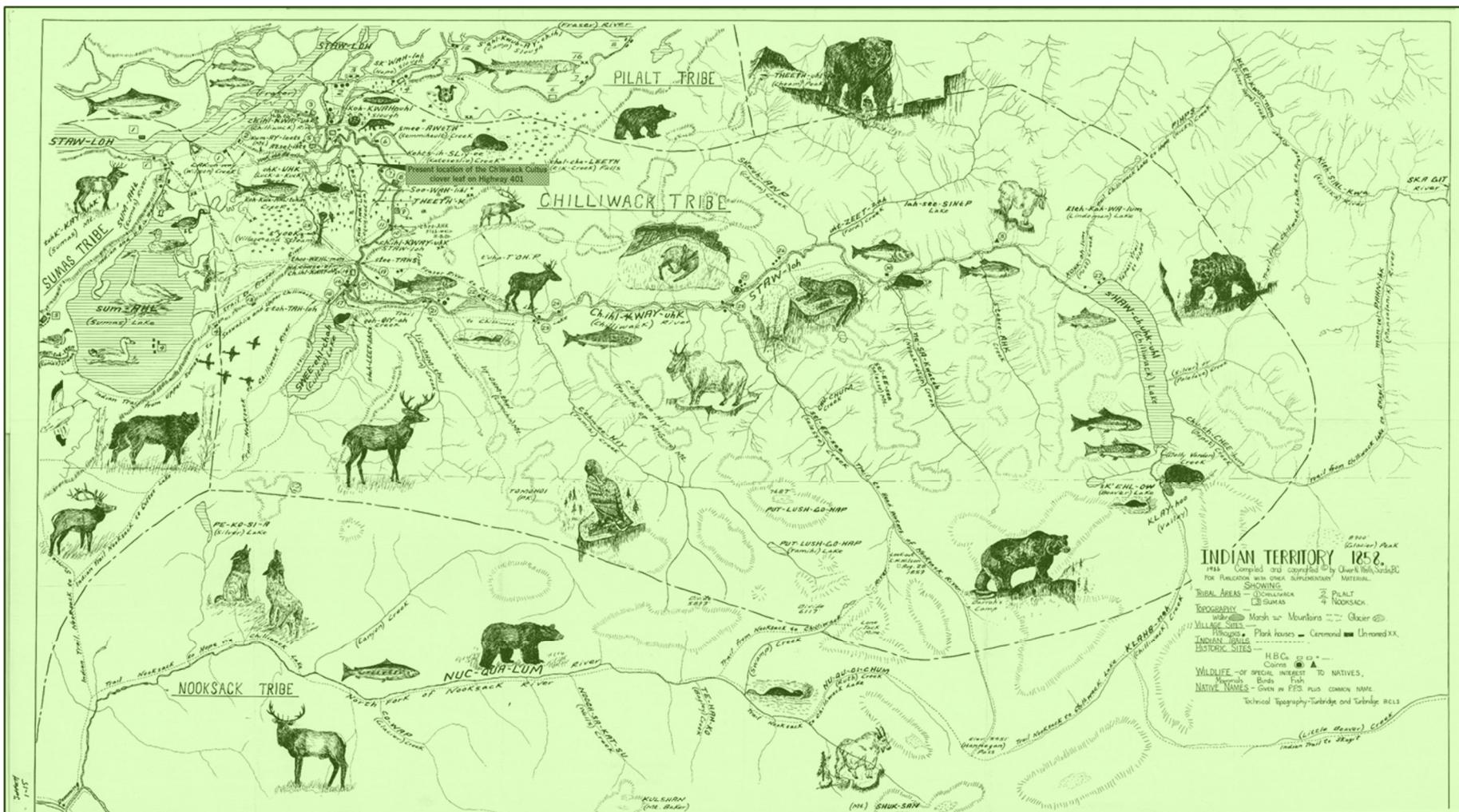
⁶² Johnson, L. 1981. *Ibid.*

⁶³ Johnson, L. 1981. *Ibid.*

⁶⁴ From Moles, K. 2014. "Ferndale – Thumbnail History" History Link.org <http://www.historylink.org/File/10806>

⁶⁵ Jeffcott, P R. 1949. Nooksack Tales and Trails . (Ferndale: Sedro-Woolley Courier Times), cited in Tremaine, D.G. 1975. Indian & Pioneer Settlement of the Nooksack Lowland, Washington to 1890. Occasional Paper #4. Center for Pacific Northwest Studies, Western Washington State College

⁶⁶ Collins, B. D., and A. J. Sheikh, 2004. *Ibid.*



P. R. Jeffcott Map #1-15
Center for Pacific Northwest Studies
Western Libraries Heritage Resources
Western Washington University

Figure 5. Map of Indian Territory in 1858, including the Nooksack, Chilliwack, Sumas and Pilalt areas. 2

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3.3 Soils and land use ¹

Based on soil capability, a significant proportion of the soils in the Laurel WID have been classified by the USDA Natural Resources Conservation Service as "Prime farmland" or "Prime if managed."⁶⁷ Much of the area is "Prime if drained" (see Table 3). The map in Figure 6 shows prime soils on those parcels that are included in the Laurel WID assessment roll as of October 2017. A map of all prime soils in the Laurel WID is included in Appendix C of this document.

Land use within the Laurel WID is predominantly agricultural. The land within the WID area is split between designated Agricultural District of Whatcom County (AG zoning)⁶⁸ and Rural Study Areas (RSA). Berries and dairy hay and corn are the predominant agricultural uses in the WID.⁶⁹ Maps of agricultural land use inventory and important agricultural land in the Laurel WID are included in Appendix C.

Table 3. Prime soils within the Laurel WID area. Data from SSURGO, NRCS (2015). ⁴

Prime Farmland Category	Description	Acres included in Laurel WID assessment roll (October 2017) ⁷⁰
0	Not prime farmland	161
1	All areas are prime farmland	3,821
2	Prime if drained	3,181
4	Prime if irrigated	71
8	Prime if subsoiled	648
30	Farmland of Statewide Importance ⁷¹	547
	<i>Acres in WID assessment roll</i>	<i>8,429</i>

⁶⁷ U.S. Department of Agriculture, Natural Resources Conservation Service. *National soil survey handbook, title 430-VI*.

http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/ref/?cid=nrcs142p2_054242

⁶⁸ Whatcom County Title 20 zoning maps <http://www.whatcomcounty.us/822/Zoning-Maps> [last accessed May 9, 2017]

⁶⁹ The story map for the Ag Water Board contains maps and graphs of crop acreages in each WID. See <http://www.agwaterboard.com/storymap>

⁷⁰ Assessment roll data provided by Henry Bierlink in January 2018. The slight difference in total acres assessed is due to changes to the assessment roll as assessed parcels are consolidated or segregated.

⁷¹ Farmland of Statewide Importance is important for the production of food, feed, fiber, forage, and oilseed crops. These lands include those that are nearly prime farmland and that economically produce high yields of crops when treated and managed according to acceptable farming methods. Some may produce as high a yield as prime farmland if conditions are favorable.

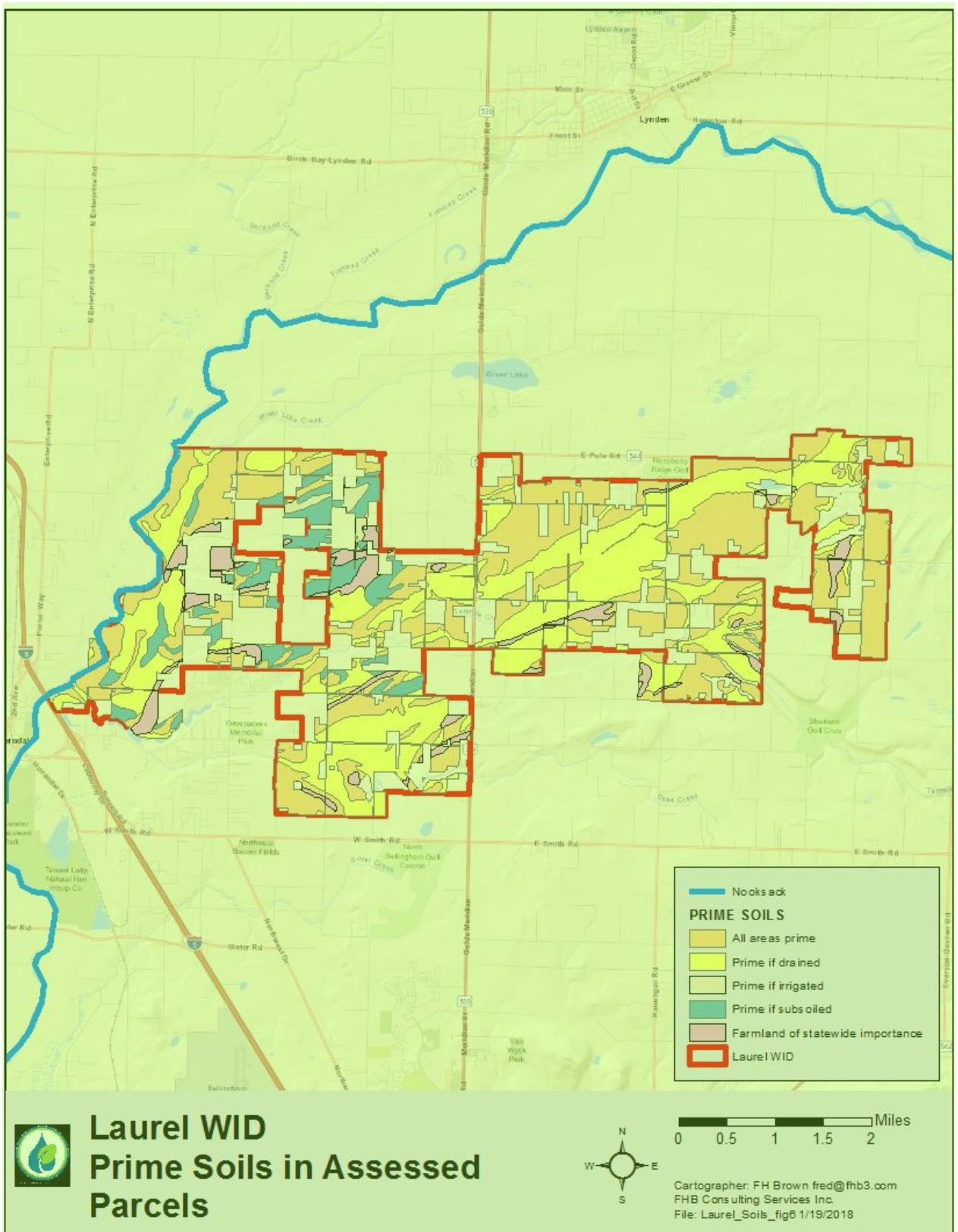


Figure 6. Map showing prime soils in parcels that are currently on the Laurel WID assessment roll. Soil **2** data from SSURGO (NRCS). Parcel data from Ag Water Board.

3.4 Water quantity, water use and water availability ¹

The locations of existing groundwater and surface water rights within the Laurel WID are shown in the water rights map in Appendix C.⁷² Many new applications and change applications are also on record for the Laurel WID area and are shown in this map. ²

Two reports are useful to understanding the water use in this area: *Quantification of Agricultural Irrigation Water Use and Water Rights*⁷³ published in 2016, and the *2010 State of the Watershed Report*.⁷⁴ The *Water Use and Water Rights*⁷⁵ estimates water use for agriculture based on crop types, and irrigation methods and acreage for all of WRIA 1 by watershed. The report groups the sub-basins in the Laurel WID area into two watersheds: the Barrett Lake, and Wiser Lake/Cougar Creek Watersheds. Most of the WID lies within the Barrett Lake watershed which includes the Fourmile, Tenmile, Deer Creek, and Fazon sub-basins. The Lake Fazon area is to the east of the Upper Fourmile and Tenmile areas, outside of the WID boundaries. A smaller portion of the WID falls in the southern part of the Wiser Lake/Cougar Creek watershed. Figures for these watersheds are reported below. ³

Table 4. Estimated agricultural water use in watersheds within or overlapping with the Laurel WID area⁴ ⁵

	Total acres	Agricultural acres	Irrigated acres	Estimated water use in acre-feet per year
Watersheds which lie partly within the WID				
Barrett Lake (includes Fourmile, Tenmile, Fazon, and Deer Creek)	22,671	6,436	2,859	4,645
Wiser Lake/Cougar Creek	7,994	3,971	2,425	4,021

The *2010 State of the Watershed Report*⁷⁶ describes metered and modeled water use for WRIA 1. This report presents water use information by smaller sub-basins: Fourmile (which includes the Lake Fazon area to the east and outside of the WID area), Tenmile, Deer Creek, and Wiser Lake/Cougar Creek. A small percentage of water use is metered. The highest level of metered use is in Tenmile, where it accounts for about 5%. The rest of the use is modeled. Agricultural use is dominant in all areas but residential use accounts for about 10% in the Wiser Lake/Cougar Creek and Fourmile areas, a little more than that in Tenmile, and about 25% in the Deer Creek area. A relatively small amount of water use is attributed to commercial enterprise in the Fourmile, Tenmile and Deer Creek sub-basins. ⁶

⁷² See Appendix C for the reference map on agricultural water rights points of diversion in the Laurel WID. That map is reproduced from the Laurel WID mapping report (2016).

⁷³ RH2 Engineering, Inc., 2016. Quantification of Agricultural Irrigation Water Use and Water Rights, December 2016. Public Utility District No. 1 of Whatcom County <http://wria1project.whatcomcounty.org/> [last accessed 1/29/18]

⁷⁴ Peterson, B., Gill, P. and J. Fleishmann. 2011. *State of the Watershed Report*. WRIA 1 Watershed Joint Board and Whatcom County. [online] <http://wria1project.whatcomcounty.org/> [last accessed February 8, 2017]

⁷⁵ RH2 Engineering, Inc., 2016. Quantification of Agricultural Irrigation Water Use and Water Rights, December 2016. Public Utility District No. 1 of Whatcom County <http://wria1project.whatcomcounty.org/> [last accessed 1/29/18]

⁷⁶ Peterson, B., Gill, P. and J. Fleishmann. 2011. *State of the Watershed Report*. WRIA 1 Watershed Joint Board and Whatcom County. [online] <http://wria1project.whatcomcounty.org/> [last accessed February 8, 2017]

Within the Laurel WID, 39 new applications have been filed in over the past five years.⁷⁷ Barrett Lake, Deer Creek, Fourmile Creek, and Tenmile Creek are closed year-round to further appropriations unless mitigated. Restrictions on irrigation from creeks, tributaries, and other surface water sources are in place until instream flows levels are met during critical periods for fish per the existing Nooksack Instream Flow Rule.⁷⁸ Limited access to water rights may impact water quantity accessibility in some areas of the WID, as major Group A public suppliers do not have adequate water rights in proper locations to meet projected future demand.⁷⁹

3.5 Water quality²

Surface water quality impairments have been reported in the Laurel WID area, related to high levels of fecal coliform bacteria and ammonia-N, high temperature, low dissolved oxygen and pH. Iron in the groundwater was identified as an agricultural priority. The groundwater in the Lynden-Everson-Nooksack-Sumas study area, an area that includes the WID, is known to contain iron of natural origin.⁸⁰ Nitrate contamination was not identified as an agricultural priority during the work session in February 2016 but nitrate contamination in groundwater has been reported over large areas of the Sumas-Blaine Aquifer.⁸¹

A map of listed water quality impairments and graphs of the results of routine water quality monitoring⁴ in the Laurel WID are included in Appendix C of this document.

3.6 Fish and wildlife⁵

The Laurel WID area contains critical habitat for trumpeter swan and shorebird concentrations. Wetland⁶ habitat occurs throughout the area. The lower Temmile and Wiser Lake/Cougar Creek south areas contain the rare plant Canadian St. John's-wort, and the upper Fourmile Creek area contains the rare plant bristly sedge. Chum, Chinook, coho, cutthroat, sockeye and steelhead are present in the tributaries within the WID. Coho and winter steelhead spawning have been documented in Deer Creek.

The watershed tables in Appendix B of this document provide more details on occurrence of specific⁷ habitats and species within the WID area, and references for sources of data. Maps of priority habitats and species, fish occurrence and fish barriers, and water flow restoration and protection priorities are included in Appendix C of this document.

For more information on local wildlife in the late 20th century, see the sections titled "*Inland Waterbirds and Shorebird Areas, Nooksack River Corridor, Wiser Lake, and Ten Mile Creek Corridor*" contained in the 1994 report on significant wildlife areas in Whatcom County.⁸²

⁷⁷ See map of Water Right Points of Diversion in Appendix C.

⁷⁸ [WAC 173-501](#) (1985), Instream Resources Protection Program – Nooksack Water Resource Inventory Area 1.

⁷⁹ *Whatcom County Coordinated Water System Plan Update* (2016),

<http://www.whatcomcounty.us/1035/Coordinated-Water-System-Plan-Update>

⁸⁰ Cox, S. E., and Kahle, S. C. (1999), Hydrogeology, Ground-Water Quality, and Sources of Nitrate in Lowland Glacial Aquifers of Whatcom County, Washington, and British Columbia, Canada; Water-Resources Investigations Report 98-4195. USGS. <<http://pubs.usgs.gov/wri/1998/4195/report.pdf>> (last accessed 4/4/2016)

⁸¹ WA Ecology (2009), Sumas-Blaine Aquifer Long-Term Groundwater Quality Monitoring Network. 2009 Annual Report. <https://fortress.wa.gov/ecy/publications/documents/1103015.pdf>

⁸² Eissinger, A. M. (1994). Significant Wildlife Areas, Whatcom County Washington. Bellingham, WA: Whatcom Version 3 (April 2018)

4 DESCRIPTION OF BASELINE CONDITIONS FOR SUB-WATERSHEDS IN THE LAUREL WID

Explanatory note 1

This section provides a summary description of baseline conditions in the Laurel WID. Note that Appendix E of this document (reproduced from the Laurel WID mapping report) lists a wide range of sources of data that would be potentially useful as baseline or background information for developing a comprehensive plan.

The purpose of describing baseline conditions and quantifying them where possible is to support the design of targeted actions to achieve agreed WID priorities, and to be able to measure and report progress towards achieving the WID priorities over time.

In subsequent versions of the Management Plan, 4

- this summary information could be expanded using available data where possible, and the gaps in knowledge could be defined in order to determine the scope of any new or additional work needed.
- Baseline information could be expanded to include the results of new analyses and field measurement as these become available.

4.1 Upper Tenmile Creek 6

Water quality: Iron of natural origin is found in most areas of the Sumas aquifer in the Lynden-Everson-Nooksack-Sumas study area.⁸³ Sections of Tenmile Creek in this area are in category 5⁸⁴ for dissolved oxygen (DO) and temperature, and one section is in category 4a for bacteria.⁸⁵

Water quantity: Tenmile Creek is closed year-round to further appropriations unless mitigated.⁸⁶ Restrictions on irrigation from creeks, tributaries, and other surface water sources are in place until instream flow levels are met during critical periods for fish per the existing Nooksack Instream Flow Rule.⁸⁷ Access to irrigation water is a priority here.⁸⁸ Twenty new water rights applications and 3 change

County Planning & Development Services. <https://wawhatcomcounty.civicplus.com/DocumentCenter/View/24178> [Last accessed March 12, 2017]

⁸³ See tables in Appendix B and Cox, S. E., and Kahle, S. C. (1999), *Hydrogeology, Ground-Water Quality, and Sources of Nitrate in Lowland Glacial Aquifers of Whatcom County, Washington, and British Columbia, Canada: Water-Resources Investigations Report 98-4195*. USGS. <<http://pubs.usgs.gov/wri/1998/4195/report.pdf>> (last accessed 4/4/2016)

⁸⁴ Category 5 - Polluted waters that require a TMDL (total maximum daily load) or other WQI (water quality Improvement) project: the traditional list of impaired water bodies traditionally known as the 303(d) list. Starting with the 2004 Water Quality Assessment, Washington's 303(d) list of polluted waters were placed under Category 5 in the approved assessment. Placement in this category means that Ecology has data showing that the water quality standards have been violated for one or more pollutants, and there is no TMDL or pollution control plan. Category 4a - has a TMDL: water bodies that have an approved TMDL in place and are actively being implemented. WA Department of Ecology, 2015. *Water Quality Assessment Categories*.

<https://fortress.wa.gov/ecy/approvedwqa/ApprovedSearch.aspx>

⁸⁵ See tables in Appendix B and Ecology (2016), Washington State Water Quality Atlas.

<https://fortress.wa.gov/ecy/wqamapviewer/map.aspx>

⁸⁶ WA Dept. of Ecology, 2012. Focus on Water Availability, Publication 11-11-006

<https://fortress.wa.gov/ecy/publications/documents/1111006.pdf> [last accessed 1/24/18]

⁸⁷ [WAC 173-501](#) (1985), Instream Resources Protection Program – Nooksack Water Resource Inventory Area 1.

⁸⁸ See summary priorities table in Appendix A and detailed agriculture tables in Appendix B
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applications have been filed in the Upper Tenmile area.⁸⁹ One Group A public water supplier in this area is projected to exceed water right limits at full build out (Hemmi Road Association) and another is currently exceeding water right limits (Guide Meridian Water Association).⁹⁰

Land Use and soils: More than 85% of soils in the Upper Tenmile area are classified as Prime, with 25-50% being Prime if Drained.⁹¹ Some agricultural land along the northern border of Upper Tenmile is included within Drainage District #3.⁹² Less than 50% of the land is zoned AG (Agriculture District),⁹³ and the majority of the land within the WID boundaries here is also within a designated Rural Study Area, which indicates potential pressure to convert land out of agriculture.⁹⁴

Habitats and species: Wetland habitat occurs in this area.⁹⁵ Chinook, chum, coho, cutthroat, and steelhead are present in Upper Tenmile.⁹⁶ Coho rearing is also documented in Upper Tenmile.⁹⁷

Water flow processes: This area is of moderate to moderate-high importance for water flow processes overall, but is moderately to highly degraded, particularly for surface storage processes. Water quality is also impaired. Enhancement actions should focus on increasing surface storage in order to retain surface flows for longer, particularly in the upper portion (AU1136). Decreasing the rate and quantity of drainage of subsurface waters will help to improve discharge to surface streams. Enhancing forest/riparian cover will help to improve delivery of water to streams, and riparian shade will help to reduce water temperature.⁹⁸

4.2 Lower Tenmile Creek ⁵

Water quality: Iron of natural origin is found in most areas of the Sumas aquifer in the Lynden-Everson-Nooksack-Sumas study area.⁹⁹ A section of Tenmile Creek in Lower Tenmile is in category 5 for DO and category 4a for bacteria.¹⁰⁰ Water quality is considered adequate for agricultural purposes in this area, but it was noted in the 2016 work session that iron in the water can clog irrigation lines.¹⁰¹

⁸⁹ See Water Right Points of Diversion map in Appendix C of this document.

⁹⁰ RH2 Engineering, Inc. (2016) *Whatcom County Coordinated Water System Plan Update*. Whatcom County. <http://www.whatcomcounty.us/DocumentCenter/View/24143>

⁹¹ See map of Prime Soils in Appendix C of this document.

⁹² Whatcom Conservation District (ND), *Find out what District you live in!* [webmap] <http://www.whatcomcd.org/ag-drainage-districts>

⁹³ See map of Agriculture Priority Areas in Appendix C of this document.

⁹⁴ See map of Agriculture Priority Areas in Appendix C of this document.

⁹⁵ See Priority species and habitats map in Appendix C of this document

⁹⁶ See watershed tables in Appendix B and map of fish distribution and barriers in Appendix C.

⁹⁷ See watershed tables in Appendix B and map of fish distribution and barriers in Appendix C.

⁹⁸ See watershed tables in Appendix B and map of Water Flow Restoration & Protection Priorities in Appendix C.

⁹⁹ See tables in Appendix B and Cox, S. E., and Kahle, S. C. (1999), *Hydrogeology, Ground-Water Quality, and Sources of Nitrate in Lowland Glacial Aquifers of Whatcom County, Washington, and British Columbia, Canada; Water-Resources Investigations Report 98-4195*. USGS. <http://pubs.usgs.gov/wri/1998/4195/report.pdf> (last accessed 4/4/2016)

¹⁰⁰ See tables in Appendix B and Ecology (2016), *Washington State Water Quality Atlas*.

<https://fortress.wa.gov/ecy/approvedwqa/ApprovedSearch.aspx>

¹⁰¹ See watershed tables in Appendix B, and Ecology (2016), *Washington State Water Quality Atlas*.

<https://fortress.wa.gov/ecy/approvedwqa/ApprovedSearch.aspx>

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Water quantity: Tenmile Creek is closed year-round to further appropriations unless mitigated.¹⁰² ¹
Restrictions on irrigation from creeks, tributaries, and other surface water sources are in place until instream flow levels are met during critical periods for fish per the existing Nooksack Instream Flow Rule.¹⁰³ Access to irrigation water is a priority here.¹⁰⁴ Two Group A public water suppliers in this area and another is currently exceeding water right limits (Guide Meridian Water Association and Flemings Platt Water Association).¹⁰⁵ Eight new water right applications have been filed in the Lower Tenmile area.¹⁰⁶

Land Use and soils: More than 85% of soils in the Lower Tenmile area are classified as Prime, with 25-50% ² being Prime if Drained.¹⁰⁷ Between 50-85% of the land here is zoned AG, which indicates that it is considered important agricultural land for Whatcom County.¹⁰⁸ About half of the land within the WID here is in a designated Rural Study Area, which indicates potential pressure to convert land out of agriculture.¹⁰⁹

Habitats and species: Wetland habitat occurs in this area¹¹⁰ and the rare plant Canadian St. John's Wort.¹¹¹

Chinook, chum, coho, cutthroat, & steelhead are present in Lower Tenmile.¹¹² Coho rearing is also⁴ documented here.¹¹³

Water flow processes: This area is of moderate to moderate-high importance for water flow processes,⁵ but overall water flow processes are highly degraded. Water quality is also impaired. Enhancement actions should focus on increasing surface storage in order to retain surface flows for longer. Decreasing the rate and quantity of drainage of subsurface waters will help to improve discharge to surface streams.¹¹⁴

4.3 Upper Fourmile Creek ⁶

Water quality: Sections of Fourmile Creek in this area are listed in category 5 for DO and pH.¹¹⁵ Water ⁷ quality is considered adequate for agricultural purposes.¹¹⁶

¹⁰² WA Dept. of Ecology, 2012. Focus on Water Availability, Publication 11-11-006

<https://fortress.wa.gov/ecy/publications/documents/1111006.pdf> [last accessed 1/24/18]

¹⁰³ [WAC 173-501](#) (1985), Instream Resources Protection Program – Nooksack Water Resource Inventory Area 1.

¹⁰⁴ See summary priorities table in Appendix A and detailed agriculture tables in Appendix B

¹⁰⁵ RH2 Engineering, Inc. (2016) *Whatcom County Coordinated Water System Plan Update*. Whatcom County.

<http://www.whatcomcounty.us/DocumentCenter/View/24143>

¹⁰⁶ See Water Right Points of Diversion map in Appendix C of this document.

¹⁰⁷ See map of Prime Soils in Appendix C of this document.

¹⁰⁸ See map of Agriculture Priority Areas in Appendix C of this document.

¹⁰⁹ See map of Agriculture Priority Areas in Appendix C of this document.

¹¹⁰ See map of Priority species and habitats in Appendix C of this document

¹¹¹ See watershed tables in Appendix B, and WA Department of Natural Resource (2015), Washington Natural Heritage Program. <http://www1.dnr.wa.gov/nhp/refdesk/qis/index.html>

¹¹² See watershed tables in Appendix B and map of fish presence and fish barriers in Appendix C.

¹¹³ See watershed tables in Appendix B and map of fish presence and fish barriers in Appendix C.

¹¹⁴ See watershed tables in Appendix B and map of Water Flow Restoration & Protection Priorities in Appendix C.

¹¹⁵ See watershed tables in Appendix B, and Ecology (2016), *Washington State Water Quality Atlas*.

<https://fortress.wa.gov/ecy/approvedwqa/ApprovedSearch.aspx>

¹¹⁶ WID work session, February 2016. See agriculture tables in Appendix B.

Water quantity: Fourmile Creek is closed year-round to further appropriations unless mitigated.¹¹⁷ 1
Restrictions on irrigation from creeks, tributaries, and other surface water sources are in place until instream flow levels are met during critical periods for fish per the existing Nooksack Instream Flow Rule.¹¹⁸ Access to irrigation water is a priority here.¹¹⁹ Four new water rights applications have been filed in the Upper Fourmile area.¹²⁰ Group A public water suppliers in this area have adequate water rights in proper locations to meet projected future demand.¹²¹

Land Use and soils: More than 85% of soils in the Upper Fourmile area are classified as Prime, with 25-50% being Prime if Drained.¹²² Much of the agricultural land in this area is actively drained and lies within Drainage District #3.¹²³ Between 50-85% of the land here is zoned AG, which indicates that it is considered important agricultural land for Whatcom County.¹²⁴ A significant portion of the area is within a designated Rural Study Area indicating potential pressure to convert land out of agriculture.¹²⁵ 2

Habitats and species: Critical habitat for Trumpeter swan occurs in this area as well as wetland¹²⁶ and the rare plant bristly sedge.¹²⁷ Coho and cutthroat are present in Upper Fourmile.^{128, 129} Chum are present in AU1133, the eastern section of Upper Fourmile.¹³⁰ 3

Water flow processes: This area is of moderately high importance for water flow processes, but water flow processes are moderately to highly degraded, particularly surface storage, delivery and discharge. Water quality is also impaired (category 5 listing for dissolved oxygen and pH and temperature). Enhancement actions should focus on increasing surface storage in order to retain surface flows for longer. Preventing additional impervious cover and reducing existing impervious cover will help to enhance recharge. Enhancing forest/riparian cover will help to improve delivery of water to streams.¹³¹ 4

¹¹⁷ WA Dept. of Ecology, 2012. Focus on Water Availability, Publication 11-11-006

<https://fortress.wa.gov/ecy/publications/documents/1111006.pdf> [last accessed 1/24/18]

¹¹⁸ [WAC 173-501](#) (1985), Instream Resources Protection Program – Nooksack Water Resource Inventory Area 1.

¹¹⁹ See summary priorities table in Appendix A and detailed agriculture tables in Appendix B

¹²⁰ See Water Right Points of Diversion map in Appendix C of this document.

¹²¹ RH2 Engineering, Inc. (2016) *Whatcom County Coordinated Water System Plan Update*. Whatcom County.

<http://www.whatcomcounty.us/DocumentCenter/View/24143>

¹²² See map of Prime Soils in Appendix C of this document.

¹²³ Whatcom Conservation District (ND), *Find out what District you live in!* <http://www.whatcomcd.org/ag-drainage-districts>

¹²⁴ See map of Agriculture Priority Areas in Appendix C of this document.

¹²⁵ See map of Agriculture Priority Areas in Appendix C of this document.

¹²⁶ See map of Priority species and habitats in Appendix C of this document.

¹²⁷ WA Department of Natural Resource (2015), Washington Natural Heritage Program.

<http://www1.dnr.wa.gov/nhp/refdesk/gis/index.html>

¹²⁸ See watershed tables in Appendix B

¹²⁹ Coho presence is also documented by WDFW: WDFW *SalmonScape* [website]

<http://apps.wdfw.wa.gov/salmonscape/>

¹³⁰ See watershed tables in Appendix B.

¹³¹ See watershed tables in Appendix B and map of Water Flow Restoration & Protection Priorities in Appendix C. *Version 3 (April 2018)*

4.4 Lower Fourmile Creek ¹

Water quality: Sections of Fourmile Creek are in category 5 for DO and pH.¹³² Water quality is considered adequate for agricultural purposes in this area.¹³³ 2

Water quantity: Fourmile Creek is closed year-round to further appropriations unless mitigated.¹³⁴ 3
Restrictions on irrigation from creeks, tributaries, and other surface water sources are in place until instream flow levels are met during critical periods for fish per the existing Nooksack Instream Flow Rule.¹³⁵ Access to irrigation water is a priority here.¹³⁶ Four new water right applications have been filed in the Lower Fourmile area.¹³⁷ One Group A public water supplier in this area is currently exceeding water right limits (Guide Meridian Water Association).¹³⁸

Land Use and soils: More than 85% of soils in the Lower Fourmile area are classified as Prime, with 25-50% being Prime if Drained.¹³⁹ Much of the agricultural land in this area is actively drained and lies within Drainage District #3 and Drainage Improvement District #5.¹⁴⁰ Between 50-85% of the land is zoned AG, which indicates that it is considered important agricultural land for Whatcom County.¹⁴¹ A very small portion of the land along the northern boundary is in a designated Rural Study Area indicating potential pressure to convert land out of agriculture.¹⁴² 4

Habitats and species: Wetland habitat occurs in this area.¹⁴³ Fall chum, coho, Chinook, and steelhead¹⁴⁴ presence has been documented in Lower Fourmile. 5

Water flow processes: The area is of moderate importance overall for water flow processes, but water flow processes are highly degraded. Water quality is also impaired (category 5 listing for dissolved oxygen and pH). Enhancement actions should focus on increasing surface storage in order to retain surface flows for longer. Decreasing the rate and quantity of subsurface water drainage will help to improve discharge to surface streams.¹⁴⁵ 6

¹³² See watershed tables in Appendix B, and Ecology (2016), *Washington State Water Quality Atlas*.

<https://fortress.wa.gov/ecy/approvedwqa/ApprovedSearch.aspx>

¹³³ WID work session, February 2016. See agriculture tables in Appendix B.

¹³⁴ WA Dept. of Ecology, 2012. Focus on Water Availability, Publication 11-11-006

<https://fortress.wa.gov/ecy/publications/documents/1111006.pdf> [last accessed 1/24/18]

¹³⁵ [WAC 173-501](#) (1985), Instream Resources Protection Program – Nooksack Water Resource Inventory Area 1.

¹³⁶ See summary priorities table in Appendix A and detailed agriculture tables in Appendix B

¹³⁷ See Water Right Points of Diversion map in Appendix C of this document.

¹³⁸ RH2 Engineering, Inc. (2016) *Whatcom County Coordinated Water System Plan Update*. Whatcom County.

<http://www.whatcomcounty.us/DocumentCenter/View/24143>

¹³⁹ See map of Prime Soils in Appendix C of this document.

¹⁴⁰ Whatcom Conservation District (ND), *Find out what District you live in!* [webmap]

<http://www.whatcomcd.org/ag-drainage-districts>

¹⁴¹ See map of Agriculture Priority Areas in Appendix C of this document.

¹⁴² See map of Agriculture Priority Areas in Appendix C of this document.

¹⁴³ See Priority species and habitats map in Appendix C of this document.

¹⁴⁴ See watershed tables in Appendix B.

