Stormwater Management Action Plan

Stormwater Basin Planning and Prioritization

Kitsap County

December 22, 2020

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Contents

Tables

Figures

Abbreviations

ac	acre(s)
BFS	Basin Fact Sheet
B-IBI	Benthic Index of Biotic Integrity
BMP	best management practice
C	coho
CFP	Capital Facilities Program
County	Kitsap County
CRP	Capital Roads Project
Ecology	Washington State Department of Ecology
ESA	Endangered Species Act
FC	fall chum
ft	foot/feet
GIS	geographic information system
HDR	HDR Engineering, Inc.
Herrera	Herrera Environmental Consultants, Inc.
ID	identifier
KCPW	Kitsap County Public Works
KPHD	Kitsap Public Health District
LID	low-impact development
LWD	large woody debris
mi	mile(s)
MS4	municipal separate storm sewer system
NA	not available
ND	no data
NOAA	National Oceanic and Atmospheric Administration
NPDES	National Pollutant Discharge Elimination System
Permit	Western Washington Phase II Municipal Stormwater Permit
PIC	pollution identification and correction
RCCT	resident coastal cutthroat trout
RWA	Receiving Water Assessment
SEEK	Sharing Environmental Education Knowledge
SH	steelhead
SMAP	Stormwater Management Action Plan
SR	State Route
SWCP	Stormwater Comprehensive Plan
SWMP	Stormwater Management Plan
T&E	threatened and endangered
TIP	Transportation Improvement Program
TSS	total suspended solids

UGA	Urban Growth Area
USFWS	United States Fish and Wildlife Service
WDFW	Washington Department of Fish and Wildlife
WDOH	Washington Department of Health
WQ	water quality
WSDOT	Washington State Department of Transportation

1 Introduction

In December 2018 Kitsap County (County) contracted HDR Engineering, Inc. (HDR) to develop a Stormwater Comprehensive Plan (SWCP) to meet Western Washington Phase II Municipal Stormwater Permit[1] (Permit) regulatory requirements and County goals for Kitsap County's Stormwater Program.

The 2019 version of the Permit has expanded requirements in Section S5, Special Conditions for Stormwater Management Program for Cities, Towns, and Counties, that include provisions requiring comprehensive stormwater planning. As such, Kitsap County Public Works (KCPW) is positioning itself for March 31, 2023, compliance with this new provision by developing an SWCP that is based in part on the requirements included in the 2019 Permit.

2 Background

The municipal separate storm sewer system (MS4) permits issued by the Washington State Department of Ecology (Ecology) require local jurisdictions to implement a wide range of programmatic stormwater management actions to protect beneficial uses of receiving waters. The 2013 Permit launched Stormwater Action Monitoring and Planning for a corresponding receiving water monitoring program to broadly inform if conditions are becoming better or worse, what best management practices (BMPs) are effective, and how to incorporate the latest science and the most effective approaches.

For the 2013 Permit, Phase I counties were the first to develop watershed-scale stormwater planning strategies that would accommodate planned growth in a developing watershed and still maintain hydrologic water quality conditions that fully support "existing uses" and "designated uses" through a stream system. The Permit requirements focused on the scale and detail of modeling and planning to bring into focus the needs of the stream system.

Models from all Phase I counties projected that riparian restoration and large amounts of additional stormwater detention and infiltration are needed to improve receiving water conditions (Ecology 2019b). Because of these findings, the 2019 Permit was expanded to include Phase II counties for developing a planning requirement, focusing on prioritizing a sub-watershed basin where stormwater management programs and capital projects, if implemented, could have measurable effects on water quality.

Effective August 1, 2019, among many new requirements, the Permit requires Permittees to include stormwater planning activities in their annual Stormwater Management Program reports. Reportable planning actions include the following:

[1] National Pollutant Discharge Elimination System and State Waste Discharge General Permit for discharges from Small Municipal Separate Storm Sewers in Western Washington (https://ecology.wa.gov/Regulations-Permits/Permits-certifications/Stormwater-general-permits/Municipal-stormwater-general-permits/Western-Washington-Phase-II-Municipal-Stormwater).

- A requirement to convene an interdisciplinary team to inform and assist in the development, progress, and influence of the (stormwater) program at informing the Permittees' comprehensive planning efforts
- Documentation of how coordination with other long-range plan updates that describe how stormwater management needs and protection/improvement of receiving water health are (or are not) informing the planning update processes and influencing policies and implementation strategies
- A continuation of existing code-related requirements to implement low-impact development (LID) principles
- Preparation of a Stormwater Management Action Plan (SMAP)

The County has prepared several stormwater plans over the years, including the North Kitsap Low Impact Development Retrofit Implementation Plan (HDR 2013), Silverdale Low Impact Development Retrofit Plan (Herrera 2013), East Bremerton and East Port Orchard Retrofit Plan (RKI 2019), and Kingston Regional Facility Plan (currently in development). Each plan resulted in targeted projects to improve water quality and address flooding; however, with issuance of the 2019 Permit, Ecology is requesting that stormwater comprehensive planning "inform and assist in the development of policies and strategies as water quality management tools to protect aquatic resources." The projects identified in the aforementioned plans could be considered for implementation if they are located within the priority basin.

This SMAP provides guidance on comprehensive watershed planning. Ecology recognizes that many jurisdictions are already actively planning stormwater investments and actions to accommodate future growth in a way that minimizes impacts to receiving waters and beneficial uses. This SMAP is intended to coordinate with other local planning efforts.

This SMAP was prepared in accordance with Ecology's draft SMAP Guidance (Ecology 2019b), which guides Permittees on selecting the highest-priority drainage basin for implementing management action plans for improving water quality conditions in receiving waters. What follows is a description of applicable County policies and the methods and analyses used for developing the County's SMAP.

2.1 Kitsap County Policies

In addition to Permit requirements, the County has developed a series of guiding principles to limit contribution to pollution and preserve water as a resource. These policies are as follows:

- Preserve natural hydrology by preventing the creation of stormwater runoff and ensuring that the runoff is free of pollutants
- Conserve groundwater resources through infiltration, conservation, and pursuing alternative sources for non-drinking water
- Reduce pollutant loading of groundwater and surface water by reducing surface flow volumes and incorporating non-polluting products or processes wherever possible

- Use land for multiple purposes by maintaining forests and open space, integrating stormwater management features into the landscape, and encouraging practices that can be used for purposes beyond just stormwater management
- Refine management to reflect the latest technology and innovations by searching for scientific research and market advances, and integrating findings into operations and regulations
- Educate employees, customers, citizens, and contractors on how their actions can impact water quality
- Provide incentives to promote actions that support these principles

Several programs have been developed to help accomplish these objectives; these programs are listed in Table 2-1.

Table 2-1. Kitsap County programs for improving water quality

Program	Water quality initiative
Adopt-A-Road, Beach, Trail, or Park	Reduce pollutant loading of groundwater and surface water.
Sharing Environmental Education Knowledge (SEEK)	Educate employees, customers, citizens, and contractors on how their actions can impact water quality.
Mutt Mitt stations	Reduce pollutant loading of groundwater and surface water.
“Can the Grease” kit	Reduce pollutant loading of groundwater and surface water.
Waste reduction and recycling	Reduce pollutant loading of groundwater and surface water.

2.2 Washington State Department of Ecology Policies

The 2019 Permit requires local jurisdictions to prioritize spending and direct strategic investments or effort to those basins and catchment areas where improvement can be most readily achieved and the benefits can be seen on a fairly near-term timeline.[2] This requirement essentially serves as the objective statement for the SMAP, which focuses addressing impacts and helps to answer the following questions:[3]

- How can existing stormwater problems be most strategically addressed?
- How can water quality goals be accomplished while still meeting future population and density targets?

Permittees are to use local information related to receiving water and contributing area to prioritize a basin, 1 to 10 square miles in area, for planning and provide a tailored set of strategies or actions to protect or improve water quality for the prioritized basin.

[2] Information draft framework for new Phase I and Phase II MS4 permit long-term MS4 planning section.

[3] Stormwater Management Action Planning Guidance.

3 Study Area

Kitsap County is located on the Kitsap Peninsula within the Puget Sound region of Washington State. It encompasses most of the peninsula, including Bainbridge Island and Blake Island. The County encompasses a total area of 566 square miles, of which 395 square miles are land and 171 square miles are water. In 2019 the population was 271,473, (United States Census Bureau. 2020) with an average population density of 687 residences per square mile.

The study area focused on watersheds greater than 1 square mile draining to water bodies within the county, excluding incorporated areas. (The County does not complete stormwater quality work outside of County-controlled areas. Stormwater management in incorporated areas is covered under individual city MS4 permits.)

Identifying the priority basin involved the following two-step process, described further in the Sections 3.1 and 3.2:

1. Conduct a Receiving Water Assessment (RWA) that determined the influence and relative contribution of the County's jurisdictional area on the receiving water. For Phase II permittees, like Kitsap County, the urbanized areas and designated Urban Growth Areas (UGAs) are required to be included in this step. The outcome of the RWA is a list of stormwater basins to be prioritized in Step 2.
2. Prioritize Basins. Basins identified in Step 1 were prioritized based on the water quality conditions in the respective receiving waters. Receiving waters conditions were assessed by identifying the beneficial uses and desired water quality conditions in each and the highest priority was given to basins with the following characteristics:
    - Moderate to high levels of impairment
    - Where municipalities can exert a greater influence on land management decisions and project implementation decisions
    - Where regional rehabilitation efforts are also focused
    - Where stormwater is directly discharged to Puget Sound convergence zones

3.1 Receiving Water Assessment

The goal of the RWA is to describe the County's receiving waters, beneficial uses, types of potential impacts of urbanization and land use activities on those receiving waters, and how this information will be used to guide basin prioritization.

The objective of the RWA is a countywide inventory that identifies conditions in a list of candidate basins that are to be considered in the more detailed prioritization process (see Section 3.2). The general scope of the RWA and associated prioritization process follows that recommended in SMAP guidance (Ecology 2019b), as follows:

- Delineate all of the basins and receiving waters in Kitsap County jurisdiction for watersheds that have areas between 1 square mile and about 20 square miles
- Perform a relatively rapid assessment of existing information about beneficial uses and associated conditions in each watershed

- Assess the relative current and potential future influence of the County's stormwater system on each receiving water
- Evaluate and summarize the information to narrow the list of basins/receiving waters that are to be advanced to a more detailed prioritization analysis

In general, the RWA consists of identification of the parameters and data sources used to assess water quality, water flow, and aquatic life habitat conditions in freshwater and marine shoreline areas.

Figure 3-1. Analyzed basins

3.1.1 Basin Delineation

The initial step in the RWA was to delineate all basins in Kitsap County jurisdiction, shown in Figure 3-1 above. A total of 27 basins were identified, with 22 basins selected for more detailed RWA, shown in Table 3-1. Five basins were eliminated from the RWA because of their location in very rural, lightly developed watersheds that are outside the census urbanized area and have little stormwater infrastructure or influence. Basin boundaries were delineated using Kitsap County's previously delineated basin boundaries.

Table 3-1. Summary of basins and receiving waters

Basin	Basin size within Kitsap (ac)	Fully within Kitsap County?	Primary streams	Marine receiving waters
Kingston	4,909	Yes	Kingston Creek	Appletree Cove
			Carpenter Creek	Puget Sound
Miller Bay	8,829	Yes	Grovers Creek	Miller Bay
			Indianola Creek	Port Madison Bay
Liberty Bay	13,570	Yes	Dogfish Creek	Liberty Bay
			Johnson Creek	Ni Se Ka Bay
			Big Scandia Creek	Dogfish Bay
			Little Scandia Creek	
			Lemolo Creek	
			Bjorgen Creek	
			Sam Snyder Creek	
Clear Creek	5,124	Yes	Clear Creek	Dyes Inlet
West Dyes	7,433	Yes	Strawberry Creek	Dyes Inlet
			Ostrich Creek	Ostrich Bay
			Phinney Creek	Oyster Bay
				Phinney Bay
				Port Washington Narrows
East Dyes	7,388	Yes	Barker Creek	Dyes Inlet
			Mosher Creek	Port Washington Narrows
	6,947	Yes	Steele Creek	Port Orchard Bay

Basin	Basin size within Kitsap (ac)	Fully within Kitsap County?	Primary streams	Marine receiving waters
Port Orchard Passage			Enetai Creek	Burke Bay
			Illahee Creek	
Central Hood Canal	19,765	Yes	Big Beef Creek	Hood Canal
			L. Anderson Creek	Seabeck Bay
			Seabeck Creek	
Chico Creek	10,424	Yes	Chico Creek	Chico Bay
Gorst Creek	6,159	Yes	Gorst Creek	Sinclair Inlet
Wright Creek	3,038	Yes	Wright Creek	Sinclair Inlet
Beach Drive	3,924	Yes	Beaver Creek	Port Orchard Bay
				Rich Passage
				Clam Bay
Long Lake	8,632	Yes	Salmonberry Creek	Yukon Harbor
			Curley Creek	
Blackjack Creek	14,045	Yes	Blackjack Creek	Sinclair Inlet
			Anderson Creek	Port Orchard Bay
			Ruby Creek	
			Ross Creek	
			Annapolis Creek	
			Karcher Creek	
Gamble Creek	12,286	Yes	Gamble Creek	Gamble Bay
			Martha John Creek	Hood Canal
			Bear Creek	
			Middle Creek	
			Little Boston Creek	
Upper Hood Canal	12,071	Yes	Kinman Creek	Hood Canal
			Lofall Creek	

Basin	Basin size within Kitsap (ac)	Fully within Kitsap County?	Primary streams	Marine receiving waters
			Jump off Joe Creek	
			Devils Hole Creek	
			Cattail Creek	
Foulweather Bluff	6,725	Yes	Hawks Hole Creek	Hood Canal
			Eglon Creek	Puget Sound
Suquamish	4,157	Yes	Klebeal Creek	Agate Pass
			Cowling Creek	Port Madison Bay
Yukon Harbor	5,702	Yes	Duncan Creek	Yukon Harbor
Olalla	7,597	No	Olalla Creek	Colvos Passage
Burley Lagoon	8,723	No	Burley Creek	Burley Lagoon
			Purdy Creek	
Minter Bay	6,741	No	Minter Creek	Minter Bay

Basin Fact Sheets (BFSs) were created for each of the basins shown in Table 3-1 using Kitsap County geographic information system (GIS) data. Each BFS shows land use information, streams, basin areas, road density, and other relevant summary information. These BFS were used in the prioritization described in the following sections for land-based criteria. Individual BFSs are provided in the Appendix.

