Stormwater Management Action Plan (SMAP) Receiving Water Assessment

Prepared for

March 2022

Prepared by

Parametrix

Stormwater Management Action Plan (SMAP) Receiving Water Assessment

Prepared for

City of Black Diamond

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ACRONYMS AND ABBREVIATIONS

303(d)	Clean Water Act Section 303(d)
AU	assessment units
B-IBI	Benthic Index of Biotic Integrity
City	City of Black Diamond
Ecology	Washington State Department of Ecology
EJSCREEN Tool	Environmental Justice Screening and Mapping Tool
EPA	Environmental Protection Agency
HUC	hydrologic unit code
NPDES	National Pollutant Discharge Elimination System
PCB	polychlorinated biphenyls
Permit	Western Washington Phase II Municipal Stormwater Permit
PSWCM	Puget Sound Watershed Characterization Model
SMAP	Stormwater Management Action Plan
TMDL	Total Maximum Daily Load
WAC	Washington Administrative Code
WQI	Water Quality Index
WRIA	Water Resources Inventory Area

1. INTRODUCTION

1.1 Purpose

In 2019, the Washington State Department of Ecology (Ecology) updated the requirements for the National Pollutant Discharge Elimination System (NPDES) Western Washington Phase I and II Municipal Stormwater Permit (Permit). In general, Phase I applies to NPDES-permitted cities and counties with populations greater than 100,000, and Phase II applies to NPDES-permitted discharges from small municipal separate storm sewers (Des Moines 2015). The Permit now requires all Phase II permittees, including the City of Black Diamond (City), to develop a stormwater management action plan (SMAP) for at least one high-priority catchment area by March 31, 2023, per S5.C.1.d. The SMAP will call for a comprehensive stormwater planning approach that will protect the designated uses of Washington waters by considering both the existing conditions and the state of expected future development. The SMAP is the final product of three sequential tasks, outlined below.

Task 1 – Receiving Water Assessment: This task involves assessing the existing conditions of the City's receiving waters.

Task 2 – Receiving Water Prioritization: This task involves selecting the receiving water and catchment area(s) that will be the focus of the City's SMAP.

Task 3 – SMAP Development: This task involves identifying stormwater management efforts that will improve the quality of the chosen receiving water and documenting the schedule and budget required to accomplish these efforts.

This report documents the receiving waters assessment for the City, required by S5.C.1.d.i of the Permit. The receiving waters were assessed in part using the methodology outlined in the Stormwater Management Action Planning Guidance (Ecology 2019). The results of this assessment will be used to support the prioritization process required by Section S5.C.1.d.ii of the Permit. The steps included in the assessment and this document are identified below.

1.2 Process Summary

The Ecology guidance includes a step-by-step process for preparing the receiving water assessment, as summarized below:

1. Basin delineation and identification of receiving waters, including a map of the delineated basins and the associated receiving waters.
2. Assessment of receiving water existing conditions and contributing areas for each delineated receiving water-scale basin and each receiving water body.
3. Assessment of expected stormwater management influence documenting how data sources were used in the assessment of existing conditions and any identified data gaps.
4. Evaluation of relative contributions and conditions summarized in a watershed inventory table, including the list of basins to be included in the prioritization process (S5.C.1.d.ii).

The Watershed Inventory Table and Map will be submitted to Ecology by March 31, 2022.

2. BASIN DELINEATION (STEP 1)

2.1 Methodology

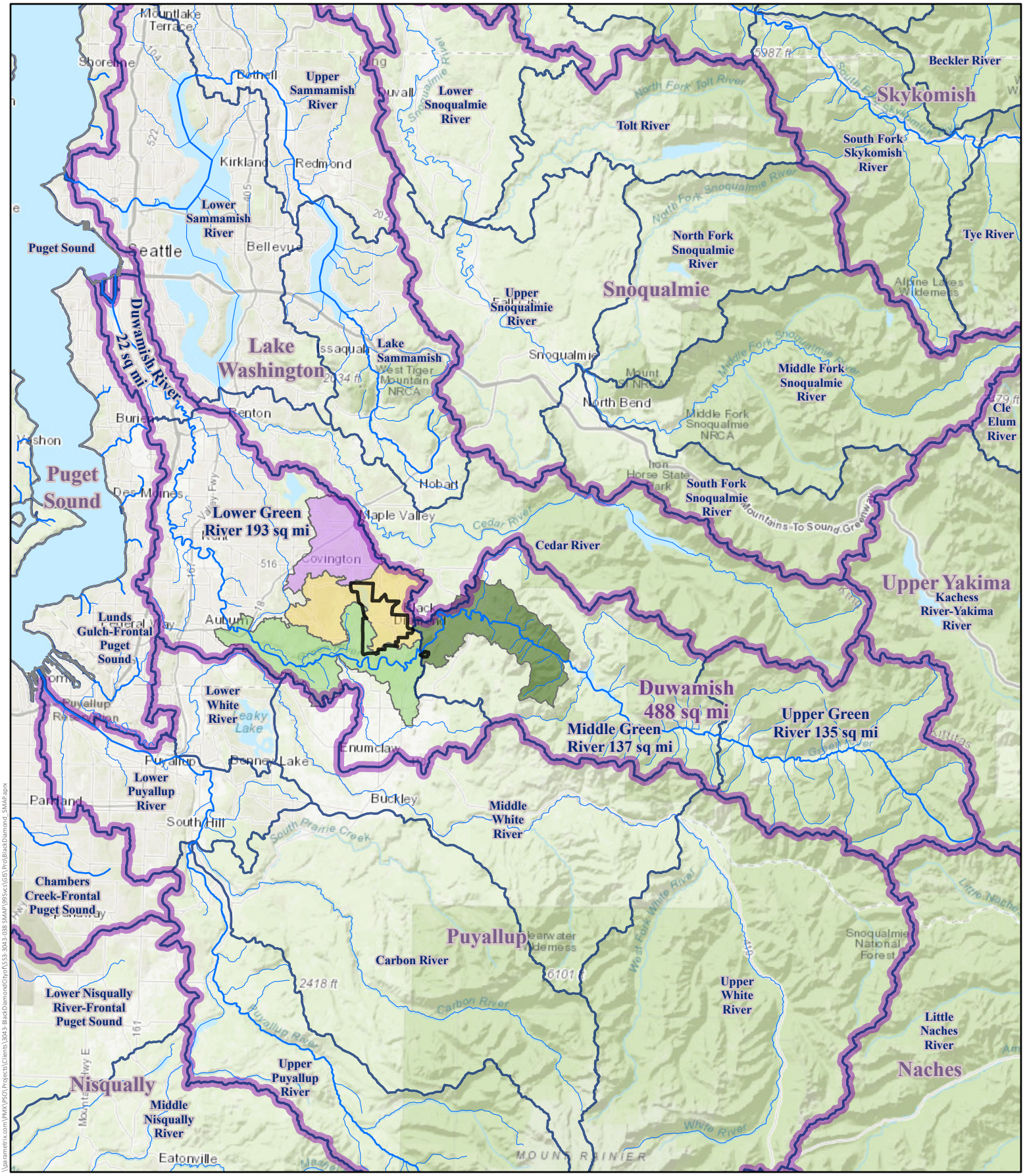
The City drains to portions of four named stream basins or receiving waters: Covington Creek, Jenkins Creek Lower Green River, and Middle Green River. Areas draining to these receiving waters were delineated into drainage basins, which were provided by the City and used as the basis for the receiving water analysis.

The basins were delineated to encompass the City area that drains to one of the identified receiving waters. The City lies within the Duwamish hydrologic unit code (HUC) 8 subbasin, as shown in Figure 1. The Duwamish has been split into four watersheds: Upper Green River, Middle Green River, Lower Green River, and Duwamish River.

The Lower Green River watershed, as shown in Figure 1, encompasses three of the receiving waters identified for the City: Covington Creek, Jenkins Creek, and Lower Green River. The drainage area contributing to these receiving waters was delineated within the Lower Green River watershed. Thus, for the purposes of this assessment, the Lower Green River drainage basin refers to the portion of the Lower Green River watershed that contributes to the Lower Green River receiving water but does not include the area draining to Covington Creek or Jenkins Creek. The Lower Green River drainage basin was delineated so that it would be at the same scale as Covington and Jenkins Creeks.

Similarly, the Middle Green River watershed extends far beyond the City boundary and is much larger than the recommended SMAP basin area of 20 square miles (Ecology 2019). For this reason, the Middle Green River drainage basin was delineated to the same area scale as was done previously for the other three receiving water drainage basins, and it should be noted that the Middle Green River drainage basin, as shown in Figure 2, is the extent to which the receiving water was evaluated for this assessment.

Attributes were identified for each basin, as listed in Table 1, and described in the following sections.



Date: 2/21/2022
Sources: USGS, City of Black Diamond, King County, Port of Seattle, WA Ecology, WA DNR, USGS, ESRI
Disclaimer: This product is for informational purposes and may not have been prepared for, or be suitable for legal, engineering, or surveying purposes.

*Note: HUC 8 and HUC 10 boundaries from the USGS Watershed Boundary Dataset have been updated in some locations to match County and City mapping.

Figure 1 - Watershed Boundaries
Black Diamond SMAP
Receiving Water Assessment

Black Diamond, WA

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Table 1. Basin Delineation Element Descriptions

Element	Description
Basin Name	Name of the drainage basin at a receiving water scale delineation. For the SMAP assessment, basins were limited to a scale of approximately 1–20 square miles within the City.
Receiving Water	The water body (stream segment, wetland, lake, large river, Puget Sound, etc.) that receives discharge from the associated basin listed in Table 1. The receiving water has been identified for all delineated basins in Table 1 and may be outside of City boundaries.
Total Drainage Basin Area	The total contributing basin area for the specified receiving water, regardless of jurisdiction. For the purposes of this assessment, the portion of the Lower Green River watershed that receives runoff from the City was delineated based on receiving water into the Lower Green River, Covington Creek, and Jenkins Creek drainage basins. The portion of the Middle Green River watershed that receives runoff from the City was delineated from within the Middle Green River watershed. A footnote has been included in Table 2 for the Lower and Middle Green River drainage basins to distinguish between the area total for the Lower and Middle Green River watersheds shown in Figure 1 and the delineated drainage basins used for this assessment shown in Figure 2.
Drainage Basin Area Within City	The total contributing basin area for the specified receiving water within City boundaries.
Percent of Total Drainage Basin Area Within City	The percentage of the Total Drainage Basin Area within City boundaries.
Percent of Total City Area Occupied by Drainage Basin	The percentage of the City encompassed by the Total Drainage Basin Area.

2.2 Receiving Water Drainage Basins

The results of the basin delineation (Step 1) have been summarized in Table 2. A map of the delineated basins is shown in Figure 2.

Table 2. Receiving Water Drainage Basins

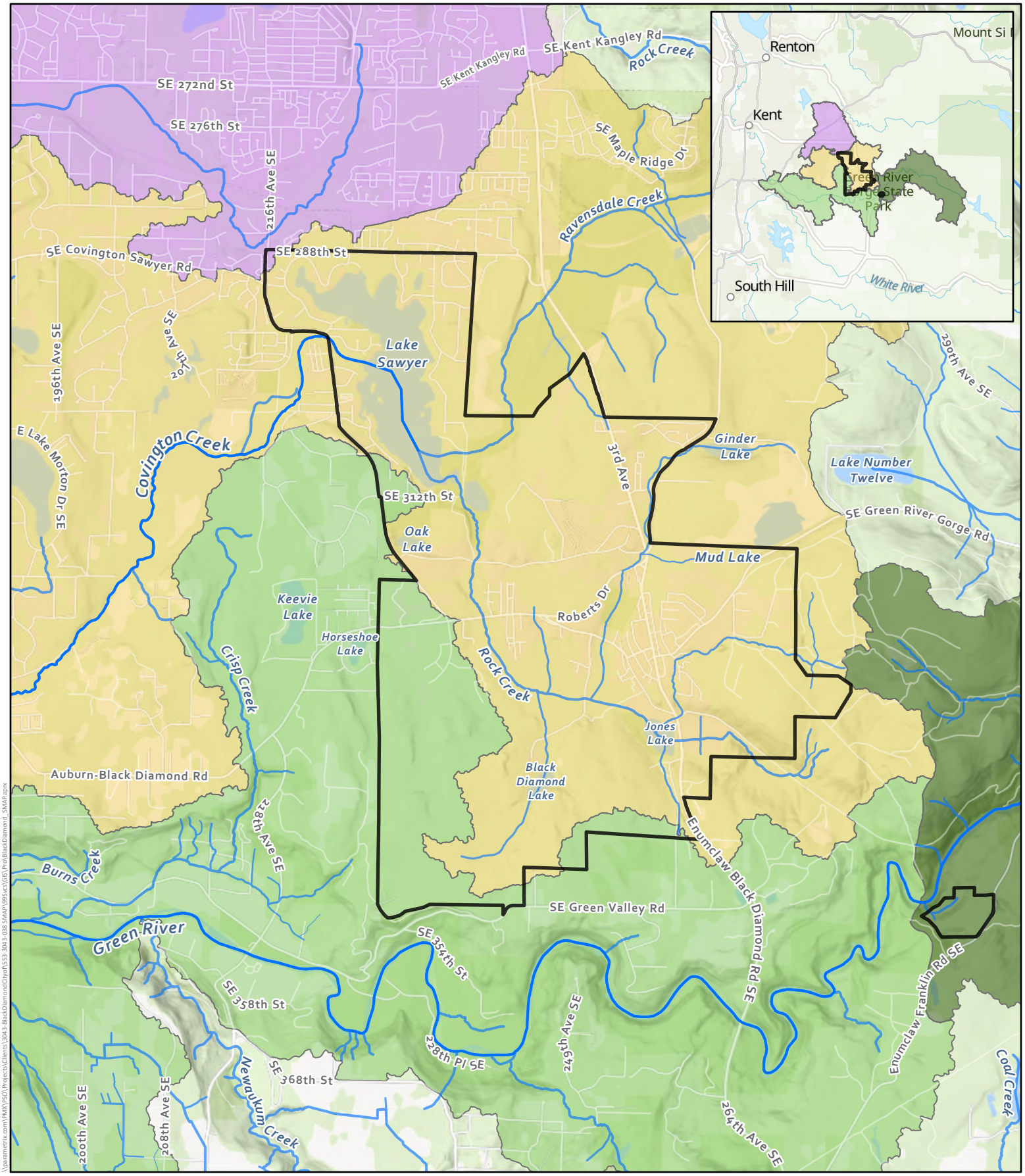
Receiving Water Drainage Basin	Receiving Water	Total Drainage Basin Area (square miles)	Drainage Basin Area Within City (square miles)	Percent (%) of Total Drainage Basin Area Within City	Percent (%) of Total City Area Occupied by Drainage Basin
Covington Creek	Covington Creek	22.4	5.9	26.2%	81.4%
Jenkins Creek	Jenkins Creek	16.5	0.0	0.0%	0.1%
Lower Green River	Lower Green River	31.7[a]	1.2	3.9%[b]	17.3%
Middle Green River	Middle Green River	27.1[c]	0.1	0.3%[d]	1.2%

[a] This refers to the Lower Green River drainage basin area delineated for use in this assessment, as shown in Figure 2. The Lower Green River drainage basin is a portion of the watershed by the same name, as shown in Figure 1. The total area of the Lower Green River watershed is 193 square miles.

[b] This refers to the Lower Green River drainage basin area delineated for use in this assessment, as shown in Figure 2. The Lower Green River drainage basin is a portion of the watershed by the same name, as shown in Figure 1. The total percent area of the Lower Green River watershed within City boundaries is 3.7 percent.

[c] This refers to the Middle Green River drainage basin area delineated for use in this assessment, as shown in Figure 2. The Middle Green River drainage basin is a portion of the watershed by the same name, as shown in Figure 1. The total area of the Middle Green River watershed is 137 square miles.

[d] This refers to the Middle Green River drainage basin area delineated for use in this assessment, as shown in Figure 2. The Middle Green River drainage basin is a portion of the watershed by the same name, as shown in Figure 1. The total percent area of the Middle Green River watershed within City boundaries is 0.3 percent.



Date: 2/23/2022
Sources: City of Black Diamond, King County, WA Ecology, WA DNR, USGS, ESRI
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Black Diamond City Limits
Stream

Receiving Water Basin
Covington Creek
Jenkins Creek
Lower Green River
Middle Green River

0 2,000 4,000 Feet

Figure 2 - Receiving Water Basins
Black Diamond SMAP
Receiving Water Assessment

Black Diamond, WA

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2.3 Individual Basin Descriptions

A summary of each basin organized by receiving water is presented below, while detailed information on basin characteristics is presented in Section 3.

2.3.1 Covington Creek

Covington Creek is one of three City receiving waters bounded by the Lower Green River watershed, as shown in Figure 1. The Creek is one of four main tributaries to Soos Creek, which ultimately discharges into the Green River (King County 2020). The Soos Creek system is an important biological network—several salmonid species have been observed spawning throughout, and the Soos Creek State Fish Hatchery, just upstream of the confluence with the Green River, has been in continuous operation since 1901 (King County 2000).

The Covington Creek drainage basin encompasses 5.86 square miles of the City, more than all of the other receiving water drainage basins combined. Current land use in the drainage basin is primarily forest and residential, though the basin contains industrial and commercial development as well. Most of the stormwater development (e.g., outfalls, pipes, culverts) identified by the City occurs within this basin. There are some areas with slopes greater than 40 percent, predominantly in the southern portion of the Covington Creek drainage basin. Areas prone to erosion hazard have also been identified by the City in this area.

Within the Covington Creek drainage basin lies Lake Sawyer, the fourth largest natural lake in King County at 286 acres (Black Diamond 2009). Lake Sawyer serves as a migratory pathway in late winter for Coho salmon on the way to spawning grounds in Ravensdale and Rock Creek (King County 2020). Other waterbodies within the basin include Ginder Lake, Ravensdale Lake, Jones Lake, and Black Diamond Lake, as well as several wetlands.

2.3.2 Jenkins Creek

Jenkins Creek is one of three City receiving waters bounded by the Lower Green River watershed, as shown in Figure 1. The creek is one of four main tributaries to Soos Creek, which ultimately discharges into the Green River (King County 2020).

The Jenkins Creek drainage basin lies predominantly northwest of the City boundary and only encompasses 0.01 square mile of the City. The area includes a portion of the residential area to the northwest of Lake Sawyer. Outside of the City, the Jenkins Creek drainage basin intersects with the City of Maple Valley and the City of Covington, where residential and commercial development is denser than within the City of Black Diamond. Lake Wilderness, Lake Lucerne, and Pipe Lake lie within the basin, as do several wetlands.

2.3.3 Lower Green River

The Duwamish/Green River is the largest freshwater component of Water Resources Inventory Area (WRIA) 9 and is bounded by the Duwamish subbasin. The portion of the City within the Duwamish subbasin lies in the Lower Green and Middle Green River watersheds, as shown in Figure 1. The Lower Green River watershed encompasses the Lower Green River, Covington Creek, and Jenkins Creek. For the purposes of this assessment, the Lower Green River drainage basin refers to the delineated area shown in Figure 2 and, as a result, does not include the area contributing to Covington or Jenkins Creeks because they were identified as separate receiving waters.

The Green River has headwaters in the Cascade Mountains and flows 93 miles, meandering just 2 miles South of the City boundary before ultimately ending in the Duwamish Waterway. The waterway is an important spawning, rearing, and migration corridor for several salmonid species (Ecology 2011a).

Lower Green River, as defined by the extent of the HUC 8 watershed shown in Figure 1, begins in Green River Gorge State Park and extends to the confluence with the Black River in Tukwila. A steep descent separates the City from the Lower Green River, with a maximum slope of 55 percent (Black Diamond 2009). The region along the river has been identified as an area with potential landslide and erosion hazards (King County 2019).

The drainage basin contributes runoff from the City to the Lower Green River indirectly by way of several tributaries, including Crisp Creek. Within the City, land cover is predominantly forest canopy, apart from the Ten Trails neighborhood just east of Horseshoe Lake.

2.3.4 Middle Green River

As previously mentioned for the Lower Green River drainage basin, the portion of the City within the Duwamish subbasin lies in the Lower Green and Middle Green River watersheds, as shown in Figure 1. For the purposes of this assessment, the Middle Green River drainage basin refers to the delineated area shown in Figure 2, which is more comparable in size to the other receiving water basins than the Middle Green watershed shown in Figure 1.

Middle Green River, as defined by the extent of the HUC 8 watershed shown in Figure 1, begins upstream from the Howard A. Hanson Dam around Maywood and extends to Green River Gorge State Park. The region along the river has been identified as an area with potential landslide and erosion hazards (King County 2019).

The drainage basin only encompasses the small portion of the City that lies south of the Green River near Green River Gorge State Park. The City area bounded by the drainage basin is entirely forested with a small tributary to the Middle Green river and a wetland.

3. CONDITION ASSESSMENT (STEP 2)

3.1 Methodology

To best understand the existing condition of the City's receiving waters, water quality was assessed independently of the watershed. After collecting the data for each receiving water, a broad understanding of level of impairment can be associated with each contributing drainage area and used as an element in guiding which basins should be considered for prioritization. Higher prioritization may be given to those receiving waters with low to moderate signs of impairment, per Ecology's prioritization guidance (Ecology 2019). The data sources used for the existing condition assessment of the identified receiving waters are outlined in Table 3 below.

Table 3. Receiving Water Condition Assessment Data

Data Type	Source	Last Updated	Description of Assessment
Water Quality			
Designated Uses	Chapter 173-201A Washington Administrative Code (WAC Parts IV and II, respectively); Ecology Publication 06-10-038[a]	2021; 2011	Designated uses for receiving waters were identified, allowable thresholds for pollutant concentrations were recorded, receiving waters with supplemental spawning and incubation protections within the City were identified and mapped accordingly.