¹⁴⁵ See watershed tables in Appendix B and map of Water Flow Restoration & Protection Priorities in Appendix C. *Version 3 (April 2018)*

4.5 Deer Creek 1

Water quality: Iron of natural origin is found in most areas of Sumas aquifer in the Lynden-Everson-Nooksack-Sumas study area.¹⁴⁶ A section of Deer Creek is in category 5 for DO, pH, ammonia-N, and category 4a for bacteria.¹⁴⁷ Water quality is considered adequate for agricultural purposes in this area.¹⁴⁸ 2

Water quantity: Deer Creek is closed year-round to further appropriations unless mitigated.¹⁴⁹ 3 Restrictions on irrigation from creeks, tributaries, and other surface water sources are in place until instream flow levels are met during critical periods for fish per the existing Nooksack Instream Flow Rule.¹⁵⁰ Access to irrigation water is a priority here.¹⁵¹ Three new water right applications have been filed in the Deer Creek area.¹⁵² Group A public water suppliers in this area have adequate water rights in proper locations to meet projected future demand; One Group A public supplier on the edge of this area is projected to exceed water right limits at full build out.¹⁵³

Land Use and soils: Between 50-85% of soils in the Deer Creek area are classified as Prime, with 25-50% being Prime if Drained.¹⁵⁴ A small portion of the land along the southern boundary lies within Drainage Improvement District 30a.¹⁵⁵ Less than 50% of the land is zoned AG, which indicates that it is considered important agricultural land for Whatcom County.¹⁵⁶ Some areas within the WID boundaries here are in a designated Rural Study Area indicating potential pressure to convert land out of agriculture.¹⁵⁷ 4

Habitats and species: Critical shorebird concentration habitat occurs in this area as well as wetlands.¹⁵⁸ 5 Coho, cutthroat, and steelhead are present in Deer Creek.¹⁵⁹ Fall chum presence and coho spawning is documented within AU1140, the lower section, and winter steelhead spawning is also documented along most of the length of Deer Creek.¹⁶⁰

¹⁴⁶ See tables in Appendix B, and Cox, S. E., and Kahle, S. C. (1999), *Hydrogeology, Ground-Water Quality, and Sources of Nitrate in Lowland Glacial Aquifers of Whatcom County, Washington, and British Columbia, Canada: Water-Resources Investigations Report 98-4195*. USGS. <<http://pubs.usgs.gov/wri/1998/4195/report.pdf>> (last accessed 4/4/2016)

¹⁴⁷ See tables in Appendix B, and Ecology (2016), *Washington State Water Quality Atlas*.
<https://fortress.wa.gov/ecy/wqamapviewer/map.aspx>

¹⁴⁸ WID work session, February 2016. See agriculture tables in Appendix B.

¹⁴⁹ WA Dept. of Ecology, 2012. Focus on Water Availability, Publication 11-11-006

<https://fortress.wa.gov/ecy/publications/documents/1111006.pdf> [last accessed 1/24/18]

¹⁵⁰ [WAC 173-501](#) (1985), Instream Resources Protection Program – Nooksack Water Resource Inventory Area 1.

¹⁵¹ See summary priorities table in Appendix A and detailed agriculture tables in Appendix B

¹⁵² See Water Right Points of Diversion map in Appendix C of this document.

¹⁵³ RH2 Engineering, Inc. (2016) *Whatcom County Coordinated Water System Plan Update*. Whatcom County.
<http://www.whatcomcounty.us/DocumentCenter/View/24143>

¹⁵⁴ See map of Prime Soils in Appendix C of this document.

¹⁵⁵ Whatcom Conservation District (ND), *Find out what District you live in!* [webmap]
<http://www.whatcomcd.org/ag-drainage-districts>

¹⁵⁶ See map of Agriculture Priority Areas in Appendix C of this document.

¹⁵⁷ See map of Agriculture Priority Areas in Appendix C of this document.

¹⁵⁸ See map of Priority species and habitats in Appendix C of this document.

¹⁵⁹ See watershed tables in Appendix B of this document.

¹⁶⁰ See watershed tables in Appendix B, map of fish presence and fish barriers in Appendix C, and WDFW *SalmonScape* [website] <http://apps.wdfw.wa.gov/salmonscape/>
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Water flow processes: Overall water flow processes are moderately to highly degraded. The lower portion of Deer Creek is of moderate-high importance for overall water flow processes. Water quality is also impaired (category 5 listings for dissolved oxygen, pH and Ammonia-N; category 4a listing for bacteria).¹⁶¹ Enhancement actions should focus on increasing surface storage in order to retain surface flows for longer. Decreasing the rate and quantity of drainage of subsurface waters will help to improve discharge to surface streams.¹⁶²

4.6 Wiser Lake/Cougar Creek (North) 2

Water quality: A section of Wiser Creek in this area is in category 5 for DO, pH, and temperature, and category 4a for bacteria. Water quality is considered adequate for agricultural purposes in this area.¹⁶³

Water quantity: Wiser Lake is closed year-round to further appropriations unless mitigated, and Wiser Lake Creek is closed to new withdrawals between May 1 and October 31 each year.¹⁶⁴ Restrictions on irrigation from creeks, tributaries, and other surface water sources are in place until instream flow levels are met during critical periods for fish per the existing Nooksack Instream Flow Rule.¹⁶⁵ One new water right application has been filed in this area.¹⁶⁶ Group A public water suppliers in this area have adequate water rights in proper locations to meet projected future demand.¹⁶⁷

Land Use and soils: More than 85% of soils in the Wiser Lake/Cougar Creek North area are classified as Prime, with 25-50% being Prime if Drained.¹⁶⁸ Much of the agricultural land in this area is actively drained and lies within Drainage Improvement District #6.¹⁶⁹ Between 50-85% of the land is zoned AG, which indicates that it is considered important agricultural land for Whatcom County.¹⁷⁰ A section of land within the WID boundaries here is within a designated Rural Study Area indicating potential pressure to convert land out of agriculture.¹⁷¹

Habitats and species: Critical shorebird concentration habitat occurs in this area as well as wetlands.¹⁷² Char, Chinook, chum, coho, cutthroat, pink, sockeye, and steelhead are present in the Wiser Lake Creek/Cougar Creek area.¹⁷³

¹⁶¹ See watershed tables in Appendix B, and map of water quality impairments in Appendix C.

¹⁶² See watershed tables in Appendix B and map of Water Flow Restoration & Protection Priorities in Appendix C.

¹⁶³ WID work session, February 2016. See agriculture tables in Appendix B.

¹⁶⁴ WA Dept. of Ecology, 2012. Focus on Water Availability, Publication 11-11-006

<https://fortress.wa.gov/ecy/publications/documents/1111006.pdf> [last accessed 1/24/18]

¹⁶⁵ [WAC 173-501](#) (1985), Instream Resources Protection Program – Nooksack Water Resource Inventory Area 1.

¹⁶⁶ See map of Water Right Points of Diversion in Appendix C of this document.

¹⁶⁷ RH2 Engineering, Inc. (2016) *Whatcom County Coordinated Water System Plan Update*. Whatcom County.

<http://www.whatcomcounty.us/DocumentCenter/View/24143>

¹⁶⁸ See map of Prime Soils in Appendix C of this document.

¹⁶⁹ Whatcom Conservation District (ND), *Find out what District you live in!* [webmap]

<http://www.whatcomcd.org/ag-drainage-districts>

¹⁷⁰ See map of Agriculture Priority Areas in Appendix C of this document.

¹⁷¹ See map of Agriculture Priority Areas in Appendix C of this document.

¹⁷² See Priority species and habitats map in Appendix C of this document

¹⁷³ See watershed tables in Appendix B of this document.

Water flow processes: Overall water flow processes are highly degraded, but this area is of only moderate importance overall for water flow processes. Water quality is impaired in this area (category 5 listings for dissolved oxygen, pH and temperature; category 4a for bacteria).¹⁷⁴ Enhancement actions should focus on increasing surface storage in order to retain surface flows for longer. Enhancing riparian cover should help to reduce surface water temperature.¹⁷⁵

4.7 Wiser Lake/Cougar Creek (South) 2

Water quality: Iron of natural origin is found in most areas of Sumas aquifer in the Lynden-Everson-Nooksack-Sumas study area.¹⁷⁶ Water quality is considered adequate for agricultural purposes in this area.¹⁷⁷

Water quantity: Wiser Lake is closed year-round to further appropriations unless mitigated, and Wiser Lake Creek is closed to new withdrawals between May 1 and October 31 each year.¹⁷⁸ Restrictions on irrigation from creeks, tributaries, and other surface water sources are in place until instream flow levels are met during critical periods for fish per the existing Nooksack Instream Flow Rule.¹⁷⁹ Access to irrigation water is a priority here.¹⁸⁰ Five new water right applications and 1 change application have been filed in this area.¹⁸¹ Group A public water suppliers in this area have adequate water rights in proper locations to meet projected future demand.¹⁸²

Land Use and soils: Between 50-85% of soils in the Wiser Lake/Cougar Creek South area are classified as Prime, with less than 25% being Prime if Drained.¹⁸³ A small area in the northeast corner of the WID lies within Drainage Improvement District #6.¹⁸⁴ More than 85% of the land is zoned AG, which indicates that it is considered important agricultural land for Whatcom County.¹⁸⁵ A significant portion of land within the WID boundaries here is within a designated Rural Study Area indicating potential pressure to convert land out of agriculture.¹⁸⁶

¹⁷⁴ See watershed tables in Appendix B, and map of water quality impairments in Appendix C.

¹⁷⁵ See watershed tables in Appendix B and map of Water Flow Restoration & Protection Priorities in Appendix C.

¹⁷⁶ See agriculture tables in Appendix B, and Cox, S. E., and Kahle, S. C. (1999), *Hydrogeology, Ground-Water Quality, and Sources of Nitrate in Lowland Glacial Aquifers of Whatcom County, Washington, and British Columbia, Canada; Water-Resources Investigations Report 98-4195*. USGS.

<<http://pubs.usgs.gov/wri/1998/4195/report.pdf>> (last accessed 4/4/2016)

¹⁷⁷ WID work session, February 2016. See agriculture tables in Appendix B.

¹⁷⁸ WA Dept. of Ecology, 2012. Focus on Water Availability, Publication 11-11-006

<https://fortress.wa.gov/ecy/publications/documents/1111006.pdf> [last accessed 1/24/18]

¹⁷⁹ [WAC 173-501](#) (1985), Instream Resources Protection Program – Nooksack Water Resource Inventory Area 1.

¹⁸⁰ See summary priorities table in Appendix A and detailed agriculture tables in Appendix B

¹⁸¹ See Water Right Points of Diversion map in Appendix C of this document.

¹⁸² RH2 Engineering, Inc. (2016) *Whatcom County Coordinated Water System Plan Update*. Whatcom County.

<http://www.whatcomcounty.us/DocumentCenter/View/24143>

¹⁸³ See map of Prime Soils in Appendix C of this document.

¹⁸⁴ Whatcom Conservation District (ND), *Find out what District you live in!* [webmap]

<http://www.whatcomcd.org/ag-drainage-districts>

¹⁸⁵ See map of Agriculture Priority Areas in Appendix C of this document.

¹⁸⁶ See map of Agriculture Priority Areas in Appendix C of this document.

Habitats and species: Wetland habitat occurs in this area¹⁸⁷ and the rare plant Canadian St. John's-wort.¹⁸⁸ 1
Char, Chinook, chum, coho, cutthroat, pink, sockeye and steelhead are present in the Wiser Lake Creek/Cougar Creek area.¹⁸⁹

Water flow processes: Overall water flow processes are highly degraded, but this area is of only moderate importance overall for water flow processes. Enhancement actions should focus on increasing surface storage in order to retain surface flows for longer. Decreasing the rate and quantity of subsurface water drainage will help to improve discharge to surface streams. Enhancing forest/riparian cover will help to improve delivery of water to streams.¹⁹⁰ 2



¹⁸⁷ See Priority species and habitats map in Appendix C of this document.

¹⁸⁸ See watershed tables in Appendix B, and WA Department of Natural Resources (2015), Washington Natural Heritage Program. <http://www1.dnr.wa.gov/nhp/refdesk/gis/index.html>

¹⁸⁹ See watershed tables in Appendix B.

¹⁹⁰ See watershed tables in Appendix B and map of Water Flow Restoration & Protection Priorities in Appendix C. Version 3 (April 2018)

5 TENMILE CREEK WATERSHED: REVIEW OF PREVIOUS AND CURRENT INITIATIVES 1

Explanatory note: 2

The Tenmile Creek watershed, which includes Fourmile Creek and Deer Creek) makes up a significant portion of the 3 Laurel WID area, although some of the watershed lies outside of the current WID boundaries (see map in Figure 3 of this Plan). Tenmile Creek watershed has been the focus and home of numerous enhancement efforts in the recent past.

The following section is a summary of previous and current efforts arranged in roughly chronological order. For 4 some projects, very little information was available and the description here is short, and for others there was a great deal of information available and the description is accordingly more detailed. Where there was clear relationship between projects, that has been noted.

1987 to 1991: Tenmile Creek Watershed Action Plan 5

In 1987, the Whatcom Conservation District was awarded funds to develop and implement a watershed 6 management plan for the Tenmile Creek watershed under the Puget Sound Early Action Watershed Program.¹⁹¹

1992 - 1996: Ten Mile Creek Watershed Action Plan 7

In 1992, the Whatcom Conservation District implemented a project along Tenmile Creek called the "Ten 8 Mile Creek Watershed Action Plan Implementation Project," funded at least in part by a Centennial grant from the Department of Ecology. The project entailed providing technical assistance to landowners on best management practices, conducting a land-use and wetlands inventory for the purpose of better understanding non-point water quality problems, and stream rehabilitation activities in cooperation with the Nooksack Indian Tribe, and other government agencies.¹⁹²

1994 – 1995: Riparian restoration and maintenance in the Kamm and Tenmile watersheds 9

In 1994, the Whatcom County Conservation District was awarded a grant from the Department of Ecology 10 to restore and maintain riparian habitat, monitor water quality, experiment with methods to control reed canary grass, and provide education to complement Best Management Practice (BMP) implementation. Accomplishments for the project as a whole (both Kamm and Tenmile watersheds) include:

- Constructed 1.5 miles of fencing to exclude livestock from streams. 11
- Planted native trees and shrubs along 4.25 miles of streams.
- Installed three alternative animal access structures for livestock watering.
- Constructed two off-site watering facilities for livestock.¹⁹³

1994-2008: Riparian restoration, instream enhancement, and livestock fencing work done by the 12 Nooksack Salmon Enhancement Association

NSEA has conducted habitat-related work in the Tenmile watershed since 1994.¹⁹⁴ From 2002 to 2005, 13 NSEA participated in the Tenmile Creek Riparian Restoration Pilot and its sub-project, the Fourmile Creek Watershed Buffer Planting. For these efforts, NSEA conducted spawner surveys in the Tenmile Creek watershed and installed native plantings along Tenmile and Fourmile Creeks. For more about these

¹⁹¹ Bada, B. 2018. Department of Ecology Water Quality Program staff. [personal communication 03/23/18]

¹⁹² Bada, B. 2018. Department of Ecology Water Quality Program staff. [personal communication 03/15/18]

¹⁹³ Bada, B. 2018. Department of Ecology Water Quality Program staff. [personal communication 03/23/18]

¹⁹⁴ Gray, D. 2018. NSEA Project manager [personal communication 2/26/18]

projects, please see the “2002-2008: Fourmile Creek Buffer Planting Project” and “2002-2005: Tenmile Creek Riparian Restoration Pilot” sections below.¹

From 2005 to 2008, NSEA implemented the Ten Mile Creek Watershed Restoration Project funded by a ² Department of Ecology Section 319 grant. The following accomplishments are reported:

- Site restoration plans were developed, and landowner agreements signed for 14 landowners totaling 10,500 feet of streambank,³
- Over 30 Large Woody Debris (LWD) structures were installed at four sites,
- Invasive vegetation was removed at each site,
- Native vegetation was planted at each site (plant survival monitoring continued for 3 years), and
- 800 feet of fencing was installed to exclude livestock from the creek (several other homeowners chose to install fencing at their own cost).¹⁹⁵

NSEA has also replaced 5 culverts in the area with fish-friendly culverts or a bridge.¹⁹⁶⁴

The following table summarizes the *additional* projects NSEA has implemented in the Tenmile Creek watershed since 1998 (projects completed between 1994 and 1998 are not included). Funding for their work has come from a variety of sources including: US Fish and Wildlife Service, Washington Department of Natural Resources, Washington Department of Fish and Wildlife, Washington Department of Ecology, National Fish and Wildlife Foundation, and the Natural Resources Conservation Service.¹⁹⁷⁵

A list of work sites on Tenmile Creek, Deer Creek, and their tributaries is available upon request.¹⁹⁸⁶

Year	Number of projects: Deer Creek				Number of projects: Fourmile Creek				Number of projects: Tenmile Creek			
	Riparian restoration	Instream enhancement	Livestock Fencing	Multiple benefit	Riparian restoration	Instream enhancement	Livestock Fencing	Multiple benefit	Riparian restoration	Instream enhancement	Livestock Fencing	Multiple benefit
1998	3		1	3	6	1		4	2	2		9
2000												1
2001	1											
2003										4		1
2004												
2006	2								4	2		
2009											1	
2010										2		
2011									1	1		
2013											1	
2014		1										

¹⁹⁵ Bada, B. 2018. Department of Ecology Water Quality Program staff. [personal communication 03/15/18]

¹⁹⁶ Gray, D. 2018. NSEA Project manager [personal communication 2/26/18]

¹⁹⁷ Gray, D. 2018. NSEA Project manager [personal communication 2/26/18]

¹⁹⁸ Gray, D. 2018. NSEA Project manager [personal communication 2/26/18]

1998 – 2001: Whatcom Water Quality Improvement Project¹⁹⁹ 1

In 1998, the Whatcom Conservation District was awarded a Centennial grant from the Department of Ecology to work with landowners, farmers, volunteers, community groups, schools, and local businesses to implement agricultural best management practices, restore stream riparian areas, and assess impacts of land uses on stream water quality. Project accomplishments included (*the geographic scope of the first 3 items likely exceeds the Tenmile watershed*):

- Developed a Manure Brokerage project 3
- Developed a Manure Composting Project.
- The CD subcontracted with Nooksack Salmon Enhancement Association (NSEA) to implement stream restoration, and develop policy guidelines for restoration, and
- NSEA implemented monitoring/survey/ assessment tasks in the Tenmile watershed, including development of a quality assurance project plan, water quality monitoring, spawner surveys, and vegetation monitoring.²⁰⁰

1998-2002: Whatcom County Shellfish Protection Plan 4

In 1998, the Whatcom County Conservation District was awarded a Section 319 grant from the Department of Ecology to develop and implement a water quality monitoring plan for designated shellfish protection areas, to develop and implement a shellfish closure response strategy for Drayton Harbor and Portage Bay shellfish protection districts, and also to provide information, education and outreach assistance to small farm owners. The project summary from the Department of Ecology says that the CD developed 15 farm plans for small farms in the target watersheds and that fecal coliform levels decreased on Tenmile Creek after hobby farm animals were moved away from the creek.²⁰¹

1999-2002: Revegetation projects 6

According to records from *LandScope*, Whatcom County provided plant material to Lummi Nation, Nooksack Tribe, NSEA, and Whatcom County Drainage Districts for revegetation projects in the Whatcom County lowlands between 1999 and 2002. Several of these revegetation sites are within the Tenmile Creek watershed.²⁰²

2001: Tenmile Creek Watershed Volunteer Restoration Project 8

In 2001, funds allocated by the Whatcom County Ag Preservation Committee and a WRIA 1 grant funded the Tenmile Creek Volunteer Restoration Project. The project was implemented between March and September 2001 and the following accomplishments were reported:

- 17,000 Douglas firs trees donated by Whatcom County Public Works were planted to stream sites, 10
- An additional 3,898 “new trees,” donated by the City of Bellingham, Whatcom Farm Forestry Association, and Lummi Nation were also planted,
- Landowners on Fourmile and Tenmile Creeks between Guide Meridian and Hannegan Road were surveyed about their beliefs and attitudes, and

¹⁹⁹ Waiting for clarification from WCD on scope of this work

²⁰⁰ Bada, B. 2018. Department of Ecology Water Quality Program staff. [personal communication 03/23/18]

²⁰¹ Bada, B. 2018. Department of Ecology Water Quality Program staff. [personal communication 03/23/18]

²⁰² LandScope America, 2018. *Find Conservation Projects on LandScope*. [interactive map]

<http://www.landscope.org/connect/conservation-projects/> [accessed March 15, 2018]

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- The project lead and partners conducted landowner outreach via 38 home or site visits, 1 neighborhood meetings, and community outreach efforts.²⁰³

The 2002-2005 Tenmile Creek Riparian Restoration Pilot project summarized below was informed by and 2 continued the work this project began.²⁰⁴

2002-2005: Fecal Coliform and Nitrate Transport in Shallow Ground Water Discharging to Streams 3
In 2002, the Nooksack Indian Tribe was awarded a Centennial grant by the Department of Ecology to study bacterial transport to surface water through subsurface pathways and to evaluate the processes influencing nitrate distribution in ground water and its discharge to surface water. There were four study sites: the Nooksack River near Everson, Fishtrap Creek, Fourmile Creek and a tributary of Bertrand Creek. The results of this study where inconclusive.²⁰⁵

2002-2005: Tenmile Creek Riparian Restoration Pilot 4

The Whatcom Conservation District, funded at least in part by a Centennial grant²⁰⁶ from the Department 5 of Ecology, worked with partners to install, maintain, and monitor riparian buffers, conduct spawner surveys, provide financial and technical assistance to local farmers, including project mapping (the project summary provided by the Department of Ecology does not elaborate on the project mapping). The project also implemented a comprehensive education and outreach program.²⁰⁷ This project was informed by and continued the work of the 2001 Tenmile Creek Watershed Volunteer Restoration Project summarized above and was followed and continued by the 2005-2008 Tenmile Watershed Rehabilitation Phase 3 project summarized below.

Accomplishments of this project include: 6

- Established a neighborhood advisory committee,
- Developed and distributed educational materials and a newsletter,
- Conducted 247 landowner visits,
- Conducted a pre-survey with landowners about attitudes and observations about the watercourses,
- Conducted neighborhood meetings on water rights and stream flow,
- Made educational presentations, conducted watershed tours, and conducted outreach at events and via local media,
- Gathered oral histories from area residents,
- Grew and gave away 42,000 trees for planting along watercourses to area residents through the Farmers Growing Trees for Salmon project,
- Area schools bought/propagated and distributed hundreds of trees and shrubs for future restoration planting,

²⁰³ Belisle, D., 2001. *Tenmile Creek Watershed Volunteer Restoration Project*. Dorie Belisle, Project Manager, For Period 3/15/2001 to 9/15/2001. Whatcom Ag Preservation Committee.

<http://wria1project.whatcomcounty.org/uploads/PDF/miscReports/eai-tenmile.PDF>

²⁰⁴ Belisle, D., 2001. *Tenmile Creek Watershed Volunteer Restoration Project*. Dorie Belisle, Project Manager, For Period 3/15/2001 to 9/15/2001. Whatcom Ag Preservation Committee.

<http://wria1project.whatcomcounty.org/uploads/PDF/miscReports/eai-tenmile.PDF>

²⁰⁵ Bada, B. 2018. Department of Ecology Water Quality Program staff. [personal communication 03/23/18]

²⁰⁶ Waiting for clarification from Dorie on the funding arrangements for this project

²⁰⁷ Bada, B. 2018. Department of Ecology Water Quality Program staff. [personal communication 03/23/18]

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- Identified 13 new riparian projects, NSEA planted 11,800 lineal feet of stream,²⁰⁸ 1
- Cleaned reed canary grass and sediment out of Fourmile Creek and planted a riparian buffer from just above Green Lake to the confluence with Tenmile Creek (information about this part of the project comes from an appendix to the *Tenmile Watershed Rehabilitation Phase 3* report and is presented in the section “Fourmile Creek Buffer Planting Project” below. It is included here because the cleaning and planting work took place from 2002-2005).²⁰⁹
- Entered 400 feet of stream into the Conservation Reserve Enhancement Program (CREP),
- NSEA, with support from Bellingham Technical College's Fisheries Technology Program, conducted spawner surveys in 2003 and 2004,
- Conducted a post-project survey to assess changes in attitude, one measure of the survey showed “... that 83 percent now believe changes to improve water quality can go hand-in-hand with land use needs, versus 63 percent who believed that before this project began.²¹⁰

2002-2006: Water Quality Monitoring Implementation 2

In 2002, Whatcom County Public Works Department was awarded a Department of Ecology Centennial grant to develop and begin implementation of a long-term water quality monitoring program for Water Resources Inventory Area (WRIA) 1. A Tenmile Creek pilot telemetry program²¹¹ was conducted under this grant.²¹² 3

2005-2008: Tenmile Watershed Rehabilitation Phase 3 4

The Whatcom Conservation District, funded at least in part by a Centennial grant from the Department of Ecology, provided education and support to implement Phase III of this citizen-based stewardship project to re-vegetate riparian corridors, increase environmental awareness, facilitate behavioral changes to improve water quality,²¹³ and enhance understanding of ground and surface water storage in the basin. This project was informed by and continued the work of the 2001 Tenmile Creek Watershed Volunteer Restoration Project summarized above. 5

Accomplishments for this project include:

- Convened Tenmile Watershed Advisory Meetings,²¹⁴ 6
- Visited landowners to discuss their land use needs and the needs of the Tenmile Creek watershed,
- Began education outreach on septic care and fecal coliform counts in the creek,
- Wrote, produced, and distributed 8 editions of Tenmile Treasures to the 2,500 watershed landowners,
- Promoted and managed “Farmers Growing Trees for Salmon” and the “Trees for Streams” programs to coordinate growth of new native plants and the distribution of them to Whatcom landowners at no cost to plant along their streams,

²⁰⁸ Waiting for clarification on whether this includes Fourmile planting

²⁰⁹ Whatcom Conservation District, 2008. *Fourmile Creek Final Report: A Planting and Maintenance Project*.

Tenmile Creek Watershed Restoration Project. Nooksack River Watershed – Whatcom County June 2008. Whatcom Conservation Distrcit. <http://www.whatcomcd.org/publications>

²¹⁰ Bada, B. 2018. Department of Ecology Water Quality Program staff. [personal communication 03/23/18]

²¹¹ More information is available from Washington State University Whatcom County Extension office.

²¹² Bada, B. 2018. Department of Ecology Water Quality Program staff. [personal communication 03/23/18]

²¹³ Bada, B. 2018. Department of Ecology Water Quality Program staff. [personal communication 03/23/18]

²¹⁴ Dorie Belisle for the Whatcom Conservation District, 2008. *Tenmile Creek Riparian Rehabilitation Phase III, CCW #G0500076a, Final Report, April 2005-June 2008.* Whatcom Conservation District.

- Produced a Tenmile wetlands map. Shared the map and information about the value of wetlands with landowners in the Tenmile, 1
- Created a community around a watershed to include such activities as workshops, displays, and continued the Tenmile Oral History Project.
- Conducted a windshield survey of the watershed to identify livestock operations,²¹⁵ and

The *Tenmile Watershed Rehabilitation Phase 3* report also mentions a low flow study initiated by PUD #1 2 and Whatcom County Public Works in 2004, and an optical brightener study conducted by Whatcom County staff at seven sites in "the Tenmile" (it seems likely that this refers to the creek not the watershed, here) conducted in 2006. These appear to be related efforts and not part of this project. No optical brightener was detected in the study possible due to high flow levels when the study was conducted.²¹⁶

2002 – 2008: Fourmile Creek Buffer Planting Project, Tenmile Creek Watershed Restoration Project 3
Part of larger Tenmile Creek watershed restoration efforts (see the "Tenmile Creek Riparian Restoration 4 Pilot," and "Tenmile Watershed Rehabilitation Phase 3" sections above) the Fourmile Creek Buffer Planting Project focused on riparian restoration along Fourmile Creek.²¹⁷

The project was funded by 2 Ecology Centennial grants and a US Fish and Wildlife Service grant and was a 5 collaboration between the Whatcom Conservation District, Washington Department of Fish and Wildlife, and Drainage and Irrigation District #3:

The project goal was to clean the creek of reed canary grass and sediments and plant a riparian buffer 6 along Fourmile Creek to improve water quality and fish habitat.²¹⁸ Earlier riparian plantings installed by NSEA in the area had been largely lost to predation from voles and beavers, and competition from weeds.²¹⁹

- Landowners within the target area, along Fourmile Creek from just above Green Lake west to the confluence with Tenmile Creek, were visited individually to discuss a long-term plan for cleaning and rehabilitating Fourmile Creek, 7
- Fourmile Creek was cleaned of reed canary grass and accumulated sediment,
- A riparian buffer of native vegetation was established along 90% of the target area, planted in 3 phases between 2002 and 2005 by the Whatcom CD and NSEA. Maintenance and replanting were undertaken by the project until 2007.^{220 221}

²¹⁵ Dorie Belisle for the Whatcom Conservation District, 2008. *Tenmile Creek Riparian Rehabilitation Phase III, CCW #G0500076a, Final Report, April 2005-June 2008*. Whatcom Conservation District.

²¹⁶ Dorie Belisle for the Whatcom Conservation District, 2008. *Tenmile Creek Riparian Rehabilitation Phase III, CCW #G0500076a, Final Report, April 2005-June 2008*. Whatcom Conservation District.

²¹⁷ Whatcom Conservation District, 2008. *Fourmile Creek Final Report: A Planting and Maintenance Project. Tenmile Creek Watershed Restoration Project. Nooksack River Watershed – Whatcom County June 2008*. Whatcom Conservation Distirct. <http://www.whatcomcd.org/publications>

²¹⁸ Lovato Niles, C., and H. MacKay, 2013. *Fourmile Creek Buffer Planting Project Summary Report*. FHB Consulting Services Inc., Lynden WA. Report available at: www.whatcomcd.org/tenmile

²¹⁹ Gray, D. 2018. NSEA Project manager [personal communication 3/07/18]

²²⁰ Whatcom Conservation District, 2008. *Fourmile Creek Final Report: A Planting and Maintenance Project. Tenmile Creek Watershed Restoration Project. Nooksack River Watershed – Whatcom County June 2008*. Whatcom Conservation Distirct. <http://www.whatcomcd.org/publications>

²²¹ Belisle, D. 2018. [personal communication 3/13/18]

During the project a number of water quality parameters were monitored.¹

- WSU Extension personnel set up six stations to measure temperature and dissolved oxygen. Dissolved oxygen measurements were taken at each station between July 2004 to May 2008, approximately every two months and Tidbit loggers recorded temperature hourly from September 2003 to February 2008.²²²
- Additionally, the Whatcom CD contracted the Northwest Indian College to take monthly water quality samples at two sites in the project area. They analyzed the samples for fecal coliform levels, DO, and pH from 11/2004 to 5/2008. The results are reported in *Fourmile Creek Final Report: A Planting and Maintenance Project*.²²³

2006: East Hemmi Neighborhood Wetland and Stream Restoration ³

The goal of the project was to add to surface water storage capacity and restore summer flows to Tenmile Creek through wetland and stream restoration. In 2006, three property owners south of E. Hemmi participated in the pilot. Meanders were placed in the stream and the landowners enrolled in CREP. The *2005 WRIA1 Watershed Management Plan Recommendations Status of Implementation 2005-2006* report states that the “lead identified was the Tenmile Watershed Steward with support from Washington Department of Fish and Wildlife and the Whatcom CD.”²²⁴ This work may have been part of the Tenmile Watershed Rehabilitation Phase 3 project.

2007-2008: Fish passage barrier removal on Tenmile ⁵

According to records from *LandScope*, the Nooksack Indian Tribe replaced a culvert with a bridge on Tenmile Creek. The project is referred to as “Stone/Schraeder” and the location given is Ten Mile Cr, R3.²²⁵

2013-present: Tenmile Creek Clean Water Project ⁷

In 2013, funded by grants from Whatcom Community Foundation and the Rose Foundation, and supported by RE Sources, the Tenmile Creek Clean Water Project began. The initial funding only lasted a couple of years; The project was then unfunded for about 3 years. During that period, RE Sources provided support in the form of staff support and webpage hosting. In 2017, the project received a one-year grant from the Whatcom Community Foundation to expand their work.^{226 227} The mission of the Tenmile Clean

²²² Whatcom Conservation District, 2008. *Fourmile Creek Final Report: A Planting and Maintenance Project. Tenmile Creek Watershed Restoration Project. Nooksack River Watershed – Whatcom County June 2008*. Whatcom Conservation District. <http://www.whatcomcd.org/publications>

²²³ Whatcom Conservation District, 2008. *Fourmile Creek Final Report: A Planting and Maintenance Project. Tenmile Creek Watershed Restoration Project. Nooksack River Watershed – Whatcom County June 2008*. Whatcom Conservation Distirct. <http://www.whatcomcd.org/publications>

²²⁴ Geneva Consulting, 2017. *2005 WRIA1 Watershed Management Plan Recommendations Status of Implementation 2005-2006*.

http://wria1project.whatcomcounty.org/uploads/PDF/Guiding%20Documents%20and%20Plans/WMP%20Actions%20Status%202005-2006_05-2017.pdf

²²⁵ LandScope America, 2018. *Find Conservation Projects on LandScope*. [interactive map] <http://www.landscope.org/connect/conservation-projects/> [accessed March 15, 2018]

²²⁶ From Clean Streams, Healthy Community Grant app. Invitational Grant application FY2018. Written by Hank Kastner for NSEA for Tenmile Clean Water Project. On the NSEA fiscal sponsorship agreement, Hank is listed as TCWP representative.

²²⁷ Kastner, H., 2018. [personal communication March 10, 2018]

Water Project is to improve water quality in the Tenmile Creek watershed by identifying sources of pollution through water sampling and correcting problems with community involvement.²²⁸¹

The TCWP is being implemented by a group of citizens, most of whom live within the watershed. Their current work includes:²

- Volunteers (and recently a grant-funded coordinator) collect monthly water samples coordinated with the Whatcom County Public Works Short Term Ambient monitoring program,
- Volunteers (and recently a grant-funded coordinator) collect additional water quality samples as needed to identify the sources of fecal coliform pollution,
- Engage landowners in addressing possible pollution sources via the personal connection of the members, events, and contacts made in the course of performing water quality sampling,²²⁹
- Collaborate with the Laurel Watershed Improvement District on sampling and outreach strategy; Laurel WID contacts landowners when the water quality sampling indicates pollution may be originating from a specific area,²³⁰
- Coordinated with County Health on septic system inspection training for homeowners,
- Currently coordinating with WCD to conduct outreach on responsible land use practices,
- Monthly meetings often feature a guest speaker or program to provide residents information on many of these subjects. Guests have included staff from WCD, Lummi Nation, RE Sources, County Health & Public Works, Dept of Ecology; Future Farmers of America students from Lynden High School.²³¹

The data collected in coordination with TCWP is available through Whatcom County's water quality data webpages <https://www.whatcomcounty.us/1072/Water-Quality>.⁴

2013-Present: Work done by Drainage Improvement Districts⁵
In 2017, Drainage District #3 dredged approximately 4,200' of Fourmile Creek west of Hannegan Road.

2017: Tenmile Watershed NRCS National Water Quality Initiative Pilot Watershed Assessment²³² ⁶
In collaboration with the Washington National Resources Conservation Service, the Whatcom Conservation District (WCD) conducted a watershed assessment to characterize and identify the land uses, or "critical source areas," that have the greatest potential for nutrient, sediment, and/or pathogen impacts to water quality. The project also worked to identify the outreach strategy and conservation management practices that could be implemented to improve water quality.⁷

²²⁸ Kastner, H., 2018. [personal communication March 10, 2018] and Tenmile Clean Water Project, n.d. *Tenmile Clean Water Project*. [promotional flyer in use in 2018]

²²⁹ Kastner, H., 2018. [personal communication March 10, 2018] as well as From Clean Streams, Healthy Community Grant app. Invitational Grant application FY2018. Written by Hank Kastner for NSEA for Tenmile Clean Water Project. On the NSEA fiscal sponsorship agreement, Hank is listed as TCWP representative.