3.1.2 Assessment of Receiving Water Conditions

The RWA compiled and reviewed a variety of available information to describe general conditions within each basin. This information and the associated data variables were identified based on a combination of designated beneficial uses and available data sets, consistent with both National Pollutant Discharge Elimination System (NPDES) permit guidance (Ecology 2019b) and guidance from *Building Cities in the Rain* (Washington Department of Commerce 2016). Table 3-2 summarizes data sets relative to beneficial uses.

Table 3-2. Summary of data sets and beneficial uses for RWA

Data category	Beneficial use	Data sets used in RWA
Water quality	• Aquatic life • Shellfish harvesting: recreational • Shellfish harvesting: commercial • Primary contact recreation	• Ecology 303(d) List • Kitsap Public Health District (KPHD) pollution identification and correction (PIC) data • KPHD marine ambient monitoring data • KPHD stream ambient monitoring data

Data category	Beneficial use	Data sets used in RWA
Water flow	• Aquatic life • Water supply • Salmonid habitat	• Ecology Watershed Characterization • Kitsap PUD stream flow monitoring
Habitat	• Aquatic life • Salmonid habitat • T&E listed ESA species • Forage fish spawning • Wildlife habitat	• WDFW SalmonScape GIS • WDFW Fish Barrier Inventory GIS • Puget Sound Benthos B-IBI Dataset • Ecology Watershed Characterization • Kitsap County GIS • WDFW Forage Fish Spawning GIS • NOAA and USFWS Critical Habitat
Shellfish and finfish consumption	• Shellfish harvesting: recreational • Shellfish harvesting: commercial • Finfish harvesting: recreational	WDOH Commercial Shellfish and Beach Closure GIS [a]
Land use	Water quality, water flow, and habitat	• Kitsap County Zoning GIS • Kitsap County Transportation GIS (road miles) • Kitsap County Parks GIS • Land cover and impervious surfaces • Census urbanized areas • Population • Incorporated areas and UGAs
Stormwater infrastructure	Water quality, water flow, and habitat	• Kitsap County Asset Management System • Kitsap County Zoning GIS

WDOH = Washington State Department of Health

[a] WDOH 2019.

As shown in Table 3-2, data used in the RWA consisted of a combination of state and local data sets. Kitsap County GIS data, which include a variety of local, state, and national data sets, were used extensively in the analysis. Ambient and project-specific water quality data collected by the Kitsap Public Health District (KPHD) over the past 10 years were a primary data source for the water quality analysis. Ecology's *Puget Sound Watershed Characterization* (Ecology 2019a) data were also used to assess a variety of beneficial uses for receiving waters.

3.1.3 Beneficial-Use Assessment

The beneficial-use assessment identified key uses and status of water quality and habitat conditions to support those uses in each basin. This consisted of evaluation of beneficial uses as described in Table 3-2 for each basin using a relative prioritization scoring for each variable, with a higher priority score associated with a higher assigned point value, as follows:

- **Excellent:** Beneficial use not impaired. For example, a basin where all stream and marine ambient water quality monitoring data meet applicable standards would be rated "Excellent."
- **Good:** Beneficial use impaired in part, or in limited areas. For example, a basin where 90 percent of stream and marine ambient water quality monitoring data meet applicable standards would be rated "Good."
- **Fair:** Beneficial use is impaired, but still complies with a portion of standard or criteria. For example, water quality monitoring data that meet Part 1 but not Part 2 of the fecal

coliform standard, or that have a portion of the receiving water in “conditional” shellfish harvest status, would be rated “Fair.”

- **Poor:** Beneficial use is significantly impaired. Examples would be basins where multiple ambient water quality monitoring stations do not meet water quality standards.

3.2 Basin Prioritization

Basin prioritization was based on the beneficial-use/impairment criteria that help to quantify pressure of development. Each of the analyzed basins was assigned a priority score for each criterion, with a higher priority score associated with a higher assigned point value. Scoring was divided into four classifications: Land Use, Jurisdiction, Aquatic Resources, and Water Quality/Basin Health. Explanations for scoring of the ranking criteria are provided in the sections below. Point values for the classifications of the top four basins are shown in Figure 3-2 through Figure 3-5. All basin prioritization scores are shown in Table 3-3.

The highest-priority basin was selected by summing point values from each criterion. From this process, East Dyes was selected as the priority basin.

3.2.1 Beneficial-Use/Impairment Criteria

Beneficial uses are codified uses that provide the public’s right to enjoy the beneficial uses of specific property or, in the case of the SMAP, of natural resources. Impairment criteria are metrics to use for assessing the condition of beneficial uses. Described below are the impairment criteria used for the SMAP.

Land Use

Impervious

Percent impervious for each of the basins was calculated from land cover GIS data obtained from the Puget Sound Watershed Characterization Project (Ecology 2019a). The percent impervious was then compared to the Puget Sound Benthic Index of Biotic Integrity (B-IBI) versus percent impervious chart to determine the lowest percent impervious for each of the B-IBI ranges for Very Poor (10–16), Poor (18–26), Fair (28–36), Good (38–44), and Excellent (45–60). A classification of Excellent was assigned a priority score of 1 and a classification of Very Poor was assigned a priority score of 5.

Zoning

Percentage of zoning classification for each of the basins was calculated from zoning classification GIS data provided by the County. Priority scoring was based on likelihood for the zoned classification to contribute to decreased water quality. The more likely a basin was to contribute to decreased water quality, the higher the priority score was.

Census Urban Area

Percentage of the basin within a census urban area was calculated from GIS data provided by the County. This metric was used to evaluate the likelihood of increased water quality

concerns because of increased impervious area. A higher priority was assigned to basins with a higher percentage of area located within a census urban area.

Jurisdiction

Urban Growth Area

UGAs are areas with densities sufficient to permit the urban growth that is projected to occur in the county for the succeeding 20-year period. These areas are experiencing urban growth but are still within County control. Percentage of the basin within a UGA was calculated from GIS data provided by the County. A higher priority was assigned to basins with a higher percentage of UGA.

City Boundary

Percentage of a basin outside of a city boundary was calculated from GIS data provided by the County. The County is not able to implement management strategies within city boundaries, so a higher priority was assigned to basins with a higher percentage outside of a city boundary.

Aquatic Recreation

Shellfish Harvesting

Shellfish harvesting prioritization scoring was based on harvesting area classification and the reason for the classification. Areas that had restricted or prohibited harvesting because of nonpoint pollution were assigned a higher priority than areas with a conditional classification.

Hatcheries

Hatchery prioritization scoring was based on the presence of hatcheries of terminal fisheries within the basin. Basins with these features were assigned a higher priority.

Swimming Beaches

Swimming beaches were used as a measure of the number of swimmable waters. Data regarding the locations of swimming beaches were obtained from the KPHD 2019 swimming beach list. A higher prioritization was assigned to basins with a higher number of beaches.

Water Quality/Basin Health

Marine Water Quality

Marine water quality was analyzed on compliance with the fecal coliform standard. Data on compliance were obtained from the KPHD 2017 Annual Water Quality Report (KPHD 2017). A higher priority score was assigned to basins that failed both parts of the fecal coliform standard.

Stream Water Quality

Similar to marine water quality, stream water quality was analyzed on compliance with the fecal coliform standard. Data on compliance were obtained from the KPHD 2018 Annual Water Quality Report (KPHD 2018). A higher priority score was assigned to basins that failed both parts of the fecal coliform standard.

Hydrology

Hydrology data for the streams in the county was pulled from the Ecology 2019 Watershed Characterization (Ecology 2019a). The study rated the level of importance maintaining overall water flow processes in a non-degraded setting, with ranks of Low, Moderate, Moderate High, and High. A higher priority score was assigned to basins with streams that were rated High.

Stream B-IBI Trend

Stream B-IBI trend is based on the overall scores at the monitoring station closest to receiving streams within the county. Scores are associated with the rankings of Very Poor, Poor-Fair, Fair-Good, Good-Excellent, and Excellent.

Fish Habitat

Fish habitat analysis was based on the number of salmonid species and number of listed salmonid species present per basin. Data for this criterion were obtained from the Stream Habitat and Fish Summary table within the Ecology 2019 Watershed Characterization (Ecology 2019a). Higher priority was given to basins with the relative highest number of salmonid species with the relative highest number of listed salmonid species.

3.2.2 Basin Rating Results: Top Four Priority Basins

The following figures show the results of scoring each basin against the beneficial-use/impairment criteria. Summary data for all basins are presented in Table 3-3.

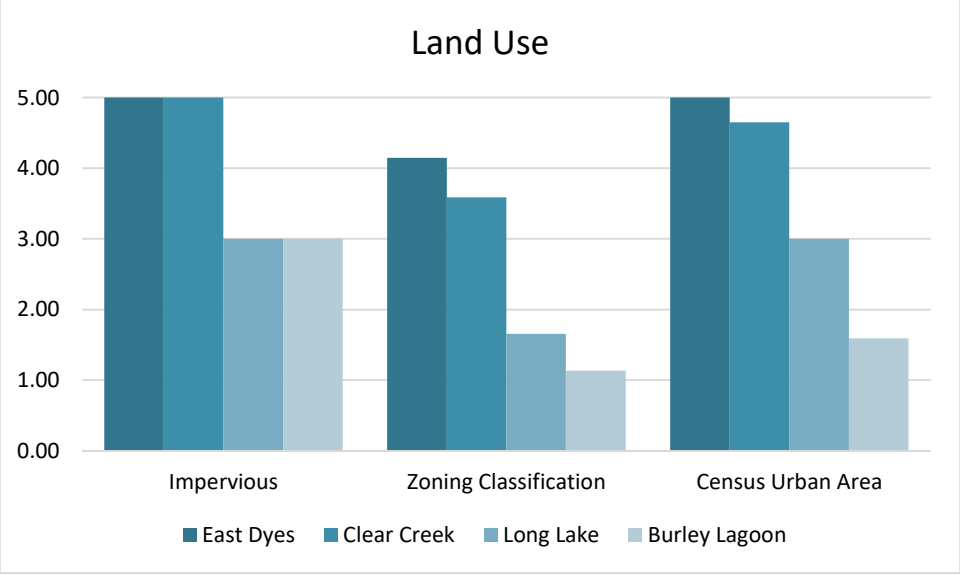

Figure 3-2. SMAP prioritization scoring for land use

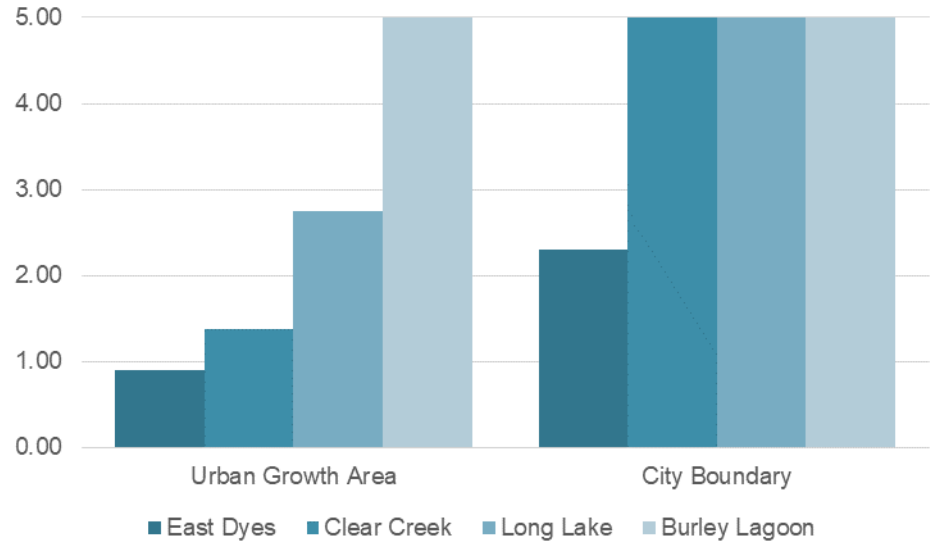

Figure 3-3. SMAP prioritization scoring for jurisdiction

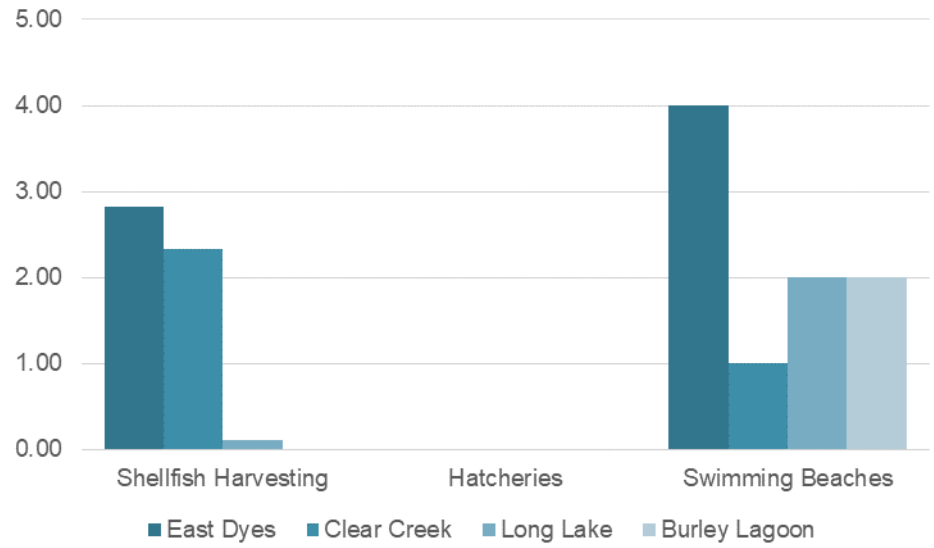

Figure 3-4. SMAP prioritization scoring for aquatic resources.

