

Drayton Watershed Improvement District
Agriculture-Watershed Characterization and Mapping Report
August 2016



Whatcom County Ag-Watershed Project



PROJECT PARTNERS



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

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Abbreviations used in this document

AU	Assessment Unit/Analysis Unit (Puget Sound Watershed Characterization Project) ¹
AWCA	Agriculture-Watershed Characterization Area
CDID	Consolidated Drainage Improvement District
DID	Drainage Improvement District
DO	Dissolved oxygen
NRCS	Natural Resource Conservation Service
PDR	Purchase of Development Rights
PSWC	Puget Sound Watershed Characterization
RSA	Rural Study Area
USDA	United States Department of Agriculture
WCD	Whatcom Conservation District
WCPDS	Whatcom County Planning & Development Services
WCPW	Whatcom County Public Works
WDFW	Washington Department of Fish & Wildlife
WID	Watershed Improvement District
WRIA 1	Water Resource Inventory Area 1

¹ In earlier pilot documents, AUs were also referred to as "Analysis Units"

1 Introduction

1.1 Background and purpose of agriculture-watershed characterization and mapping

Agricultural operations and watershed features have long been key components of Whatcom County's distinct landscape. Both are critical for our community's economy and health. While it may seem that agriculture and watershed functions are at odds with one another after decades of regulations and planning, there are in fact many locations where protection of agricultural lands and enhancement of watershed functions can result in mutual benefits.

Healthy watersheds provide a wide range of watershed ecosystem services. These include: surface and ground water supply and recharge; water storage and flood protection; production of food, fish, fiber and building materials; soil processes and sediments; cycling of nutrients, transport of pollutants; and protection against natural hazards such as floods, droughts and landslides.

These many watershed services rely on processes involving water flow and storage, water quality, plants and animals.

Farming relies on watershed services as part of the "natural infrastructure" for production. Agricultural production requires enough water of suitable quality for irrigation, livestock and processing; healthy high-quality soils; drainage of fields and protection from flooding. In addition, agricultural systems require: a large enough land base to sustain a vibrant agricultural economy; access to labor, markets and additional "built infrastructure".

However, farms are also providers of watershed services, the most obvious being food production. The preservation of open space, wildlife corridors, protection of soils and flood water storage are other watershed services that can be provided on actively farmed

land. Landowners and farmers who participate in strategic actions to maintain, repair or protect larger-scale watershed processes can help to improve watershed health and enhance critical watershed services.

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.

The agriculture-watershed characterization maps and tables combine existing spatial data with field experience and farmers' local knowledge to identify agricultural priorities and needs in the 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 characterization and mapping results presented in this report 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.

1.2 About the Ag-Watershed Project

The Ag-Watershed Project is examining ways to reward the good things that farmers already do - those beneficial actions that go beyond existing regulation to maintain, repair or protect large-scale watershed processes, while also strengthening agriculture in Whatcom County.

The Ag-Watershed Project is a research and development project 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 reports and reference documents, can be found at <http://whatcomcounty.us/2260/Agricultural-Watershed-Pilot-Project>

1.3 What is in this document

This document 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. An overview of the document contents is also provided in the color-coded table in the front of this document.

Sections 1 and 2 provide background information about the Ag-Watershed Project, the characterization and mapping task, and the Drayton Watershed Improvement District.

Section 3 is a summary of the overall methodology and results. It can be read as a stand-alone resource to obtain an overview of the process and the outcomes.

Section 4 contains a detailed description of the agricultural characterization methodology, and includes the agricultural prioritization maps and the detailed tables of information about agricultural priorities.

Section 5 contains a detailed description of the watershed characterization methodology, and includes the watershed prioritization maps and the detailed tables of information about watershed priorities.

Section 6 contains the set of agricultural and watershed reference maps that were used in generating the agriculture-watershed characterization results.

Sections 7 and 8 contain the bibliography and glossary of key terms. Sources of information cited in the text of the report are included in the bibliography but are also provided in footnotes for easy reference.

Appendices contain additional supporting information for future reference by the WID.

This document is one of a series of six reports. A customized report has been prepared for each of the Watershed Improvement Districts in Whatcom County. Reports for other Watershed Improvement Districts can be accessed through the WID websites² or through the Ag-Watershed Project page.³ The results of the characterization and mapping have also been incorporated into an online story map that can be accessed at <http://arcg.is/29MYdYu>.⁴

² Links to each WID website can be found at <http://www.agwaterboard.com/>

³ See <http://www.co.whatcom.wa.us/2260/Agricultural-Watershed-Pilot-Project>

⁴ 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, using ArcGIS® software by Esri. <http://arcg.is/29MYdYu>

2 Overview of the Drayton Watershed Improvement District

The Nooksack River watershed and certain adjacent basins (including Lake Whatcom) which discharge to the marine waters of Georgia Strait and Puget Sound and to the Fraser River system in Canada are included in Water Resource Inventory Area 1 (WRIA 1), as designated by the State of Washington. The majority of Whatcom County is in WRIA 1 with a portion of the WRIA 1 extending into neighboring Skagit County (see Figure 1 and Figure 2).

Each Watershed Improvement District (WID) is a unique agricultural neighborhood in Whatcom County's broader farming community. Natural characteristics of the soil, locations of surface and ground waters and topography of the area help to delineate viable areas for the many types of agricultural production taking place. The boundaries of the WIDs have been selected not only to reflect the characteristics and interests of different agricultural neighborhoods, but also to align where possible with the geographic boundaries of water management areas used in mapping and planning of water resources by local and state governments and the agricultural land classifications used by local land use planners and agricultural specialists.

The Drayton Watershed Improvement District (see Figure 3) is located in the northern coastal lowland area of Whatcom County, within WRIA 1. Land use in the local area is diverse, including agricultural, rural, commercial and low-density residential areas. Blaine (pop. 5,000), the closest city, lies to the northwest. Agriculture includes a mix of dairy corn, dairy hay, potatoes and berry crops. A significant proportion of the soils in the Drayton WID have been classified by the USDA Natural Resources

Conservation Service as Prime or Prime if managed⁵ (see Prime Soils reference map), with the predominant classification being "Prime if Subsoiled".

The Drayton WID area encompasses 7,385 acres in total. The WID area includes portions of the Dakota, California, and Haynie Creek drainages. Flow through these creeks is generally to the northwest, entering Drayton Harbor, which contains active shellfish farming areas.

The WID contains two other special purpose districts within its boundaries, whose primary purpose is to improve and maintain drainage of agricultural land within those portions of the WID. These are Drainage Improvement District No. 7 and Drainage Improvement District No. 2 (see Special Districts reference map).

More information about the Drayton WID can be found at their website <http://www.draytonwid.com/>

⁵ 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

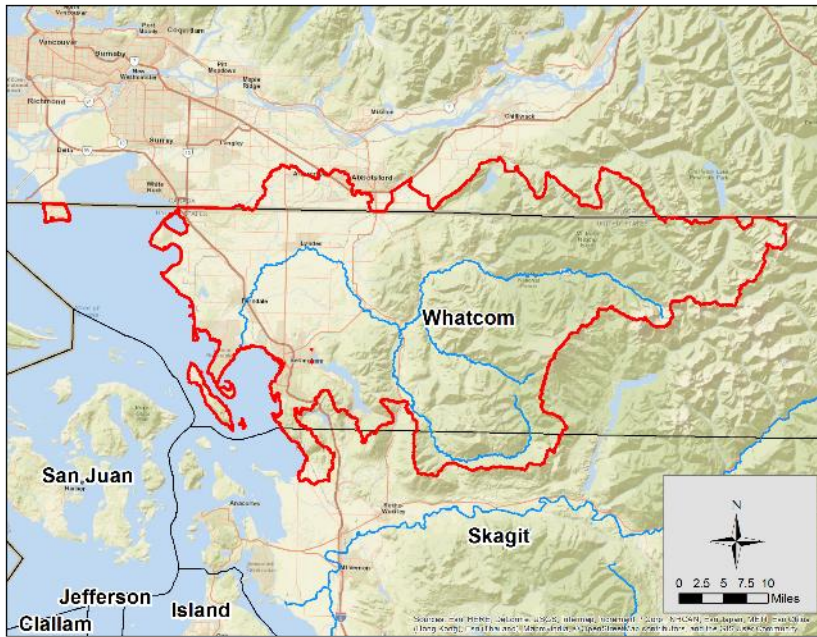


Figure 1. Regional map showing general location of Whatcom County and Water Resource Inventory Area 1 (red boundary)

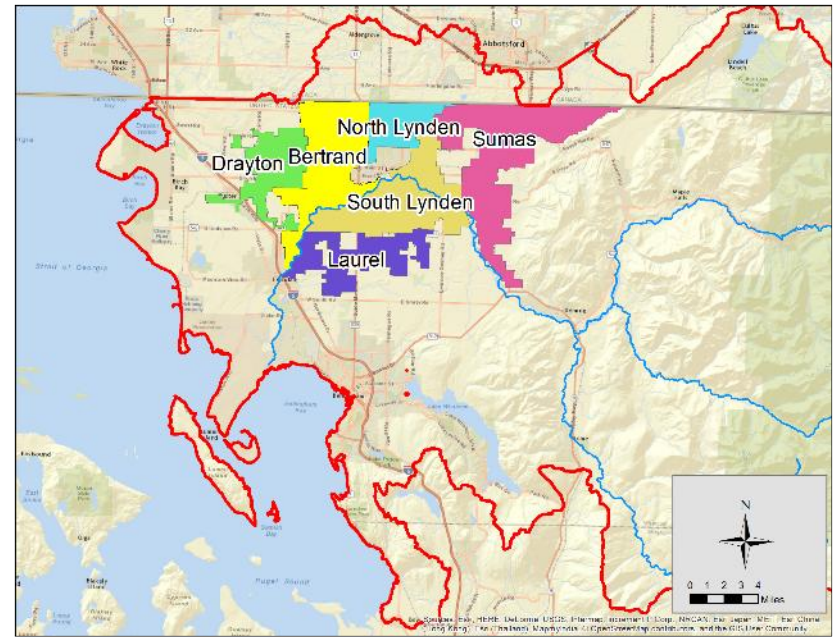


Figure 2. Map showing Water Resource Inventory Area 1 and the Drayton Watershed Improvement District

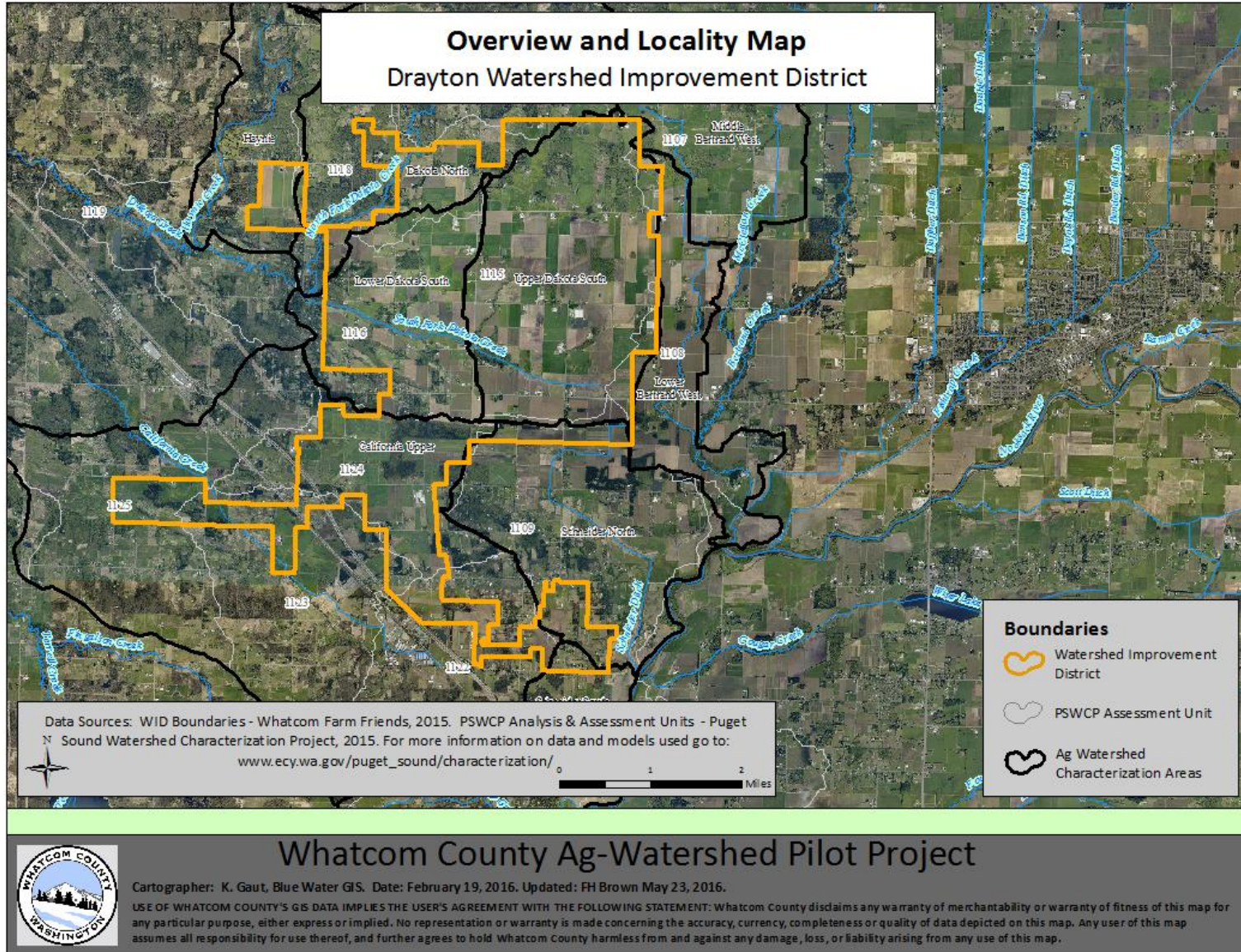


Figure 3. Drayton WID overview and locality map

3 Summary results and approach used for agriculture-watershed characterization

3.1 Pilot characterization and mapping (2012)

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).⁶ Project Fact Sheet 2 provides additional background information on the agriculture-watershed characterization and mapping process.⁷

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.

3.2 Brief description: Methodology used for the 2016 WID characterization and mapping

Areas within the Drayton 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.

A work session was held with Drayton 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.

3.2.1 Watershed analysis

The results of the watershed characterization and mapping for the Drayton 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 Drayton WID, the information contained in the watershed reference maps (see section 6.2 of this report) was combined with the results of watershed characterization⁸ (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 5.1 of this report.

⁶ 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>

⁷ Ag-Watershed Project fact sheets can be downloaded from <http://whatcomcounty.us/2260/Agricultural-Watershed-Pilot-Project>

⁸ 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

3.2.2 Agricultural analysis

The results of the agricultural characterization and mapping for the Drayton 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 6.1 of this 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 agricultural characterization methodology is provided in section 4.1 of this report.

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

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 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 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 this report.

3.4 Summarized results for the Drayton Watershed Improvement District

The summary table below (Table 1) and the summary maps in Figure 4 highlight the most significant watershed and agricultural enhancement opportunities within the Drayton 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 and information on priorities, and descriptions of opportunities for enhancement through specific actions can be found in Table 3 and Table 5 in this report.

Table 1. Summary results of agriculture-watershed characterization and mapping for the Drayton WID
(See locality map in Figure 3 for locations of agriculture-watershed characterization areas)

Agriculture-Watershed Characterization Area	Dakota Creek South (Upper)	Dakota Creek South (Lower)	Dakota Creek North	Haynie Creek	California Creek (Upper)	Schneider Ditch (North)
Agricultural Enhancement Priority (See Table 3 for details)						
Prime agricultural Soils	ü	ü	ü	ü	ü	ü
Water quality for crops and livestock	-	-	-	-	ü	-
Water quantity	ü	ü	-	ü	ü	-
Agricultural drainage	-	ü	-	-	ü	-
Flood protection	-	-	-	-	ü	ü
Agricultural Land Base						
Important agricultural land	ü	ü	ü	ü	ü	ü
Protection from development pressure	-	ü	ü	ü	ü	ü
Other:	-	-	-	-	-	-
Watershed Enhancement Priority (See Table 5 for details)						
Water Quality						
Nutrients, Ammonia-N	-	-	-	-	-	-
Bacteria	-	ü	ü	-	ü	-
Temperature	-	-	-	-	-	-
Dissolved oxygen	-	-	ü	-	ü	-
Other:	-	-	-	-	ü(bioassessment)	-
Habitat						
Salmon spawning (current, documented)	-	-	ü	ü	ü	-
Anadromous fish	ü	ü	ü	ü	ü	-
Wildlife	-	-	-	-	ü	ü
Wetland	ü	ü	ü	-	ü	-
Water Flow Processes ⁹						
Delivery	-	-	-	-	-	-
Discharge	-	ü	ü	ü	-	-
Recharge	-	ü	-	ü	-	-
Storage	-	-	-	ü	ü	-

⁹ 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.

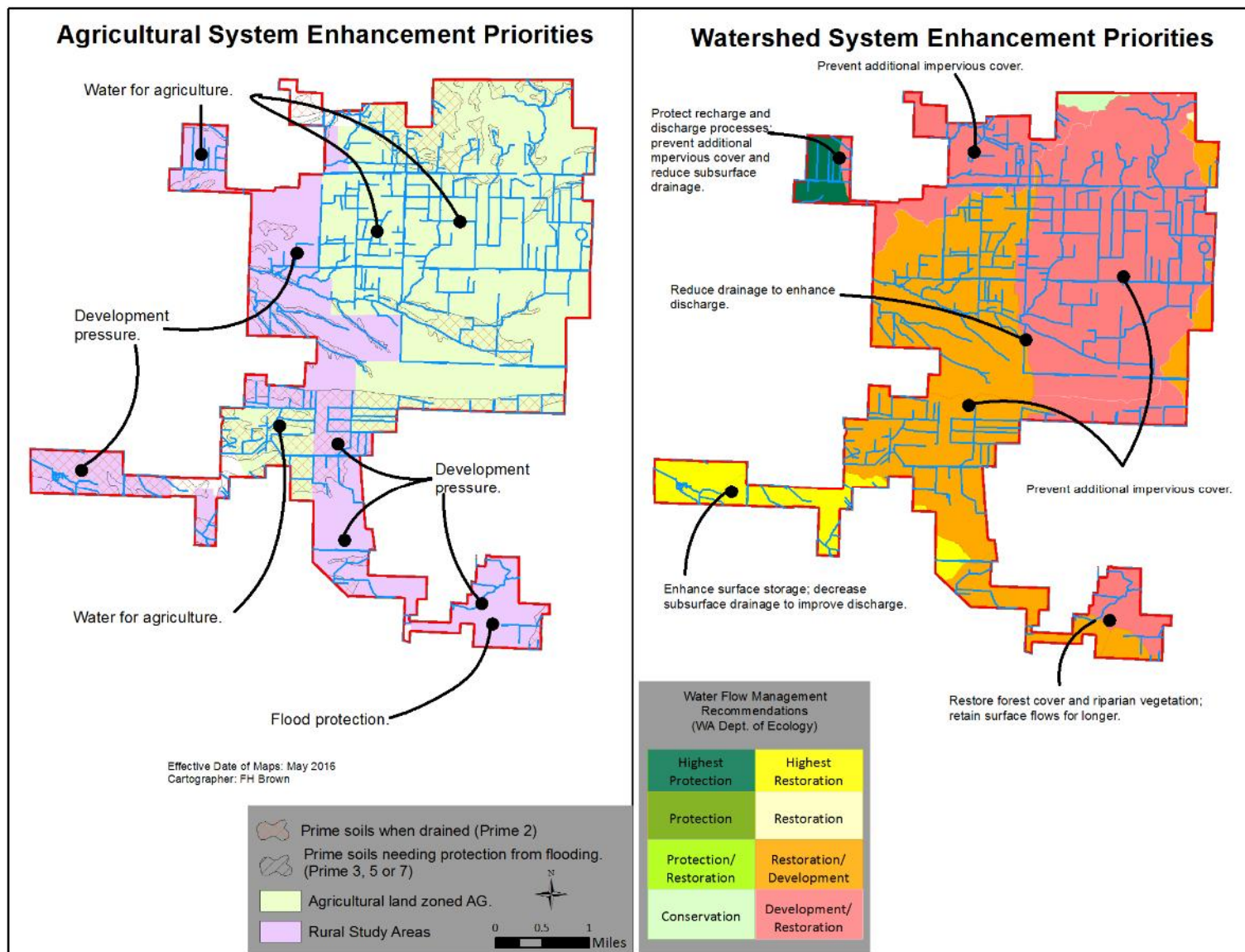


Figure 4. Drayton WID: Summary maps of agricultural and watershed enhancement priorities

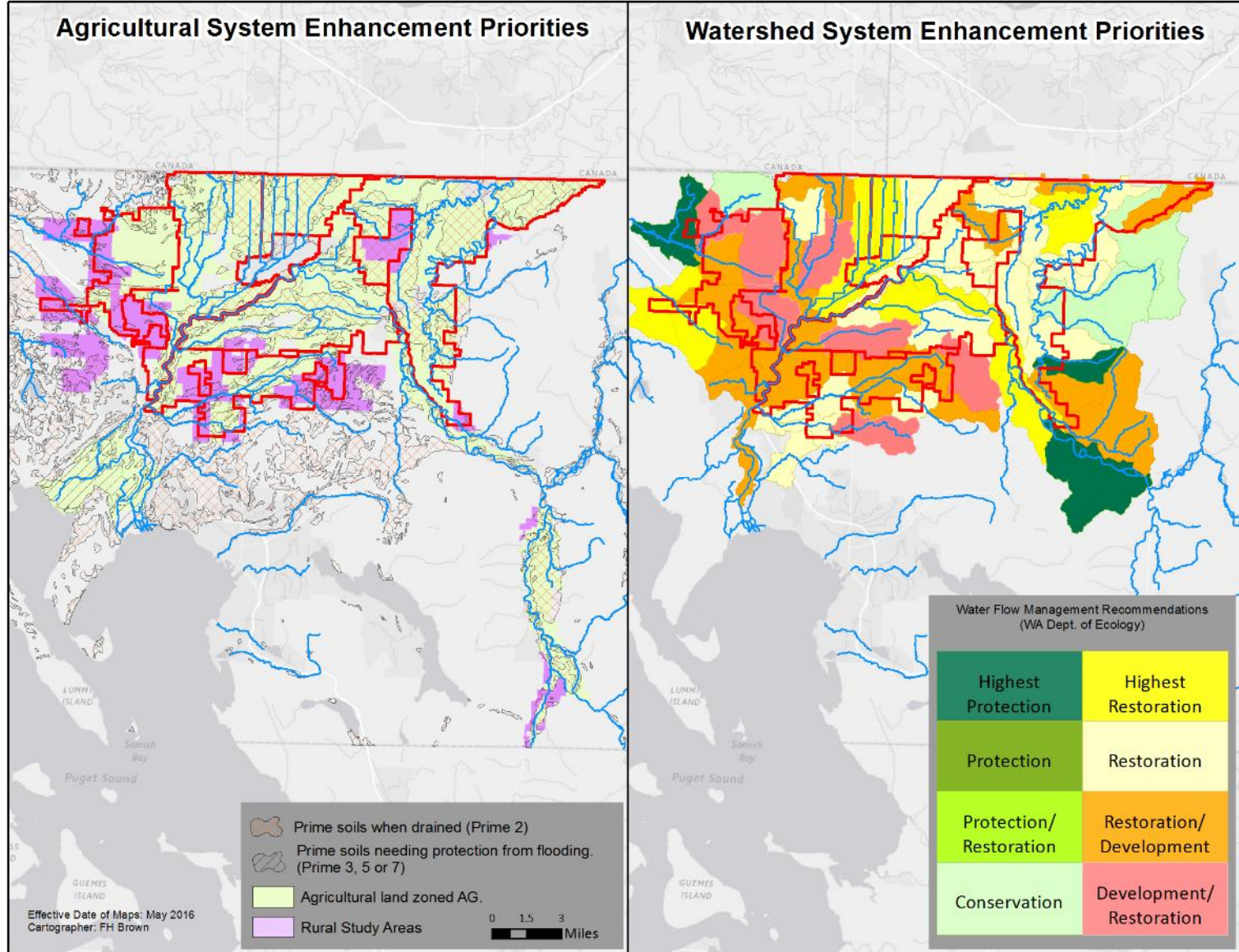


Figure 5. General agricultural and watershed enhancement priorities for the lowland areas of Whatcom County

3.5 Possible future challenges and priorities

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

- Water quantity: Access to legal irrigation water is a key priority (39 new applications have been filed in the WID area). Dakota Creek and California 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 flow levels are met during critical periods for fish per the existing Nooksack Instream Flow Rule.¹⁰ Access to larger volumes of groundwater is constrained due to local hydrogeological characteristics. Some Group A public water suppliers do not have adequate water rights in suitable locations to meet projected future demand.¹¹
- Protection of agricultural land from development pressure: The Drayton WID is mostly located on prime farmland soils, but the land is largely zoned Rural (R5-acre and R10-acre) instead of Agriculture (AG), is heavily parcelized and is vulnerable to conversion for low-density rural residential use.
- Water quality: Elevated fecal bacteria levels have been recorded both within the WID and in areas of the Drayton Harbor watershed outside the WID. This is of particular concern for the protection of commercial shellfish beds in Drayton Harbor. Potential sources include residential and commercial development, wildlife, livestock (both commercial and non-commercial).
- Drainage & flood management: Drainage is needed in some areas of the Drayton WID and flood protection in others. Maintaining the effectiveness of drainage ditches is important for drainage, flooding and water quality.

¹⁰ [WAC 173-501](#) (1985), Instream Resources Protection Program – Nooksack Water Resource Inventory Area 1.

¹¹ *Whatcom County Coordinated Water System Plan Update* (2016), <http://www.whatcomcounty.us/1035/Coordinated-Water-System-Plan-Update>

4 Agricultural characterization and mapping for the Drayton Watershed Improvement District

4.1 Methodology

4.1.1 General approach

The general approach used in this work has been to identify and characterize

- what the priority agricultural needs are in the WID area, and why these are priorities for farming,
- where these are most needed in the WID area for the long term success of agriculture,
- what are the potential opportunities for agricultural enhancements that can address these needs, and
- which specific actions at reach-scale or farm-scale might be most effective in meeting agricultural enhancement needs in the WID.

The method used to characterize, prioritize and map agricultural enhancement needs within the area of the Watershed Improvement District (WID) was developed used in the pilot study,¹² and has since been adapted and refined as described here. The methodology relies on the structured combination of information derived from

- (i) existing agricultural land protection programs in Whatcom County,
- (ii) available GIS data used to prepare the agricultural reference maps, and
- (iii) local knowledge provided by participants in the WID work session.

¹² 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>

4.1.2 What are the priorities for agriculture and why are these needed?

A viable agricultural system relies on three kinds of infrastructure:

- Natural infrastructure including available land, soils, water, air, plants and animals;
- Built infrastructure including product packing and processing facilities, livestock shelter and management facilities, transportation and water conveyance systems for irrigation, land drainage and flood protection;
- Supporting socio-cultural-economic infrastructure including research capacity, cultural value, knowledge and information transfer, labor, regulations and governance, business structures, access to markets.

The agricultural characterization has been focused on those aspects of agricultural infrastructure that are considered to be priorities for maintaining a viable agricultural industry in Whatcom County, and that are suited to mapping. These general priorities were initially identified in the pilot agricultural characterization and mapping workshop held in Lynden in October 2012¹³ with farmers, agriculture professionals, planning and conservation agency staff:

- Availability of prime agricultural soils for all crop types and rotations;
- Water quantity for agricultural activities (irrigation, livestock and agricultural processing);
- Water quality for agriculture (livestock, crops, processing);
- Land drainage including timing of drainage for soil preparation, crop growth and harvesting;
- Protection of fields from flooding at critical times in the growing season;

¹³ Gill, P. (2013). *Ibid.*

- Protection of the agricultural land base from conversion for non-farming land uses;
- Protection from development pressure and agricultural-residential conflicts.

4.1.3 Detailed description of process for characterizing and mapping agricultural enhancement priorities

Step 1: Delineation of Agriculture-Watershed Characterization Areas. The WID area was divided into several smaller “Agriculture-Watershed Characterization Areas”, based on a combination of the WRIA 1 water management areas¹⁴ and the Puget Sound Watershed Characterization Project assessment units (see section 5 in this report for explanation of the assessment units). The AWCAs reflect hydrological and agricultural characteristics in the landscape, are recognizable for WID members, and are of a size that is practical for the WIDs to utilize in their planning processes. Importantly, the AWCAs represent common areas within which to characterize and map both agricultural and watershed enhancement priorities.

Step 2: Agriculture priority maps. The project team assembled a series of agriculture priority maps based on analysis of GIS data from Whatcom County’s existing Agriculture Program and other relevant sources. The agriculture priority maps included, for each agriculture-watershed characterization area (AWCA) associated with the WID:

- Proportion of prime soils (Figure 6);
- Drainage needs for agricultural land (Figure 7);
- Flood protection needs for agricultural land (Figure 8);

- Important agricultural land and needs for protection of the agricultural land base (Figure 9);
- Water quantity needs for agricultural activities (Figure 10).

Step 3: Agriculture reference maps. The project team prepared a series of agriculture reference maps to provide background information for the characterization and mapping process, using GIS data from Whatcom County and other relevant sources. The agriculture reference maps included:

- Agriculture priority areas identified in the County’s Agriculture Program as important agricultural land,¹⁵ including land within the Agriculture District (AG), land in the Rural Study Areas, and land on which agricultural conservation easements have been placed through the Purchase of Development Rights program (Figure 17);
- Agricultural land use inventory,¹⁶ showing current land cover on agricultural lands in the WID (Figure 18);
- Location of Prime farmland soils as defined by the USDA (Figure 19);
- Potential residential development rights on agricultural land (Figure 20);
- Water right points of diversion – existing water rights and new applications (Figure 21);
- Special Districts that are wholly or partially within the WID area, including drainage, diking and flood control districts (Figure 22);
- Surface water quality impairments (Figure 27).