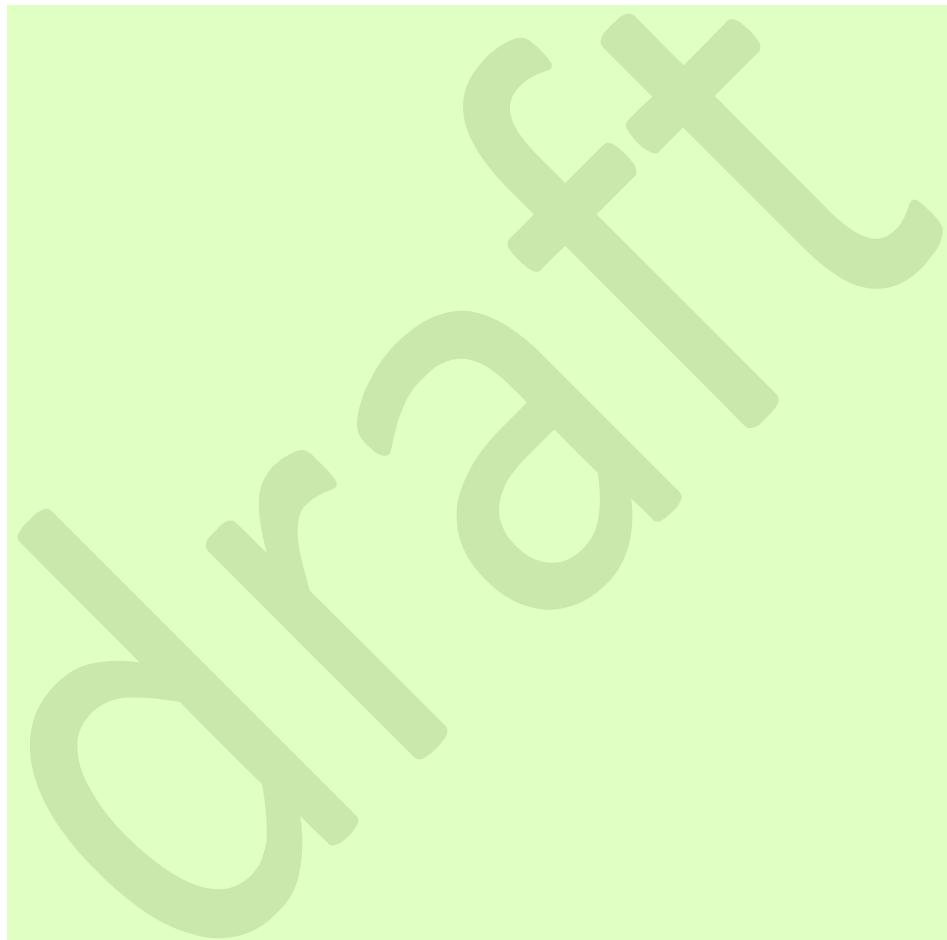
²³⁰ Kastner, H., 2018. [personal communication March 10, 2018] as well as From Clean Streams, Healthy Community Grant app. Invitational Grant application FY2018. Written by Hank Kastner for NSEA for Tenmile Clean Water Project. On the NSEA fiscal sponsorship agreement, Hank is listed as TCWP representative.

²³¹ From Clean Streams, Healthy Community Grant app. Invitational Grant application FY2018. Written by Hank Kastner for NSEA for Tenmile Clean Water Project. On the NSEA fiscal sponsorship agreement, Hank is listed as TCWP representative.

²³² Whatcom Conservation District, 2017. *NRCS National Water Quality Initiative (NWQI) Pilot Watershed Assessment: Tenmile Watershed*. September 2017, v.3. Available on request from Whatcom Conservation District Version 3 (April 2018)

The WCD gathered information on precipitation, soils, hydrologic features, elevation, land cover and land use, and livestock numbers. Relevant data was input to a software program developed to model nonpoint source pollution and erosion, OpenNSPECT. Maps of potential critical source area contributors for phosphorous, nitrogen, total suspended solids and pathogens were generated.¹

The WCD also conducted a survey of farmers and rural landowners in the Tenmile Watershed to evaluate perceptions of and attitudes towards water quality in the watershed, landowners' experiences with conservation practices and their willingness to implement them, and trusted sources of information. The results of this survey, work with focus groups, and other outreach in the Tenmile will inform how the WCD will design and outreach efforts to improve water quality.²³³²



²³³ Whatcom Conservation District, 2017. *NRCS National Water Quality Initiative (NWQI) Pilot Watershed Assessment, September 2017 v.3*. Whatcom Conservation District: Lynden, WA.
Version 3 (April 2018)

6 SUPPORTING INFORMATION FOR PLANNING OF SPECIFIC ACTIONS

Explanatory notes 1

In later versions of the Management Plan, this section would contain as much detail as possible on priority actions agreed by the WID, including a description and rationale for each task, a planned schedule, and indication of who would assist in implementation. Some priority actions might require additional resources, more detailed baseline studies or collection of new data: descriptions of these actions would be supported by a scope of work and estimated budget.²

Maintenance of agricultural drainage and management of water quality are two areas where the WID has been particularly active and already has a number of actions planned or ongoing. In cases where there might be little or no available information on how the WID proposes to address an issue and implement priority actions related to that issue, we have made some notes about how actions might be identified and prioritized during further development of the WID Management Plan.³

As the Management Plan is developed in more detail, it is likely that different actions will be prioritized in different parts of the WID area, depending on farmers' needs and availability of resources.⁴

5



6.1 Hydrology and water availability; water use and water rights 1

6.1.1 Desired outcomes, goals and possible actions 2

In subsequent versions of the Management Plan, this section would include: 3

- a review of what information is readily available to determine
 - water availability for current and future agricultural water needs (both surface and groundwater),
 - climate (focus on precipitation and temperature) and potential evapotranspiration analysis,
 - estimated current water use for agricultural purposes and potential future demand;
- scope of work and resources needed for any additional work that might be needed to collate data or to conduct relevant baseline assessments, to be incorporated into the WID Management Plan;
- priority actions, responsibilities and timelines.

Specialists: Joanne Greenberg and Jim Bucknell 6

From Table 2, the suggested priority actions are: 7

- i. *Support & coordinate with Ag Water Board for efforts in legal negotiations and actions related to water rights* 8
- ii. *Support & coordinate with Ag Water Board in:* 9
 - a. *development of drainage-based management plans;* 10
 - b. *development of a Water Supply Strategy;*
 - c. *participation in the Water Supply Work Group and in the Whatcom Water Supply Coalition*
- iii. *Expand hydrological analysis to include surface water, climate, and evapotranspiration, to assess overall water use and water availability and to identify shortfalls – possibly coordinate with other WIDs on the analysis** 11
- iv. *Pursue and test feasibility within the WID of options such as water exchange or water banking, changes in place of use, change to groundwater, aquifer recharge etc.** 12
- v. *Support & coordinate with Ag Water Board to communicate water rights concerns with legislators* 13
- vi. *Foster task force pilot: identify WID members who might participate with other WIDs and the AWB, and prioritize locations where transfers might be feasible and practical & would benefit surface flows (board meeting 4/2018)*
- vii. *Participate in workshop on water right tools planned for early June (board meeting 4/2018).* 14

Additional actions that might be considered for inclusion here (from meeting discussions & other WID documents): 15

- viii. *Provide education about water rights to WID members, possibly through a workshop* 16
* denotes actions that may need additional resources, and more detailed scope & description

6.1.2 Supporting information related to hydrology, water use and water rights 17

Additional supporting information related to the recently completed, ongoing and future priorities listed 18 in Table 2 includes:

- Agricultural and watershed characterization tables contained in Appendix B of this Plan 19
- Reference maps contained in Appendix C of this Plan
- Data sources listed in Appendix E of this Plan

- Summary and references for work done on water banking (Water Supply Coalition) 1
- PUD#1 (2016). [Quantification of Agricultural Irrigation Water Use and Water Rights](#)
- PUD#1 (2016) [Whatcom County Streamflow Analysis](#)
- Summary of results and references for the groundwater modeling project – currently there are documents available at <http://wria1project.whatcomcounty.org/Resource-Library/2016-Groundwater-Forum/116.aspx>

6.2 Water quality (surface and groundwater) 2

6.2.1 Desired outcomes, goals and possible actions 3

In subsequent versions of the Management Plan, this section would include: 4

- a review of what information is readily available to determine current status and trends in water quality and implementation of BMPs;
- scope of work and resources needed for any additional work that might be needed to collate data or to conduct relevant baseline assessments, to be incorporated into the WID Management Plan;
- priority actions, responsibilities and timelines.

Specialists: Anneke Sweeney, Nichole Embertson 6

From Table 2, the suggested priority actions are: 7

- i. Continue to invest in water quality monitoring by the WID as well as in partnership with the Tenmile group 8
- ii. Continue to develop relationships with other groups working on water quality

Additional actions that might be considered for inclusion here: 9

- iii. Coordinate with Ag Water Board and other WIDs on water quality programs and responses, the Portage Bay Partnership, implementation of best management practices.

The items below were added to the table after the March 1 Tenmile forum. Board to advise on which should be incorporated into the WID Plan as possible future actions. 10

Ongoing actions: 11

- iv. Continue to work with Whatcom County Public Works to access and report shared bacteria data from multiple partners who are sampling in the WID area (WCD, WID, WCPW) 12

Possible future actions: 13

- v. Work with local partners and agencies to establish an integrated data repository that can provide a full suite of watershed information for the WID (WCD, Laurel WID, Ag Water Board and other WIDs) 14
- vi. Extend the more detailed Tenmile Watershed Assessment (2018) to the remainder of the Laurel WID area, primarily the Wiser Lake/Cougar Creek sub-watersheds (WCD, WID)
- vi. Conservation practices
 - a. Identify the most effective conservation practices for each land use based on current practices by the landowner (WCD?). 15
 - b. Define and track measurable metrics for progress related to:
 - location & level of implementation of NRCS conservation practices (NRCS, WCD)
 - water quality at or near implementation sites (local PIC partners & others)

- improvements/changes in downstream water quality at station T1 and lower Nooksack mainstem stations (PIC partners, DOH, LNNR) 1
 - c. Track implementation of conservation practices (NRCS Protracts program, WCD)
 - d. Continue edge-of-field monitoring in Whatcom County for various land use types and conservation practices (WCD)
- vii. Conservation planning/Farm planning 2
- a. Encourage farmers and landowners in the WID to draw up farm plans, in order to support implementation, evaluation and adaptation of a broader watershed management plan. (WCD, WID) 3
- viii. Ongoing water quality monitoring (need to identify partners for each case below)
- a. Conduct surface water monitoring of 10 ambient stations for fecal coliforms, plus additional source identification or storm event monitoring. 4
 - b. Conduct regular sampling of nitrogen, phosphorus and sediment in surface water at T1 station, quarterly.
 - c. Collect flow measurements at T1 and additional ambient monitoring stations in order to estimate flows and loads based on measured pollutant concentrations.

6.2.2 Supporting information related to water quality 5

Additional supporting information related to the recently completed, ongoing and future priorities listed in Table 2 includes: 6

- Agricultural and watershed characterization tables contained in Appendix B of this Plan 7
- Reference maps contained in Appendix C of this Plan
- Data sources listed in Appendix E of this Plan
- Data associated with previous and current efforts in the Tenmile watershed, described in detail in section 5 of this Plan.

6.3 Agricultural field drainage 1

6.3.1 Desired outcomes, goals and possible actions 2

In subsequent versions of the Management Plan, this section would include: 3

- next steps that the WID would take to discuss and agree on selected priority actions for maintaining drainage infrastructure and ditches in the WID area in collaboration with DIDs #3, #5, #6, #30A;
- scope of work and resources needed for any additional work that might be needed to collate data or to conduct relevant baseline assessments for a set of agreed actions, to be incorporated into the WID Management Plan;
- priority actions, responsibilities and timelines.

Specialists: Frank Corey 5

From Table 2, the suggested priority actions are: 6

- Prioritize ditch maintenance actions and coordinate with Whatcom County and drainage districts (DID#3, #5, #6 and #30A) for ditch cleaning and mowing. In addition to sites in Table 5, sites needing attention include: western segment of Tenmile Rd.; north ditch along Tenmile Rd. east of Chasteen Rd.; Eldred/Megard and on Fourmile near Roger's farm; Fourmile upstream of Guide Meridian; Deer Creek near Chasteen Rd.
- Proactively identify locations for mitigation sites and mitigation actions to be addressed in a programmatic drainage permit, that could also contribute to advancing watershed & habitat priorities. Culvert replacements could be an alternative to tree planting & maintenance
- Document the specific procedures for responding to situations requiring ad hoc or emergency actions. Include these procedures in the management plan and in WID communications/website.

6.3.2 Supporting information related to field drainage 8

The following supporting information supports the WID's discussions related to agricultural drainage and the development of an action plan for inclusion in the WID Management Plan: 9

- Map of the WID boundary (Figure 7 below), which also shows the modified waterways and ditches that are maintained as part of the drainage infrastructure.
- Map of priority actions identified by the WID in the February 2016 work session (Figure 8 below). These actions are almost all related to drainage and flooding. The actions are listed in Table 5 below.
- Agricultural reference map (Appendix C of this document) indicating where soils are Prime if drained.
- Detailed agricultural and watershed enhancement tables prepared at the WID work session in February 2016 indicate drainage concerns and priorities in different parts of the WID. The tables are contained in Appendix B of this Plan.
- Maps and drainage management plans for the Drainage Improvement Districts that are within or close to the Laurel WID, downloadable from the Whatcom Conservation District website at <http://www.whatcomcd.org/ag-drainage-districts>
- Information on the programmatic permitting process for stream projects involving drainage and/or habitat (see Table 6)
- Data sources listed in Appendix E of this Plan.

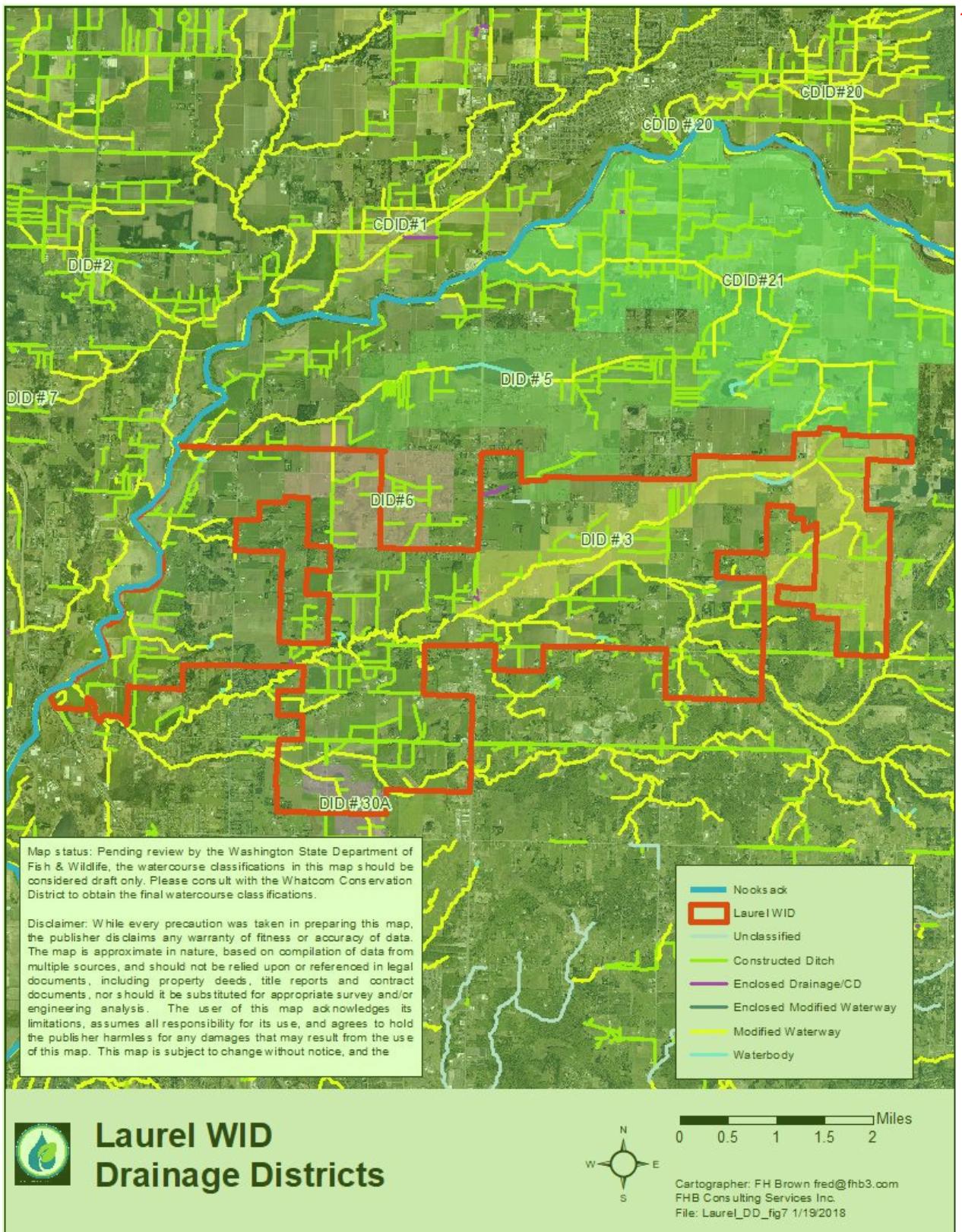


Figure 7. Map showing the Laurel WID and drainage districts. Map layers: Whatcom Conservation 2 District.

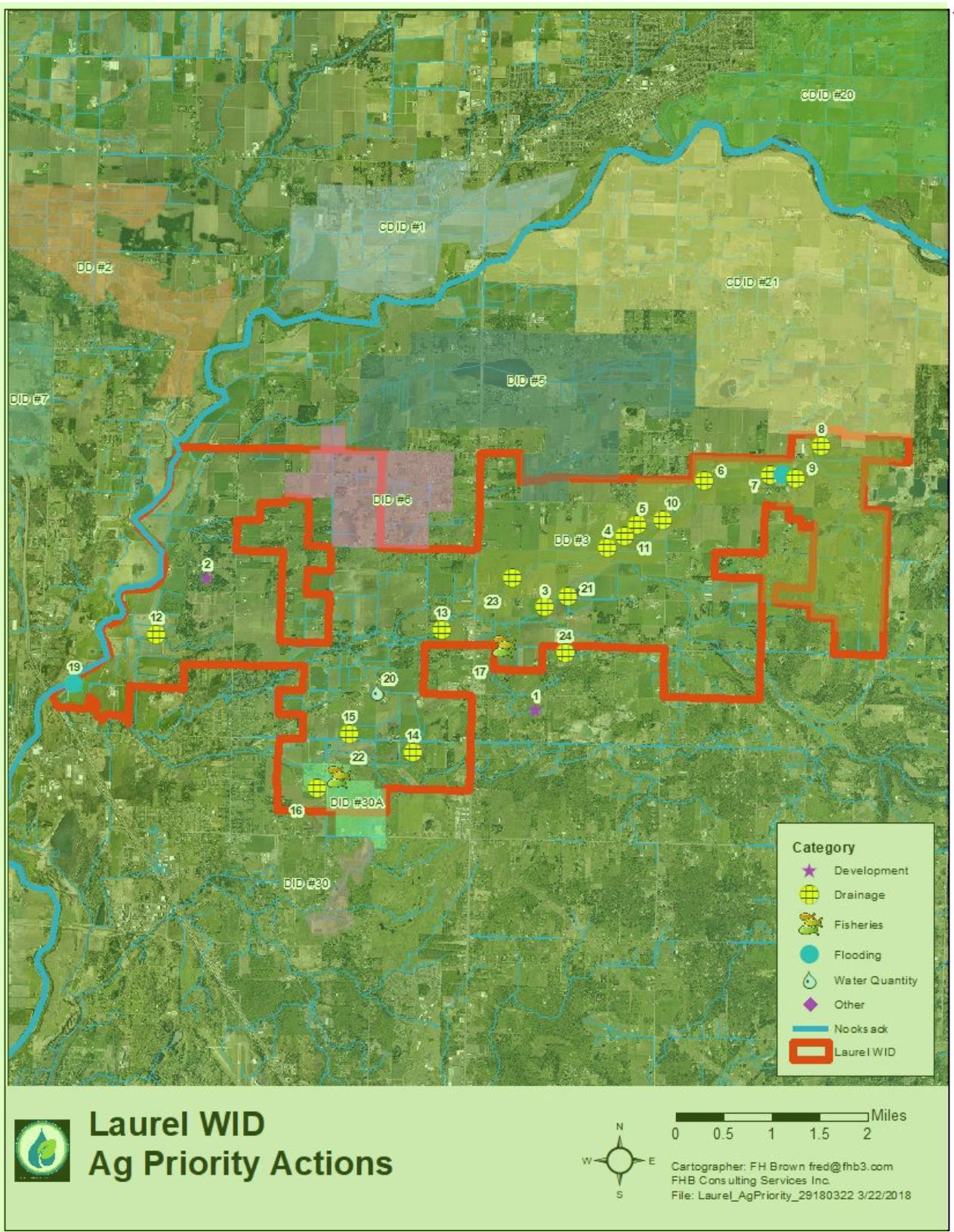


Figure 8. Laurel WID map of specific agricultural priority actions (from WID work session in February 2016 and WID meeting minutes 2016-2017). See table below for map key.

Table 5. Key for actions on agricultural priority actions map in Figure 8 (from mapping work session in ¹ February 2016).

Action # on map	AU #	Priority	Notes	²
1	1137	Development	Purchase development rights in upper Silver Springs Creek.	
2	1112	Development	There are lots of residential / development conflicts here.	
3	1137	Drainage	Clean out Tenmile Creek channel west of Chasteen Rd for 0.5 miles downstream.	
4	1133	Drainage	Potential sediment trap in Fourmile Creek.	
5	1133	Drainage	Maintenance required on Fourmile Creek to keep channel flow.	
6	1133	Drainage	Clean out of Green Lake Slough to Hannegan Rd. needed to improve drainage of boggy area.	
7	1133	Drainage	Bypass around lake needs to be cleaned.	
8	1114	Drainage	Maintenance needed to clear willows out of waterway.	
9	1133	Drainage	More agricultural land would be available if this area drained.	
10	1133	Drainage	Beaver dam removal by bridge necessary.	
11	1133	Drainage	Maintenance needed to clear willows that have fallen into water.	
12	1112	Drainage	This area has poor drainage.	
13	1139	Drainage	This area needs better drainage (western segment of Tenmile Road).	
14	1138	Drainage	Problems with drainage and beaver management needed.	
15	1140	Drainage	Wet field, would benefit from cleaning culvert	
16	1140	Drainage	Keeping this ditch clear is key to drainage to east. Creek runs slowly (south fork of Deer Creek, E of Aldrich Road)	
17	1137	Fisheries	Fish passage problem.	
18	1133	Flooding	Beaver management needed to prevent flooding.	
19	1139	Flooding	Potential good location for flood gate.	
20	1139	Water Quantity	Groundwater quantity is limited here, not enough for cows and high iron levels.	
21		Drainage	Ditch cleaning needed on south fork of Deer Creek near Chasteen Road (discussed at Nov 2017 board meeting).	
22		Fisheries	Action on south fork of Deer Creek, at culvert E of Aldrich Road, would benefit habitat and water quality (discussed at April 2016 meeting)	
23		Drainage	Drainage maintenance needed on Fourmile Creek upstream of Guide Meridian (discussed at January 2018 meeting)	
24		Drainage	Drainage maintenance needed on Deer Creek near Chasteen Road (discussed at November 2017 meeting)	
25		Drainage	Eldred/Megard and on Fourmile near Roger's farm (discussed at August 2016 meeting). <i>Note for WID board: please locate this site on the map in Figure 8 above. Location is not clear from the meeting minutes.</i>	

Table 6. Programmatic permitting process for stream projects (drainage, habitat) ¹

(Information provided by Frank Corey, Whatcom Conservation District)

Washington Department of Fish & Wildlife (WDFW) can issue a 5-year permit (Hydraulic Project Approval) based upon a Drainage Maintenance and Habitat Improvement Plan.

Whatcom County Planning & Development Services (PDS) can concurrently issue a programmatic Land Disturbance Permit or Shorelines Exemption.

Basic Plan Components: ³

- General description of District and important natural and structural features
- Watercourse classification map
- General list of 5-year drainage maintenance needs
- General list of habitat projects to offset impacts of drainage maintenance and voluntary habitat improvement projects
- Annual reporting forms
- Mitigation sequencing process
- Typical cross-section for maintenance dredging
- Best management practices
- ESA Habitat Assessment and mitigation plan for floodplain areas
- WDFW notification requirements individual projects (includes discussion of mitigation)
- PDS Natural Resource Notification of Activity (\$35.00) for individual projects
- SEPA
- LDP or shorelines

Permitting pathway: ⁵

1. Complete Drainage Maintenance and Habitat Improvement Plan
2. Complete non-project SEPA checklist
3. Complete Shorelines Exemption or Land Disturbance Permit (LDP) applications
4. Complete on-line Joint Aquatic Resource Permit Application (JARPA)
5. Submit Plan, SEPA, Shorelines (or LDP), and supporting information to PDS
6. Submit JARPA to WDFW
7. Notify WDFW (call or email) and PDS (Notification form) for each project prior to implementation.
8. Also submit mitigation plans for each project. Preferred mitigation will be on-site and in-kind (example planting). Other mitigation such as replacing culverts that are barriers to fish passage also possible.
9. Submit annual reports to WDFW and PDS

Permit Fees: ⁷

• WDFW	\$175.00	⁸
• SEPA	\$535.00	
• LDP	\$600.00*	
• (or Shorelines Exemption	\$435.00)**	
• (Flood Review	\$110.00)**	

*Other fees may apply ⁹

**If in floodplain

6.4 Flooding and stormwater management 1

6.4.1 Desired outcomes, goals and possible actions 2

The map of agricultural priorities (Figure 8) includes several possible actions to maintain flood infrastructure in specific locations within the Laurel WID area. 3

In subsequent versions of the Management Plan, this section would include: 4

- next steps that the WID would take to discuss and agree on selected priority actions for protecting agricultural land from flooding, in collaboration with Whatcom County Public Works;
- scope of work and resources needed for any additional work that might be needed to collate data or to conduct relevant baseline assessments for a set of agreed actions, to be incorporated into the WID Management Plan;
- priority actions, responsibilities and timelines.

Specialists: 6

From Table 2, the suggested priority actions are: 7

- Review and update priority actions identified at the February 2016 work session* 8
- Devries Levee – widen & flatten backslope. Included in SWIF plan by Whatcom County Public Works*

6.4.2 Supporting information related to flooding and stormwater management 9

The following supporting information supports the WID's discussions related to flooding and stormwater management and the development of an action plan for inclusion in the WID Management Plan: 10

- Map in Figure 9 showing flood infrastructure along the Nooksack River adjacent to the Laurel WID. 11
- Detailed agricultural and watershed enhancement tables prepared at the WID work session in February 2016 indicate flooding concerns and priorities in different parts of the WID. The tables are contained in Appendix B of this Plan.
- Data sources listed in Appendix E of this Plan.
- Lower Nooksack River Comprehensive Flood Hazard Management Plan (1997). The plan is currently being updated. See <http://www.whatcomcounty.us/2572/Completed-Plans-Lower-Nooksack>
- Additional plans and studies related to flooding in the Lower Nooksack River: a number of technical reports and analyses are available at the Whatcom County Public Works website <http://www.whatcomcounty.us/2572/Completed-Plans-Lower-Nooksack>

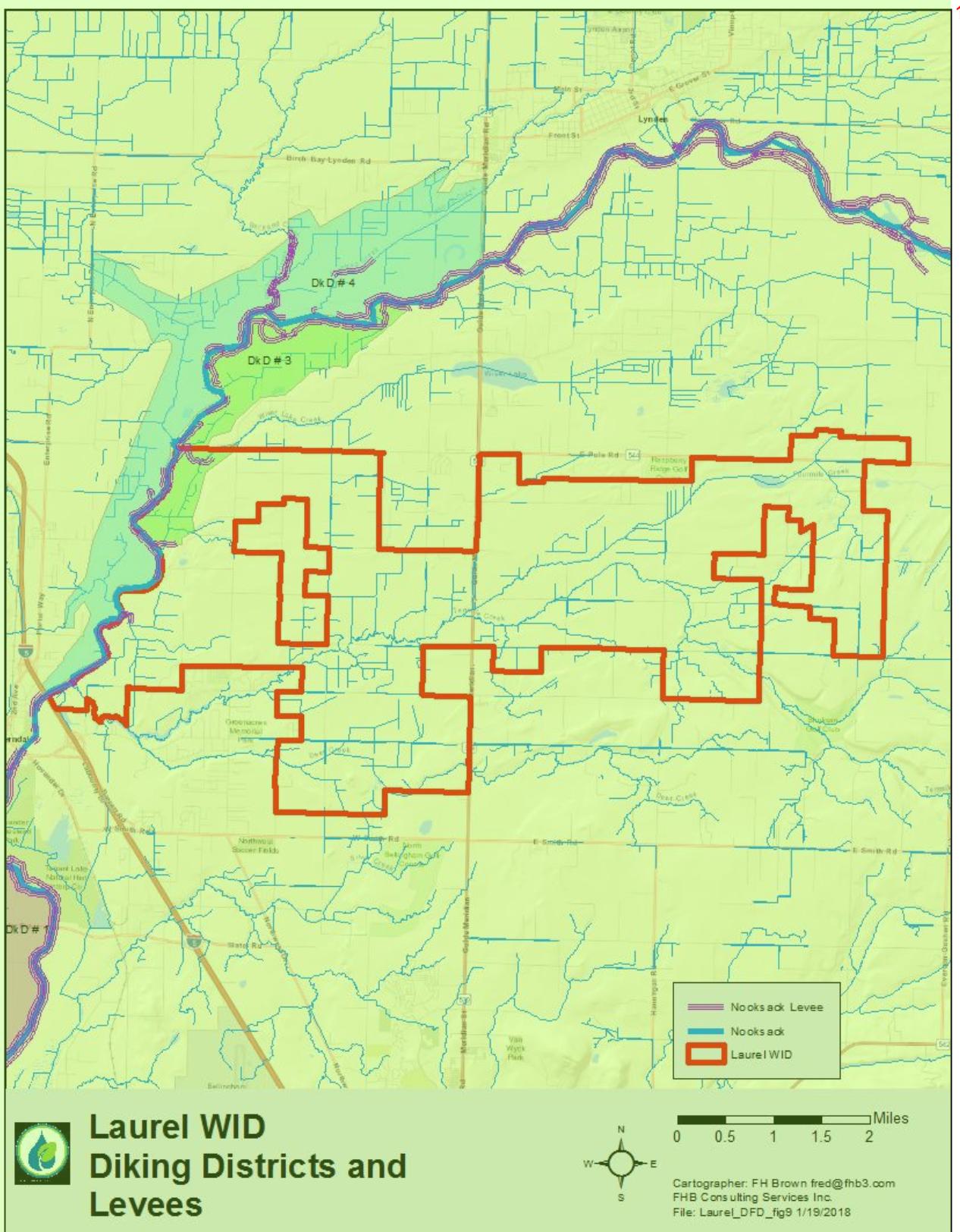


Figure 9. Map showing Diking Districts and Nooksack River levees associated with the Laurel WID ² area. Map layers: Whatcom County Public Works.

6.5 Water flow processes; fish and wildlife 1

6.5.1 Desired outcomes, goals and possible actions 2

During the February 2016 WID work session, priorities for water flow processes and fish and wildlife (including habitats) were discussed in some detail and suggested actions were noted for specific locations within the Laurel WID. The results of these discussions and the supporting analyses are contained in the Laurel WID mapping report. For easier reference, we have included the summary map of watershed enhancement priorities in Appendix A of this document, and the detailed information on watershed characterization can be found in the tables in Appendix B of this document.

The watershed characterization tables provide suggestions for site-specific watershed actions that the WID can use to begin developing their action plan, and to identify potential mitigation sites that could be included in a drainage management plan. For example, Table 5C in Appendix B contains the following note under "Summary & potential for enhancement":

"Upper Fourmile Creek: This area is of moderately high importance for water flow processes, but water flow processes are moderately to highly degraded, particularly surface storage, delivery and discharge. No water quality impairments are listed for this area, but there are listings for dissolved oxygen and bacteria in Tenmile Creek downstream of the confluence with Fourmile Creek. Enhancement actions should focus on increasing surface storage in order to retain surface flows for longer. Preventing additional impervious cover and reducing existing impervious cover will help to enhance recharge. Enhancing forest/riparian cover will help to improve delivery of water to streams."

In subsequent versions of the Management Plan, this section would include: 6

- next steps that the WID would take to discuss and agree on selected priority actions for protecting or enhancing water flow processes, fish and wildlife habitats in the WID area, using the information in the watershed characterization maps and tables (see Appendix B) and any other relevant information (see Appendix E);
- scope of work and resources needed for any additional work that might be needed to collate data or to conduct relevant baseline assessments for a set of agreed actions, to be incorporated into the WID Management Plan;
- priority actions, responsibilities and timelines.

Specialists: 8

From Table 2, the suggested priority actions are: 9

- i. *Review possible actions to enhance or protect water flow processes in specific locations within the Laurel WID area, as listed in the watershed characterization tables prepared during the WID work session in February 2016 (see tables in Appendix B of this Plan)**
 - *Suggested actions in specific parts of the WID include, for example, enhancing surface water storage, reducing or preventing additional impervious cover, protecting and/or restoring riparian and forest cover, reducing subsurface drainage rates.*
 - *Consider action at South Fork of Deer Creek culvert, access road east of Aldrich Rd. This would provide benefit for habitat and water quality (see Figure 8 in this Plan).*

*ii. Make a list of possible habitat-related actions (5/2016) and coordinate this with development of programmatic drainage permits, in order to utilize opportunities such as culvert replacement (4/2017) to "bank" mitigation that might be required for drainage permits. ** 1

iii. Consider request from Fourmile DID #3 to assist with mitigation planting in the spring (01/2018)?

* denotes actions that may need additional resources & more detailed scope & description

6.5.2 Supporting information related to water flow processes, fish and wildlife 2

The following supporting information supports the WID's discussions related to water flow processes, fish and wildlife, and the development of an action plan for inclusion in the WID Management Plan: 3

- Detailed agricultural and watershed enhancement tables prepared at the WID work session in February 2016 indicate priorities for water flow processes, fish and wildlife in different parts of the WID. The tables are contained in Appendix B of this Plan.
- Reference maps contained in Appendix C of this Plan.
- Data sources listed in Appendix E of this Plan.
- Data associated with previous and current efforts in the Tenmile watershed, described in more detail in section 5 of this Plan.

6.6 Agricultural protection (protection of the agricultural industry) 5

Protection of the agricultural industry will require not just protection of the agricultural land base, but also the provision of agricultural infrastructure and the ability to continue normal farming operations on working farmland. 6

In subsequent versions of the Management Plan, this section would include: 7

- scope of work and resources needed for any additional work that might be needed to collate data or to conduct relevant baseline assessments, to be incorporated into the WID Management Plan;
- priority actions, responsibilities and timelines.