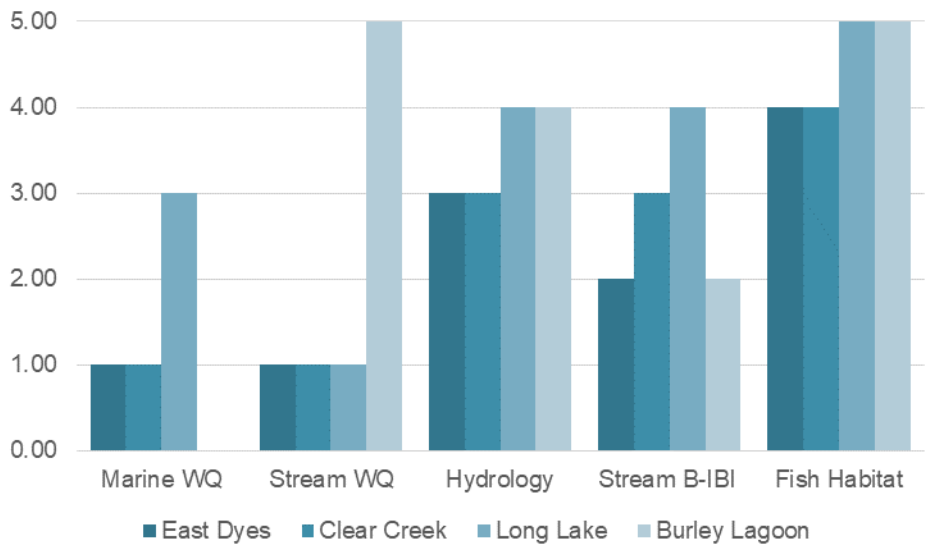

Figure 3-5. SMAP prioritization scoring for water quality/basin health

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Table 3-3. Basin prioritization summary

Basin	Sum	Land use			Jurisdiction		Aquatic recreation			Water quality/basin health				
		Impervious	Zoning classification	Census urban area	UGA	City boundary	Shellfish harvesting	Hatcheries	Swimming beaches	Marine WQ	Stream WQ	Hydrology	B-IBI [a]	Fish habitat
East Dyes	35.17	5	4.15	5.00	0.90	2.31	2.82	0	4	1	1	3	2	4
Clear Creek	34.95	5	3.59	4.65	1.37	5.00	2.34	0	1	1	1	3	3	4
Long Lake	34.51	3	1.65	3.00	2.74	5.00	0.11	0	2	3	1	4	4	5
Burley Lagoon	33.73	3	1.14	1.59	5.00	5.00	0.00	0	2	0	5	4	2	5
Miller Bay	31.69	2	1.78	1.82	4.97	5.00	0.11	5	2	1	3	4	0	1
Kingston	31.63	3	1.93	1.80	1.55	5.00	0.34	5	1	1	1	5	1	4
Beach Drive	30.84	5	1.95	5.00	3.85	5.00	0.04	0	2	1	1	3	2	1
Minter Bay	30.53	3	1.47	0.95	5.00	5.00	0.11	5	2	0	3	4	0	1
Upper Hood Canal	30.35	2	3.35	5.00	0.89	4.00	0.11	0	2	1	5	3	3	1
Gamble Bay	30.28	2	2.04	1.06	5.00	5.00	0.18	0	4	1	3	1	2	4
Liberty Bay	29.70	4	2.33	3.09	3.87	2.33	0.08	0	2	1	3	2	2	4
Suquamish	29.35	2	3.35	5.00	0.89	5.00	0.11	0	2	1	1	3	3	3
Yukon Harbor	29.35	2	3.35	5.00	0.89	5.00	0.11	0	2	1	3	3	3	1
Gorst	27.74	2	3.80	1.16	2.87	0.73	0.18	0	4	1	3	3	2	4
Chico Creek	27.56	2	2.83	1.14	3.96	2.52	0.11	0	5	1	1	3	1	4
PO Passage	27.24	2	3.35	5.00	0.89	3.89	0.11	0	2	1	3	3	0	3
Blackjack	26.96	5	3.50	4.19	2.51	1.13	0.63	0	2	1	1	3	2	1
West Dyes	26.80	2	3.35	5.00	0.89	1.45	0.11	0	5	1	1	3	3	1
Central Hood Canal	26.68	2	1.55	1.13	3.89	5.00	0.11	0	1	1	1	3	2	5
Olalla	26.06	2	1.05	0.90	5.00	5.00	0.11	0	2	1	3	3	0	3
Foulweather Bluff	25.67	2	1.25	1.00	5.00	5.00	0.42	0	4	0	0	1	2	4
Wright Creek	23.07	2	3.35	5.00	0.89	0.71	0.11	0	2	1	1	3	3	1

[a] Kitsap County 2016. B-IBI Report. Prepared by Herrera Environmental Consultants.

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4 Priority Basin Characterization and Existing Condition

The East Dyes basin consists of several residential and agricultural parcels that were developed before implementation of the Permit. As such, they were grandfathered in and provide little to no stormwater runoff mitigation. Most opportunities for improvement are presented along the various streams located within this basin. Existing habitat within the various creeks is summarized in the following sections.

4.1 Barker Creek

Barker Creek originates at Island Lake and flows more than 3 miles (mi) to Dyes Inlet. Hoot Creek is the major tributary to Barker Creek. The most complete habitat assessment of Barker Creek is from the 2003 *Salmonid Refugia Report* (May 2003), which is summarized in Table 4-1 below.

Barker Creek supports runs of chum and coho salmon, as well as cutthroat trout. There is also limited, but consistent utilization by Chinook salmon and steelhead trout reported in the lower mainstem. The lower mainstem of Barker Creek is contained within a relatively deep ravine. Instream habitat conditions between Barker Creek Road and Nels Nelson Road are generally very good. There is a balanced pool-riffle channel configuration and a moderate level of instream large woody debris (LWD) and habitat complexity. Streambank stability is generally good, with only minor fine sediment deposition in spawning gravels. The riparian corridor in this segment of the creek is mainly intact, with several stands of mature conifers (cedars and hemlocks) located throughout the riparian zone.

From Nels Nelson Road to Waaga Way, there is generally good spawning and rearing habitat. The riparian corridor is largely intact, although encroachment by development and road crossings has degraded habitat conditions. LWD is lacking in this section of the creek.

The floodplain of Barker Creek, upstream of Nels Nelson Road, is also impacted by development including areas where the streambanks have been armored. This area historically was a broad wetland zone (patches of riparian wetland still remain), but encroachment has likely eliminated access to most historical floodplain areas. Riparian condition is generally good from Nels Nelson Road to Waaga Way/State Route (SR) 303. Upper Barker Creek (upstream of Waaga Way/SR 303) and the Hoot Creek tributary are considered critical contributing areas to Barker Creek.

As shown in Table 4-1, the Hoot Creek tributary to Barker Creek is impacted by multiple (31) public and private barrier culverts. Hoot Creek is listed as a Type F stream and supports anadromous salmonid use (winter steelhead, coho, and fall chum) to barrier culverts at SR 303, and resident trout populations above SR 303 (WDFW 2019). Intermittent flow in Hoot Creek upstream of SR 303 prevents fish passage during low flow conditions, and multiple historical ditching and development projects have degraded both instream and riparian habitat conditions in this segment (Haring 2000).

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Table 4-1. Summary of available freshwater salmonid habitat information

Stream	Stream type/ length (ft)		Length	Basin size	Fish use	Fish passage barriers			Land use (percent)		County area	Urban zones	Habitat evaluation			Diver-sity	Produc-tivity
	F	Ns/ p	(mi)	(ac)	Species [a]	KCPW	WSDOT	Pvt.	Developed	Forested	(percent)	(percent)	Wet-lands	Flood-plains	In-stream	Score [b]	Score [b]
Narrows Creek	0.4	0.6	1	154	None	0	0	0	33	67	33	100	NA	Low	ND	3	1
Pahrmann Creek	0.9	0.7	1.6	281	RCCT	0	0	0	55	43	94	100	Mediu m	Low	High	3	1
Mosher Creek	3.3	0.6	3.9	1,050	FC, RCCT	2	0	0	60	40	100	100	High	Low	Medium	3	1
Stampede Creek	0.9	0.7	0.2	210	RCCT	0	0	0	66	34	100	72	NA	Low	Low	3	1
Unnamed Stream 1	0.0	0.4	0.4	76	None	0	0	0	22	78	100	80	NA	NA	ND	ND	ND
Barker Creek	7.4	5.2	12.6	2,322	SH, FC, C, RCCT	4	5	22	49	51	100	60	High	High	ND	5	4

Stream and habitat data source: East Kitsap Steelhead Habitat Evaluation Project (Kitsap County 2017). Prepared for West Sound Watersheds Council.
Fish passage barrier data source: WDFW 2019.
[a] RCCT = resident coastal cutthroat trout; FC = fall chum; SH = steelhead; C = coho.
[b] Qualitative analysis from May 2003. Maximum diversity score is 7, and maximum productivity score is 5. Median combined score for all Kitsap County = 8.
ND = no data. NA = not available.

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4.2 Mosher Creek

Little information is available on Mosher Creek habitat conditions. Haring (2000) identifies habitat conditions as generally fair to good, with partial fish passage barriers present at Tracyton Boulevard and Central Valley Road. Mosher Creek supports coho and resident coastal cutthroat trout.

4.3 Pahrmann Creek

Little information is available on Pahrmann Creek habitat conditions. Haring (2000) identifies habitat conditions as generally poor, with incised channel, little LWD, and limited riparian vegetation. Salmonid use is limited to resident coastal cutthroat trout.

4.4 Stampede Creek

Little information is available on Stampede Creek habitat conditions. Haring (2000) identifies habitat conditions as generally poor, with little LWD and riparian vegetation. Salmonid use is limited to resident coastal cutthroat trout.

4.5 Narrows Creek

No information was available on Narrows Creek habitat conditions except for the potential presence of a barrier culvert at the mouth of the stream (Haring 2000). Salmonid use is limited to resident coastal cutthroat trout.

5 Needs and Opportunities

Strategically, this SMAP addresses existing problems and lays out a plan to meet future population and density targets while protecting resources. Through the basin prioritization analysis, the East Dyes basin showed opportunities for improvement for shellfish harvesting, swimming beaches, and habitat restoration. The County has completed several retrofit studies, which provided insight to the location of previously identified problem areas within the East Dyes basin. Locations of the projects are shown in Figure 5-1. Projects were split into existing or proposed if they have currently been completed or are yet to be completed, respectively. Proposed projects were investigated to verify that they met the SMAP objectives; locations are shown in Figure 5-2. Table 5-1 provides additional information on project type and data source.