¹⁴ *Surface Water Delineation Boundaries in WRIA 1* (November 2002). http://wria1project.whatcomcounty.org/uploads/PDF/Maps/WRIA%201%20Water%20sheds%20&%20Streams%20V3_draftscreen.pdf

¹⁵ *Whatcom County Agricultural Strategic Plan*. (2011), Planning & Development Services Published May 17, 2011; Re-Published July 27, 2011 <http://www.whatcomcounty.us/DocumentCenter/View/3630>

¹⁶ *Whatcom County Agricultural Land Cover Analysis* (2013), Whatcom County Planning & Development Services: Agricultural Program, May 2013 <http://www.co.whatcom.wa.us/DocumentCenter/View/3989>

Step 4: WID work session. The WID commissioners hosted a work session to bring together participants with local knowledge of agriculture in the WID area, including farmers and residents, agency staff and agriculture professionals. At the work session, participants gathered around several large printed maps of the WID area and discussed the agricultural and watershed priorities in the WID. Participants were provided with a set of the reference maps to use in the discussion as needed. Participants' inputs on agricultural priorities and specific actions were compiled by the project team as notes in a series of tables (see Table 4 in this report) and as notes on the large desk-top maps.

Step 5: Characterization and determination of agricultural enhancement priorities and specific actions. The project team added information from the agricultural priority maps and other reference documents to the detailed agricultural enhancement tables, along with the information provided by the work session participants (see Table 4). Agricultural priorities were determined for each Agriculture-Watershed Characterization Area (AWCA) by combining the reference information and the work session information as shown in Table 2 below. Where specific actions at specific locations were suggested by work session participants, these were included in the Agricultural Priority Actions Map (Figure 11).

Step 6: Mapping of agricultural enhancement priorities. A summary agricultural enhancement map was prepared (Figure 4) to show, as far as possible in a single map, the locations of agricultural priorities including prime farmland soils, important agricultural land, flood protection and agricultural drainage.

Table 2. Methodology for determination of agricultural enhancement priorities in the Drayton WID.

1. Primary indicator of priority: Refer to the reference maps and reference documents for a substantiated agricultural priority in each agriculture-watershed characterization area according to the criteria below. If a criterion is met for indicating an agricultural priority, then add this in yellow highlight to the detailed agriculture characterization tables, and put a check mark in the summary table of agricultural and watershed enhancement priorities (Table 1).		
2. Modifiers: Refer to the work session participants' comments for this area to see whether their comments might modify the indicator of a priority or would support a priority being added to this table, as explained below. Modify the agricultural priority indicators in summary Table 1 and detailed Table 3 as needed.		
3. Specific actions/opportunities: If the participants recommended specific actions to address priority needs, then record these in the "possible actions" column in the detailed agricultural characterization tables. Specific actions that can be tied to a specific location should be placed on the agricultural priority actions map. Specific actions that are more general can be listed in the possible actions column of the detailed agricultural characterization tables.		
Priority	Criteria for indicating priority	Modifiers
<i>Prime agricultural soils</i>	>50% of the area is Prime farmland (any prime soils category 1-10 according to USDA definitions for prime farmland)	-
<i>Water quality for crops and livestock</i>	Note WA Dept. of Ecology water quality impairments in category 5, 4a or 4b where these might affect use of the water for agricultural activities.	If work session participants noted a specific agriculture water quality issue that could affect the use of water for agricultural purposes (e.g. iron causes blockage of irrigation pipes; nitrate can be a problem for livestock), then indicate as "priority for agriculture" and crosscheck with reference documents or reference maps to substantiate if possible.
<i>Water quantity for agricultural activities</i>	More than 1 new application for water right in the area.	Refer to participants' comments and reference maps. If number of new applications is <3 and participants stated with supporting evidence, that water quantity for agriculture is currently sufficient, then the priority indicator can be removed
<i>Agricultural drainage</i>	>50% of the area contains Prime 2 soils (Prime if drained) Note presence of drainage district – not a modifier but indicates that drainage needs ongoing maintenance to remain effective.	Refer to participants' comments to see whether they consider drainage to be a priority (if they do not, that does not necessarily mean that drainage is not needed in the areas, but probably means that if drainage infrastructure is present then it is adequately maintained). If specific actions were recommended at specific locations, then add those to the actions column.
<i>Flood protection</i>	Contains >5% soils that are Prime if protected from flooding, OR Contains 1 in 100-year flood area, OR Contains floodway	If only a small portion of the area contains one of the 3 criteria at left, then refer to participants' comments and if they did not consider flood protection to be a general need for the area, then the priority indicator can be removed.
<i>Agricultural land base:</i> <ul style="list-style-type: none"> <i>Important agricultural land</i> <i>Protection from development pressure</i> 	>50% of the area is any combination of AG zoned, Rural Study Area or PDR easement.	-
	Reference maps: If a Rural Study Area is present (see agriculture priority areas reference map), OR If the area contains parcels with more than 2 potential additional dwelling units (development rights reference map)	Refer to participants' comments to see if they are experiencing residential-agriculture conflicts or pressure for conversion of agricultural land in the area and consider this to be a priority.
<i>Other:</i>	Refer to participants' comments. Crosscheck with reference documents or reference maps to substantiate if possible.	-

Table 3. Agricultural characterization tables for the Drayton WID

NOTE: Possible actions include: Specific actions identified by WID Actions Map # location (e.g. D1) and Area Units (AU), 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.

3A. Agricultural Enhancement Priorities: Dakota Creek South Fork (Upper)							
	Water quantity: Irrig., stock, and processing	Water quality	Drainage	Flood protection	Land	Other	Possible actions
Dakota Creek South Fork (Upper) AU1115 Notes from reference maps and other documents:	10-25 new water rights applications in Upper Dakota (South) – See Ag Priorities maps: Water Quantity. Water quantity priority		<25% of soils are prime if drained – see Ag Priorities maps: Drainage.	<5% of soil is prime if protected from flooding in Upper Dakota South – See Ag Priorities maps: Flooding.	95% of soils are prime 1-10 in Upper Dakota South. – See Ag Priorities maps: Prime Soils Prime soils priority 99% of land in Upper Dakota South is in AG Zoning. – See Ag Priorities maps: Ag Land Base Ag land base priority		
Dakota Creek South Fork (Upper) AU1115 Notes from work session in February 2016.	Irrigation water is limited; more is needed here.		Some drainage problems in early spring. Drainage ditch near Burk & Markworth Roads has clutter from trees, needs better maintenance for drainage flow. Noted as an action in the Bertrand WID report (B11/51 in AU1108)		Agricultural land north of Badger Road is rocky and not easy to till. Higher value agricultural land is south of Badger Road. Currently not much development pressure on land in this area.	High value potatoes, berries, nursery & greenhouses in this area.	(D1/50) AU1115: Drainage: Drainage blocked by WDFW fish culvert then backs up surface water. Need soils dry, drained (D11/63) AU 1115 <u>Drainage issue</u> . More drainage outflow is needed at the county right of way. (D2/52) AU1115: Drainage: New ditch at Enterprise Road is filling in. (D3/53) AU 1115: Drainage: Whatcom County road ditch on Badger Rd (east of Sunrise Rd) sporadic cleaning of ditch not enough.

3B. Agricultural Enhancement Priorities: Dakota Creek South Fork (Lower)							
	Water quantity: Irrigation, stock, and processing	Water quality	Drainage	Flood protection	Land	Other	Possible actions
Dakota Creek South Fork (Lower) AU1116 Notes from reference maps and other documents	10-25 new applications for water rights in Lower Dakota South – See Ag Priorities maps: Water Quantity Ag water quantity priority	Elevated iron in water likely originates in iron-manganese nodules known to exist in peat in the region. ¹⁷	<25% of soils are prime if drained.	<5% of soil is prime if protected from flooding and Dakota Creek in Lower Dakota South lies in 1:100-year flood zone – See Ag Priorities maps: Flooding	98% of land in Lower Dakota South is in Ag Zoning & RSAs. - See Ag Priorities maps: Ag Land Base Ag land base priority A Rural Study Area occupies most of this subbasin. – See Ag Reference maps: Ag Priority Areas Protection from development pressure is an ag priority 94% of soils are prime 1-10 in Lower Dakota South. – See Ag Priorities maps: Prime Soils Prime soils priority		
Dakota Creek South Fork (Lower) AU1116 Notes from work session in February 2016.	Berries are dependent on reliable water supply; irrigation is crucial to all agriculture here. Surface water flow rates are low. Surface water storage potential is limited in area southwest of Enterprise and Loomis Trail Roads.	Iron in ground-water near Loomis Trail Rd.	There are problem spots, but no drainage district in this area. Slower flow from the west of south fork Dakota. Loomis Trail ditch drains poorly. Wet spot south side of Badger Rd is spreading. School/DNR wooded property north of Loomis Trail drains toward Loomis Trail Rd, keeping this area boggy. Rip rap in the ditch along Sunrise Rd. impedes cleaning. Drainage outlets must be maintained. There is a wet area with beaver activity in new ditch north of South Fork Dakota Creek (west of Enterprise Rd). Beaver management is needed. Ag drainage priority In north part of this area, surface water drains from the north end towards Badger Road.		Residential area is Zoned R5 and there are some conflicts with neighbors. Increasing pressure for residential development from east side toward Sunrise Rd. Farmers want to see farming maintained. Participants open to programs to reduce Development Rights in Ag areas. Possibly allow higher density in rural zone where ag is not present - from I-5-west. Modern farm equipment not able to work rocky soils in northeast area even though designated as prime agricultural land.	Ease up on wetland regulations. Potential for forest fragmentation. Crops include berries, potatoes, dairies, nurseries, Along Enterprise Rd. there are more berries and potatoes as the ground is higher here. Animals are pastured on fields in winter, in the northern part between Sunrise and Delta Roads. Road design should be improved.	(D12/64) AU 1116 Drainage: Drainage needs to be maintained. (D13/65) AU 1116 Drainage: Wet area. Drainage needs improvement.

¹⁷ Mitchell, RJ, Babcock RS, Hirsch H, McKee L, Matthews RA & Vanderspyen J (2005), *Water Quality: Abbotsford-Sumas Final Report*. Western Washington University. http://kula.geol.wvu.edu/rjmitch/Report_2005.pdf

3C. Agricultural Enhancement Priorities: Dakota Creek (North Fork)							
	Water quantity: Irrigation, stock, and processing	Water quality	Drainage	Flood protection	Land	Other	Possible actions
Dakota Creek (North Fork) AU1118 Notes from reference maps and other documents	<3 new applications for water rights in Dakota North – See Ag Priorities maps: Water Quantity	A small section of Dakota Creek North is in category 5 ¹⁸ for Dissolved oxygen.	<50% of soils are prime if drained. See Ag Priorities map: Drainage	<5% of soil is prime if protected from flooding. The lower section of Dakota Creek North Fork lies in 1:100-year flood zone but this area is outside the WID – See Ag Priorities maps: Flooding	29% of land in Dakota North Ag-Watershed Characterization Area is in Ag Zoning & RSAs. However, most of the area of Dakota North within the Drayton WID is AG zoning or Rural Study Area. See Ag Priorities maps: Ag Land Base, and Ag Reference map: Agriculture Priority Areas. Ag land base priority Protection from development pressure is an ag priority 85% of soils are prime 1-10 in Dakota North area – See Ag Priorities maps: Prime Soils Prime soils priority		
Dakota Creek (North Fork) AU1118 Notes from work session in February 2016.	Not much groundwater available - deep wells are low producing (70gpm).	Animals on the fields in the winter can create water quality issues if pastures are overstocked.			North of the WID boundary is mostly Rural zoning.		

¹⁸ 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 2008 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. WA Department of Ecology, 2015. *Water Quality Assessment Categories*. <http://www.ecy.wa.gov/programs/wq/303d/WQAssessmentCats.html> (Accessed March 28, 2016)

3D. Agricultural Enhancement Priorities: Haynie Creek							
	Water quantity: Irrigation, stock, and processing	Water quality	Drainage	Flood protection	Land	Other	Possible actions
Haynie Creek AU1119 Notes from reference maps and other documents	3 new applications for water rights in Haynie – See Ag Priorities maps: Water Quantity Ag water quantity priority	A section of Dakota Creek in Haynie is in category 5 for DO and bacteria. ¹⁹	<25% of the soils in this area are prime if drained.	<5% of soil is prime if protected from flooding. Haynie Creek at the confluence with Dakota Creek lies in 1:100-year flood zone, but this is outside the WID – See Ag Priorities maps: Flooding	38% of land in Haynie Ag- Watershed Characterization Area is in Ag Zoning & RSAs, but the entire portion that is within Drayton WID is important agricultural land. - See Ag Priorities map: Ag Land Base and Ag Reference map: Ag priority areas Ag land base priority An RSA occupies the southern portion of this subbasin. – See Ag Reference maps: Ag priority areas Protection from development pressure is an ag priority 59% of soils are prime 1-10 in Haynie Ag-Watershed Characterization Area, but in the portion within Drayton WID, almost all soils are prime. – See Ag Priorities maps: Prime Soils Prime soils priority		
Haynie Creek AU1119 Notes from work session in February 2016.	Low surface water flows in summer.						<u>D14/66) AU 1119</u> Drainage re-routed in the area, used to flow west direct, now jogs south west through woodlot to Haynie Creek. <u>(D17/68) AU 1119</u> Flooding: Beaver activity causing flooding.

¹⁹ 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 2008 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. WA Department of Ecology, 2015. *Water Quality Assessment Categories*. <http://www.ecy.wa.gov/programs/wq/303d/WQAssessmentCats.html> (Accessed March 28, 2016)

3E. Agricultural Enhancement Priorities: Upper California Creek							
	Water quantity: Irrigation, stock, and processing	Water quality	Drainage	Flood protection	Land	Other	Possible actions
Upper California Creek AU1113 AU1122 AU1123 AU1124 AU1125 Notes from reference maps and other documents	2 new applications for water rights in Upper California – See Ag Priorities maps: Water Quantity Ag water quantity priority	A section of California Creek in Upper California are in category 5 for DO and bioassessment. ²⁰ Elevated iron in water likely originates in iron-manganese nodules known to exist in peat in the region. ²¹	<50% of soils in the Upper California Ag-Watershed Characterization Area are prime if drained, but in the portion that is within the Drayton WID, most soils are prime if drained. Drainage Improvement Districts #7 and #17 are located within the Upper California subbasin. ²² See Ag reference map: Prime soils. Ag drainage priority	<5% of soil is prime if protected from flooding in Upper California – See Ag Priorities maps: Flooding	58% of land in Upper California is in Ag Zoning & RSAs. - See Ag Priorities maps: Ag Land Base Ag land base priority Rural Study Area occupies most of this subbasin. – See Ag Reference maps: Ag Priority Areas Protection from development pressure is an ag priority 83% of soils are prime 1-10 in California Upper. – See Ag Priorities maps: Prime Soils Prime soils priority		
Upper California Creek AU1113 AU1122 AU1123 AU1124 AU1125 Notes from work session in February 2016.	Irrigation is needed on drier soils on high ground. There is insufficient surface water in summer to satisfy water rights. Groundwater rights are desirable.	High iron concentrations in groundwater in some areas. Groundwater quality may not be suitable for livestock. Ag water quality priority	If reed canary grass is controlled, then drainage is fairly good. Poor drainage around Wiley Lake Road due to peat soils and high water table. Winter flooding on fields near Ham Rd. Many beaver dams on California Creek. Small tiles drain the area east of I-5 at Harksell Rd. No flow around Wiley Lake Rd. Sand mine in the area contributes to wet spot.	Beaver are very active north of WID boundary at California Creek and the big woods west of Valley View Rd. Increased runoff attributed to residential development to the west (Ferndale development along Fox Road). Ditches are insufficient to handle it. In general the area is pretty flat, so any beaver dams will create flooding. Some areas flood in winter and early spring. Railroad is fixing some culverts which will help. Flood protection priority	Participants reported only one residential complaint. Prime ag soils on high ground along Delta Line Road.		(D4/54) AU1125 <u>Drainage</u> : Clogged culvert. (D5/55) AU 1125: <u>Drainage</u> : Beaver problems in wooded area south of California Creek (iii) (D15/56) AU1123: <u>Flooding</u> : Water over Valley View Rd for 1-2 months. (D6/57) AU 1123. <u>Drainage</u> : Blocked railroad culvert. (D7/58) AU 1122. <u>Drainage</u> : Blocked railroad culvert. (D16/59) AU 1122: <u>Flooding</u> : Beaver dams on California Creek affect people on Old Hwy 99 (iii) (D8/60) AU 1122: <u>Drainage</u> : Poor drainage causes houses here to flood (iii) (D9/61) AU 1124: <u>Drainage</u> : Peat soils, drainage required.

²⁰ 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 2008 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. WA Department of Ecology, 2015. *Water Quality Assessment Categories*. <http://www.ecy.wa.gov/programs/wq/303d/WQAssessmentCats.html> (Accessed March 28, 2016)

²¹ Mitchell, RJ, Babcock RS, Hirsch H, McKee L, Matthews RA & Vanderspyen J (2005), *Water Quality: Abbotsford-Sumas Final Report*. Western Washington University. http://kula.geol.wvu.edu/rjmitch/Report_2005.pdf

²² WCD (2014), *Agricultural Drainage for Drainage Districts*. <http://www.whatcomcd.org/ag-drainage-districts> [last accessed March 28, 2015]

3F. Agricultural Enhancement Priorities: Schneider Ditch (North)							
	Water quantity: Irrigation, stock, and processing	Water quality	Drainage	Flood protection	Land	Other	Possible actions
Schneider Ditch North AU1109 & small portion of AU1112 Notes from reference maps and other documents	1 new application for water rights in Schneider North – See Ag Priorities maps: Water Quantity	Sections of Keefe Lake Outlet in Schneider North are in category 5 ²³ for DO, and category 4a ²⁴ for bacteria.	<25% of soils in Schneider North Ag-Watershed Characterization Area are prime if drained. Drainage District #2 is located within the Schneider North subbasin. ²⁵	<5% of soil is prime if protected from flooding, but much of the Schneider North area lies in floodway and 1:100-year flood zone – See Ag Priorities maps: Flooding Ag flood protection priority	100% of land in Schneider North is in Ag Zoning & RSAs. – See Ag Priorities maps: Ag Land Base Ag land base priority A Rural Study Area occupies most of this subbasin. – See Ag Reference maps: Ag priority areas Protection from development pressure is an ag priority 97% of soils are prime 1-10 in Schneider North. – See Ag Priorities maps: Prime Soils Prime soils priority		
Schneider Ditch North AU1109 & small portion of AU1112 Notes from work session in February 2016.			There are drainage problems in Bertrand WID south of Dalhberg Rd at Nooksack Mainstem. (added as Action B12 in Bertrand WID).				D10/62) AU 1109 Drainage: Beaver activity is plugging drainage tiles, water going under road near Woodland Rd.(iii)

²³ 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 2008 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. WA Department of Ecology, 2015. *Water Quality Assessment Categories*. <http://www.ecy.wa.gov/programs/wq/303d/WQAssessmentCats.html> (Accessed March 28, 2016)

²⁴ 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*. <http://www.ecy.wa.gov/programs/wq/303d/WQAssessmentCats.html> [last accessed March 28, 2016]

²⁵ WCD (2014), *Agricultural Drainage for Drainage Districts*. <http://www.whatcomcd.org/ag-drainage-districts>

4.2 Agricultural priorities: Summary maps

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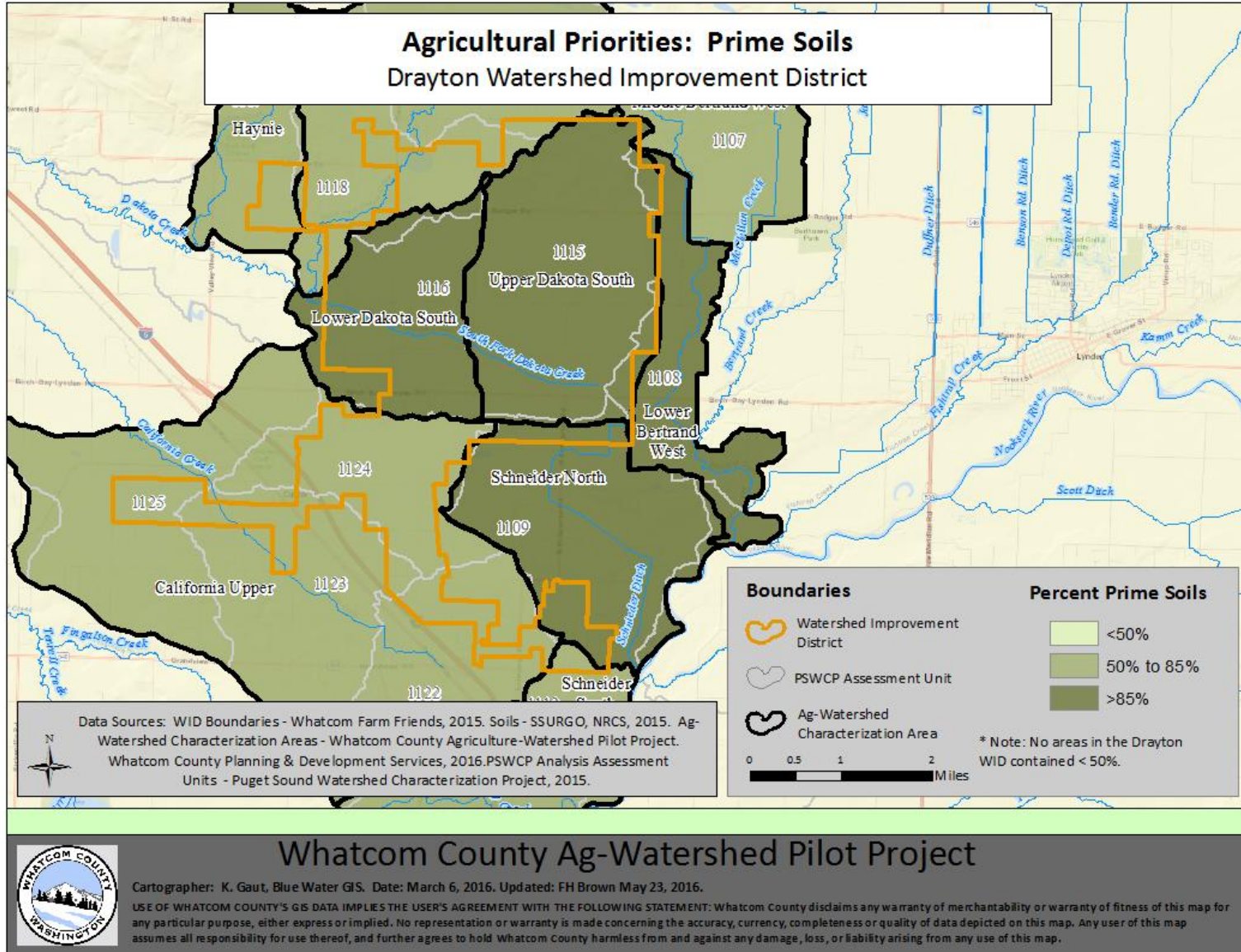


Figure 6. Drayton WID agricultural priorities: Proportion of prime soils. Data from reference map of prime soils

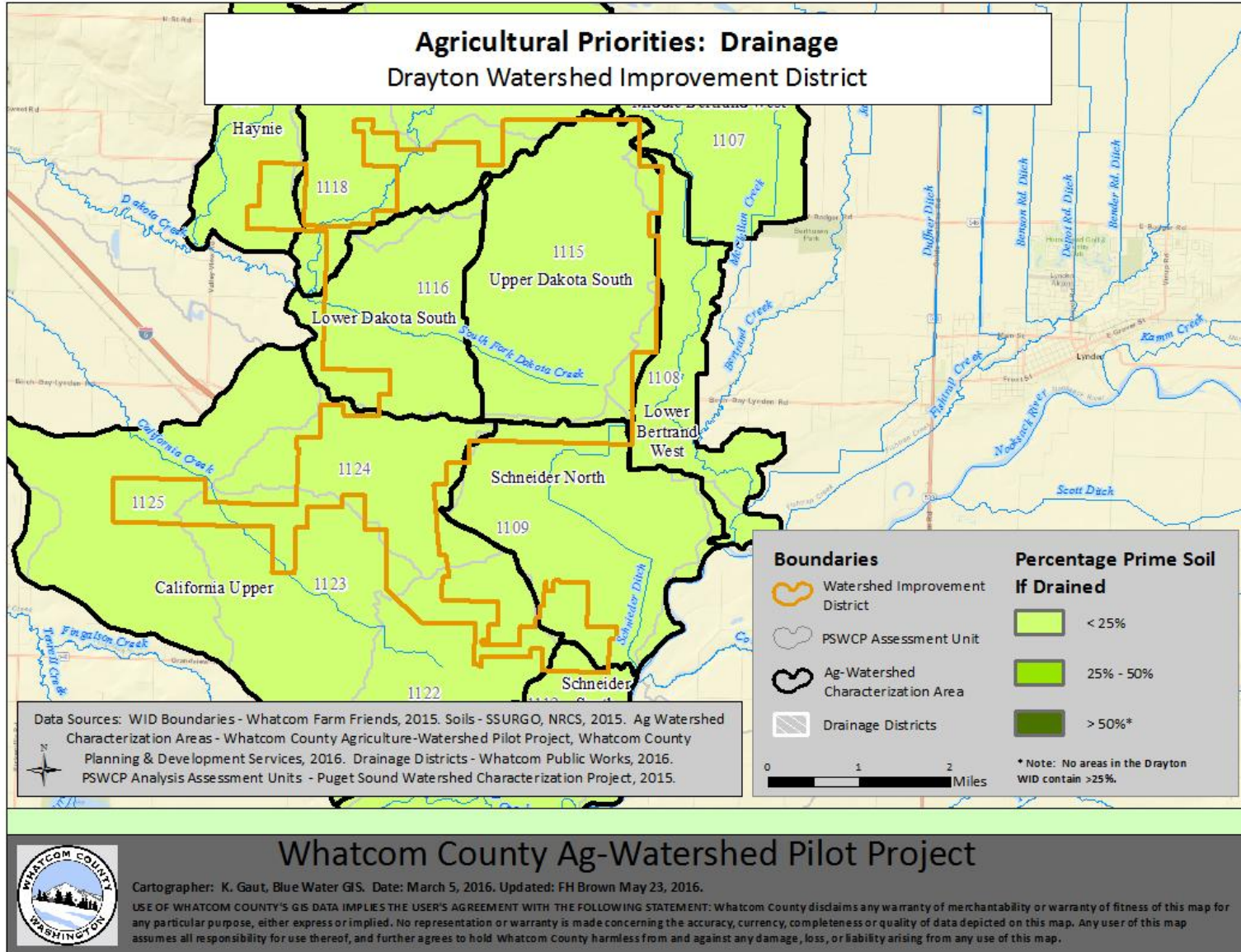


Figure 7. Drayton WID agricultural priorities: Drainage of agricultural land. Data from reference maps of prime soils and special districts

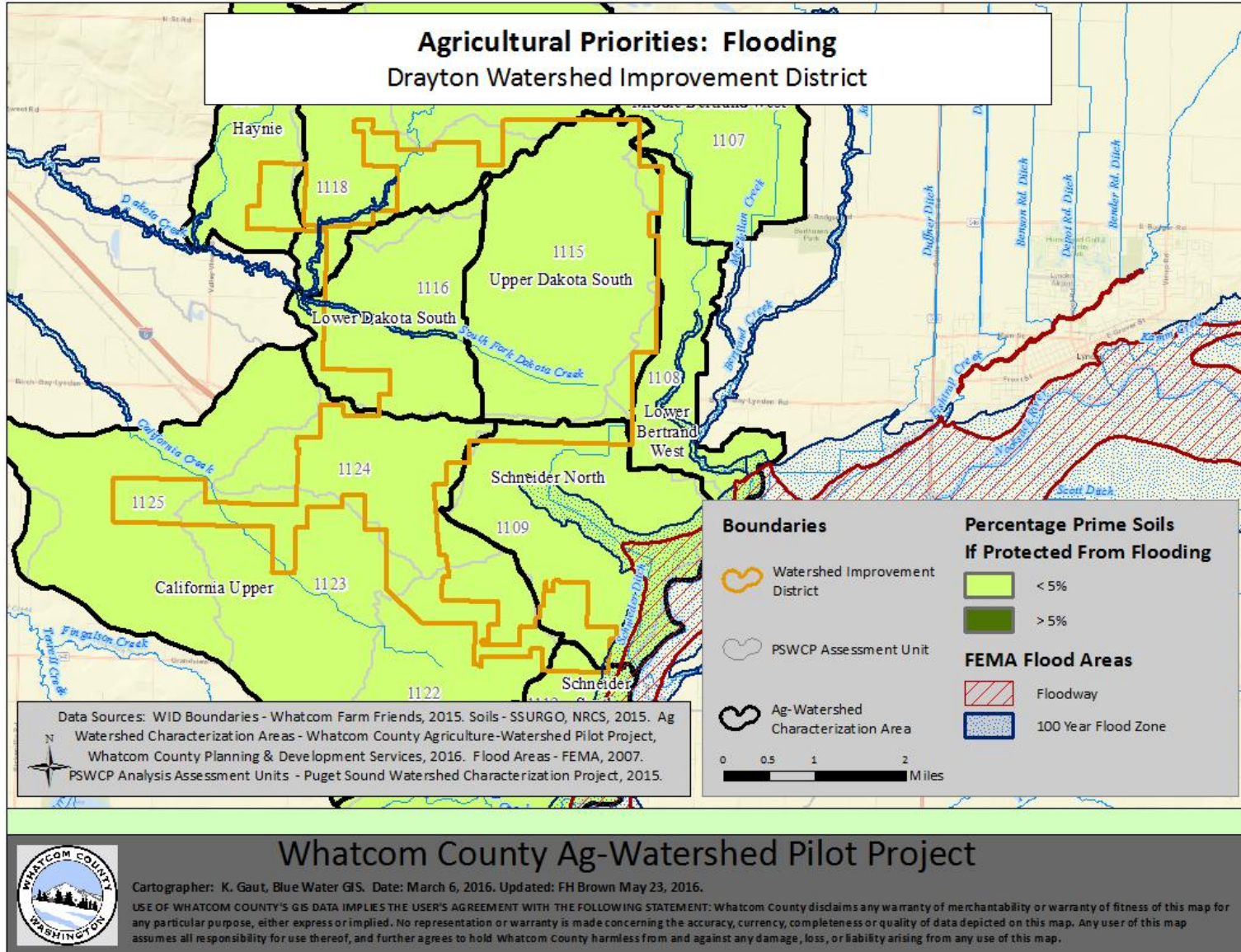


Figure 8. Drayton WID agricultural priorities: Protection from flooding. Data from reference maps on prime soils and special districts