6.6.1 Desired outcomes, goals and possible actions 9

From Table 2, the suggested priority actions are: 10

- i. engage and communicate with non-ag landowners in the WID area about WID priorities and programs, normal farming operations, right-to-farm etc. (include specific actions in the communication strategy)* 11
- ii. coordinate with Whatcom Family Farmers to address legal challenges and preserve "one voice outreach" on behalf of agriculture (from March 20 work session)

* denotes actions that may need additional resources, and more detailed scope & description

6.6.2 Supporting information related to agricultural protection 1

Available supporting information includes: 2

- Detailed agricultural and watershed enhancement tables prepared at the WID work session in February 2016 indicate priorities for water flow processes, fish and wildlife in different parts of the WID. The tables are contained in Appendix B of this document.
- Reference maps contained in Appendix C of this Plan (specifically the map of Agriculture Priority Areas).
- Gillies J & MacKay H (2016). *Preliminary Assessment of Drivers of Agricultural Land Conversion in Whatcom County, Washington*. Project Memo prepared for the Whatcom County Agriculture-Watershed Pilot Project, Whatcom County Planning & Development Services, Bellingham. <https://sites.google.com/site/wcwatershedag/home>

6.7 Communication, outreach, education and reporting strategy 4

In addition to the technical work associated with preparing a Management Plan and implementing actions on the ground, the WID board will need to keep communicating internally with WID members and engaging with them on addressing agreed priority issues, and communicating externally with neighboring landowners, other stakeholders and relevant agencies. 5

While much of the work of external communication and engagement would be coordinated through the Ag Water Board, Laurel-specific information and inputs will be needed for the AWB's efforts. 6

In subsequent versions of the Management Plan, this section would include: 7

- An outline of how the WID currently approaches internal and external communication and engagement;
- Next steps for communication and engagement related to implementation of the Management Plan;
- Scope of work and resources needed to assist the WID in communication and engagement related to future implementation of the Management Plan, including templates for regular reporting on progress with priority issues and actions;
- priority actions, responsibilities and timelines.

Specialists: 9

From Table 2, the suggested priority actions are: 10

- i. Internal: Prepare a Management Plan for the Laurel WID
- ii. Internal: Establish a template for tracking and regular reporting of WID progress on priority issues, based on a set of simple indicators of progress.*
- iii. Internal: Continue to distribute newsletter to WID members summarizing WID progress.
- iv. Internal: Coordinate with other WIDs to help members build skills for effective engagement and communication (March 2017 work session notes).
- v. External: Coordinate with other WIDs to share what farmers are doing to benefit water quality and habitat (March 20th work session notes)
- vi. External: Coordinate with other WIDs to track legislation, rule-making, agendas and impacts on agriculture at County, State, Federal levels (March 20th work session notes; Whatcom County Agricultural Advisory Committee & Whatcom County Planning Commission were mentioned)

- vii. *Added after Tenmile forum on March 1*: coordinate with the WCD and the Tenmile Clean Water Project to integrate planning and implementation for WID outreach and Tenmile Watershed outreach efforts (WID, WCD)
- viii. *Added after April 2018 board meeting*: coordinate with the Drainage Improvement Districts to resolve sharing of costs, permitting and mitigation for work on drainage infrastructure.
- * denotes actions that may need additional resources, and more detailed scope & description



Appendix A: Executive Summary of the 2016 Agriculture-Watershed Characterization and Mapping ¹ Report for the Laurel WID

Contains maps and a summary table showing the agricultural and watershed enhancement priorities ² based on the February 2016 work session with Laurel WID members and on additional technical analysis by the Ag-Watershed Project team. The full WID mapping report can be downloaded from the Laurel WID website <https://www.laurelwid.com/> [Alternative download [here](#)]

Source: ³

Whatcom County Agriculture-Watershed Pilot Project (2016). *Agriculture-Watershed Characterization and Mapping Report for the Laurel Watershed Improvement District*. Whatcom County Planning & Development Services. <https://www.laurelwid.com/> [Alternative download [here](#)]





Whatcom County Ag-Watershed Project



PROJECT PARTNERS



The Ag-Watershed Project is a research and development project ¹ funded by a National Estuary Program Watershed Protection and Restoration Grant (June 2012 to June 2016) to Whatcom County Planning & Development Services, administered by the Washington Department of Commerce. Project partners include: Whatcom Farm Friends–Community Education, Whatcom Conservation District and Washington State Department of Fish & Wildlife.

Project fact sheets and links to all previous work, including technical ² reports and reference documents can be found at
<http://whatcomcounty.us/2260/Agricultural-Watershed-Pilot-Project>

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Photo credits: John Gillies, Stephen Seymour ⁷

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Background¹

The agriculture-watershed characterization maps and tables² combine existing spatial data with field experience and farmers' local knowledge to identify agricultural priorities and needs in the lowland areas of Whatcom County and to bring those into the planning conversation with watershed priorities and needs. The results are intended to support integrated land and water planning at watershed scale, and to support the identification and prioritization of agricultural and watershed enhancement actions at farm and reach scale. These products will be provided to the Watershed Improvement Districts (WIDs) and Special Districts to inform and complement their current comprehensive planning work.

The full characterization and mapping report for the Laurel WID¹³ contains the reference information, work session information and results of the agriculture-watershed characterization and analysis conducted in 2016. The document is arranged into sections that allow easy access to specific categories of information.

The results of the characterization and mapping have also been⁴ incorporated into an online story map at <http://arcg.is/29MYdYu>²

A customized report has been prepared for each of the six⁵ Watershed Improvement Districts in Whatcom County. Full reports for other Watershed Improvement Districts can be accessed through the WID websites³ or through the Ag-Watershed Project page.⁴

The characterization and mapping results presented in this report⁶ have been derived from multiple information sources. The information is provided for planning purposes only, is not for use in regulatory actions, and is intended to contribute to ongoing Whatcom County Planning and Development Services efforts to improve agricultural and watershed conditions.

Definitions: for the purposes of the Ag-Watershed Project,

- *agricultural enhancement* entails maintaining the land base, soil, water, air, plants, animals, production capacity and natural infrastructure necessary to keep farmers farming over the long term as land uses and economic situations change over time. Thus "agricultural enhancement" and "agricultural protection" include but are not limited to agricultural land protection alone.
- *watershed enhancement* actions are those actions which improve the ability of the watershed to provide its natural benefits and services to communities. Watershed enhancement includes the idea of "repairing" major landscape processes related to hydrology and ecosystems, in order to maintain, protect or improve the delivery of watershed services.

¹ Whatcom County Agriculture-Watershed Pilot Project (2016). *Agriculture-Watershed Characterization and Mapping Report for the Laurel Watershed Improvement District*. Whatcom County Planning & Development Services.

Download from <http://www.laurelwid.com/>

² Whatcom County Agriculture-Watershed Project (2016), *Agriculture-Watershed Characterization & Mapping, Whatcom County*. Story map prepared for the Whatcom County Agriculture-Watershed Pilot Project, Whatcom County Planning & Development Services, Bellingham

³ Links to each WID website can be found at
<http://www.agwaterboard.com/>

⁴ See <http://www.co.whatcom.wa.us/2260/Agricultural-Watershed-Pilot-Project>

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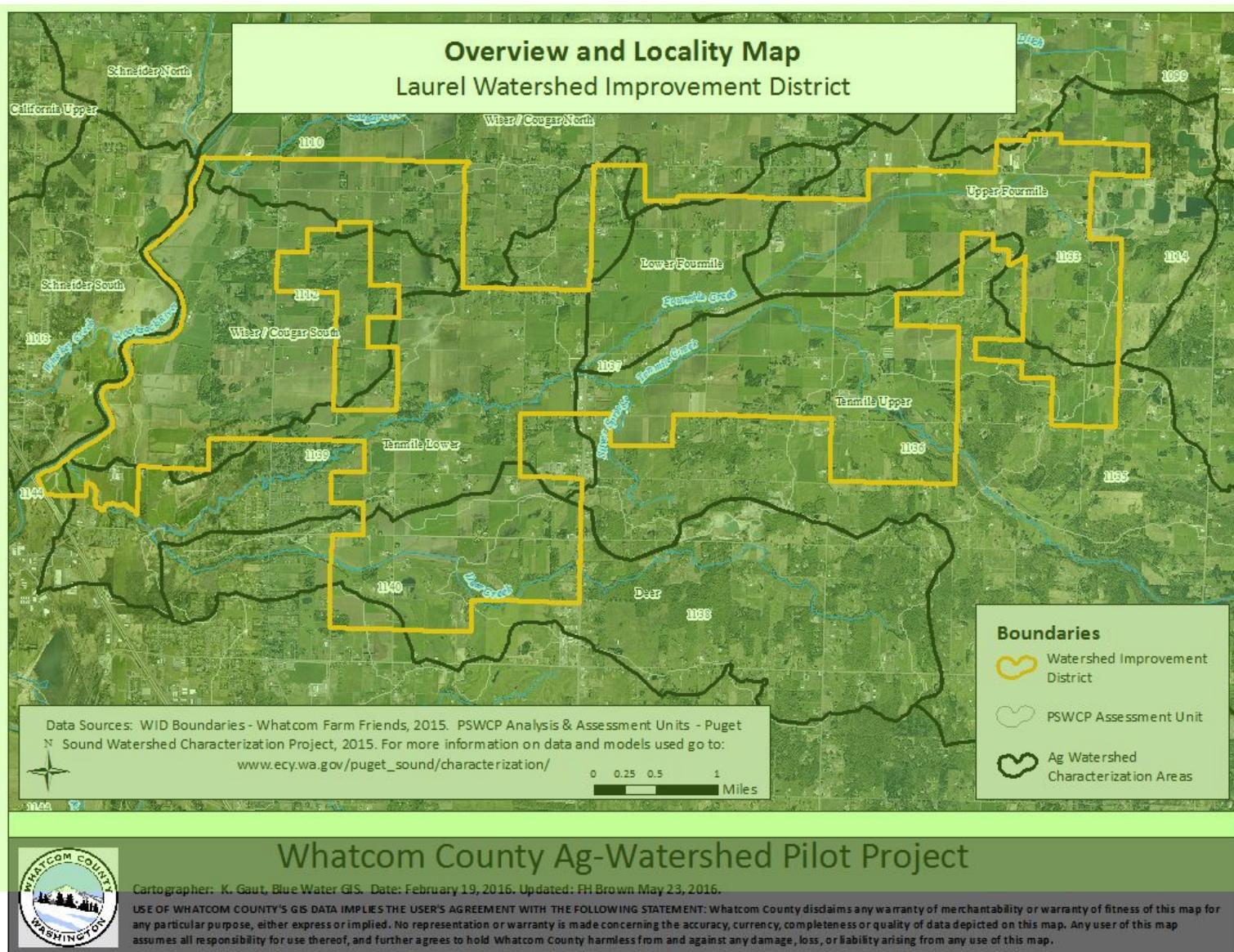


Figure 1. Laurel WID: Overview and locality map [2](#)

3

Approach used for agriculture-watershed¹ characterization

Pilot characterization and mapping (2012)²

The methodology for agriculture-watershed characterization and mapping was developed and pilot-tested during Phase 1 of the Ag-Watershed Project. The pilot focus area covered the Bertrand, Fishtrap and Kamm watersheds. The pilot results are reported in the Phase 1 report on mapping and characterization (Gill, 2013).⁵ Project Fact Sheet 2 provides additional background information on the agriculture-watershed characterization and mapping process.⁶

Information that was gathered during the pilot study in 2012 was reviewed and updated and has been incorporated into the 2016 agriculture-watershed characterization reports for the Bertrand, North Lynden and South Lynden Watershed Improvement Districts.

Methodology used for the 2016 WID characterization and mapping⁵

Areas within the Laurel Watershed Improvement District (WID) have been prioritized for both watershed and agricultural enhancement. This work has used an approach of structured combination and integration of local field knowledge and experience with a series of reference maps and tables, all of which draw on existing information and data.

⁵ Gill P (2013). *Agriculture-Watershed Characterization and Mapping Report for the North Lynden watersheds*. Prepared for the Whatcom County Agriculture-Watershed Pilot Project, Whatcom County Planning & Development Services, Bellingham.

<http://www.co.whatcom.wa.us/2260/Agricultural-Watershed-Pilot-Project>

⁶ Ag-Watershed Project fact sheets can be downloaded from
<http://whatcomcounty.us/2260/Agricultural-Watershed-Pilot-Project>

A work session was held with Laurel WID members and technical staff of local agencies in February 2016, during which participants used maps to identify and prioritize the type and location of agricultural and watershed services that could potentially be enhanced on agricultural land where there is potential for mutual benefit to both agricultural and watershed systems.⁷

Watershed analysis⁸

The results of the watershed characterization and mapping for the Laurel WID include tables and summary maps which describe the watershed services that are most needed for a healthy watershed (including the restoration of salmon populations) and where they could be enhanced in the watershed.

In order to generate these tables and summary maps for the Laurel WID, the information contained in the watershed reference maps (see section 6 of the main report) was combined with the results of watershed characterization⁷ (water flow assessments for WRIA 1, provided by the Department of Ecology in a series of maps showing the areas which are most in need of either restoration or protection of larger-scale water flow processes). The work session participants reviewed this information, provided additional local field knowledge on site-specific watershed priorities, and identified potential actions or projects that could help to achieve watershed priorities.

A more detailed description of the watershed characterization methodology is provided in section 5 and Appendix C of the main report.

⁷ Watershed 'characterization' is a set of water and habitat assessments that compare areas within a watershed for restoration and protection value. It is a coarse-scale tool that supports decisions regarding where on the landscape should efforts be focused first, and what types of actions are most appropriate to that place." See

http://www.ecy.wa.gov/puget_sound/characterization/index.html

Agricultural analysis 1

The results of the agricultural characterization and mapping for the Laurel WID include tables and summary maps which describe the agricultural services that are most needed for the long-term success of agriculture, and where they could be enhanced in the watershed. The primary focus was on the “natural infrastructure” for agriculture: soils, water, adequate drainage and flood protection, and long-term protection of the agricultural land base.

Methods used to prioritize agricultural needs are based on a combination of: information from (i) existing agricultural protection programs in Whatcom County, (ii) available GIS data contained in the agricultural reference maps (see section 6 of the main report) and (iii) local knowledge provided at the WID work session.

At the WID work session, participants assisted the project team to collate and evaluate information on agricultural system needs and priorities in the WID area, and to locate the different agricultural system needs and priorities on base maps of the WID area. A more detailed description of the methodology is provided in section 3 of the main report.

Application: How to use the results of the agriculture-watershed characterization and mapping 5

The WID can use the characterization maps and tables of agricultural and watershed priorities to support their land and water planning, management, and project funding.

The characterization maps and tables should help the WID to identify, prioritize, and strategically locate practical beneficial projects and actions at the farm or reach-scale, and to enhance agricultural operations and watershed functions in the WID area.

The characterization maps and tables should also help the WID 8 identify project opportunities that enhance watershed processes while strengthening agriculture where agricultural and watershed priorities are complementary, and to find acceptable trade-offs where they compete.

These results, which incorporate local knowledge and farmer 9 insights, may also be used to communicate the WIDs’ priority enhancement needs to planners for consideration in broad scale planning such as Whatcom County’s Comprehensive Planning Process. More information on how to use these results in planning can be found in the Ag-Watershed Project Fact Sheet 5, included as Appendix D of the main report.

Summarized results for the Laurel Watershed 10 Improvement District

The summary table below (Table 1) and the summary maps in 11 Figure 2 highlight the most significant watershed and agricultural enhancement opportunities within the Laurel WID area. Check marks in Table 1 indicate where a specific enhancement priority was identified during the characterization and mapping process.

Detailed descriptions of priorities, the sources of data or 12 information on priorities, and descriptions of each priority and the opportunities for enhancement through specific actions can be found in Tables 3 and 5 of the main report.

Table 1. Summary results of agriculture-watershed characterization and mapping for the Laurel WID ¹
 (See locality map in Figure 1 for locations of agriculture-watershed characterization areas)

	Tenmile Creek Upper	Tenmile Creek Lower	Fourmile Creek Upper	Fourmile Creek Lower	Deer Creek	Wiser/Cougar North	Wiser/Cougar South
Agricultural Enhancement Priority (See Table 3 in the main report for details)							
Prime agricultural soils	ü	ü	ü	ü	ü	ü	ü
Water quality for crops and livestock	ü	-	-	-	-	-	-
Water quantity	ü	ü	ü	ü	ü	-	ü
Agricultural drainage	ü	-	ü	ü	ü	-	-
Flood protection	ü	-	-	-	-	-	-
Agricultural land base:							
Important agricultural land	ü	ü	ü	ü	ü	ü	ü
Protection from development pressure	ü	ü	ü	ü	ü	ü	ü
Other:							
Watershed Enhancement Priority (See Table 5 in the main report for details)							
Water Quality							
Nutrients, Ammonia-N	-	-	-	-	ü (Ammonia-N)	-	-
Bacteria	ü	ü	-	-	ü	ü	-
Temperature	-	-	-	-	-	-	-
Dissolved oxygen	ü	ü	-	-	ü	ü	-
Other:					ü(pH)		
Habitat							
Salmon spawning (current, documented)	-	-	-	-	ü	-	-
Anadromous fish	ü	ü	ü	ü	ü	ü	ü
Wildlife	-	-	ü	-	ü	ü	-
Wetland	ü	ü	ü	ü	ü	ü	ü
Water Flow Processes ⁸							
Delivery	-	-	ü	-	-	-	-
Discharge	-	ü	-	-	ü	-	ü
Recharge	-	-	ü	-	-	-	-
Storage	ü	ü	ü	ü	ü	ü	ü
Other	-	-	-	-	-	-	-

⁸ Check marks are shown in the summary table if the recommendation for any water flow process is indicated as highest restoration/restoration/highest protection/protection. ³

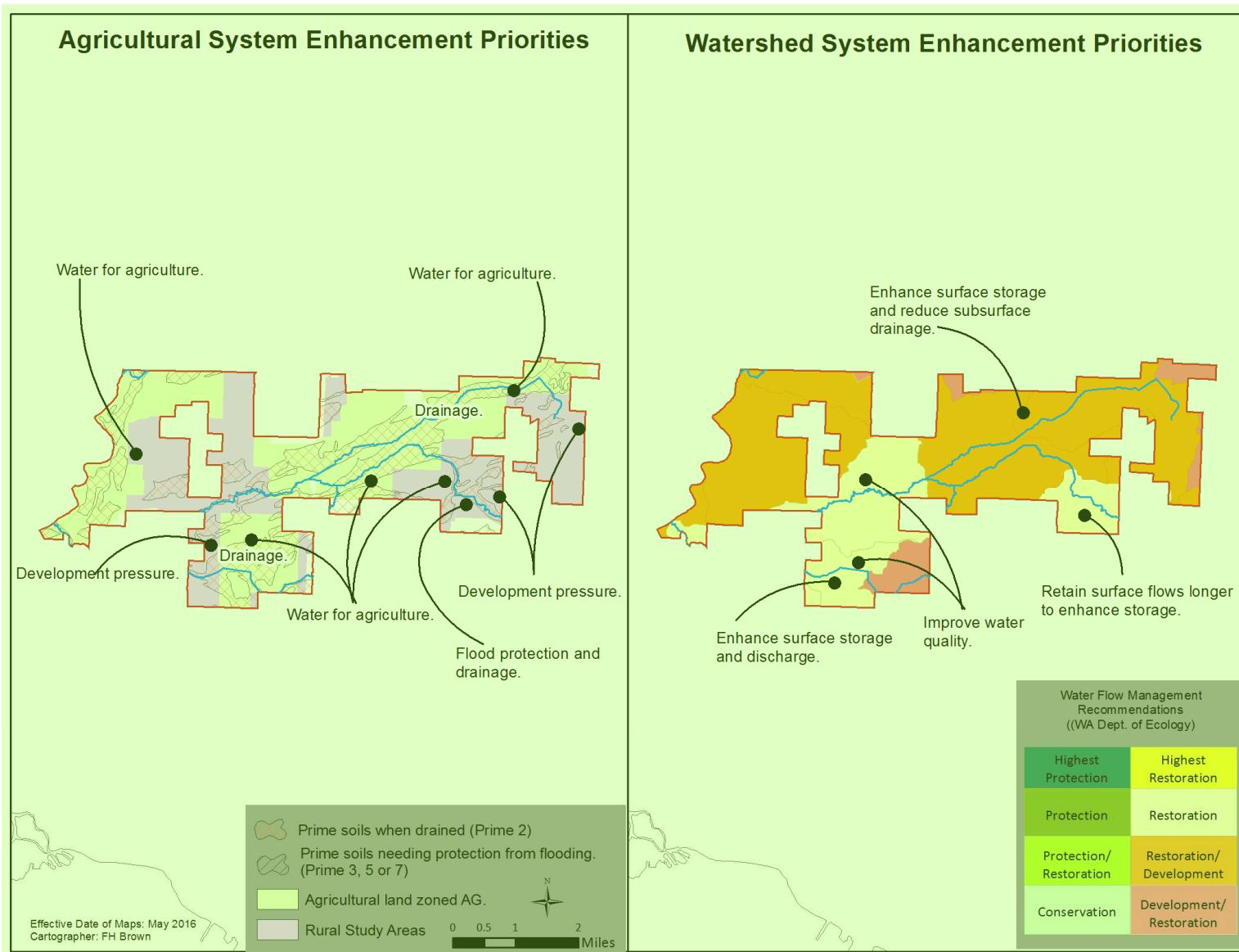


Figure 2. Summary maps: Agricultural and watershed system enhancement priorities 2

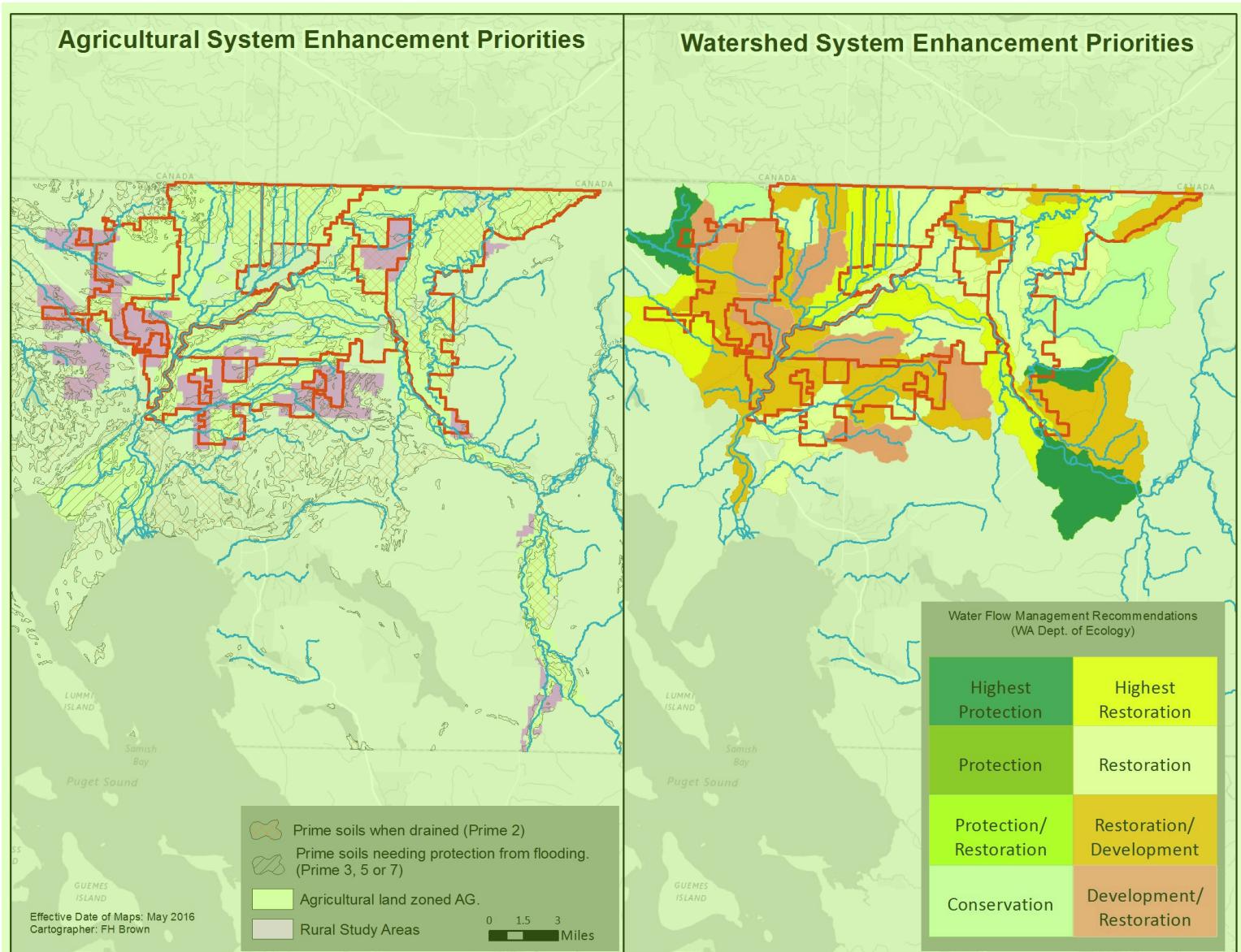


Figure 3. General agricultural and watershed enhancement priorities for the lowland areas of Whatcom County²

1

Possible future challenges and priorities ¹

Future challenges (1- 10 years) may include issues listed below. See ² Table 1 for the full summary results of agriculture-watershed characterization and mapping for the Laurel WID.

- Water quantity: Access to legal irrigation water is a key priority (39 new applications have been filed in the WID area over the past five years). Barrett Lake, Deer Creek, Fourmile Creek, and Tenmile Creek are closed year-round to further appropriations unless mitigated. Restrictions on irrigation from creeks, tributaries, and other surface water sources are in place until instream flows levels are met during critical periods for fish per the existing Nooksack Instream Flow Rule.⁹ Limited access to water rights may impact water quantity accessibility in some areas of the WID, as major Group A public suppliers do not have adequate water rights in proper locations to meet projected future demand.¹⁰ ³
- Protection of agricultural land from development pressure: All sub-basins within the Laurel WID area contain prime agricultural soils that are considered important to Whatcom County's agricultural land base. Pressures from residential and commercial development are found in sub-basin areas that contain major arterials. ⁴

• Water quality: Tenmile and Fourmile Creeks are actively monitored for water quality parameters (dissolved oxygen, bacteria, and fecal coliform). Groundwater quality (nitrates) is of concern in large areas of the Sumas-Blaine Aquifer located within the WID area. ⁵

• Drainage: Much of the Laurel WID area includes woodlots and riparian plantings along major creeks and tributaries of the Nooksack River. Regular management of beaver and removal of other impediments to agricultural drainage infrastructure is needed, in order to access fields at critical times during the growing season. ⁶

⁹ [WAC 173-501](#) (1985), Instream Resources Protection Program – Nooksack Water Resource Inventory Area 1.

¹⁰ *Whatcom County Coordinated Water System Plan Update* (2016), <http://www.whatcomcounty.us/1035/Coordinated-Water-System-Plan-Update>

Appendix B: Agricultural and watershed characterization tables for the Laurel WID ¹

Contains the detailed tables listing and describing agricultural and watershed enhancement priorities as discussed at the February 2016 work session of the Laurel WID. The tables are included in the full Agriculture-Watershed Characterization Report (2016) but are presented in this appendix for easy reference.

Source for these tables:

Whatcom County Agriculture-Watershed Pilot Project (2016). *Agriculture-Watershed Characterization and Mapping Report for the Laurel Watershed Improvement District*. Whatcom County Planning & Development Services. The full WID mapping report can be downloaded from the Laurel WID website <https://www.laurelwid.com/> [Alternative download [here](#)]

Update March 2018: Please note that the Washington Department of Ecology has a new website. ⁴

References to Ecology's Water Quality Assessment should now be directed to the new link

<https://fortress.wa.gov/ecy/approvedwqa/ApprovedSearch.aspx>

Table 3. Agriculture characterization tables for the Laurel WID. ¹

NOTE: Possible actions include: Specific actions identified by WID Actions Map # and location (e.g. L17) and Assessment Unit (AU); and general actions which do not have locations specified. Some of these actions do not appear on the WID Actions Map due to: (i) action is general in description, no location is noted; (ii) action is specific in description, but no location noted; (iii) action is general in description, but location is outside the WID area; or (iv) action is specific in description, location outside the WID. AUs are provided when known.

3A. Agricultural Enhancement Priorities: Upper Tenmile Creek ³

	Water quantity: Irrigation, stock and processing	Water quality	Drainage	Flood protection	Land	Other	Possible actions
Upper Tenmile Creek AU1137 AU1136 Notes from reference maps and other documents:	10-25 new applications for water rights in Upper Tenmile – See Ag Priorities maps: Water Quantity Water quantity priority	Sections of Tenmile Creek in Upper Tenmile are in category 5 ¹ for DO. One section is in category 4a ² for bacteria. ³ <i>Note: Above is from Department of Ecology 2012 Water Quality Atlas data. 2016 update shows Ten Mile Creek in this section is also listed in category 5 for temp.⁴</i> Iron (natural origin) found in most areas of Sumas aquifer in the Lynden-Everson- Nooksack-Sumas study area. ⁵	25-50% of soil in Upper Tenmile is prime if drained. – See Ag Priorities map: Drainage.	<5% of soil is prime if protected from flooding in Upper Tenmile – See Ag Priorities maps: Flooding.	41% of land is in Ag Zoning and RSA. An RSA occupies a substantial portion of Upper Tenmile. – See Ag Priorities map: Ag Land Base. Ag land base priority in section of Upper Tenmile that is within Laurel WID >85% of area is prime 1-10 in Upper Tenmile. – See Ag Priorities map: Prime Soils. Ag prime soils priority		
Upper Tenmile Creek AU1137 AU1136 Notes from work session February 2016	Silver Spring Creek is very important - supports irrigation use and maintains Tenmile Creek flow. Upper Silver Spring Creek goes dry (possibly due to gravel pit at headwater of Silver Spring Creek). A deep ditch below Ten Mile road goes dry from July through September	Problems with DO and fecal coliforms in main creek. There is increased sediment in Silver Springs Creek, possibly in runoff from Laurel Rd and upstream development. AU 1136: Some iron issues in water in this area. Ag water quality priority	Important to maintain drainage. Beaver control is needed. Sediment accumulates in channel (channel not specified by participants). AU 1136: Flow is not good by the Old Guide and Hemmi Rd area. After silage was harvested out of Hemmi/Tenmile area the ground became wet year round. Ag drainage priority	AU 1136: Regular flooding after installation of log jams in channel of Tenmile. Ag flood protection priority	AU 1136: Development causing some increased sediment and storm water flow. Development pressure	Historically, water quality has been good.	(L17/30) AU 1137 Fish passage problem. (L3/31) AU 1137: Clean out Tenmile Creek channel west of Chasteen Rd for 0.5 miles downstream. (L1/32) AU 1137: Consider purchase of development rights in upper Silver Springs Creek. AU 1136: Remove old dam at the school.

¹ Polluted waters that require a TMDL (total maximum daily load) or other WQI (water quality Improvement) project: the traditional list of impaired water bodies traditionally known as the 303(d) list. Placement in this category means that Ecology has data showing that the water quality standards have been violated for one or more pollutants, and there is no TMDL or pollution control plan. WA Department of Ecology, 2015. *Water Quality Assessment Categories*. <https://ecology.wa.gov/Water-Shorelines/Water-quality/Water-improvement/Assessment-of-state-waters-303d/Assessment-categories> (last accessed 1/24/18)

² Category 4a - has a TMDL: water bodies that have an approved TMDL in place and are actively being implemented. WA Department of Ecology, 2015. *Water Quality Assessment Categories*

² Category 4a - has a TMDL: water bodies that have an approved TMDL in place and are actively being implemented. WA Department of Ecology, 2015. *Water Quality Assessment Categories*. <https://ecology.wa.gov/Water-Shorelines/Water-quality/Water-improvement/Assessment-of-state-waters-303d/Assessment-categories> (last accessed 1/24/18)

³ Ecology (2012), *Water Quality Assessment for Washington*. Now at: <https://fortress.wa.gov/ecy/wqamapviewer/map.aspx>

⁴ Ecology (2016), *Washington State Water Quality Atlas*. <https://fortress.wa.gov/ecy/wqamapviewer/map.aspx>

⁵ Cox, S. E., and Kahle, S. C. (1999), *Hydrogeology, Ground-Water Quality, and Sources of Nitrate in Lowland Glacial Aquifers of Whatcom County, Washington, and British Columbia, Canada*; Water-Resources Investigations Report 98-4195. USGS. <<http://pubs.usgs.gov/wri/1998/4195/report.pdf>> (last accessed 4/4/2016)

3B. Agricultural Enhancement Priorities: Lower Tenmile Creek¹

	Water quantity: Irrigation, stock and processing	Water quality	Drainage	Flood protection	Land	Other	Possible actions
Lower Tenmile AU1139 plus small portion of AU1137 Notes from reference maps and other documents:	1-10 new applications for water rights in Lower Tenmile. See Ag Priorities maps: Water Quantity (map shows 6 applications) Water quantity priority	A section of Tenmile Creek in Lower Tenmile is in category 5 for DO, and category 4a for bacteria. ⁶ Iron (natural origin) found in most areas of Sumas aquifer in the Lynden-Everson-Nooksack-Sumas study area. ⁷	25-50% of soil in Tenmile Lower is prime if drained. – See Ag Priorities maps: Drainage.	<5% of soil is prime if protected from flooding in Lower Tenmile. A small area along the Nooksack River lies in floodway and 100-year flood zone – See Ag Priorities maps: Flooding.	71% of land in Lower Tenmile is in Ag Zoning and RSA. Ag land base priority A Rural Study Area occupies a substantial portion of this subbasin. – See Ag Priorities map: Ag Land Base. Development pressure 92% of soils in Lower Tenmile are Prime. See Ag Priorities map: Prime Soils. Ag prime soils priority		
Lower Tenmile AU1139 plus small portion of AU1137 Notes from work session February 2016		West of Guide Meridian work is being done on creek. Participants noted water temperature concerns for the creek. Iron in groundwater can clog berry irrigation equipment.					