Table 3. Receiving Water Condition Assessment Data (continued)

Data Type	Source	Last Updated	Description of Assessment
Water Quality Conditions	King County Water Quality Index (WQI)[b]	Water Year 2020	Reviewed WQI scores of receiving waters at available King County WQI program monitoring stations in or near City boundaries.
	Ecology Washington State Water Quality Assessment 303(d) Candidate List and Water Quality Atlas[d]	2018	Receiving water impairments were identified and summarized in a water quality table and interactive web map.
	Ecology Directory of Water Quality Improvement Projects[e]	1993, 2011, 2017	Collected and reviewed watershed specific total maximum daily load (TMDL) studies and water quality improvement projects for receiving waters relevant to the study area.
Biological Condition	Puget Sound Stream Benthos[f]	1995–2021	Collected available data related to biological condition from the Benthic Index of Biotic Integrity (B-IBI), developed by a coalition led by King County, which assesses overall biological condition.
Watershed Condition			
Land Cover	King County GIS	2016-2022	A land cover layer was generated using 2016 Lidar, 2019 NAIP 4-band imagery, King County buffered road centerlines, and open street map building footprints.
Buildable and Vacant Lands	Information to be built based on tax lot vacant status, building dates, and zoning in the prioritization step.	TBD	City vacant and buildable lands information to be used in prioritization.
Watershed Characterization	Puget Sound Watershed Characterization Model (PSWCM)[g]	2016	Used the Ecology PSWCM interactive mapping tool to score receiving water basins within the City and their associated watersheds for the ecological value of water flow, water quality, and fish and wildlife habitat using the model.
Public Health and the Environment	EJSCREEN Tool – Demographic Index (U.S. Census Bureau Estimates)[h]	2014–2018	The Combined Equity Index was created by combining Environmental Justice Screening and Mapping Tool (EJSCREEN Tool) Demographic and Environmental Hazards Indices with the Environmental Opportunity Index developed by Parametrix.
	EJSCREEN Tool – Environmental Hazards Index (informed by a combination of collected data and various Environmental Protection Agency (EPA) models, studies and regulations)[i]	2006–2019	
	Environmental Opportunity Index – based on land cover data, including tree canopy, parks, open spaces, and golf courses	2016-2022	

Sources: [a] Ecology 2011; [b] King County 2020; [c] Ecology 2022; [d] Ecology 2018; [e] Ecology 2021; [f] King County 2021; [g] Ecology 2016b; [h] U.S. Census Bureau 2020; [i] EPA 2019

3.2 Water Quality

Water quality for the City's receiving waters is summarized in Table 4 and discussed in the following sections.

3.2.1 Designated Uses

Ecology has defined four groups of designated uses for surface water within the state of Washington. Designated uses for City receiving waters are listed in in Table 4. Water quality criteria have been identified, and thresholds for the relative condition of Washington's water bodies have been set for each designated use. Appendix A provides additional information regarding the designated uses and applicable thresholds for Washington's surface waters per WAC 173-201A-200 as well as the City's

receiving waters and assigned uses identified in Table 602 of WAC 173-201A-600. In addition, receiving waters were compared to the maps from Ecology Publication 06-10-038 (Ecology 2011b) to determine where additional supplemental spawning standards have been set. Maps indicating waterbodies with additional supplemental spawning standards have been included in Appendix A.

3.2.2 Water Quality Index

The Water Quality Index (WQI) is a score generated by King County using a unitless number ranging from 10 to 100. The index expresses modeled results for temperature, pH, fecal coliform, bacteria, and dissolved oxygen relative to the levels required to maintain uses according to the criteria specified in WAC 173-201A. For nutrient and sediment measures, where standards are not specified, results are specified relative to expected conditions in each ecoregion. Multiple constituents are then combined and aggregated over periods of time to produce scores for each sampling station, where data is collected (King County 2020).

3.2.3 State Water Quality Assessment

3.2.3.1 Assessment

The federal Clean Water Act requires states to perform a water quality assessment every 2 years to track the health of surface waters such as rivers, lakes, and marine water bodies, with a long-term goal of restoring their water bodies to be "fishable and swimmable." The assessed water bodies are placed into categories that describe water quality.

For the purposes of this data summary, only waters in Categories 4 and 5 have been considered in assessing the City's receiving water impairments. Category 4 impairments are not part of the 303(d) list; while they are still impaired, they do not require a state total maximum daily load (TMDL) for the following reasons: impairments in the 4A category have an Environmental Protection Agency (EPA)-approved TMDL; those in the 4B category have a pollution control program that is being actively implemented by a local, state, or federal program or strategy; and those in the 4C category have impairments caused by a type of pollution that cannot be addressed effectively through implementation of a TMDL. Category 5 can be defined as water bodies whose designated uses (such as for drinking, recreation, aquatic habitat, and industrial use) are impaired by a pollutant and require the development of a water quality improvement project to address the pollution. All waters in these categories have persistently failed to meet applicable water quality standards for their impaired parameter(s) (Ecology 2020).

3.2.3.2 303(d) List

The 303(d) list, guided by federal laws, state water quality standards, and Ecology's Water Quality Assessment Policy 1-11 identifies water bodies in the polluted water Category 5. Ecology's 2018 Water Quality Assessment identifies water quality impairments in the receiving water basins (Ecology 2018). The known impairments have been summarized in Table 4, presented in Figure 3, and the full analysis of the available data can be found in Appendix A.

3.2.3.3 Total Maximum Daily Load (TMDL)

The TMDL is a plan for cleaning up polluted waters to meet state water quality standards. The federal Clean Water Act requires states to develop water quality improvement projects known as TMDLs for Category 5 impaired waterbodies identified on the 303(d) list. A TMDL plan begins with determination of the highest amount of pollutant loading that a surface water body can receive and still meet water

quality standards, followed by monitoring and analysis. Monitoring helps identify sources and amounts of pollutants causing water quality issues, and the technical analysis determines the pollution reduction measures necessary to protect each waterbody (Ecology 2020). Once EPA approves a TMDL, the plan is implemented, and the monitoring process provides data to reflect the status of a water body's health. When water quality standards are met, the assessment status is changed to Category 1: Meets tested standards for clean waters. Any known TMDLs associated with a 303(d)-listed water quality impairment that has been identified in one of the City's receiving water basins have been summarized in Table 4.

3.2.4 Biological Condition

The Puget Sound Stream Benthos, a data repository and analysis tool indicating biological health of streams throughout the Puget Sound, was used to aid in the assessment of the biologic condition of the City's receiving waters. The stream benthos indicates the region in or near a streambed. Benthic macroinvertebrates, animals that live within the stream benthos, are crucial to the stream ecosystem and are good indicators of the overall health of a stream. The tool uses benthic macroinvertebrate data to assess stream ecological health. A decline in stream biodiversity can be indicative of altered flow regimes; changes in runoff constituents; organism exposure to flashier hydrographs; elevated levels of contaminants and nutrients; or altered channel stability and morphology (King County 2015).

The database uses the Puget Sound Lowlands Benthic Index of Biotic Integrity (B-IBI) scoring system to assess the relative health of a stream. The overall B-IBI score used in this analysis is the summation of 10 metrics related to the taxa richness of various indicator macroinvertebrates within the stream. Each metric is assigned a score of 1 to 10, and the overall B-IBI score ranges from 1 to 100. A high score is representative of a stream in excellent biological condition, and a low score is a stream in very poor biological condition (King County 2015). Table 4 summarizes available data on the biological condition of monitored streams, and a full description of parameters and scoring elements has been provided with the water quality data included in Appendix A.

Table 4. Receiving Water Quality Data Summary

Receiving Water	Designated Uses (173-201A WAC)	King County WQI Score[a]	Water Quality Assessment Listings[b]			Benthic Index of Biotic Integrity (B-IBI)		
			Category	WQ Parameter	TMDLs in the Basin	Stream Name (Site ID)	Overall Score	Biological Condition
Covington Creek	Aquatic Life Uses • Core summer salmonid habitat Recreational Uses • Primary contact recreation Water Supply Uses • Domestic, industrial, agricultural, and livestock Miscellaneous Uses • Wildlife habitat, harvesting, commerce/navigation, boating, and aesthetics	Good (84)[c] Good (92) Poor (19)	5[c]	Bacteria (fecal coliform)	Soos Creek Subbasin Multiparameter TMDL (in development) Sawyer Lake TMDL for Phosphorus (1993)	Covington Creek (2002)[c]	20.0	Poor
			5	Bioassessment (B-IBI)		Covington Creek (221)[c]	50.5	Fair
			5	Dissolved Oxygen		Covington Creek (220)	74.5	Good
			5	Temperature		Covington Creek (287)[g]	77.9	Good
			5[d]	Various Tissue-Medium Parameters		Rock Creek Tributary (223)[g]	56.8	Fair
			4A[e]	Total Phosphorus		Rock Creek Tributary (222)	67.3	Good
			4C[f]	Invasive Exotic Species		Rock Creek (219)	37.9	Poor
						Covington Creek (218)[c]	66.4	Good
						Ginder Creek (288)[c,h]	59.2	Fair
						Covington Creek (1987)[c,h]	78.2	Good
						Covington Creek (289)[c]	68.7	Good
						Covington Creek (1929)[c]	72.2	Good
						Covington Creek (1998)[c,i]	88.5	Excellent
						Soos Creek (1619)[c,i]	71.4	Good
						Soos Creek (1620)[c,h]	86.9	Excellent
						Covington Creek (217)[c,i]	69.3	Good
						Covington Creek (2023)[c,i]	72.0	Good
Jenkins Creek	Aquatic Life Uses • Core summer salmonid habitat Recreational Uses • Primary contact recreation Water Supply Uses • Domestic, industrial, agricultural, and livestock Miscellaneous Uses • Wildlife habitat, harvesting, commerce/navigation, boating, and aesthetics	Good (89)[c]	5[c]	Bioassessment (B-IBI)	Soos Creek Subbasin Multiparameter TMDL (in development)	Jenkins Creek (1935)[c]	47.9	Fair
			5[c]	Temperature		Jenkins Creek (236)[c]	62.4	Good
			4C[c,f]	Invasive Exotic Species		Jenkins Creek (235)[c]	63.6	Good
						Jenkins Creek (234)[c]	84.4	Excellent
						Jenkins Creek (1931)[c]	54.9	Fair
						Jenkins Creek (1989)[c]	90.5	Excellent
						Jenkins Creek (308)[c]	39.1	Poor
						Jenkins Creek (1935)[c]	47.9	Fair

Table 4. Receiving Water Quality Data Summary (continued)

Receiving Water	Designated Uses (173-201A WAC)	King County WQI Score[a]	Water Quality Assessment Listings[b]			Benthic Index of Biotic Integrity (B-IBI)		
			Category	WQ Parameter	TMDLs in the Basin	Stream Name (Site ID)	Overall Score	Biological Condition
Lower Green River	Aquatic Life Uses • Core summer salmonid habitat Recreational Uses • Primary contact recreation Water Supply Uses • Domestic, industrial, agricultural, and livestock Miscellaneous Uses • Wildlife habitat, harvesting, commerce/navigation, boating, and aesthetics	Good (96)[c] Moderate (62)[c] Good (87)[c] Moderate (64)[c]	5[c]	Bioassessment (B-IBI)	Green River Temperature TMDL (2011)	Icy Creek (248)[c]	75.9	Good
			5[c]	Dissolved Oxygen		Cristy Creek (247)[c]	61.9	Good
			5[c,e]	Total Phosphorus		Cristy Creek (246)[c]	61.8	Good
			4A[c]	Temperature		Green River – Middle Tributary (245)[c]	12.6	Very Poor
						Green River (1986)[c]	60.9	Good
						Crisp Creek Tributary (244)[c]	38.2	Poor
						Crisp Creek (1965)[c,j]	30.5	Poor
						Crisp Creek (243)[c,j]	34.1	Poor
						O'Grady Creek (242)[c]	71.4	Good
Middle Green River	Aquatic Life Uses • Core summer salmonid habitat Recreational Uses • Primary contact recreation Water Supply Uses • Industrial, agricultural, and livestock Miscellaneous • Wildlife habitat, harvesting, commerce/navigation, boating, and aesthetics	No Data	5[c]	Dissolved Oxygen	Green River Temperature TMDL (2011)	Green River – Middle Tributary (249)[c]	87.5	Excellent
			4A[c]	Temperature		Green River – Middle Tributary (323)[c]	64.1	Good

[a] WQI scores and status: **poor** (40 and below) – does not meet expectations, highest concern; **moderate** (40 to 80) – of moderate concern; **good** (80 and above) – meets expectations, lowest concern (King County 2020). The WQI was developed to score water quality for streams and rivers using stream monitoring gauge data. The Middle Green River did not have a King County WQI scored station in its drainage basin, so it has been listed as having no data for this parameter.

[b] Includes all tributaries in the delineated receiving water basin. If a receiving water had several impairments for the same parameter, it was combined into one row for presentation in Table 4.

[c] At least one impairment for the parameter listed or monitoring station for WQI or B-IBI is entirely outside of City boundaries.

[d] The Covington Creek drainage basin had the following impairments for parameters assessed using tissue data from Lake Sawyer: 2,3,7,8-TCDD (Dioxin) and polychlorinated biphenyls (PCBs). These listings are noted for reference and included in Appendix A but are not discussed further nor shown in Figure 3. The focus of this section was the assessment of water quality, specifically with regards to impairments for bacteria, dissolved oxygen, pH, temperature, and bioassessment.

[e] The following lakes were assessed as impaired for Total Phosphorus: Lake Sawyer and Horseshoe Lake. These listings are noted for reference and included in Appendix A but are not discussed further nor labeled in Figure 3. The focus of this section was the assessment of water quality, specifically with regards to impairments for bacteria, dissolved oxygen, pH, temperature, and bioassessment.

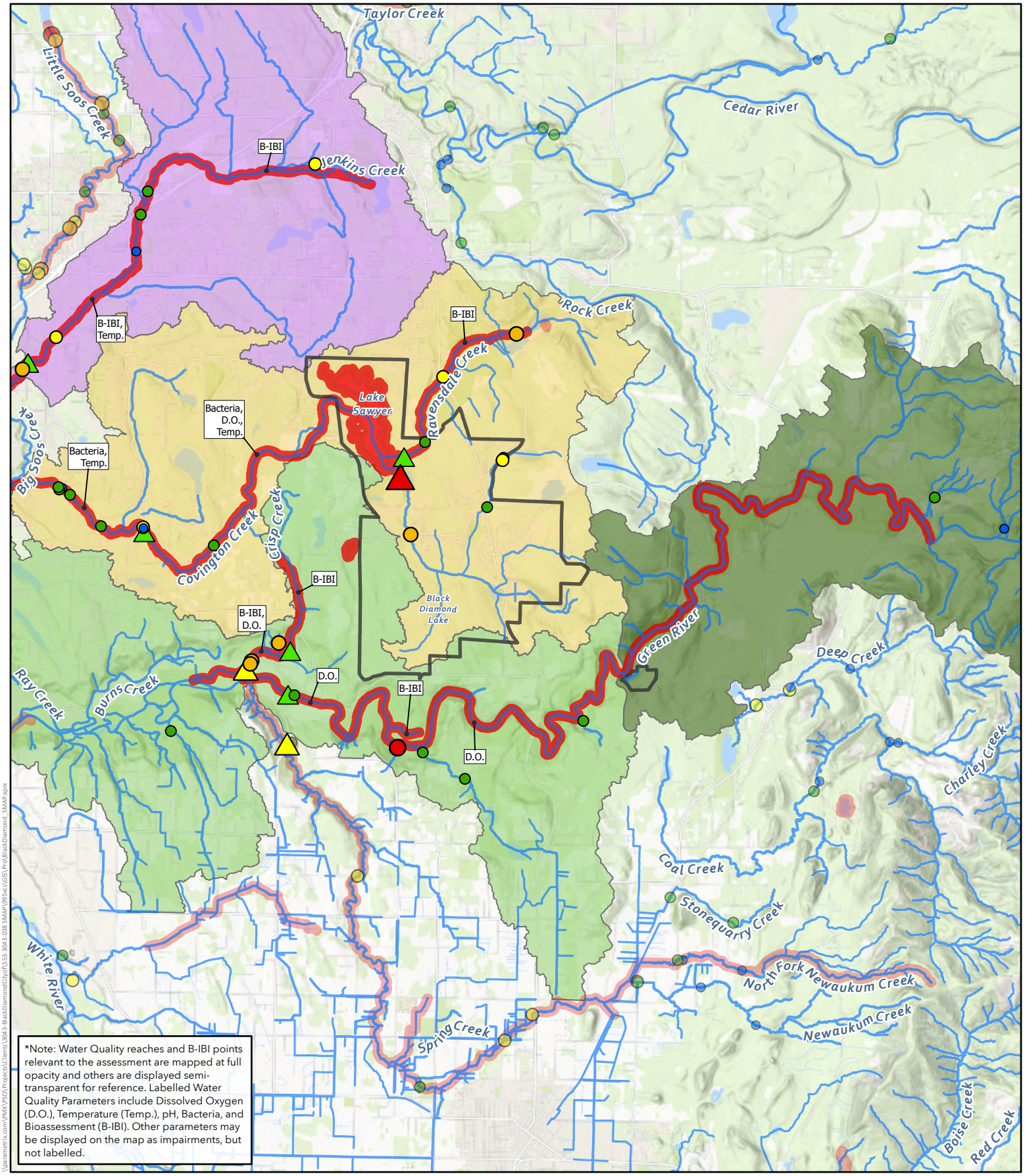
[f] The following lakes were assessed as impaired using habitat as a medium for invasive exotic species: Lake Sawyer, Pipe Lake, and Wilderness Lake. These listings are noted for reference and included in Appendix A but are not discussed further nor labeled in Figure 3. The focus of this section was the assessment of water quality, specifically with regards to impairments for bacteria, dissolved oxygen, pH, temperature, and bioassessment.

[g] Monitoring site 287 is obscured by monitoring site 223 in Figure 3 because these B-IBI monitoring stations are within close proximity to one another.

[h] Monitoring sites 288 and 1987 are obscured by monitoring site 1620 in Figure 3 because these B-IBI monitoring stations are within close proximity to one another.

[i] Monitoring site 1998 is obscured by monitoring sites 217, 2023, and 1619 in Figure 3 because these B-IBI monitoring stations are within close proximity to one another.

[j] Monitoring site 1965 is obscured by monitoring site 243 in Figure 3 because these B-IBI monitoring stations are within close proximity to one another.



Date: 3/9/2022
Sources: City of Black Diamond, Puget Sound Stream Benthos, King County, Port of Seattle, WA Ecology, WA DNR, USGS, ESRI
Disclaimer: This product is for informational purposes and may not have been prepared for, or be suitable for legal, engineering, or surveying purposes.

Streams
City Limits
303D Impaired Waters
*Water Quality
Sediment

B-IBI Biotic Integrity
0-20 (Very Poor)
20-40 (Poor)
40-60 (Fair)
60-80 (Good)
80-100 (Excellent)

Water Quality Index
Good
Moderate
Poor

Receiving Water Basin
Covington Creek
Jenkins Creek
Lower Green River
Middle Green River

0 1 2 Miles

Figure 3 - Water Quality
Black Diamond SMAP
Receiving Water Assessment

Black Diamond, WA

3.3 Watershed Condition

The condition of each drainage basin was assessed separately to help explain the results of the water quality assessment and predict how future development may factor into the condition of the receiving waters. As part of the prioritization task, the drainage basins will need to be evaluated for retrofit suitability and, within each basin, areas that necessitate water quality management actions—including conservation, protection, and restoration—will need to be identified. Assessing the watershed condition of each basin can thus begin to inform the appropriateness for carrying a drainage basin on for prioritization.

The following sources were used to assess the watershed condition for each basin.

3.3.1 Land Cover

The City provided a land cover layer that was updated using Lidar survey performed in 2016 and reformatting it into the land cover categories that will be needed for the analysis performed for prioritization. A preliminary map has been generated that displays the existing land cover and is presented in Figure 4.

3.3.2 Buildable and Vacant Lands

The City provided information for the buildable and vacant lands that will be used in the next phase of the SMAP analysis. In the upcoming prioritization process, the latest draft version of available data will be used in the analysis to forecast areas of projected or targeted growth, score and rank sub-catchments, and evaluate impacts to the watershed.

3.3.3 Puget Sound Watershed Characterization Model

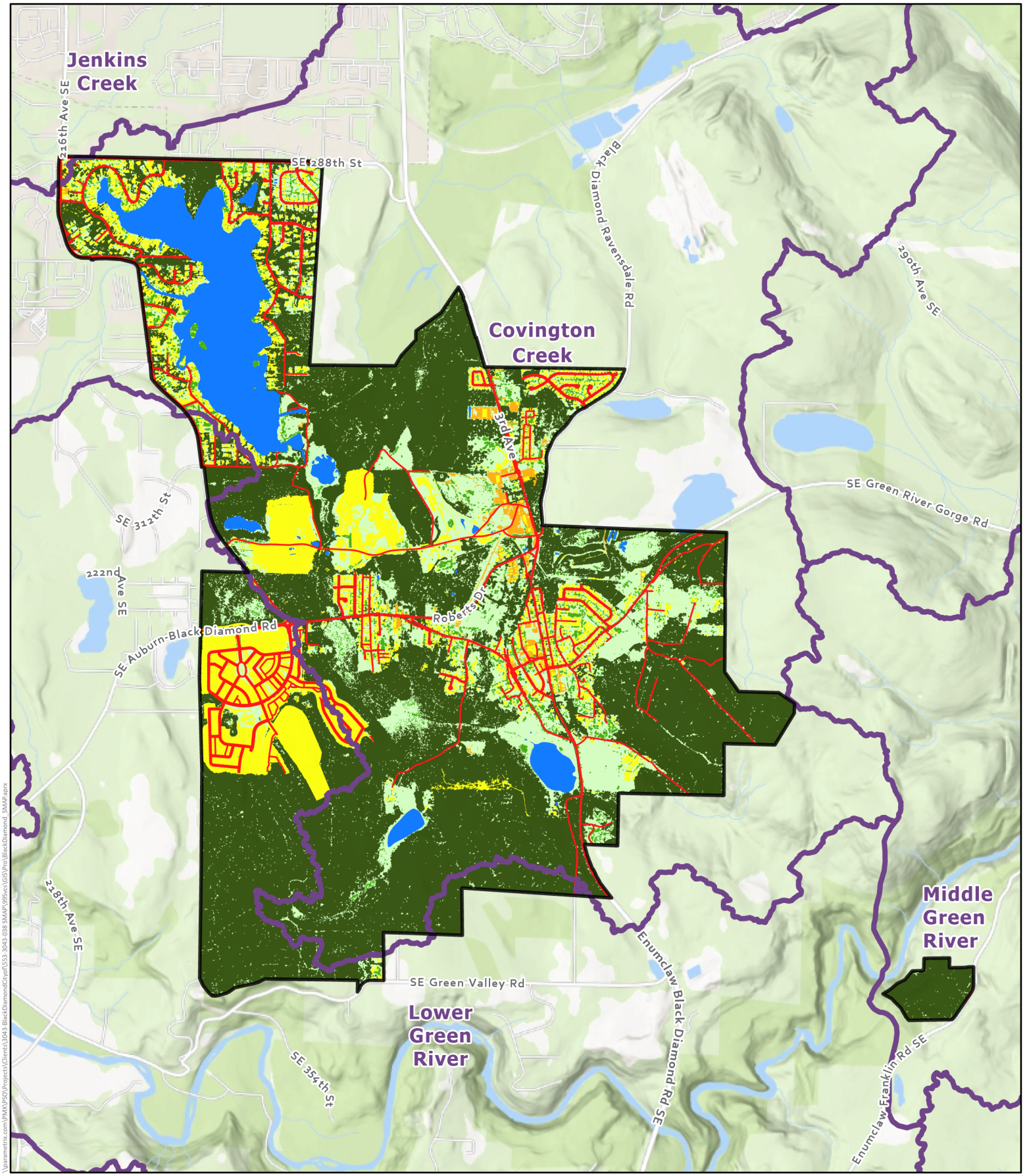
Ecology has developed a mapping tool, the Puget Sound Watershed Characterization Model (PSWCM), that can be used to support stormwater management planning. The PSWCM includes different categories for water flow, water quality, and fish and wildlife habitats. The PSWCM provides color-coded maps that show the restoration and protection value of small watersheds and marine shorelines in the Puget Sound Basin, also known as assessment units (AUs), by comparing factors based on the assessed importance of flow, water quality, and habitat processes in sub-models. The relative value is determined by the potential importance of the area to ecological processes or values, such as water delivery, sediment delivery, or habitat/species conservation. Scores ranged from 1 to 16, where a score of 16 would be representative of a basin with high potential importance to ecological processes or values, and a score of 1 would be representative of a basin with low potential importance (Ecology 2016a and 2016b).