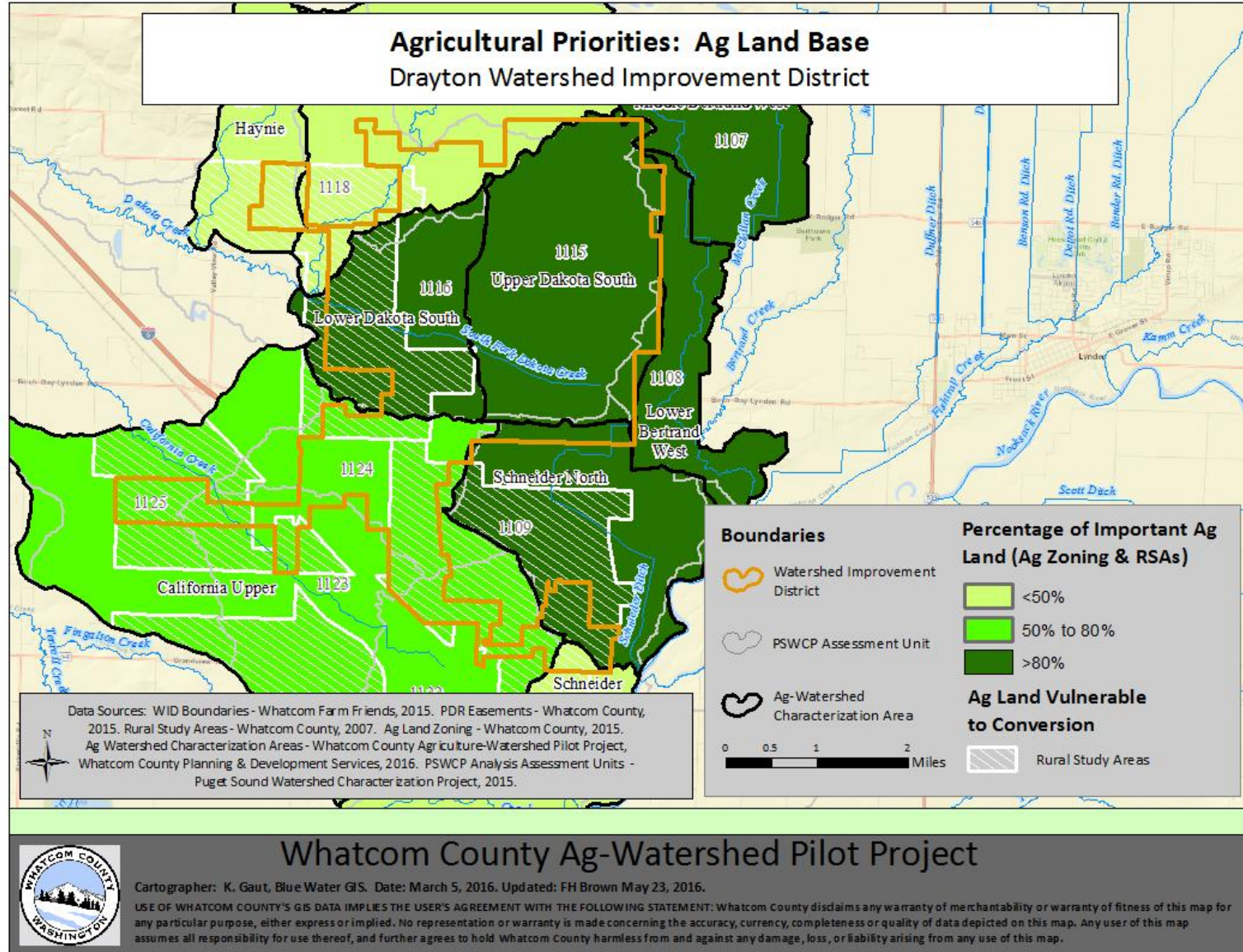


Figure 9. Drayton WID agricultural priorities: Protection of the agricultural land base. Data from reference map of agricultural priority areas

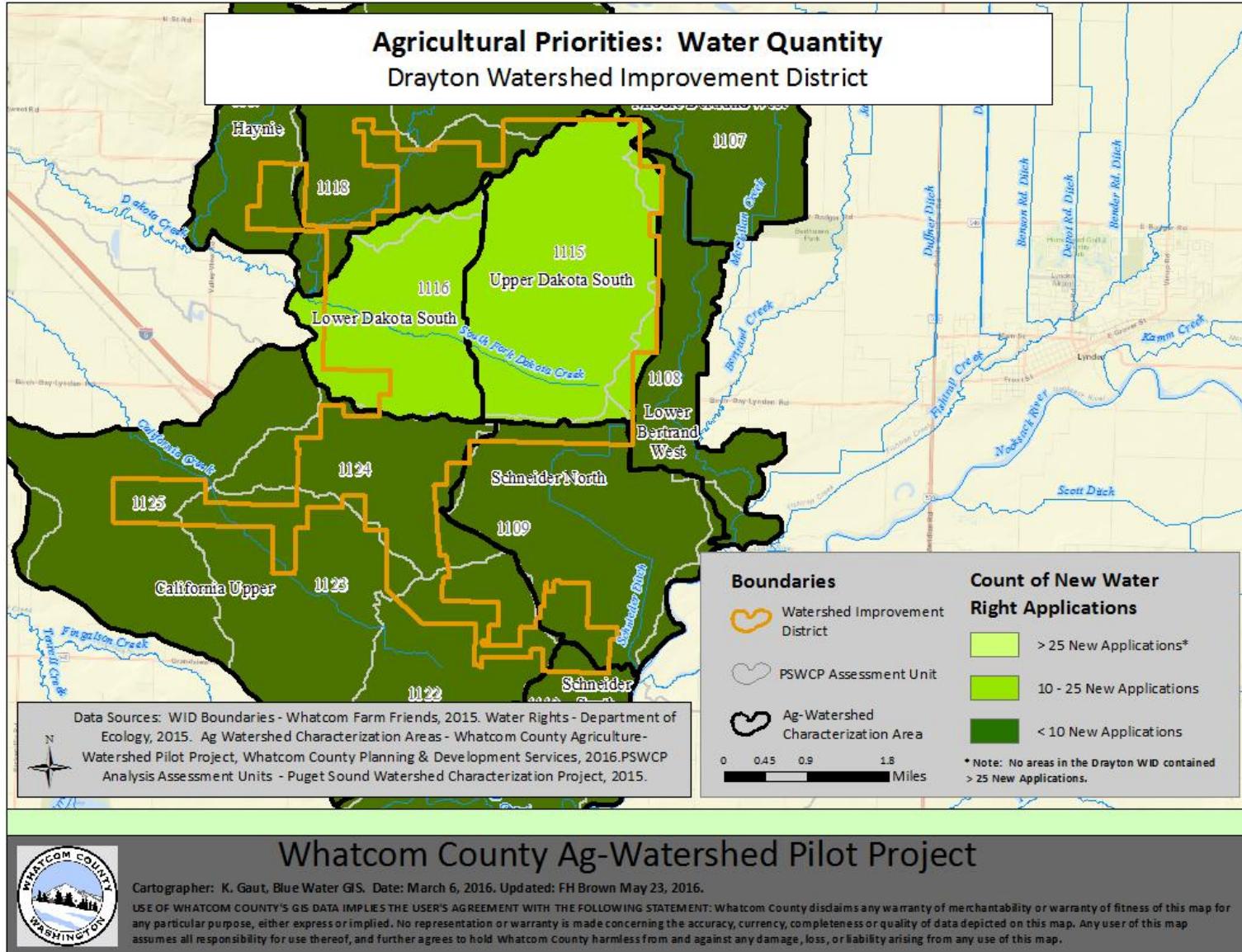


Figure 10. Drayton WID agricultural priorities: Water for agricultural activities. Data from reference map on water right points of diversion

4.3 Agricultural priorities: Specific actions map

Table 4. Key for actions on agricultural priorities specific actions map

Action # on map	AU #	Priority	Notes
1	1108	Drainage	Drainage blocked by WDFW fish culvert then backs up surface water. Need soils dry, drained.
2	1115	Drainage	New ditch at Enterprise Road is filling in.
3	1115	Drainage	Whatcom County road ditch: (Badger Rd, east of Sunrise Rd) sporadic cleaning is not enough.
4	1125	Drainage	Clogged culvert.
5	1125	Drainage	Beaver problems in wooded area in ditches south of California Creek.
6	1123	Drainage	Blocked railroad culvert.
7	1122	Drainage	Blocked railroad culvert.
8	1122	Drainage	Poor drainage causes houses here to flood.
9	1124	Drainage	Peat soils, drainage required.
10	1109	Drainage	Beaver plugging drainage tile, water going under road near Woodland Rd.
11	1115	Drainage	Drainage issue. More drainage outflow capacity is needed at County right-of-way.
12	1116	Drainage	Drainage needs to be maintained.
13	1116	Drainage	Wet area. Drainage needs improvement.
14	1119	Drainage	Drainage rerouted, used to flow west direct, now jogs south to west through woodlot to Haynie Creek.
15	1123	Flooding	Water over Valley View Road for 1-2 months.
16	1123	Flooding	Beaver dams on California Creek affect people on Old Hwy 99.
17	1119	Flooding	Beaver activity causing flooding.

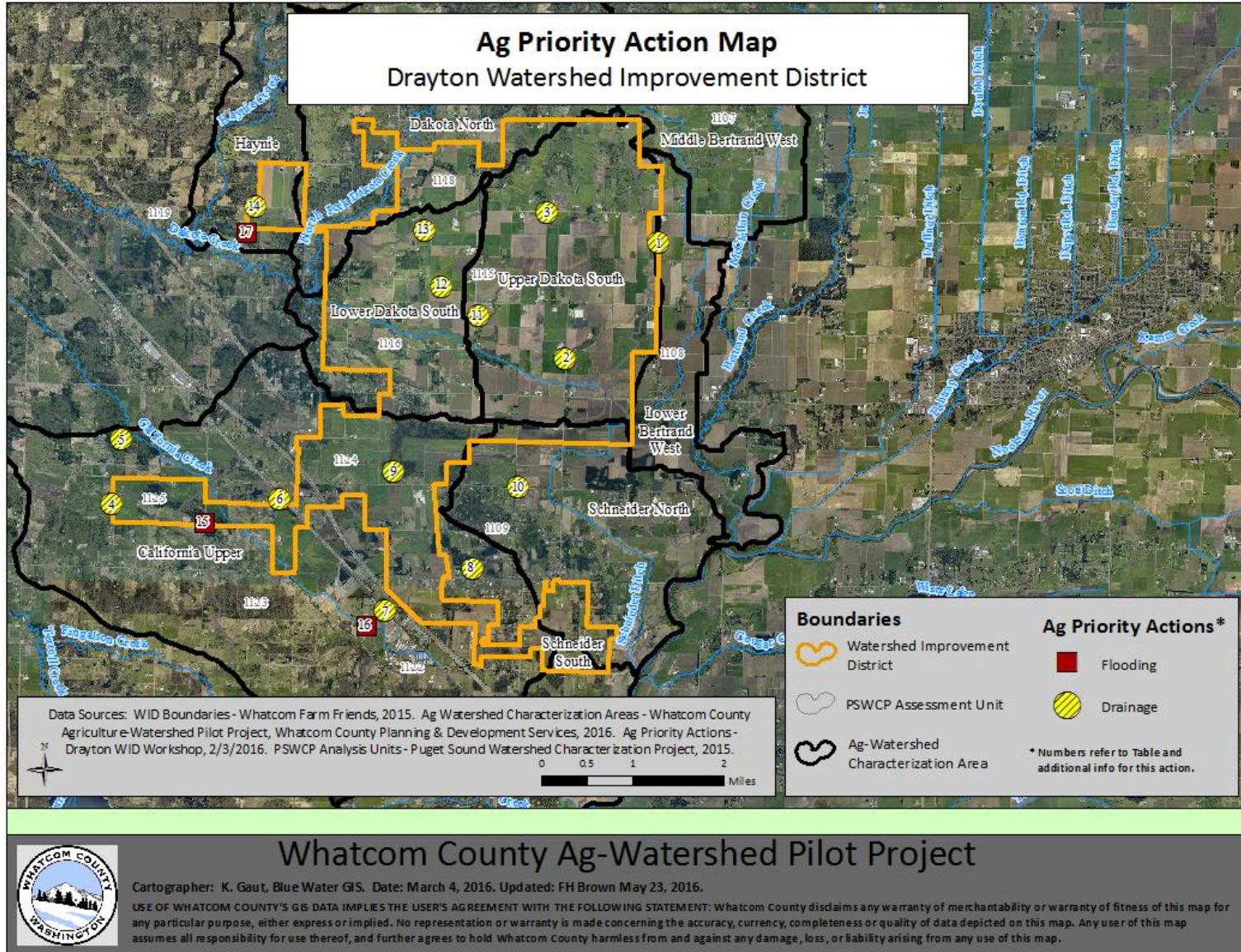


Figure 11. Drayton WID: Map of specific actions for agricultural priorities. Information on this map is from the WID work session in February 2016.

5 Watershed characterization and mapping for the Drayton Watershed Improvement District

5.1 Methodology

The following description of the watershed characterization methodology has been adapted from that provided in the Appendix to the pilot Agriculture-Watershed Characterization and Mapping Report.²⁶

5.1.1 General approach

The watershed characterization assessment uses methods developed by the Puget Sound Watershed Characterization Project.²⁷ The results of the watershed characterization assessment are intended to assist the WIDs in identifying high priority opportunities for watershed enhancement projects on agricultural land in the lowland areas of Whatcom County, with a focus in areas where watershed and agricultural priorities could be mutually reinforcing.

The *Puget Sound Watershed Characterization (PSWC)* is a set of water and habitat assessments that compare areas within a watershed for relative restoration and protection value. It is a coarse-scale decision-support tool that provides information for regional, county, and watershed-based planning. The information it provides allows local and regional governments, as well as NGOs, to base their land use decisions on a systematic analytic framework. It

prioritizes specific geographic areas for protection, restoration, and conservation of our region's natural resources, and identifies where best to focus new development. Application of this method should result in future land-use patterns that protect the health of terrestrial and aquatic resources while directing limited financial resources to the highest priority areas for restoration and protection.

The objective of the PSWC characterization assessment is to "characterize" the watershed in a way that helps to identify priority enhancement opportunities. The relative comparison of assessment units (AUs) for water flow processes across the lowland watersheds allows for a coarse-level snapshot of which areas are relatively important or degraded for water flow. From this snapshot we suggest possible enhancement actions that could contribute to improving or protecting water flow processes at the AU scale. Actual site location of those actions within an assessment unit would require different analyses not described here.

The assessment results in this document address the following primary questions for the Whatcom County lowland watersheds:

- (1) *Where on the landscape* should management efforts be focused first to benefit water flow processes in the watersheds that are part of the Watershed Improvement District?
- (2) *What types of activities and actions* are most appropriate to that place based on the assessment results?

The assessment results therefore address both the "where" and the "what" to focus on, in terms of water flow processes. This integrated approach offers a systematic framework for identifying more important areas within the lowland watersheds and those which are more degraded for water flow processes and water quality, with the intent of identifying areas that offer the most potential for enhancement.

²⁶ Hume C & Stanley S (2013). *Summary of water flow assessment results for Bertrand, Fishtrap and Kamm watersheds*. Appendix A in Gill P (2013). *Agriculture-Watershed Characterization and Mapping Report for the North Lynden watersheds*. Prepared for the Whatcom County Agriculture-Watershed Pilot Project by the Washington Department of Ecology Shorelands and Environmental Assistance Program.

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

²⁷ See http://www.ecy.wa.gov/puget_sound/characterization/index.html

5.1.2 Limitations

Care should be taken to use the Puget Sound Watershed Characterization as intended. It is a coarse-scale assessment and is not intended for site-specific application or decision-making at the site scale. Finer scale data, local information and technical expertise is needed for those decisions. In addition:

- The Puget Sound Watershed Characterization is for planning purposes only. This does not affect or alter existing land use/environmental regulations although it may be used to help inform future land use and regulatory decisions.
- For the water flow assessment, the rankings for any single AU are relative only to other AUs in the area of analysis. This means it is only appropriate to compare the WID results with results in other AUs in the lowland area of WRIA 1.
- Results at the AU scale represent land-use planning-level information. At the project- or site scale, each AU will have a combination of on-the-ground challenges and opportunities. Just because an AU is rated as a low priority for restoration does not mean there are no suitable restoration sites or opportunities in that AU. Similarly, not every site in an AU that is a high priority for restoration will be suitable for restoration.
- The assessments are landscape-scale and consequently do not address site-specific issues. These are best addressed through finer-scale studies, which will remain essential to the success of local conservation efforts. When developing site-level plans, the WID should evaluate the need for finer-scale information and collect it where needed.
- The watershed characterization assessment is not intended to address compliance with state or federal water quality law, nor describe the actions necessary to achieve compliance with those laws. It is a violation of state law when activities are shown to cause or have the substantial potential to cause nonpoint source pollution. If the reader has questions about

the water quality laws, they can contact Whatcom County Public Works or the WA Department of Ecology for additional information.

5.1.3 Fundamental concepts of watershed characterization

Watershed processes are defined as the dynamic physical and chemical interactions that form and maintain the landscape and ecosystems on a geographic scale of watershed to basins. This includes the movement of water, sediment, nutrients, pathogens, chemicals and wood. Watershed processes are controlled and influenced by natural attributes and human actions. Natural controls on watershed processes include physical attributes of the ecosystem such as geomorphology, geology, and soils. Many human actions influence watershed processes. For example, timber harvest may reduce the amount of wood entering streams. Shoreline armoring can reduce sediment input from bluffs and alter the erosion, movement, and deposition of sediments along beaches. Urban development can increase the amount and amplitude of stormwater runoff. Watershed characterization attempts to model these watershed processes such that areas of the landscape can be identified which are relatively more important (presence of natural controls) or degraded (due to human impacts).

5.1.4 Understanding the water flow assessment results

The water flow assessment uses two models to compare the *importance* and *degradation* of water flow processes in a watershed. Together, they identify areas that are relatively more suitable for protection or restoration of water flow processes. Each model provides a ranking from low to high for how important and how degraded each assessment unit is *relative* to the other units in the watershed.

Water flow importance

The *importance* model evaluates the watershed in its “unaltered” state. This model combines the delivery, surface storage, recharge, and discharge components to compare the relative *importance* of assessment units in maintaining overall water flow processes in a non-degraded setting. When precipitation is “delivered” as either rain or snow, there are physical features that control the surface and subsurface movement of that precipitation within an assessment unit.

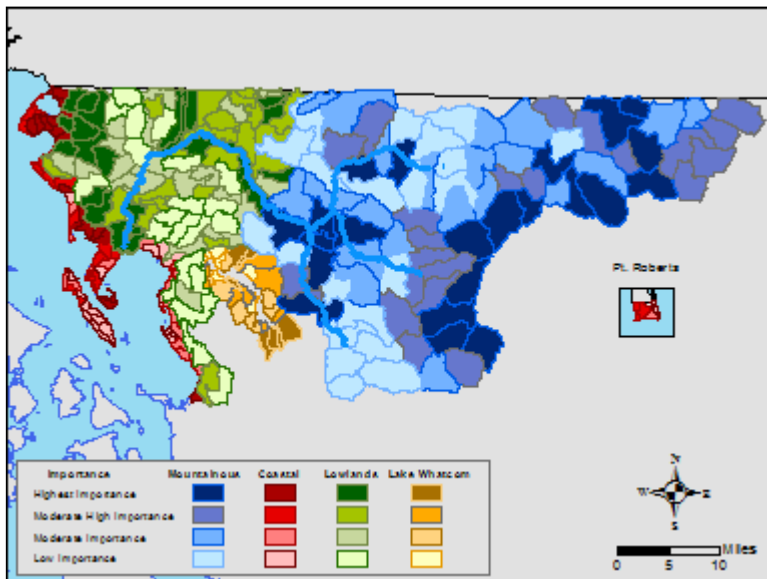


Figure. Overall importance to water flow processes: Results of Puget Sound Watershed Characterization assessment for WRIA 1. Darkest colored assessment units are considered highest *importance* relative to other assessment units in the same landscape group of WRIA 1.

These physical features include land cover, storage areas such as wetlands and floodplains, areas of higher infiltration and recharge, and areas that discharge groundwater. These areas are considered “important” to the overall water flow processes.

In the figure to the left, each landscape group is displayed in a different color gradient (i.e. shades of blue, green, red or tan), which allows for direct comparison within the extent of the landscape group only. Dark green assessment units would be considered *highly important* for overall water flow processes *only* within the lowland area of WRIA 1, and are not comparable to AUs outside of that extent. However, this does allow one to determine which AUs throughout the lowland areas of WRIA 1 are *relatively more important* than others in that same extent.

Water flow degradation

In the water flow *degradation* model the watershed is evaluated in its “altered” state to consider the impact of human actions on water flow processes. The *degradation* model calculates the degree of alteration to those controls that regulate the delivery, movement and loss of water, such as forest clearing and impervious surfaces. This model combines the delivery, surface storage, recharge, and discharge components to compare the relative *degradation* to overall water flow processes in assessment units. Degradation to these processes generally accelerates the movement of surface flows downstream. This accelerated delivery increases downstream flooding and erosion and subsequently degrades aquatic habitat over time.

The figure below displays the results of the *degradation* to water flow processes for all of WRIA 1. Since degradation is not controlled by landscape, we compare assessment units within the entire extent of the WRIA. A dark pink unit along the coast is comparable in level of degradation to a unit in the lowland area.

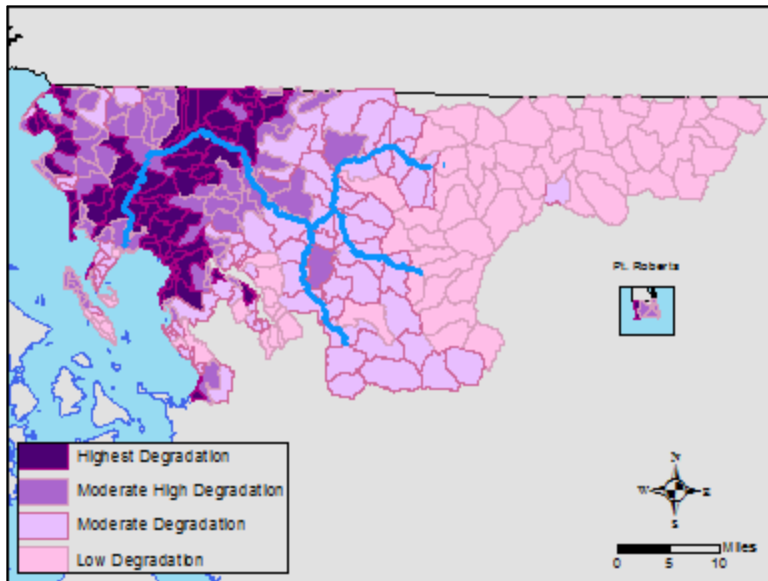


Figure. Overall degradation of water flow processes: Results of Puget Sound Watershed Characterization assessment for WRIA 1. Dark pink assessment units are considered to have the highest *degradation* relative to other assessment units in WRIA 1.

Management matrix for water flow

Combining the results of the *importance* and *degradation* models yields a simple categorical matrix that planners can use, along with other science-based information, to inform land management strategies and actions. At its simplest, this management matrix conveys which areas are relatively important and/or degraded, and what actions might be most appropriate there:

Highly important – low degradation = protect
 Highly important – high degradation = restore
 Low importance – low degradation = conserve
 Low importance – high degradation = develop

The Puget Sound Watershed Characterization project generally prioritizes restoration or enhancement actions in watersheds which

are both highly important and are relatively more degraded for watershed processes (yellow boxes in the Management Matrix Figure below). This does not mean that there are not important areas or necessary restoration actions in assessment units that are not highly important and highly degraded. Rather, given limited funding these might be the first places to focus on in order to increase the likelihood of improving watershed processes.

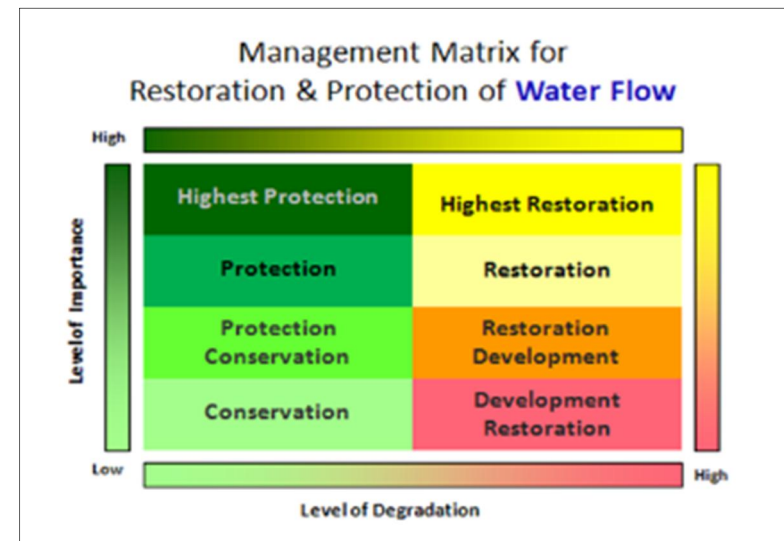


Figure. Management matrix for water flow, indicating relative priorities for restoration and protection of processes

By accounting for both the relative level of *importance* and the relative level of *degradation* of an Assessment Unit one can begin to prioritize which areas of a watershed to apply management strategies which protect water flow processes, and which areas to prioritize restoration of water flow processes.

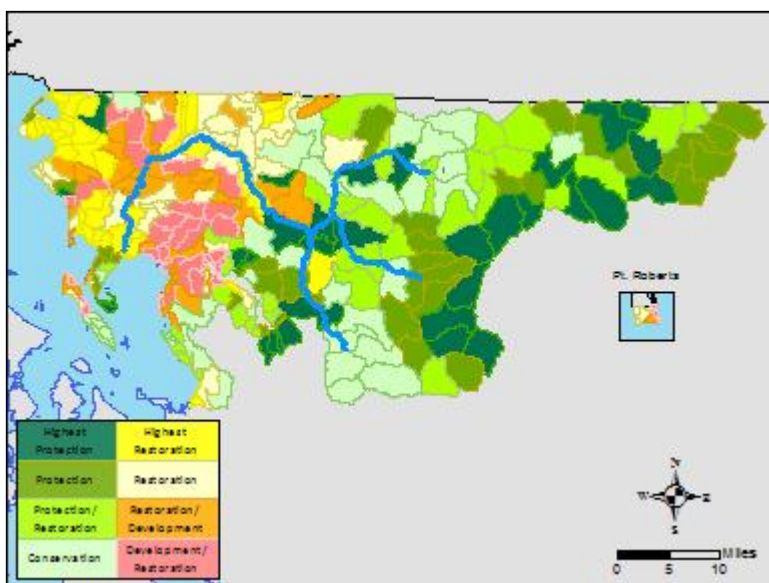


Figure. Overall priorities for restoration and protection of water flow processes in WRIA 1: Results of Puget Sound Watershed Characterization assessment.

5.1.5 Using the results of the water flow assessment

For water flow process enhancement or restoration, actions should be directed towards reducing the degradation to controls that regulate the delivery and movement of water through the watershed. These controls include forest cover, areas of surface storage, areas of permeable deposits, areas of slope wetlands and areas of floodplains with permeable deposits.

The terms “restoration” and “protection” as used in this document do not mean a return to historic land cover conditions or retaining 100% forested land cover. Restoration and protection actions should be done in a manner that recognizes and works within the constraints of the existing land use activities. For example, restoration in agricultural areas could mean consideration of

measures that enhance a critical portion of water flow processes such as surface storage. This could involve the retention of water on fields for a longer period to avoid harmful peak flows within streams during the winter months. Restoration and protection measures are, therefore, always proposed here in the context of both the landscape setting and the current land use activities.

There are actions which can offer mutual benefits to both water flow and water quality. For example, there are some areas where wetland restoration or enhancement to surface storage processes could provide some improvements for both. The potential enhancement actions suggested in Table 5 may have additional benefits to other watershed processes and functions particularly in the area of riparian habitat and structure which are critical to salmonid habitats throughout the Whatcom County lowland watersheds.

5.2 Watershed characterization tables

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Table 5. Watershed characterization tables for the Drayton WID

NOTE: Possible actions include: Specific actions identified by WID Actions Map # location and Assessment Units (AU), 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: Dakota Creek South Fork (Upper)				
	Wildlife habitat	Salmonid habitat	Water quality	Summary & potential for enhancement
Upper Dakota Creek (South) AU1115 Notes from reference maps and other documents	Critical Habitat: Wetland (See Watershed reference map: Priority Habitats & Species)	Chum, coho, cutthroat ²⁸ (See Watershed reference map: Fish presence & fish barriers)	No impairments listed for this area.	<p><u>Results of PSWC water flow assessment:</u> An area of moderate importance for delivery, discharge and recharge processes. No water quality impairments listed.</p> <p><u>Summary & potential for enhancement:</u> Overall water flow processes are highly degraded, especially discharge and surface storage processes. Although this is an area of relatively low importance for water flow processes overall, recharge processes are still relatively intact compared to other parts of this watershed. Actions should focus on protecting existing vegetated cover and preventing new impervious cover in order to maintain recharge processes.</p>
Upper Dakota Creek (South) AU1115 Notes from February 2016 work session	Note Enterprise restoration project.			