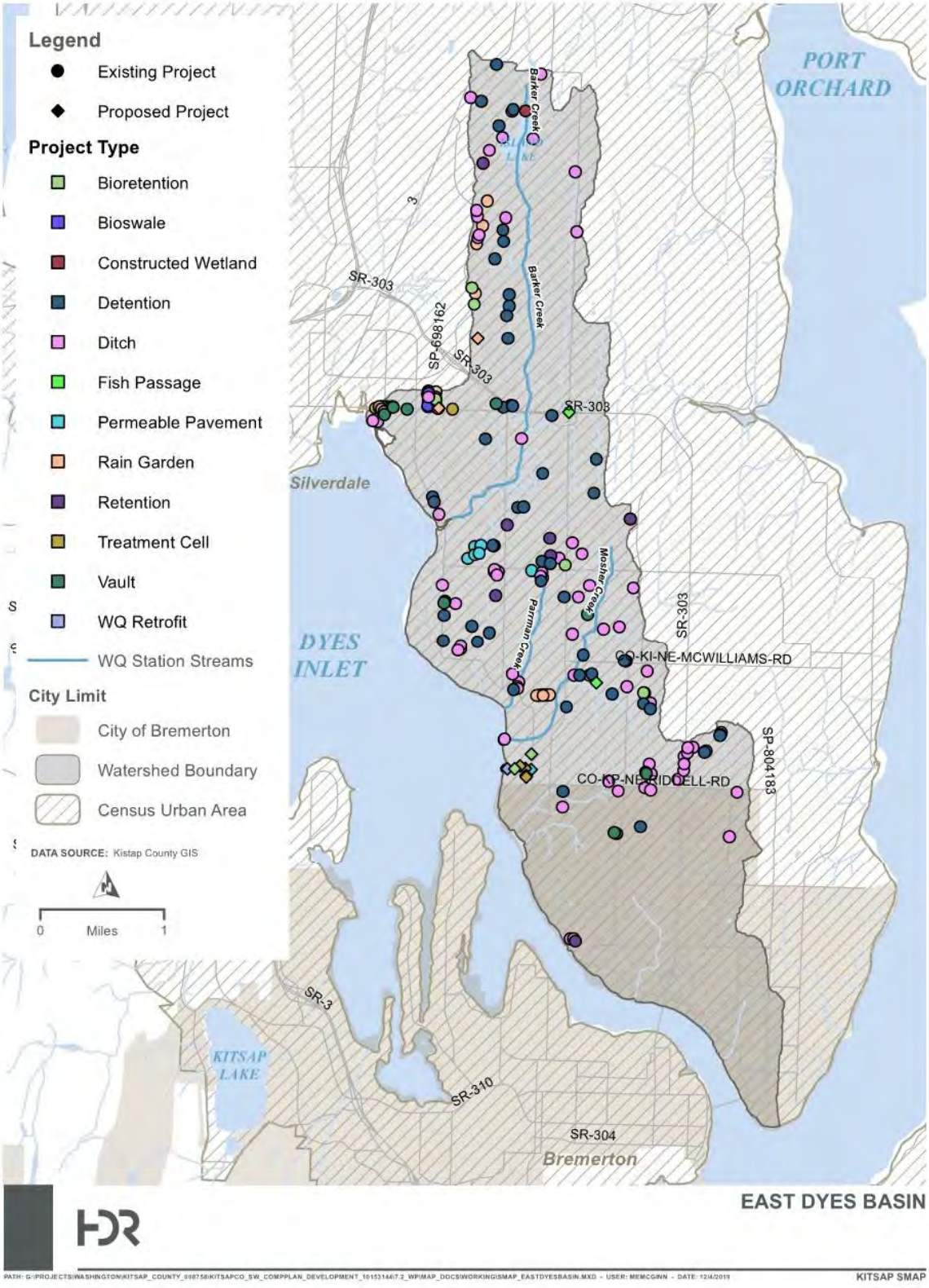

Figure 5-1. Existing and proposed LID/BMPs

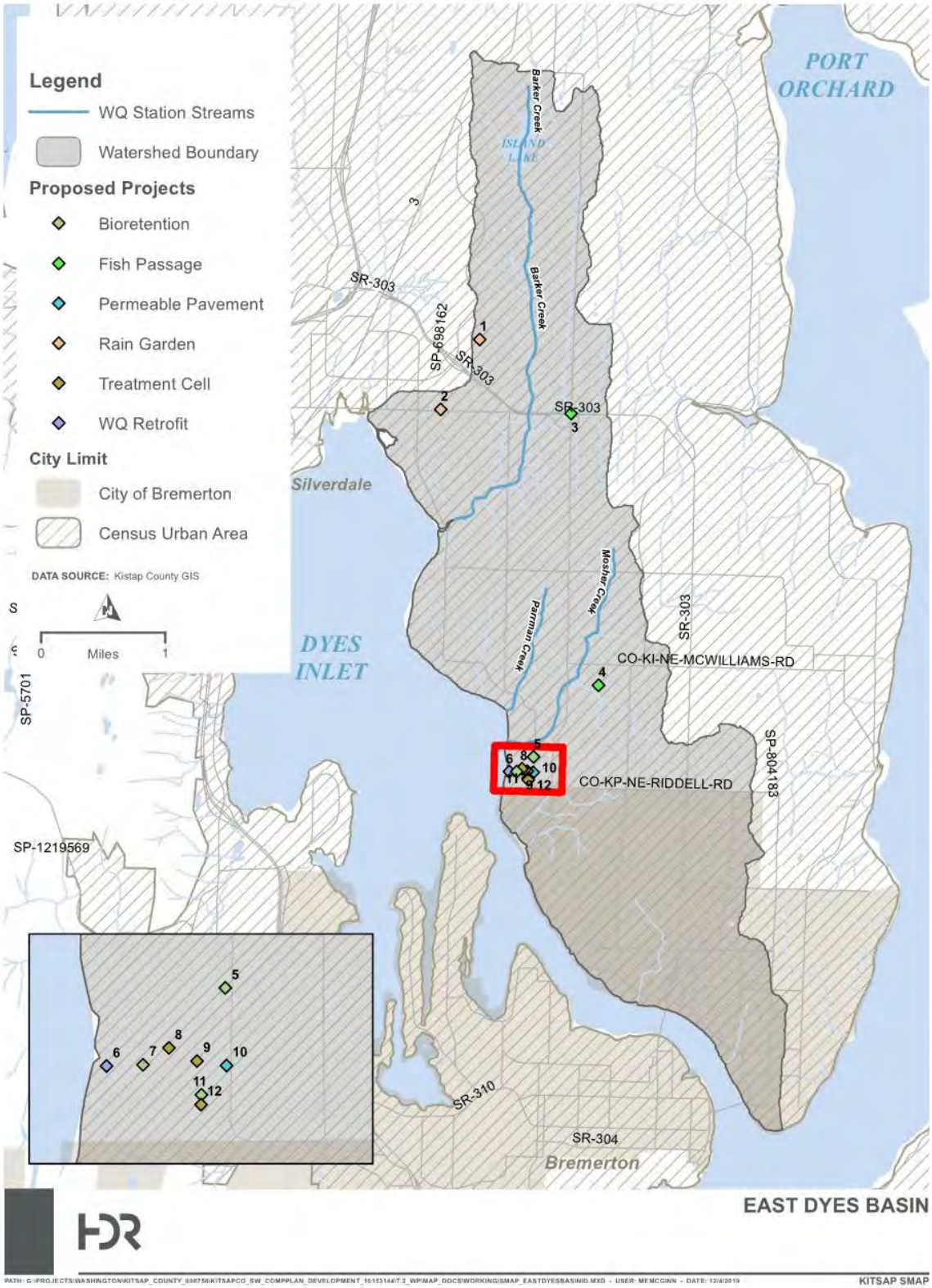

Figure 5-2. Proposed LID/BMPs

Table 5-1. Project type and source

Site ID	LID/BMP	Project source
1	Rain garden	Silverdale retrofit [a]
2	Rain garden	KCPW projects
3	Fish passage	WSDOT
4	Fish passage	KCPW projects
5	Bioretention	East Bremerton retrofit [b]
6	WQ retrofit	CFP
7	Bioretention	East Bremerton retrofit
8	Treatment cell	East Bremerton retrofit
9	Treatment cell	East Bremerton retrofit
10	Permeable pavement	East Bremerton retrofit
11	Bioretention	East Bremerton retrofit
12	Treatment cell	East Bremerton retrofit

[a] KCPW (2013b)
[b] KCPW (2019a)

5.1 Short-Term Actions

Short-term actions are actions that the County can take over the next 6 years.

Water quality concerns within the East Dyes basin appear to be common nonpoint source pollution issues. These issues are better addressed through programs, such as source control investigations or focused outreach, rather than capital projects.

The County currently provides public education related to stormwater through a variety of forums and presentation media within the KCPW Stormwater Division.

The Mutt Mitt program was implemented in 2014, providing more than 505 pet-waste disposal bag stations throughout the county. Through this effort it is estimated that 201.5 tons of dog waste have been diverted from natural surface waters (Clean Water Kitsap 2019). As an expansion of the program, the County is considering the development of a "Pet Waste—Get it in the Bin" program to inform the public of the importance of proper disposal.

Lawn care is another source of urban nonpoint source pollution. The County is partnering with Clean Water Kitsap and surrounding jurisdictions to put together programs on natural yard care and green stormwater solutions for homeowners.

In addition to long-term outreach programs, the County continues to host yearly events in which students partake in hands-on activities to learn about the hydrologic cycle and where the water goes when they flush. The County plans to continue and expand its efforts through the Water Festival and National Public Works Week.

5.2 Long-Term Actions

Long-term actions are actions that the County can take over the next 7 to 20 years. As shown in Table 5-1 above, several long-term projects have been identified in retrofit studies and through Washington State Department of Transportation (WSDOT) project planning.

As previously discussed, during basin prioritization analysis the East Dyes basin shows that it would benefit from habitat restoration projects along streams. With the addition of wood to the streams, deep, in-channel pools would form increasing habitat for fish to forage and seek refuge.

Barriers to fish migration also exist. The County is required by state law to maintain fish passage at all road crossings. Culverts that are perched high above the stream channel or culverts where the water is too shallow or too fast are examples of fish passage barriers. Removing fish barriers supports the community's vision for fishable waters, and regional efforts to protect and enhance salmon populations. Table 5-2 summarizes habitat and barrier projects from the County's existing Capital Facilities Program (CFP) that provide long-term action opportunities.

Table 5-2. Summary of recommended/proposed habitat enhancement, restoration, and protection projects

Project name	Description	Sponsor agency
Lower Mosher Creek Fish Passage Barrier Replacement	Tracyton Boulevard culvert replacement	KCPW
Upper Mosher Creek Fish Passage Barrier Replacement	McWilliams Court culvert replacement	KCPW
Pahrmann Creek Culvert Replacement	Barrier culvert replacement at Tracyton Boulevard	KCPW
Hoot Creek Culvert Replacements	Five barrier culvert replacements at SR 303	WSDOT
Hoot Creek Culvert Replacements	Barrier culvert replacements at Bucklin Hill Road	WSDOT
Barker Creek LWD Enhancement Above Nels Nelson Road	Improve in stream structure and habitat diversity	Not currently programmed

5.3 Recommended Capital Facilities Plan

Projects included in the County's 2020–2025 CFP located in East Dyes include the Ridgetop Boulevard Green Street Retrofit project and Tracyton Green Streets Stormwater Retrofit project.

The Ridgetop Boulevard Green Street Retrofit project is a joint Roads Department and stormwater project to retrofit Ridgetop Boulevard as a green street. The objective of the project is improve water quality in the Clear Creek estuary and Dyes Inlet through installation of water quality facilities including bioretention cells along Quail Run Drive in the town of Silverdale. This project will provide treatment for total suspended solids (TSS), oil (total petroleum hydrocarbons), dissolved copper, dissolved zinc, and total phosphorus to reduce stormwater runoff volume and improve water quality to

downstream receiving waters by intercepting stormwater runoff prior to it entering the built drainage system with infiltrating BMPs.

Soil properties for the project have undergone subsurface exploration and infiltration testing so that infiltrative capacity is well understood. The project is specified and a high-priority project in the following plans:

- Kitsap County Transportation Improvement Program (TIP)
- Stormwater CFP
- County's "Water as a Resource" policy Implementation Plan
- Puget Sound Partnership West Central Local Implementation Near Term Action WC-21

The project will also add pedestrian safety features, bike lanes, and traffic safety improvements. See TIP Project CRP 1593

The Tracyton Green Streets Stormwater Retrofit project (noted as Project EB-1, the East Bremerton Retrofit Plan) proposes the following stormwater BMP installations:

- Permeable pavement parking with subsurface weirs on NW Tracy Avenue between Naomi Street NW and May Street NW
- New curb bulb-out bioretention cells in the roadway right-of-way at two intersections:
  - NW Tracy Avenue and May Street NW
  - May Street NW and NW Nichols Avenue
- Retrofit existing ditches on Stingle Street NW between NW Tracy Avenue and NW Riddell Road
- Install proprietary treatment facilities on Stingle Street NW and NW Tracy Avenue
- Install sidewalks on May Street NW between NW Tracy Avenue and NW Nichols Avenue

The swales and proprietary treatment facility will provide enhanced water quality treatment for stormwater runoff from approximately 21 acres (ac) of existing impervious surface. Runoff from this area currently discharges untreated to Puget Sound.

6 Financial Plan Review and Recommendations

The County relies on state and federal grant funds to pay for CFP projects. Small projects that have a construction cost less than $1 million are usually designed by staff engineers. The County's Surface Water Division CFP budget has funding to supplement projects led by the Roads Department.

Two projects located in the East Dyes inlet basin are recommended for implementation to meet SMAP objectives to identify priority projects in the highest-ranked priority basin to improve conditions in receiving waters.

Because the County has relied on grants to fund CFP projects, the County's financial ability to fund these projects is uncertain. A financial assessment that includes strategies for funding capital projects is included in the County's Comprehensive Stormwater Management Plan.

7 Implementation Plan

The Phase II Permit includes timelines for SMAP implementation. The timelines are illustrated in Table 7-1.