The overall scores for the City were determined by summing the scores for the selected ecological processes or values, which were weighted by a sub-model to match updated City basins. For the basin area within City boundaries, the model AUs were clipped to the City boundary and summed according to their relative contribution. The same process was used to find scores for the watersheds, clipping according to the watershed boundaries delineated by King County (King County 2018). The PSWCM and City results are presented in Table 5 and Figures 5 and 6. The methodology of how the model weighted and summed the sub-model inputs for water flow, water quality, and fish and wildlife habitat components—as well as the full description of model parameters, inputs, calculations, maps, and results—are presented in are detailed in Appendix B.

Table 5. Puget Sound Watershed Characterization Model Scoring

Basin Name	Basin Area Within City Boundary (square miles)	Overall Score Within City Boundary	Total Drainage Basin Area (square miles)	Overall Score of Total Drainage Basin
Covington Creek	5.86	11.41	22.35	11.39
Jenkins Creek	0.01	10.06	16.45	10.52
Lower Green River	1.24	11.70	31.71	11.17
Middle Green River	0.09	9.00	27.06	9.36

Note: Scoring summations would be translated to quartiles as follows: High – 16; Moderate-high – 12; Moderate – 8; and Low – 4.



Date: 3/1/2022
Sources: City of Black Diamond, King County, WA Ecology, WA DNR, USGS, ESRI
Disclaimer: This product is for informational purposes and may not have been prepared for, or be suitable for legal, engineering, or surveying purposes.

City Limits
Receiving Water Basin

Road
Parking
NPGIS
Water

Grass/Landscape
Tree
Forest Canopy

Figure 4 - Land Cover
Black Diamond SMAP
Receiving Water Assessment

0 2,000 4,000 Feet

Black Diamond, WA

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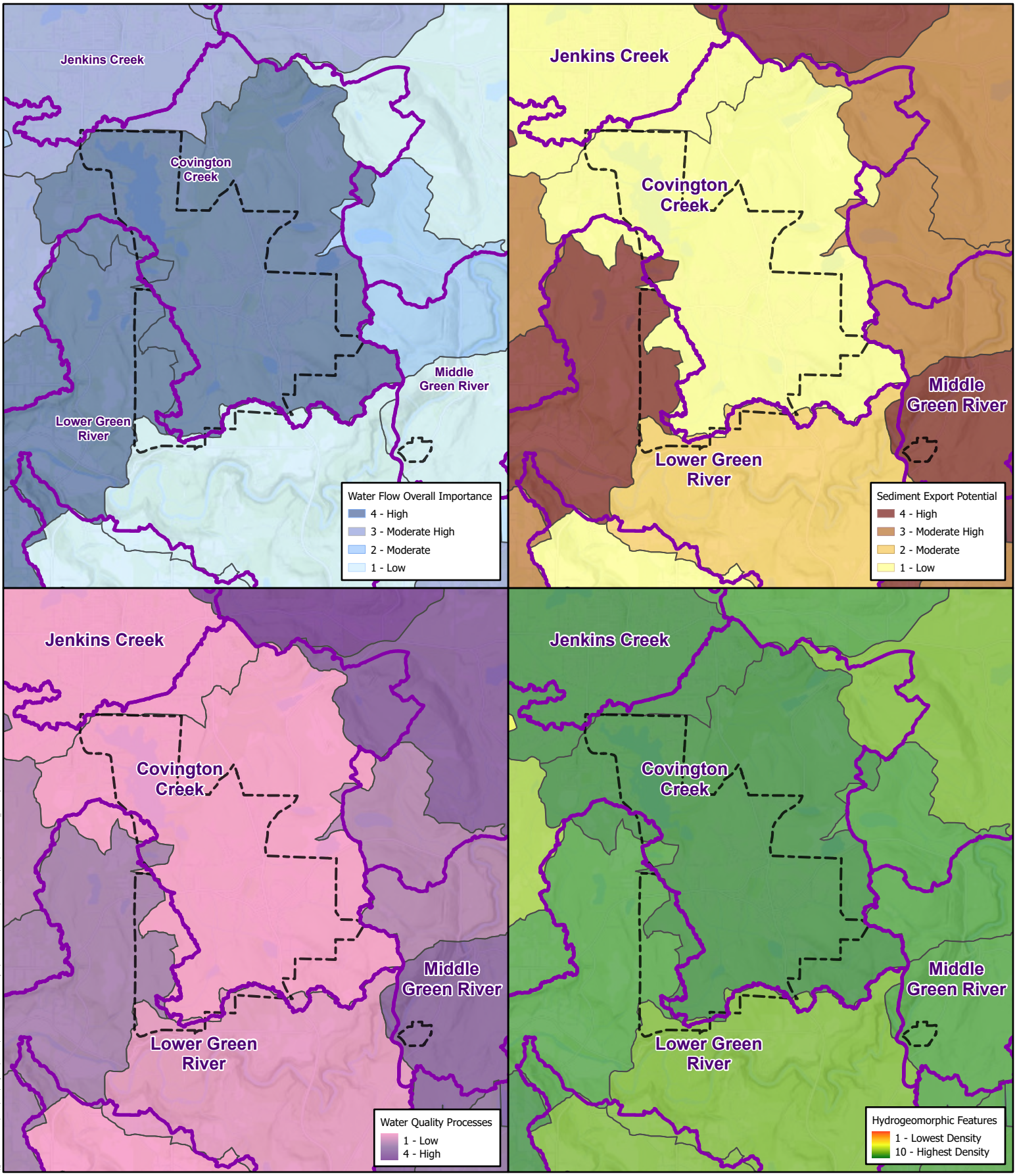

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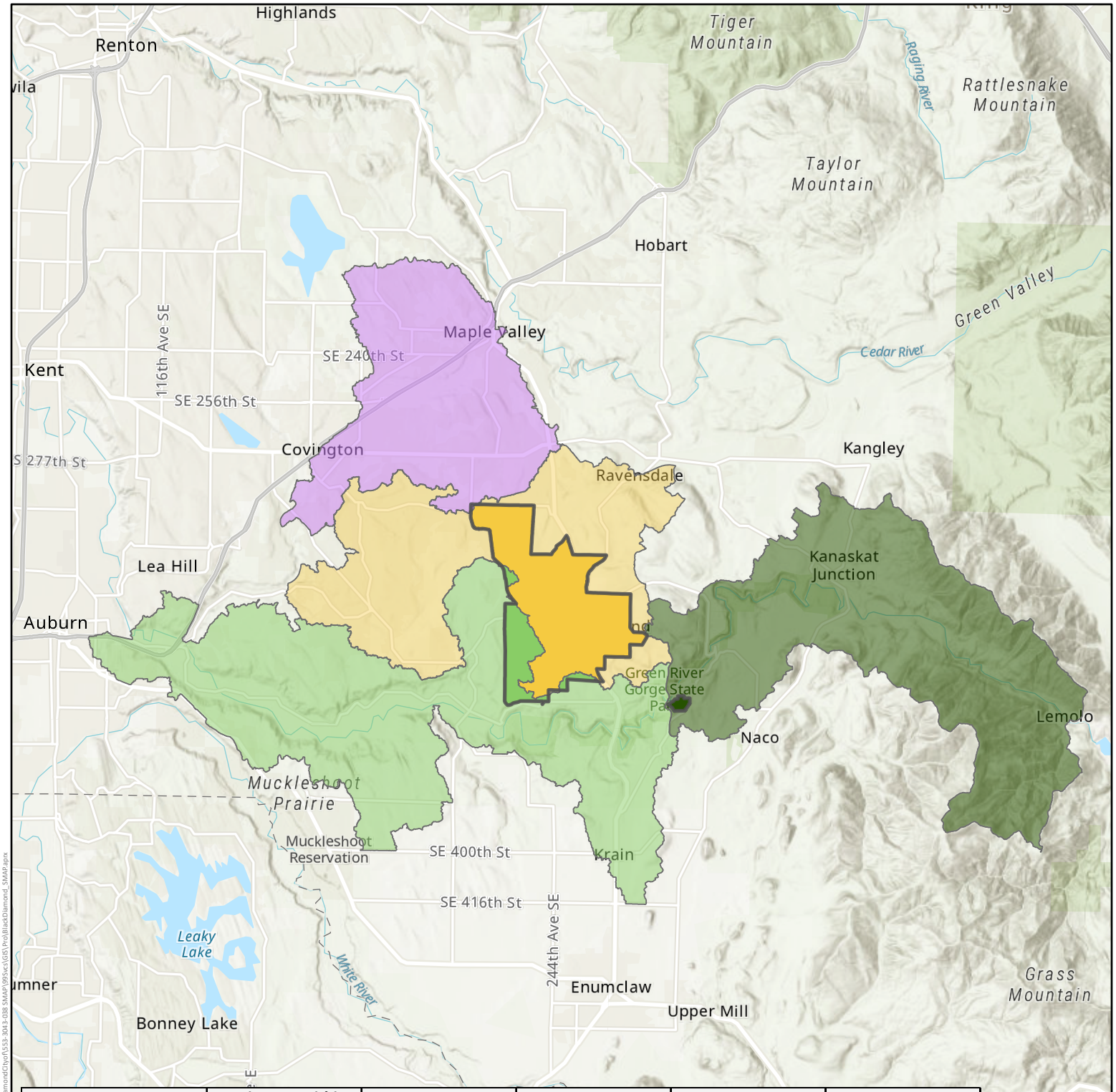
Date: 2/24/2022
Sources: Black Diamond, WA Ecology, WA DNR, USGS, ESRI
Disclaimer: This product is for informational purposes and may not have been prepared for, or be suitable for legal, engineering, or surveying purposes.

Receiving Water Basin
PSWCM Boundaries
Black Diamond City Limits

Figure 5 - Puget Sound Watershed Characterization Sub-Model Inputs
Black Diamond SMAP
Receiving Water Assessment

0 0.5 1 2 Miles

Black Diamond, WA



Basin Name	Basin Area within City Boundary (Square Miles)	Overall Score within City Boundary	Total Watershed Area (Square Miles)	Overall Score of Watershed	Percent contribution to watershed
Jenkins Creek	0.01	10.06	16.45	10.52	0.05%
Middle Green River	0.09	9.00	27.06	9.36	0.32%
Covington Creek	5.86	11.41	22.35	11.39	26.22%
Lower Green River	1.24	11.70	31.71	11.17	3.92%

Date: 2/24/2022
Sources: Black Diamond, King County, Pierce County, WA Ecology, WA DNR, USGS, ESRI
Disclaimer: This product is for informational purposes and may not have been prepared for, or be suitable for legal, engineering, or surveying purposes.

Black Diamond City Limits

0 0.5 1 2 Miles

Figure 6 - Puget Sound Watershed Characterization Model Output Summary
Black Diamond SMAP
Receiving Water Assessment

Black Diamond, WA

3.4 Public Health and the Environment

3.4.1 Environmental Justice Screening and Mapping Tool

The EPA has developed a web-based tool known as the Environmental Justice Screening and Mapping Tool (EJSCREEN Tool) (EPA 2019) that uses national data to support a wide range of research and policy goals. The EJSCREEN Tool supports these goals by informing an understanding of where the impacts of existing pollution may be the greatest by filing certain data gaps to ensure these areas are not overlooked so they may receive appropriate consideration, analysis, and outreach when policies are developed to protect and improve public health and the environment in an equitable way. EJSCREEN puts each indicator or index value in perspective by reporting the value as a percentile. The indicators listed in Table 6 were selected from the EJSCREEN Tool to be analyzed during prioritization because they are related to the management of surface water and stormwater resources.

Table 6. EJSCREEN Tool Indicators

Demographic Index Indicators[a]	Environmental Index Indicators[b]
Low Income	NATA Air Toxics Cancer Risk
Minority	NATA Respiratory Hazard Index
Individuals Over the Age 25 with Less Than a High School Education	NATA Diesel PM
	Particulate Matter
Individuals in Linguistic Isolation	Ozone
Individuals Under Age 5	Traffic Proximity and Volume
Individuals Over Age 64	Proximity to Risk Management Plan Sites
	Proximity to Treatment, Storage, or Disposal Facilities for Hazardous Waste
	Proximity to National Priorities List Sites
	Wastewater Discharge
	Lead Paint Indicator

[a] U.S. Census Bureau 2020
[b] EPA 2019

3.4.2 The Environmental Opportunity Index

The Environmental Opportunity Index was developed to complement the indices sourced from the EJSCREEN tool to create a single Combined Equity Index score. This Index was developed by scoring canopy cover and park/open space access using GIS data and joining it to the existing block groups to identify areas with the greatest need or areas that could benefit the most from gaining greater access to these resources. In this Index, areas with the lowest canopy cover or the least access to parks or open spaces would be identified as having the highest need.

3.4.3 The Combined Equity Index

The equity layer, or the Combined Equity Index, was developed by averaging the scores from the EJSCREEN Demographic Index, EJSCREEN Environmental Hazard Index, and an Environmental Opportunity Index prepared for this analysis. The weighting of the indicators for each index is equal in the preliminary analysis but will be adjusted in the prioritization phase through public engagement and stakeholder inputs to the process to meet the specific identified needs. A summary of the three input indices and the resulting Combined Equity Index Score is presented in Table 7 and Figure 7, and a full description the inputs and preliminary scores it generated are provided in Appendix C.

Table 7. Environmental Justice and Opportunity Index Scores

Basin Name	Demographic Index Score	Environmental Hazard Index Score	Environmental Opportunity Index Score	Combined Equity Index Score
Covington Creek	33.1	35.8	67.4	45.4
Jenkins Creek	41.2	39.8	68.0	49.7
Lower Green River	37.7	33.4	65.1	45.4

Note: The Middle Green River basin was not analyzed because it does not have any development; therefore, it has no demographics, no opportunity for the City to retrofit municipal separate storm sewer systems, and no opportunity to improve community access to parks and open spaces.

In general, a basin with a higher demographic index score is indicative of a basin with a higher population of individuals that identify with the indicators listed in Table 6. A basin with a high environmental index score is indicative of a basin with higher potential exposure to environmental pollutants. As previously discussed, a basin with a high environmental opportunity index score is indicative of an area with the highest need for additional canopy cover and more parks/open space access. A high combined equity score is reflective of high component scores and could be used to identify basins where environmental justice efforts may be most beneficial.

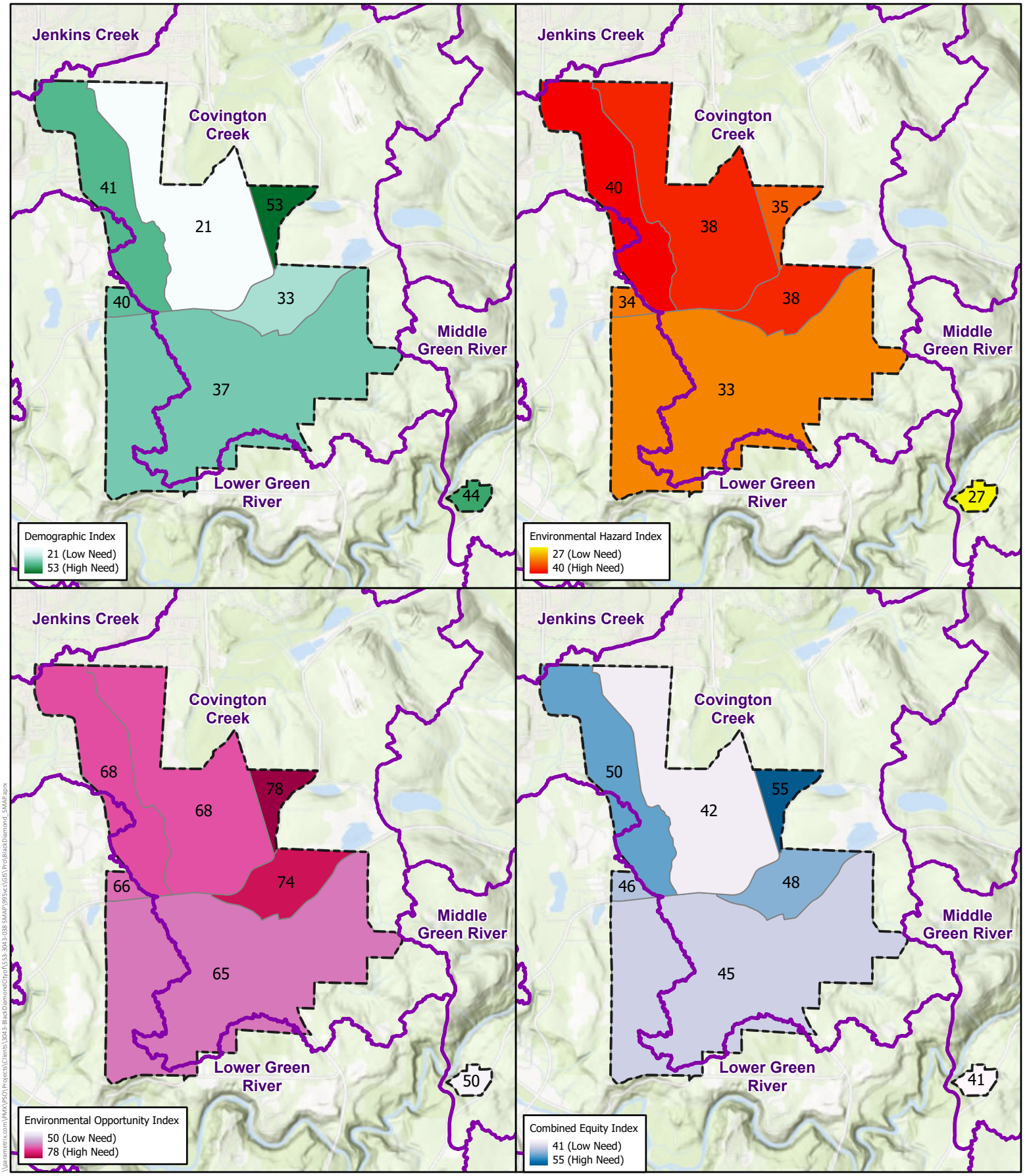
4. STORMWATER MANAGEMENT INFLUENCE (STEP 3)

The previous sections delineated the affected receiving waters in the City and provided key aspects regarding existing conditions of the waters. This section addresses some of the potential watershed actions and factors that could influence those receiving water conditions and begins to outline some of the measures and approaches that can be applied to address or minimize those watershed influences.

Three questions are considered in this section.

1. What are the major flow or pollutant impacts expected to be contributed by each basin in the City, and how might they be expected to change?
2. Are there approaches, other than direct stormwater treatment or controls, that could serve to limit impacts?
3. Can growth be managed to minimize adverse stormwater impacts?

The following sections provide a discussion of approaches that can be considered in the SMAP to evaluate and address existing conditions and potential measures to be considered to control the activities most responsible for receiving water degradation.



Date: 3/1/2022
Sources: EPA (EJ Screen), City of Black Diamon, WA Ecology, WA DNR, USGS, ESRI
Disclaimer: This product is for informational purposes and may not have been prepared for, or be suitable for legal, engineering, or surveying purposes.

Receiving Water Basin
City Limits

Figure 7 - Environmental and Social Justice Equity Indices
Black Diamond SMAP
Receiving Water Assessment

0 0.5 1 2 Miles

Black Diamond, WA

\\panametrix.com\PMX\PSO\Projects\Clients\3043-BlackDiamondDisp\553-3043-038 SMAP\995xcs\GIS\Pro\BlackDiamond_SMAP.aprx

4.1.1 Stormwater Management Influence

Development and activities in the watershed result in changes to basin hydrology and addition of pollutants to stormwater runoff. The relative intensity of impervious surfaces and pollution-generating activities generally have commensurate relative impacts found in the receiving waters. As part of the SMAP process, the City has begun to evaluate key factors that characterize the potential magnitude of these watershed influences, which can lead to directing actions to those areas that need it the most. Conversely, an assessment of watersheds that have lower potential watershed impacts can demonstrate the magnitude to which land use decisions and growth management actions can be applied to protect receiving waters that still exhibit positive characteristics.

The City has reviewed the stormwater management influence of each receiving water subbasin, considering both hydrologic impact and potential pollutant loadings—qualitatively estimated based on existing land cover shown in Figure 4—as described in the Stormwater Management Action Planning Guidance (Ecology 2019). This evaluation is summarized in Table 8 below.