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

5B. Watershed Enhancement Priorities: Dakota Creek South Fork (Lower)				
	Wildlife habitat	Salmonid habitat	Water quality	Summary & potential for enhancement
Dakota Creek South Fork (Lower) AU1116 Notes from reference maps and other documents	Critical Habitat: Wetland (See Watershed reference map: Priority Habitats & Species)	Chum, coho, cutthroat ²⁹ (See Watershed reference map: Fish presence & fish barriers)	No impairments listed. However, routine monitoring results indicate elevated fecal bacteria levels in the period 2013-2016 in this reach of Dakota Creek (see Figure 28 Watershed reference map: Routine water quality monitoring results.)	<u>Results of PSWC water flow assessment:</u> An area of moderately high importance for discharge and recharge processes. <u>Summary & potential for enhancement:</u> No water quality impairments listed. Overall water flow processes are moderately to highly degraded. This is an area of moderate importance for water flow processes overall. Actions should focus on restoring recharge and discharge processes by reducing impervious cover and preventing additional impervious cover, and by decreasing the rate and quantity of subsurface water drainage.
Dakota Creek South Fork (Lower) AU1116 Notes from February 2016 work session	Wetland: area with trees has been impaired by diking up into the trees. Can groundwater recharge activities co-exist with farming in the ponded area near Enterprise Road?			

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

5C. Watershed Enhancement Priorities: Dakota Creek North Fork				
	Wildlife habitat	Salmonid habitat	Water quality	Summary & potential for enhancement
Dakota Creek North AU1118 & small portion of AU1117 Notes from reference maps and other documents	Critical Habitat: Wetland (See Watershed reference map: Priority Habitats & Species)	Chum, coho, cutthroat ³⁰ (See Watershed reference map: Fish presence & fish barriers) Documented fall Chinook, coho, fall chum, & winter steelhead spawning in N. Fork Dakota Creek ³¹	A section of N.F. Dakota Creek is in category 5 ³² for Dissolved Oxygen. ³³ Routine monitoring results indicate elevated fecal bacteria levels in the period 2013-2016 in this reach of Dakota Creek (see Figure 28 Watershed reference map: Routine water quality monitoring results.)	<u>Results of PSWC water flow assessment:</u> AU1118: An area of moderately high importance for discharge and moderate importance for delivery and recharge processes. Overall water flow processes are moderately degraded. AU1117: An area of moderately high importance for delivery. Low importance for all other water flow processes. Overall water flow processes are moderately degraded. <u>Summary & potential for enhancement:</u> There are water quality impairments listed for dissolved oxygen in North Fork Dakota Creek. Although this area is of relatively low importance for water flow processes overall, recharge processes are still fairly intact. Actions should focus on protecting and restoring recharge processes by reducing impervious cover and preventing additional impervious cover.
Dakota Creek North AU1118 & small portion of AU1117 Notes from February 2016 work session		Documented fall Chinook, coho, fall chum, & winter steelhead spawning in N. Fork Dakota Creek ³⁴	Backup of water at South Fork and North Fork is stagnant. Testing site here captures high fecal.	Monitor conditions at the confluence of North & South Fork for potential water quality problems.

³⁰ Fish Habitat Technical Team (2004), WRIA 1 Watershed Management Project. Data provided by Sarah Watts, Whatcom County Planning & Development Services.

³¹ WDFW (n.d.), *SalmonScape* [interactive webmap] <<http://apps.wdfw.wa.gov/salmonscape/>> [last accessed May 09, 2016]

³² 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 2008 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. WA Department of Ecology, 2015. *Water Quality Assessment Categories*. <http://www.ecy.wa.gov/programs/wq/303d/wqAssessmentCats.html> (Accessed March 28, 2016)

³³ Ecology (2012), *Water Quality Assessment for Washington* <http://www.ecy.wa.gov/programs/Wq/303d/index.html>

³⁴ WDFW (n.d.), *SalmonScape* [interactive webmap] <<http://apps.wdfw.wa.gov/salmonscape/>> [last accessed May 09, 2016]

5D. Watershed Enhancement Priorities: Haynie Creek				
	Wildlife habitat	Salmonid habitat	Water quality	Summary & potential for enhancement
Haynie Creek AU1119 Notes from reference maps and other documents	Critical Habitat: None.	Coho ³⁵ (See Watershed reference map: Fish presence & fish barriers) Documented fall Chinook, coho, fall chum, & winter steelhead spawning in Haynie and Dakota Creek in this AU ³⁶	No listings in Haynie Creek, but a section of Dakota Creek at the confluence with Haynie Creek (outside the Drayton WID area) is in category 5 ³⁷ for Dissolved Oxygen and bacteria. ³⁸	<u>Results of PSWC water flow assessment:</u> An area of high importance for discharge and moderate high importance for recharge and storage processes. <u>Summary & potential for enhancement:</u> Overall water flow processes are moderately degraded but this area is of highest importance especially for discharge and recharge processes which remain relatively intact. Actions should focus on protecting and maintaining recharge processes by preventing additional impervious cover and reducing the amount of existing impervious cover. Consider actions to restore delivery processes by reducing the rate and quantity of subsurface water drainage.
Haynie Creek AU1119 Notes from February 2016 work session		Good salmon habitat in this area.		AU 1119. Provide refuge habitat (deep pools) to allow fish to survive low flow periods, outside the WID area to the north – Participant comments from WID work session.

³⁵ Fish Habitat Technical Team (2004), WRIA 1 Watershed Management Project. Data provided by Sarah Watts, Whatcom County Planning & Development Services.

³⁶ WDFW (n.d.) *SalmonScape* [interactive webmap] <<http://apps.wdfw.wa.gov/salmonscape/>> [last accessed May 09, 2016]

³⁷ 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 2008 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. WA Department of Ecology, 2015. *Water Quality Assessment Categories*. <http://www.ecy.wa.gov/programs/wq/303d/wqAssessmentCats.html> (Accessed March 28, 2016)

³⁸ Ecology (2012), *Water Quality Assessment for Washington* <http://www.ecy.wa.gov/programs/Wq/303d/index.html>

5E. Watershed Enhancement Priorities: California Creek (Upper)				
	Wildlife habitat	Salmonid habitat	Water quality	Summary & potential for enhancement
California Creek AU1122 AU1123 AU1124 AU1125 Notes from reference maps and other documents	Critical Habitat: Wetland, Band tailed Pigeon (See watershed reference map: Priority Habitats and Species)	Coho, cutthroat, & steelhead ³⁹ Documented coho spawning ⁴⁰	Sections of California Creek in AU1123 are in category 5 for DO and bioassessment. ⁴¹ A section of California Creek in AU1125 is in category 5 for bacteria. ⁴² Routine monitoring results indicate elevated fecal bacteria levels in the period 2013-2016 in the reach of California Creek within AU1123 and upstream (see Figure 28 Watershed reference map: Routine water quality monitoring results.)	<u>Results of PSWC water flow assessment:</u> AU1122: An area of high importance for discharge and moderate importance for surface storage. AU1123: An area of high importance for discharge and surface storage processes. There are impairments listed for dissolved oxygen, bacteria and for bioassessment in California Creek. AU1124: An area of high importance for surface storage and moderate importance for discharge. Overall water flow processes are highly degraded. AU1125: An area of high importance for surface storage and discharge processes. Overall water flow processes are moderately to highly degraded. <u>Summary & potential for enhancement:</u> Overall water flow processes are moderately high to highly degraded, especially discharge and surface storage. Much of this area is of high importance for water flow processes overall. Actions should focus on restoring discharge and storage processes, by decreasing the rate and quantity of subsurface water drainage while also looking for opportunities in the landscape to retain surface flows for longer.
California Creek AU1122 AU1123 AU1124 AU1125 Notes from February 2016 work session	No notes were added at the February 2016 work session.			

³⁹ Fish Habitat Technical Team (2004), WRIA 1 Watershed Management Project. Data provided by Sarah Watts, Whatcom County Planning & Development Services.

⁴⁰ WDFW (n.d.) SalmonScape [interactive webmap] <<http://apps.wdfw.wa.gov/salmonscape/>> [last accessed May 09, 2016]

⁴¹ Ecology (2012) *Water Quality Assessment for Washington*. <http://www.ecy.wa.gov/programs/Wq/303d/index.html>

⁴² Ecology (2012), *Water Quality Assessment for Washington*. <http://www.ecy.wa.gov/programs/Wq/303d/index.html>

5F. Watershed Enhancement Priorities: Schneider Ditch (North)				
	Wildlife habitat	Salmonid habitat	Water quality	Summary & potential for enhancement
Schneider Ditch North AU1109 & small portion of AU1110 Notes from reference maps and other documents	Critical Habitat: Band-tailed pigeon (See watershed reference map: Priority Habitats and Species)	None in the area of Schneider Ditch North that is within the Drayton WID.	None in the Drayton WID area.	<u>Results of PSWC water flow assessment:</u> Degradation of overall water flow processes is moderate-high, with surface storage and delivery processes in particular being highly degraded. However, this area is of relatively low importance for water flow processes overall in the watershed. <u>Summary & potential for enhancement:</u> Protection and restoration of forest cover and riparian vegetation in this area would help to improve delivery processes. Investigate opportunities to increase surface storage and retain surface flows for longer in this area.
Schneider Ditch North AU1109 & small portion of AU1110 Notes from February 2016 work session				

5.3 Watershed priorities: Summary maps

The water flow assessment maps contained in this section were prepared using data from the Puget Sound Watershed Characterization Project, provided by the WA Department of Ecology. See http://www.ecy.wa.gov/puget_sound/characterization/index.html

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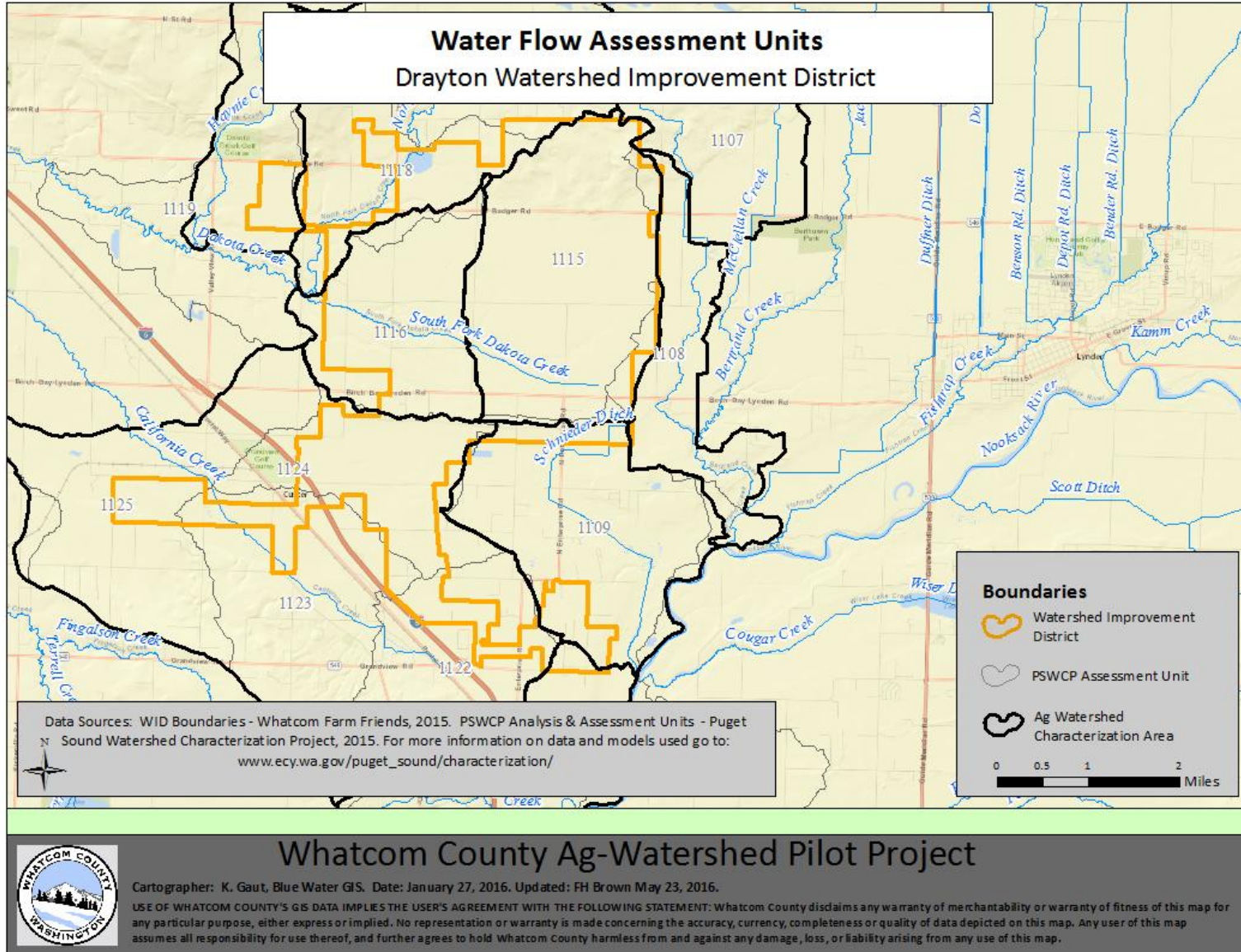


Figure 12. Drayton WID: Water flow assessment units in relation to the WID area

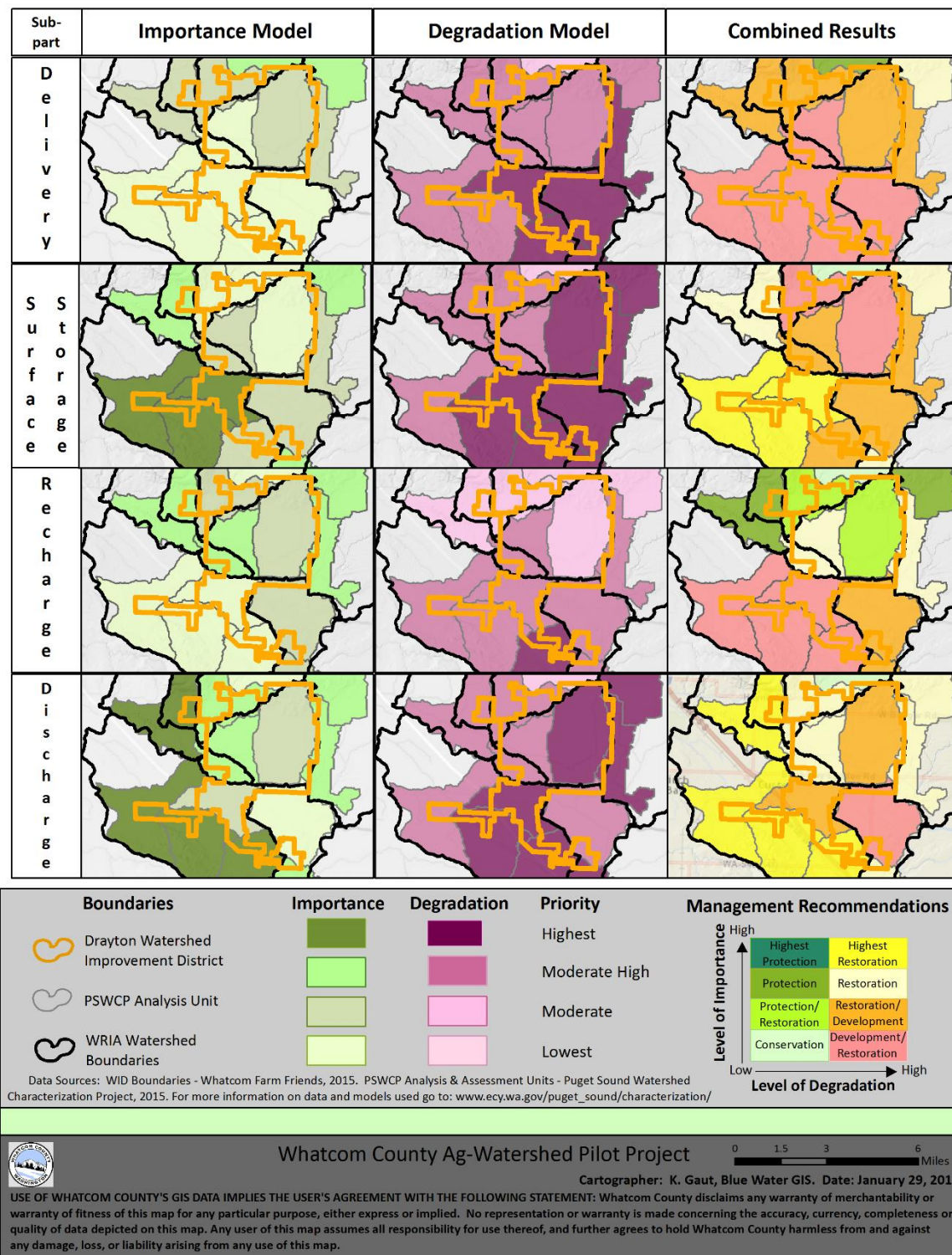


Figure 13. Drayton WID: Water flow process assessment results

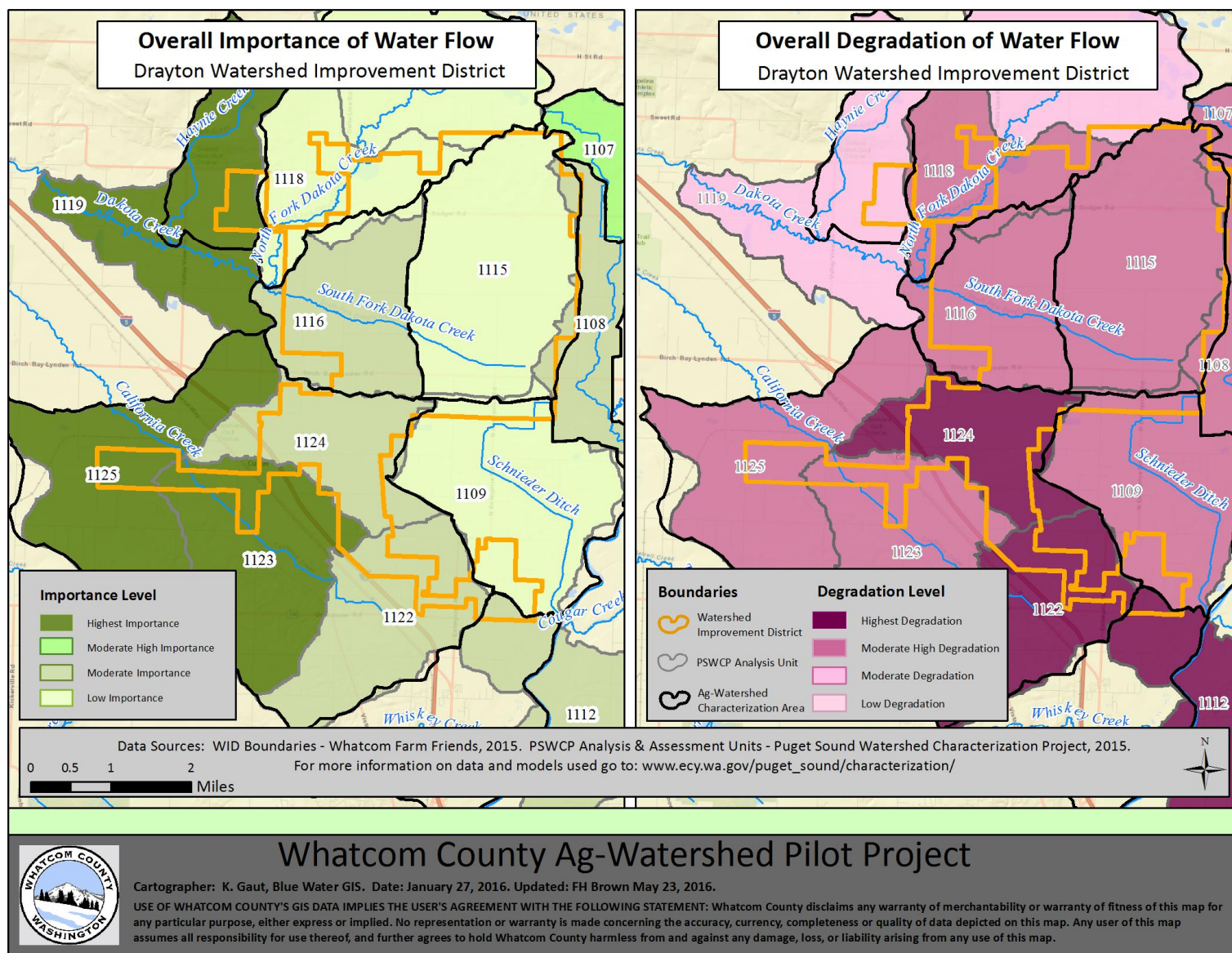


Figure 14. Drayton WID: Overall importance and degradation of water flow processes

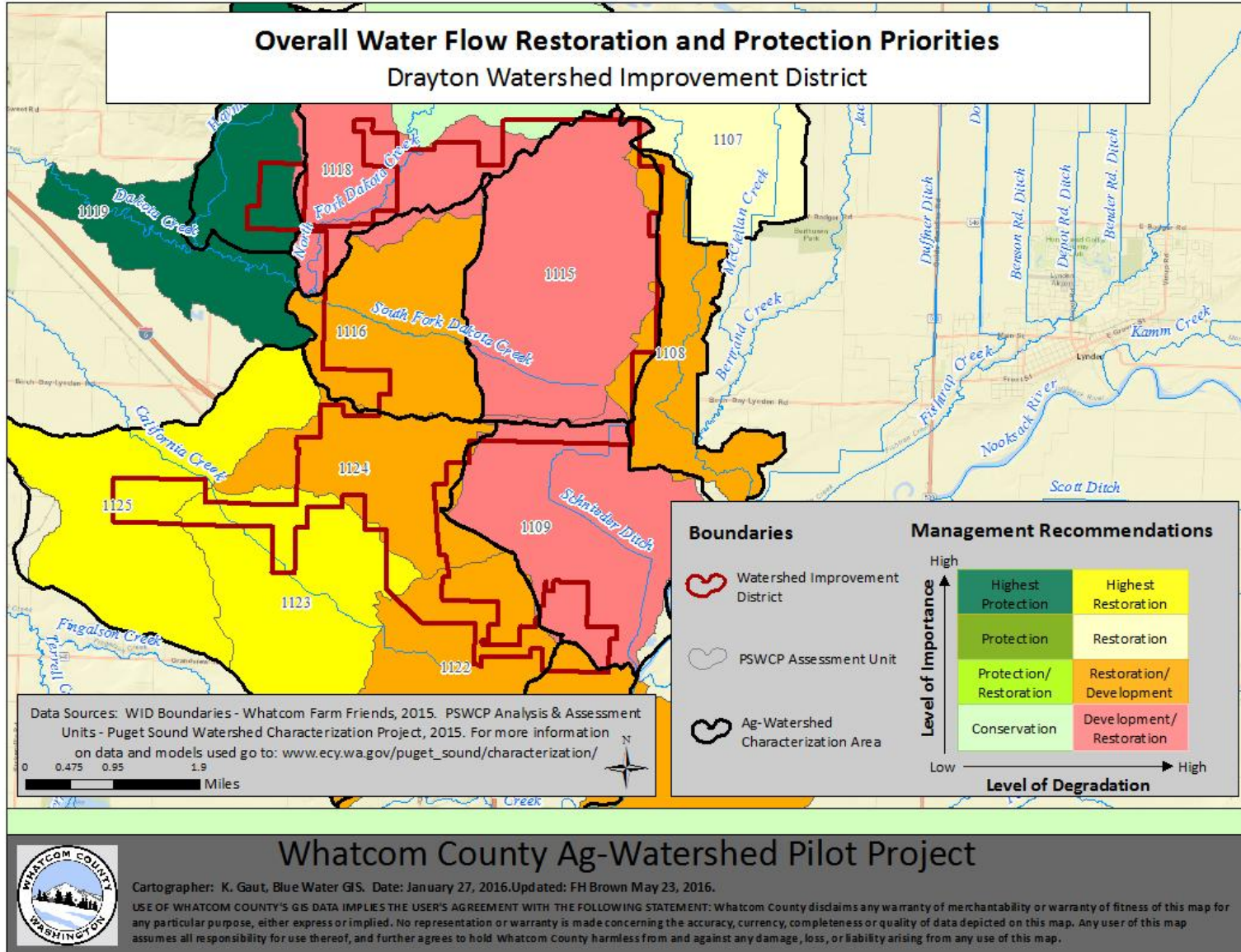


Figure 15. Drayton WID: Overall water flow protection and restoration priorities

5.4 Watershed priorities: Specific actions map

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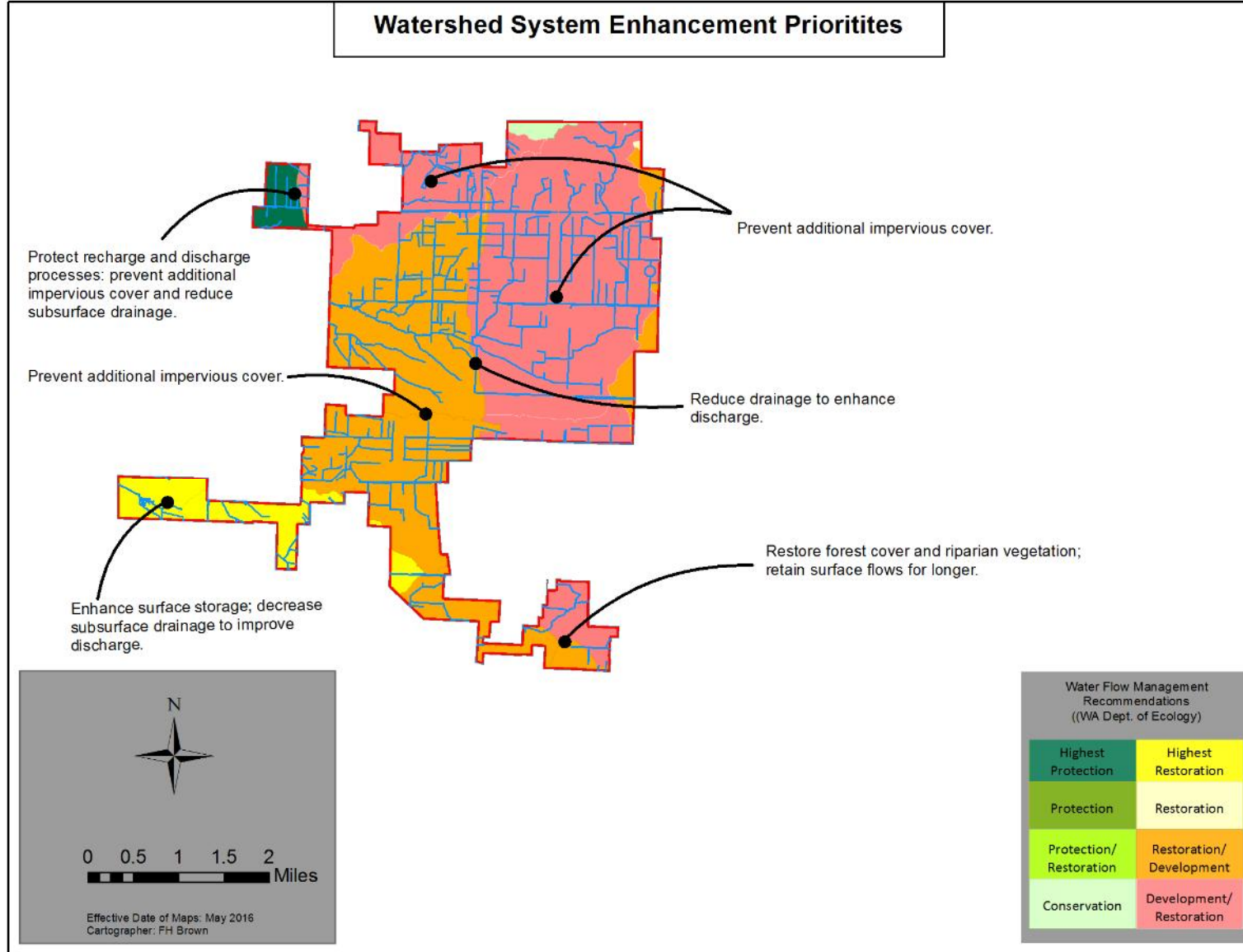


Figure 16. Drayton WID: Summary watershed system enhancement priorities and specific actions