⁶ Ecology (2012), *Water Quality Assessment for Washington*. Now at: <https://fortress.wa.gov/ecy/wqamapviewer/map.aspx>

⁷ Cox, S. E., and Kahle, S. C. (1999), *Hydrogeology, Ground-Water Quality, and Sources of Nitrate in Lowland Glacial Aquifers of Whatcom County, Washington, and British Columbia, Canada*; Water-Resources Investigations Report 98-4195. USGS. <<http://pubs.usgs.gov/wri/1998/4195/report.pdf>> (last accessed 4/4/2016)

3C. Agricultural Enhancement Priorities: Upper Fourmile Creek ¹

2

	Water quantity: Irrigation, stock and processing	Water quality	Drainage	Flood protection	Land	Other	Possible actions
Upper Fourmile Creek AU1133 AU1114 Notes from reference maps and other documents:	1-10 new applications for water rights in Upper Fourmile – See Ag Priorities maps: Water Quantity (map shows 4 applications). Water quantity priority	<i>Note: There were no category 4 or 5 Department of Ecology listings in the 2012 Water Quality Atlas data. The 2016 Water Quality Atlas shows sections of Fourmile Creek in this area are listed in category 5 for DO, pH.⁸</i>	25-50% of soil in Upper Fourmile is prime if drained. – See Ag Priorities map: Drainage. Drainage District # 3 is located within the Fourmile subbasin. ⁹	<5% of soil is prime if protected from flooding in Upper Fourmile. – See Ag Priorities maps: Flooding.	81% of land in Upper Fourmile is in Ag Zoning & RSA. Ag land base priority A Rural Study Area occupies a portion of this subbasin. – See Ag Priorities map: Ag Land Base. Development pressure >85% of area is prime 1-10 in Upper Fourmile – See Ag Priorities map: Prime Soils. Ag prime soils priority		
Upper Fourmile Creek AU1133 AU1114 Notes from work session February 2016	Water Rights are available. There is plenty of surface water. There are lots of springs in the area. More groundwater irrigation rights are needed.	Green Lake has water quality problems May-Oct (low DO, high temperature)	Drainage is an issue in this area. Peat soils around Noon and Lunde Rds need drainage; new blueberries on Pole Rd are adding drainage water to the creek; Guide Meridian runoff. Green Lake Slough was dredged 10 years ago and this helped drainage in area. AU1114: The Drainage District used to dredge Fourmile and this helped drainage. (36) A comment was made that the elevation of Fourmile drops 1' from Green Lake to Hannegan Rd. Loss of ag lands in area at the edge of the gravel pit - 5 years ago it was dry, where it is now chronically wet. Ag drainage priority	Beaver dams are creating localized flood problems and keeping land out of agriculture between Green Lake and the gravel pit. (L9/39) Beaver dam removal and buffer planting maintenance is needed to prevent channel blockage by bridge. Flood protection is not currently a priority in this area – however, see beaver maintenance item L18.	5-acre development has brought increased stormwater runoff flowing toward Fourmile Creek. Land can be used for residential between Central and Ten Mile Rds.	Noon Rd and Hemmi Road are built on peat and are settling Fourmile to Guide has less reed canary grass and good shade.	(L4/33) AU1133: Potential sediment trap in Fourmile Creek (L5/34) AU1133: Maintenance required on Fourmile Creek to keep channel flowing. (L7/36) AU 1133: Bypass around lake needs to be cleaned. (L18/37) AU1114: Beaver management needed to prevent flooding. (L8/38) AU1114: Maintenance needed to clear willows out of waterway. (L9/39) AU1114: More ag land would be available if this area drained. (L11/41) AU1133: Maintenance needed to clear willows that have fallen into water.

⁸ Ecology (2016), Washington State Water Quality Atlas. <https://fortress.wa.gov/ecy/wqamapviewer/map.aspx>

⁹ WCD (2014), Agricultural Drainage for Drainage Districts. Whatcom Conservation District. <http://www.whatcomcd.org/ag-drainage-districts>

3D. Agricultural Enhancement Priorities: Lower Fourmile Creek ¹

	Water quantity: Irrigation, stock and processing	Water quality	Drainage	Flood protection	Land	Other	Possible actions
Lower Fourmile Creek AU1137 Notes from reference maps and other documents:	1-10 new applications for water rights in Lower Fourmile. See Ag Priorities maps: Water Quantity (map shows 4 applications). Water quantity priority	<i>Note: There were no category 4 or 5 Department of Ecology listings in the 2012 Water Quality Atlas data. The 2016 Water Quality Atlas shows sections of Fourmile Creek in this area are listed in category 5 for DO, pH.</i> ¹⁰	25-50% of soil in Lower Fourmile is prime if drained. See Ag Priorities map: Drainage. Drainage District #3 is located within the Fourmile subbasin. ¹¹	<5% of soil is prime if protected from flooding in Lower Fourmile – See Ag Priorities map: Flooding.	84% of land in Lower Fourmile is in Ag Zoning & RSA. Ag land base priority A Rural Study Area occupies a small portion of this subbasin. – See Ag Priorities map: Ag Land Base. Development pressure >85% of area is prime 1-10 in Lower Fourmile. – See Ag Priorities map: Prime Soils. Ag prime soils priority		
Lower Fourmile Creek AU1137 Notes from work session February 2016	Summer flow is low. Need more groundwater irrigation rights.	Participants mentioned fecal coliforms, DO as concerns, particularly for Tenmile downstream of Fourmile confluence. Low DO is possibly associated with peat soils in the area.	Fourmile channel grade is flat and requires periodic maintenance to maintain drainage. There are peat soils in the area which require drainage. Drainage below old Guide is very bad. Land is 4-5" under water and drainage for whole Tenmile system is impaired. Flow gets slow by the school. Ag drainage priority				Need to check if old rip rap is possibly adding to channel failures. (iii) Allow for more fall to the creek to increase outflow. (iv)

¹⁰ Ecology (2016), Washington State Water Quality Atlas. <https://fortress.wa.gov/ecy/wqamapviewer/map.aspx>

¹¹ WCD (2014), Agricultural Drainage for Drainage Districts. Whatcom Conservation District. <http://www.whatcomcd.org/ag-drainage-districts>

3E. Agricultural Enhancement Priorities: Deer Creek ¹

	Water quantity: Irrigation, stock and processing	Water quality	Drainage	Flood protection	Land	Other	Possible actions
Deer Creek AU1140 and AU1138 Notes from reference maps and other documents:	1-10 new applications for water rights in Deer Creek – See Ag Priorities maps: Water Quantity (map shows 3 applications within the WID area of Deer Creek). Water quantity priority	A section of Deer Creek is in category 5 for DO, pH, ammonia-N, and category 4a for bacteria. ¹² Iron (natural origin) found in most areas of Sumas aquifer in the Lynden-Everson-Nooksack-Sumas study area. ¹³	25-50% of soil in Deer is prime if drained. See Ag Priorities map: Drainage. Drainage Improvement District #30A includes the south fork of Deer Creek – <i>Agricultural Drainage for Drainage Districts.</i> http://www.whatcomcd.org/ag-drainage-districts	<5% of soil is prime if protected from flooding in Deer Creek. See Ag Priorities maps: Flooding.	The portion of Deer Creek that is within the Laurel WID is in Ag Zoning & RSA. See Ag Reference map: Agriculture Priority Areas. Ag land base priority 84% of soils are prime 1-10 in Deer Creek – See Ag Priorities map: Prime Soils. Prime soils priority		
Deer Creek AU1140 and AU1138 Notes from work session February 2016	Deer Creek goes dry in summer. Need to use water from community water association for stock watering. The summer of 2015 was very dry, the normally high quality hay production was reduced. One participant tried to install a 600 ft well in the area but the well yielded white sand & salt water. Lake in the area now drains neighboring landowner's spring (location detail not provided).	Iron levels are high in some areas. There are high fecal coliform counts in the area, participants had questions about possible sources of fecal coliforms. Crystal Springs development is a possible source of sediment entering the stream.	There were beaver issues in the lower areas (lower lands), but repeated dam removal over several years has controlled them. It is too wet to grow corn or grass in fields between Deer Creek and Axton, also wet through area along Guide and above Hemmi near woodlot. Ag drainage priority	Beaver dams cause flooding around backside of Wiser Lake. Flood protection is not currently a priority in this area but see beaver maintenance action item #L14.	Hay and beef cows in the area. Dairy farmers are leaving and selling land for berries. The land is good for growing lots of things. There are lots of residential conflicts: smells, noise, pesticide concerns. Development pressure The headwater is in jeopardy due to development - reduced streamflow.		(L13/44) AU1140: This area needs better drainage. (L20/45) Groundwater quantity is limited here, not enough for cows and lots of iron. (L14/46) AU1140: Problems with drainage and beaver management needed. (L15/47) AU1140: Wet field, would benefit from cleaning culvert. (L16/48) AU1140: Keeping this ditch clear is key to drainage to east. Creek runs slowly.

¹² Ecology (2012), *Water Quality Assessment for Washington*. Now at: <https://fortress.wa.gov/ecy/wqamapviewer/map.aspx>

¹³ Cox, S. E., and Kahle, S. C. (1999), *Hydrogeology, Ground-Water Quality, and Sources of Nitrate in Lowland Glacial Aquifers of Whatcom County, Washington, and British Columbia, Canada*; Water-Resources Investigations Report 98-4195. USGS. <<http://pubs.usgs.gov/wri/1998/4195/report.pdf>> (last accessed 4/4/2016)

3F. Agricultural Enhancement Priorities: Wiser Lake/Cougar Creek (South) ¹

	Water quantity: Irrigation, stock and processing	Water quality	Drainage	Flood protection	Land	Other	Possible actions
Wiser Lake/Cougar Creek (South) AU1112 Notes from reference maps and other documents:	1-10 new applications for water rights in Wiser/Cougar South – See Ag Priorities maps: Water Quantity (map shows 5 applications). Water quantity priority	Iron (natural origin) found in most areas of Sumas aquifer in the Lynden-Everson-Nooksack-Sumas study area. ¹⁴	<25% of soil in Wiser/Cougar South is prime if drained. See Ag Priorities map: Drainage.	<5% of soil is prime if protected from flooding in Wiser/Cougar South. A small area along the Nooksack River lies in floodway and 100 year flood zone. See Ag Priorities maps: Flooding.	97% of land in Wiser/Cougar South is in AG Zoning & RSA. Ag land base priority A Rural Study Area occupies a substantial portion of this sub-basin. See Ag Priorities map: Ag Land Base, and Ag reference map: Agriculture Priority Areas. Development pressure 80% of soils are prime 1-10 in Wiser/Cougar S. – See Ag Priorities map: Prime Soils. Ag prime soils priority		
Wiser Lake/Cougar Creek (South) AU1112 Notes from work session February 2016	Irrigation is critical by Piper and Northwest Rds. Groundwater is ample. There is a good well by Pole Rd.	Water is clean. Iron levels vary greatly, high in some places, not present in others.	The Sandy soils drain well here. Drainage District takes care of flooding well.	AU1112: Flood waters recede pretty quickly, but there is increasing spring and fall flooding. If trend continues it will impact farming operations, e.g. corn harvest.		Fish passage barrier between Chasteeen and Guide Meridian Rds.	[L12] AU1112: Drainage - improve drainage functions along Neevel Rd and Nooksack River. [L19] AU1112: Drainage - Confluence of Tenmile and Nooksack River would be a good place for floodgate. (iv)

¹⁴ Cox, S. E., and Kahle, S. C. (1999), *Hydrogeology, Ground-Water Quality, and Sources of Nitrate in Lowland Glacial Aquifers of Whatcom County, Washington, and British Columbia, Canada*; Water-Resources Investigations Report 98-4195. USGS. <<http://pubs.usgs.gov/wri/1998/4195/report.pdf>> (last accessed 4/4/2016)

3G. Agricultural Enhancement Priorities: Wiser Lake/Cougar Creek (North) – only a small portion is within the Laurel WID ¹							
	Water quantity: Irrigation, stock and processing	Water quality	Drainage	Flood protection	Land	Other	Possible actions
Wiser Lake/Cougar Creek (North) AU1110 Notes from reference maps and other documents:	1 new application for a water right in the portion of Wiser/Cougar North that is within the Laurel WID, but there are more applications in this area outside the WID boundary. See Ag Priorities maps: Water Quantity and Ag reference map: Water right points of diversion.	A section of Wiser Creek in Wiser/Cougar North are in category 5 for DO, and category 4a for bacteria, and a section of Unnamed Creek (Tributary to Nooksack River) in AU1110 is in category 5 for DO. ¹⁵ , ¹⁶ <i>Note: Above is from Department of Ecology 2012 Water Quality Atlas data. The 2016 update shows a section of Wiser Creek is also listed in category 5 for pH and Temperature.¹⁷</i>	25-50% of soil in Wiser/Cougar North is prime if drained. – See Ag Priorities map: Drainage. Drainage Improvement District #5 is located within the Wiser/Cougar North sub-basin. ¹⁸	<5% of soil is prime if protected from flooding in Wiser/Cougar North. A small area along the Nooksack River lies in floodway and 100-year flood zone – See Ag Priorities maps: Flooding.	83% of land in Wiser/Cougar North is in AG Zoning & RSA. Ag land base priority A Rural Study Area occupies a portion of this sub-basin. – See Ag Priorities map: Ag Land Base. Development pressure 94% of area is prime 1-10 in Wiser/Cougar North. – See Ag Priorities map: Prime Soils. Ag prime soils priority		
Wiser Lake/Cougar Creek (North) AU1110 Notes from work session February 2016	Sufficient water from Tenmile.		Drainage is sufficient.				

¹⁵ Ecology (2012), Water Quality Assessment for Washington. Now at: <https://fortress.wa.gov/ecy/wqamapviewer/map.aspx>

¹⁶ Ecology (2012), Water Quality Assessment for Washington. Now at: <https://fortress.wa.gov/ecy/wqamapviewer/map.aspx>

¹⁷ Ecology (2016), Washington State Water Quality Atlas. <https://fortress.wa.gov/ecy/wqamapviewer/map.aspx>

¹⁸ Agricultural Drainage for Drainage Districts. Whatcom Conservation District. <http://www.whatcomcd.org/ag-drainage-districts>

Table 5. Watershed characterization tables for the Laurel WID 1

NOTE: Possible actions include: Specific actions identified by WID Actions Map # location and Assessment Unit (AUs), and General actions which do not have locations specified. Some of these actions do not appear on the WID Priority Actions Map due to: (i) action is general in description no location is noted; (ii) action is specific in description but no location noted; (iii) action is general in description, located outside the WID area; (iv) action is specific in description, located outside the WID.

5A. Watershed Enhancement Priorities: Upper Tenmile Creek 3

	Wildlife habitat	Salmonid habitat	Water quality	Summary & potential for enhancement
Upper Tenmile AU1137 AU1136 + small portion of AU1135 Notes from reference maps and other documents	Critical Habitat: Wetland (See Watershed reference map: Priority Species & Habitats)	Chinook, chum, coho, cutthroat, & steelhead ¹⁹ (See Watershed reference map: Fish presence & fish barriers)	Sections of Tenmile Creek in Upper Tenmile (AU1137 and AU1136) are in category 5 ²⁰ for DO, and in category 4a ²¹ for bacteria. ²² <i>Note: Above is from Department of Ecology 2012 Water Quality Atlas data. 2016 update shows Ten Mile Creek in this section is also listed in category 5 for temp.²³</i>	Results of PSWC water flow assessment: AU1137: An area of moderate importance for all flow processes, especially surface storage. Overall water flow processes are highly degraded. AU1136: An area of high importance for discharge and moderately high importance for surface storage. Overall water flow processes are highly degraded, especially discharge and surface storage. AU1135: An area of moderately high importance for discharge and delivery processes. Overall water flow processes are moderately to highly degraded, especially discharge. Summary: This area is of moderate to moderate-high importance for water flow processes overall, but is moderately to highly degraded, particularly for surface storage processes. Category 5 for dissolved oxygen and Category 4a for bacteria in Ten Mile Creek. Enhancement actions should focus on increasing surface storage in order to retain surface flows for longer, particularly in the upper portion (AU1136). Decreasing the rate and quantity of drainage of subsurface waters will help to improve discharge to surface streams.
Upper Tenmile AU1137 AU1136 + small portion of AU1135 Notes from February 2016 work session		Good fish habitat in Silver Springs Creek (comment from WID work session.)		

¹⁹ Fish Habitat Technical Team (2004). WRIA 1 Watershed Management Project. Data provided by Sarah Watts, Whatcom County Planning & Development Services.

²⁰ Polluted waters that require a TMDL (total maximum daily load) or other WQI (water quality Improvement) project: the traditional list of impaired water bodies traditionally known as the 303(d) list. Placement in this category means that Ecology has data showing that the water quality standards have been violated for one or more pollutants, and there is no TMDL or pollution control plan. WA Department of Ecology, 2015. *Water Quality Assessment Categories*. <https://ecology.wa.gov/Water-Shorelines/Water-quality/Water-improvement/Assessment-of-state-waters-303d/Assessment-categories> (last accessed 1/24/18)

²¹ Category 4a - has a TMDL: water bodies that have an approved TMDL in place and are actively being implemented. WA Department of Ecology, 2015. *Water Quality Assessment Categories*

²² Category 4a - has a TMDL: water bodies that have an approved TMDL in place and are actively being implemented. WA Department of Ecology, 2015. *Water Quality Assessment Categories*. <https://ecology.wa.gov/Water-Shorelines/Water-quality/Water-improvement/Assessment-of-state-waters-303d/Assessment-categories> (last accessed 1/24/18)

²³ Ecology (2012), *Water Quality Assessment for Washington*. Now at: <https://fortress.wa.gov/ecy/wqamapviewer/map.aspx>

²³ Ecology (2016), *Washington State Water Quality Atlas*. <https://fortress.wa.gov/ecy/wqamapviewer/map.aspx>

5B. Watershed Enhancement Priorities: Lower Tenmile Creek ¹

2

	Wildlife habitat	Salmonid habitat	Water quality	Summary & potential for enhancement
Lower Tenmile AU1139 + small portion of AU1137 Notes from reference maps and other documents	-Critical Habitat: Wetland -Rare Plant: Canadian St. John's-wort ²⁴ (See Watershed reference map: Priority Habitats & Species)	Chinook, chum, coho, cutthroat, & steelhead ²⁵ (See Watershed reference map: Fish presence & fish barriers)	A section of Tenmile Creek in Lower Tenmile is in category 5 for DO, and category 4a for bacteria. ²⁶	<p><u>Results of PSWC water flow assessment:</u> AU1139: An area of moderately high importance for discharge and surface storage processes. Overall water flow processes are highly degraded. AU1137: An area of moderate importance for all flow processes, especially surface storage. Overall water flow processes are highly degraded.</p> <p><u>Summary:</u> This area is of moderate to moderate-high importance for water flow processes, but overall water flow processes are highly degraded. Category 5 for dissolved oxygen category 4a for bacteria. Enhancement actions should focus on increasing surface storage in order to retain surface flows for longer. Decreasing the rate and quantity of drainage of subsurface waters will help to improve discharge to surface streams.</p>
Lower Tenmile AU1139 + small portion of AU1137 Notes from February 2016 work session		Salmon in Deer Creek (upstream of confluence with Tenmile Creek). In summer, pools will have fish in them.		

²⁴ WA Department of Natural Resources (2015), Washington Natural Heritage Program. <http://www1.dnr.wa.gov/nhp/refdesk/gis/index.html>

²⁵ Fish Habitat Technical Team (2004), WRIA 1 Watershed Management Project. Data provided by Sarah Watts, Whatcom County Planning & Development Services.

²⁶ Ecology (2012), Water Quality Assessment for Washington. Now at: <https://fortress.wa.gov/ecy/wqamapviewer/map.aspx>

5C. Watershed Enhancement Priorities: Upper Fourmile Creek ¹

	Wildlife habitat	Salmonid habitat	Water quality	Summary & potential for enhancement
Upper Fourmile AU1133 + AU1114 Notes from reference maps and other documents	AU1114: Critical Habitat: Trumpeter swan and wetland AU1133: Rare plant: bristly sedge. ²⁷ (See Watershed reference map: Priority Habitats & Species)	AU1133: Chum, coho & cutthroat ²⁸ AU1114: Coho & cutthroat ²⁹ Documented presence of coho, fall chum ³⁰	No water quality impairments listed for Fourmile Creek, but there are listings for dissolved oxygen and bacteria in Tenmile Creek downstream of the confluence with Fourmile. ³¹ <i>Note: There were no category 4 or 5 Department of Ecology listings for Fourmile Creek in the 2012 Water Quality Atlas data. The 2016 Water Quality Atlas shows sections of Fourmile Creek in this area are listed in category 5 for DO, pH.³²</i>	<u>Results of PSWC water flow assessment:</u> AU1133: An area of moderate high importance for recharge, surface storage and delivery processes. Overall water flow processes are highly degraded. AU1114: An area of moderate high importance for recharge and delivery processes. Overall water flow processes are moderately to highly degraded. <u>Summary:</u> This area is of moderately high importance for water flow processes, but water flow processes are moderately to highly degraded, particularly surface storage, delivery and discharge. No water quality impairments are listed for this area, but there are listings for dissolved oxygen and bacteria in Tenmile Creek downstream of the confluence with Fourmile Creek. Enhancement actions should focus on increasing surface storage in order to retain surface flows for longer. Preventing additional impervious cover and reducing existing impervious cover will help to enhance recharge. Enhancing forest/riparian cover will help to improve delivery of water to streams.
Upper Fourmile AU1133 + AU1114 Notes from February 2016 work session		Fourmile Creek to Guide Meridian Road has less reed canary grass and good shade, since the riparian vegetation was planted.	Green Lake has water quality problems May-Oct (low DO, high temperature)	

²⁷ WA Department of Natural Resources (2015), *Washington Natural Heritage Program*. <http://www1.dnr.wa.gov/nhp/refdesk/gis/index.html>

²⁸ Fish Habitat Technical Team (2004), WRIA 1 Watershed Management Project. Data provided by Sarah Watts, Whatcom County Planning & Development Services.

²⁹ Fish Habitat Technical Team (2004), WRIA 1 Watershed Management Project. Data provided by Sarah Watts, Whatcom County Planning & Development Services.

³⁰ WDFW SalmonScape [website] <http://apps.wdfw.wa.gov/salmonscape/>

³¹ Ecology (2012), *Water Quality Assessment for Washington*. Now at: <https://fortress.wa.gov/ecy/wqamapviewer/map.aspx>

³² Ecology (2016), *Washington State Water Quality Atlas*. <https://fortress.wa.gov/ecy/wqamapviewer/map.aspx>

5D. Watershed Enhancement Priorities: Lower Fourmile Creek ¹

	Wildlife habitat	Salmonid habitat	Water quality	Summary & potential for enhancement
Lower Fourmile AU1137 Notes from reference maps and other documents	Critical Habitat: Wetland (1) (See Watershed reference map: Priority Habitats & Species)	Chinook, chum, coho, cutthroat & steelhead ³³ Documented presence of coho and fall chum ³⁴	No water quality impairments listed for Fourmile Creek, but there are listings for dissolved oxygen and bacteria in Tenmile Creek downstream of the confluence with Fourmile. ³⁵ <i>Note: There were no category 4 or 5 Department of Ecology listings for Fourmile Creek in the 2012 Water Quality Atlas data. The 2016 Water Quality Atlas shows sections of Fourmile Creek in this area are listed in category 5 for DO, pH.³⁶</i>	<u>Results of PSWC water flow assessment:</u> An area of moderate importance for all flow processes, especially surface storage. Delivery, surface storage and discharge processes are highly degraded. <u>Summary:</u> The area is of moderate importance overall for water flow processes, but water flow processes are highly degraded. No water quality impairments are listed for this area, but there are listings for dissolved oxygen and bacteria in Tenmile Creek downstream of the confluence with Fourmile Creek. Enhancement actions should focus on increasing surface storage in order to retain surface flows for longer. Decreasing the rate and quantity of subsurface water drainage will help to improve discharge to surface streams.
Lower Fourmile AU1137 Notes from February 2016 work session		WDFW did a survey in 2009 for steelhead. Fourmile Creek to Guide Meridian Road has less reed canary grass and good shade, since the riparian vegetation was planted. Used to be 30 years ago you could see fish in the Creek in this area, but they are no longer evident (comment from WID work session). Fish (species not known) have been observed in the lowermost reach of Fourmile Creek between the Fourmile/Tenmile confluence and Guide Meridian Road (comment from WID resident, who was not present at the work session).	Participants mentioned fecal coliforms, dissolved oxygen as concerns, particularly for Tenmile downstream of Fourmile confluence. Low dissolved oxygen in Fourmile Creek is possibly also associated with peat soils in the area.	

³³ Fish Habitat Technical Team (2004), WRIA 1 Watershed Management Project. Data provided by Sarah Watts, Whatcom County Planning & Development Services.

³⁴ WDFW SalmonScape [website] <http://apps.wdfw.wa.gov/salmandscape/>

³⁵ Ecology (2012), Water Quality Assessment for Washington. Now at: <https://fortress.wa.gov/ecy/wqamapviewer/map.aspx>

³⁶ Ecology (2016), Washington State Water Quality Atlas. <https://fortress.wa.gov/ecy/wqamapviewer/map.aspx>

5E. Watershed Enhancement Priorities: Deer Creek ¹

	Wildlife habitat	Salmonid habitat	Water quality	Summary & potential for enhancement
Deer Creek AU1140 AU1138 Notes from reference maps and other documents	Critical Habitat: Shorebird concentration, wetland (See Watershed reference map: Priority Habitats & Species)	Coho, cutthroat, & steelhead; chum also in AU1140. ³⁷ Documented spawning: coho and winter steelhead. Documented presence: fall chum. ³⁸	Sections of Deer Creek are in category 5 for DO, pH, Ammonia-N and category 4a for bacteria. ³⁹	<u>Results of PSWC water flow assessment:</u> An area of high importance for surface storage and moderately high importance for discharge. Delivery, surface storage and discharge processes are highly degraded. <u>Summary:</u> Overall water flow processes are moderately to highly degraded. The lower portion of Deer Creek is of moderate-high importance for overall water flow processes. Water quality listings for dissolved oxygen, pH, ammonia-N and bacteria. Enhancement actions should focus on increasing surface storage in order to retain surface flows for longer. Decreasing the rate and quantity of drainage of subsurface waters will help to improve discharge to surface streams.
Deer Creek AU1140 AU1138 Notes from February 2016 work session		NSEA surveys in Deer Creek and Silver Springs, tributary to Tenmile. Found coho presence in Deer and Silver Springs in 2013 and 2012. ⁴⁰ WDFW did survey in 2009 for steelhead. Salmon in Deer Creek. In summer, pools will have fish in them. Coho have been sighted in Deer Creek (reported by others not present at the work session). Fish presence was not observed by those present. The individuals present in the work session group do not claim ability to distinguish between species.		

³⁷ Fish Habitat Technical Team (2004), WRIA 1 Watershed Management Project. Data provided by Sarah Watts, Whatcom County Planning & Development Services.

³⁸ WDFW SalmonScape [website] <http://apps.wdfw.wa.gov/salmonscape/>

³⁹ Ecology (2012), Water Quality Assessment for Washington. Now at: <https://fortress.wa.gov/ecy/wqamapviewer/map.aspx>

⁴⁰ NSEA (2012 & 2013), Salmon Spawning Grounds Surveys 2012 and Salmon Spawning Grounds Surveys 2013 <<http://www.n-sea.org/archived-publications>>

5F. Watershed Enhancement Priorities: Wiser Lake/Cougar Creek North 1

	Wildlife habitat	Salmonid habitat	Water quality	Summary & potential for enhancement
Wiser/Cougar North AU1110 Notes from reference maps and other documents	Critical Habitat: Shorebird concentrations (1) and wetland (1) (See Watershed reference map: Priority Habitats & Species)	Char, Chinook, chum, coho, cutthroat, pink, sockeye, steelhead. ⁴¹ Documented presence: coho. Documented historic presence: bull trout. ⁴²	A section of Wiser Creek in Wiser/Cougar North AU1110 is in category 5 for DO, and category 4a for bacteria and a section of Unnamed Creek (Tributary to Nooksack River) in AU1110 is in category 5 for DO. ⁴³ <i>Note: Above is from Department of Ecology 2012 Water Quality Atlas data. The 2016 update shows a section of Wiser Creek is also listed in category 5 for pH and Temperature.⁴⁴</i>	Results of PSWC water flow assessment: An area of moderately high importance for surface storage and moderate importance for recharge. Delivery, surface storage and discharge processes are highly degraded. Summary: Overall water flow processes are highly degraded, but this area is of only moderate importance overall for water flow processes. There are water quality listings for dissolved oxygen and bacteria in this area. Enhancement actions should focus on increasing surface storage in order to retain surface flows for longer.
Wiser/Cougar North AU1110 Notes from February 2016 work session		Fish presence noted in Elder Ditch (comment from WID work session).		

⁴¹ Fish Habitat Technical Team (2004), WRIA 1 Watershed Management Project. Data provided by Sarah Watts, Whatcom County Planning & Development Services.

⁴² WDFW SalmonScape [website] <http://apps.wdfw.wa.gov/salmandscape/>

⁴³ Ecology (2012), Water Quality Assessment for Washington. Now at: <https://fortress.wa.gov/ecy/wqamapviewer/map.aspx>

⁴⁴ Ecology (2016), Washington State Water Quality Atlas. <https://fortress.wa.gov/ecy/wqamapviewer/map.aspx>

5G. Watershed Enhancement Priorities: Wiser Lake/Cougar Creek South 1

2

	Wildlife habitat	Salmonid habitat	Water quality	Summary & potential for enhancement
Wiser/Cougar South AU1112 Notes from reference maps and other documents	Critical Habitat: Wetland (1) Rare Plant: Canadian St. John's-wort ⁴⁵ (See Watershed reference map: Priority Habitats & Species)	Char, Chinook, chum, coho, cutthroat, pink, sockeye & steelhead. ⁴⁶ Documented presence: coho ⁴⁷	No water quality impairments listed in Wiser/Cougar South AU1112. ⁴⁸	<p>Results of PSWC water flow assessment: An area of moderate-high importance for surface storage and discharge and moderate importance for recharge. Delivery, surface storage and discharge processes are highly degraded.</p> <p><u>Summary:</u> Overall water flow processes are highly degraded, but this area is of only moderate importance overall for water flow processes. Enhancement actions should focus on increasing surface storage in order to retain surface flows for longer. Decreasing the rate and quantity of subsurface water drainage will help to improve discharge to surface streams. Enhancing forest/riparian cover will help to improve delivery of water to streams.</p>
Wiser/Cougar South AU1112 Notes from February 2016 work session	St. John's Wort present in Wiser/Cougar South (reported by others not present. No observation of it by those present). Discussion as to whether this plant could be poisonous to cows.	Fish passage barrier between Chasteen and Guide Meridian Rds (comment from WID work session)		Potential action: Remove fish passage barrier between Chasteen and Guide Meridian Rds.

⁴⁵ WA Department of Natural Resources (2015), *Washington Natural Heritage Program*. <http://www1.dnr.wa.gov/nhp/refdesk/gis/index.html>

⁴⁶ Fish Habitat Technical Team (2004), WR1A 1 Watershed Management Project. Data provided by Sarah Watts, Whatcom County Planning & Development Services.

⁴⁷ WDFW SalmonScape [website] <http://apps.wdfw.wa.gov/salmonscape/>

⁴⁸ Ecology (2012), *Water Quality Assessment for Washington*. Now at: <https://fortress.wa.gov/ecy/wqamapviewer/map.aspx>

Appendix C: Selected Reference Maps for the Laurel WID ¹

Contains a selection of reference maps related to the Laurel watershed and various WID priorities. ²
Most of the maps in this appendix were also included in the 2016 Agriculture-Watershed Characterization and Mapping Report, and are appended here for readers' convenience. Figure and page numbers for these maps are unchanged from the original report.

Source for these maps:

Whatcom County Agriculture-Watershed Pilot Project (2016). *Agriculture-Watershed Characterization and Mapping Report for the Laurel Watershed Improvement District*. Whatcom County Planning & Development Services. The full WID mapping report can be downloaded from the Laurel WID website <https://www.laurelwid.com/> [Alternative download [here](#)]

In future technical work associated with the WID's management plan, these maps might be updated or ⁴
refined to include more detail as required for baseline studies and development of an action plan.

Maps included in this appendix:

- Figure 17. Laurel WID Reference map: Agriculture priority areas
- Figure 18. Laurel WID Reference map: Agricultural land use inventory
- Figure 19. Laurel WID Reference map: Prime soils
- Figure 20. Laurel WID Reference map: Assessment of potential development rights
- Figure 21. Laurel WID Reference map: Water right points of diversion
- Figure 22. Laurel WID Reference map: Special districts
- Figure 14. Laurel WID: Overall importance and degradation of water flow processes
- Figure 15. Laurel WID: Overall water flow restoration and protection priorities
- Figure 24. Laurel WID Reference map: Priority species and habitat
- Figure 25. Laurel WID Reference map: Fish distribution and fish barriers
- Figure 26. Laurel WID Reference map: Condition of riparian zone
- Figure 27. Laurel WID Reference map: Water quality impairments (2016 - updated)
- Figure 28. Laurel WID: Routine water quality monitoring results.