Table 8. Receiving Water Influence

Consideration	City Condition	Include Subbasin in Prioritization Analysis?
Hydrologic (Flow) Impact – Is basin runoff associated only with:		
Flow-control exempt receiving waters	Some, but will be included in assessment	Yes
Ephemeral streams	None. All subbasins have been delineated based on associated perennial streams, rivers, or lakes, or marine waters	Yes
Receiving waters primarily influenced by groundwater flows	None	Yes
Pollutant Load (Water Quality Impact) – Is basin runoff generated only from:		
Non-pollutant generating surfaces?	No subbasins meet this threshold	Yes
Low-density residential land uses?	No subbasins meet this threshold	Yes
Parking areas with up to 100 total trip ends or for up to 300 employees?	No subbasins meet this threshold	Yes
Roads with ADT up to 7,500; limited access highways with ADT up to 15,000?	Some subbasins may meet this threshold, but the City will include in prioritization process	Yes
Other land uses where runoff is already being fully treated to current standards?	No subbasins meet this threshold	Yes

The PSWCM also includes information on the hydrologic and pollutant loading impacts discussed in Section 3.3.3 and in Appendix B. Those results are summarized in Table 9. The hydrologic impact values were derived from the water flow importance layer sub-model, while the pollutant loading impact values were calculated by combining the values from the sediment loading, phosphorus, nitrogen, and heavy metal export potential sub-model within the City boundaries. In general, a basin with a high hydrologic impact is indicative of a basin with greater potential importance to the movement of water based on physical attributes of the landscape. Similarly, a basin with a high pollutant loading impact is indicative of a basin expected to have a higher potential for the generation and export of pollutants to areas downstream. A drawback of the PSWCM is that it does not consider controlled stormwater within its assessment of hydrologic or water quality impacts. Further information regarding the sub-models can be found in Appendix B.

Table 9. Receiving Water Influence from PSWCM

Basin Name	Hydrologic Impacts	Pollutant Loading Impacts
Covington Creek	High	Low
Jenkins Creek	Moderate-high	Low
Lower Green River	Moderate-high	Moderate
Middle Green River	Low	High

Note: Scoring is based on a number scale from 1 (Low) to 4 (High). More information on scoring is given in Appendix B.

Based on the criteria from Ecology and the information from the PSWCM, the City has not excluded any receiving water basins. Furthermore, these results are not a prioritization, but rather a relative comparison of basins that can be applied to the ranking and prioritization process that will be developed in future SMAP development. This report focused on the overall receiving waters-specific sources for flow impacts and pollutants will be addressed in future SMAP processes. Measures to control these existing and ongoing watershed impacts will also be developed in future SMAP process after drainage area prioritization to provide a targeted approach to the selected basin.

4.1.2 Other Approaches to Limit Impacts

The watershed analyses described in previous sections provide some insight into the accumulated potential for impacts due to watershed development and activities. Non-treatment alternatives include, but are not limited to, the following:

- Reduced development – downzoning property.
- Reduced development footprint and infilling – reducing impervious area requirements; “building up” to provide same livable area with smaller ground footprint; infilling to use existing infrastructure and regional treatment.
- Road diets and increased and incentivized transit.
- Further limiting encroachment into riparian critical areas.
- Behavior changes and education.
- Product replacement to reduce pollutant sources.
- Source control management, inspections, and enforcement.

While policy decisions developed in the SMAP will include recommendations and measures to reduce future impacts via land use strategies, other potential measures listed are generally beyond the scope of the SMAP or are already addressed in the ongoing stormwater management programs being implemented by the City and other Phase I and II communities under the Permit.

4.1.3 Growth Management Strategies

Washington communities, under the Growth Management Act, are required to prepare plans to address and accommodate expected growth into appropriate areas. These strategies, as related to stormwater, are expected to consider the potential impacts of growth on the receiving waters and recommend strategies to address these potential impacts. The final SMAP will include policy measures to potentially inform growth management planning and strategies.

Growth and new development are the key factors that require controls and measures to manage stormwater and limit receiving water impacts, and accommodating expected growth is a key consideration for growth management planning. Consequently, there is a direct potential conflict

between the objectives of growth management (new development, infill, redevelopment) and non-treatment stormwater control strategies. The following are a list of non-treatment stormwater control strategies that may be considered in the prioritization and the final SMAP:

- Modifying growth center locations and shapes to match drainage basin boundaries.
- Directing infill and redevelopment to areas with existing infrastructure.
- Directing new development, infill, and redevelopment to areas with preferred conditions for infiltration.
- Using existing regional stormwater facilities or expansion and constructing new regional facilities (this strategy has a treatment component).
- Initiating and implementing basin transfer programs in redevelopment zones.
- Developing transit plans and road diets to reduce roadway impacts.
- Establishing mitigation banks for riparian zone protection and restoration.

The prioritization process and final SMAP will include steps to consider future development potential and the influence of redevelopment or infill strategies.

5. RELATIVE CONDITIONS AND CONTRIBUTIONS (STEP 4)

This step is intended to narrow the number of receiving waters and subbasins beyond any that were eliminated in Step 3 above to a candidate list for inclusion in the Receiving Water Prioritization process. To support this evaluation, the City has considered the Ecology SMAP Guide (Ecology 2019), the PSWCM (Ecology 2016a), and Building Cities in the Rain – Watershed Prioritization for Stormwater Retrofit (Commerce 2016). These guides and studies look at two overlapping factors for subbasin evaluation: current condition and level of influence on the receiving water. Of these two factors, the level of influence on the receiving water generally has a higher importance for initial action, whether the condition of the subbasin warrants either protection (of an excellent current condition) or restoration (of a degraded current condition).

This Receiving Water Assessment has summarized known conditions of the waters at selected locations and reaches. These outcomes can reflect waters that are impaired and need restoration or exhibit good conditions where protection is warranted. It can also reflect a lack of data or an unknown condition. In the basin planning process, questions are often posed as to whether protection or restoration is a higher priority or more urgent and how to choose the condition category to which the drainage analysis unit belongs. The approach chosen in this Receiving Water Assessment is to assume that all existing degraded watersheds (or any subunit contained therein) or receiving water could benefit from restoration and all basins, degraded or not, are subject to potential beneficial improvements. Also, existing stormwater controls for new development and redevelopment are AKART (all known, available, and reasonable methods of prevention, control, and treatment) and can reasonably be considered an effective protection approach, thus future potential development threats have been addressed. It could be argued that a basin close to a “tipping point” from not degraded to degraded could be a targeted basin for improvement. This consideration will be evaluated in the next prioritization step during the SMAP process as an important interpretation of the findings of the basin drainage analysis unit characterization. In addition, the City is not in a position at this time to make this policy decision that could be interpreted as conflicting with state policy and regulations on degraded systems. Therefore, all receiving water subbasins will be included in the SMAP prioritization process moving forward. The specific condition of each subbasin—warranting the range of actions from protection to restoration—

will be assessed during the Receiving Water Prioritization based on the information summarized in this Receiving Water Assessment.

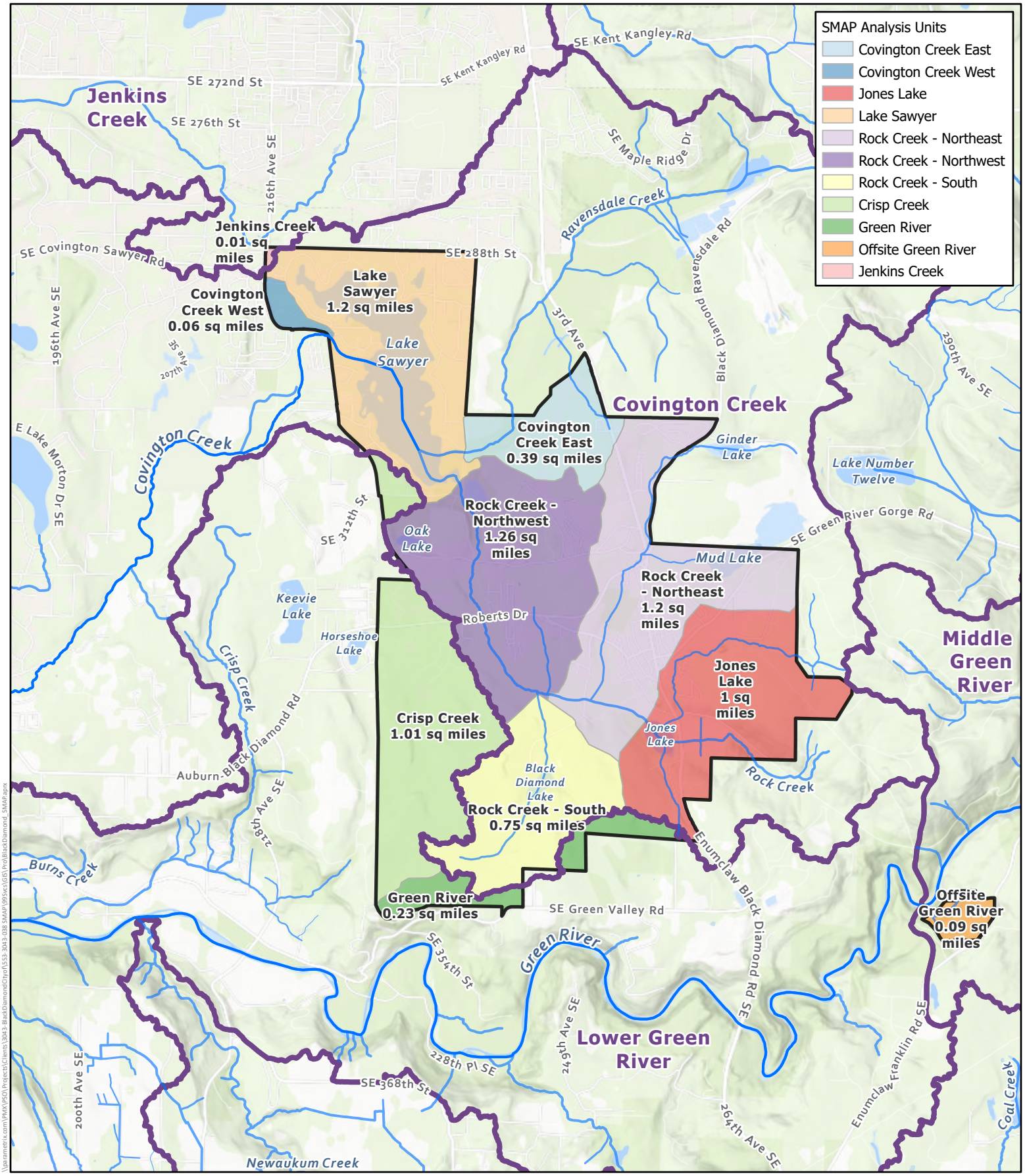
The data collected and summarized in the report are intended to provide a general characterization of what is known about each of the receiving waters in the City, provide an assessment of available watershed characteristics (in the PSWCM) that can influence runoff to those waters, and summarize other data to characterize other social factors that may influence the prioritization decisions to be made in the SMAP. This step is not intended to analyze data about specific catchment areas or drainage analysis units, make comparisons, prioritize, or apply other subjective criteria about targeted stormwater investments in the selected map basin. These analyses will be completed in the Receiving Water Prioritization report when the basin data can be properly evaluated, scored, and assessed for basin-specific comparative data. Consequently, the two data sets used to assess the basins in this step in the SMAP process are the summary water quality metrics that were considered from Section 3.2 related to each watershed in the City and the PSWCM summary results considered in Section 3.3.3. The summary of both is shown in Table 10. It may be anticipated that the preferred SMAP drainage analysis unit could be in one of the basins that scored as having the greatest need and would be a possible preferred target for additional stormwater investments.

The catchment area data collected and reviewed in the report were used as a basis for developing the preliminary drainage analysis units for the prioritization analysis (Figure 8). The analysis units were created by overlaying the receiving water basins on an existing drainage basin layer within the city. The drainage basins were then grouped based on topography and storm system pipes to produce appropriately sized basins for the SMAP analysis (around 1 square mile).

Data regarding key runoff and stormwater management characteristics for each basin will be processed in a spreadsheet model to score basin existing conditions (stormwater influences such as land cover and impervious surfaces), show existing stormwater controls (potentially mitigating those existing impacts) and consider future development potential. After this screening analysis, a series of overlays are proposed. The first group are other key factors, such as environmental justice and other social considerations (Section 3.4) as well as existing receiving water condition (Section 3.3). The next group will consider subjective overlays and include items such as preferred basins that meet other planning objectives. The capital improvement plan for the City will be reviewed for other key projects that may influence coordinated project planning. Additional plans that will be reviewed include but are not limited to: the stormwater comprehensive plan; growth centers or redevelopment strategies identified in the growth management plan; transit plans and significant roadway upgrades; known large-scale redevelopment or infill plans; and park and open space plans.

6. RESULTS

Results of the City's SMAP Receiving Water Assessment are summarized in Table 10.



Date: 2/23/2022
Sources: City of Black Diamond, King County, WA Ecology, WA DNR, USGS, ESRI
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Stream
Black Diamond City Limits
Receiving Water Basin

Figure 8 - SMAP Analysis Units
Black Diamond SMAP
Receiving Water Assessment

0 2,000 4,000 Feet

Black Diamond, WA

Table 10. SMAP Drainage Basin Inventory

Receiving Water Basin	Total Drainage Basin Area (square miles)	Percent of Total Drainage Basin Area Within the City (%)	Relative Water Quality Condition of Receiving Water				Puget Sound Watershed Characterization Model Score[b] Within the City	Combined Equity Index Score	Included in Prioritization? Yes/No
			Water Quality Data Points in Basin						
			WQI Rating[a]	303(d) Listings/TMDL	Benthic Index of Biotic Integrity				
					Stream Name (Site ID)	Biological Condition (Overall Score)			
Covington Creek	22.4	26.2%	Good (84) Good (92) Poor (19)	Bacteria (fecal coliform) Bioassessment (B-IBI) Dissolved Oxygen Temperature Tissue Impairments (Dioxin and PCBs) Invasive Exotic Species Sawyer Lake Total Maximum Daily Load for Phosphorus (1993) Soos Creek Subbasin Multiparameter TMDL (in development)	Covington Creek (2002)	Poor (20)	11.41	45.4	Yes
					Covington Creek (221)	Fair (50.5)			
					Covington Creek (220)	Good (74.5)			
					Covington Creek (287)	Good (77.9)			
					Rock Creek Tributary (223)	Fair (56.8)			
					Rock Creek Tributary (222)	Good (67.3)			
					Rock Creek (219)	Poor (37.9)			
					Covington Creek (218)	Good (66.4)			
					Ginder Creek (288)	Fair (59.2)			
					Covington Creek (1987)	Good (78.2)			
					Covington Creek (289)	Good (68.7)			
					Covington Creek (1929)	Good (72.2)			
					Covington Creek (1998)	Excellent (88.5)			
					Soos Creek (1619)	Good (71.4)			
					Soos Creek (1620)	Excellent (86.9)			
					Covington Creek (217)	Good (69.3)			
					Covington Creek (2023)	Good (72.0)			
Jenkins Creek	16.5	0.0%	Good (89)	Bioassessment (B-IBI)	Jenkins Creek (1935)	Fair (47.9)	10.06	49.7	Yes
				Temperature	Jenkins Creek (236)	Good (62.4)			
					Jenkins Creek (235)	Good (63.6)			
				Invasive Exotic Species	Jenkins Creek (234)	Excellent (84.4)			
				Soos Creek Subbasin Multiparameter TMDL (in development)	Jenkins Creek (1931)	Fair (54.9)			
					Jenkins Creek (1989)	Excellent (90.5)			
					Jenkins Creek (308)	Poor (39.1)			
Lower Green River	31.7	3.9%	Good (96) Good (87) Moderate (62) Moderate (64)	Bioassessment (B-IBI)	Icy Creek (248)	Good (75.9)	11.70	45.4	Yes
				Dissolved Oxygen	Cristy Creek (247)	Good (61.9)			
				Total Phosphorus	Cristy Creek (246)	Good (61.8)			
				Green River Temperature Watershed TMDL (2011)	Green River – Middle Tributary (245)	Very Poor (12.6)			
					Green River (1986)	Good (60.9)			
					Crisp Creek Tributary (244)	Poor (38.2)			
					Crisp Creek (1965)	Poor (30.5)			
					Crisp Creek (243)	Poor (34.1)			
					O'Grady Creek (242)	Good (71.4)			
Middle Green River	27.1	0.3%	No WQI Data	Dissolved Oxygen	Green River – Middle Tributary (249)	Excellent (87.5)	9.00	N/A	Yes
				Green River Temperature Watershed TMDL (2011)	Green River – Middle Tributary (323)	Good (64.1)			

Sources: WQI Rating – King County 2020; 303(d) Listings/TMDL – Ecology 2018; Benthic Index of Biotic Integrity – King County 2015; PSWCM Score – Ecology 2016a and 2016b; Combined Equity Index Score – EPA 2019.

[a] WQI scores and status: **poor** (40 and below) – does not meet expectations, highest concern; **moderate** (40 to 80) – of moderate concern; **good** (80 and above) – meets expectations, lowest concern (King County 2020). **No WQI Data** means that there are no King County WQI monitoring stations in this receiving water. The WQI was developed to score water quality for streams and rivers using stream monitoring gauge data.

[b] Scoring summations would be translated to quartiles as follows: High – 16; Moderate - high -12; Moderate– 8; and Low - 4

7. REFERENCES

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Appendix A

Water Quality Assessment

DESIGNATED USES & WATER QUALITY CONDITION THRESHOLDS

The Department of Ecology has defined four groups of designated uses for surface water within the state of Washington: Aquatic Life Uses, Recreational Uses, Water Supply Uses, and Miscellaneous Uses. Water quality criteria has been identified, and thresholds for the relative condition of Washington's water bodies have been set for each designated use. Table A-1 below defines the designated uses, and Table A-2 describes the applicable thresholds for Washington's surface waters per WAC 173-201A-200.

The state of Washington has been divided into 62 watersheds, otherwise known as Water Resource Inventory Areas (WRIA). The Department of Ecology uses WRIAs to regulate water bodies. Table 602 in WAC 173-201A-600 lists specific water bodies organized by WRIA along with their assigned designated uses (Table A-3). The City of Black Diamond boundaries are within the Duwamish-Green watershed (WRIA 9). The receiving waters for the City of Black Diamond listed in Table 602 include the Green River in WRIA 9.

Per Ecology publication 06-10-038, all of the mainstem receiving waters identified for the City would require supplemental spawning and incubation protection for salmonid species (Ecology 2011). Figure A-1 shows the location of waters in WRIA 9, respectively, with supplemental spawning and incubation criteria. Per WAC 173-201A-200 (1)(c)(iv), the waters identified in Ecology publication 06-10-038 are required to apply the following criteria to protect the reproduction of native char, salmon, and trout:

- Maximum 7-DADMax temperatures of 9°C (48.2°F) at the initiation of spawning and at fry emergence for char; and
- Maximum 7-DADMax temperatures of 13°C (55.4°F) at the initiation of spawning for salmon and at fry emergence for salmon and trout.

Table A-1. Designated Use Definitions

Designated Use	Definition
Aquatic Life	Designated based on the presence of or to provide protection for salmonid and char spawning and rearing, salmonid migration, core summer salmonid habitat, non-anadromous interior redband trout, and indigenous aquatic species. Waters with designated uses in this category have criteria standards for toxic, radioactive, and deleterious materials; aesthetic values; temperature; dissolved oxygen; total dissolved gas; and pH.
Recreational	Designation for waters used as a means of primary contact recreation, where a person would have direct contact with water to the point of complete submergence, including skin diving, swimming, water skiing, etc. Waters with designated uses in this category have criteria standards for toxic, radioactive, and deleterious materials; aesthetic values; and bacteria (*E. coli*).
Water Supply	Designation for waters used for domestic, agricultural, and/or industrial water supply, and stock watering purposes. Waters with designated uses in this category have criteria standards for toxic, radioactive, and deleterious materials as well as aesthetic values.
Miscellaneous	Designation for waters used as the following: wildlife habitat (those waters that provide food support to aquatic life and wildlife at any life stage or activity); fish harvesting; commerce and navigation; boating; and aesthetics. Waters with designated uses in this category have criteria standards for toxic, radioactive, and deleterious materials as well as aesthetic values.

Source: WAC 172-201A-200

Table A-2. Designated Uses and Standards for Washington Water Bodies per WAC 173-201A-200

Use Designation	Use General Description	Use Standards (see WAC 173-201A-200)				
Aquatic Life Uses:	**(see WAC 173-201A-200[1])**	**Highest 7-DADMax**	**DO**	**Turbidity**	**Total Dissolved Gas**	**pH**
Char Spawning/Rearing	Char spawning and rearing. The key identifying characteristics of this use are spawning or early juvenile rearing by native char (bull trout and Dolly Varden) or use by other aquatic species similarly dependent on such cold water. Other common characteristic aquatic life uses for waters in this category include summer foraging and migration of native char and spawning, rearing, and migration by other salmonid species.	12°C (53.6°F)	9.5 mg/L	Shall not exceed: • 5 NTU over background when the background is 50 NTU or less; or • A 10% increase in turbidity when the background turbidity is more than 50 NTU.	Total dissolved gas shall not exceed 110% of saturation at any point of sample collection.	pH shall be within the range of 6.5 to 8.5, with a human-caused variation within the above range of less than 0.2 units.
Core Summer Habitat	Core summer salmonid habitat. The key identifying characteristics of this use are summer (June 15–September 15) salmonid spawning or emergence, or adult holding; use as important summer rearing habitat by one or more salmonids; or foraging by adult and subadult native char. Other common characteristic aquatic life uses for waters in this category include spawning outside of the summer season, rearing, and migration by salmonids.	16°C (60.8°F)	9.5 mg/L	Same as above.	Same as above.	Same as above.
Spawning/Rearing	Salmonid spawning, rearing, and migration. The key identifying characteristic of this use is salmon or trout spawning and emergence that only occurs outside of the summer season (September 16–June 14). Other common characteristic aquatic life uses for waters in this category include rearing and migration by salmonids.	17.5°C (63.5°F)	8.0 mg/L	Same as above.	Same as above.	pH shall be within the range of 6.5 to 8.5, with a human-caused variation within the above range of less than 0.5 units.
Rearing/Migration Only	Salmonid rearing and migration only. The key identifying characteristic of this use is use only for rearing or migration by salmonids (not used for spawning).	17.5°C (63.5°F)	6.5 mg/L	Shall not exceed: • 10 NTU over background when the background is 50 NTU or less; or • A 20% increase in turbidity when the background turbidity is more than 50 NTU.	Same as above.	Same as above.
Redband Trout	Non-anadromous interior redband trout. For the protection of waters where the only trout species is a non-anadromous form of self-reproducing interior redband trout (*O. mykiss*) and other associated aquatic life are present.	17.5°C (63.5°F)	8.0 mg/L	Shall not exceed: • 5 NTU over background when the background is 50 NTU or less; or • A 10% increase in turbidity when the background turbidity is more than 50 NTU.	Same as above.	Same as above.
Warm Water Species	Indigenous warm water species. For the protection of waters where the dominant species under natural conditions would be temperature tolerant indigenous nonsalmonid species. Examples include dace, redside shiner, chiselmouth, sucker, and northern pikeminnow.	17.5°C (63.5°F)	6.5 mg/L	Shall not exceed: • 10 NTU over background when the background is 50 NTU or less; or • A 20% increase in turbidity when the background turbidity is more than 50 NTU.	Same as above.	Same as above.
Recreational Uses:	**(see WAC 173-201A-200[2])**	**Bacteria Criteria--*E. coli***				
Primary Contact	Primary contact recreation.	*E. coli* organism levels within an averaging period must not exceed a geometric mean value of 100 CFU or MPN per 100 mL, with not more than 10% of all samples (or any single sample when less than ten sample points exist) obtained within the averaging period exceeding 320 CFU or MPN per 100 mL.				
Water Supply Uses:	**(see WAC 173-201A-200[3])**	**Toxic, Radioactive, and Deleterious Materials and Aesthetic Values[a]**				
Domestic Water	Domestic water supply.	General criteria that apply to water supply uses are described in WAC 173-201A-260 (2)(a) and (b) and are for toxic, radioactive, and deleterious materials as well as aesthetic values. A list of toxic and radioactive substances as well as associated thresholds can be found in WAC 173-201A-240, Toxic substances, and WAC 173-201A-250, Radioactive substances.				
Industrial Water	Industrial water supply.					
Agricultural Water	Agricultural water supply.					
Stock Water	Stock watering.					
Miscellaneous Uses:	**(see WAC 173-201A-200[4])**	**Toxic, Radioactive, and Deleterious Materials and Aesthetic Values**				
Wildlife Habitat	Wildlife habitat.	General criteria that apply to miscellaneous freshwater uses are described in WAC 173-201A-260 (2)(a) and (b) and are for toxic, radioactive, and deleterious materials as well as aesthetic values. A list of toxic and radioactive substances as well as associated thresholds can be found in WAC 173-201A-240, Toxic substances, and WAC 173-201A-250, Radioactive substances.				
Harvesting	Fish harvesting.					
Commerce/Navigation	Commerce and navigation.					
Boating	Boating.					
Aesthetics	Aesthetic values.					