6 Reference maps for the Drayton Watershed Improvement District

6.1 Agriculture reference maps

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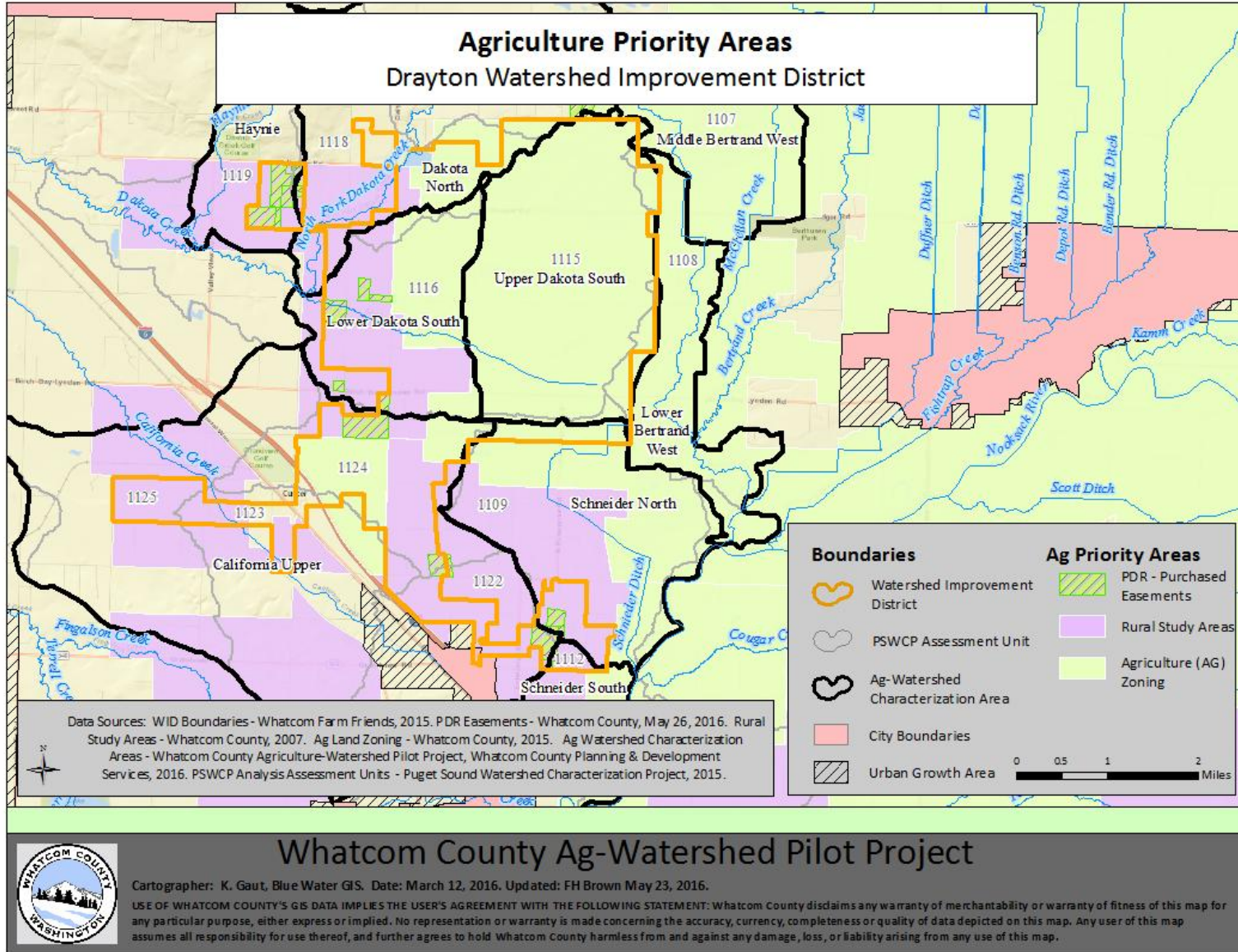


Figure 17. Drayton WID Reference map: Agriculture priority areas

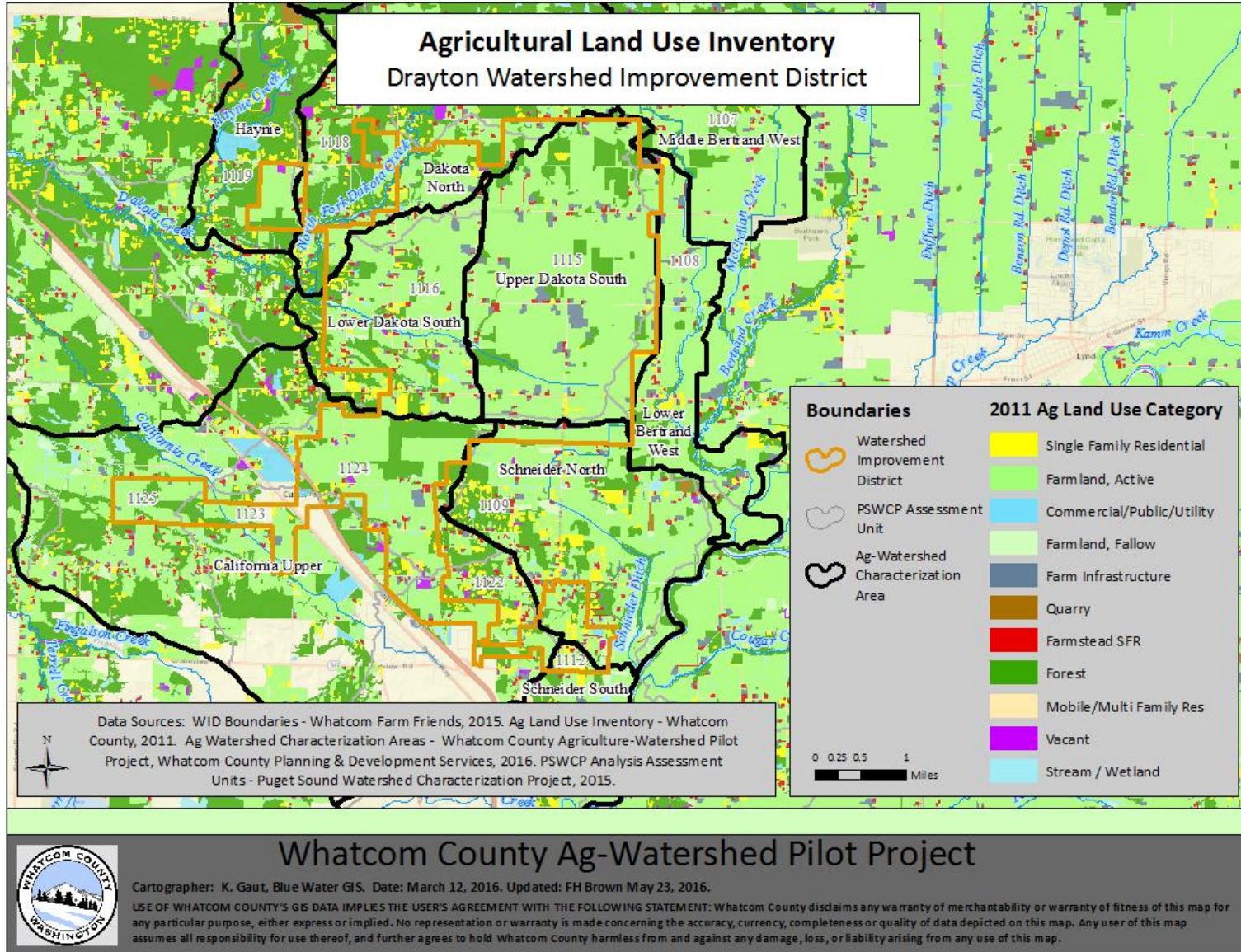


Figure 18. Drayton WID Reference map: Agricultural land use inventory

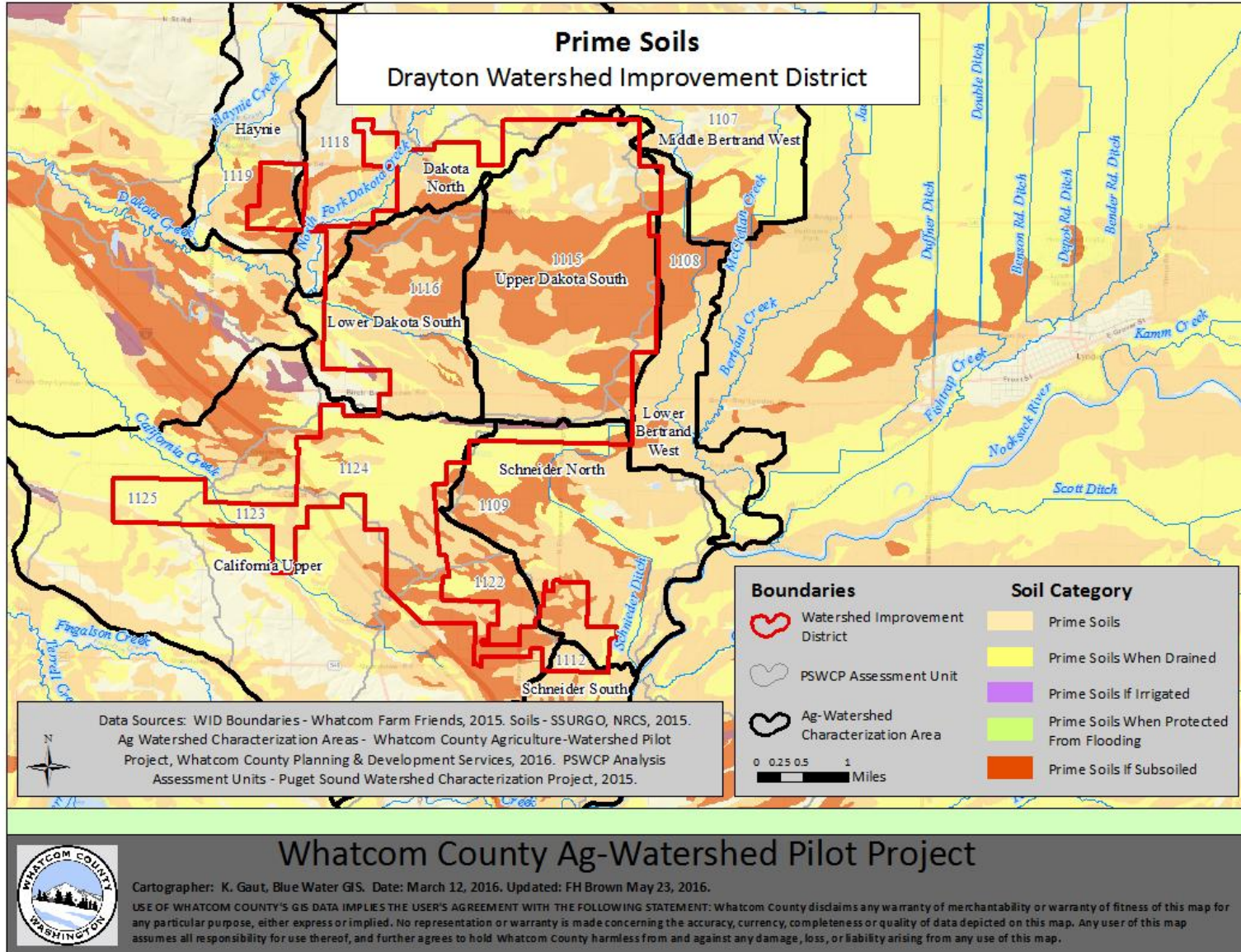


Figure 19. Drayton WID Reference map: Prime soils

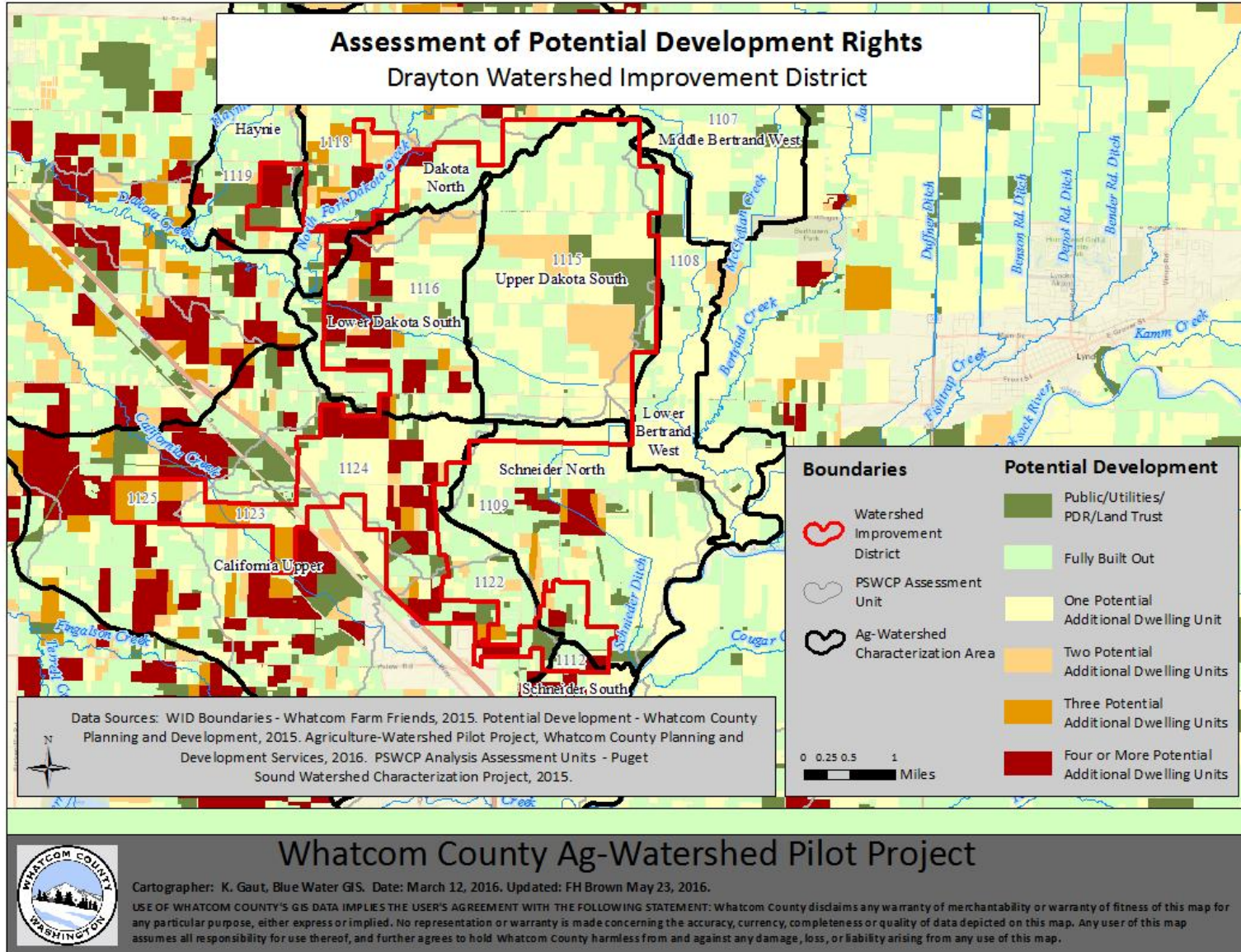


Figure 20. Drayton WID Reference map: Assessment of potential development rights

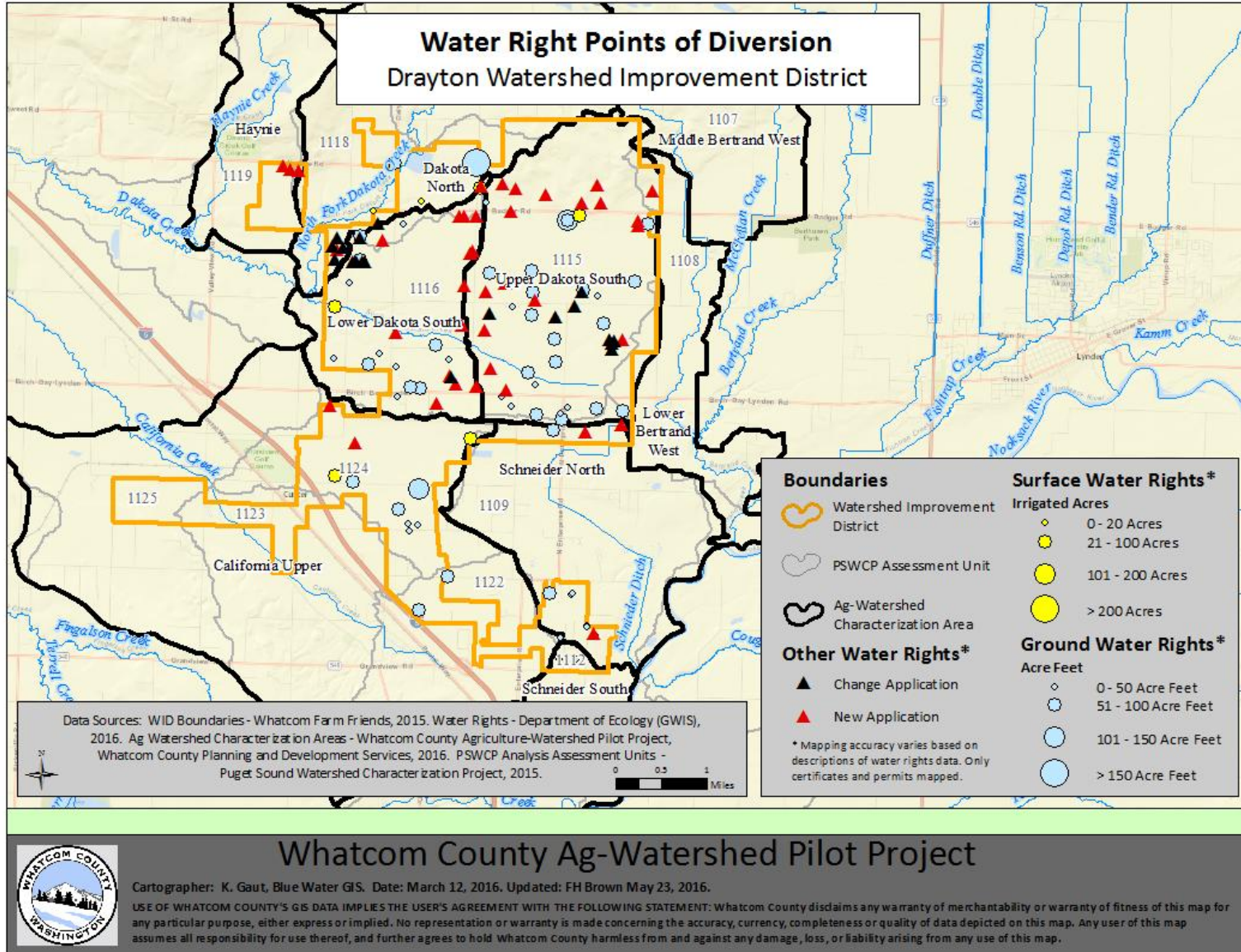


Figure 21. Drayton WID Reference map: Water right points of diversion

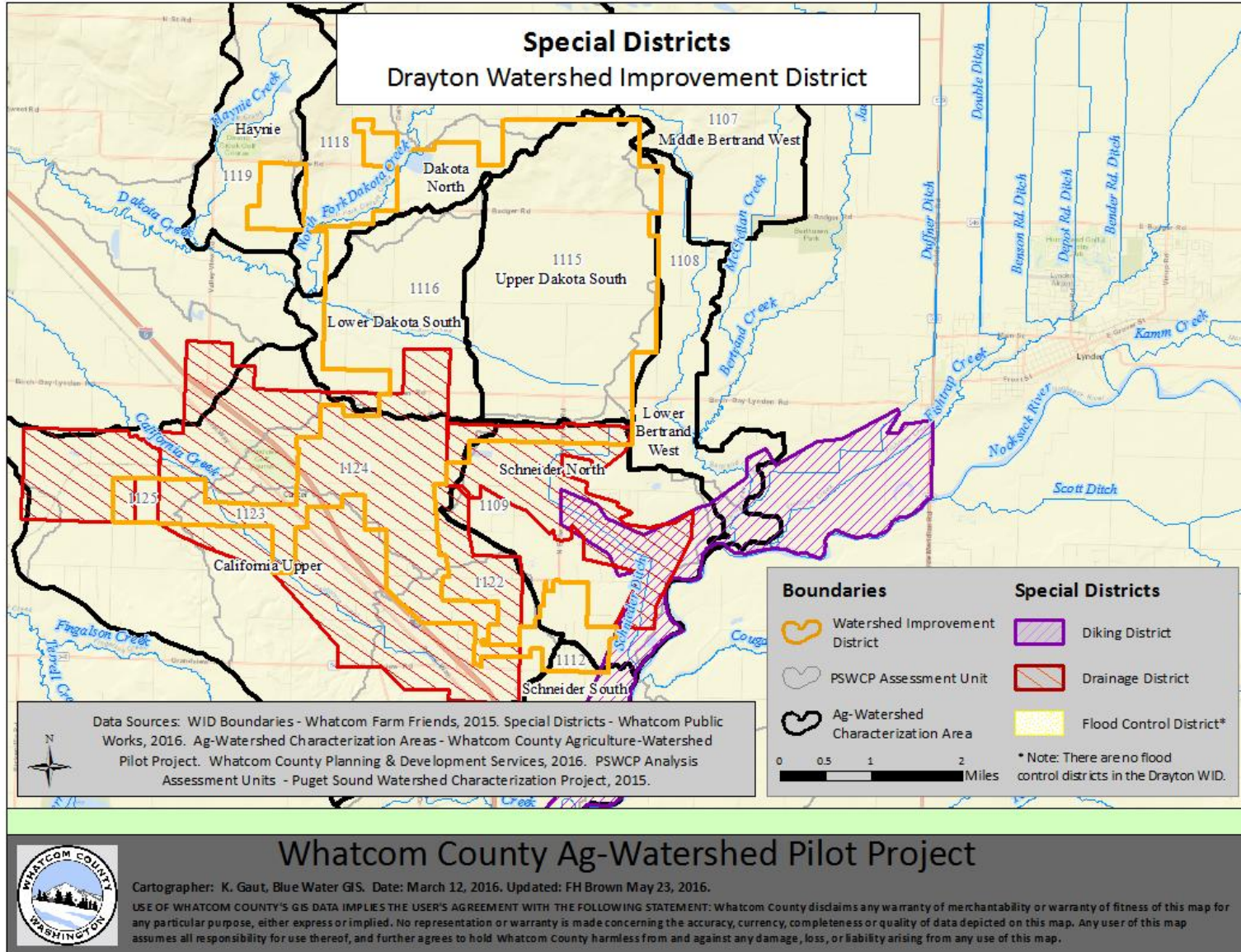


Figure 22. Drayton WID Reference map: Special districts

6.2 Watershed reference maps

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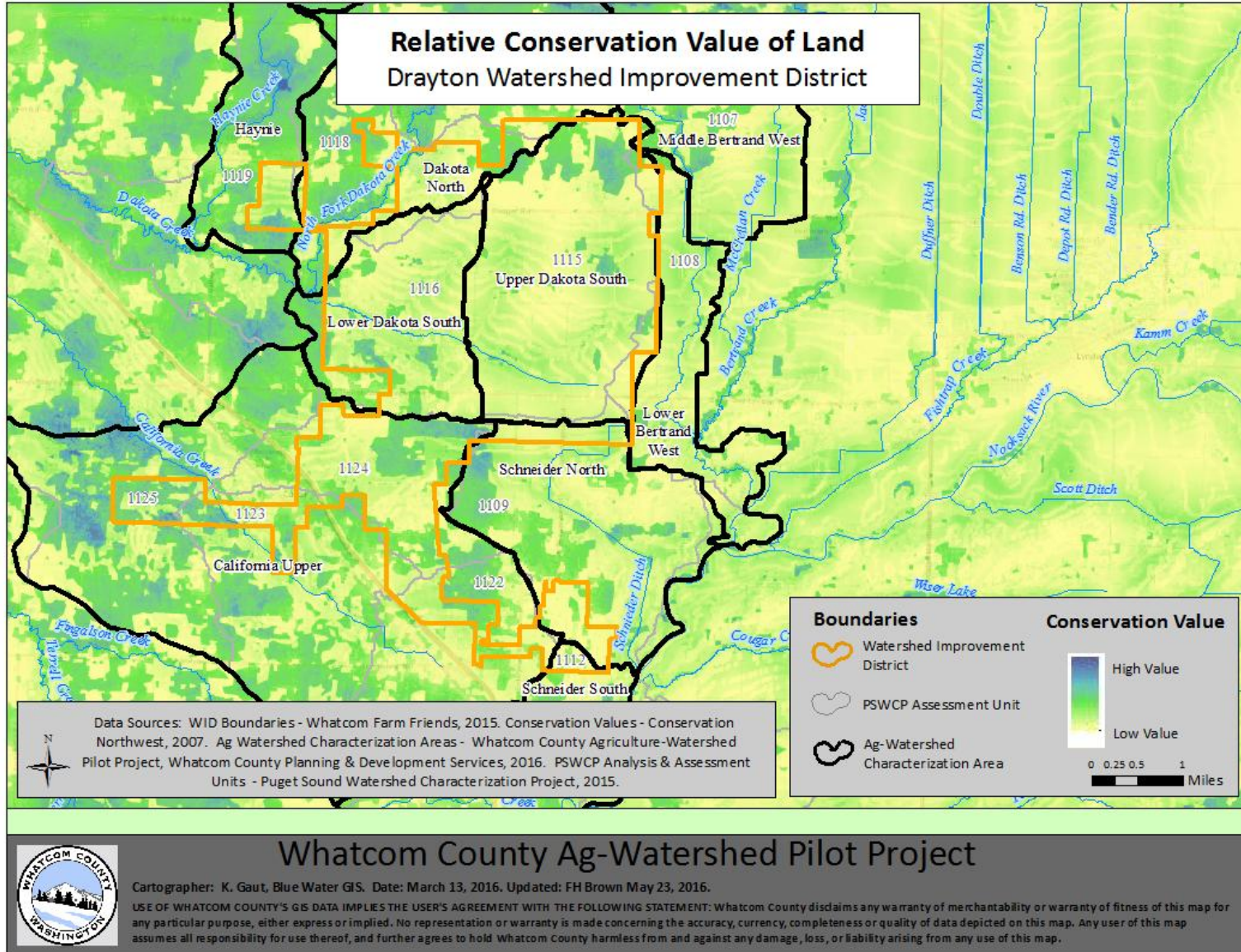