Update March 2018: Please note that the Washington Department of Ecology has a new website. ⁶
References to Ecology's Water Quality Assessment should now be directed to the new link
<https://fortress.wa.gov/ecy/approvedwqa/ApprovedSearch.aspx>

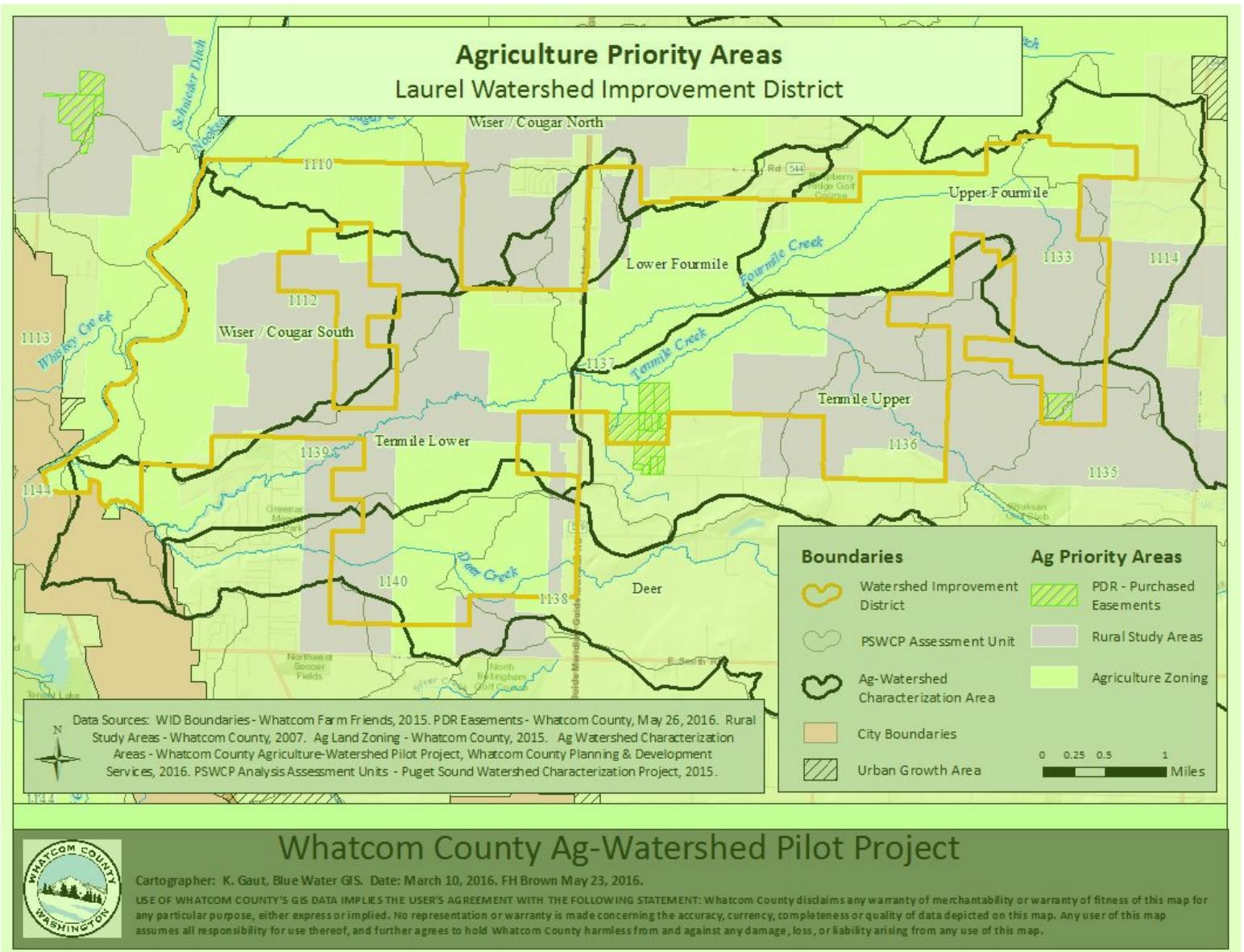


Figure 17. Laurel WID Reference map: Agriculture priority areas ²

1

1

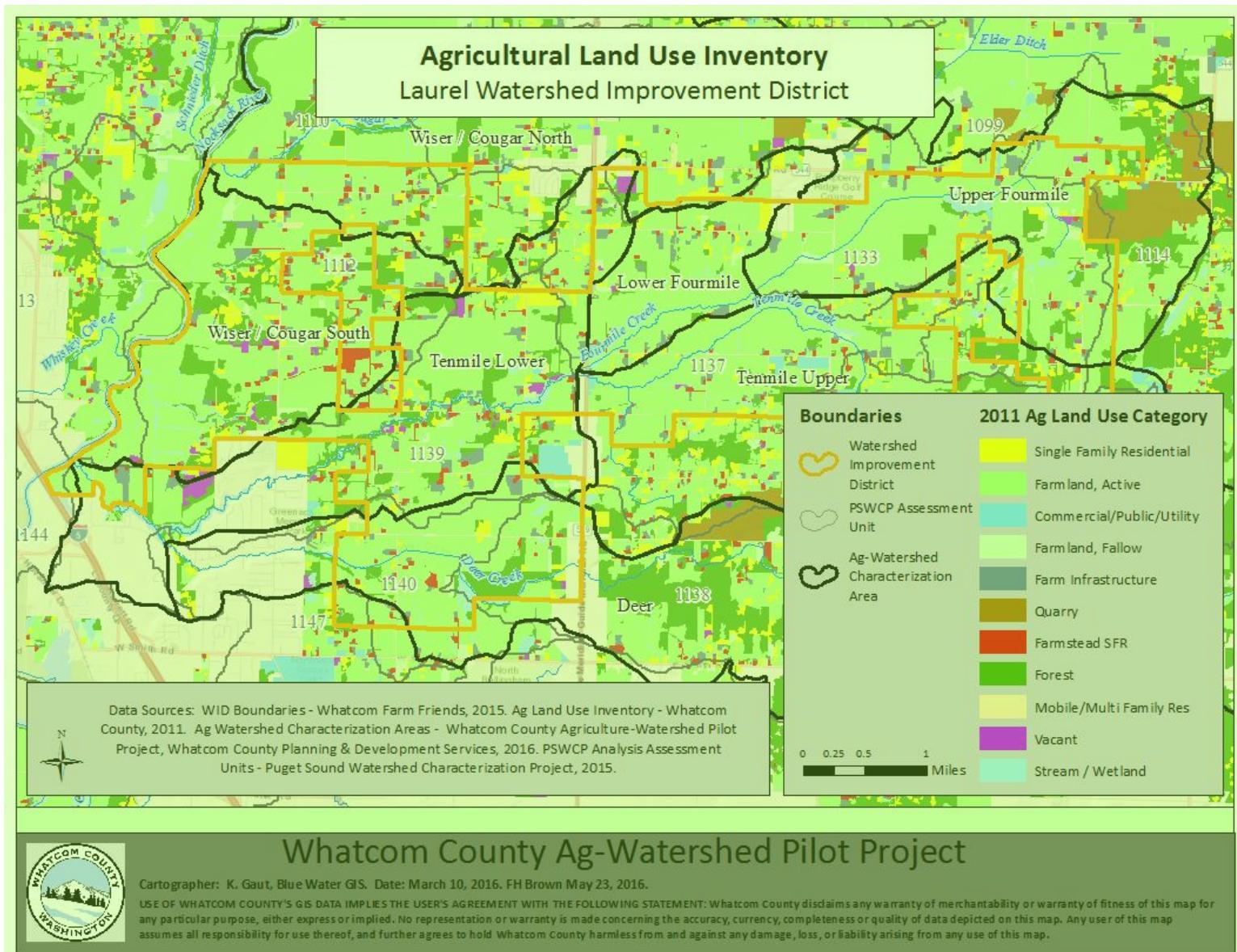


Figure 18. Laurel WID Reference map: Agricultural land use inventory ²

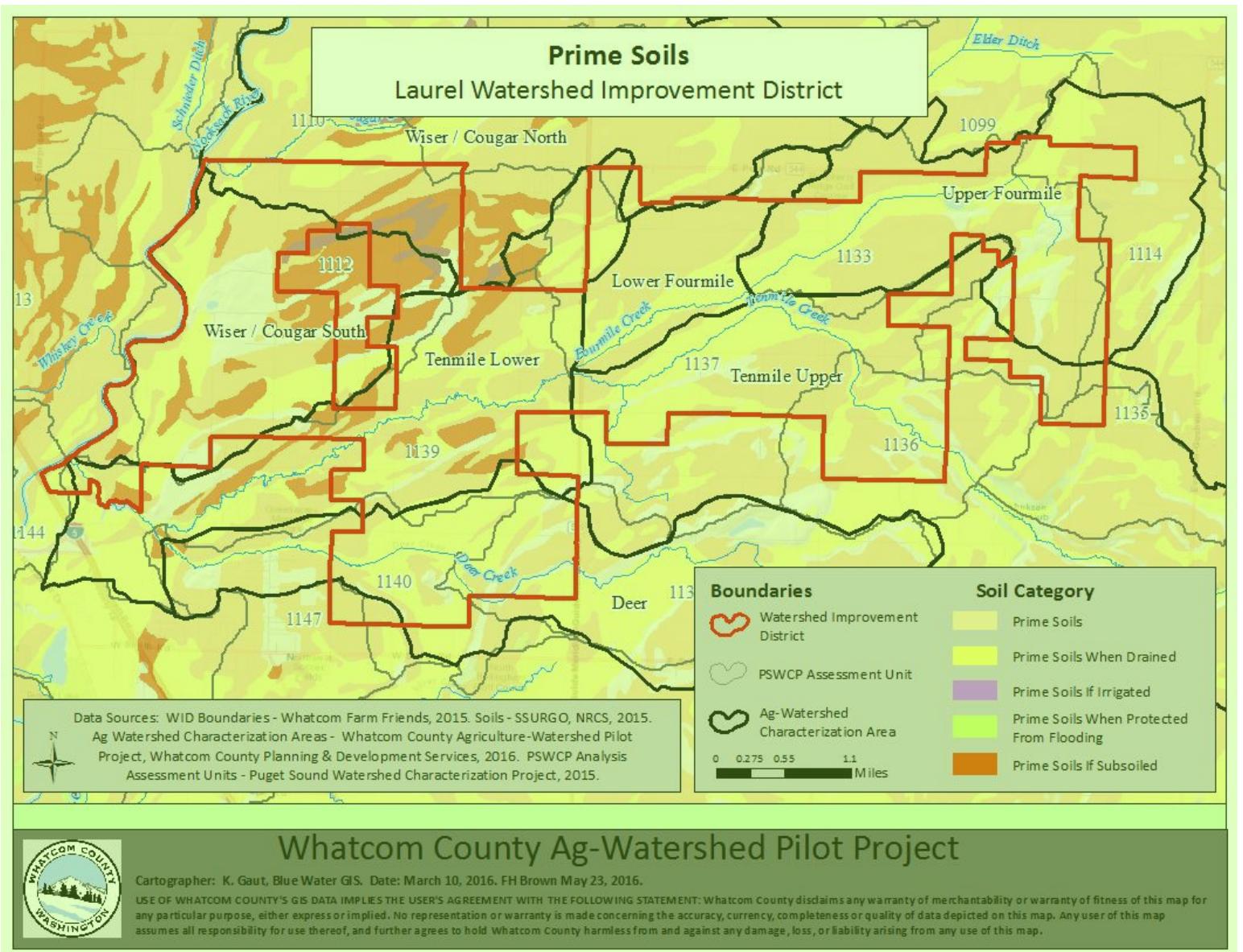
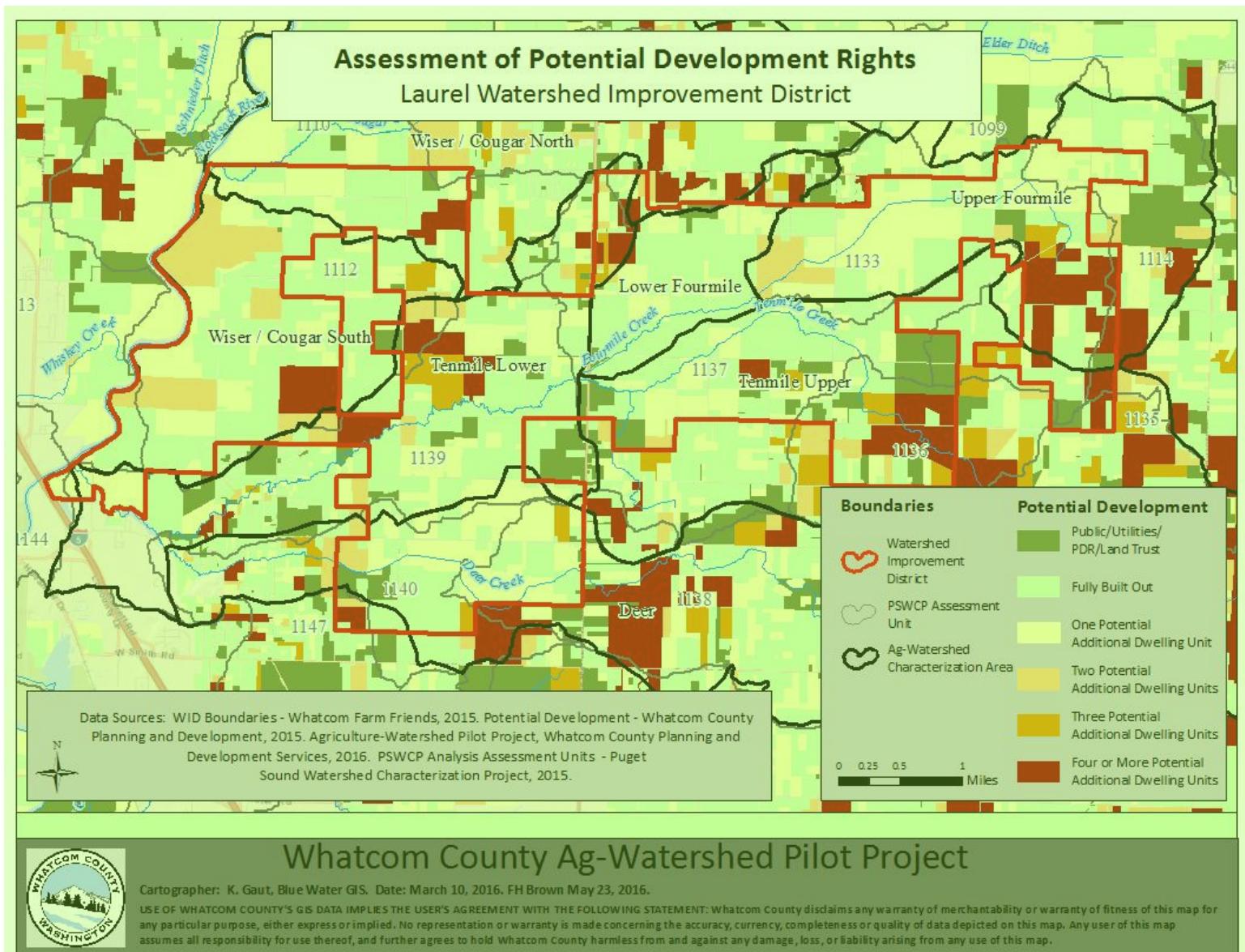
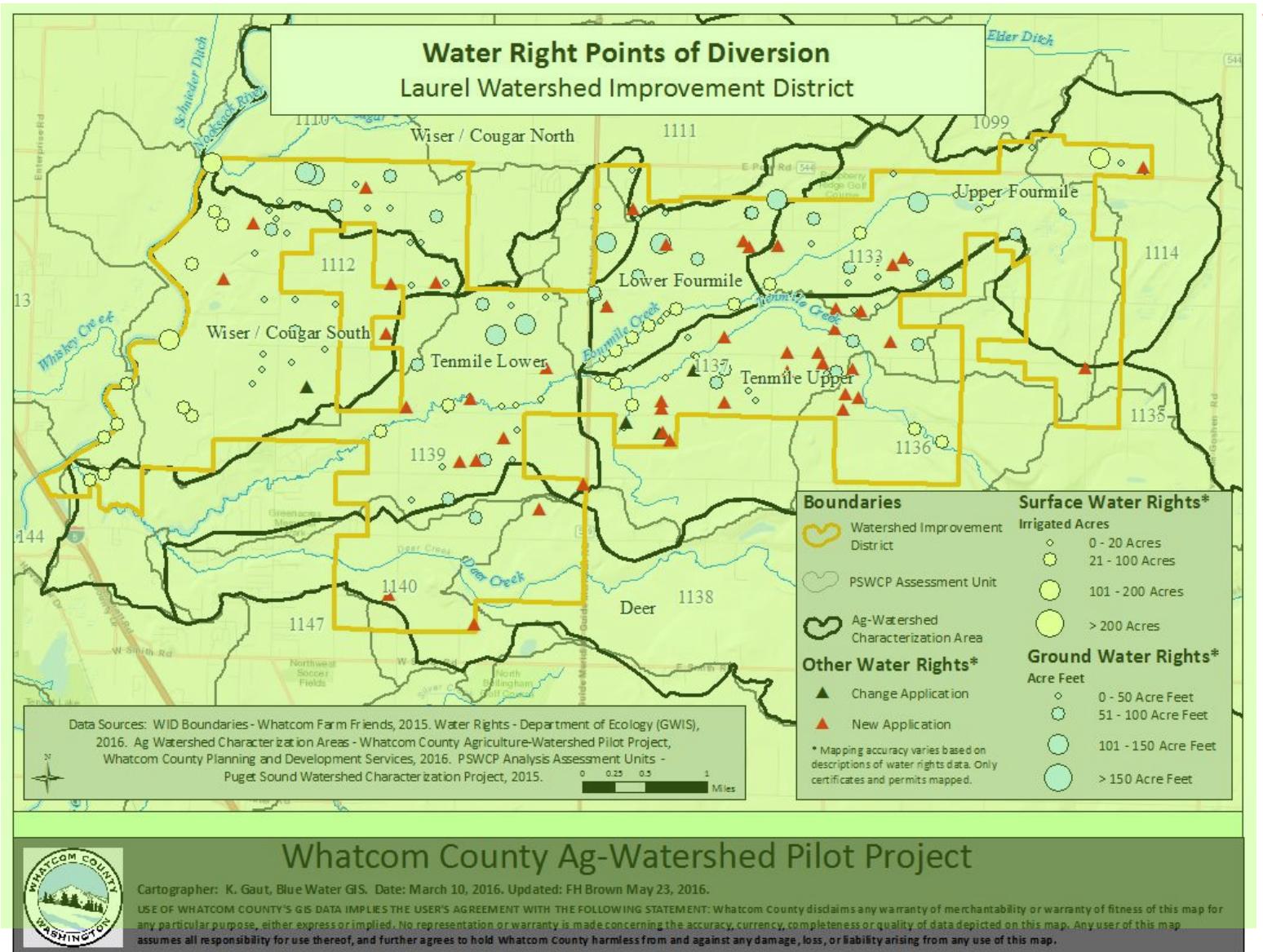


Figure 19. Laurel WID Reference map: Prime soils 2





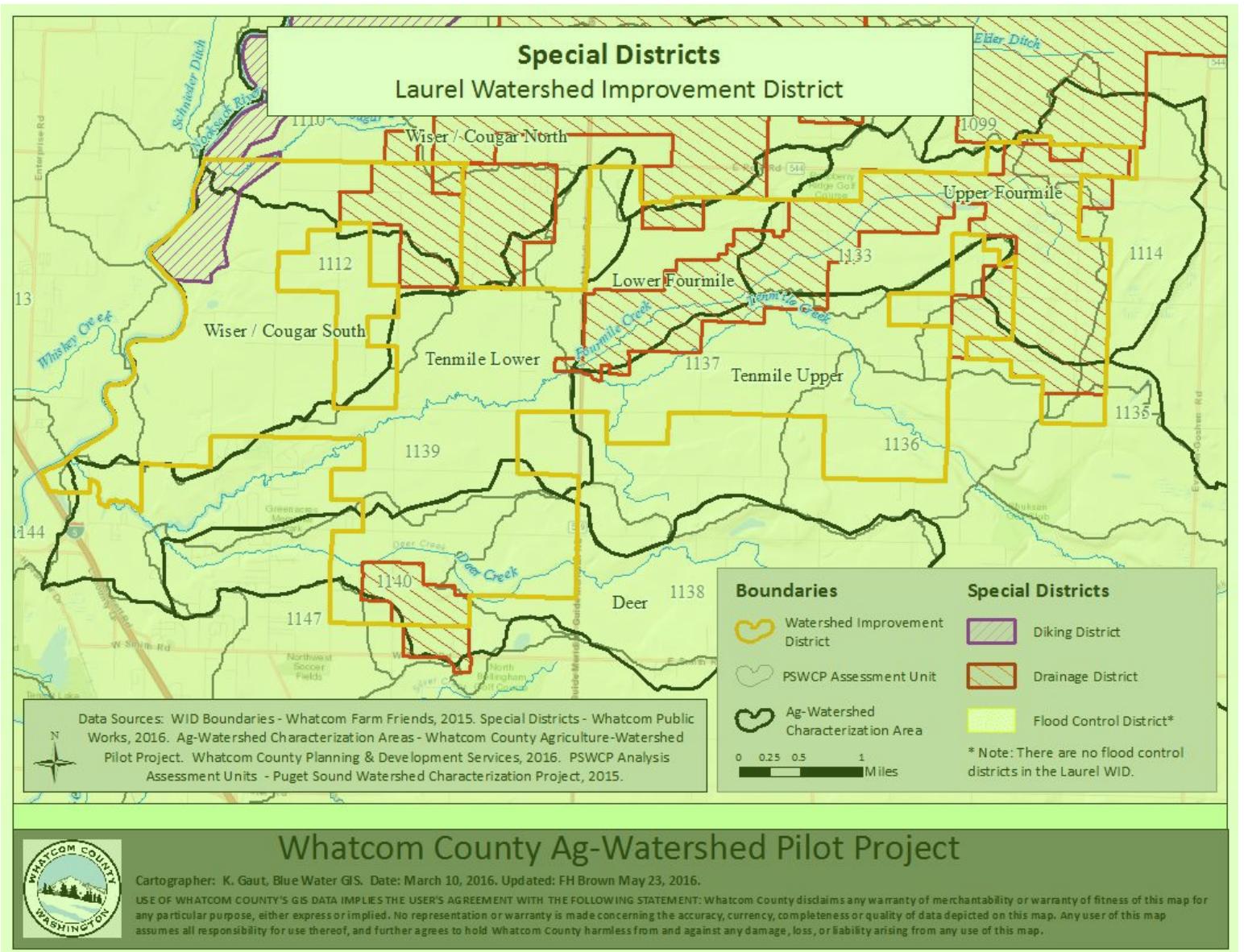


Figure 22. Laurel WID Reference map: Special districts ²

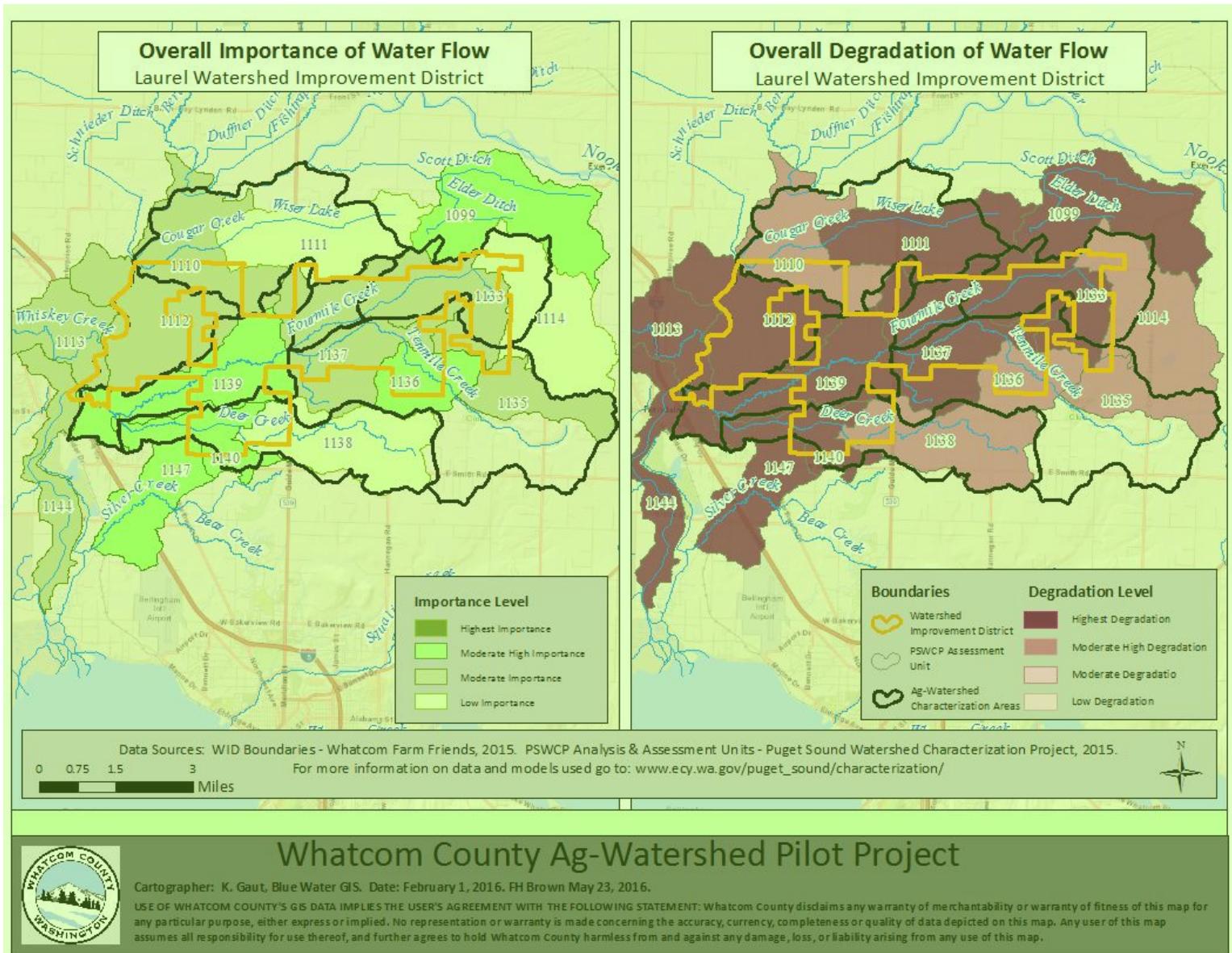


Figure 14. Laurel WID: Overall importance and degradation of water flow processes ²

1

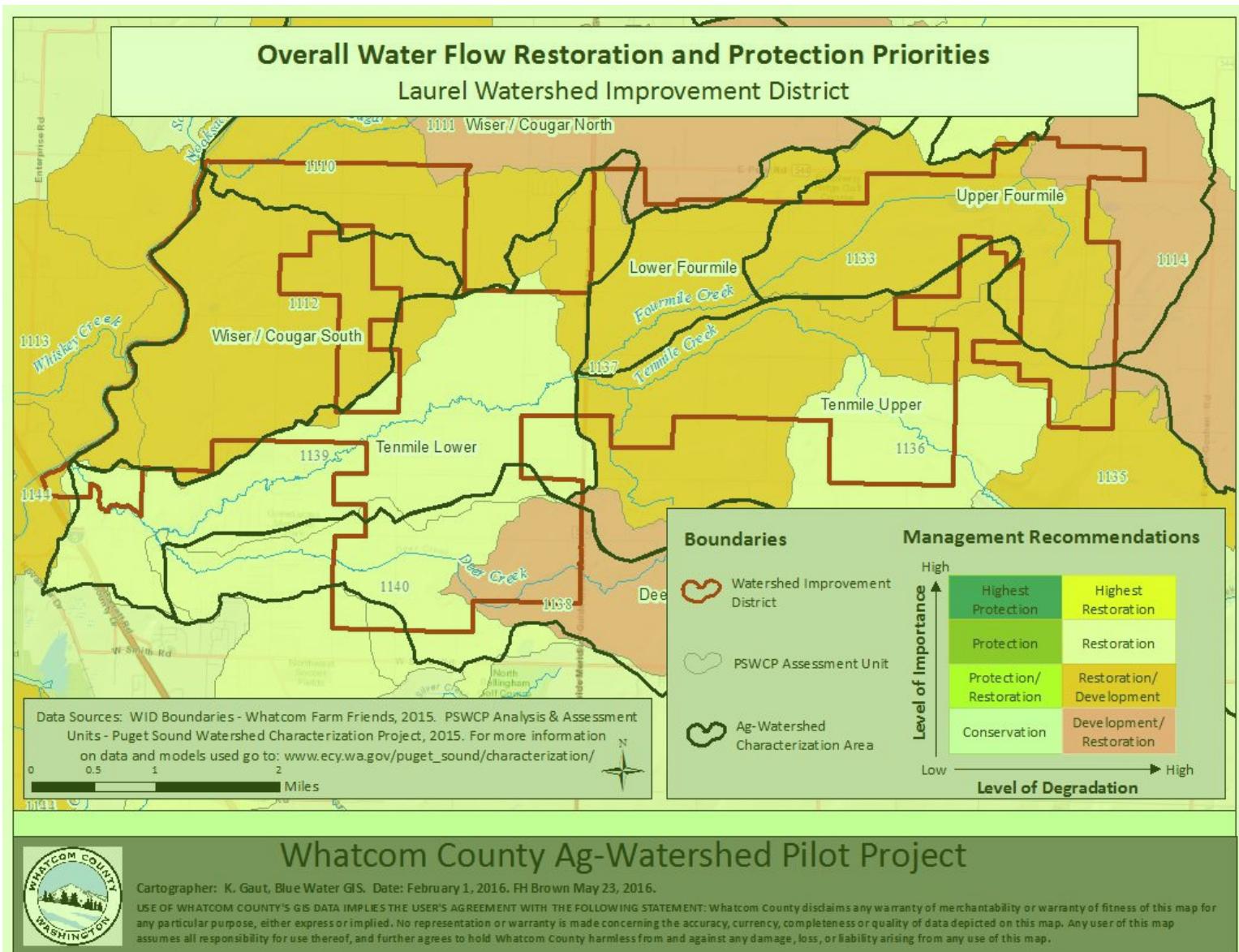


Figure 15. Laurel WID: Overall water flow restoration and protection priorities ²