Notes: CFU = colony forming units; DO = dissolved oxygen; mg/L = milligrams per liter; mL = milliliter; MPN = most probable number; NTU = nephelometric turbidity units

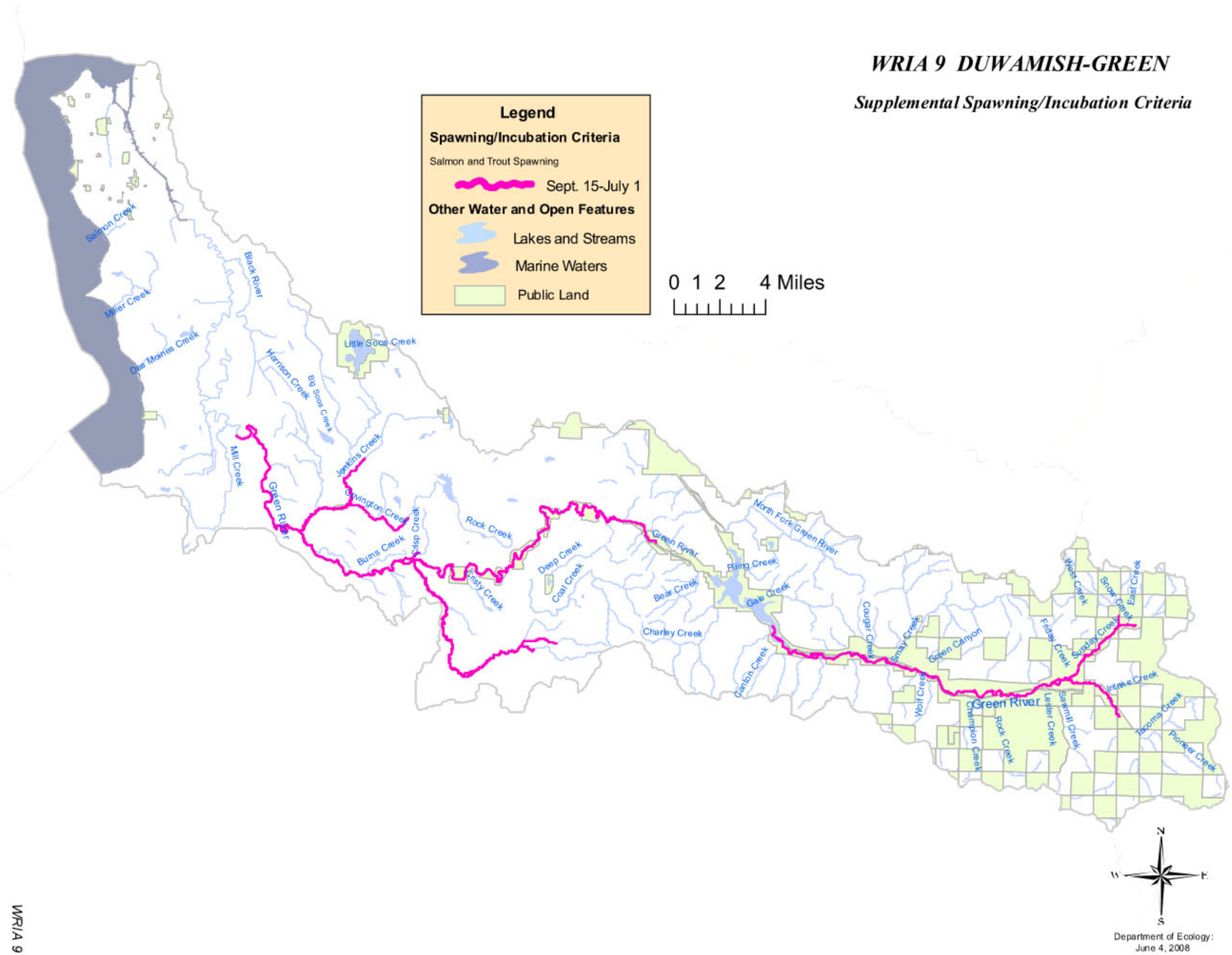
[a] Toxic, radioactive, and deleterious materials and aesthetic values listed also apply for all Aquatic Life and Recreational Uses.

Table A-3. Designated Uses for Black Diamond Receiving Waters

WRIA Number	WRIA Name	Receiving Water	Table 602 Location Information	Aquatic Life Uses	Recreation Uses	Water Supply Uses	Misc. Uses	Additional Info for Waterbody
9[a]	Duwamish-Green	Green River	Upstream from above confluence with Mill Creek at latitude 47.3699, longitude -122.2461 (east of the West Valley highway) to west boundary of Flaming Geyser State Park, including tributaries.	Core Summer Habitat	Primary Contact	All	All	173-201A-200 (1)(c)(iv)
		Green River	Upstream from the west boundary of Flaming Geyser State Park (latitude 47.2805, longitude -122.0379) to headwaters, including tributaries (except where designated char and core).	Core Summer Habitat	Primary Contact	All	All	173-201A-200 (1)(c)(iv)
N/A	N/A	All surface waters not named in Table 602	N/A	Spawning/Rearing or Core Summer Habitat[c]	All	All	All	173-201A-600 (1)

[a] This WRIA contains waters requiring supplemental spawning and incubation protection for salmonid species per WAC 173-201A-200 (1)(c)(iv). See Ecology 2011 for further information.

[b] Per WAC 173-201A-600 (1)(a), all waters not in Table 602 will be protected for the salmonid spawning, rearing, and migration designated uses. Additionally, the following waters are also to be protected for core summer habitat: all surface waters in national parks, national forests, and/or wilderness areas; all lakes and all feeder streams to lakes; all surface waters that are tributaries to waters designated core summer salmonid habitat; all fresh surface waters that are tributaries to extraordinary aquatic life marine waters.



Source: Ecology 2011

Figure A-1. Waters in WRIA 9 with Supplemental Spawning/Incubation Criteria (per Ecology 2011).

WATER QUALITY INDEX

The Water Quality Index (WQI) attempts to integrate a series of key water quality parameters into a single number that can be used to compare different sampling locations over time. Originally, the WQI was developed by the Environmental Protection Agency (EPA) Region 10 and was based on curves that relate concentrations or measurements of eight constituents to index scores and then aggregates scores into a single number. The EPA curves were a synthesis of national criteria, state standards, and technical guidelines. Ecology adapted this index for use in Washington State by adjusting the curves to reflect local water quality standards and/or guidelines. In 2009, Ecology modified the WQI to reflect revised state water quality rules for the protection of native fish and aquatic resources reflected in supplemental temperature criteria for many of the Puget Sound basins. In addition to modifications for revised state criteria, the WQI was further modified in 2009 by Ecology to reflect conditions more directly in Puget Sound lowland streams. King County is using Ecology's Puget Sound lowland stream version of the WQI. For purposes of year-to-year comparison, results from previous years were recalculated using the new Puget Sound Lowland Stream WQI (King County 2020).

Table A-4. Water Quality Index (WQI) Scoring and Status Index

WQI Score	Status
80 and above	Good – meets expectations – lowest concern
40 to 80	Moderate – of moderate concern
40 and below	Poor – does not meet expectations – highest concern

Source: Ecology 2002

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Attachment A1

King County DNRP Water Quality Index

White River Water Quality Index Spreadsheet Results

King County DNRP Water Quality Index

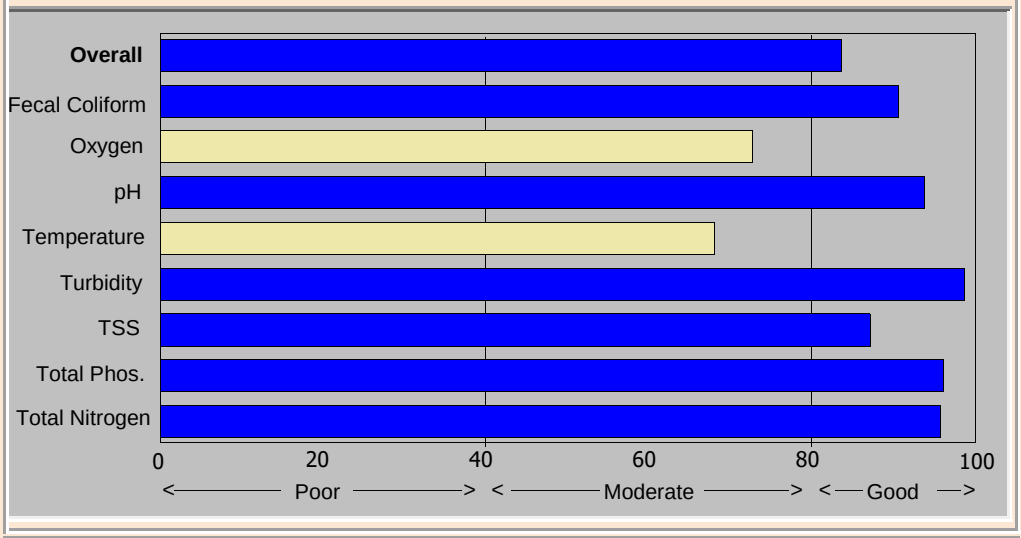
STATION C320 WATER YEAR 2020

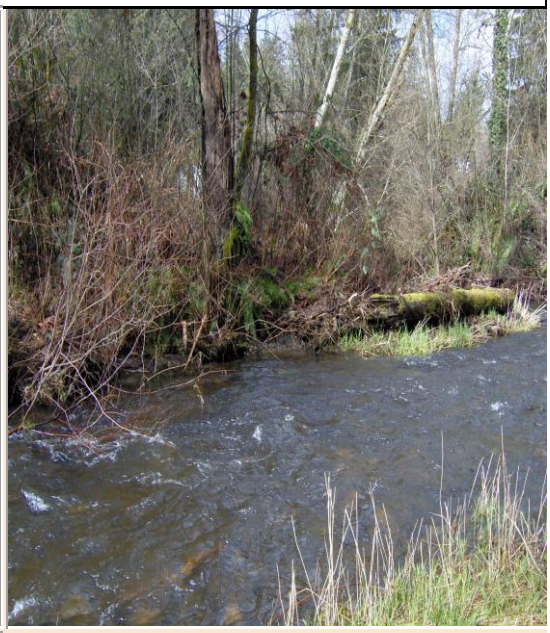
GAUGE # 09a **Covington Creek near Mouth, Soos CR Watershed** Overall Index **84**

King County monitors water quality on Soos Creek at four locations. Station C320 is located in Covington Creek on the bridge on Kent-Black Diamond Rd near Thomas Rd. Monitoring at this site began in 1972 and continued until 2008 when budget cutbacks reduced the breadth of King County's water quality monitoring program. Regular water quality monitoring resumed in February 2013. The Soos Creek basin encompasses 44,800 acres east of the City of Kent and drains into the Green River. The creek system contains 60 miles of stream, including 4 main tributaries – Covington Creek, Jenkins Creek, Little Soos Creek, and Soosette. The Soos Creek basin is an extensive system of interacting lakes, wetlands and permeable soils that collectively attenuate peak stream flows. However, increasing urban development, particularly in the western half of the basin, has led to increasing water temperature and more dramatic seasonal flow fluctuations. All five species of Pacific Salmon as well as steelhead and coastal cutthroat trout have been observed in the Soos Creek basin.

Annual Water Quality Index Scores

Water quality was GOOD based on data collected 10/1/2019 to 9/30/2020.

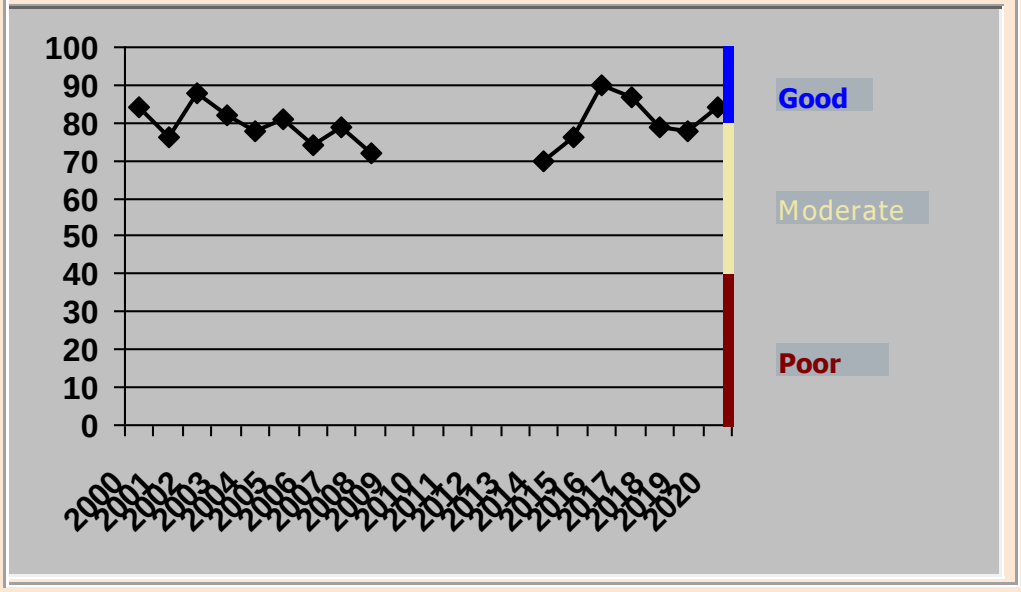




Monthly Scores For Water Year 2020

Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
88	90	98	98	99	99		88	78	93	90	85

WQI Score Comparison By Water Year



About The Water Quality Index:

The Water Quality Index (WQI) score is a unit-less number ranging from 10 to 100: the higher the number, the higher the water quality. Scores are calculated from data collected during the monthly routine sampling. For temperature, pH, fecal coliform bacteria, turbidity, and dissolved oxygen, the index expresses results relative to levels required to maintain beneficial uses according to criteria in Washington's Water Quality Standards, WAC 173-201A. For nutrient and sediment measures where there are no standard, results are expressed relative to guidelines for this eco-region. Results from the eight parameters are aggregated over time to produce a single score for each sample station. In general, stations scoring 80 and above did not fail water quality standards or guidelines and are of "low concern", scores 40 to 80 indicate "moderate concern", and water quality at stations with scores below 40 are of "high concern". For more information about the WQI please visit https://green2.kingcounty.gov/streamsdata/WQI.aspx

For more information about this creek please visit our website at http://green.kingcounty.gov/WLR/Waterres/StreamsData/streamlist.aspx

King County DNRP Water Quality Index

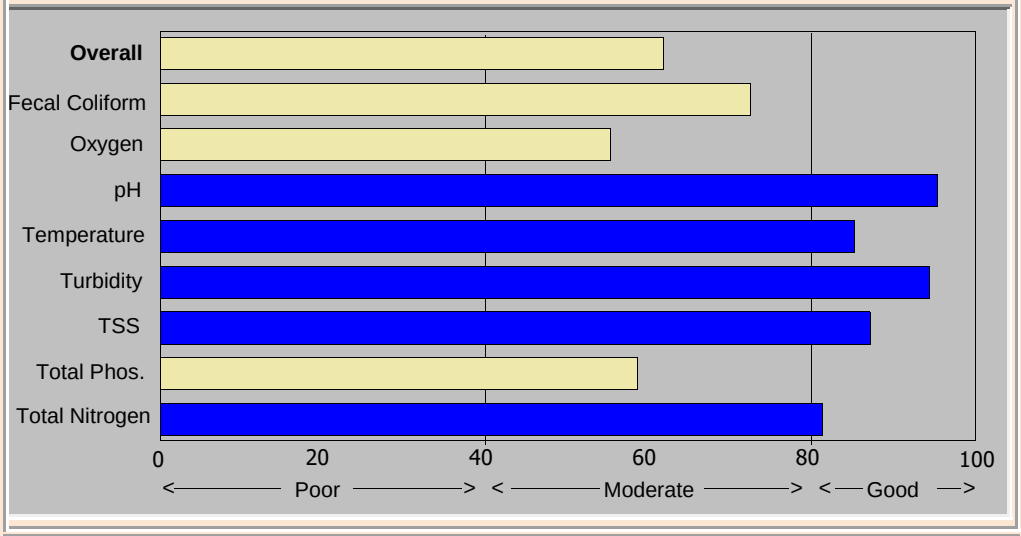
STATION 321 WATER YEAR 2020

GAUGE # 40d **Crisp Creek at Green River RD** **Overall Index** 62

King County monitors water quality in Crisp Creek at two locations. Station 0321 is located at the mouth of the creek at the bridge on Southeast Green Valley Road, west of 212th Place SE. Water quality samples were collected at this site monthly from 1972 to 2008 when budget cutbacks reduced the breadth of King County's water quality monitoring program. King County resumed regular monitoring in February 2013. Crisp Creek originates from several groundwater springs and a 20-acre bog and runs three miles before reaching the Green River. Its basin covers 3,200 acres and lies between the cities of Black Diamond and Maple Valley in southern King County. The upper reaches of Crisp Creek are forested where the stream traverses through commercial timberlands. Downstream of the commercial timberlands the riparian area becomes wider with mostly deciduous trees. Crisp Creek provides spawning and rearing habitat for coho, chinook, chum and winter steelhead.

Annual Water Quality Index Scores

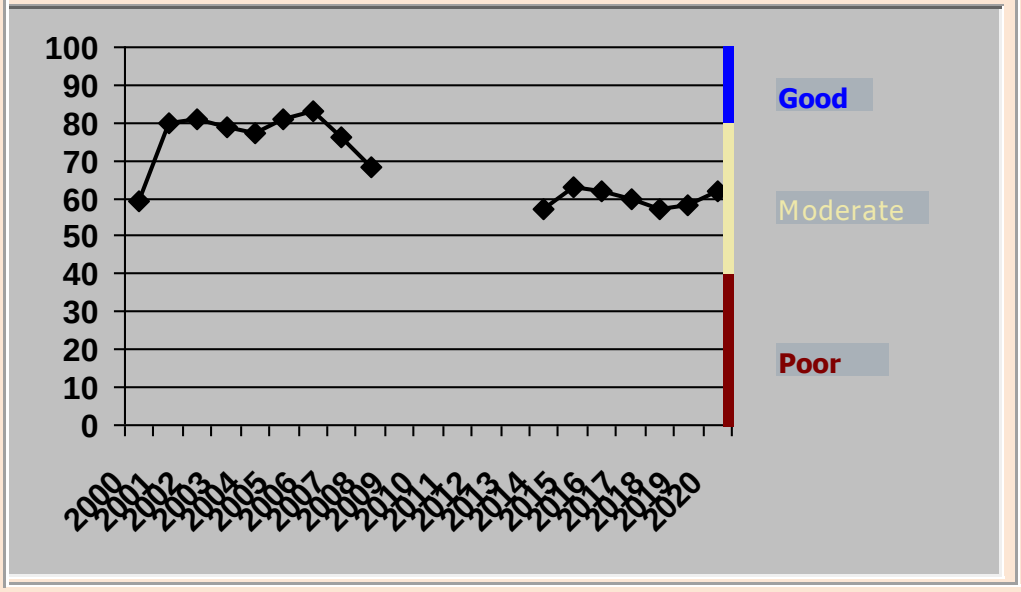
Water quality was MODERATE based on data collected 10/1/2019 to 9/30/2020.