Table 7-1. SMAP implementation plan

Permit Sub-Section C.1	Compliance action	Permit due date	County status
a	Convene a team to inform and assist in the development, progress, and influence of the stormwater planning program.	8/1/2020	Ongoing
b.i.a	Describe for the previous permit term (2013–2019) how stormwater management needs and protection/improvement of receiving water health did (or did not) inform the planning update process and influenced policy and strategies (e.g., updates to the SWCP or other long-range land use plans used to accommodate growth or transportation).	3/31/2021	Planning phase
b.i.b	Describe (via a report) how stormwater management needs and protection/improvement of receiving water health are (or are not) informing the planning update process and influencing policy and strategies since 8/1/2019 (e.g., updates to the SWCP or other long-range land use plans used to accommodate growth or transportation).	1/1/2023	2020 SWCP
c.i	Continue to require LID principles and BMPs when updating, revising, and developing new local development codes, rules, standards, and other enforceable documents. Make LID the preferred and commonly used approach to site development.	Ongoing	Ongoing
c.i.a	Assess and document any newly identified administrative or regulatory barriers to LID implementation. Describe (if any) mechanisms adopted to encourage or require implementation of LID principles or BMPs.	Annually	Ongoing

Permit Sub-Section C.1	Compliance action	Permit due date	County status
d.i	**Receiving Water Assessment:** Document and assess existing information related to local receiving waters and contributing area conditions to identify receiving waters most likely to benefit from stormwater management planning. **Submit a watershed inventory to Ecology in table format, with contents described in this Permit section and the guidance document. Include assessment documentation.**	3/31/2022	June 2020 SMAP report
d.ii	**Receiving Water Prioritization:** Develop and implement a prioritization method and process to determine which receiving waters will receive the most benefit from the retrofits, SWMP actions, and other land/development management actions. **Rank the list and document the method and ranking process used in a report format.**	6/30/2022	June 2020 SMAP report

Bold text = Future action item for Kitsap County

8 Adaptive Management Plan

Adaptive management is the systematic use of information to improve operations, especially in the face of uncertainty. This concept is common in business practices, such as General Electric's "Six Sigma" as well as conservation planning, such as The Nature Conservancy's "Open Source." These two examples have been used by multiple governments, businesses, and nonprofit organizations. While most business sectors use some type of system to determine actions, adaptive management is a focused, systematic approach to improving future work by learning from the outcomes of implemented actions. Establishing an intentional learning environment allows an organization to move forward in an uncertain environment, establish reasonable expectations and time frames, and reduce the risk of misdirected actions and funding. The key elements are condensed into an ongoing, cyclical process, as shown in Figure 8-1.

The adaptive management process can be applied at any scale, from budget processes to individual projects to overall stormwater management programs. This systematic process identifies uncertainties, monitors results, and informs actions. A formalized program that clearly articulates the uncertainties and monitors results reduces the risk of errors and allows programs to move forward in the face of uncertainty.

The CFP Plan comprises individual projects that are identified through system evaluations related to the public stormwater system operations regarding flooding, water quality, and habitat. It is recommended that these programs operate on a 7-year basis with a CFP review occurring every 2 years in off-budget years to inform the budget process. The CFP should review the goals and objectives of each program, consider the effects of sea-level rise on CFP design and operations, evaluate current conditions and

needs, develop project lists and preliminary budget, and then review the action plan with environmental staff for recommendations for approval to the County Commissioners as part of the budget process.

Individual project design can use a team approach for triple-bottom-line evaluation of best solutions. CFP projects for streams typically have permit conditions requiring a 5-year monitoring plan for plant survivability. Effectiveness of individual projects can be evaluated within the larger context of system assessment for flooding, water quality, and stream habitat. A formal adaptive management process that focuses on specific capital project design elements, such as plant survival rates or designs that improve fish passage with the least cost for maintenance, helps to identify successful implementation strategies.

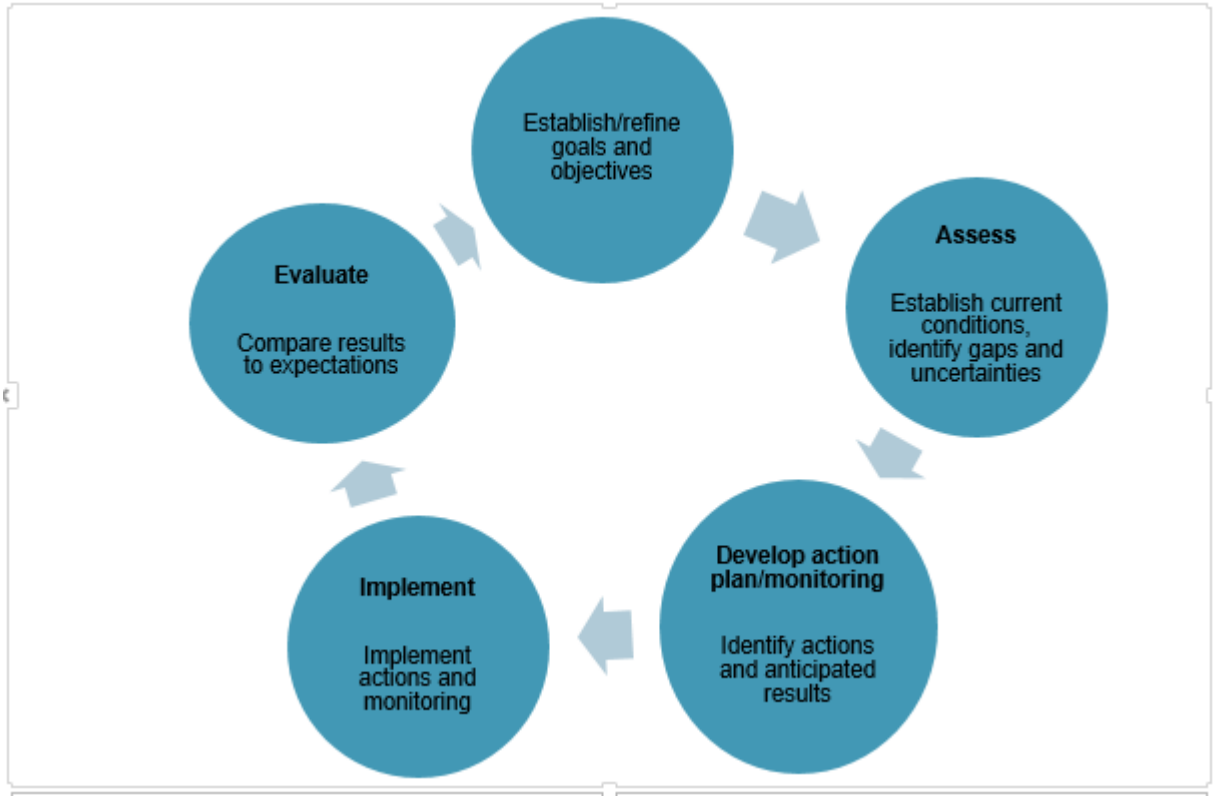

Figure 8-1. Adaptive management concept.

8.1 Environmental Indicator Monitoring

Monitoring programs provide information to guide the larger adaptive management program. Monitoring streams, small lakes, and aquatic life provides data to determine progress toward the overall stormwater vision and helps to guide or evaluate capital investment projects that affect stream habitat and fish passage.

The number and types of animals living in streams are good indicators of the relative condition of the streams. Biological information about streams collected by the County includes salmon spawning surveys of fall and summer salmon use of streams. Annual collection of benthic macroinvertebrates data from streams provides critical information for making resource decisions. Staff, professional consultants, and volunteers collect

biological information used to assess the environmental health of Kitsap County's open streams.

Aquatic benthic macroinvertebrates, resident fish, and spawning salmon populations are considered an indicator of aquatic health, as the diversity and types of organisms reflect the water quality and physical habitat conditions of the stream over the course of their life spans. Water quality samples can reflect the condition of the water only at the time of sampling and for the pollutants that were analyzed. While aquatic benthic macroinvertebrates cannot provide specific information on the types of pollutants that may be present, they can indicate general influences, such as toxic substances, sediment, or water temperature, that have biological significance over the course of their aquatic life.

Summer fish populations provide indications of water temperature and physical habitat conditions typically relating to spring and summer conditions. Decreased or absent trout, sculpin, or juvenile coho populations in summer sampling can indicate increased temperature, loss of instream pool habitat, increased heavy metals, or significant water quality concerns. Both aquatic macroinvertebrate and summer fish populations respond to local habitat conditions and are not likely directly linked to outside influences such as harvest or ocean conditions.

Salmon spawning surveys, while affected by outside influences, provide direct information about fish passage through culverts, as well as indications of physical habitat conditions. Salmon spawning surveys provide information about habitat conditions during the fall and winter, including late summer water temperature, flows, fine sediment, and stream stability. Using the aquatic indicator information as a whole helps to determine the types of projects and sequencing of stream projects that would best support aquatic life. For instance, increasing the complexity of habitat with LWD could help areas that spawning salmon or aquatic macroinvertebrates indicate have been affected by fine sediment. Salmon spawning surveys provide direct evidence whether salmon are using habitat created through capital projects or other basin improvements to normalize flow and/or sediment regimes. While monitoring the number of successful juveniles from those spawning adults would provide a direct measure of habitat health and the success of salmon habitat improvements, aquatic benthic macroinvertebrates have been used as a less expensive surrogate.

Because environmental indicators are instrumental in evaluating aquatic habitat conditions and informing where stream CFP projects should be constructed, it is recommended that the County continue to conduct salmon spawning surveys, continue to collect macroinvertebrate data, start to collect instream habitat data for LWD structures and instream pools, stay current on research evaluating the effectiveness of stream habitat standards that guide CFP Plan design, and develop a program for ongoing review of previously constructed CFP open-stream projects to inform future design strategies.

9 References

Clean Water Kitsap. 2019. 2019 Stormwater Management Program (SWMP) for National Pollutant Discharge Elimination System (NPDES) Permit Implementation in Kitsap County, Washington. Prepared for Kitsap County Department of Public Works Surface and Stormwater Management.

Ecology (Washington State Department of Ecology). 2019a. Puget Sound Watershed Characterization Project. Online GIS map application. https://fortress.wa.gov/ecy/coastalatlas/wc/landingpage.html

Ecology. 2019b. Stormwater Management Action Planning Guidance. Phase I and Western Washington Phase II Municipal Stormwater Permits. Prepared by Water Quality Program Washington State Department of Ecology, Olympia, Washington. Publication 19-10-010. August.

Haring, D. 2000. Salmonid Habitat Limiting Factors: Water Resource Inventory Area 15 (East). Final report to the Washington State Conservation Commission.

HDR (HDR Engineering, Inc.). 2013. North Kitsap Low Impact Development Retrofit Implementation Plan. Prepared for Kitsap County Department of Public Works Surface and Stormwater Management.

Herrera (Herrera Environmental Consultants, Inc.). 2013. Silverdale Low Impact Development Retrofit Plan. Prepared for Kitsap County Department of Public Works Surface and Stormwater Management.

Kitsap County. 2016. B-IBI Report. Prepared by Herrera Environmental Consultants.

Kitsap County. 2017. East Kitsap Steelhead Habitat Evaluation Project. Prepared for West Sound Watersheds Council.

KCPW (Kitsap County Public Works). 2019. East Bremerton and East Port Orchard stormwater retrofit plan. Prepared by RKI; Osborn Consulting; Aspect Consulting; Russell Lambert Landscape Architects; Kindred Hydro; and Ei.

KCPW (Kitsap County Public Works). 2013a. North Kitsap low impact development retrofit implementation plan. Prepared by HDR Engineering, Inc.

KCPW (Kitsap County Public Works). 2013b. Silverdale low impact development retrofit plan. Prepared by Herrera Environmental Consultants, Inc; Aspect Consulting, LLC; BCRA Inc.

KCPW (Kitsap County Public Works). 2012a. Kingston LID stormwater retrofit: LID retrofit implementation plan. Prepared by 2020 Engineering, Inc.

KCPW (Kitsap County Public Works). 2012b. Manchester LID stormwater retrofit. Prepared by SvR, Project No. 11009.

KPHD (Kitsap Public Health District). 2017. Water Pollution Identification and Correction Program 2018 Annual Water Quality Report.

KPHD. 2018. Water Pollution Identification and Correction Program 2018 Annual Water Quality Report.

May, C.W. and G. Peterson. 2003. *Kitsap Salmonid Refugia Report*. Prepared for Kitsap County.

United States Census Bureau. 2020. United States Census Bureau website data. Accessed at: https://www2.census.gov/programs-surveys/popest/tables/1990-2000/2000-subcounties-evaluation-estimates/sc2000f_wa.txt and https://www.census.gov/search-results.html?searchType=web&cssp=SERP&q=Bellingham%20city,%20WA.

Washington Department of Commerce. 2016. Building Cities in the Rain. Watershed Prioritization for Stormwater Retrofits. Publication 006. September.

WDFW (Washington Department of Fish and Wildlife). 2019 SalmonScape. Online http://geo.wa.gov/datasets/1e56a648718543ab952e75ff9971f086

WDOH (Washington Department of Health). 2019. Fish and Shellfish Consumption Advisories. Online https://www.doh.wa.gov/CommunityandEnvironment.