Figure 23. Drayton WID Reference map: Relative conservation value of land

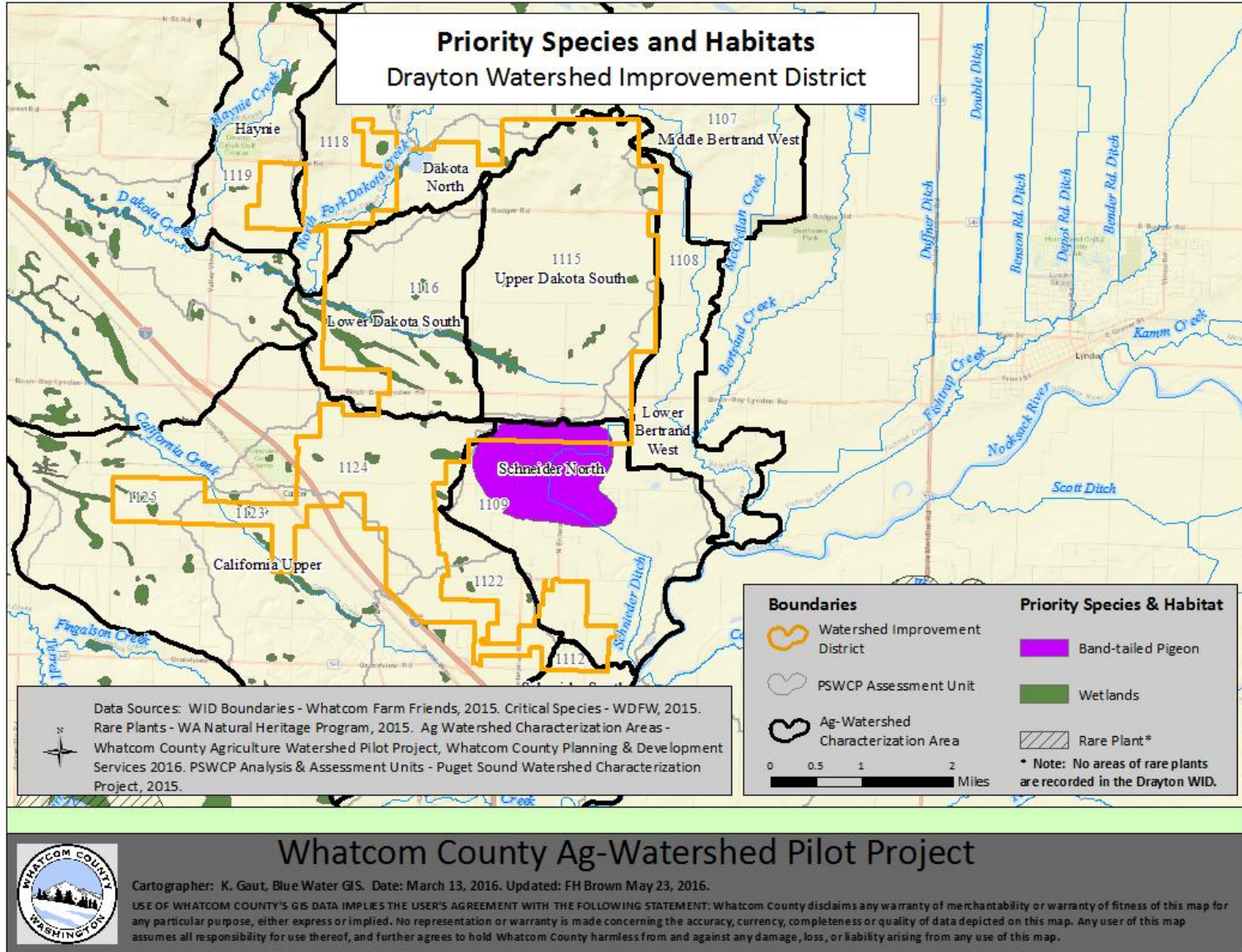


Figure 24. Drayton WID Reference map: Priority species and habitat

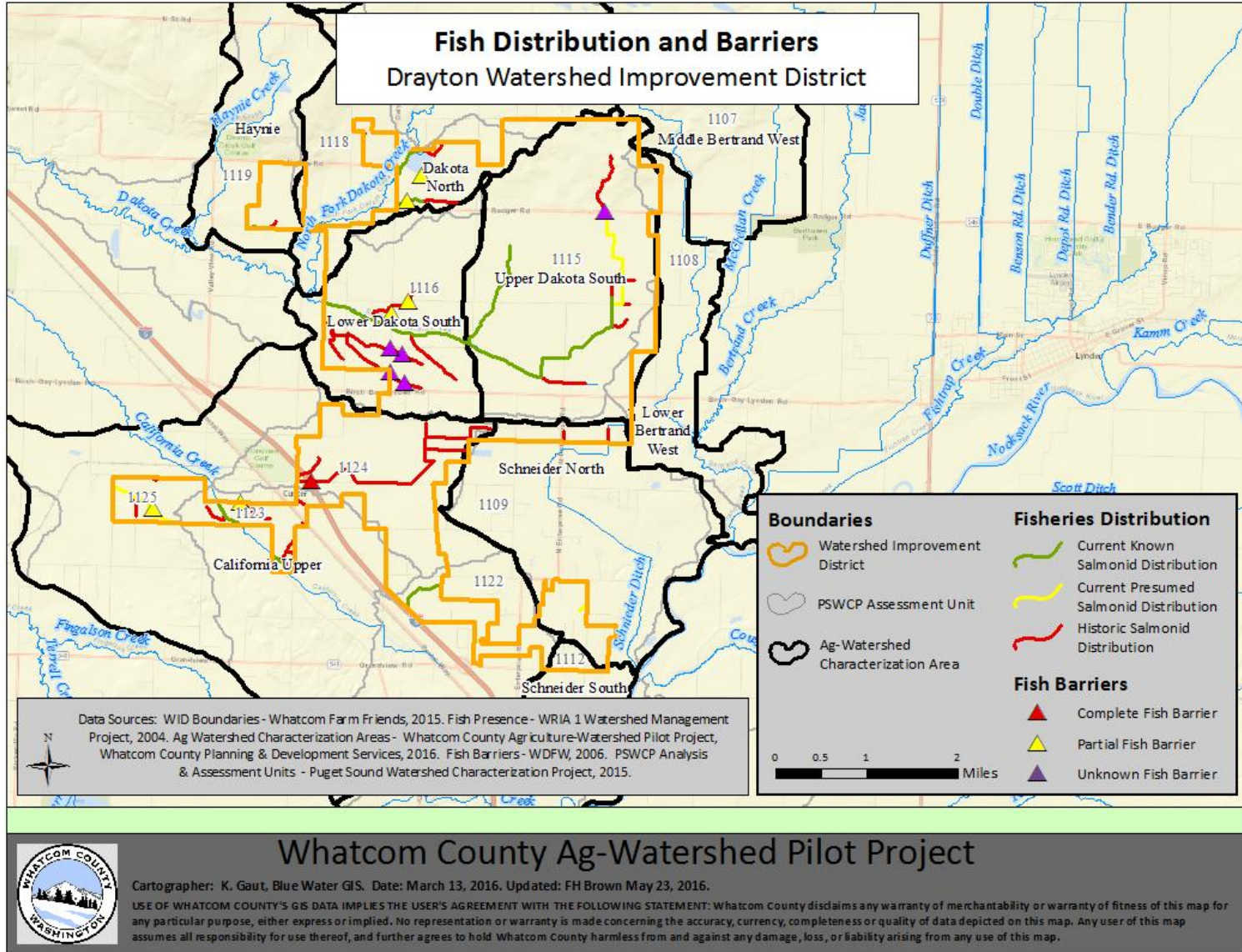


Figure 25. Drayton WID Reference map: Fish distribution and fish barriers

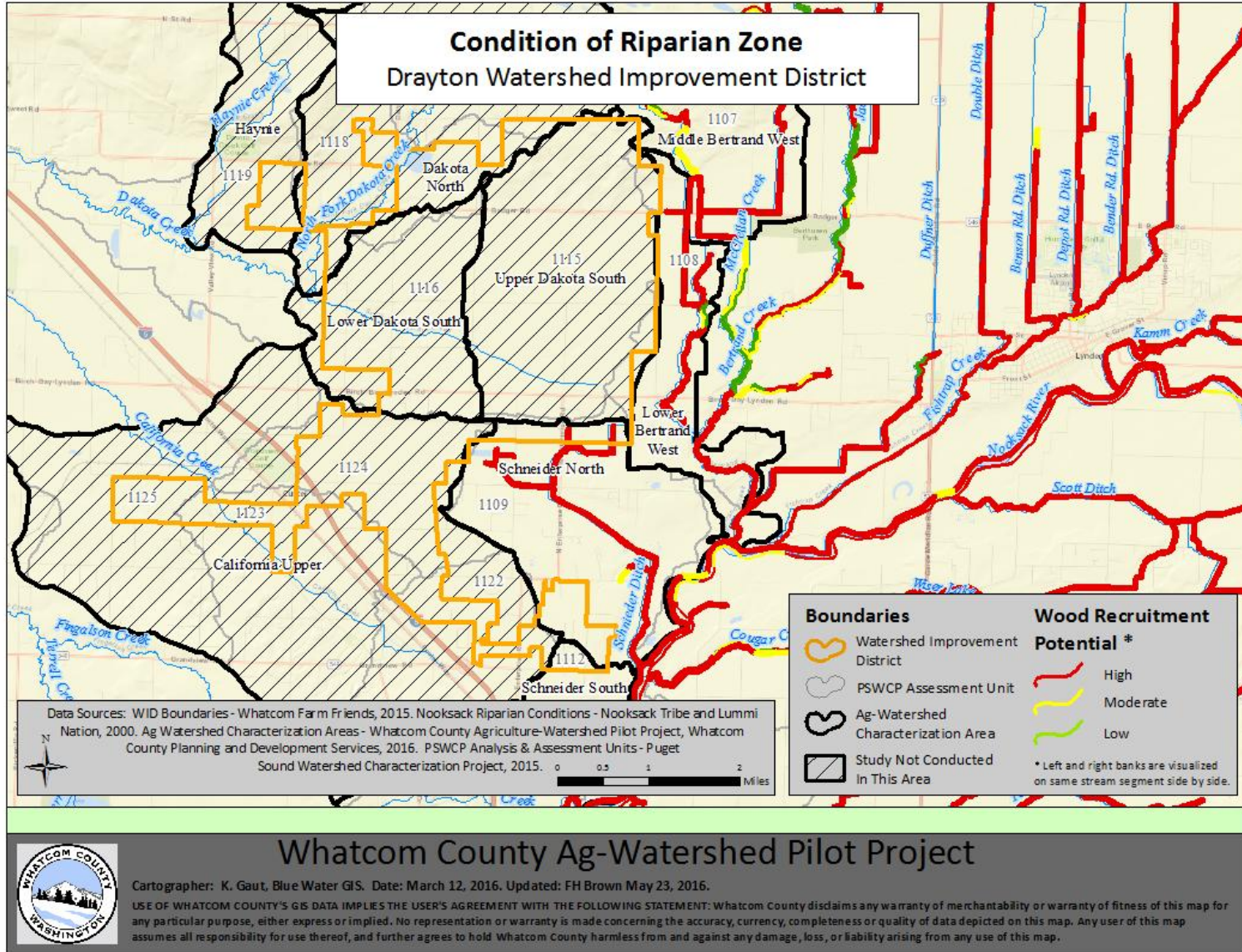


Figure 26. Drayton WID Reference map: Condition of riparian zone

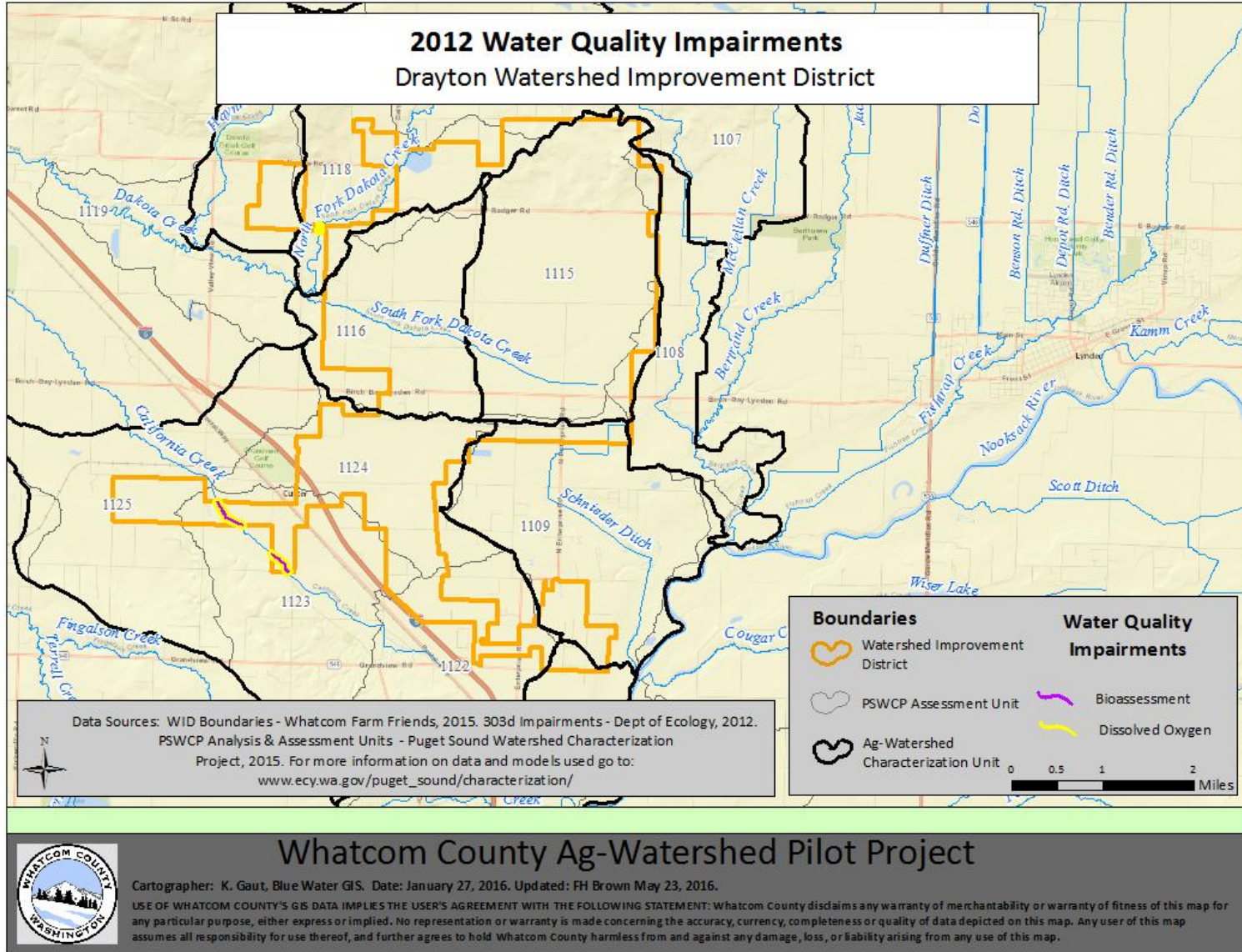
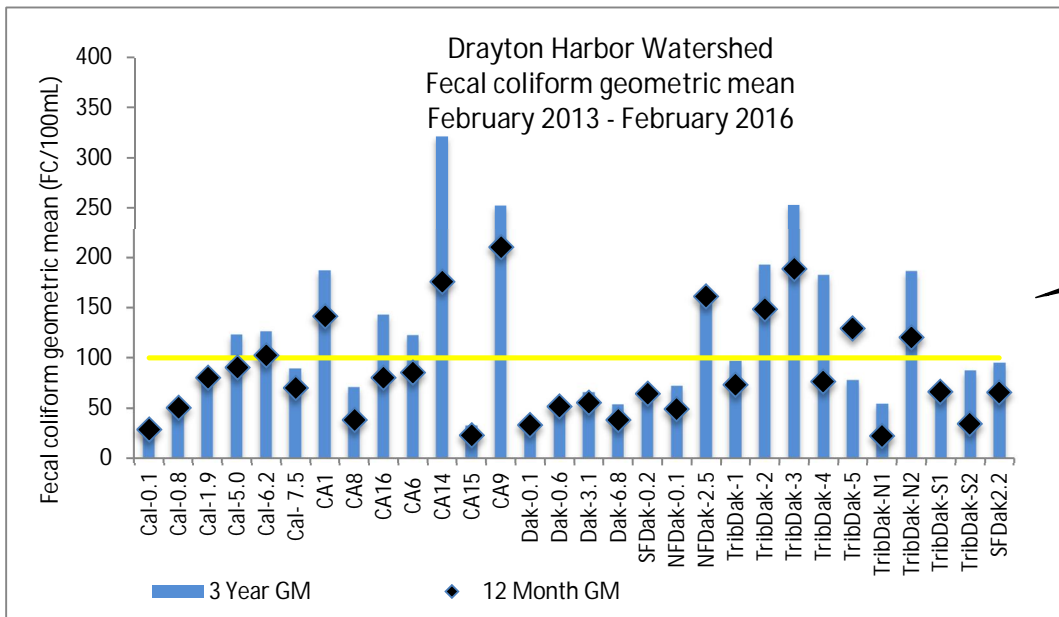
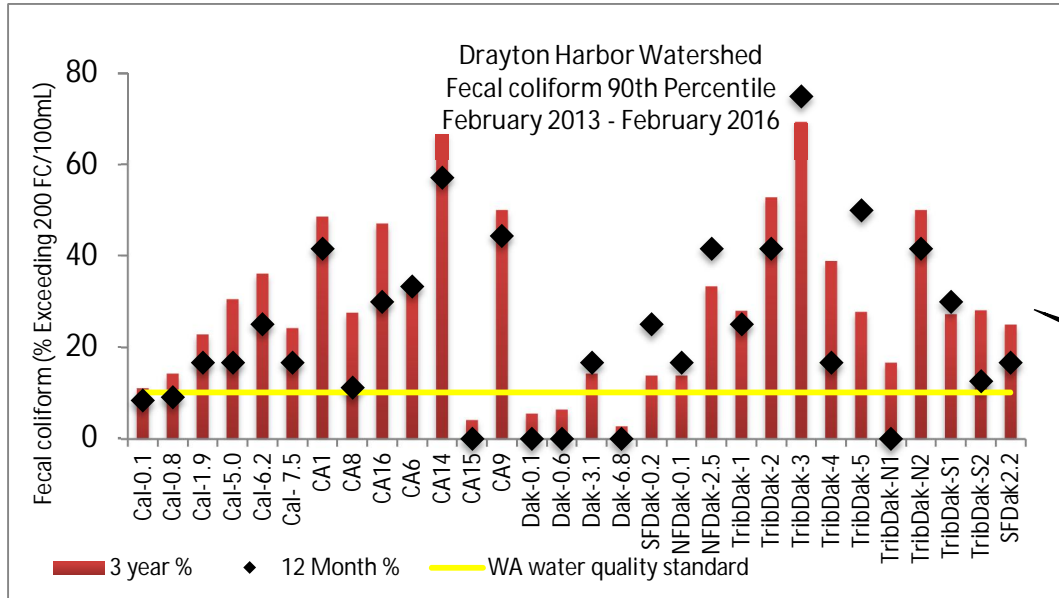


Figure 27. Drayton WID Reference map: Water quality impairments (2012)



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.

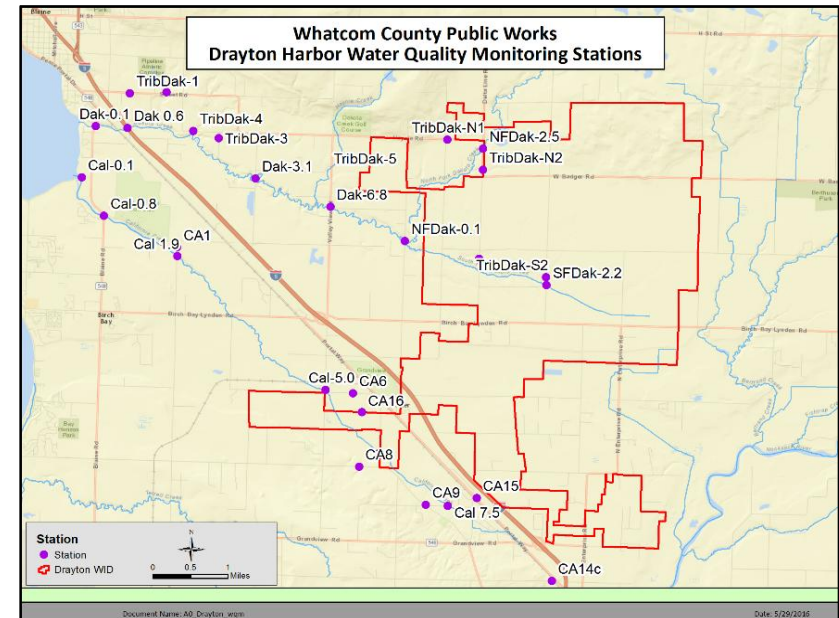


Figure 28. Drayton WID Reference map: Routine water quality monitoring results. Data from Whatcom County Public Works

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Agricultural land use inventory	Whatcom County Planning & Development Services, 2011. Received from Sarah Watts December 2015.
Agricultural Priority Actions	Generated at WID work sessions in January-February 2016.
Ag-Watershed Characterization Areas	Generated for the Whatcom County Agriculture-Watershed Pilot Project, January 2016.
Cropland	Cropland Data Layers, United States Department of Agriculture, National Agricultural Statistics Service, 2015. http://nassgeodata.gmu.edu/CropScape/
Fish Barriers	Washington Department of Fish & Wildlife, 2006 http://wdfw.wa.gov/conservation/habitat/fish_passage/data_maps.html
Fish Presence	Fish Habitat Technical Team, WRIA 1 Watershed Management Project, 2004. Received from Sarah Watts, Whatcom County Planning & Development Services, December 2015.
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Hydrography	Washington State Department of Natural Resources. https://fortress.wa.gov/dnr/adminsa/DataWeb/dmmatrix.html
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Potential Development Rights	Whatcom County Planning and Development Services, 2015. Received from Sarah Watts, December 2015.
Prime soils	Soil Survey Geographic Database (SSURGO), Natural Resources Conservation Service, United States Department of Agriculture. Available online at http://websoilsurvey.nrcs.usda.gov/ (Last accessed December 2015)
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Water Resource Inventory Area 1 (WRIA1) boundary	Whatcom County Planning & Development Services, 2015.
Water Rights	Washington Department of Ecology, Geographic Water-right Information System (GWIS) 2016. http://www.ecy.wa.gov/2016Water.html
Watershed characterization	Landscape groups, water flow assessment results from the Puget Sound Watershed Characterization Project http://www.ecy.wa.gov/puget_sound/characterization/index.html (Last accessed April 2016)
Watershed Improvement District boundaries	Received from Ag Water Board, 2015. www.agwaterboard.com
Whatcom County Tax Parcels	Dated October 6, 2015. Received from Sarah Watts, Whatcom County Planning & Development Services.
Zoning	Whatcom County Title 20 Zoning, Whatcom County Planning & Development Services. http://www.whatcomcounty.us/716/Data/

8 Glossary of key terms used in this report

Agricultural enhancement [protection]	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.	Landscape Group	A group of AU’s within the analysis area that each have similar environmental characteristics, such as precipitation, landform, and/or geology. In the current version of the Characterization models, landscape groups are identified strictly on geographical position (coastal, lowland, and mountain, plus a subset of lowland assessment units that drain to one of four large lakes).
Agriculture-Watershed Characterization Area (AWCA)	Each WID area has been divided into several smaller “Agriculture-Watershed Characterization Areas”, based on a combination of the WRIA 1 water management areas and the PSWC Project Assessment Units. The AWCAs reflect hydrological and agricultural characteristics in the landscape; are recognizable for WID members and are of a size that is practical for the WIDs to utilize in their planning processes. Importantly, the AWCAs represent common areas within which to characterize and map both agricultural and watershed enhancement priorities.	Watershed characterization	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
Assessment Unit (AU)	The assessment units (AUs) used in the Puget Sound Watershed Characterization (PSWC) represent the minimum spatial scale over which the characterization results are meaningful. The AUs were derived from reach-scale catchments delineated by the Salmon and Steelhead Habitat Inventory and Assessment Program (SSHIAP; NWIFC 2009). The SSHIAP catchments were aggregated into larger units with a mean size 4.7 square miles. See: Stanley et al. (2011) https://fortress.wa.gov/ecy/publications/documents/1106016.pdf Wilhere et al. (2013) ftp://www.ecy.wa.gov/gis_a/inlandWaters/ps_project/Docs/Watershed_Characterization_WDFW_Report_Final_Dec2013.pdf	Watershed enhancement	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.
		Water Resource Inventory Area	Water Resource Inventory Area (WRIA): Administrative watershed boundaries designated by the State of Washington’s natural resource agencies.

Appendices

Appendix A: Data sources for the Drayton Watershed Improvement District

Appendix B: WID work session information

Appendix C: Watershed characterization results for Water Resource Inventory Area 1

Appendix D: Fact sheet 5 (Planning, designing and implementing beneficial actions for agricultural & watershed enhancement)



Appendix A: Sources of Available Data for Drayton WID

July 2016

Prepared by Cheryl Lovato Niles & Heather MacKay

Whatcom County Ag-Watershed Project

Purpose of this document

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

Sources for the following data types have been collated for the Haynie, Dakota, and California Creek watersheds:

- Water quality measures (fecal coliform, temperature, dissolved oxygen, turbidity, nitrogen, and phosphorous) from 2000 to the present,
- Hydrography,
- Stream flow from 2000 to the present,
- Erosion and avulsion hazard in the Nooksack River channel migration zone,
- Ground water measurements from 2000 to the present,
- Water rights,
- Land Use /Land Cover
- 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,
- Wildlife, and
- Soils.

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Table 1: Fecal coliform monitoring maps and reports

Watershed/Area	Parameter	Source	Description	URL
Haynie, Dakota North, Dakota South, California Upper	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 (see note below for information on how to download FC data)
Haynie, Dakota North, Dakota South, California Upper	Fecal coliform	Conservation District	Watershed Health Assessment (November 2015)	http://www.whatcomcounty.us/2170/Water-Quality-Monitoring-Results
Whatcom County (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	Map of preliminary source tracking results	http://www.whatcomcounty.us/2170/Water-Quality-Monitoring-Results

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

To see the most recent couple of months of data from the map of routine water quality monitoring by Whatcom County, Nooksack Tribe and Washington State Department of Ecology available 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 Table 2 below.

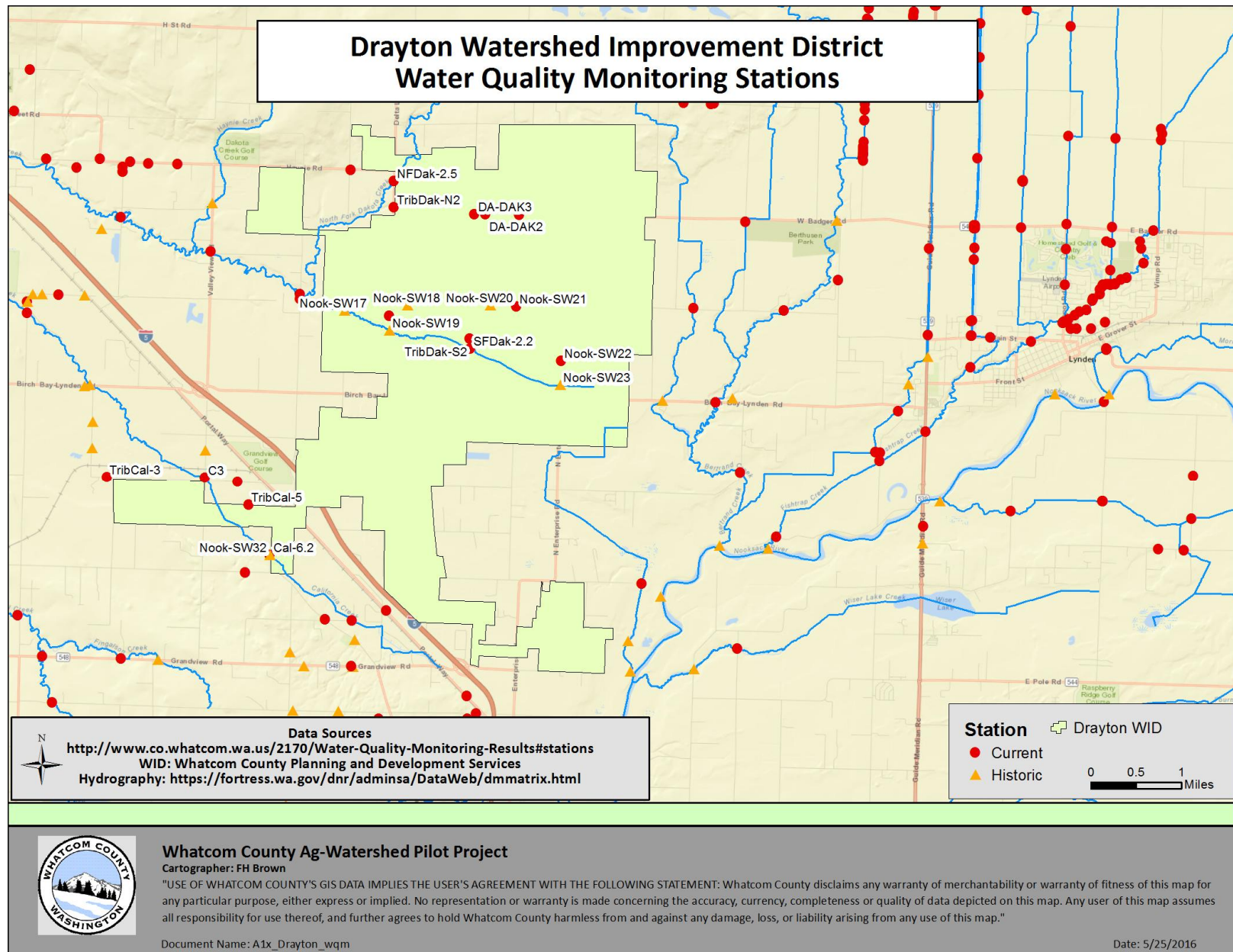


Figure 1: Drayton WID: Routine water quality monitoring stations. See Tables 1 and 2 for more information

Table 2: Where to find earlier water quality data from monitoring stations on Whatcom County Water Quality Monitoring Results for Drayton WID area. *Data for the County Health Department is not included here because their monitoring focuses entirely on marine water. Earlier Washington Department of Agriculture data is available by request. See table 1 for contact information.*

Historic data available from	Department of Ecology	Whatcom County Public Works	Nooksack Tribe
What	Data generally includes FC, pH, T, Conductivity, and DO. Occasionally flow and wetted width are recorded.	Focused on fecal coliform	Fecal coliform, E.coli, T, pH, DO, Conductivity, Turbidity,
How	Can be accessed via Environmental Information Management System (EIM) map or database. If accessing via the map, you can draw a polygon around the area of interest and request the data via email. Download requests of 50,000 records or less are processed immediately, a link to the file is sent to your email address. The contents can be saved to an excel file. If accessing via the database, you can search for data using specific station names, or by location name, WRIA, and County	Annual reports for 2011 through 2013 are available online at url below.	Available by request
Details	Map:< https://fortress.wa.gov/ecy/eimreporting/Map/Map.aspx?MapType=EIM > Database: < https://fortress.wa.gov/ecy/eimreporting/ >	< http://www.co.whatcom.wa.us/2172/Resource-Library >	Jezra Belieu, Water Resources Specialist Nooksack Indian Tribe jbeaulieu@nooksack-nsn.gov
Station Names	1-CAL-0.1 1-CAL-0.8 1-CAL-3.1 1-CAL-5.0 1-CAL-6.2 1-CAL-SD1 1-DAK-0.1 1-DAK-3.1 1-DAK-4.9 1-DRAYSHORE-37 1-NF-DAK-0.1 1-NF-DAK-2.5 1-SF-DAK-0.2 1-SFDAK-2.2 1-TRIBCAL-0	Cal-0.1 Cal-0.8 Cal-1.9 Cal-5.0 Cal-6.2 Cal-7.5 Dak0.1 Dak0.6 Dak 3.1 Dak 6.8 NFDak-0.1 NFDak2.5 SFDak0.2 SFDak2.2	SW17 SW18 SW19 SW20 SW21 SW22 SW23 SW24 SW25 SW26 SW27 SW28 SW29 SW30 SW31 SW32 SW37

Historic data available from	Department of Ecology	Whatcom County Public Works	Nooksack Tribe
	1-TRIBCAL-1 1-TRIBCAL-2 1-TRIBCAL-3 1-TRIBCAL-4 1-TRIBCAL-5 1-TRIBDAK-3 1-TRIBDAK-4 1-TRIBDAK-5 1-TRIBDAK-N1 1-TRIBDAK-N2 1-TRIBDAK-S1 1-TRIBDRAY-1 NWIC-C1* NWIC-C3* NWIC-D1* NWIC-DG* RSM06600-001776 WAM06600-001776 – California Creek	TribDak1 TribDak2 TribDak3 TribDak4 TribDak5 TribDakN1 TribDakN2 TribDakS1 TribDakS2 CA1 CA8 CA16 CA6 CA14 CA15 CA9	SW38 SW39 SW40 SW41 SW42 SW43 SW44 SW45 SW46

Table 3: Streamflow

Watershed	Ongoing/ Completed	Station ID	Description	Lat	Long	Collected by	Source	URL
California Upper	Ongoing	12213500	California Creek near Custer	485515	1223935	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]
Haynie	Ongoing	12214000	Dakota Creek near Blaine	485725	1223930	USGS	same	same

Table 4: Hydrography

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 5: Additional streamflow reports

Ag-watershed characterization area	Watershed	Title	Published	URL
<i>None available</i>				

Table 6: Stream flow plus additional measures

Ag-watershed characterization area	Watershed	Additional parameters	Station ID	Station location	Ongoing/Completed	Collected by	Source	URL	notes
Drayton	California Upper	T, Pressure, Cond., pH, DO,	17110002	California Creek near Pleasant Valley	ongoing	USGS	River & Stream Water Quality Monitoring	https://fortress.wa.gov/ecy/eap/riverwq/regions/station.asp [last accessed January 20, 2016]	Name doesn't match location on the USGS map, I think it should read "near Valley View"

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

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 8: Groundwater data

Area	Parameter	Title of Table/Source	Station ID	Source	URL	Notes
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	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/tab/eGW2.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.

Area	Parameter	Title of Table/Source	Station ID	Source	URL	Notes
all	Well location, use, depth, installation date, open interval	Wells with Sufficient Information to Compute Hydraulic Conductivities, Downloaded from the USGS National Water Information System (NWIS)	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 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	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.