Monthly Scores For Water Year 2020

Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
79	48	65	73	85	84		93	93	97	90	91

WQI Score Comparison By Water Year



For more information about this creek please visit our website at http://green.kingcounty.gov/WLR/Waterres/StreamsData/streamlist.aspx

About The Water Quality Index:

The Water Quality Index (WQI) score is a unit-less number ranging from 10 to 100: the higher the number, the higher the water quality. Scores are calculated from data collected during the monthly routine sampling. For temperature, pH, fecal coliform bacteria, turbidity, and dissolved oxygen, the index expresses results relative to levels required to maintain beneficial uses according to criteria in Washington's Water Quality Standards, WAC 173-201A. For nutrient and sediment measures where there are no standard, results are expressed relative to guidelines for this eco-region. Results from the eight parameters are aggregated over time to produce a single score for each sample station. In general, stations scoring 80 and above did not fail water quality standards or guidelines and are of "low concern", scores 40 to 80 indicate "moderate concern", and water quality at stations with scores below 40 are of "high concern". For more information about the WQI please visit https://green2.kingcounty.gov/streamsdata/WQI.aspx

King County DNRP Water Quality Index

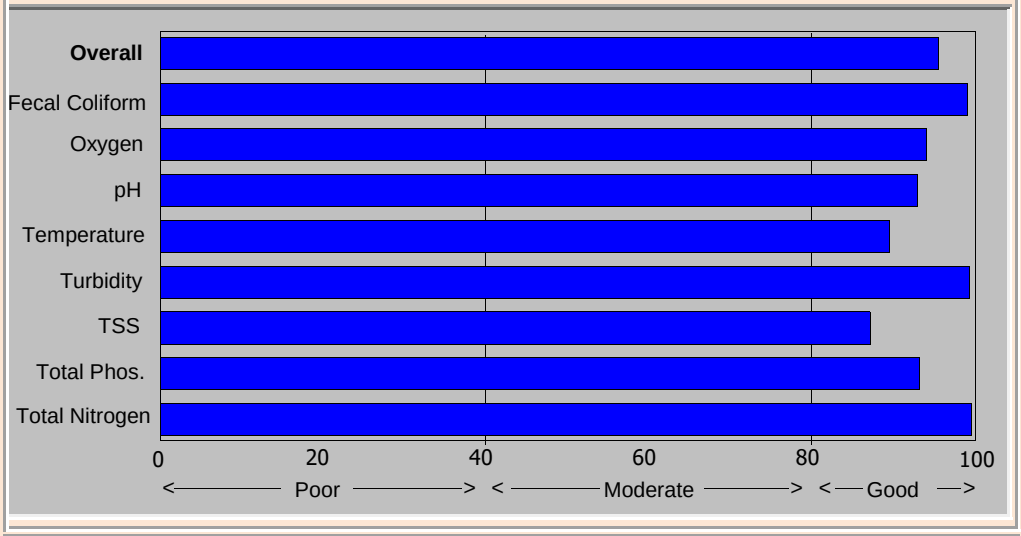
STATION FF321 WATER YEAR 2020

GAUGE # **40D2** **Crisp Creek above New Hatchery** **Overall Index** **96**

King County monitors water quality in Crisp Creek at two locations. Station F321 is located upstream of the hatchery inflow near SE 348th and 215th Avenue SE. Routine monthly monitoring began at this site in 1993 and continued until 2008 when budget cutbacks reduced the breadth of King County's water quality monitoring program. In February of 2013, the collection of monthly water quality samples resumed at station F321. Crisp Creek originates from several groundwater springs and a 20-acre bog and runs three miles before reaching the Green River. The upper reaches of Crisp Creek are forested where the stream traverses through commercial timberlands. Downstream of the commercial timberlands the riparian area becomes wider with mostly deciduous trees.

Annual Water Quality Index Scores

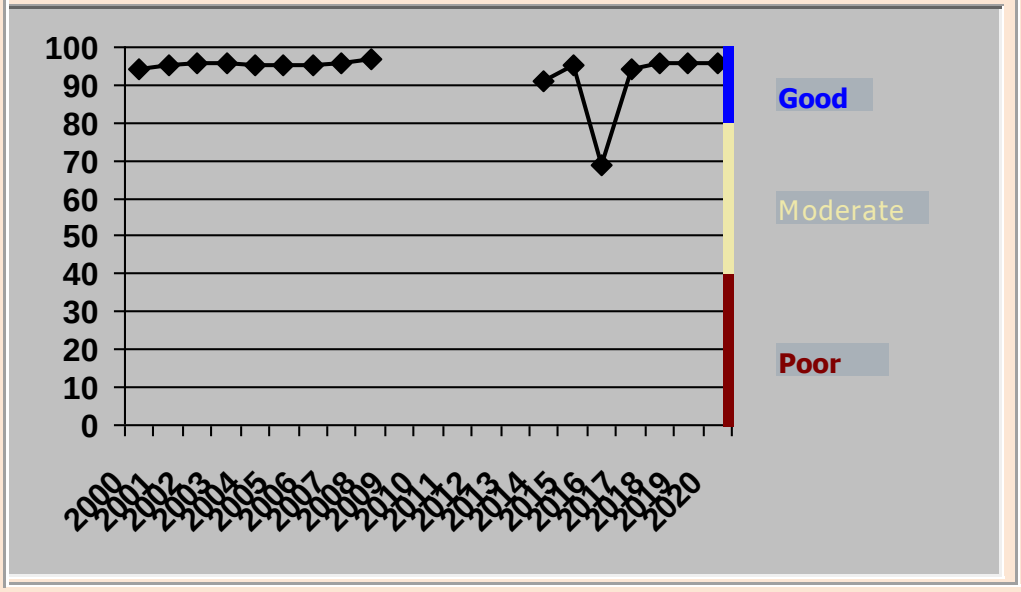
Water quality was GOOD based on data collected 10/1/2019 to 9/30/2020.



Monthly Scores For Water Year 2020

Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
97	96	97	97	97	97		94	97	98	97	98

WQI Score Comparison By Water Year



For more information about this creek please visit our website at http://green.kingcounty.gov/WLR/Waterres/StreamsData/streamlist.aspx

About The Water Quality Index:

The Water Quality Index (WQI) score is a unit-less number ranging from 10 to 100: the higher the number, the higher the water quality. Scores are calculated from data collected during the monthly routine sampling. For temperature, pH, fecal coliform bacteria, turbidity, and dissolved oxygen, the index expresses results relative to levels required to maintain beneficial uses according to criteria in Washington's Water Quality Standards, WAC 173-201A. For nutrient and sediment measures where there are no standard, results are expressed relative to guidelines for this eco-region. Results from the eight parameters are aggregated over time to produce a single score for each sample station. In general, stations scoring 80 and above did not fail water quality standards or guidelines and are of "low concern", scores 40 to 80 indicate "moderate concern", and water quality at stations with scores below 40 are of "high concern". For more information about the WQI please visit https://green2.kingcounty.gov/streamsdata/WQI.aspx

King County DNRP Water Quality Index

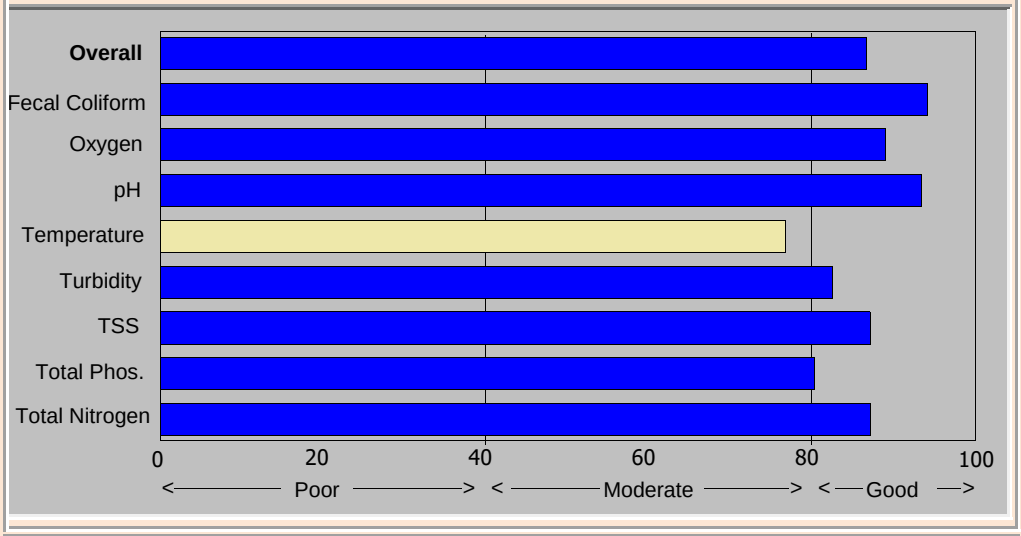
STATION B319 WATER YEAR 2020

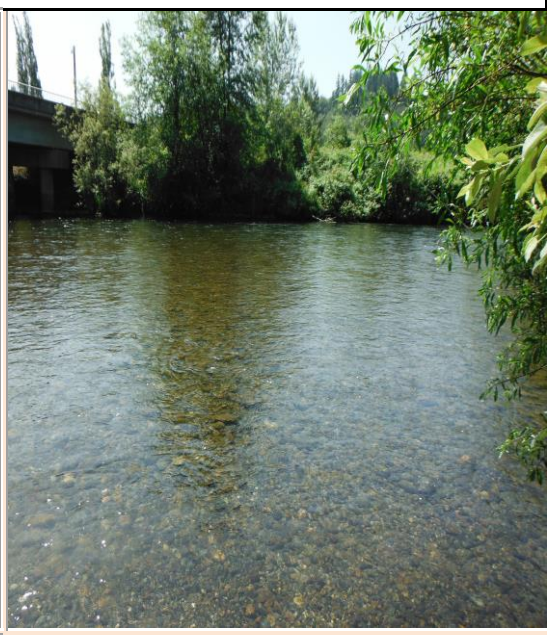
GAUGE # 40a **Green River at 218th AV SE** Overall Index **87**

King County has monitored water quality in the Green-Duwamish River at five locations. Station B319 is located upstream of the confluence of Newaukum Creek at the bridge on Southeast Green Valley Road. Sampling began in 1972 and continues today. The Green-Duwamish runs 93 miles from the crest of the Cascade Mountains to Elliot Bay. Major alterations to the river system have occurred in the last century including the diversion of the White, Black, and Cedar Rivers to alternate discharge points. Anadromous salmonids have been blocked from the upper Green River though the lower river supports coho, Chinook, chum, sockeye, and pink salmon. Land use varies considerably throughout the length of the Green-Duwamish River watershed; land in the Upper Green River is almost entirely used for forest production while development intensity generally increases further downstream.

Annual Water Quality Index Scores

Water quality was GOOD based on data collected 10/1/2019 to 9/30/2020.

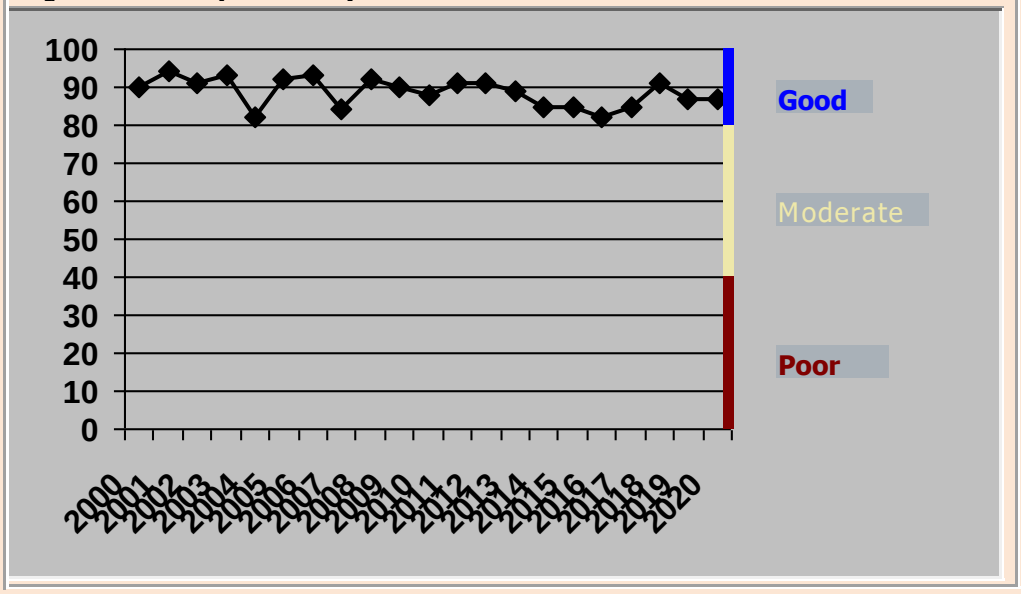




Monthly Scores For Water Year 2020

Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
92	99	99	100	82	100		95	96	94	94	88

WQI Score Comparison By Water Year



For more information about this creek please visit our website at http://green.kingcounty.gov/WLR/Waterres/StreamsData/streamlist.aspx

About The Water Quality Index:

The Water Quality Index (WQI) score is a unit-less number ranging from 10 to 100: the higher the number, the higher the water quality. Scores are calculated from data collected during the monthly routine sampling. For temperature, pH, fecal coliform bacteria, turbidity, and dissolved oxygen, the index expresses results relative to levels required to maintain beneficial uses according to criteria in Washington's Water Quality Standards, WAC 173-201A. For nutrient and sediment measures where there are no standard, results are expressed relative to guidelines for this eco-region. Results from the eight parameters are aggregated over time to produce a single score for each sample station. In general, stations scoring 80 and above did not fail water quality standards or guidelines and are of "low concern", scores 40 to 80 indicate "moderate concern", and water quality at stations with scores below 40 are of "high concern". For more information about the WQI please visit https://green2.kingcounty.gov/streamsdata/WQI.aspx

King County DNRP Water Quality Index

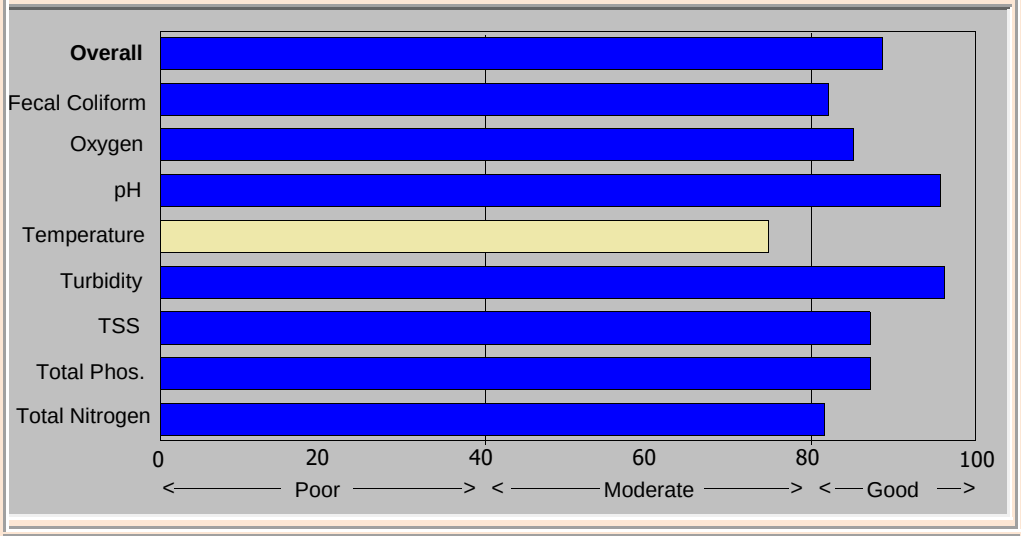
STATION D320 WATER YEAR 2020

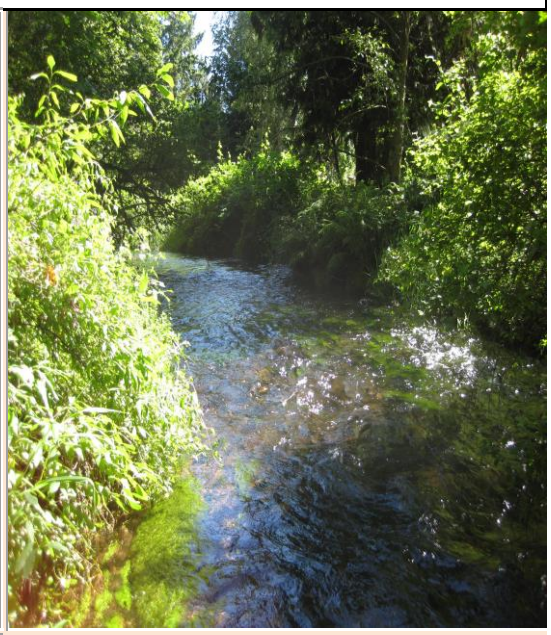
GAUGE # 26a **Jenkins Creek near Mouth - Soos Creek Watershed** Overall Index **89**

King County monitors water quality on Soos Creek at four locations. Station D320 is located near the mouth of Jenkins Creek just upstream its confluence with Soos Creek at the bridge on Kent-Black Diamond Rd near 157th Ave SE. Monitoring at this site began in 1972 and continues today. The Soos Creek basin encompasses 44,800 acres east of the City of Kent and drains into the Green River. The creek system contains 60 miles of stream, including 4 main tributaries – Covington Creek, Jenkins Creek, Little Soos Creek, and Soosette. The Soos Creek basin is an extensive system of interacting lakes, wetlands and permeable soils that collectively attenuate peak stream flows.

Annual Water Quality Index Scores

Water quality was GOOD based on data collected 10/1/2019 to 9/30/2020.

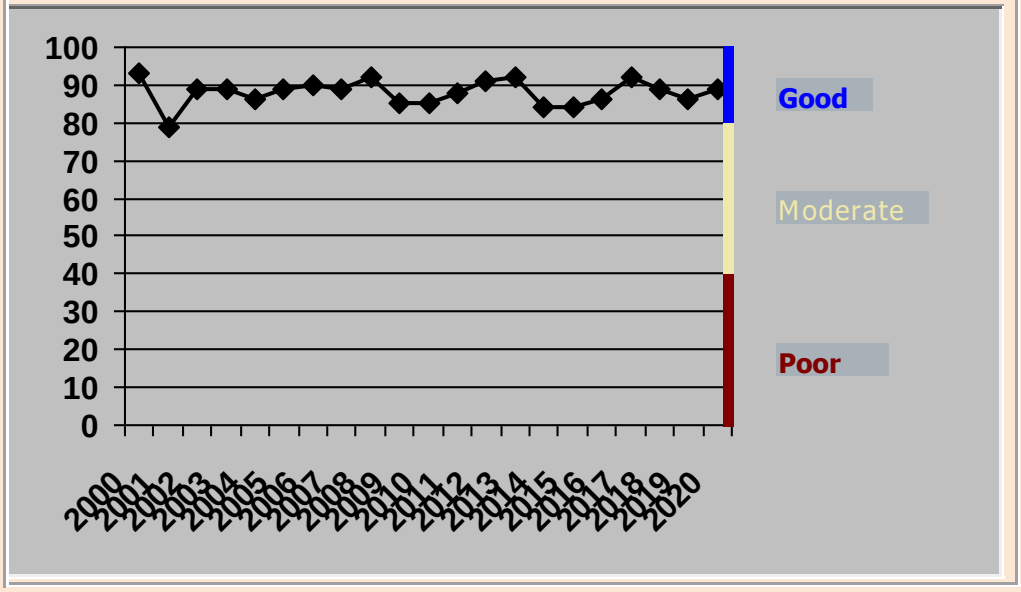




Monthly Scores For Water Year 2020

Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
93	95	95	94	95	97		90	85	92	93	92

WQI Score Comparison By Water Year



For more information about this creek please visit our website at http://green.kingcounty.gov/WLR/Waterres/StreamsData/streamlist.aspx

About The Water Quality Index:

The Water Quality Index (WQI) score is a unit-less number ranging from 10 to 100: the higher the number, the higher the water quality. Scores are calculated from data collected during the monthly routine sampling. For temperature, pH, fecal coliform bacteria, turbidity, and dissolved oxygen, the index expresses results relative to levels required to maintain beneficial uses according to criteria in Washington's Water Quality Standards, WAC 173-201A. For nutrient and sediment measures where there are no standard, results are expressed relative to guidelines for this eco-region. Results from the eight parameters are aggregated over time to produce a single score for each sample station. In general, stations scoring 80 and above did not fail water quality standards or guidelines and are of "low concern", scores 40 to 80 indicate "moderate concern", and water quality at stations with scores below 40 are of "high concern". For more information about the WQI please visit https://green2.kingcounty.gov/streamsdata/WQI.aspx

King County DNRP Water Quality Index

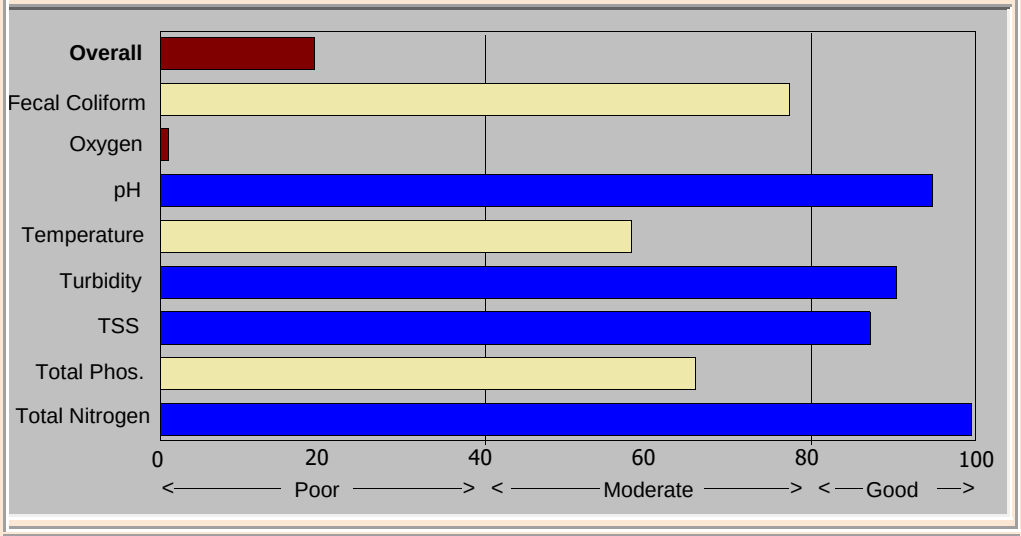
STATION LSIN1 WATER YEAR 2020

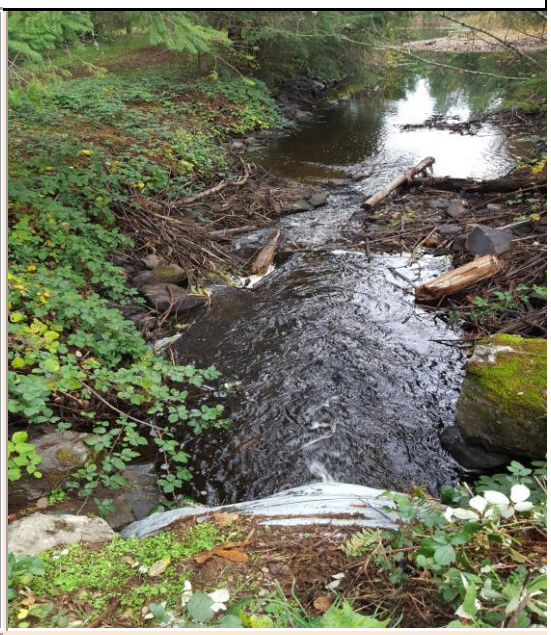
GAUGE # 09b **Rock Creek at Lake Sawyer - Soos Creek Watershed** **Overall Index** 19

King County monitors water quality in Rock Creek at station LSIN1, which is located near the mouth of the creek where it crosses SE 312th Street. Monthly monitoring began at this site in 2014. Rock Creek is a major tributary to Lake Sawyer with flows from Black Diamond Lake, Jones Lake, and Ginder Lake. The creek enters the southeastern portion of the lake in the Lake Sawyer Regional Park. Almost the entire drainage is in the City of Black Diamond. As part of the Big Soos Creek basin of the Green River watershed, Lake Sawyer serves as a pathway for a late winter run of Coho salmon. Coho salmon travel through Lake Sawyer on their way to spawning grounds in the Ravensdale and Rock Creek systems.