10 Appendix

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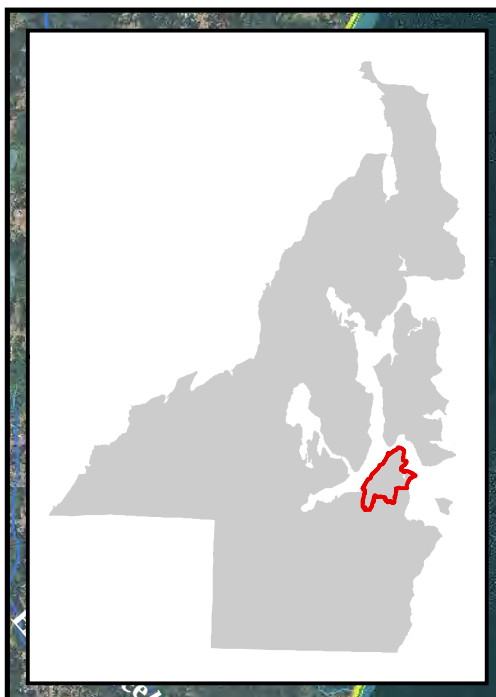


Rich Passage

Port Orchard Bay

Clam Bay

Beaver Creek

Little Clam Bay

Salmonberry Creek

Curley Creek

Basin Statistics	
Basin Area (acres)	3924.3
Urban Growth Area (acres)	146.8
Census Urbanized Area (acres)	3924.3
Road Density Average (miles/sq mile)	6.5

Basin Boundary
Census Urbanized Area
Wetland
Fresh Water
Stormwater Facility
Park

Stream Type

Shoreline of the State
Fish Habitat
Non-Fish Habitat
Perennial Non-Fish Habitat
Seasonal Non-Fish Habitat
Unsurveyed
No Channel Found

Shoreline Use

Commercial
Industrial
MFR
Marina
Public
SFR
Undisturbed

Drift Cells

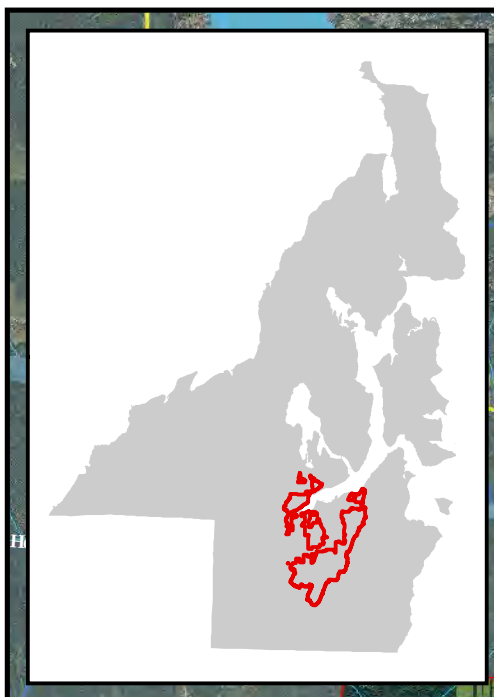
Divergence Zone
Left To Right
No Appreciable Drfit
Right To Left
Undefined

KITSAP COUNTY

Basin Fact Sheet - Beach Drive Basin

0 0.5 1 Miles

N W E S



Oyster Bay
Port Orchard Bay
Sinclair Inlet
Gorst Creek
Parish Creek
Anderson Creek
BERRY LAKE
Ruby Creek
NORTH LAKE
Salmonberry Creek
Curley Creek
LAKE EMELIA
Coulter Creek
NELS JOHNSON LAKES
Square Creek
SQUARE LAKE
Blackjack Creek
TROPHY LAKE
LAKE FLORA
Burley Creek
WICKS LAKE
Minter Creek

Basin Statistics	
Basin Area (acres)	17082.7
Urban Growth Area (acres)	11020.7
Census Urbanized Area (acres)	13186.4
Road Density Average (miles/sq mile)	14.6

Basin Boundary
Census Urbanized Area
Wetland
Fresh Water
Stormwater Facility
Park

Stream Type
Shoreline of the State
Fish Habitat
Non-Fish Habitat
Perennial Non-Fish Habitat
Seasonal Non-Fish Habitat
Unsurveyed
No Channel Found

Shoreline Use
Commercial
Industrial
MFR
Marina
Public
SFR
Undisturbed

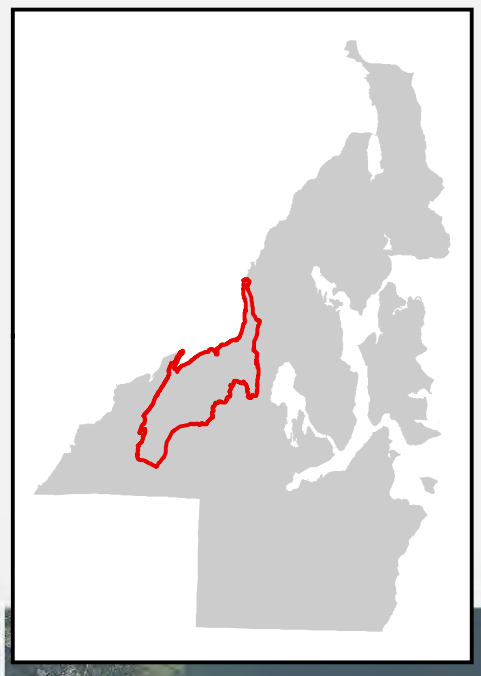
Drift Cells
Divergence Zone
Left To Right
No Appreciable Drfit
Right To Left
Undefined

KITSAP COUNTY

Basin Fact Sheet - Blackjack Basin

0 0.5 1 Miles

N W E S



Hood Canal
Seabeck Bay
Stavis Bay
Boyce Creek
Stavis Creek
Seabeck Creek
Anderson Creek
Little Beef Creek
Big Beef Creek
LAKE SYMINGTON
WILDCAT LAKE
Wildcat
Tin Mine Creek
Lost Creek
LAKE TAHUYEH
Gold Creek
Tahuya River
Mission Creek
MISSION LAKE
Hazel Creek
Basin Boundary
Census Urbanized Area
Wetland
Fresh Water
Stormwater Facility
Park
Stream Type
Shoreline of the State
Fish Habitat
Non-Fish Habitat
Perennial Non-Fish Habitat
Seasonal Non-Fish Habitat
Unsurveyed
No Channel Found
Shoreline Use
Commercial
Industrial
MFR
Marina
Public
SFR
Undisturbed
Drift Cells
Divergence Zone
Left To Right
No Appreciable Drfit
Right To Left
Undefined

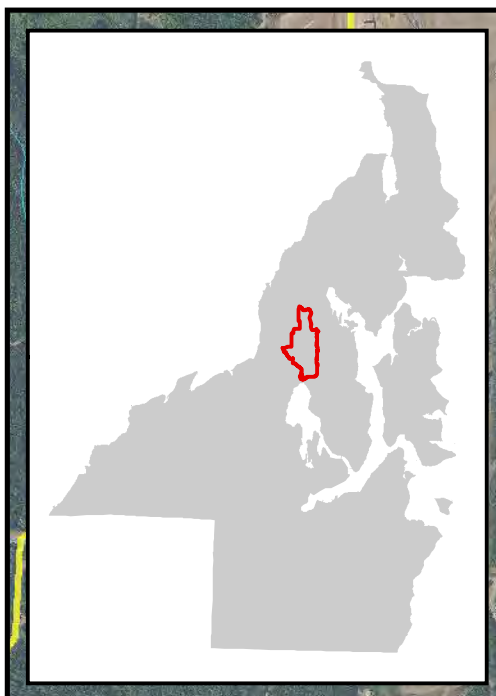
Basin Statistics	
Basin Area (acres)	19793.0
Urban Growth Area (acres)	526.4
Census Urbanized Area (acres)	2515.9
Road Density Average (miles/sq mile)	5.27

KITSAP COUNTY

Basin Fact Sheet - Central Hood Canal Basin

0 0.5 1 Miles

N W E S



ISLAND LAKE

Barker Cree

Clear Creek

Dyes Inlet

Basin Statistics	
Basin Area (acres)	5109.4
Urban Growth Area (acres)	1590.4
Census Urbanized Area (acres)	4676.3
Road Density Average (miles/sq mile)	10.5

Basin Boundary
Census Urbanized Area
Wetland
Fresh Water
Stormwater Facility
Park

Stream Type

Shoreline of the State
Fish Habitat
Non-Fish Habitat
Perennial Non-Fish Habitat
Seasonal Non-Fish Habitat
Unsurveyed
No Channel Found

Shoreline Use

Commercial
Industrial
MFR
Marina
Public
SFR
Undisturbed

Drift Cells

Divergence Zone
Left To Right
No Appreciable Drfit
Right To Left
Undefined

KITSAP COUNTY

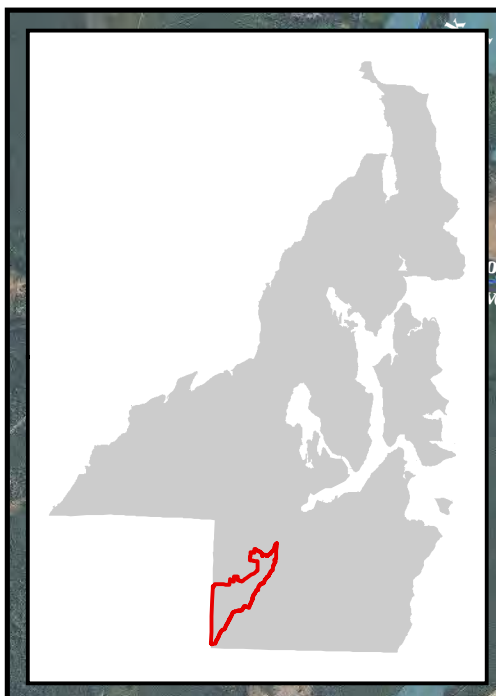
Basin Fact Sheet - Clear Creek Basin

0 0.5 1 Miles

N W E S

KITSAP COUNTY

Basin Fact Sheet - Coulter Creek Basin



Basin Statistics	
Basin Area (acres)	7135.3
Urban Growth Area (acres)	1642.6
Census Urbanized Area (acres)	0
Road Density Average (miles/sq mile)	0.6

Basin Boundary
Census Urbanized Area
Wetland
Fresh Water
Stormwater Facility
Park

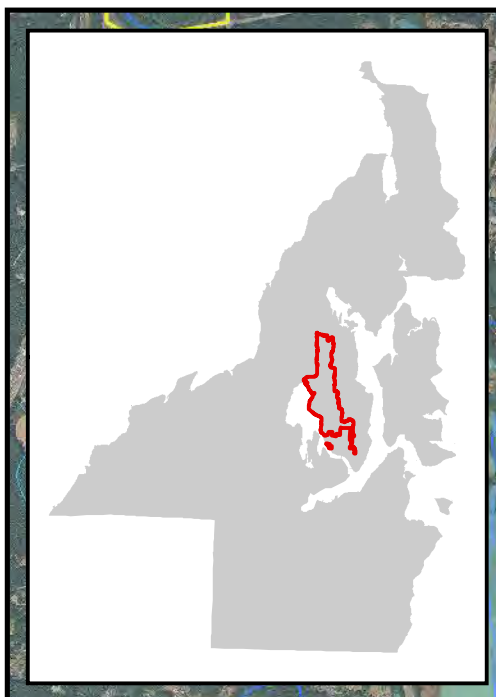
Stream Type
Shoreline of the State
Fish Habitat
Non-Fish Habitat
Perennial Non-Fish Habitat
Seasonal Non-Fish Habitat
Unsurveyed
No Channel Found

Shoreline Use
Commercial
Industrial
MFR
Marina
Public
SFR
Undisturbed

Drift Cells
Divergence Zone
Left To Right
No Appreciable Drfit
Right To Left
Undefined

0 0.5 1 Miles

N W E S



Dogfish Bay
ISLAND LAKE
Royal Valley Creek
Port Orchard Bay
Clear Creek
Crouch Creek
Hoot Creek
Barker Creek
Pinsch Creek
Dyes Inlet
Pahrmann Creek
Mosher Creek
Chico Bay
Chico Creek
Phinney Bay
Port Washington Narrows

Basin Boundary
Census Urbanized Area
Wetland
Fresh Water
Stormwater Facility
Park

Stream Type
Shoreline of the State
Fish Habitat
Non-Fish Habitat
Perennial Non-Fish Habitat
Seasonal Non-Fish Habitat
Unsurveyed
No Channel Found

Shoreline Use
Commercial
Industrial
MFR
Marina
Public
SFR
Undisturbed

Drift Cells
Divergence Zone
Left To Right
No Appreciable Drfit
Right To Left
Undefined