Table 9: Additional Reports on Groundwater

Watershed/ Area	Title	Published	Authors	URL
all	Nitrate Contamination in the Sumas-Blaine Aquifer, Whatcom County, Washington	Publication No. 11-03-027, May 2011	Melanie Redding L. Hg., Barbara Carey L. Hg., and Kirk Sinclair L. Hg., Washington State Department of Ecology	https://fortress.wa.gov/ecy/publications/documents/1103027.pdf
all	Sumas-Blaine Aquifer Nitrate Contamination Summary	Department of Ecology Pub. No. 12-03-026, June 2012	Barbara Carey, L. Hg.	www.ecy.wa.gov/biblio/1203026.html
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	
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/

Table 10: Ground-Water maps

Watershed/ 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 all well locations have been verified and therefore they may plot in the wrong locations.
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 October 1, 2015]	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: Data use information, Soil Conservation Service, National Cartography and GIS Center, Fort Worth, Texas, accessed January 28, 2000, at URL http://www.ftw.nrcs.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 11: Water rights

Watershed/ 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	http://www.ecy.wa.gov/programs/wr/info/webmap.html [last accessed October 1, 2015]	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	

Table 12: Land Use/Land Cover

Watershed/ Area	Parameter	Document	URL
Whatcom County	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
Whatcom County	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 October 1, 2015]
Whatcom County	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 13: WDFW Spawner Surveys

Watersheds	Parameter	Site	Station location	Frequency	Date	Collected by	Source
California Creek and Dakota Creek	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	WDFW	WDFW Tasha Geiger Nooksack River Stock Assessment 360-305-2023 Natasha.geiger@dfw.wa.gov

Table 14: Aquatic Nuisance Species

Watersheds/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/aids [last accessed October 1, 2015]	WDFW
Washington State	Washington Herp Atlas		unknown	Maps updated 2013	http://www1.dnr.wa.gov/nhp/refdesk/herp/herpmain.html [last accessed October 1, 2015]	DNR
Washington State	Washington Nature Mapping Program – wildlife distribution maps		unknown	unknown	http://naturemappingfoundation.org/natmap/maps/ [last accessed October 1, 2015]	NatureMapping Program
US	USGS NAS – Nonindigenous Aquatic Species – presence and distribution	Searchable database/maps of nonindigenous aquatic species sightings organized by group, i.e. amphibians, fish, mammals.	unknown	Date of info varies	http://nas.er.usgs.gov/queries/default.aspx [last accessed October 1, 2015]	USGS
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	http://www.ecy.wa.gov/programs/wq/plants/weeds/index.html [last accessed October 1, 2015]	WA Department of Ecology

Watersheds/Area	Title - Parameter	Notes	Frequency	Date		Source
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 15: Additional Habitat/Wildlife Documents

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]
Includes Dakota and California Creeks	Riparian inventory and function assessment	Anchor QEA, LLC, 2010. Riparian Vegetation Inventory and Function Assessment of Tributaries and Marine Shoreline, Northwest Whatcom County. Whatcom County Water Resources. June, 2010. < 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.
Dakota North	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/
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
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 16: Additional Habitat/Wildlife Maps and Databases

Watershed/Area	Parameter	Document/Website	URL	Source
WRIA 1	Fish Presence Char, Chinook, Chum, Coho, Cutthroat, Kokanee, Pink, Steelhead	Maps: Fish Presence by species available on Whatcom Salmon Recovery website	http://whatcomsalmon.whatcomcounty.org/maps-fishpresence.html [last accessed October 1, 2015]	
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	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

Watershed/Area	Parameter	Document/Website	URL	Source
US	Critical habitat maps for marine and anadromous fishes	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 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.	http://www.nmfs.noaa.gov/pr/species/criticalhabitat.htm [last accessed January 21, 2016]	NMFS NOAA
US	Threatened and Endangered Species	Environmental Conservation Online System, data and maps.	http://ecos.fws.gov/ecp/	US FWS
Washington State	Rare plants, animals, ecological communities	Reference Desk of the Washington Natural Heritage Program. Includes searchable databases	http://www1.dnr.wa.gov/nhp/refdesk/gis/index.html [last accessed October 1, 2015]	Washington State Department of Natural Resources
Puget Sound Region	Wetlands	National Wetlands Inventory, data and maps	http://www.fws.gov/wetlands/	US FWS

Table 17: Soils

Watershed	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 18: WRIA 1 Materials Online - *In addition to the WRIA 1 materials included in this memo, there are many additional resources available on the WRIA 1 Resource Library webpages*

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), and 2005 Numerical Groundwater Flow Model of the Abbotsford-Sumas Aquifer	http://wria1project.whatcomcounty.org/Resource-Library/8.aspx >
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

Appendix B: WID Work session information Drayton Watershed Improvement District

1. Overview of Drayton WID characterization and mapping work

Drayton Watershed Improvement District (Drayton WID) hosted a work session with the ag-watershed project team to prepare agricultural-watershed characterization and mapping work products for use in the Drayton WID's ongoing comprehensive planning. Some of the final work products will also be used as part of the Ag-Watershed Project final report to the Whatcom County Planning & Development Services (WCPDS) Agriculture Program and to the Washington Department of Commerce.¹

This appendix provides documentation of the February 2016 WID work session, a summary of materials used to gather and document input both before and after the work session, and a list of participants engaged in developing and reviewing the agricultural-watershed characterization and mapping work.

The Drayton WID Board reviewed and approved:

- the scope of work for Task 6 (extended ag-watershed characterization and mapping: December 2015),
- draft characterization tables from the work session and preliminary draft maps (February-March 2016),
- the draft summary report documenting methods and results (April-May 2016), and
- the full draft report on the WID characterization and mapping (this document: May-June 2016).

¹ The Ag-Watershed Project is a research and development project 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

2. Drayton WID work session

The February 3, 2016 work session participants included Drayton WID members and guests who contributed local knowledge and expertise to identify agriculture and watershed priorities and enhancement opportunities within in the WID area.

Participants were introduced to a structured process to identify specific characteristics of the agricultural and watershed systems and locate these on maps of the WID area. Small groups of participants then worked together to identify, characterize and locate agricultural system characteristics and enhancement opportunities in the WID area.

The February 2016 work session orientation included an overview of the Drayton WID area and instruction on the method used for the characterization and mapping activities.

Background information provided at the work session included:

- February 3, 2016 Agenda and work session overview.
- Summary of the Agricultural Analysis Method, included in an excerpt from the 2013 Ag-Watershed Characterization & Mapping Report.
- Fact sheet #2 "Identifying Opportunities to Strengthen Agriculture & Watershed Systems in Whatcom County."
- "*About the Drayton WID*" website excerpt describing the WID boundary locations and list of WID priorities for agriculture and watershed services.

Friends-Community Education, Whatcom Conservation District, and Washington State Department of Fish & Wildlife. Project fact sheets and links to all previous work, including technical reports and reference documents can be found at <http://whatcomcounty.us/2260/Agricultural-Watershed-Pilot-Project>

Reference information provided at the work session:

Prior to the WID work session, the Ag-Watershed Project team compiled information from existing planning and reference documents describing agricultural and watershed systems and enhancement priorities in the Drayton WID area. Background maps and materials were prepared for use in table-top mapping activities (see complete list of work session maps and supporting materials below).



Figure 1. WID Work session table-top materials.

Work session materials:

- Drayton WID large-scale locality maps for table-top discussion and note-taking purposes.
- Drayton WID Agricultural Enhancement Priorities: Tables & Worksheets.
- Drayton WID Watershed Enhancement Priorities: Tables & Worksheets.
- Drayton WID Background Maps featuring Water Flow Assessments:
 - Water Flow Assessment Unit (AU) map.
 - Water Flow Characterization Results (All) from Puget Sound Watershed Characterization Project (PSWCP) 2015 management recommendations.

- Importance and Degradation of Water Flow from PSWCP 2015 analysis.
- Overall Water Flow Restoration & Protection Management Recommendations from PSWCP 2015 analysis.

Reference maps provided at the work session:

- Overview and Locality Map: Preliminary showing PSWCP 2015 Area Units & Drayton WID sub-area names, locations.
- Agricultural Priority Areas: Preliminary Draft from Whatcom County Planning & Development Services (WCPDS), 2015 Purchase of Development Rights (PDR) Easements.
- Agriculture Priority Areas and Zoning from WCPDS, 2015.
- Actively Farmed Land from WCPDS, 2015.
- Fish Presence from WRIA 1 Watershed Management Project, 2004.
- Relative Conservation Value of Land from Conservation Northwest, 2007.
- Agricultural Land Use Classes from WCPDS, 2011.
- Priority Habitats and Species from WA Department of Fish & Wildlife 2014 and WA Natural Heritage Program, 2015.
- Prime Soils from SSURGO, NRCS, 2015.
- Water Rights: Points of Diversion from WA Department of Ecology, 2016.
- Condition of Riparian Zone from Nooksack Tribe and Lummi Nation Nooksack Riparian Conditions, 2000.
- Potential Development Rights from WCPDS, 2015.
- 303d Water Quality Impairments (2012) from WA Department of Ecology.
- Watershed health assessment results from Whatcom Conservation District, 2015.



Figure 2. Laurel WID 2016 work Session in action.

Work session participants:

The objective of the February 2016 Drayton WID work session was to gather input on agricultural system characteristics and enhancement opportunities from a representative mix of agricultural producers and landowners, with the goal of 51% of participants who are active farmers and/or landowners and Drayton WID members.

The WID Board invited a mix of participants considering: (i) location within the WID sub-basins; (ii) type of agricultural operation; (iii) size of agricultural operation; and (iv) parcel size. The WID Board identified additional guests to assist with and advise the work session participants, to provide additional technical inputs at the work sessions, and to review work products for accuracy. See Table 1 for a summary of Drayton WID work session invitees and attending participants*.

Table 1. Drayton WID Work Session Invitees and Participants.

WID Invitees & Participants*	WID Area	Ag Type
Leonard Ebe	Drayton South	Potato
Dale Bedlington *	Drayton South	Potato
Ed Pomeroy*	California Upper	Dairy
Tom & Sue Fenton*		Turf
Chris Paul*	Haynie	Dairy
Jag Alamwala	Drayton South	Berry
Rud Browne	Drayton North	Misc.
Michael Koenen	Drayton North	Beef
Dave Buys*	Drayton North	Dairy
Kevin Maddux	California Upper	Berry
Cornie Timmermans	Haynie	Berry
Rick Vander Veen		
Rod Tjoelker*	Drayton North	Dairy
Scott James*	Drayton North	Dairy
Marty Maberry	Drayton North	Berry
Alan Brown	Drayton North	Berry
Jeff Bedlington*	Drayton South	Potato
Greg Ebe	Drayton South	Potato
WID Guests	Expertise	Agency
Karin Beringer*	Ag land priorities, enhancements	Ag Land Program, WCPDS
Chris Elder*		
Mark Personius		
Paula Harris	Flood, drainage enhancements	Flood, WCPW
Chris Benedict*	Ag priorities	WSU Extension
Frank Corey *	Riparian priorities, enhancements, CREP, water quality	Whatcom Conservation District

3. Record of meetings

During WID Board meetings, WID Commissioners reviewed the proposed scope of the ag-watershed characterization and mapping work products, the draft work session materials, and preliminary draft work products prior to the completion of the final project deliverables. Meetings included:

December 15, 2015 - Drayton WID Board reviewed project scope of work (SOW) and proposed Memorandum of Understanding (MOU) with Whatcom County Planning and Development Services.

January 19, 2016 - Drayton WID Board reviewed and approved proposed SOW, MOU, and work session agenda and invitees.

February 3, 2016 - Drayton WID Board reviewed summary of work session input and preliminary draft report contents.

May-June 2016 - Drayton WID Board reviewed and confirmed the final Drayton WID Agriculture-Watershed Characterization and Mapping Report.

4. Record of documents

The Drayton WID Board worked with Ag-Watershed Project staff to conduct work session outreach and proceedings. This record of documents includes administrative documents used to guide the project work and documentation of Ag-Watershed Project team and participant contributions to the final work products and analysis (maps, tables and summary report).

Administrative materials included:

- December 2015 SOW for Drayton WID agricultural and watershed characterization and mapping project (see Table 2 on page 4 with excerpt on the Agricultural Analysis Method).
- December 2015 draft MOU with WCPDS.
- February 2016 Drayton WID work session invitation and RSVP tracking list.
- February 3, 2016 Drayton WID Work Session Agenda.

Information materials provided for preliminary review included:

Tables

- Table 1. Summary of results of ag-watershed characterization mapping for the Drayton WID.
- Table 2. Agricultural characterization tables for Drayton WID characterization mapping for the Drayton WID.
- Table 3. Key actions on agricultural priorities specific actions map.
- Table 4. Watershed characterization tables for the Drayton WID.

Maps

- Drayton WID overview and locality.
- Drayton WID agricultural priorities: Proportion of prime soils. Data from reference map of prime soils.
- Drayton WID agricultural priorities: Drainage of agricultural land. Data from reference maps of prime soils and special districts.
- Drayton WID agricultural priorities: Protection of agricultural land from flooding. Data from reference maps of prime soils and special districts plus WCPDS GIS data on FEMA flood areas.
- Drayton WID agricultural priorities: Protection of the agricultural land base. Data from reference map of agriculture priority areas.
- Drayton WID agricultural priorities: Water for agricultural activities. Data from reference map on water right points of diversion.
- Drayton WID map of specific actions for agricultural priorities (generated at February 3 2016 work session).
- Drayton WID: Overall water flow restoration & protection priorities.
- Drayton WID: Water flow assessment units in relation to WID area.
- Drayton WID: Water flow process assessment results.
- Drayton WID: Overall water flow restoration & protection priorities.

Table 2. Excerpt: Ag-Watershed Project Agricultural Analysis Method²

<i>Priority What?</i>	<i>Where?</i>	<i>Related Background Info.</i>
Soils	Primary, secondary, tertiary soils for all crop types and rotations. Selection Criteria: Prime Agricultural soils are present in the watershed.	Map: Ag Priority Areas Map: Ag Land Use Map: Prime soils
Water Quantity	Water for irrigation, livestock and agricultural processing. Selection Criteria: One or more applications for new water rights are present, and identified in the Ag Mapping Workshop.	Map: Water Rights
Land Drainage	Includes timing of field drainage for agricultural crops and storage opportunities. Selection Criteria: Over 50% of area contains Prime Ag soils only if drained, or identified in the Ag Mapping Workshop.	Map: Prime soils
Flood Protection	Relief from high flashy flows and sustained flooding events. Selection Criteria: Contains prime Ag soils only if protected from flooding, or identified in the Ag Mapping Workshop.	Map: Ag Land Use Map: Prime soils
Protection of the Ag Land Base	Use of purchase or transfer of unrealized development rights in order to protect working ag land from conversion pressures. Selection Criteria: over 50% the area includes any combination of land zoned Agriculture, "Rural Study Area", or in PDR easements.	Map: Ag Priority Areas Map: Ag Land Use Map: Potential Development Rights

² Agricultural Analysis Method from the Agriculture-Watershed Characterization & Mapping Report combines information on existing agricultural protection programs, local knowledge and available GIS data. 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>

Appendix C: Water Flow Assessment Results for Water Resource Inventory Area 1

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1 Methodology

The description of the watershed characterization methodology has been adapted from that provided in the Appendix to the pilot agriculture-watershed characterization and mapping report.¹

1.1 General approach

The watershed characterization assessment uses methods developed by the Puget Sound Watershed Characterization Project.² The results of the watershed characterization assessment are intended to assist the WIDs in identifying high priority opportunities for watershed enhancement projects on agricultural land in the lowland areas of Whatcom County, with a focus in areas where watershed and agricultural priorities could be mutually reinforcing.

The *Puget Sound Watershed Characterization (PSWC)* is a set of water and habitat assessments that compare areas within a watershed for relative restoration and protection value. It is a coarse-scale decision-support tool that provides information for regional, county, and watershed-based planning. The information it provides allows local and regional governments, as well as NGOs, to base their land use decisions on a systematic analytic framework. It prioritizes specific geographic areas for protection, restoration, and conservation of our region's natural resources, and identifies where best to focus new development. Application of this method should result in future land-

use patterns that protect the health of terrestrial and aquatic resources while directing limited financial resources to the highest priority areas for restoration and protection.

The objective of the PSWC assessment is to “characterize” the watershed in a way that helps to identify priority enhancement opportunities. The relative comparison of assessment units (AUs) for water flow processes across the lowland watersheds allows for a coarse-level snapshot of which areas are relatively important or degraded for water flow. From this snapshot we suggest possible enhancement actions that could contribute to improving or protecting water flow processes at the AU scale. Actual site location of those actions within an assessment unit would require different analyses not described here.

The assessment results in this document address the following primary questions for the Whatcom County lowland watersheds:

(1) *Where on the landscape* should management efforts be focused first to benefit water flow processes in the watersheds that are part of the Watershed Improvement District?

(2) *What types of activities and actions* are most appropriate to that place based on the assessment results?

The assessment results therefore address both the “where” and the “what” to focus on, in terms of water flow processes. This integrated approach offers a systematic framework for identifying more important areas within the lowland watersheds and those which are more degraded for water flow processes and water quality, with the intent of identifying areas that offer the most potential for enhancement.

¹ Hume C & Stanley S (2013). *Summary of Water Flow Assessment Results for Bertrand, Fishtrap and Kamm Watersheds*. Appendix A in Gill P (2013). *Agriculture-Watershed Characterization and Mapping Report for the North Lynden watersheds*. Prepared for the Whatcom County Agriculture-Watershed Pilot Project by the Washington Department of Ecology Shorelands and Environmental Assistance Program.

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

² See http://www.ecy.wa.gov/puget_sound/characterization/index.html

1.2 Limitations

Care should be taken to use the Puget Sound Watershed Characterization as intended. It is a coarse-scale assessment and is not intended for site-specific application or decision-making at the site scale. Finer scale data, local information and technical expertise is needed for those decisions. In addition:

- The Puget Sound Watershed Characterization is for planning purposes only. This does not affect or alter existing land use/environmental regulations although it may be used to help inform future land use and regulatory decisions.
- For the water flow assessment, the rankings for any single AU are relative only to other AUs in the area of analysis. This means it is only appropriate to compare the Watershed Improvement District (WID) results with results in other AUs in the lowland area of WRIA 1.
- Results at the AU scale represent land-use planning-level information. At the project- or site scale, each AU will have a combination of on-the-ground challenges and opportunities. Just because an AU is rated as a low priority for restoration does not mean there are no suitable restoration sites or opportunities in that AU. Similarly, not every site in an AU that is a high priority for restoration will be suitable for restoration.
- The assessments are landscape-scale and consequently do not address site-specific issues. These are best addressed through finer-scale studies, which will remain essential to the success of local conservation efforts. When developing site-level plans, the WID should evaluate the need for finer-scale information and collect it where needed.
- The watershed characterization assessment is not intended to address compliance with state or federal water quality law, nor describe the actions necessary to achieve compliance with those laws. It is a violation of state law when activities are shown to cause or have the substantial potential to cause nonpoint source

pollution. If the reader has questions about the water quality laws, they can contact Whatcom County Public Works or the WA Department of Ecology for additional information.

1.3 Fundamental Concepts of Watershed Characterization

Watershed processes are defined as the dynamic physical and chemical interactions that form and maintain the landscape and ecosystems on a geographic scale of watershed to basins. This includes the movement of water, sediment, nutrients, pathogens, chemicals and wood. Watershed processes are controlled and influenced by natural attributes and human actions. Natural controls on watershed processes include physical attributes of the ecosystem such as geomorphology, geology, and soils. Many human actions influence watershed processes. For example, timber harvest may reduce the amount of wood entering streams. Shoreline armoring can reduce sediment input from bluffs and alter the erosion, movement, and deposition of sediments along beaches. Urban development can increase the amount and amplitude of stormwater runoff. Watershed characterization attempts to model these watershed processes such that areas of the landscape can be identified which are relatively more important (presence of natural controls) or degraded (due to human impacts).

1.4 Understanding the Water Flow Assessment results

The Water Flow Assessment uses two models to compare the *importance* and *degradation* of water flow processes in a watershed. Together, they identify areas that are relatively more suitable for protection or restoration of water flow processes. Each model provides a ranking from low to high for how important and how degraded each assessment unit is *relative* to the other units in the watershed.

Water Flow importance

The *importance* model evaluates the watershed in its “unaltered” state. This model combines the delivery, surface storage, recharge, and discharge components to compare the relative *importance* of assessment units in maintaining overall water flow processes in a non-degraded setting. When precipitation is “delivered” as either rain or snow, there are physical features that control the surface and subsurface movement of that precipitation within an assessment unit. These physical features include land cover, storage areas such as wetlands and floodplains, areas of higher infiltration and recharge, and areas that discharge groundwater. These areas are considered “important” to the overall water flow processes.

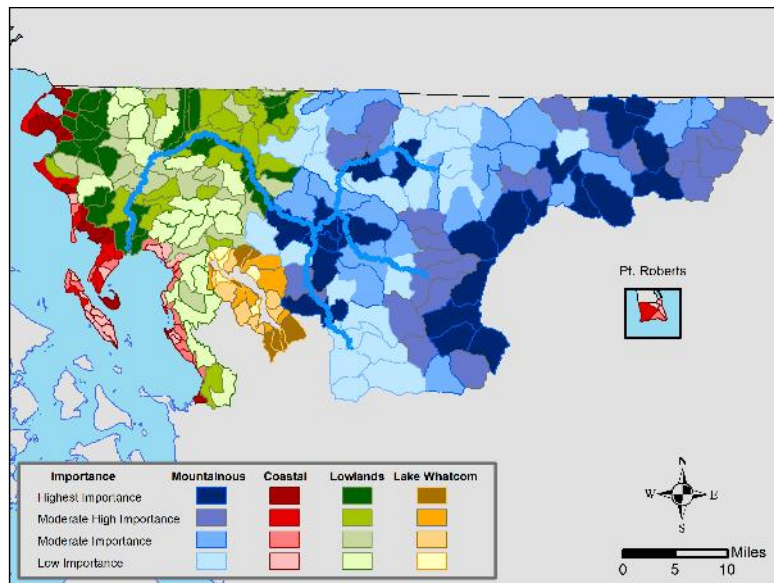


Figure. Overall importance to water flow processes: Results of Puget Sound Watershed Characterization assessment for WRIA 1. Darkest colored assessment units are considered highest *importance* relative to other assessment units in the same landscape group of WRIA 1.

In the figure to the left, each landscape group is displayed in a different color gradient (i.e. blue, green, red or tan), which allows for direct comparison within the extent of that landscape group only. Dark green assessment units would be considered *highly important* for overall water flow processes *only* within the lowland area of WRIA 1, and are not comparable to AUs outside of that extent. However, this does allow one to determine which AUs throughout the lowland areas of WRIA 1 are *relatively more important* than others in that same extent.

Water flow degradation

In the water flow *degradation* model the watershed is evaluated in its “altered” state to consider the impact of human actions on water flow processes. The *degradation* model calculates the degree of alteration to those controls that regulate the delivery, movement and loss of water, such as forest clearing and impervious surfaces. This model combines the delivery, surface storage, recharge, and discharge components to compare the relative *degradation* to overall water flow processes in assessment units. Degradation to these processes generally accelerates the movement of surface flows downstream. This accelerated delivery increases downstream flooding and erosion and subsequently degrades aquatic habitat over time.

The figure below displays the results of the *degradation* to water flow processes for all of WRIA 1. Since degradation is not controlled by landscape, we compare assessment units within the entire extent of the WRIA. A dark pink unit along the coast is comparable in level of degradation to a unit in the lowland area.

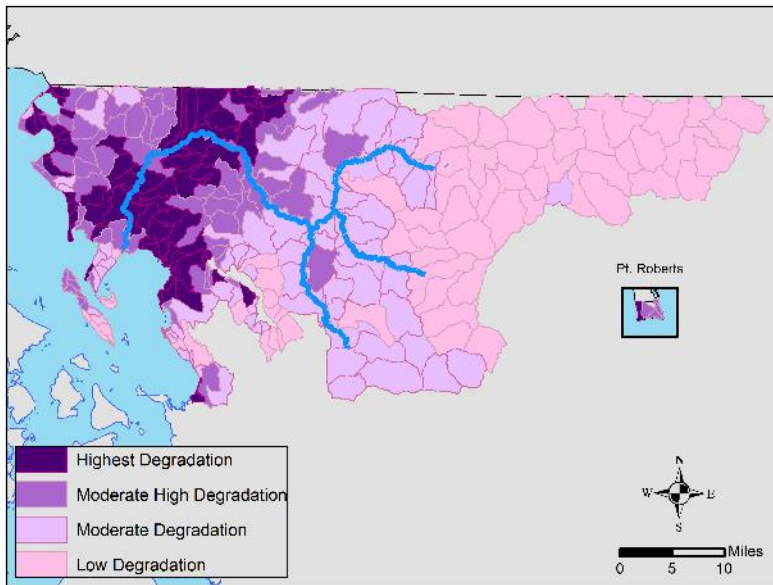


Figure. Overall degradation of water flow processes: Results of Puget Sound Watershed Characterization assessment for WRIA1. Dark pink assessment units are considered to have the highest *degradation* relative to other assessment units in WRIA1.

Management matrix for water flow

Combining the results of the *importance* and *degradation* models yields a simple categorical matrix that planners can use, along with other science-based information, to inform land management strategies and actions. At its simplest, this management matrix conveys which areas are relatively important and/or degraded, and what actions might be most appropriate there:

Highly important – low degradation = protect
 Highly important – high degradation = restore
 Low importance – low degradation = conserve
 Low importance – high degradation = develop

The Puget Sound Watershed Characterization project generally prioritizes restoration or enhancement actions in watersheds which

are both highly important and are relatively more degraded for watershed processes (yellow boxes in the Management Matrix Figure below). This does not mean that there are not important areas or necessary restoration actions in assessment units that are not highly important and highly degraded. Rather, given limited funding these might be the first places to focus on in order to increase the likelihood of improving watershed processes.

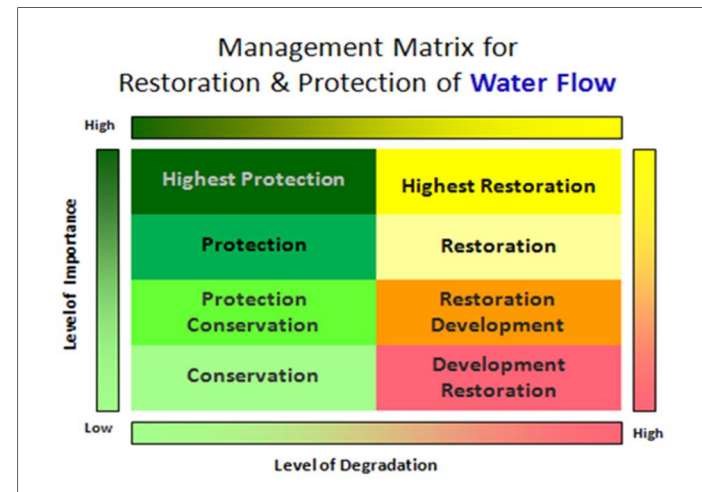


Figure: Management Matrix for Water Flow, indicating relative priorities for restoration and protection of processes. By accounting for both the relative level of *importance* and the relative level of *degradation* of an Assessment Unit one can begin to prioritize which areas of a watershed to apply management strategies which protect water flow processes, and which areas to prioritize restoration of water flow processes.

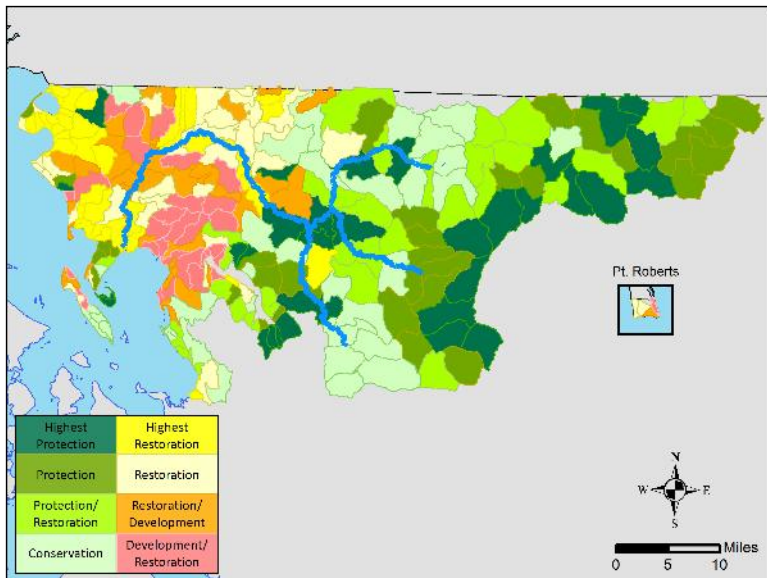


Figure. Overall priorities for restoration and protection of water flow processes in WRIA 1: Results of Puget Sound Watershed Characterization assessment.

2 Using the results of the water flow assessment

For water flow process enhancement or restoration, actions should be directed towards reducing the degradation to controls that regulate the delivery and movement of water through the watershed. These controls include forest cover, areas of surface storage, areas of permeable deposits, areas of slope wetlands and areas of floodplains with permeable deposits.

The terms “restoration” and “protection” as used in this document do not mean a return to historic land cover conditions or retaining 100% forested land cover. Restoration and protection actions should be done in a manner that recognizes and works within the constraints of the existing land use activities. For example, restoration in agricultural areas could mean consideration of measures that enhance

a critical portion of water flow processes such as surface storage. This could involve the retention of water on fields for a longer period to avoid harmful peak flows within streams during the winter months. Restoration and protection measures are, therefore, always proposed here in the context of both the landscape setting and the current land use activities.

There are actions which can offer mutual benefits to both water flow and water quality. For example, there are some areas where wetland restoration or enhancement to surface storage processes could provide some improvements for both. Enhancement actions for water flow processes may have additional benefits to other watershed processes and functions particularly in the area of riparian habitat and structure which are critical to salmonid habitats throughout the Whatcom County lowland watersheds.