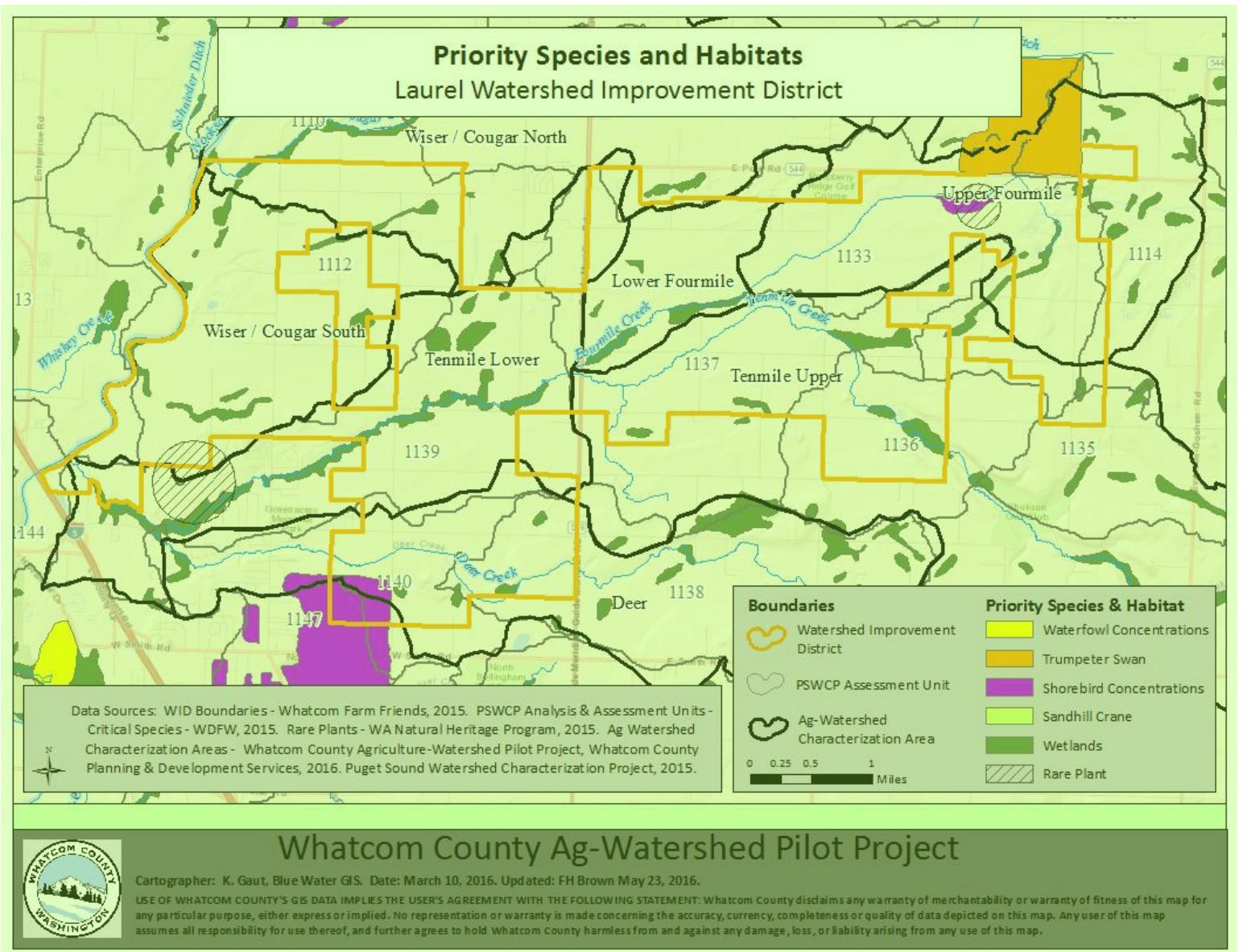


Figure 24. Laurel WID Reference map: Priority species and habitat ²

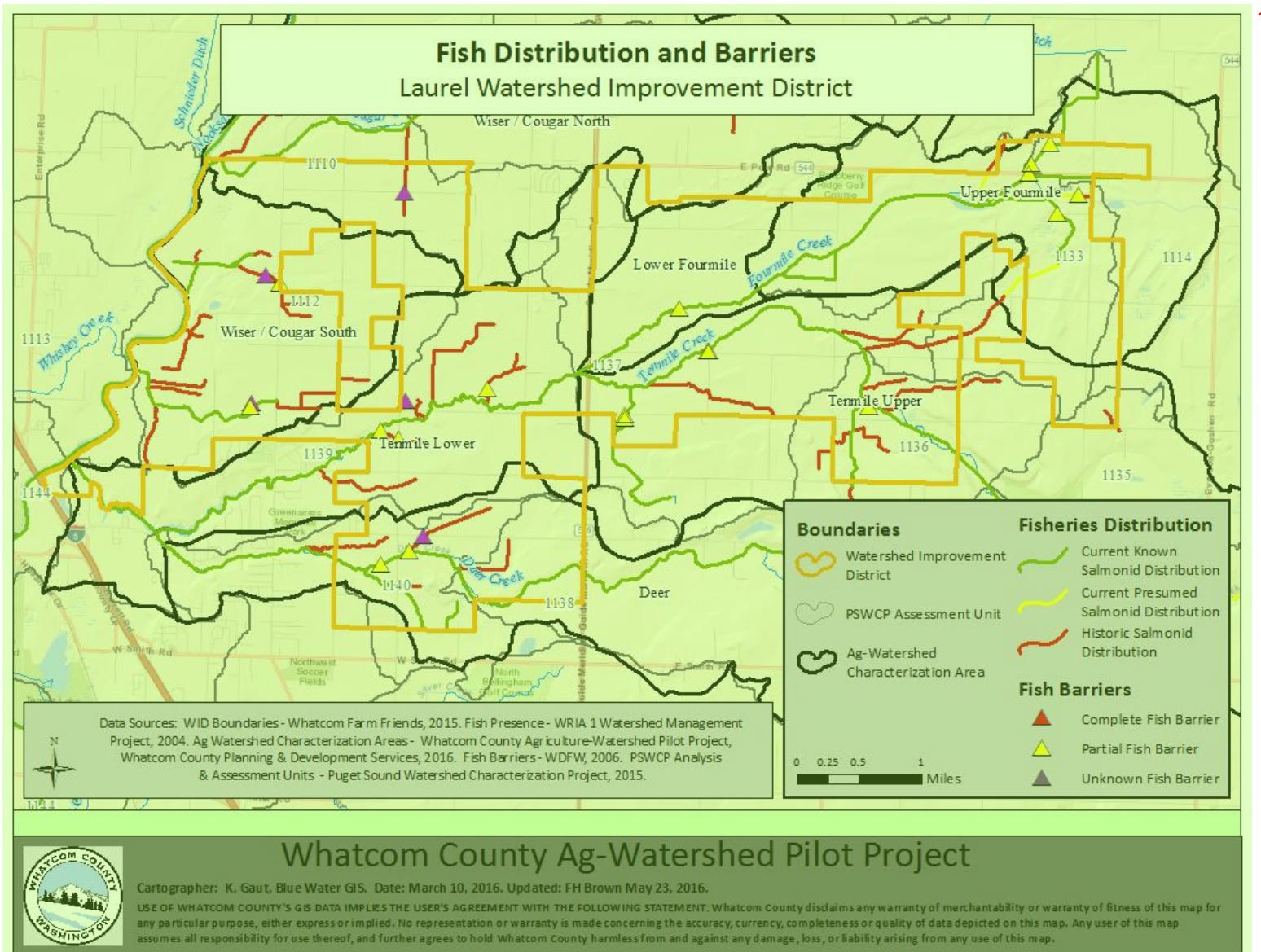


Figure 25. Laurel WID Reference map: Fish distribution and fish barriers ²

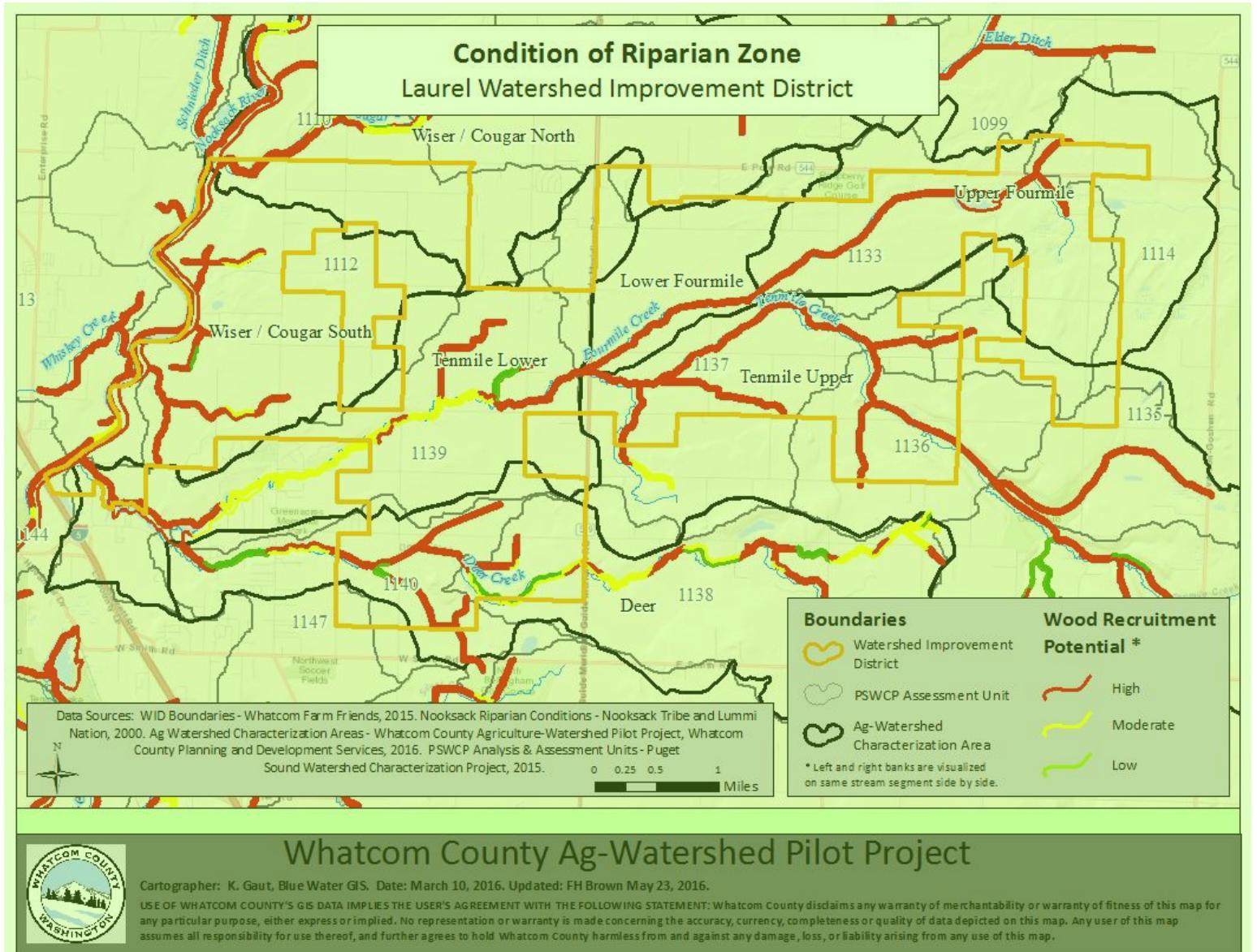


Figure 26. Laurel WID Reference map: Condition of riparian zone ²

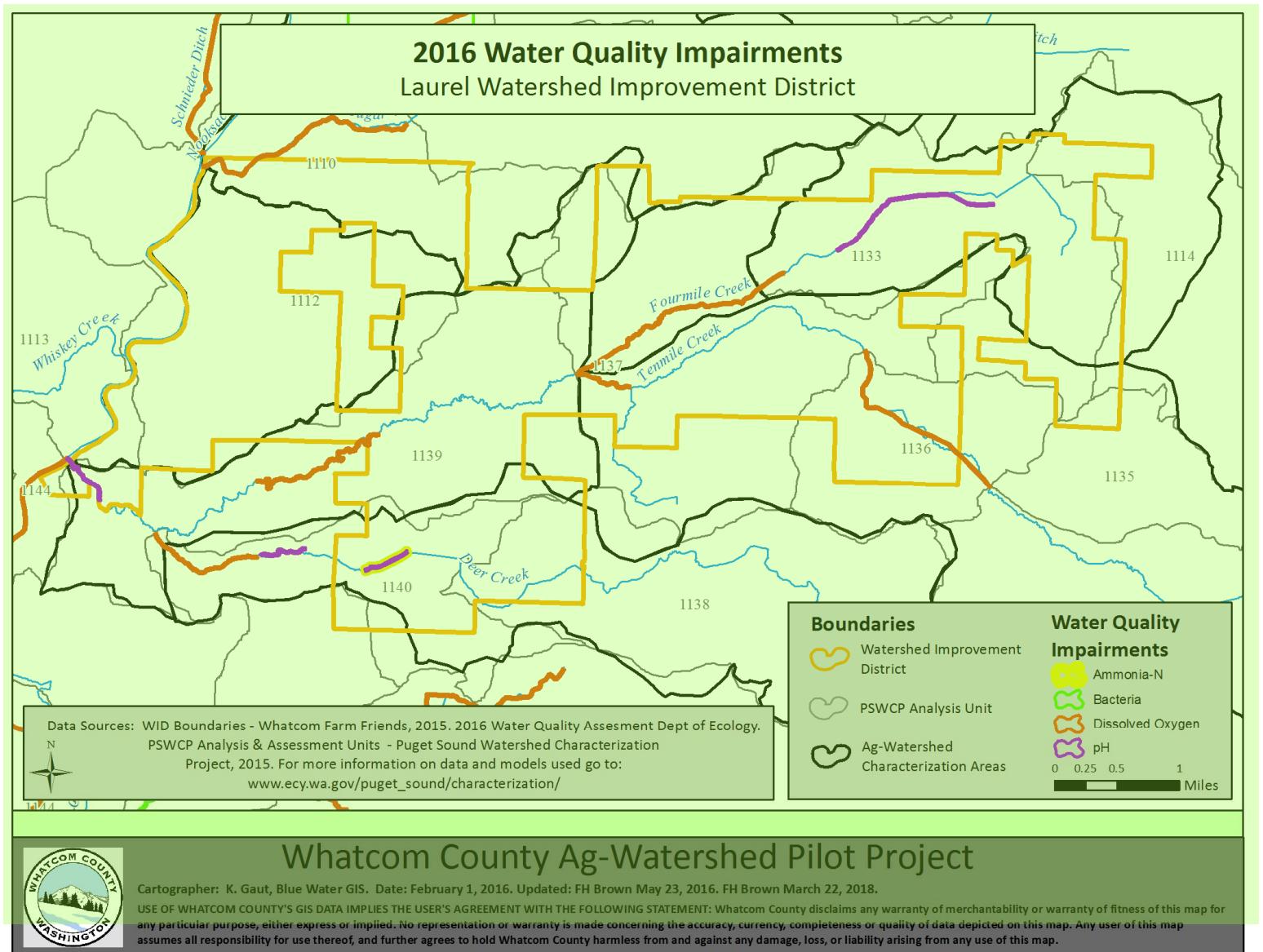
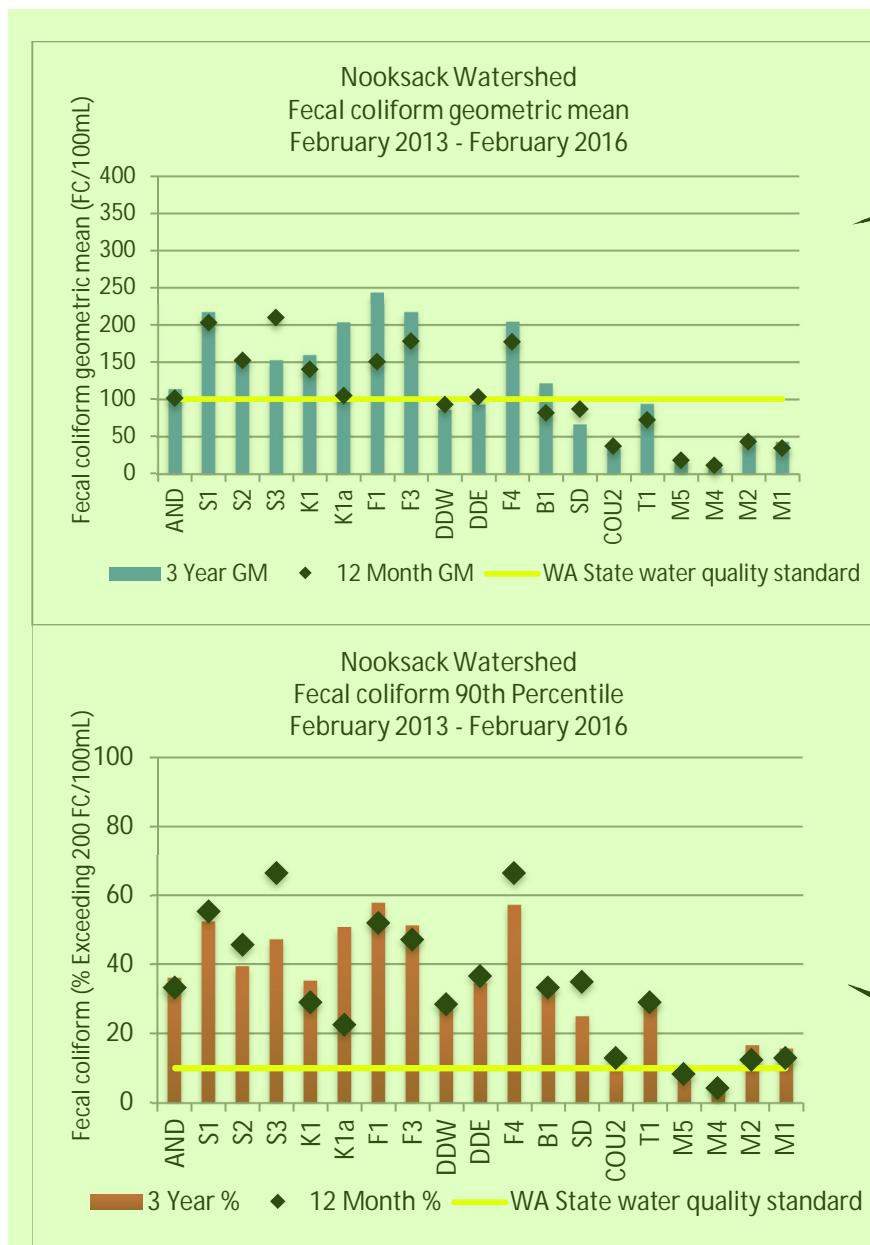
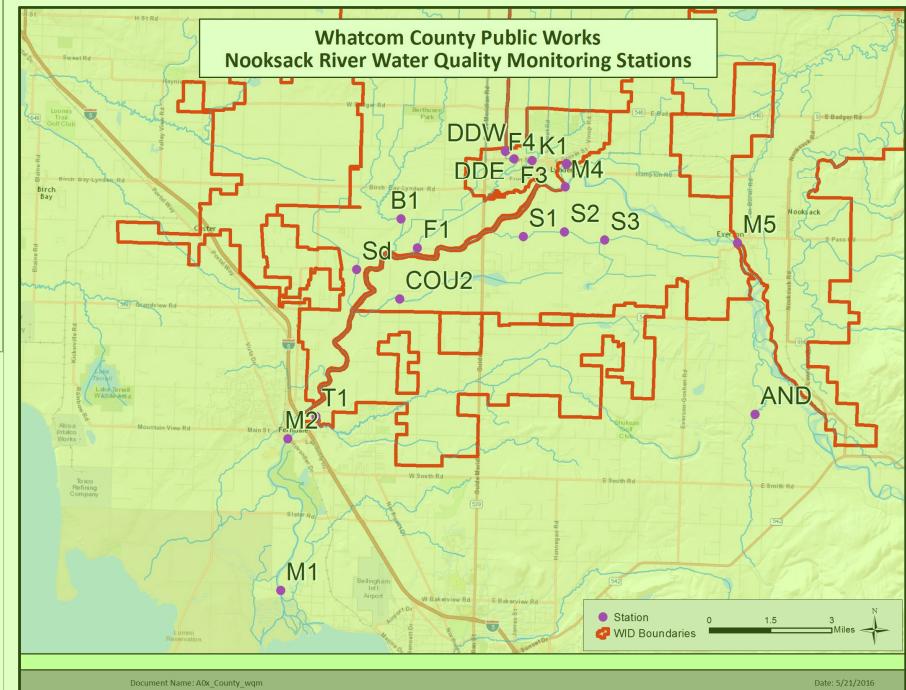


Figure 27. Laurel WID Reference map: Water quality impairments (2016) 2



This graph illustrates fecal coliform geometric means at routine stations. A black dot located above the blue bar indicates that bacteria levels have been increasing in the past twelve months at that site. Data from Whatcom County Public Works.



This graph illustrates the percent of samples exceeding 200 FC/100mL at routine monitoring stations. A black dot above the red bar indicates that bacteria levels have been increasing in the past twelve months at that site. Data from Whatcom County Public Works.

Figure 28. Laurel WID Reference map: Routine water quality monitoring results

Appendix D: Relevant goals and policy statements for the WRIA 1 Watershed Management Project and ¹
the Whatcom County Comprehensive Plan (2016), compared to suggested priorities for the Laurel WID



Priority	WR1A1 watershed management project	Whatcom County Comprehensive Plan (Aug 2016)
	WR1A1 Watershed Management Project (2008). <i>Goals of the WMP.</i> http://wr1a1project.whatcomcounty.org/About-The-Project/Goals-Of-WMP/17.aspx	Whatcom County Comprehensive Plan, adopted August 2016. http://wa-whatcomcounty.civicplus.com/DocumentCenter/View/21056 ¹
Water quantity - water availability (hydrology)	To assess water supply and use, and develop strategies to meet current and future needs. The strategies should retain or provide adequate amounts of water to protect and restore fish habitat, provide water for future out-of-stream uses, and ensure that adequate water supplies are available for agriculture, energy production, and population and economic growth under the requirements of the state's Growth Management Act.	Chapter 2 Land Use, Goal 2A Chapter 8 Resource Lands, Goal 8A, 8F Chapter 10, Goal 10D, 10F, 10G, 10I
Water quantity - access to water (rights/legal access)	To assess water supply and use, and develop strategies to meet current and future needs. The strategies should retain or provide adequate amounts of water to protect and restore fish habitat, provide water for future out-of-stream uses, and ensure that adequate water supplies are available for agriculture, energy production, and population and economic growth under the requirements of the state's Growth Management Act.	Chapter 2, Land Use Goal 2A Chapter 7 Economics, Goal 7K Chapter 8 Resource Lands, Goal 8F (also viable ag)
Water quality	To ensure that the quality of our water is sufficient for current and future uses, including restoring and protecting water quality to meet the needs of salmon and shellfish, contact recreational uses, cultural uses, protection of wildlife, providing affordable, safe domestic water supplies, and other beneficial uses. The initial objectives of the water quality management strategy will be to meet the water quality standards.	Chapter 8 Resource Lands, Goal 8A, 8E Chapter 10 Environment, Goal 10F, 10H, 10G, 10I, 10K, 10L

1

Priority	WRIA1 watershed management project	Whatcom County Comprehensive Plan (Aug 2016)
Drainage - subsurface field drainage	n/a	Chapter 8 Resource Lands, Goal 8D, 8E Chapter 10 Environment, Goal 10H
Drainage - floodwater	n/a	Chapter 10 Environment, Goal 10H
Education & communication	n/a	Chapter 2 Land Use, Goal 2M Chapter 10 Environment, Goal 10B
Representation (This priority is pulled from the minutes not the stated priorities on the website and representation overlaps with Water Rights).	n/a	Chapter 8 Resource Lands, Goal 8A Chapter 10 Environment, Goal 10L
Media/community relations (this priority is pulled from the minutes not the stated priorities on the website)	n/a	n/a
Habitat	To protect or enhance fish habitat in the management area and to restore salmon, steelhead, and trout populations to healthy and harvestable levels and improve habitats on which fish rely.	Chapter 2 Land Use, goal 2A, 2M Chapter 7 Economics, goal 7H Chapter 8 Resource lands, goal 8B (habitat and reg.s), 8D, 8E Chapter 10 Environment, goal 10A, 10B 10C (reg.s), 10F, 10H, 10K, 10L, 10M (wetland)
Water flow processes	n/a	Chapter 10 Environment, Goal 10H, 10G
Land	n/a	Chapter 2 Land Use, Goal 2A Chapter 7 Economics, Goal 7H (also viable ag) Chapter 8 Resource Lands, Goal 8A (also viable ag),

Appendix E: Sources of available data for Laurel WID (July 2016).¹

Reproduced from the Laurel WID mapping report.²

Source for this material:

Whatcom County Agriculture-Watershed Pilot Project (2016). *Agriculture-Watershed Characterization and Mapping Report for the Laurel Watershed Improvement District*. Whatcom County Planning & Development Services. The full WID mapping report can be downloaded from the Laurel WID website <https://www.laurelwid.com/> [Alternative download [here](#)]³

Update March 2018: Please note that the Washington Department of Ecology has a new website.⁴

References to Ecology's Water Quality Assessment should now be directed to the new link

<https://fortress.wa.gov/ecy/approvedwqa/ApprovedSearch.aspx>



⁵



Sources of Available Data for Laurel WID¹

Updated March 2018

Prepared by Cheryl Lovato Niles & Heather MacKay²

Whatcom County Ag-Watershed Project

Purpose of this document³

The purpose of this document is to collate relevant sources of data, particularly sources for data sets generated through longer-term routine monitoring⁴ programs. These data sets are potentially useful for field and desk work in the Laurel Watershed Improvement District (WID).

Sources for the following data types have been collated for the Fourmile, Tenmile, Deer, and Wiser/Cougar South watersheds:⁵

- Water quality measures (fecal coliform, temperature, dissolved oxygen, turbidity, nitrogen, and phosphorous) from 2000 to the present,⁶
- Hydrography,
- Stream flow from 2000 to the present,
- Ground water measurements from 2000 to the present,
- Erosion and avulsion hazard in the Nooksack River channel migration zone,
- Watershed level assessments of flow, storage, water quality, and habitat,
- Water rights, and agricultural irrigation water use,
- Present and future needs of public water systems,
- Fish presence and habitat evaluations from 1990 to the present,
- Salmon and steelhead population boundaries,
- Aquatic nuisance species,
- Instream and streambank vegetation from 1990 to the present,
- Land use and land cover from 2000 to the present, including land uses and locations with water quality impacts potential within Tenmile watershed,
- Wildlife,
- Soils, and
- Social survey of Tenmile watershed landowners.

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Table 1: Fecal coliform monitoring maps and reports 1

Area	Watershed	Parameter	Source	Description	URL
Laurel	Fourmile, Tenmile, Deer, Wiser/Cougar South	Fecal coliform	Whatcom County	Map of routine monitoring sites and reports of sampling results updated monthly	http://www.whatcomcounty.us/2170/Water-Quality-Monitoring-Results [last accessed February 27, 2018] (see note below for information on how to download FC data)
Laurel	Fourmile, Tenmile, Deer, Wiser/Cougar South	Fecal coliform	Conservation District	Watershed Health Assessment (November 2015)	http://www.whatcomcounty.us/2170/Water-Quality-Monitoring-Results [last accessed February 27, 2018]
All	All (Department of Agriculture tests numerous stations routinely and also in response to high FC counts – station locations vary)	Fecal coliform	Washington State Departments of Agriculture and Ecology (only WSDA results shown as of 2/9/16). Data is available upon request from WSDA Dairy Nutrient Management group - Michael Isensee 360-961-7412	Interactive maps of preliminary source tracking results and other fecal coliform assessments	http://www.whatcomcounty.us/2170/Water-Quality-Monitoring-Results [last accessed February 27, 2018]

Accessing water quality data from routine monitoring sites: Figure 1 shows the locations of routine water quality monitoring sites that are within the Laurel 2 Watershed Improvement District.

Whatcom County, the Tribes, Washington State Department of Ecology, and Washington Department of Agriculture coordinate their water quality monitoring efforts. To see the most recent couple of months of data from the map of routine water quality monitoring online at the County's website <http://www.whatcomcounty.us/2170/Water-Quality-Monitoring-Results>, open the map at <http://wacds.maps.arcgis.com/apps/webappviewer/index.html?id=71fa677503c949c8847066178a531099>, and click on the layers symbol in the upper right hand corner. This opens a box titled Layer List. Select the box to the left of "Preliminary WQ Data Results (All)", and then click on the arrow to the right to open up the drop-down menu. Select "Open Attribute Table". A detailed table will open up. Under "Options" in the upper left corner of the table, you can choose to export the data and it will automatically populate an Excel spreadsheet. The purple dots indicate station locations; the blue squares indicate that there is data associated with that station in this system. To find earlier data see the table below. 4

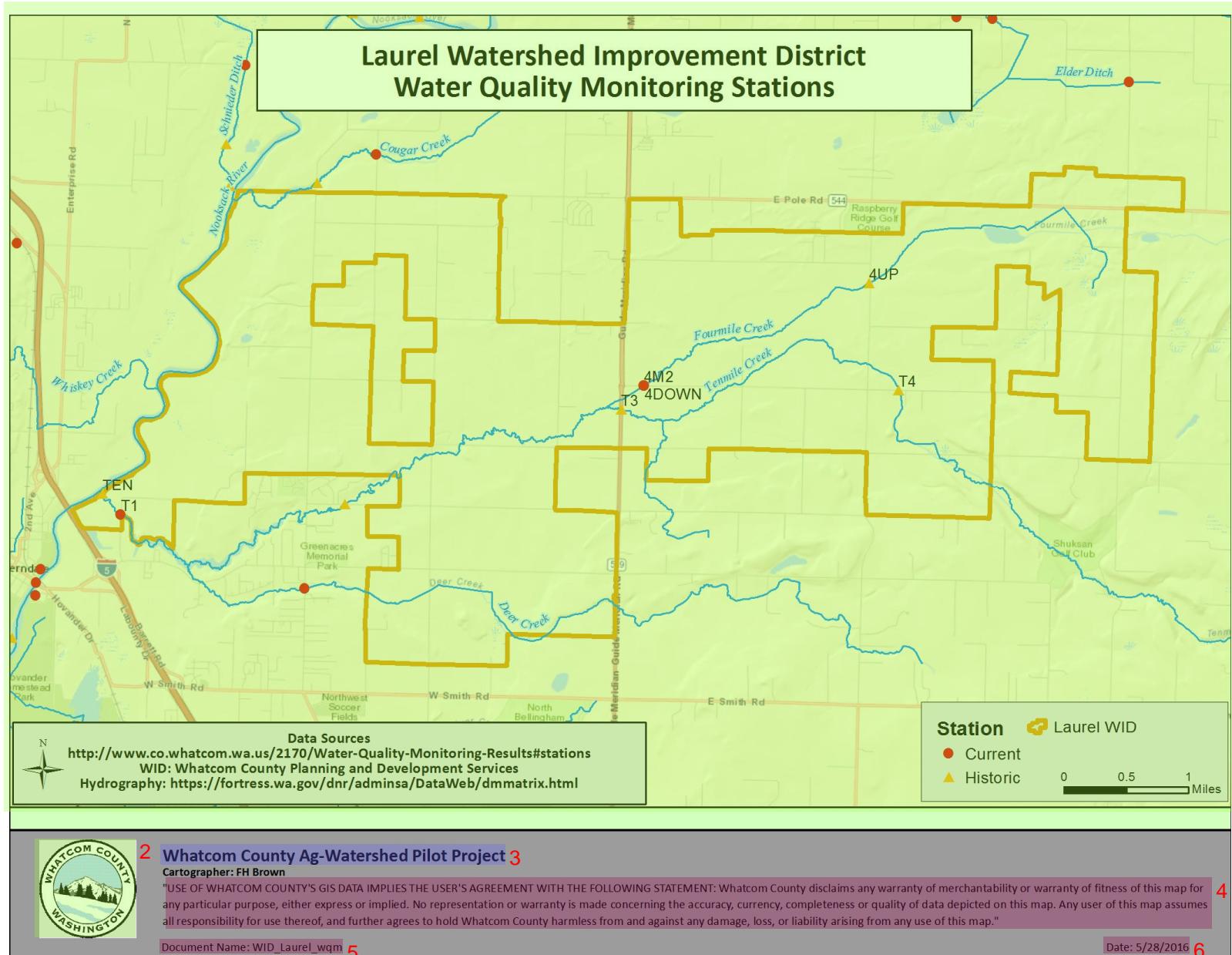


Table 2: Where to find earlier water quality data from monitoring stations on Whatcom County Water Quality Monitoring Results for the Laurel WID area. 1
 Data for the County Health Department are not included here because their monitoring focuses entirely on marine water.

Who	Department of Ecology	Whatcom County Public Works	Washington State Department of Agriculture	Nooksack Tribe
What	Data generally includes FC, pH, T, Conductivity, and DO. Occasionally flow and wetted width are recorded.	Focused on fecal coliform	Focused on fecal coliform	Fecal coliform, E.coli, T, pH, DO, Conductivity, Turbidity,
How	You may request the data from the Department of Ecology Bellingham Field office. Details below.	Annual reports for 2011 through 2013 are available online at URL below.	Data is available upon request from WSDA Dairy Nutrient Management group - Michael Isensee 360-961-7412	Available by request
Details	You may request data for a watershed subbasin from Jessica Kirkpatrick, Steve Hood, or Chris Luerkens at 360-715-5200.	http://www.co.whatcom.wa.us/2172/Resource-Library	Station locations are shown on Whatcom County's map of routine monitoring sites but results are available on the Preliminary Source ID Results map (both maps at http://www.whatcomcounty.us/2170/Water-Quality-Monitoring-Results) and by request – contact information above.	Jezra Belieau, Water Resources Specialist Nooksack Indian Tribe jbeaulieu@nooksack-nsn.gov
Station Names	DRC T1 T2 T3 T4 NWIC-4UP NWIC-4DOWN	CA14c COU2	4M2	SW15

Table 3: Water quality data collected for Fourmile Buffer Project (also see Additional habitat/wildlife documents for *Fourmile Buffer Planting Project Report*)¹

Area	Parameters	Frequency	Stations	Dates	Source	URL
Fourmile Creek	Fecal coliform, temperature, dissolved oxygen, pH	monthly	Locations of the 6 stations shown in the Fourmile Creek Final Report	2004-2008	Northwest Indian College took the measurements. Results are reported in <i>Fourmile Creek Final Report: A Planting and Maintenance Project; Tenmile Creek Watershed Restoration Project; Nooksack River Watershed – Whatcom County, June 2008</i>	http://www.whatcomcd.org/sites/default/files/watersheds/tenmile/FourmileCreekFinalReport.pdf
Fourmile Creek	Temperature, dissolved oxygen	T taken hourly, DO approx. every 2 months.	Locations of the 6 stations shown in the Fourmile Creek Final Report	2003-2013	Data are analyzed and presented in the <i>Fourmile Creek Final Report</i> , above, and in the summary report of 2013 (see url at right). Raw data are available upon request from: Dorie Belisle, Bellwood Acres Farm, Lynden, WA	http://www.whatcomcd.org/sites/default/files/watersheds/tenmile/Fourmile-Creek-buffer-planting-project-report-June-2013.pdf

Table 4: Washington State list of water bodies impaired by pollution³

WID/Area	Parameter	Source	URL
All	Water quality Assessment and 303(d) list	WA Department of Ecology	https://fortress.wa.gov/ecy/wqamapviewer/map.aspx [last accessed February 28, 2018]

Table 5: Streamflow⁵

WID/Area	Watershed	Ongoing/Completed	Station ID	Description	Lat	Long	Collected by	Source	URL
Laurel	Tenmile Lower	Ongoing	12212900	Tenmile Creek near Laurel	485149	1222945	USGS	USGS "Summary Information for Continuous Streamflow Gages in and near the WRIA 1 Study Area"	http://wa.water.usgs.gov/projects/wria01/sw.htm [last accessed October 1, 2015]
Laurel	Tenmile Lower	Ongoing	12213000	Tenmile Creek near Ferndale	485115	1223225	USGS	USGS "Summary Information for Continuous Streamflow Gages in and near the WRIA 1 Study Area"	http://wa.water.usgs.gov/projects/wria01/sw.htm [last accessed October 1, 2015]

Table 6: Streamflow plus additional measures 1

WID/Area	Watershed	Additn'l parameters	Station ID	Station location	Ongoing/ Completed	Collected by	Source	URL	notes
South of Laurel	Mainstem	FC, T, NH3, NO2 NO3, TPN, TPP, OP, DO, pH,	01A050	Nooksack River @Brennan	ongoing	Ecology	River & Stream Water Quality Monitoring	https://fortress.wa.gov/ecy/eap/riverwq/regions/stat.e.asp [last accessed February 28, 2018]	Oxygen is monitored "continuously" - 15 to 30 minute intervals

Table 7: Additional streamflow reports 3

WID/Area	Title	Published	URL
Bertrand, N. Lynden, S. Lynden, Laurel	USGS Estimating low-flow frequency statistics and hydrologic analysis of selected stream-flow gaging stations, Nooksack River basin, report 2009-5170	USGS Scientific Investigations Report, 2009.	http://wria1project.whatcomcounty.org/uploads/PDF/WaterQN/2009_USGS%20Report%20for%20Selected%20WRIA%201%20Gage%20Stations.pdf

Table 8: Hydrography 5

Area	Parameter	Source	URL
US	Hydrography	USGS. The National Map, Hydrography	http://viewer.nationalmap.gov/viewer/nhd.html?p=nhd [last accessed September 30, 2015]

Table 9: Erosion and avulsion in Nooksack River channel migration zone 7

Area	Parameter	Document Title	Author	Date	URL
Sumas, S. Lynden, N. Lynden, Bertrand, Laurel	Erosion and Avulsion	Erosion and Avulsion Hazard Mapping and Methodologies for use in the Nooksack River Channel Migration Zone Mapping	Paul Pittman, LEG Whatcom County Public Works and Peter Gill, Whatcom County Planning and Development Services,	2009	http://wa-whatcomcounty.civicplus.com/DocumentCenter/View/15492 [last accessed February 29, 2016]

Table 10: Groundwater Data 1

2

WID/ Area	Water- shed	Parameter	Title of Table/Source	Station ID	Source	URL	Notes
All	All	Well location, use, depth, installation date, open interval	Summary Information for Wells in the WRIA 1 Study Area	1297 wells listed. Latitude and Longitude provided for all.	USGS	http://wa.water.usgs.gov/projects/wria01/data/well_info.htm via http://wa.water.usgs.gov/projects/wria01/gw.htm [both last accessed October 1, 2015]	This table contains data for all wells in the WRIA 1 study area that were in the USGS database as of December 14, 1999. There are many wells in the WRIA 1 study area that are not in the database. Additional information regarding wells in this table can be obtained by contacting Luis Fuste, the Information Officer of the USGS Washington Water Science Center of the USGS, at (253) 428-3600 x2653. Information in this table may overlap with information in the database of the Whatcom County Health and Human Services Department See Summary Information for Whatcom County Health and Human Services Department Wells in the WRIA 1 Study Area).
All	All	Well location, use, depth, installation date, open interval	Summary Information for Wells in the WRIA 1 Study Area, Downloaded from the Whatcom County Health and Human Services Department Database	Numerous wells listed. Township, range, section, and quarter section listed for all.	Whatcom County Health and Human Services	http://wa.water.usgs.gov/projects/wria01/data/tableGW2.htm [last accessed October 1, 2015]	This table contains selected data for all wells in the WRIA 1 study area that were in the Whatcom County Health and Human Services Department database as of January 7, 2000. There are many wells in the WRIA 1 study area that are not in the database. Additional information regarding wells in this table can be obtained by contacting Anne Marie Karlberg at the Whatcom County Health and Human Services Department, at (360) 738-2504 x50819. Information in this table may overlap with information in the database of the USGS (see Summary Information for Wells in the WRIA 1 Area, Downloaded from the USGS National Water Information System). Disclaimer: The locations of these wells have not been field checked. Construction information was gathered from driller's logs and may contain errors.
All	All	Well location, use, depth, installation date, open interval	Wells with Sufficient Information to Compute Hydraulic Conductivities-Downloaded from the USGS	Numerous wells listed. Lat. and long. listed for all.	USGS	http://wa.water.usgs.gov/projects/wria01/data/tableGW4.htm [last accessed October 1, 2015]	All information in this table is provisional and subject to revision. The data in the database were collected and entered for a wide variety of projects and purposes over a long period of time and the resulting dataset varies in quality and detail. Although many wells have accurate information (especially those checked and used in recent studies), some problems are known to exist for older entries. Examples of known problems include, but are not limited to, inaccurate well locations, old information regarding the primary use of the well, incorrect installation dates, and erroneous labeling of well locations as

WID/Area	Water-shed	Parameter	Title of Table/Source	Station ID	Source	URL	Notes
			National Water Information System (NWIS)				having been field-checked. No checks were performed to assure consistency between the latitude and longitude of a well and its assigned local name
All	All	Water level below surface, date of measurement, method	Historical Ground-Water Levels in the WRIA 1 Study Area	Numerous wells listed. USGS ID is lat long.	USGS	http://wa.water.usgs.gov/projects/wria01/data/water_levels.htm [last accessed October 1, 2015]	Table contains historical water-level information for wells in the WRIA 1 study area that were in the USGS National Water Information System (NWIS) on December 14, 1999, and for which water-level information was available. Additional information regarding wells in this table can be obtained by contacting Luis Fuste, the Information Officer of the USGS Washington Water Science Center of the USGS, at (253) 428-3600 x2653.
Laurel	Tenmile	Ground-water and low flow	Groundwater Study of Crystal and Larrabee Springs in Tenmile Creek Watershed, Dec. 2005		Whatcom County, PUD #1	This report may be requested from Public Utility District #1. Contact Rebecca Schlotterback, 360-384-4288 ext. 13.	Whatcom County and PUD #1 initiated this study which was conducted by HydroLogic Services
Laurel	Tenmile lower?	Hydraulic conductivity	Summary Information for Aquifer Tests in the WRIA 1 Study Area	Ferndale	USGS, Ecology, Cascades Env. Services and Water Resources Cons. Team	http://wa.water.usgs.gov/projects/wria01/gw.htm [last accessed February 28, 2018]	The published source of the data may be found by cross-referencing the code in the column labeled "Catalogue Number" with information in a Microsoft Access* database developed by Greenberg and others (1996) and expanded by the USGS as part of the current (January, 2000) study.

Table 11: Additional reports on groundwater ¹²

Watershed	Title	Published	Authors	URL
All	Nitrate Contamination in the Sumas-Blaine Aquifer, Whatcom County, Washington	Publication No. 11-03-027, May 2011	Melanie Redding, Barbara Carey, and Kirk Sinclair, Washington State Department of Ecology	https://fortress.wa.gov/ecy/publications/documents/1103027.pdf [last accessed February 27, 2018]
All	Sumas-Blaine Aquifer Nitrate Contamination Summary	Department of Ecology Pub. No. 12-03-026, June 2012	Barbara Carey	https://fortress.wa.gov/ecy/publications/summarypages/1203026.html [last accessed February 28, 2018]
All	Hydrogeology, ground water quality, and sources of nitrate in lowland glacial aquifers of Whatcom County, Washington, and British Columbia, Canada	US Geological Survey Water-Resources Investigations Report 98-4195. 1999. 251 pages, 5 plates.	Cox, S. E., and S. C. Kahle	http://pubs.usgs.gov/wri/1998/4195/report.pdf [last accessed February 27, 2018]
WRIA1	WRIA 1 Groundwater Data Assessment: Overview. In Bandaragoda, C., C. Lindsay, J. Greenberg, and M. Dumas, editors. WRIA 1 Groundwater Data Assessment	Whatcom County PUD #1, Whatcom County, WA. WRIA 1 Joint Board, 2013.	Lindsay, C. and C. Bandaragoda	http://wria1project.whatcomcounty.org/ [last accessed 2/1/16]

Table 12: Groundwater maps ³⁴

WID/Area	Parameter	Title	Last modified	Source	URL	Notes
All	Ground-water movement	Generalized Pattern of Ground -Water Movement for the Puget Sound Aquifer System in the WRIA 1 Study Area	2000	USGS	http://wa.water.usgs.gov/projects/wria01/maps/mapGW2.pdf [last accessed October 1, 2015]	Modified from Vaccaro, J.J., Hasen, A.J. and Jones, M.A., 1998. Hydrogeologic Framework of the Puget Sound Aquifer System, Washington and British Columbia; US Geological Survey Professional Paper 1424-D.
All	Selected well locations	Locations of Selected Wells in the WRIA 1 Study Area by Primary Water Use	2000	USGS	http://wa.water.usgs.gov/projects/wria01/maps/mapGW4.pdf [last accessed October 1, 2015]	USGS National Water Information System (NWIS), downloaded December 14, 1999. Not well locations have been verified and therefore they may plot in the wrong locations.