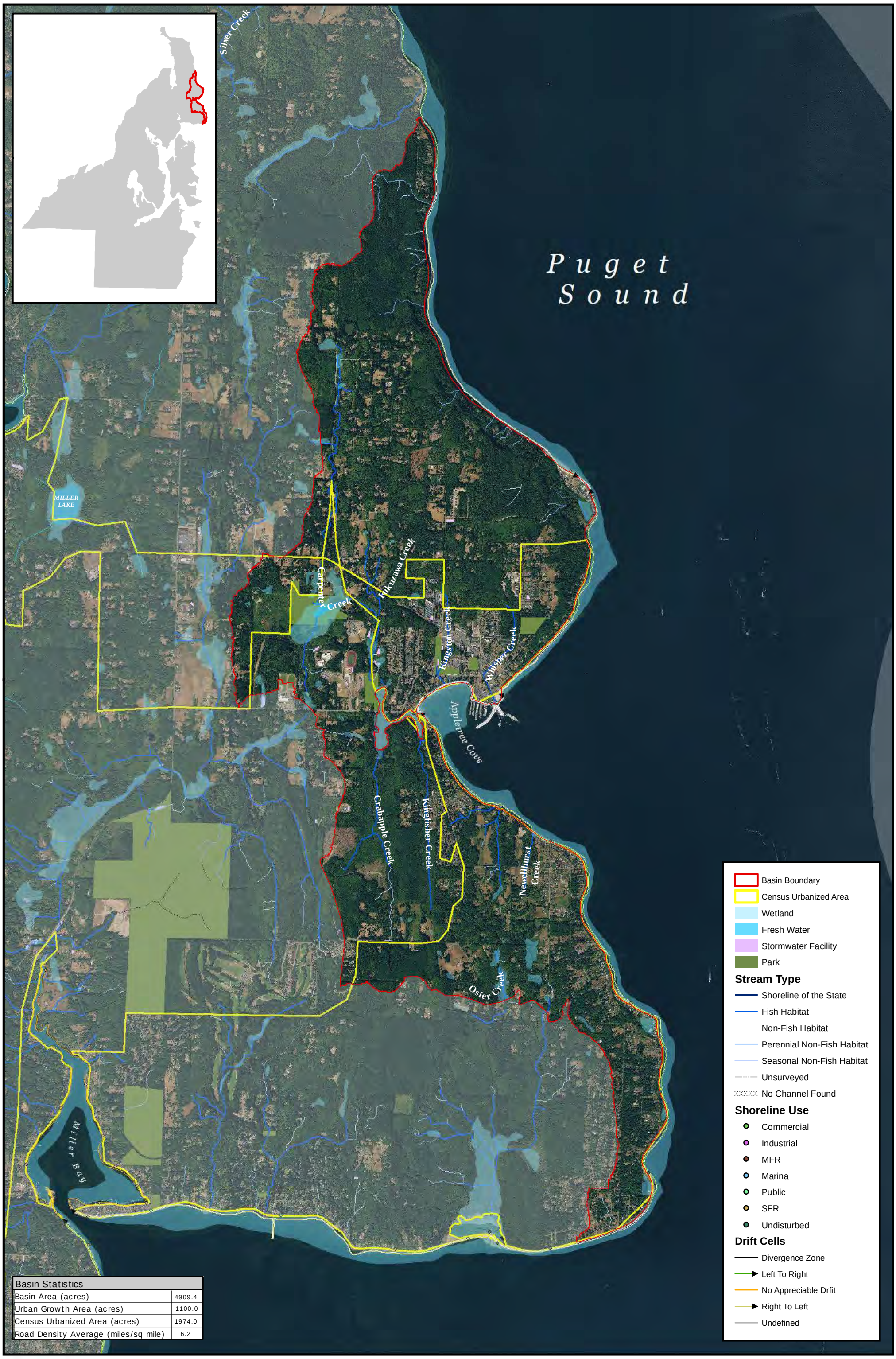
Basin Statistics	
Basin Area (acres)	7387.8
Urban Growth Area (acres)	5773.2
Census Urbanized Area (acres)	7387.8
Road Density Average (miles/sq mile)	13.2

KITSAP COUNTY

Basin Fact Sheet - East Dyes Basin

0 0.5 1 Miles

N W E S



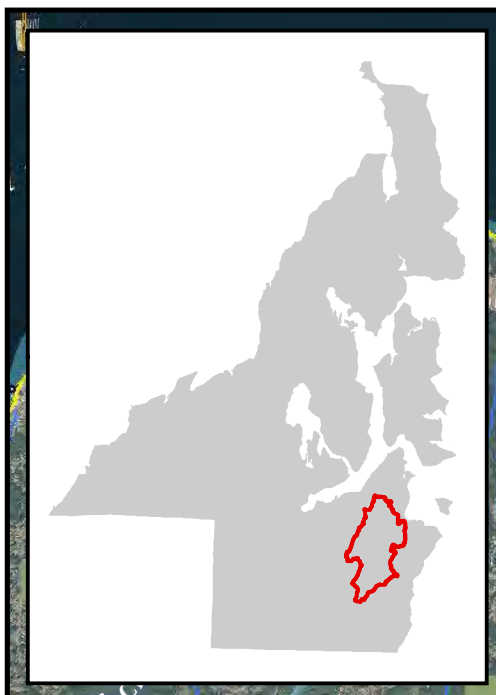
Basin Statistics	
Basin Area (acres)	4909.4
Urban Growth Area (acres)	1100.0
Census Urbanized Area (acres)	1974.0
Road Density Average (miles/sq mile)	6.2

KITSAP COUNTY

Basin Fact Sheet - Kingston Basin

0 0.5 1 Miles

N W E S



Beaver Creek

Yukon Harbor

Blackjack Creek

Salmonberry Creek

Curley Creek

LAKE EMELIA

Wilson Creek

LONG LAKE

Burley Creek

Olalla Creek

Basin Statistics	
Basin Area (acres)	8632.2
Urban Growth Area (acres)	740.7
Census Urbanized Area (acres)	5757.0
Road Density Average (miles/sq mile)	5.5

Basin Boundary
Census Urbanized Area
Wetland
Fresh Water
Stormwater Facility
Park

Stream Type

Shoreline of the State
Fish Habitat
Non-Fish Habitat
Perennial Non-Fish Habitat
Seasonal Non-Fish Habitat
Unsurveyed
No Channel Found

Shoreline Use

Commercial
Industrial
MFR
Marina
Public
SFR
Undisturbed

Drift Cells

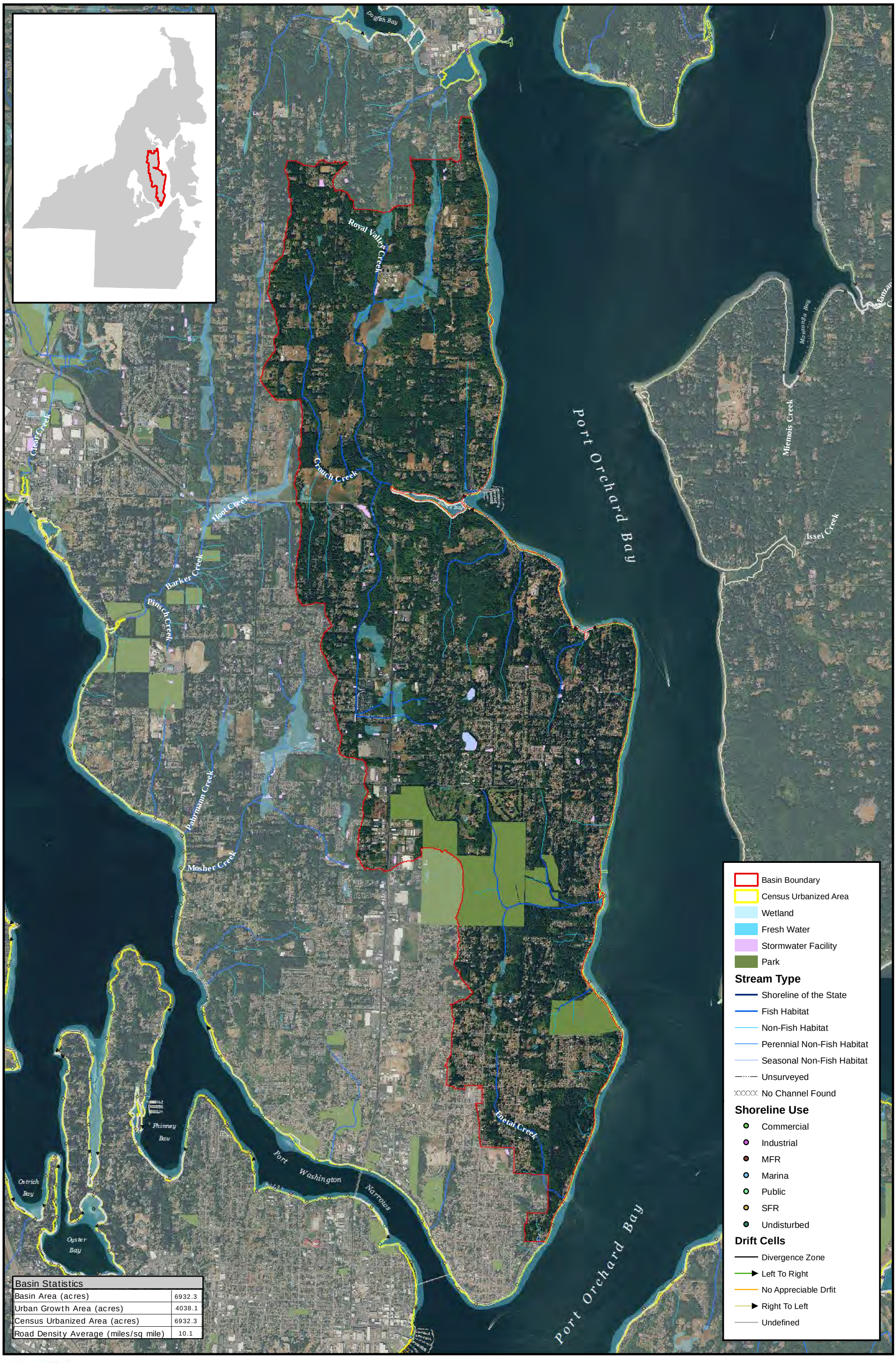
Divergence Zone
Left To Right
No Appreciable Drfit
Right To Left
Undefined

KITSAP COUNTY

Basin Fact Sheet - Long Lake Basin

0 0.5 1 Miles

N W E S



Basin Statistics	
Basin Area (acres)	6932.3
Urban Growth Area (acres)	4038.1
Census Urbanized Area (acres)	6932.3
Road Density Average (miles/sq mile)	10.1

KITSAP COUNTY

Basin Fact Sheet - Port Orchard Passage Basin

0 0.5 1 Miles

N W E S

East Fork Union River
Gorst Creek
Parish Creek
Anderson Creek
NORTH LAKE
Square Creek
SQUARE LAKE
TROPHY LAKE
LAKE FLORA
Blackjack Creek
KRIEGLER LAKE
WICKS LAKE
Coulter Creek
WYE LAKE
Rocky Creek
Huge Creek
FERN LAKE
CARNEY LAKE

Basin Boundary
Census Urbanized Area
Wetland
Fresh Water
Stormwater Facility
Park

Stream Type

Shoreline of the State
Fish Habitat
Non-Fish Habitat
Perennial Non-Fish Habitat
Seasonal Non-Fish Habitat
Unsurveyed
No Channel Found

Shoreline Use

Commercial
Industrial
MFR
Marina
Public
SFR
Undisturbed

Drift Cells

Divergence Zone
Left To Right
No Appreciable Drfit
Right To Left
Undefined

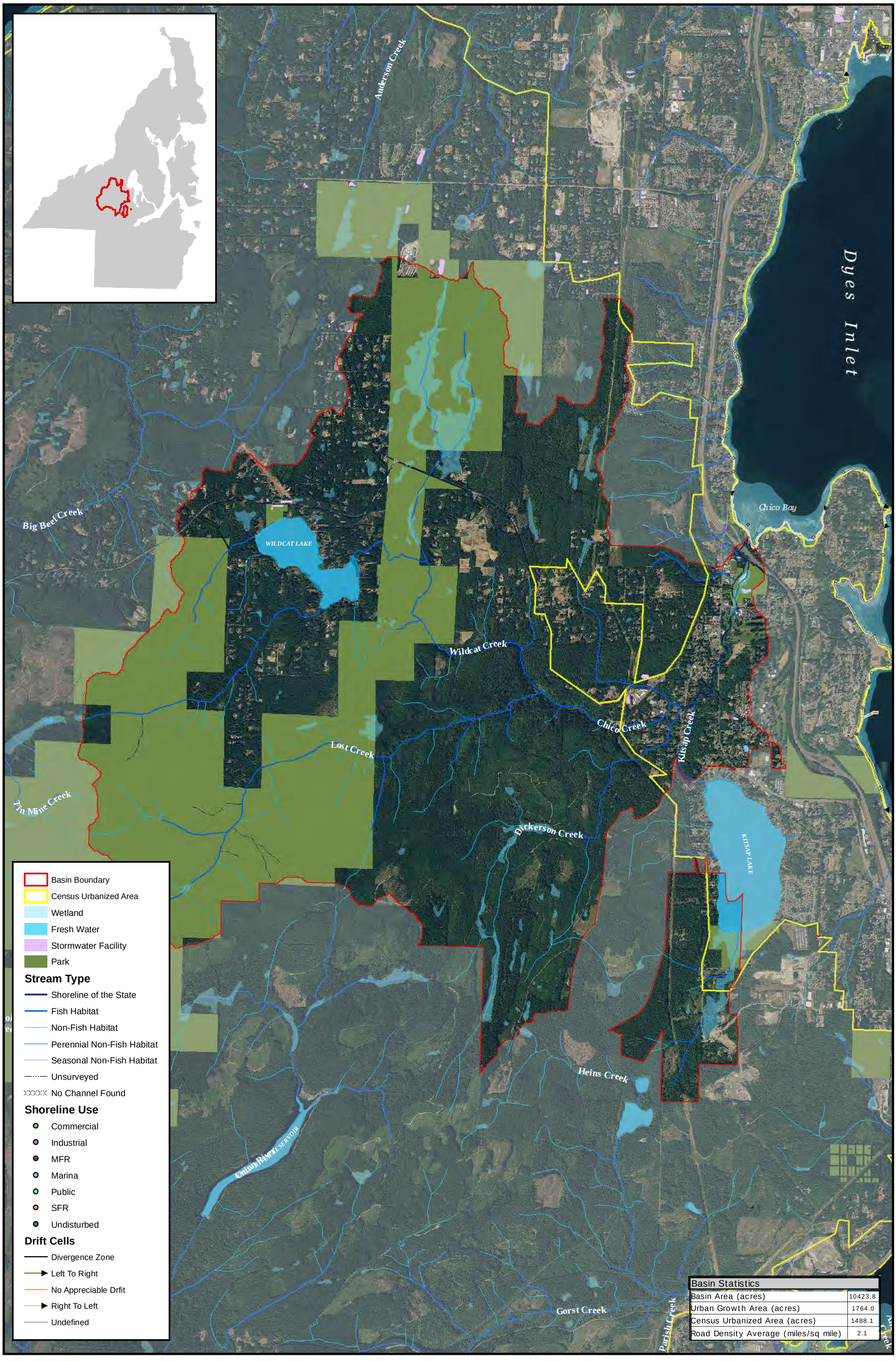
Basin Statistics	
Basin Area (acres)	7856.0
Urban Growth Area (acres)	170.0
Census Urbanized Area (acres)	60.1
Road Density Average (miles/sq mile)	2.3