Annual Water Quality Index Scores

Water quality was POOR based on data collected 10/1/2019 to 9/30/2020.

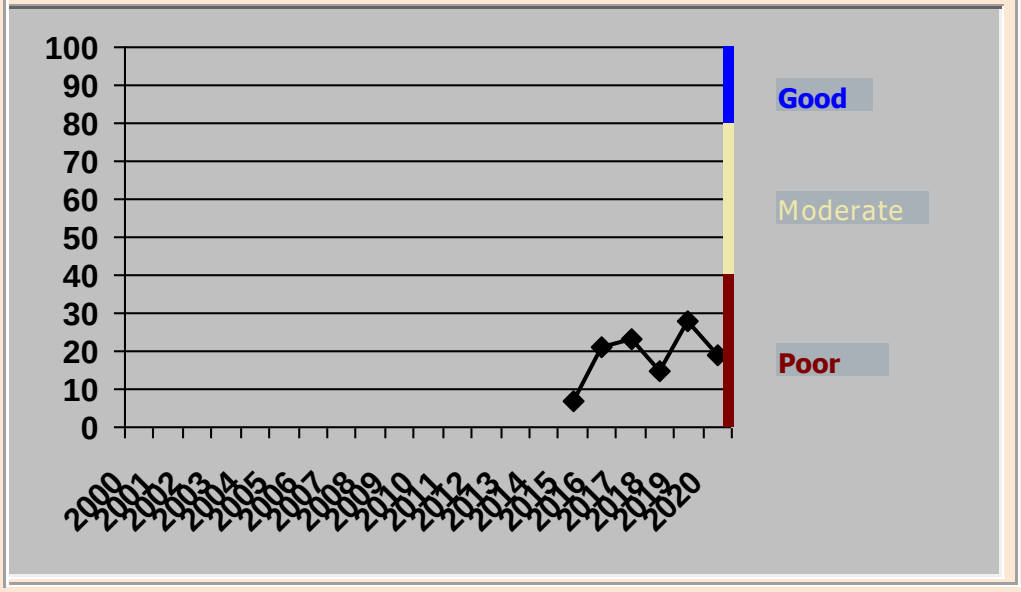




Monthly Scores For Water Year 2020

Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
78	70	93	85	96	89		18	40	18	20	35

WQI Score Comparison By Water Year



For more information about this creek please visit our website at http://green.kingcounty.gov/WLR/Waterres/StreamsData/streamlist.aspx

About The Water Quality Index:

The Water Quality Index (WQI) score is a unit-less number ranging from 10 to 100: the higher the number, the higher the water quality. Scores are calculated from data collected during the monthly routine sampling. For temperature, pH, fecal coliform bacteria, turbidity, and dissolved oxygen, the index expresses results relative to levels required to maintain beneficial uses according to criteria in Washington's Water Quality Standards, WAC 173-201A. For nutrient and sediment measures where there are no standard, results are expressed relative to guidelines for this eco-region. Results from the eight parameters are aggregated over time to produce a single score for each sample station. In general, stations scoring 80 and above did not fail water quality standards or guidelines and are of "low concern", scores 40 to 80 indicate "moderate concern", and water quality at stations with scores below 40 are of "high concern". For more information about the WQI please visit https://green2.kingcounty.gov/streamsdata/WQI.aspx

King County DNRP Water Quality Index

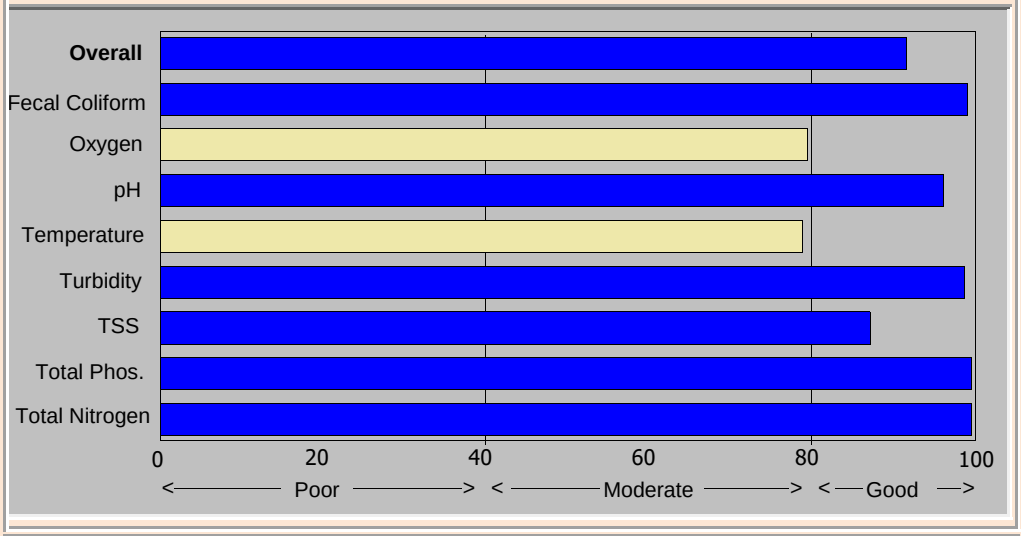
STATION LSIN9 WATER YEAR 2020

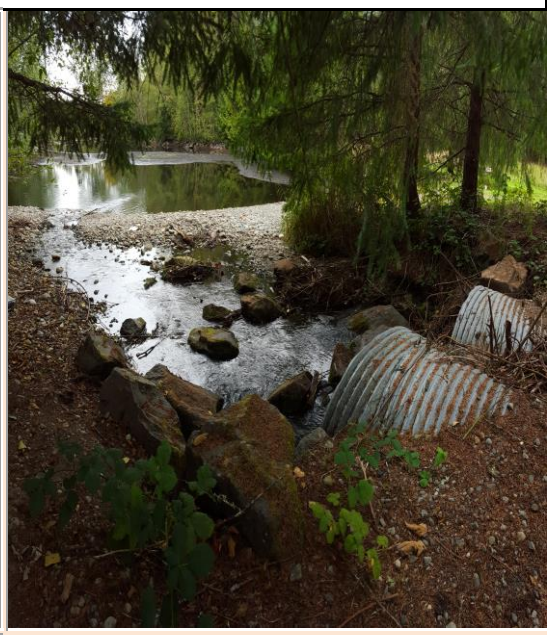
GAUGE # 09d **Ravensdale Creek (Lake Sawyer Inflow #3)** Overall Index **92**

King County monitors water quality in Ravensdale Creek at station LSIN9, which is located near the mouth of the creek where it crosses SE 312th Street. Monthly monitoring began at this site in 2104. Ravensdale Creek is a major tributary to Lake Sawyer flowing from Ravensdale Lake through the Henry's Ridge Natural Area and the Black Diamond Natural Area before entering the southeastern portion of the lake in the Lake Sawyer Regional Park. As part of the Big Soos Creek basin of the Green River watershed, Lake Sawyer serves as a pathway for a late winter run of Coho salmon. Coho salmon travel through Lake Sawyer on their way to spawning grounds in the Ravensdale and Rock Creek systems.

Annual Water Quality Index Scores

Water quality was GOOD based on data collected 10/1/2019 to 9/30/2020.

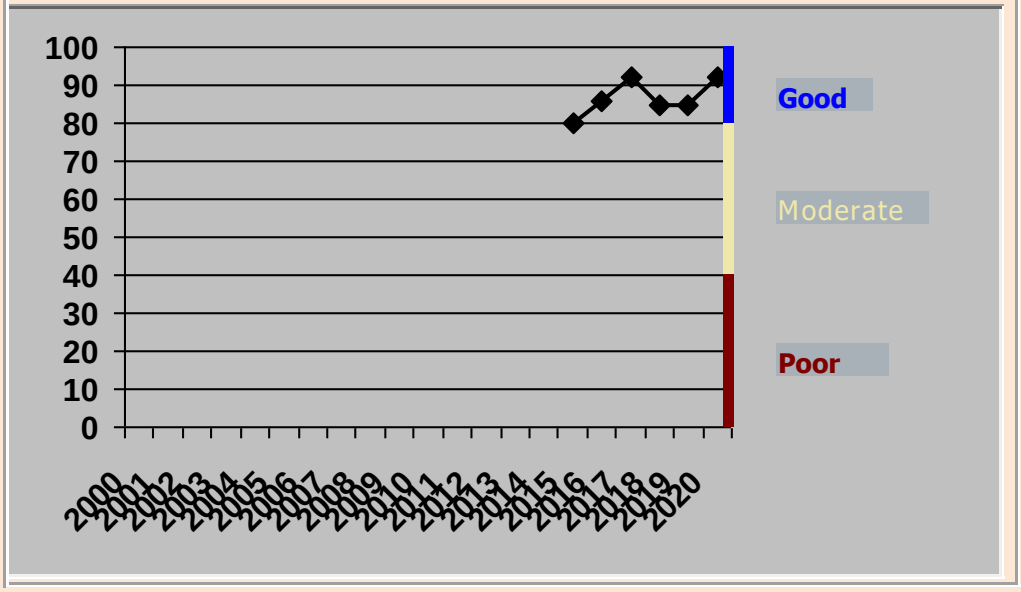




Monthly Scores For Water Year 2020

Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
98	98	100	98	98	99		93	95	87	94	97

WQI Score Comparison By Water Year



About The Water Quality Index:

The Water Quality Index (WQI) score is a unit-less number ranging from 10 to 100: the higher the number, the higher the water quality. Scores are calculated from data collected during the monthly routine sampling. For temperature, pH, fecal coliform bacteria, turbidity, and dissolved oxygen, the index expresses results relative to levels required to maintain beneficial uses according to criteria in Washington's Water Quality Standards, WAC 173-201A. For nutrient and sediment measures where there are no standard, results are expressed relative to guidelines for this eco-region. Results from the eight parameters are aggregated over time to produce a single score for each sample station. In general, stations scoring 80 and above did not fail water quality standards or guidelines and are of "low concern", scores 40 to 80 indicate "moderate concern", and water quality at stations with scores below 40 are of "high concern". For more information about the WQI please visit https://green2.kingcounty.gov/streamsdata/WQI.aspx

For more information about this creek please visit our website at http://green.kingcounty.gov/WLR/Waterres/StreamsData/streamlist.aspx

King County DNRP Water Quality Index

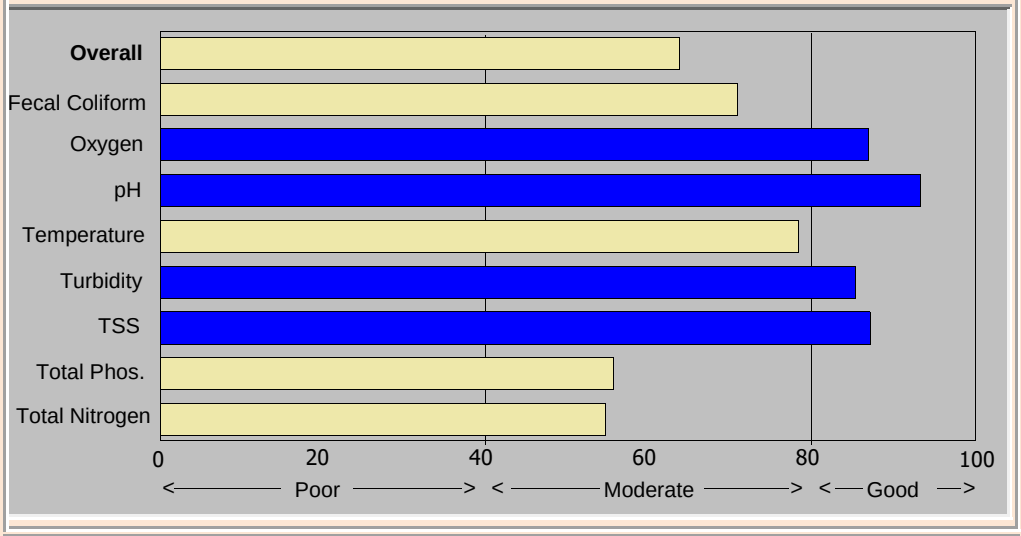
STATION 322 WATER YEAR 2020

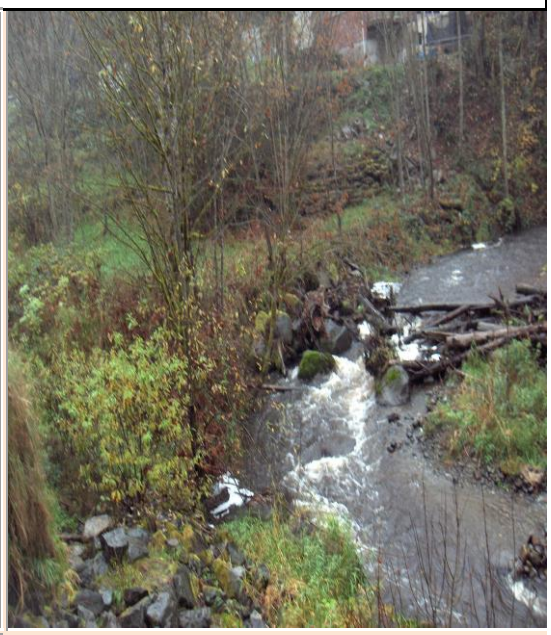
GAUGE # 44a **Newaukum USGS Gage** **Overall Index** 64

King County monitors the ecological health of Newaukum Creek at station 0322, which is one mile upstream from the mouth of the creek. Water quality sampling began at the station in 1972 and continues today. The Newaukum Creek basin encompasses 17,800 acres. The creek originates east of Enumclaw Plateau and flows 14 miles before entering the Middle Green River. Land use in the basin has transitioned from historic forested lands to agriculture and now to rural residential. The creek is on the 2012 Washington Department of Ecology's 303(d) list for violation of water temperature, dissolved oxygen, fecal coliform bacteria, and copper standards. This subbasin of the Green-Duwamish watershed is considered to be a major producer of winter steelhead, coho and chinook salmon. Resident and anadromous cutthroat have been observed throughout the basin.

Annual Water Quality Index Scores

Water quality was MODERATE based on data collected 10/1/2019 to 9/30/2020.

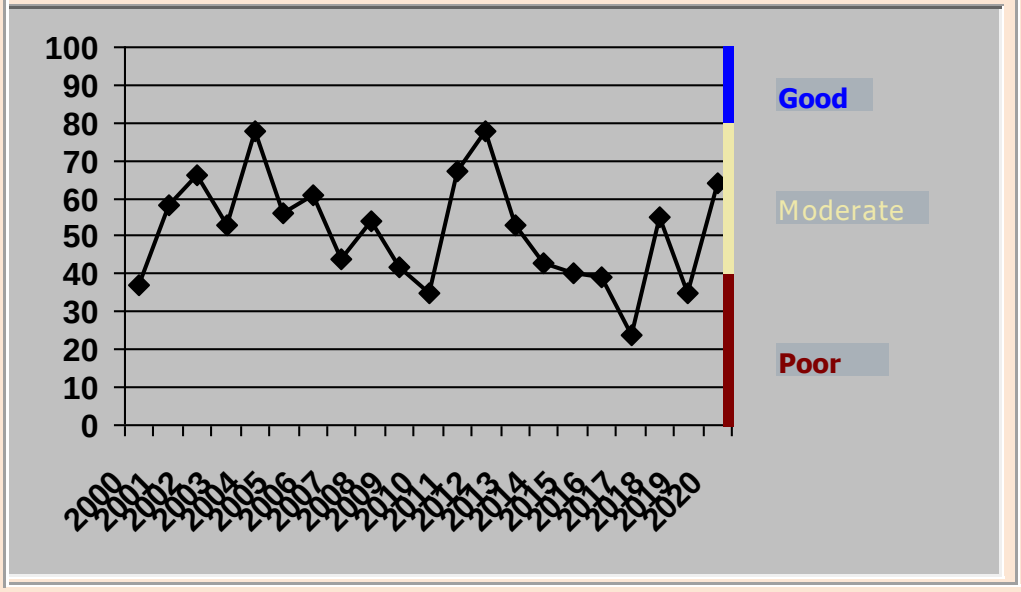




Monthly Scores For Water Year 2020

Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
94	84	69	81	78	85		90	46	92	82	91

WQI Score Comparison By Water Year



About The Water Quality Index:

The Water Quality Index (WQI) score is a unit-less number ranging from 10 to 100: the higher the number, the higher the water quality. Scores are calculated from data collected during the monthly routine sampling. For temperature, pH, fecal coliform bacteria, turbidity, and dissolved oxygen, the index expresses results relative to levels required to maintain beneficial uses according to criteria in Washington's Water Quality Standards, WAC 173-201A. For nutrient and sediment measures where there are no standard, results are expressed relative to guidelines for this eco-region. Results from the eight parameters are aggregated over time to produce a single score for each sample station. In general, stations scoring 80 and above did not fail water quality standards or guidelines and are of "low concern", scores 40 to 80 indicate "moderate concern", and water quality at stations with scores below 40 are of "high concern". For more information about the WQI please visit https://green2.kingcounty.gov/streamsdata/WQI.aspx

For more information about this creek please visit our website at http://green.kingcounty.gov/WLR/Waterres/StreamsData/streamlist.aspx

WATER QUALITY ASSESSMENTS

Table A-5. 303(d) List

Category Rank	Category	Category Definition
1	Meets Tested Criteria	Recent data is sufficient in showing attainment of the applicable water quality standard for the assessed parameter. Placement in this category does not mean the assessment unit is compliant with standards for any other purpose (i.e., permitting). Not part of the 303(d) list.
2	Water of Concern	If Ecology determines that the data for an assessment unit parameter indicate credible concern but there are fewer exceedances than necessary for placement in Category 5, then the assessment unit will be placed in this category. Not part of the 303(d) list.
3	Insufficient Data to Make Determination	Assessment units with insufficient data to determine whether the water quality parameter in question has met the use standard. Not part of the 303(d) list.
4	4 Impaired but Does Not Require a TMDL	Not part of the 303(d) list but still impaired. Category 4 is broken up into 4A, 4B, and 4C.
	4A Has a TMDL Approved by EPA	When a TMDL for a parameter in an impaired assessment unit is approved by the EPA, Ecology reassigns the parameter for that assessment unit from Category 5 to Category 4A. If Ecology deems the TMDL is not being implemented, then the assessment unit parameter may be moved by to Category 5 to flag it for further action.
	4B Has a Pollution Control Program That Is Being Actively Implemented	When Ecology determines that a local, state, or federal program/strategy is implementing a pollution control program with the expectation of attaining water quality standards for an impaired assessment unit parameter, Ecology will place the Category 5 listing in question into Category 4B for review by the EPA.
	4C Impaired by a Non-Pollutant	When an assessment unit parameter fails to meet applicable water quality standards, but the cause is by a type of pollution not adequately addressed by development of a TMDL. Impaired designated uses caused by degradation but not resulting in the exceedance of a pollutant criterion would be placed here. Non-pollutant factors that cause impairment would be placed in this category and include physical habitat alterations and/or fish migration barriers, invasive exotic species, flow alterations, and degraded biological integrity.
5	The 303(d) List	Ecology will place an assessment unit parameter in Category 5 when data shows water quality criteria are not persistently attained, or narrative evidence indicates designated use impairment by a pollutant. Placement in this category means the associated designated use of the waterbody segment in question is impaired. If an assessment unit is projected to exceed applicable water quality standards through trend analysis, Ecology may preemptively move the assessment unit to this category. Only assessment units ranked as Category 5 are included in the 303(d) list for review by the EPA. All assessment units in Category 5 will need a TMDL, pollution control program, or other action to bring the waterbody into compliance.

Source: Ecology 2020

Attachment A2

Water Quality Assessment Listings by Receiving Water and Main Listing Information

Main Listing Information

Listing ID: 51577
Waterbody Name: SAWYER LAKE
Medium: Tissue
Parameter: 2,3,7,8-TCDD (Dioxin)
WQI Project: None
Designated Use: None

Year	Category
2014	5
2012	5
2008	5
2004	3
1998	N
1996	N

Assessment Unit

Assessment Unit ID: 17110013000395 **County:** King
WRIA: 9 - Duwamish-Green

Basis Statement

In 2006,
> Location ID(s) [SAWYERLK-F] -- 2 of 2 composite sample(s) of cutthroat trout (Oncorhynchus clarkii) Fillet, skin on tissue exceeded Washington's FTEC.

Data from 2006 :
User Location ID [SAWYERLK-F] - Fillet samples of rainbow trout did not exceed the National Toxics Rule criterion for 2,3,7,8-TCDD.

Remarks

The water quality assessment category 5 was based on results indicating an exceedance of 2,3,7,8-TCDD in fillet samples of cutthroat trout. There was not enough information to make a determination of the fillet samples of rainbow trout; Laboratory detection limits were higher than the criterion for this parameter.

Sample results exceeded the FTEC; therefore the Assessment Unit meets the requirements for a Category 5 determination.

The FTEC (fish tissue equivalent concentration) is the concentration of a contaminant in fish tissue that Washington equates to the National Toxics Rule water quality criterion for the protection of human health.

Data Sources

Study Id	Location Id
WSTMP06	SAWYERLK-F
WSTMP06	SAWYERLK-F

Map Link

Map Link (https://apps.ecology.wa.gov/waterqualityatlas/wqa/map?lstid=51577)

Main Listing Information

Listing ID: 13162
Waterbody Name: COVINGTON CREEK
Medium: Water
Parameter: Bacteria
WQI Project: None
Designated Use: None

Year	Category
2014	5
2012	5
2008	5
2004	5
1998	N
1996	N

Assessment Unit

Assessment Unit ID: 17110013000103 **County:** King
WRIA: 9 - Duwamish-Green

Basis Statement

King County unpublished data from station C320 (Covington Creek RM 0.5) show standards were not met each year in samples collected in 1998, 1999 and 2000.