WID/ Area	Parameter	Title	Last modified	Source	URL	Notes
All	Ground-water levels	Water-Level Contours in the Uppermost Aquifer of the Lynden-Everson-Nooksack-Sumas (LENS) Study Area	2000	USGS	http://wa.water.usgs.gov/projects/wria01/maps/mapGW3.pdf [last accessed February 27, 2018]	From: Cox, S.E., and Kahle, S.C., 1999, Hydrogeology, Ground-Water Quality, and Sources of Nitrate in Lowland Glacial Aquifers of Whatcom County, Washington, and British Columbia, Canada: U.S. Geological Survey Water-Resources Investigations Report 98-4195, 5 plates, 251 p.
All	Aquifer tests	Approximate Locations of Aquifer Tests in the WRIA 1 Study Area	2000	USGS	http://wa.water.usgs.gov/projects/wria01/maps/mapGW5.pdf [last accessed October 1, 2015]	From: Various Hydrogeologic Studies in the WRIA 1 Study Area
All	Selected well locations	Locations of Selected Wells in the WRIA 1 Study Area with Sufficient Information to Compute Hydraulic Conductivities	2000	USGS	http://wa.water.usgs.gov/projects/wria01/maps/mapGW6.pdf [last accessed October 1, 2015]	From: USGS National Water Information System (NWIS), downloaded December 14, 1999. Not all well locations have been verified, therefore they may plot in the wrong locations.
All	Selected well locations	Locations of Selected Wells in the WRIA 1 Study Area with Five or More Historical Water Levels	2000	USGS	http://wa.water.usgs.gov/projects/wria01/maps/mapGW7.pdf [last accessed October 1, 2015]	From: USGS National Water Information System (NWIS), downloaded December 14, 1999. Not all well locations have been verified and therefore they may plot in the wrong locations
All	Soil types	Distribution of Soil Map Units in the WRIA 1 Study Area	2000	USGS	http://wa.water.usgs.gov/projects/wria01/maps/mapGW8.pdf [last accessed October 1, 2015]	From: U.S. Department of Agriculture, 1994, State Soil Geographic (STATSGO) Data Base: Date use information, Soil Conservation Service, National Cartography and GIS Center, Fort Worth, Texas, accessed January 28, 2000, at URL http://www.ftw.nrcc.usda.gov/stat_data.html . Note: The soil information for this map was Natural Resources Conservation Service 1994 STATSGO data. STATSGO was compiled at 1:250,000 and designed to be used primarily for regional, multi-state, state, and river-basin resource planning, management, and monitoring.
All	Soil permeability	Soil Permeability in Parts of the WRIA 1 Study Area	2000	USGS	http://wa.water.usgs.gov/projects/wria01/maps/mapGW9.pdf [last accessed October 1, 2015]	Modified from: U.S. Department of Agriculture-Soil Conservation Service, 1992, Soil Survey of Whatcom County Area, Washington, 54 sheets, 481 p.

Table 13: Water rights ¹

Area	Parameter	Title	Source	URL	Notes
All	Quantity, place of use, source, purpose, all documents associated with water rights, and well logs	Water Resources Explorer	Washington State Department of Ecology	https://fortress.wa.gov/ecy/waterresources/map/WaterResourcesExplorer.aspx [last accessed February 28, 2018]	You can search with an interactive map, or using information such as address, township and range, or latitude and longitude.
All	Water rights	WRIA 1 Water Rights Atlas, 2003	Public Utility District No. 1	http://wria1project.whatcomcounty.org/Resource-Library/Studies-And-Reports/Water-Rights/65.aspx [last accessed February 1, 2016]	

Table 14: Present and future needs of public water systems ³

Area	Parameter	Title	Source	URL
All	Present and future needs for public water systems	Whatcom County Coordinated Water System Plan, 2016	Whatcom County Public Works	http://www.whatcomcounty.us/DocumentCenter/View/24143 [last accessed August 28, 2017]

Table 15: Agricultural Irrigation water use and water rights ⁵

Area	Parameter	Title	Source	URL
All	Agricultural irrigation water	Quantification of Agricultural Irrigation Water Use and Water Rights, December 2016.	Public Utility District no. 1 of Whatcom County	http://wria1project.whatcomcounty.org/

Table 16: Watershed level assessment of water flow and storage, water quality, and habitat ⁷

Area	Parameter	Title	Source	URL
All	Watershed characterization: water flow (delivery and storage), water quality, and habitat assessments	Puget Sound Watershed Characterization Project	Washington State Department of Ecology	https://fortress.wa.gov/ecy/coastalatlas/wc/landingpage.html [last accessed February 28, 2018]

Table 17: Land use/Land cover 1

2

WID/Area	Watershed	Parameter	Document	URL
Laurel WID	Tenmile	Land uses with greatest potential for water quality impacts	Whatcom Conservation District, 2017. <i>NRCS National Water Quality Initiative (NWQI) Pilot Watershed Assessment: Tenmile Watershed. September 2017, v.3.</i>	Available on request from Whatcom Conservation District: 360-526-2381.
Whatcom County	All	Agricultural Land Cover Analysis	Whatcom County Agricultural Land Cover Analysis version 2.3. 2013. Whatcom County Planning and Development Services	http://www.whatcomcounty.us/documentcenter/view/3989 [last accessed October 1, 2015]
Whatcom County	All	Critical Areas Ordinance Maps	Whatcom County's Critical Areas (CAO) are environmentally sensitive natural resources that have been designated for protection and management in accordance with the requirements of the Growth Management Act.	http://www.whatcomcounty.us/811/County-Wide-Critical-Area-Ordinance-Maps [last accessed February 26, 2016]
Whatcom County	All	Land Cover Change	WDFW High Resolution Change Detection Project; Whatcom County: Land Cover Change by Sub-Basin	http://wa-whatcomcounty.civicplus.com/DocumentCenter/View/15805 [last accessed February 26, 2016]

Table 18: Land use/Land cover map and charts from Lower Nooksack Water Budget Overview 3

Report covers Tenmile, Four Mile, Fazon, Deer, and Wiser Lake/Cougar Creek

4

From: Bandaragoda, C., J. Greenberg, M. Dumas and P. Gill. (2012). Lower Nooksack Water Budget (Chapter 5, Land Cover). Whatcom County, WA: WRIA 1 Joint Board. Retrieved from http://wria1project.whatcomcounty.org/ [last accessed October 1, 2015]	Figure
WRIA 1 map of existing land cover	Figure 1
WRIA 1 map of historic land cover classes, produced by Utah State University (Winkelaar 2004).	Figure 2
Areal distribution of existing and historical land cover classes in the Lower Nooksack watershed (top) and the Nooksack Forks watershed (bottom).	Figure 7
Final land cover classification, original data source class, and Lower Nooksack Water Budget land cover parameters.	Table 1
Crop types in the Lower Nooksack Subbasin.	Table 2

Table 19: Land use/Land cover electronic data from Lower Nooksack Water Budget Overview ¹

Report covers Tenmile, Four Mile, Fazon, Deer, and Wiser Lake/Cougar Creek

From: Bandaragoda, C., J. Greenberg, M. Dumas and P. Gill. (2012). Lower Nooksack Water Budget (Chapter 5, Land Cover). Whatcom County, WA: WRIA 1 Joint Board. Retrieved from http://wria1project.whatcomcounty.org/ [last accessed October 1, 2015].	Title	²
Tables of crop type summarized by the 16 drainages of the Lower Nooksack Subbasin	Appendix Chap5A_LN_AgLandUse.pdf	
Classes and descriptions of original NOAA CCAP dataset	Appendix Chap5B_LandCoverClass.pdf	
Classes and descriptions of original Whatcom County Agricultural Land Cover Analysis	Appendix Chap5C_WhatcomCountyLandCover.pdf	
GIS data, Whatcom County Agricultural Land Cover Analysis	Agrural-use-pds2011.shp	
Parameter grids (ascii files) and Excel spreadsheets of parameter values by land cover class	Land Cover Model Parameter Lookup Tables (Folder: Ascii grids/ see lulc_existing.xls and lulc_historic.xls)	
Matlabcode to convert raster, lookup tables, and shapefile data to area averaged parameter values	Topnet-WM Preprocessing Program files	
ArcGIS 10 Files Geodatabase Raster Grids 30 Meter Pixel resolution; Metadata xml	wria1_lulc_water_budget.gdb, 1. Existing Land Cover GIS data (<Lulc_exist>) 2. Historical Land Cover GIS data (<Lulc_hist>)	
Lower Nooksack Subbasin Land cover tables and charts from GIS data	Lulc_charts_lowerNookonly.xlsx	
WRIA 1 Land cover codes, tables, and charts from GIS data	Lulc_charts_wria1.xlsx	

Table 20: NSEA spawner surveys ³

NSEA has spawner survey reports from 1998 to the present. This table includes every relevant reach surveyed since 2005. Some reaches were not surveyed every year.

Watershed	Creek	Station Location	Collected by	Source	Notes
Ten Mile Upper	Silver Springs Creek	RM 0.0 – 0.5	trained NSEA staff and volunteers	Nooksack Salmon Enhancement Spawning Grounds data and reports. http://www.n-sea.org/archived-publications [last accessed Feb 1, 2016]	Live salmon, carcasses and redds are recorded. The reports include brief descriptions of the reach. The monitored reaches have changed somewhat over time.
Ten Mile Upper	Starry Creek	RM 0 – 0.75	trained NSEA staff and volunteers	Nooksack Salmon Enhancement Spawning Grounds data and reports. http://www.n-sea.org/archived-publications [last accessed Feb 1, 2016]	Live salmon, carcasses and redds are recorded. The reports include brief descriptions of the reach. The monitored reaches have changed somewhat over time.
Ten Mile Upper	Ten Mile	RM 9-9.2	trained NSEA staff and volunteers	Nooksack Salmon Enhancement Spawning Grounds data and reports. http://www.n-sea.org/archived-publications [last accessed Feb 1, 2016]	Live salmon, carcasses and redds are recorded. The reports include brief descriptions of the reach. The monitored reaches have changed somewhat over time.

Watershed	Creek	Station Location	Collected by	Source	Notes
Deer Creek	Deer Creek Upper	RM 3.2-3.7	trained NSEA staff and volunteers	Nooksack Salmon Enhancement Spawning Grounds data and reports. http://www.n-sea.org/archived-publications [last accessed Feb 1, 2016]	Live salmon, carcasses and redds are recorded. The reports include brief descriptions of the reach. The monitored reaches have changed somewhat over time.
Deer Creek	Deer Creek Lower	RM 0.5-1.1	trained NSEA staff and volunteers	Nooksack Salmon Enhancement Spawning Grounds data and reports. http://www.n-sea.org/archived-publications [last accessed Feb 1, 2016]	Live salmon, carcasses and redds are recorded. The reports include brief descriptions of the reach. The monitored reaches have changed somewhat over time.

Table 21: WDFW spawner surveys ²

Watershed	Parameter	Creek	Station location	Frequency	Date	Ongoing/completed	Collected by	Source
Wiser Lake/Cougar Creek, Fourmile and Ten Mile Creeks	Limited field data from a one year survey to assess adult Steelhead spawning habitat: Steelhead redds or suitable gravel for Steelhead spawning.	Specifics are available upon request	Specifics are available upon request	One-time	2009	Completed	WDFW and NSEA field crews	WDFW Tasha Geiger Nooksack River Stock Assessment 360-305-2023 Natasha.geiger@dfw.wa.gov

Table 22: Aquatic nuisance species ⁴

Area	Title - Parameter	Notes	Frequency	Date	Source
Washington State	Aquatic invasive species	Description of aquatic nuisance species with distribution maps. Organized by organism.	ongoing		http://wdfw.wa.gov/ais [last accessed October 1, 2015]
Washington State	Washington Herp Atlas		unknown	Maps updated 2013	http://www1.dnr.wa.gov/nhp/redesk/herp/heremain.html [last accessed October 1, 2015]
Washington State	Washington Nature Mapping Program – wildlife distribution maps		unknown	unknown	http://naturemappingfoundation.org/natmap/maps/ [last accessed October 1, 2015]
US	USGS NAS – Nonindigenous Aquatic Species – presence and	Searchable database/maps of nonindigenous aquatic species sightings organized	unknown	Date of info varies	http://nas.er.usgs.gov/queries/default.aspx [last accessed October 1, 2015]

1

Area	Title - Parameter	Notes	Frequency	Date		Source
	distribution	by group, i.e. amphibians, fish, mammals.				
Washington State	Washington Department of Ecology Environmental Assessment Aquatic Plant Monitoring	Description of aquatic nuisance plants with distribution maps, searchable survey results by county, lake, or plant name, and downloadable survey data.	ongoing	Date of info varies	https://ecology.wa.gov/About-us/Get-to-know-us/Our-Programs/Environmental-Assessment [last accessed February 28, 2018]	WA Department of Ecology
Whatcom County	Whatcom County Noxious Weeds webpages	Distribution map of some noxious weeds. Field guides and information about noxious weeds.	unknown	Map date is 2008. Website date is 2007. Other material is undated.	http://www.whatcomcounty.us/DocumentCenter/View/2506 [last accessed October 1, 2015]	Whatcom County
Pacific Northwest	Aquatic and Riparian Effectiveness Monitoring Program Invasive Species Report	Description of monitoring program and presence of invasive species in surveyed areas.	2010	2011	http://www.reo.gov/monitoring/reports/watershed/AREMP%20Aquatic%20Invasive%20Species%20Report%202010.pdf [last accessed October 1, 2015]	UW Forest Service and Bureau of Land Management

Table 23: Additional habitat/wildlife documents 2

3

Watershed/area	Parameter	Document
Fourmile Creek	Water quality, temperature, fish habitat, reed canary grass control, drainage	Lovato Niles, C. and MacKay H. (2013) <i>Fourmile Creek Buffer Planting Project Summary Report</i> . FHB Consulting Services, Inc., Bellingham WA. www.fhb3.com http://www.whatcomcd.org/sites/default/files/watersheds/tenmile/Fourmile-Creek-buffer-planting-project-report-June-2013.pdf [last accessed 3/28/18]
Whatcom County	Buffer width, shade and temperature	Benedict, C. and J. Shaw, 2012. <i>Agricultural Waterway Buffer Study; Whatcom County, Washington 2012</i> . WSU Whatcom County Extension. https://salishsearestoration.org/images/2/2f/Benedict_%26_Shaw_2012_shade_benefits_from_hedgerow_on_ditched_streams.pdf
Does not include Dakota, California, or Sumas River watersheds	Riparian function	Coe, T. 2001. Nooksack River Watershed Riparian Function Assessment. Nooksack Indian Tribe Natural Resources Department. http://salmon.wria1.org/resources/documents [last accessed January 4, 2016]

Watershed/area	Parameter	Document
Whatcom County	Fish barriers	Whatcom County Public Works, 2006. Whatcom County Fish Passage Barrier Inventory Final Report - IAC Project Number: 01-1258 N. January, 2006. http://salmon.wria1.org/resources/documents [last accessed January 4, 2016]
WRIA 1	Fish habitat	Smith, C.J. 2002. Salmon and steelhead habitat limiting factors in WRIA 1, the Nooksack basin. Washington State Conservation Commission, Lacey, Washington. 325 pp.
Ten Mile	2013 Data Integration of WRIA 1 Hydraulic, Fish Habitat, and Hydrology Models	Bandaragoda, C. Joanne Greenberg, and Mary Dumas (2013). Data integration of WRIA 1 Hydraulic, Fish Habitat, and Hydrology Models. 134 pp. Nooksack Indian Tribe, Whatcom County, WA. WRIA 1 Joint Board. Retrieved [Date], from http://wria1project.whatcomcounty.org/ [last accessed February 1, 2016]
Nooksack	Fish presence	Nooksack Tribe, 2004. Referenced in North Lynden Watershed Improvement District Management Plan for Drainage, flooding, Irrigation and Fish Issues, 2009. Bibliography entry is unclear.
WRIA 1	Fish presence	Anchor Environmental, LLC. 2003. Fish periodicity in WRIA 1. Prepared for City of Bellingham Public Works Department. Seattle, Washington. 43 pp+ Appendices
Deer Creek	Juvenile salmonids (salmon, steelhead, trout)	This data was collected by Bob Vadas (WDFW) and is not an official report but it does speak to juvenile population numbers found in Bertrand Cr, Fishtrap Cr and Deer Cr sampling locations where also sampled for comparison. This data has not been fully analyzed at this time and should only be used as an initial look into juvenile populations. Sampling was conducted from 2006-2010.
Whatcom County	Biodiversity	Nelson, R., 2007. Mapping Biodiversity in Whatcom County: Data and Methods. Submitted to the Whatcom Legacy Project, August 2007. http://wa-whatcomcounty.civicplus.com/DocumentCenter/View/15493 [last accessed February 29, 2016}
Whatcom County	Wildlife	Eissinger, A., 1994. Significant Wildlife Areas. (Available through the public library)

Table 24: Additional habitat/wildlife maps and databases ¹²

Watershed/Area	Parameter	Document/Website	URL	Source
Whatcom County	Fish Presence Char, Chinook, Chum, Coho, Cutthroat, Pink, Steelhead, Bull Trout/Dolly Varden	Maps: Fish Presence by species available on Whatcom County Critical Areas Ordinance Maps page	http://www.co.whatcom.wa.us/811/County-Wide-Critical-Area-Ordinance-Maps [last accessed February 24, 2016]	Whatcom County
Whatcom County	Wildlife	The Whatcom County mappings were completed in 2007, as part of a project to characterize ecosystem processes and wildlife habitat in the Birch Bay Watershed.	http://wdfw.wa.gov/conservation/habitat/planning/lha/whatcom.html [last accessed February 28, 2018]	Washington Department of Ecology and Washington Department of Fish and Wildlife
Washington State	Priority Habitats and Species on the Web	PHS on the Web is a Washington Department of Fish and Wildlife web-based, interactive map for citizens, landowners, cities and counties, tribal governments, other agencies, developers, conservation groups, and interested parties to find basic information about the known location of Priority Habitats and Species (PHS) in Washington State.	http://wdfw.wa.gov/mapping/phs/ [last accessed October 1, 2015]	Washington Department of Fish and Wildlife
Washington State	Salmon distribution, status, and habitats	SalmonScape is an interactive mapping application designed to display and report a wide range of data related to salmon distribution, status, and habitats. The data sources used by SalmonScape include stream specific fish and habitat data, and information about stock status and recovery evaluations.	http://apps.wdfw.wa.gov/salmonscape/ [last accessed October 1, 2015]	Washington Department of Fish and Wildlife
West Coast	Salmon	Maps of salmon and steelhead population boundaries	http://www.westcoast.fisheries.noaa.gov/maps_data/maps_and_gis_data.html [last accessed October 1, 2015]	NOAA Fisheries, West Coast Region
Whatcom County	Marine species and Habitats	Whatcom County Marine Resources maps of marine species and habitats	http://www.mrc.whatcomcounty.org/library [last accessed October 1, 2015]	Whatcom County Marine Resources Committee Library
US	Critical habitat maps for marine and	Website links to data and maps. The critical habitat maps provided here are for illustrative purposes only. Textual descriptions of critical habitats, which are provided in the	http://www.nmfs.noaa.gov/species/criticalhabitat.htm [last accessed January 21, 2016]	NMFS NOAA

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Watershed/ Area	Parameter	Document/Website	URL	Source
	anadromous fishes	associated <i>Federal Register</i> notices (see links below), are the definitive sources for determining critical habitat boundaries. Map and <i>Federal Register</i> notice links are PDF files.		
US	Threatened and Endangered Species	Environmental Conservation Online System, data and maps.	http://ecos.fws.gov/ecp/ [last accessed February 18, 2016]	US FWS
Washington State	Rare plants, animals, ecological communities	Reference Desk of the Washington Natural Heritage Program. Includes searchable databases	https://www.dnr.wa.gov/natural-heritage-program [last accessed February 28, 2018]	Washington State Department of Natural Resources
Puget Sound Region	Wetlands	National Wetlands Inventory, data and maps	http://www.fws.gov/wetlands/ [last accessed February 1, 2016]	US FWS

Table 25: Soils 2

3

WID/Area	Parameter	Document	URL	Source
US	Soils	Web Soil Survey	http://websoilsurvey.nrcs.usda.gov/app/ last accessed October 1, 2015	USDA Natural Resource Conservation Service

Table 26: WRIA 1 materials online

1

In addition to the WRIA 1 materials included in this memo, there are many additional resources available on the WRIA1 Resource Library webpages

2

Watersheds	Type of Resource	Topics or Titles	URL
All	Studies	Water rights, Water Quantity, Water Quality, and Habitat and Instream Flow; The 2010 State of the Watershed Report, 2013 WRIA Groundwater Data Assessment, 2013 Data Integration of WRIA 1 Hydraulic, Fish Habitat and Hydrology Models, The Whatcom County Coordinated Water System Plan, 2000 (a 2016 version is available at http://www.whatcomcounty.us/1035/Coordinated-Water-System-Plan-Update), and 2005 Numerical Groundwater Flow Model of the Abbotsford-Sumas Aquifer	http://wria1project.whatcomcounty.org/Resource-Library/8.aspx [last accessed February 1, 2016]
All	Maps	WRIA 1 Watersheds Map V3 Historic Land Cover Map - USU Existing Land Cover Future Land Cover – USGS Impervious Surfaces – NOAA Population Density – WA DOE Approximate Depth to Water Combined Hydrology Mechanisms, Draft – 11 Precipitation – PRISM Surface Water Storage Alterations Water Right Watershed Status Long Term Monitoring Adopted Map, and Interactive WRIA Monitoring Stations.	http://wria1project.whatcomcounty.org/Resource-Library/Maps/38.aspx [last accessed February 1, 2016]

Table 27: Social survey

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Watersheds	Study	Description	Source
Tenmile	Tenmile watershed 2017 landowner social survey	Surveyed landowner opinions on water quality, best management practices, and trusted sources of information.	Available on request from the Whatcom Conservation District: 360-526-2381

Appendix F: Notes from the Whatcom Watershed Improvement Districts Work Session in Lynden, 1
March 20, 2017.



2

Notes¹

Whatcom Watershed Improvement Districts Work Session

Steakhouse 9 - Lynden, WA

March 20, 2015 – 10:30 am to 3:00 pm

Facilitator – Ray Ledgerwood²

Meeting Purpose:³

- § Identify strategic priorities in each WID, discuss coordination on certain priorities, and learn⁴ techniques for comprehensive plans.

Opening Comments⁵

Come together to see what we have done, what we want to do as WIDs...individually and⁶ collectively.

Watershed Improvement District (WID) Reports of What Has Been Done since April 2015⁷

WID	Report
Bertrand WID	<ul style="list-style-type: none">· Raised assessment to have revenue for technical and legal assistance· Surface to ground water· New tide gate on Schell Creek· Active on Lummi negotiations· Streamflow augmentation project· Funding for ground water model· Guide Meridian ditch work· Water quality sampling· Worked with Heather on resource inventory· Culvert replacements
North Lynden WID	<ul style="list-style-type: none">· Smallest WID· Water quality testing with county...PIC program...very intense· Farmers in area substantiated by monitoring indicating Canada issues· City of Lynden working on getting septic systems connected and/or addressed· Ditch maintenance on local ditches...difference in water quality sampling improvement· Contacts with neighbors regarding practices· Spray ditches annually for Reed Canary Grass
Laurel WID	<ul style="list-style-type: none">· Have discussions on problem areas, identify areas with issues...go out and talk with land owners· Water quality reporting...challenge in bracketing...showing where the problems were noted· Workshop on horse management· Developing a 5 year plan· Developing relationships with other groups· Supporting the bigger water board· Working with 10 mile group

South Lynden WID	<ul style="list-style-type: none"> • Water quality testing...some things did not make sense • Worked on known problems • Worked on water banking concept, storage of water for later use, deep well possibilities, • Protecting water rights • Comprehensive plan development • Talking with fellow farmers regarding water quality • Drainage issues and river running through our area • Ditch spraying • Possibilities of improving drainage of the river • Supporting AWB 	1
Sumas WID	<ul style="list-style-type: none"> • Thorough water testing...added sites • Interesting monitoring information • Share water quality data with farmers • Mapping project with help from Heather • Looking at the various areas to do work • Looking at a management plan for the WID with available funding • Outreach lunch in Sumas to take our work to the people in the WID...shared results of water testing • Tour scheduled cancelled because of snow...when Keith is available to see which potential projects are out there • Did drainage work with local drainage district • Looking at prioritizing projects • Met with RESources to work on quality monitoring - elephants in room 	
Drayton WID	<ul style="list-style-type: none"> • Work with Birch Bay Sewer and Water and other partner organizations and specialists • Deep water aquifer project and water resource data • Looking at water resource potential, water rights, supply issues • Water quality monitoring • Drayton Harbor shellfish beds opened up...credit due...goal • Conservation workshop • WIDS do more than just the projects we are talking about • AWB work (coordination) with the tribes • Work on legal and political issues...Whatcom Family Farmers...important that we formed WIDs when we did • Disappointed in another organization with a recent assertion that we have not done anything • Entering a most critical phase of negotiation with the tribes • Water conservation, water quality projects completed • Work with Whatcom Family Farmers regarding most serious issues, influence 	
Resource Specialists	<ul style="list-style-type: none"> • Got our pollution prevention program going in county • PUD and RH2 worked on water quality report • First 3 phase of ground water data collection • Whatcom Water Supply working group • PUD on drought contingency planning effort • Lummi infrastructure study 	

	<ul style="list-style-type: none"> Integrate water supply efforts...merging boards...system wide improvement of levies Comprehensive plan update Purchase development rights program (issue) Threshold on impervious surfaces (issue that could damage agriculture)...meeting this Thursday 	1
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Summary Whatcom WIDs Strategic Priorities (revised 3.20.17) 2

WID	Priority 1	Priority 2	Priority 3	Priority 4	3
Bertrand WID	Water Rights	Water Quality	Drainage	Flood Management	
Drayton WID	Water Rights	Water Quality	Comprehensive Plan		
North Lynden WID	Drainage	Water Quality	Water Rights	Flood Management	
Laurel WID	Water Rights	Drainage	Water Quality	Flood Management	
South Lynden WID	Water Quality	Water Rights	Drainage	Flood Management	
Sumas WID	Water Quality	Water Rights	Agricultural Protection	Communication, Outreach, Education	

Top Activities for Upcoming Year 4

If we had time, money, energy for one, then that one and one more, those two...etc. 5

WID	Top Activities for Upcoming Year	6
Bertrand WID	<ol style="list-style-type: none"> Water augmentation project finished Surface to groundwater transfers...support legislation and legal effort Continue water quality testing to bring quality back Update Comprehensive plan 	
Drayton WID	<ol style="list-style-type: none"> Continue to work on deep water aquifer...move beyond just the exploration...to supply or mitigation of new water rights Continue to monitor water quality and find hot spots Working with farmers on legal avenues to move water around...spreading, piping, water bank, transfers Public relations...family farmers to dispute misinformation 	
North Lynden WID	<ol style="list-style-type: none"> 5 year permit for drainage maintenance...Find the funding for development of the 5 year plan...chase paperwork Continue our water quality work with Whatcom County Public Works, and Lynden Work on culvert repair/replacement 	
Laurel WID	<ol style="list-style-type: none"> Support the AWB for efforts in legal negotiation and lobbying Develop a 5 year plan for drainage Set up the DNA testing for water quality 	
South Lynden WID	<ol style="list-style-type: none"> Work with resources on DNA sequencing Continue water quality testing Work on water rights...obtain, distribute water rights...lobby to get it done 	

Sumas WID	<ol style="list-style-type: none"> 1. Ditch cleaning project 2. Continued water quality testing 3. Outreach and education with our land owners 	1
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Strategies for Working Together 2

Strategy	Lead	3
<i>Communication/Outreach</i>		
<ul style="list-style-type: none"> · Preserving the “one voice” outreach...continue work with key partners...work together to defend agriculture and get the word out 	<ul style="list-style-type: none"> · Whatcom Family Farmers – Fred, specific partners – eg public affairs people in organizations · Story specific for information · Brad & Rich 	
<ul style="list-style-type: none"> · Communication and community outreach...message in positive way 	<ul style="list-style-type: none"> · See above 	
<ul style="list-style-type: none"> · Habitat for species...telling people what farmers are doing to benefit habitat 	<ul style="list-style-type: none"> · 	
<i>Legal</i>		
<ul style="list-style-type: none"> · Continue to identify legal access to water supply...acquiring, getting water where it needs to go 	<ul style="list-style-type: none"> · Bill, Marty, Henry, Chuck, Greg 	
<ul style="list-style-type: none"> · Work together on tribal negotiations on water quality and supply 	<ul style="list-style-type: none"> · Negotiation Team, Fred, Greg · Needs expanded and probably a different team as supply is addressed 	
<ul style="list-style-type: none"> · Legal challenges, and holding them off 	<ul style="list-style-type: none"> · Bill, Marty, Scott, Jeff, Greg, Henry 	
<i>Quality</i>		
<ul style="list-style-type: none"> · Work together on funding for and implementation of DNA testing 	<ul style="list-style-type: none"> · David – N3, Landon, Kent, 	
<ul style="list-style-type: none"> · Water quality projects and how it effects our industry...improving and communicating xx 	<ul style="list-style-type: none"> · Fred, · See above 	
<i>Drainage</i>		
<ul style="list-style-type: none"> · Get permits faster and eliminate some of the paper work – 5 year Programmatic Permits 	<ul style="list-style-type: none"> · Karin, Frank, Joel, Henry, Fred 	
<i>Supply/Access</i>		
<ul style="list-style-type: none"> · Water quantity projects and ability to have water long term for future generations...mitigation banking 	<ul style="list-style-type: none"> · Bill, Marty, Scott, Jeff, Greg, Henry 	
<i>Organizational/Administrative</i>		
<ul style="list-style-type: none"> · Tracking legislation, rule making, agendas, and impacts at County, State, Federal levels...agriculture representation on committees 	<ul style="list-style-type: none"> · Henry, Bill, Fred, partner individuals 	
<ul style="list-style-type: none"> · Utilize the influence system of collective WIDs including messengers and skills development (training) 	<ul style="list-style-type: none"> · Whatcom Family Farmers 	
<ul style="list-style-type: none"> · Organize the listing of committees and groups to get agriculture representation on 	<ul style="list-style-type: none"> · Henry, Fred and members 	

Expert Resources

Chuck Lindsay, AESI - hydrogeology	<ul style="list-style-type: none"> • Hydrologist • 30 years' experience... • Identification, ground water supply • Water right evaluations • Working for County • Stream augmentation work • Surface to ground water transfer information • Development of deep water – Drayton • Water rights guidance manual for farmers 	1
Jon Hutchings – WCPW Director	<ul style="list-style-type: none"> • Public works director • Drainage, culverts, roads • River and road program • Natural resources and water resources • Expectation and growing number of services that county provides...county council passed water action plan • Work with industry on water quality • No new dollars...fixed revenue from flood control district...action plan developed...correction on revenue side needed 	
Joel Ingram – WDFW hydraulics permits	<ul style="list-style-type: none"> • Working with fish and fsh habitat for past 12 years...4 years in Whatcom County • Salmon recovery • Permitting for hydraulic • 5 year plans – certainty about what is expected by WDFW...planning and process work beforehand...revisit each five years • Windows of work • Beaver management, trash racks, • Project work, agreements, streamline process 	
Aneka Sweeney – WCD Education Specialist	<ul style="list-style-type: none"> • Packet of information...Conservation District • How to best develop programmatic permits • If you need assistance with projects, information • Assist land managers with conservation choices • 5 year planning...preservation of future of farming • Develop educational program to preserve farming in Whatcom County • Farm Speaker series in cooperation with AWB and WCD...different subject matter • Education in schools about natural resources • Communication plan development • Water quality education group • Grant writing support for partnership programs • Insurance for Farm Tours 	
Jim Bucknell/Andy Dunn – RH2 Engineering – water right preparation	<ul style="list-style-type: none"> • Civil engineering firm • Water rights expertise • 35 years' experience with Ecology...change applications 	

	<ul style="list-style-type: none"> · Understand water law, statutes, regulations, and know the people · Drought contingency plan, water bank, water exchange · Lummi projects...water for in stream and out of stream – how to move water around for projects...resolving issues · Study with PUD on water rights
Heather MacKay/Cheryl Lovato Niles – FHB Consulting – plan development	<ul style="list-style-type: none"> · Work with Henry for several years · Banking and trading of water · Whatcom County – Ag watershed data...copy for each WIDs · Worked with each WID regarding priorities and restoration of flow and habitat...need for farming and need for habitat · Worked with farmers on planning resources · Detailed priorities, reference maps, species, ag lands cover...available for each WID · Working with Sumas WID on action plan
Erika Douglas – WCPW – water quality	<ul style="list-style-type: none"> · Water quality monitoring...bacteria driven · Drainage into key areas · Working with Canada · Routine monitoring throughout drainages in Whatcom County · Seeing water quality areas of concern...focused areas...North Lynden, Nooksack, · Seeing what is going on...pollution prevention program...on hot spots, practice application · Not just one source of pollution...talking with folks about various pollution sources · Partners with Whatcom CD · Success in Drayton Harbor...attributed to community coming together...whole combination of community coming together
Steve Jilk – PUD #1 General Manager	<ul style="list-style-type: none"> · County wide economic development program · County wide water planning · City administrator...Lynden · One of three agencies with authority to operate and manage water resources in Whatcom County · Took on electricity supply...took on water rights...service of water to BP refinery · Have most water rights in county · Separate irrigation water rights · All of Cherry Point, Ferndale – West, I-5 Grandview Industrial Park · Engaged in watershed planning board · Try to play a problem solving role in water quality · Worked with Bellingham and partners on Lower Nooksack strategy...water supply plan...broad 40,000 ft level of water resources tied to planning · Water supply group

Kent Oostra – Exact Scientific Lab	<ul style="list-style-type: none">• Resident of Whatcom CD• E.coli as monitoring• DNA sequencing – non targeted• \$20,000 in research regarding DNA testing specific to related• Running fecal Whatcom CD• Looking at Nooksack from mountains to ocean• Bio indicators and what profile is• Tracking sources for \$125 per sample• Needing to build a data set now• FDA requiring this type of testing
David – N3	<ul style="list-style-type: none">• Drayton WID Board• Feedback loop is very important and open to suggestions on how to do this better• Water test indicating very good• One item is water nitrates...much better than 10 years ago• On committees...must have agriculture representation...see what is going on