3 Water flow assessment results for WRIA1

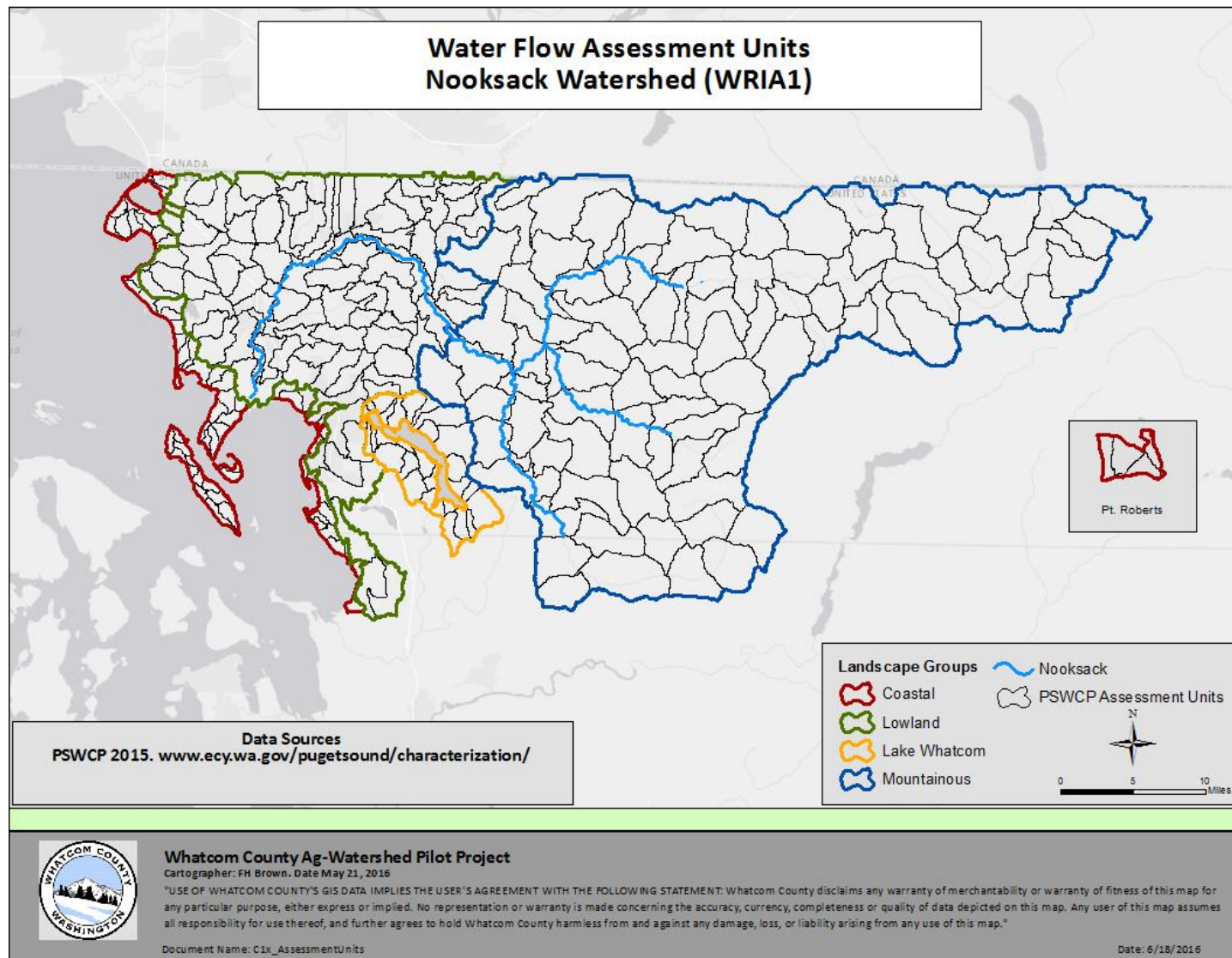


Figure 1. Water flow assessment units used in the Puget Sound Watershed Characterization.

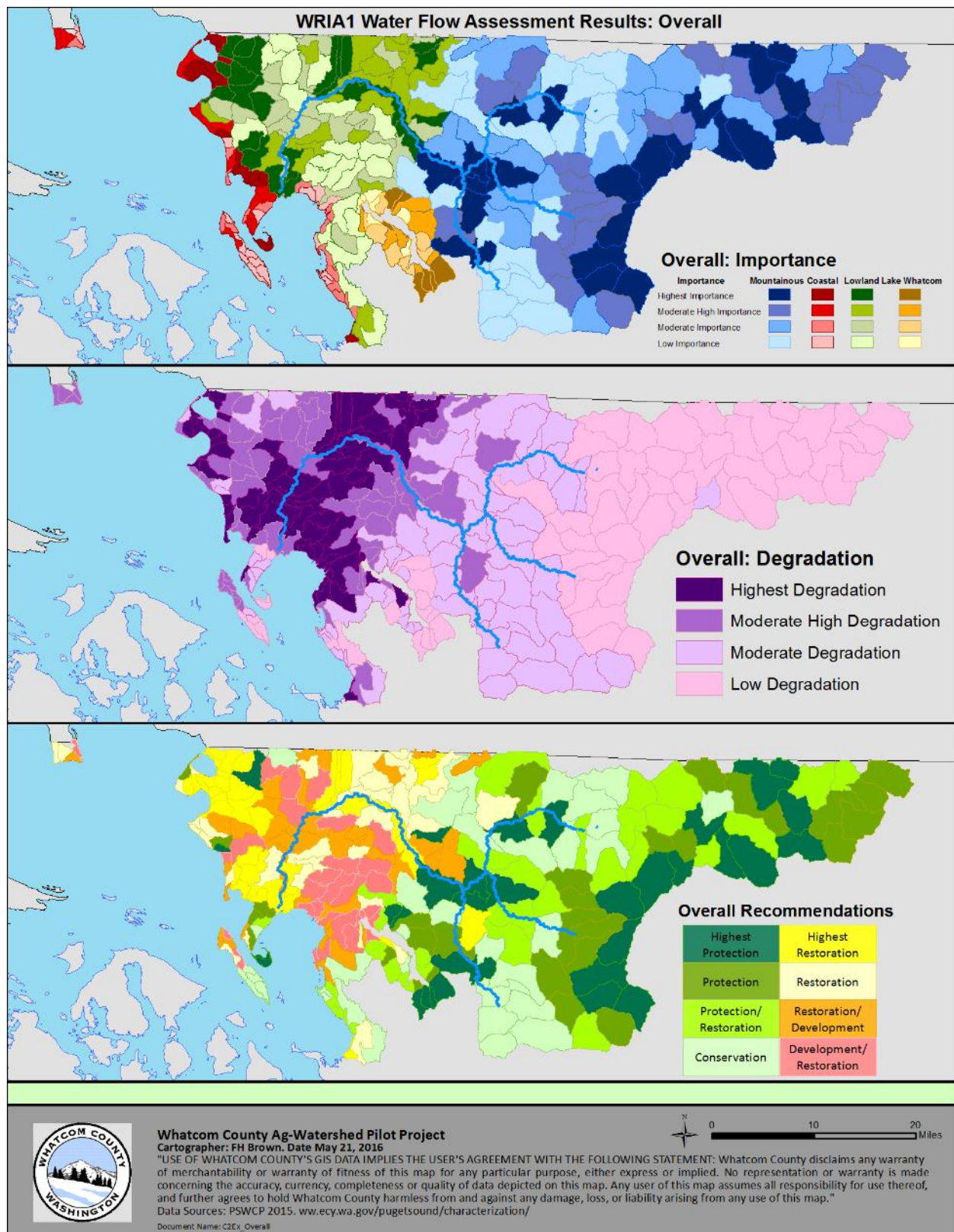


Figure 2. Overall water flow assessment results for WRIA1.

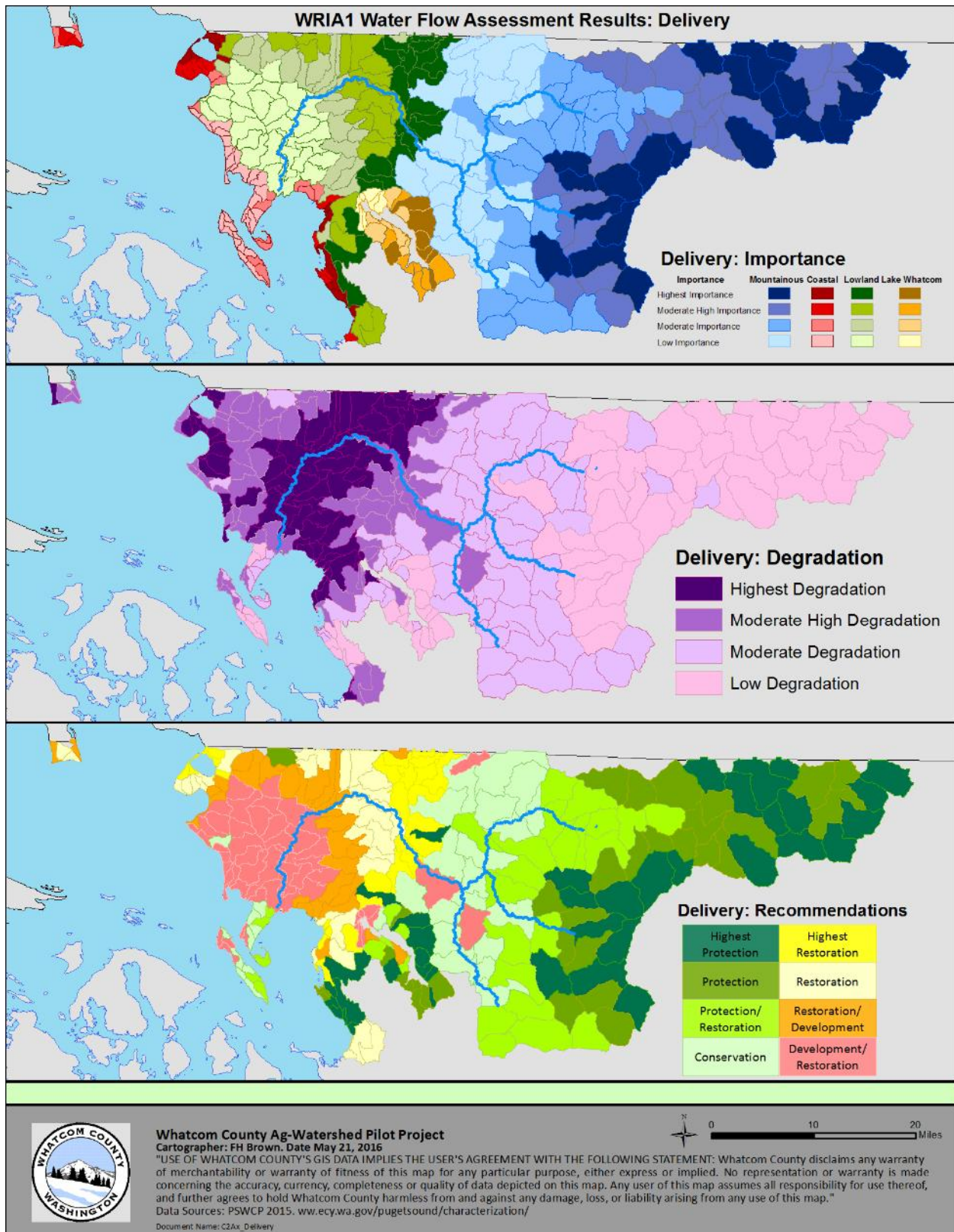


Figure 3. Delivery processes: Assessment results for WRIA1.

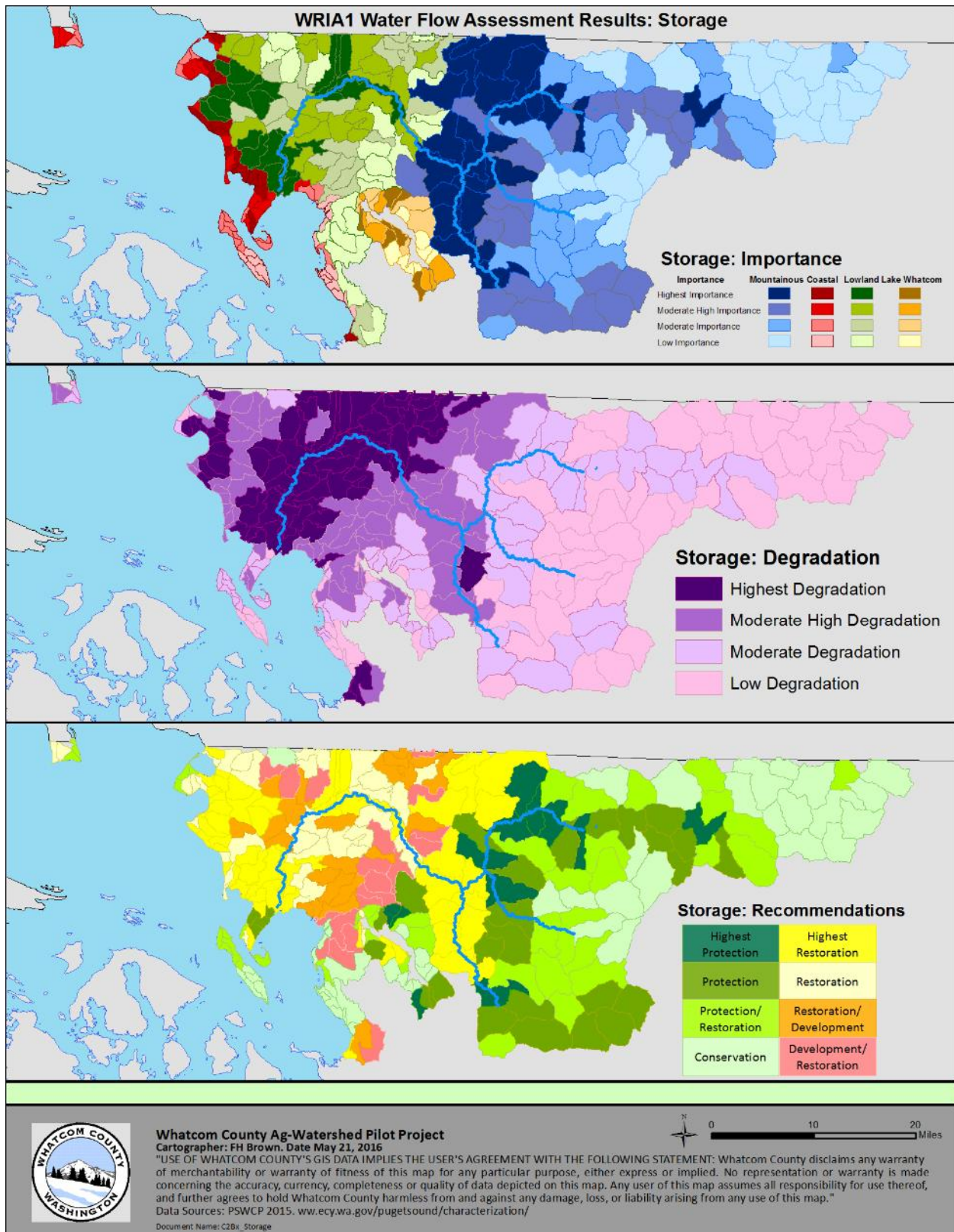


Figure 4. Storage processes: Assessment results for WRIA1.

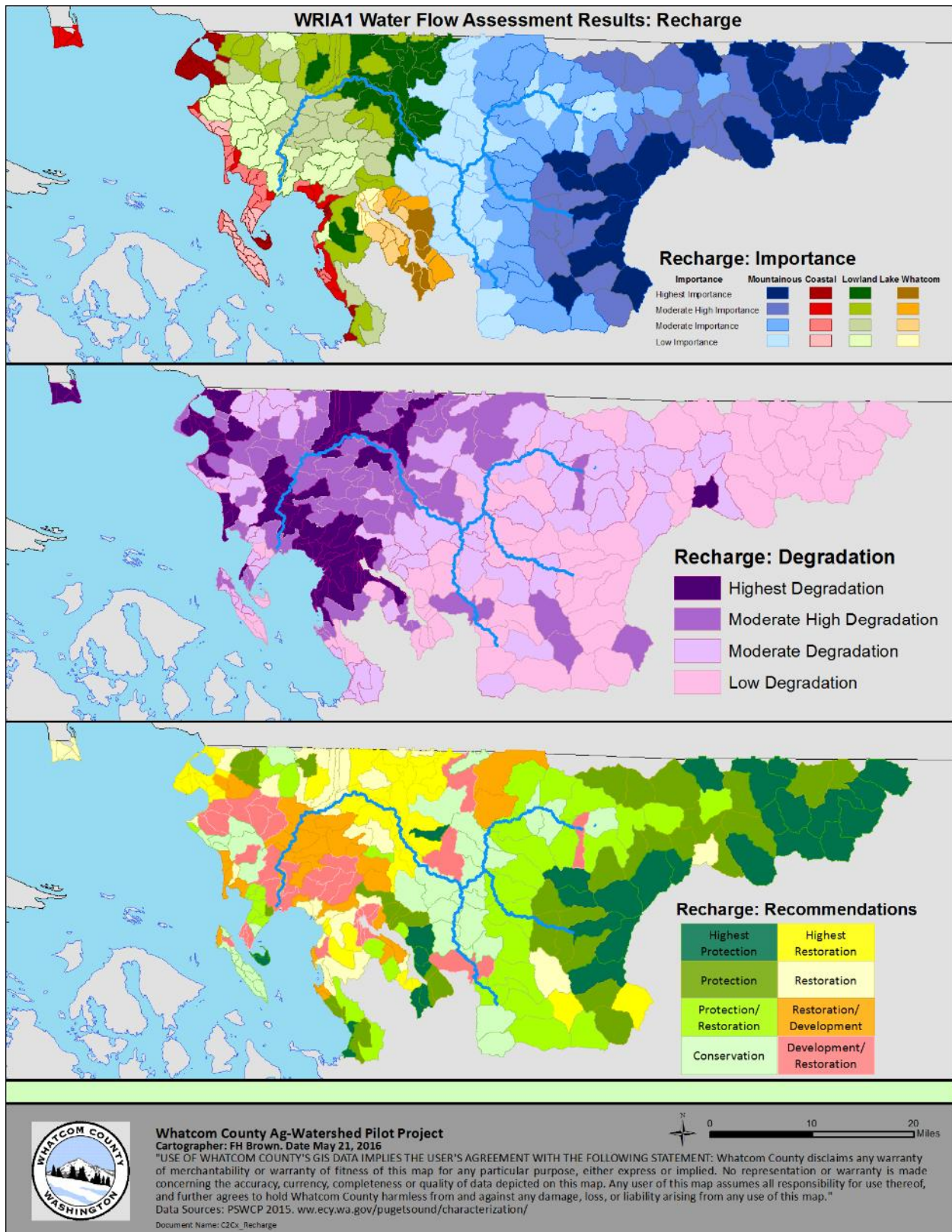


Figure 5. Recharge processes: Assessment results for WRIA1.

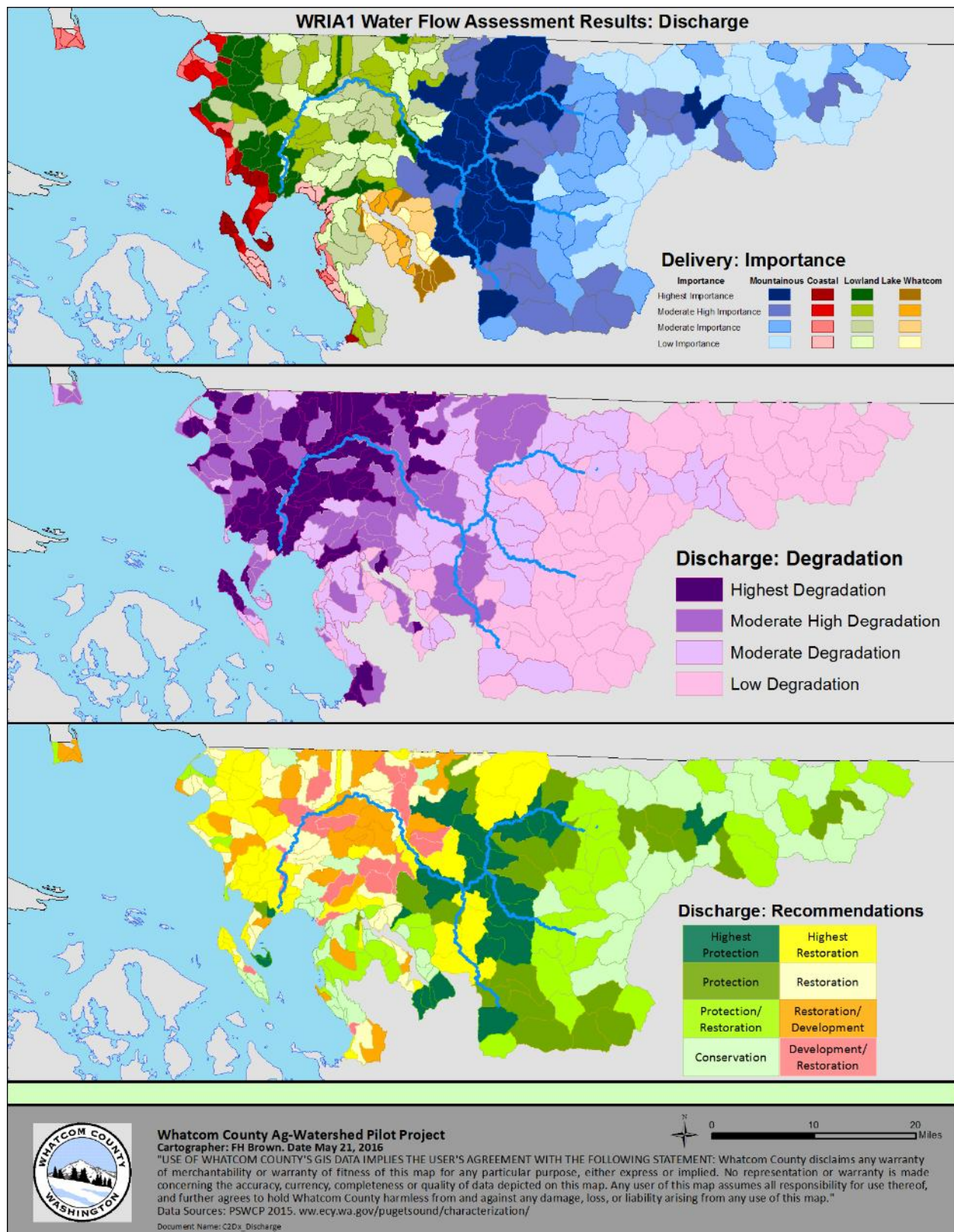


Figure 6. Discharge processes: Assessment results for WRIA1.

Appendix D. Ag-Watershed Project Fact Sheet #5:

Planning, designing and implementing beneficial actions for agricultural & watershed enhancement



Whatcom County Ag-Watershed Project Fact Sheet #5

Planning, designing and implementing beneficial actions for agricultural & watershed enhancement

The Whatcom County Agriculture-Watershed Pilot Project (the "Ag-Watershed Project") has examined ways to reward beneficial actions by farmers and landowners who voluntarily go beyond existing regulation to maintain, restore or enhance large-scale watershed processes, while also strengthening agriculture in Whatcom County (see [Fact Sheet #1](#)).

Agricultural landowners and farmers have worked with the Project Partners (Whatcom County, Whatcom Conservation District, Whatcom Farm Friends and Washington Department of Fish & Wildlife) to test ways to better integrate agriculture and watershed planning and to design, select and implement effective local enhancement projects.

The project has used pilot studies on agricultural land in Whatcom County to test

- planning tools to identify high-priority, high-value opportunities to take actions for agricultural and watershed enhancement and/or protection,
- scientific measurement tools that connect specific beneficial actions on working farmland to measurable outcomes for agriculture and watersheds, and
- administrative tools to verify, track and account for the benefits of these actions over time.

Fact sheet #5 shows how Agriculture-Watershed Characterization and Mapping can be used as a planning tool to:

- integrate local agricultural priorities into routine planning for consideration alongside adopted watershed priorities in Whatcom County and the Puget Sound region, and
- design local projects on a single farm or group of farms that help to achieve both agricultural and watershed enhancement priorities.

STEP1: CHARACTERIZE AND MAP AGRICULTURAL AND WATERSHED ENHANCEMENT PRIORITIES

The characterization and mapping process combines information from current agriculture and watershed plans with existing spatial data, field experience and farmers' local knowledge to identify agricultural priorities and needs in the area alongside watershed priorities and needs, as shown below in the example maps for a Watershed Improvement District. (See [Fact Sheet #2](#) for more detailed information on the characterization and mapping process.)

Farmers, planners and landowners identify, characterize & map enhancement priorities, using local field knowledge, existing data and reference maps.



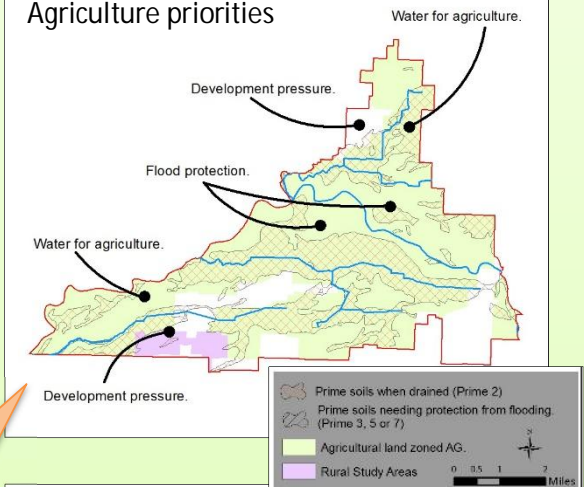
Working agricultural lands. Needs and enhancement priorities:

- Water quantity for out of stream uses
- Water quality for agricultural use
- Drainage of fields
- Flood protection
- Protection of agricultural land base and soils
- Pollination

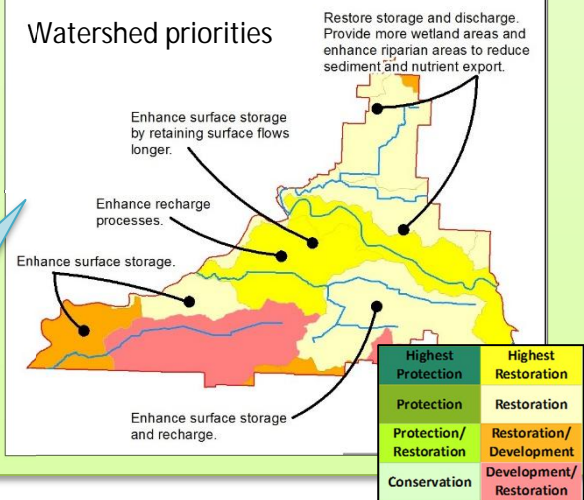
Watershed systems. Protection, restoration and enhancement priorities:

- Water quality
- Habitat (riparian, instream, fish, wildlife, wetlands)
- Water quantity
- Water flow processes (recharge, discharge, surface water storage, water delivery)

Agriculture priorities



Watershed priorities



STEP 2: IDENTIFY PLACES WHERE AGRICULTURAL AND WATERSHED PRIORITIES COINCIDE

In some locations, agricultural and watershed priorities may be in competition; in other locations they may be complementary. Ideally, projects should enhance watershed processes while also strengthening agriculture. Sometimes, however, acceptable tradeoffs must be found between agricultural and watershed priorities. Mapping these priorities concurrently allows farmers and planners to identify the places in the landscape that offer opportunities to address both watershed and agricultural needs most efficiently and effectively.

STEP 3: SELECT SPECIFIC ACTIONS FOR AGRICULTURAL AND WATERSHED ENHANCEMENT

Watershed Improvement Districts (WIDs) and other special districts, planners and landowners can use the maps and characterization reports to determine which agricultural enhancements or conservation actions might be most appropriate at a site, given current regulation. Scientific measurement tools (metrics) allow planners and WIDs to develop potential scenarios for optimizing agricultural and watershed enhancements before pursuing project design, verification and implementation (see [Fact Sheet #3](#)).

STEP 4: INTEGRATE ACTIONS INTO WATERSHED & LAND USE PLANS AND INVESTMENT STRATEGIES

Priority actions and projects can be integrated into farmers' business plans, ongoing WID planning, land and watershed management efforts and funding programs (see [Fact Sheet #4](#)). Tracking progress against longer-term goals helps to quantify the benefits of investing in actions for watershed and agricultural enhancement on working farmland.

AG-WATERSHED PROJECT PILOTS & CASE STUDIES: EXAMPLES OF BENEFICIAL ACTIONS & PROJECTS

Pilot 1 (single landowner)

Proposed enhancement: Avoided conversion of wetland habitat resulting from beaver activity in the headwaters of an important salmon bearing stream, on a site that could be returned to active farming at the end of the Conservation Reserve Enhancement Program (CREP) lease.

Agricultural benefits: diversification of revenue from payment for permanent wetland conservation easement on marginal farmland.

Watershed benefits: wetland habitat and surface water storage capacity in the upper watershed are permanently protected.



Pilot 2 (multiple landowners):

Improve flood protection and field drainage for low-lying farmland, while concurrently increasing stream width and channel complexity, improving stream-floodplain connectivity and restoring riparian vegetation in a highly channelized reach. Agricultural benefits: improved flood protection and drainage for fields on prime farmland [proposed project design addresses faster removal of flood waters from fields & improved efficiency of drainage ditches].

Watershed benefits: stream function and habitat condition in the reach are enhanced in exchange for a small amount of agricultural land taken out of production to accommodate channel widening.

Case study (land use planning): Measuring the potential agricultural benefits of different land use options. The demonstration site is an undeveloped property located in the Nooksack basin lowlands, within the floodway. Soils are mostly agricultural, but prone to flooding. Surrounding land use is mixed urban and agricultural.

Future option 1 (agricultural use)

- Entire site actively farmed, except for creek buffer
- Permanent Agricultural Conservation Easement protects

- land for farming

- Maintain soil drainage for fields

Future option 2 (mixed use)

- NE portion actively farmed, SW portion converted to recreation/open space

- Watershed enhancement along creek & floodway