KITSAP COUNTY

Basin Fact Sheet - Rocky Creek Basin

0 0.5 1 Miles

N W E S

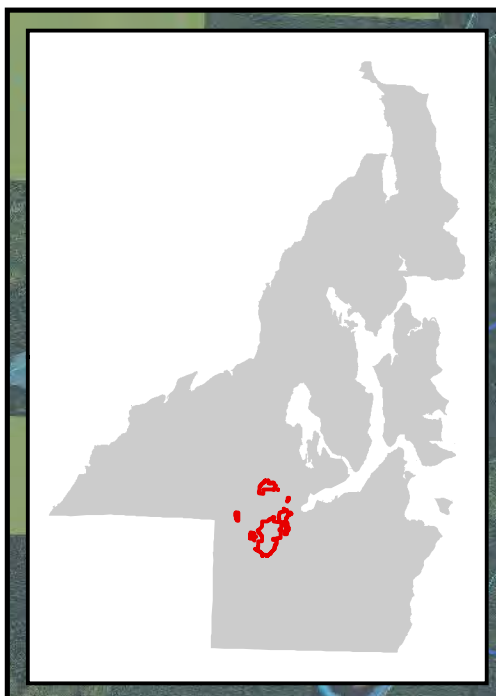


KITSAP COUNTY

Basin Fact Sheet - Chico Creek Basin

0 0.5 1 Miles

N W E S



Dickerson Creek

Heins Creek

KITSAP LAKE

UNION RIVER RESERVOIR

Gorst Creek

TWIN LAKE

East Fork Union River

Sinclair Inlet

Parish Creek

Anderson Creek

Coulter Creek

NELS JOHNSON LAKES

Basin Boundary
Census Urbanized Area
Wetland
Fresh Water
Stormwater Facility
Park

Stream Type

Shoreline of the State
Fish Habitat
Non-Fish Habitat
Perennial Non-Fish Habitat
Seasonal Non-Fish Habitat
Unsurveyed
No Channel Found

Shoreline Use

Commercial
Industrial
MFR
Marina
Public
SFR
Undisturbed

Drift Cells

Divergence Zone
Left To Right
No Appreciable Drfit
Right To Left
Undefined

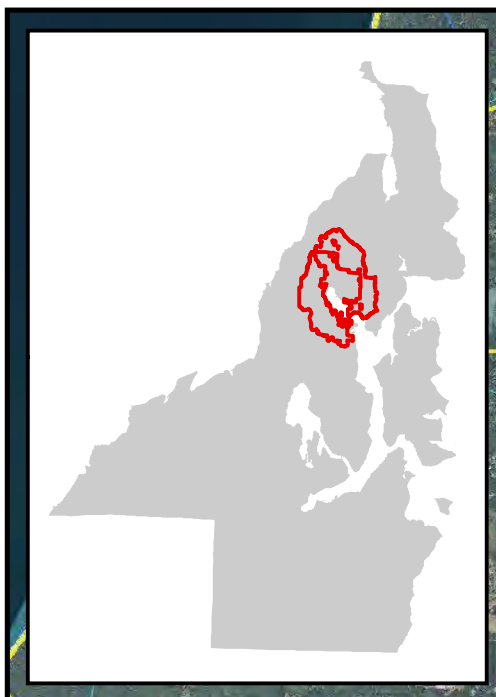
Basin Statistics	
Basin Area (acres)	6159.0
Urban Growth Area (acres)	4184.7
Census Urbanized Area (acres)	1011.8
Road Density Average (miles/sq mile)	2.5

KITSAP COUNTY

Basin Fact Sheet - Gorst Basin

0 0.5 1 Miles

N W E S



Creek

Jump Off Creek

Liberty Bay

Borgen Creek

Ne Si Ka Bay

Dogfish Bay

ISLAND LAKE

Barker Creek

Hoot Creek

Crouch Creek

Royal Valley Creek

Basin Boundary
Census Urbanized Area
Wetland
Fresh Water
Stormwater Facility
Park

Stream Type

Shoreline of the State
Fish Habitat
Non-Fish Habitat
Perennial Non-Fish Habitat
Seasonal Non-Fish Habitat
Unsurveyed
No Channel Found

Shoreline Use

Commercial
Industrial
MFR
Marina
Public
SFR
Undisturbed

Drift Cells

Divergence Zone
Left To Right
No Appreciable Drfit
Right To Left
Undefined

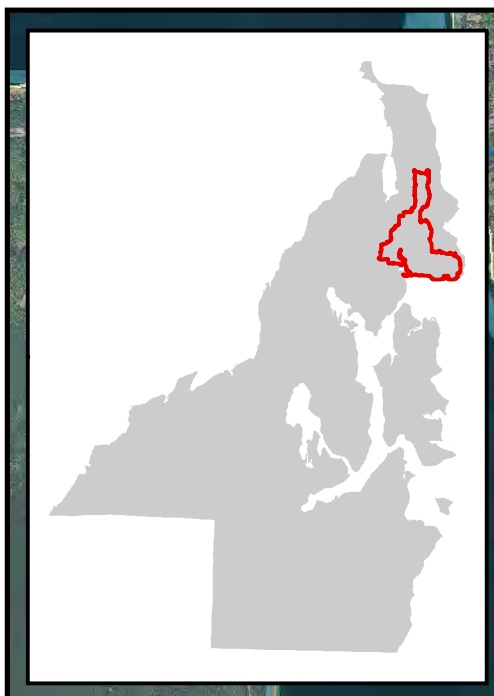
Basin Statistics	
Basin Area (acres)	14002.0
Urban Growth Area (acres)	3842.1
Census Urbanized Area (acres)	9877.4
Road Density Average (miles/sq mile)	10.8

KITSAP COUNTY

Basin Fact Sheet - Liberty Bay Basin

0 0.5 1 Miles

N W E S



Basin Boundary
Census Urbanized Area
Wetland
Fresh Water
Stormwater Facility
Park

Stream Type

Shoreline of the State
Fish Habitat
Non-Fish Habitat
Perennial Non-Fish Habitat
Seasonal Non-Fish Habitat
Unsurveyed
No Channel Found

Shoreline Use

Commercial
Industrial
MFR
Marina
Public
SFR
Undisturbed

Drift Cells

Divergence Zone
Left To Right
No Appreciable Drfit
Right To Left
Undefined

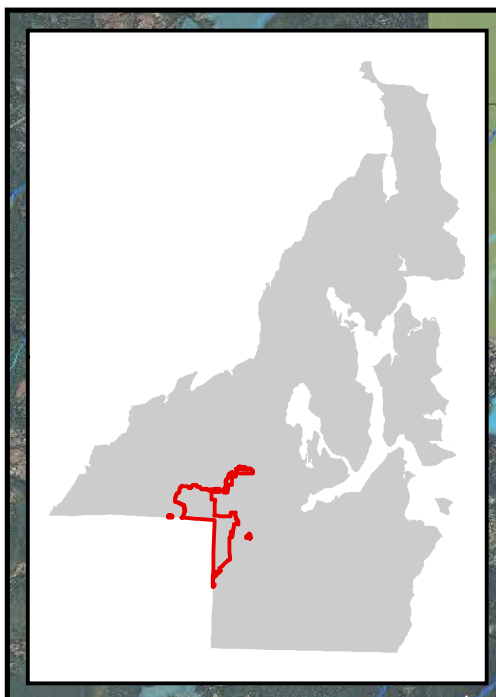
Basin Statistics	
Basin Area (acres)	8829.3
Urban Growth Area (acres)	44.2
Census Urbanized Area (acres)	3671.0
Road Density Average (miles/sq mile)	7.4

KITSAP COUNTY

Basin Fact Sheet - Miller Bay Basin

0 0.5 1 Miles

N W E S



Tin Mine Creek
Lost Creek
LAKE TAHUYEH
Gold Creek
Tahuya River
Mission Creek
Dickerson Creek
Heins Creek
Union River
RESERVOIR
MISSION LAKE
Panther Creek
PANTHER LAKE
Bear Creek
TWIN LAKE
Hazel Creek
East Fork Union River
Gorst Creek
North East Fork Union River
KAITGLER LAKE
Coulter Creek

Basin Boundary
Census Urbanized Area
Wetland
Fresh Water
Stormwater Facility
Park

Stream Type

Shoreline of the State
Fish Habitat
Non-Fish Habitat
Perennial Non-Fish Habitat
Seasonal Non-Fish Habitat
Unsurveyed
No Channel Found

Shoreline Use

Commercial
Industrial
MFR
Marina
Public
SFR
Undisturbed

Drift Cells

Divergence Zone
Left To Right
No Appreciable Drfit
Right To Left
Undefined

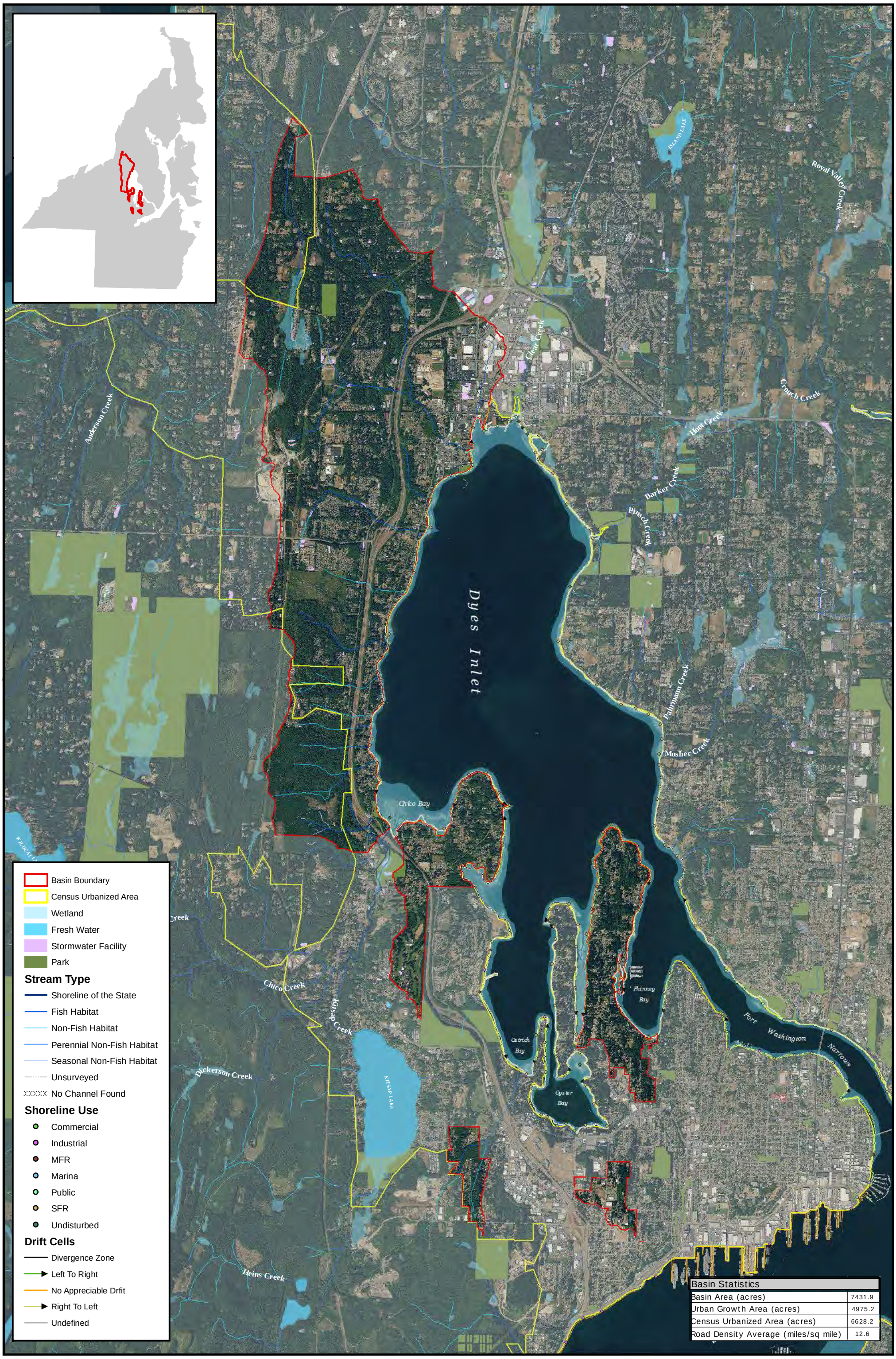
Basin Statistics	
Basin Area (acres)	10743.4
Urban Growth Area (acres)	5613.8
Census Urbanized Area (acres)	0
Road Density Average (miles/sq mile)	2.2

KITSAP COUNTY

Basin Fact Sheet - Union River Basin

0 0.5 1 Miles

N W E S



KITSAP COUNTY

Basin Fact Sheet - West Dyes Basin

0 0.5 1 Miles

N W E S