Remarks

No Remarks Entered

Data Sources

No Source Records

Map Link

Map Link (https://apps.ecology.wa.gov/waterqualityatlas/wqa/map?lstid=13162)

Main Listing Information

Listing ID: 74201
Waterbody Name: COVINGTON CREEK
Medium: Water
Parameter: Bacteria
WQI Project: None
Designated Use: None

Year	Category
2014	5
2012	3
2008	3
2004	3
1998	N
1996	N

Assessment Unit

Assessment Unit ID: 17110013000104 **County:** King
WRIA: 9 - Duwamish-Green

Basis Statement

Location ID: [KCM-C320] -- In water year 2009, 1 of 3 sample values (33%) showed an excursion of the % criterion for this waterbody (200 cfu/100mL). Fewer than five samples were available, therefore a geometric mean was not calculated for this period.

Location ID: [KCM-C320] -- In water year 2008, 2 of 12 sample values (17%) showed an excursion of the % criterion for this waterbody (200 cfu/100mL). The geometric mean of 40.2 does not exceed the geometric mean criterion (100 cfu/100mL).

Location ID: [KCM-C320] -- In water year 2007, 0 of 12 sample values (0%) showed an excursion of the % criterion for this waterbody (200 cfu/100mL). The geometric mean of 22.8 does not exceed the geometric mean criterion (100 cfu/100mL).

Location ID: [KCM-C320] -- In water year 2006, 0 of 11 sample values (0%) showed an excursion of the % criterion for this waterbody (200 cfu/100mL). The geometric mean of 54.5 does not exceed the geometric mean criterion (100 cfu/100mL).

Location ID: [KCM-C320] -- In water year 2005, 0 of 12 sample values (0%) showed an excursion of the % criterion for this waterbody (200 cfu/100mL). The geometric mean of 40.5 does not exceed the geometric mean criterion (100 cfu/100mL).

Location ID: [KCM-C320] -- In water year 2004, 1 of 8 sample values (13%) showed an excursion of the % criterion for this waterbody (200 cfu/100mL). The geometric mean of 49.2 does not exceed the geometric mean criterion (100 cfu/100mL).

Remarks

Impairment was determined by exceedance of the percent criterion in water year(s) 2009, 2008, and 2004.

This listing contains E.coli data. E. coli is a subset of Fecal coliform bacteria therefore E.coli levels above the Fecal coliform standard can be used to infer an exceedance of this water quality standard.

Data Sources

Study Id	Location Id
KCstrm-1	KCM-C320

Map Link

Map Link (https://apps.ecology.wa.gov/waterqualityatlas/wqa/map?lstid=74201)

Main Listing Information

Listing ID: 47477
Waterbody Name: COVINGTON CREEK
Medium: Water
Parameter: Dissolved Oxygen
WQI Project: None
Designated Use: None

Year	Category
2014	5
2012	5
2008	5
2004	3
1998	N
1996	N

Assessment Unit

Assessment Unit ID: 17110013000104 **County:** King
WRIA: 9 - Duwamish-Green

Basis Statement

Location ID: [KCM-C320] -- In 2008, 3 of 12 sample values (25%) showed an excursion of the criterion (9.5 mg/L) for this waterbody;

Location ID: [KCM-C320] -- In 2007, 5 of 12 sample values (42%) showed an excursion of the criterion (9.5 mg/L) for this waterbody;

Location ID: [KCM-C320] -- In 2006, 5 of 11 sample values (45%) showed an excursion of the criterion (9.5 mg/L) for this waterbody;

Location ID: [KCM-C320] -- In 2005, 4 of 12 sample values (33%) showed an excursion of the criterion (9.5 mg/L) for this waterbody;

Location ID: [KCM-C320] -- In 2004, 2 of 11 sample values (18%) showed an excursion of the criterion (9.5 mg/L) for this waterbody;

Remarks

Ten percent or more of the samples collected in a single year were excursions of the criterion, and at least 3 excursions exist from all data considered.

Data Sources

Study Id	Location Id
KCstrm-1	KCM-C320
KCstrm-1	KCM-C320

Map Link

Map Link (https://apps.ecology.wa.gov/waterqualityatlas/wqa/map?lstid=47477)

Main Listing Information

Listing ID: 52691
Waterbody Name: SAWYER LAKE
Medium: Tissue
Parameter: Polychlorinated Biphenyls (PCBs)
WQI Project: None
Designated Use: None

Year	Category
2014	5
2012	5
2008	5
2004	3
1998	N
1996	N

Assessment Unit

Assessment Unit ID: 17110013000395 **County:** King
WRIA: 9 - Duwamish-Green

Basis Statement

In 2006,
> Location ID(s) [SAWYERLK-F] -- 2 of 2 composite sample(s) of cutthroat trout (Oncorhynchus clarkii) Fillet, skin on tissue exceeded Washington's FTEC.
> Location ID(s) [SAWYERLK-F] -- 1 of 1 composite sample(s) of largemouth bass (Micropterus salmoides) Fillet, skin on tissue exceeded Washington's FTEC.
> Location ID(s) [SAWYERLK-F] -- 1 of 1 composite sample(s) of rainbow trout (Oncorhynchus mykiss) Fillet, skin on tissue exceeded Washington's FTEC.

Remarks

Category determination based on results from lab methods for PCB Aroclors and PCB congeners.

Sample results exceeded the FTEC; therefore the Assessment Unit meets the requirements for a Category 5 determination.

The FTEC (fish tissue equivalent concentration) is the concentration of a contaminant in fish tissue that Washington equates to the National Toxics Rule water quality criterion for the protection of human health.

Data Sources

Study Id	Location Id
WSTMP06	SAWYERLK-F
WSTMP06	SAWYERLK-F

Map Link

Map Link (https://apps.ecology.wa.gov/waterqualityatlas/wqa/map?lstid=52691)

Main Listing Information

Listing ID: 73256
Waterbody Name: COVINGTON CREEK
Medium: Water
Parameter: Temperature
WQI Project: None
Designated Use: None

Year	Category
2014	5
2012	3
2008	3
2004	3
1998	N
1996	N

Assessment Unit

Assessment Unit ID: 17110013000104 **County:** King
WRIA: 9 - Duwamish-Green

Basis Statement

Location ID: KCM-C320 -- In 2008, 2 of 3 sample values (67%) showed an excursion of the criteria (16°C) for this waterbody;
{Supplemental Spawning Period}: Location ID: KCM-C320 -- In 2008, 0 of 9 sample values (0%) showed an excursion of the criteria (13°C) for this waterbody;

Location ID: KCM-C320 -- In 2007, 0 of 3 sample values (0%) showed an excursion of the criteria (16°C) for this waterbody;
{Supplemental Spawning Period}: Location ID: KCM-C320 -- In 2007, 0 of 9 sample values (0%) showed an excursion of the criteria (13°C) for this waterbody;

Location ID: KCM-C320 -- In 2006, 0 of 3 sample values (0%) showed an excursion of the criteria (16°C) for this waterbody;
{Supplemental Spawning Period}: Location ID: KCM-C320 -- In 2006, 1 of 8 sample values (13%) showed an excursion of the criteria (13°C) for this waterbody;

Location ID: KCM-C320 -- In 2005, 0 of 3 sample values (0%) showed an excursion of the criteria (16°C) for this waterbody;
{Supplemental Spawning Period}: Location ID: KCM-C320 -- In 2005, 1 of 9 sample values (11%) showed an excursion of the criteria (13°C) for this waterbody;

Location ID: KCM-C320 -- In 2004, 0 of 2 sample values (0%) showed an excursion of the criteria (16°C) for this waterbody;
{Supplemental Spawning Period}: Location ID: KCM-C320 -- In 2004, 1 of 9 sample values (11%) showed an excursion of the criteria (13°C) for this waterbody;

Remarks

Supplemental Criteria apply from Sep 15 - Jul 1

Data Sources

Study Id	Location Id
KCstrm-1	KCM-C320

Map Link

Map Link (https://apps.ecology.wa.gov/waterqualityatlas/wqa/map?lstid=73256)

Main Listing Information

Listing ID: 8182
Waterbody Name: SAWYER LAKE
Medium: Water
Parameter: Total Phosphorus
WQI Project: Lake Sawyer Total Phosphorus TMDL
Designated Use: None

Year	Category
2014	4A
2012	4A
2008	4A
2004	5
1998	N
1996	N

Assessment Unit

Assessment Unit ID: 17110013000395 **County:** King
WRIA: 9 - Duwamish-Green

Basis Statement

Hart-Crowser, 1990.

Carrol and Pelletier, 1991.

King County Volunteer Citizen Monitoring Program unpublished data show show summer mean epilimnetic total phosphorus did not exceed the water quality standards nutrient criterion from samples collected between 1998-2002.

Location ID [KC-A718] -- In 2006 the summer epilimnetic mean concentration of total phosphorus samples did not exceed the action value for this ecoregion (20 ug/L).

Location ID [KC-A718] -- In 2007 the summer epilimnetic total phosphorus samples did not exceed the action value for this ecoregion (20 ug/L).

Location ID [KC-A718] -- In 2008 the summer epilimnetic mean concentration of total phosphorus samples did not exceed the action value for this ecoregion (20 ug/L).

Location ID [KC-A718] -- In 2009 the summer epilimnetic mean concentration of total phosphorus samples did not exceed the action value for this ecoregion (20 ug/L).

Location ID [KC-A718] -- In 2010 the summer epilimnetic mean concentration of total phosphorus samples did not exceed the action value for this ecoregion (20 ug/L).

Remarks

Sumioka and Dion basis removed on 04/10/06. Listing was not reassessed and keeps Category 5. -kk TMDL based on the building of an interceptor for the City of Black Diamond wastewater discharge submitted 3/9/92. EPA approved the TMDL on 2/12/93. Onwumere (2002) determined that the goals set by the TMDL were not being achieved.

Part of the Sawyer Lake Total Phosphorus TMDL approved by EPA in 1993. -kk

(public) Part of the Sawyer Lake Total Phosphorus TMDL approved by EPA in 1993. -kk (public) Sumioka and Dion basis removed on 04/10/06. Listing was not reassessed and keeps Category 5. -kk TMDL based on the building of an interceptor for the City of Black Diamond wastewater discharge submitted 3/9/92. EPA approved the TMDL on 2/12/93. Onwumere (2002) determined that the goals set by the TMDL were not being achieved.

Data Sources

Study Id	Location Id
KC_Minor_Lakes	KC-A718

Map Link

Map Link (https://apps.ecology.wa.gov/waterqualityatlas/wqa/map?lstid=8182)

Main Listing Information

Listing ID: 4685
Waterbody Name: SAWYER LAKE
Medium: Habitat
Parameter: Invasive Exotic Species
WQI Project: None
Designated Use: None

Year	Category
2014	4C
2012	4C
2008	4C
2004	4C
1998	N
1996	N

Assessment Unit

Assessment Unit ID: 17110013000395 **County:** King
WRIA: 9 - Duwamish-Green

Basis Statement

Ecology survey (Parsons and O'Neal, 2000) found Eurasian water-milfoil (Myriophyllum spicatum)

Remarks

No Remarks Entered

Data Sources

No Source Records

Map Link

Map Link (https://apps.ecology.wa.gov/waterqualityatlas/wqa/map?lstid=4685)

Main Listing Information

Listing ID: 70150
Waterbody Name: RAVENSDALE CREEK
Medium: Other
Parameter: Bioassessment
WQI Project: None
Designated Use: None

Year	Category
2014	5
2012	3
2008	3
2004	3
1998	N
1996	N

Assessment Unit

Assessment Unit ID: 17110013000171 **County:** King
WRIA: 9 - Duwamish-Green

Basis Statement

Location ID [09COV1756] was sampled by King County - the Benthic Index of Biotic Integrity (B-IBI) score was 36 in 2006, 36 in 2007, 38 in 2008, 40 in 2009, 34 in 2010.

Location ID [09COV1798] was sampled by King County - the Benthic Index of Biotic Integrity (B-IBI) score was 34 in 2006, 26 in 2007, 36 in 2008, 34 in 2009, 18 in 2010

Remarks

The listing has been placed in Category 5 because the two most recent data points indicate that biological integrity is degraded or because two or more B-IBI/RIVPACS data points in the most recent five data points indicate biological degradation and the scores do not qualify for Category 1 or Category 2. A B-IBI score ≤ 27 and a RIVPACS score less than 0.73 indicates degraded biological integrity. A data point is the lowest bioassessment score observed for a given year.

The listing has been reassessed under the current Policy 1-11 and has been moved from Category 3 to Category 5 based on new data.

The source of the benthic macroinvertebrate community data and associated B-IBI scores is the Puget Sound Stream Benthos database, which is maintained by King County.

Data Sources

No Source Records

Map Link

Map Link (https://apps.ecology.wa.gov/waterqualityatlas/wqa/map?lstid=70150)

Main Listing Information

Listing ID: 7048
Waterbody Name: COVINGTON CREEK
Medium: Water
Parameter: Temperature
WQI Project: None
Designated Use: None

Year	Category
2014	5
2012	3
2008	3
2004	1
1998	N
1996	N

Assessment Unit

Assessment Unit ID: 17110013000103 **County:** King
WRIA: 9 - Duwamish-Green

Basis Statement

Location ID: KC_T_09a -- In 2010, between 7/2/2010 and 9/14/2010, the 7-day mean of daily maximum values (7DADmax) exceeded the criterion for this waterbody (16°C) on 23 of 75 days (31%); The maximum exceedance during this period was 18.33°C for the 7-day period centered on 7/9/2010 ;
{Supplemental Spawning Period}: Location ID: KC_T_09a -- In 2010, during the supplemental criteria period, the 7-day mean of daily maximum values (7DADmax) exceeded the criterion for this waterbody (13°C) on 62 of 287 days (22%); The maximum exceedance during this period was 16.69°C for the 7-day period centered on 6/25/2010 ; (External Data Source: King County Database)

Location ID: KC_T_09a -- In 2009, between 7/2/2009 and 9/14/2009, the 7-day mean of daily maximum values (7DADmax) exceeded the criterion for this waterbody (16°C) on 0 of 75 days (0%); ;
{Supplemental Spawning Period}: Location ID: KC_T_09a -- In 2009, during the supplemental criteria period, the 7-day mean of daily maximum values (7DADmax) exceeded the criterion for this waterbody (13°C) on 49 of 290 days (17%); The maximum exceedance during this period was 17.17°C for the 7-day period centered on 6/1/2009 ; (External Data Source: King County Database)

Location ID: KC_T_09a -- In 2008, between 7/2/2008 and 9/14/2008, the 7-day mean of daily maximum values (7DADmax) exceeded the criterion for this waterbody (16°C) on 0 of 75 days (0%); ;
{Supplemental Spawning Period}: Location ID: KC_T_09a -- In 2008, during the supplemental criteria period, the 7-day mean of daily maximum values (7DADmax) exceeded the criterion for this waterbody (13°C) on 35 of 291 days (12%); The maximum exceedance during this period was 16.11°C for the 7-day period centered on 6/27/2008 ; (External Data Source: King County Database)

Location ID: KC_T_09a -- In 2007, between 7/2/2007 and 9/14/2007, the 7-day mean of daily maximum values (7DADmax) exceeded the criterion for this waterbody (16°C) on 0 of 75 days (0%); ;
{Supplemental Spawning Period}: Location ID: KC_T_09a -- In 2007, during the supplemental criteria period, the 7-day mean of daily maximum values (7DADmax) exceeded the criterion for this waterbody (13°C) on 52 of 290 days (18%); The maximum exceedance during this period was 15.46°C for the 7-day period centered on 6/1/2007 ; (External Data Source: King County Database)

Location ID: KC_T_09a -- In 2006, between 7/2/2006 and 9/14/2006, the 7-day mean of daily maximum values (7DADmax) exceeded the criterion for this waterbody (16°C) on 0 of 75 days (0%); ;
{Supplemental Spawning Period}: Location ID: KC_T_09a -- In 2006, during the supplemental criteria period, the 7-day mean of daily maximum values (7DADmax) exceeded the criterion for this waterbody (13°C) on 59 of 233 days (25%); The maximum exceedance during this period was 16.04°C for the 7-day period centered on 6/27/2006 ; (External Data Source: King County Database)

King County unpublished data from station C320 (Covington Creek RM 0.5) show temperature criterion was met in all years between 1998 and 2002.

Remarks

Unknown if critical temporal period adequately captured to conclude non-impairment based on WQP Policy 1-11. -mh
There is insufficient data to meet minimum requirements according to Policy 1-11.
Historical Remarks: There is insufficient data to meet minimum requirements according to Policy 1-11. Unknown if critical temporal period adequately captured to conclude non-impairment based on WQP Policy 1-11. -mh
Supplemental Criteria apply from Sep 15 - Jul 1

Data Sources

No Source Records

Map Link

Map Link (https://apps.ecology.wa.gov/waterqualityatlas/wqa/map?lstid=7048)

Main Listing Information

Listing ID: 70161
Waterbody Name: JENKINS CREEK
Medium: Other
Parameter: Bioassessment
WQI Project: None
Designated Use: None

Year	Category
2014	5
2012	3
2008	3
2004	3
1998	N
1996	N

Assessment Unit

Assessment Unit ID: 17110013000168 **County:** King
WRIA: 9 - Duwamish-Green

Basis Statement

Location ID [09JEN1318] - the Benthic Index of Biotic Integrity (B-IBI) score was 28 in 2006, 24 in 2007, 14 in 2008, 30 in 2010.
Location ID [09JEN1357] was sampled by King County - the Benthic Index of Biotic Integrity (B-IBI) score was 24 in 2006, 34 in 2007, 30 in 2008, 26 in 2009, 28 in 2010

Remarks

The listing has been placed in Category 5 because the two most recent data points indicate that biological integrity is degraded or because two or more B-IBI/RIVPACS data points in the most recent five data points indicate biological degradation and the scores do not qualify for Category 1 or Category 2. A B-IBI score ≤ 27 and a RIVPACS score less than 0.73 indicates degraded biological integrity.

The listing has been reassessed under the current Policy 1-11 and has been moved from Category 3 to Category 5 based on new data.

The source of the benthic macroinvertebrate community data and associated B-IBI scores is the Puget Sound Stream Benthos database, which is maintained by King County.

Data Sources

No Source Records

Map Link

Map Link (https://apps.ecology.wa.gov/waterqualityatlas/wqa/map?lstid=70161)

Main Listing Information

Listing ID: 70162
Waterbody Name: JENKINS CREEK
Medium: Other
Parameter: Bioassessment
WQI Project: None
Designated Use: None

Year	Category
2014	5
2012	3
2008	3
2004	3
1998	N
1996	N

Assessment Unit

Assessment Unit ID: 17110013000493 **County:** King
WRIA: 9 - Duwamish-Green

Basis Statement

Location ID [09JEN1358] was sampled by King County - the Benthic Index of Biotic Integrity (B-IBI) score was 26 in 2006, 24 in 2007, 22 in 2008, 30 in 2009,

Remarks

The listing has been reassessed under the current Policy 1-11 and has been moved from Category 3 to Category 5 based on new data.

The listing has been placed in Category 5 because the two most recent data points indicate that biological integrity is degraded or because two or more B-IBI/RIVPACS data points in the most recent five data points indicate biological degradation and the scores do not qualify for Category 1 or Category 2. A B-IBI score ≤ 27 and a RIVPACS score less than 0.73 indicates degraded biological integrity.

The source of the benthic macroinvertebrate community data and associated B-IBI scores is the Puget Sound Stream Benthos database, which is maintained by King County.

Data Sources

No Source Records

Map Link

Map Link (https://apps.ecology.wa.gov/waterqualityatlas/wqa/map?lstid=70162)

Main Listing Information

Listing ID: 7045
Waterbody Name: JENKINS CREEK
Medium: Water
Parameter: Temperature
WQI Project: None
Designated Use: None

Year	Category
2014	5
2012	3
2008	3
2004	1
1998	N
1996	N

Assessment Unit

Assessment Unit ID: 17110013000168 **County:** King
WRIA: 9 - Duwamish-Green

Basis Statement

Location ID: KC_T_26a -- In 2010, between 7/2/2010 and 9/14/2010, the 7-day mean of daily maximum values (7DADmax) exceeded the criterion for this waterbody (16°C) on 5 of 75 days (7%); The maximum exceedance during this period was 16.52°C for the 7-day period centered on 8/15/2010 ;
{Supplemental Spawning Period}: Location ID: KC_T_26a -- In 2010, during the supplemental criteria period, the 7-day mean of daily maximum values (7DADmax) exceeded the criterion for this waterbody (13°C) on 24 of 290 days (8%); The maximum exceedance during this period was 14.09°C for the 7-day period centered on 9/18/2010 ; (External Data Source: King County Database)

Location ID: KC_T_26a -- In 2009, between 7/2/2009 and 9/14/2009, the 7-day mean of daily maximum values (7DADmax) exceeded the criterion for this waterbody (16°C) on 25 of 75 days (33%); The maximum exceedance during this period was 19.62°C for the 7-day period centered on 7/30/2009 ;
{Supplemental Spawning Period}: Location ID: KC_T_26a -- In 2009, during the supplemental criteria period, the 7-day mean of daily maximum values (7DADmax) exceeded the criterion for this waterbody (13°C) on 48 of 290 days (17%); The maximum exceedance during this period was 15.53°C for the 7-day period centered on 6/1/2009 ; (External Data Source: King County Database)

Location ID: KC_T_26a -- In 2008, between 7/2/2008 and 9/14/2008, the 7-day mean of daily maximum values (7DADmax) exceeded the criterion for this waterbody (16°C) on 11 of 75 days (15%); The maximum exceedance during this period was 16.91°C for the 7-day period centered on 8/16/2008 ;
{Supplemental Spawning Period}: Location ID: KC_T_26a -- In 2008, during the supplemental criteria period, the 7-day mean of daily maximum values (7DADmax) exceeded the criterion for this waterbody (13°C) on 34 of 291 days (12%); The maximum exceedance during this period was 15.77°C for the 7-day period centered on 6/27/2008 ; (External Data Source: King County Database)

Location ID: KC_T_26a -- In 2007, between 7/2/2007 and 9/14/2007, the 7-day mean of daily maximum values (7DADmax) exceeded the criterion for this waterbody (16°C) on 25 of 75 days (33%); The maximum exceedance during this period was 17.33°C for the 7-day period centered on 7/13/2007 ;
{Supplemental Spawning Period}: Location ID: KC_T_26a -- In 2007, during the supplemental criteria period, the 7-day mean of daily maximum values (7DADmax) exceeded the criterion for this waterbody (13°C) on 39 of 290 days (13%); The maximum exceedance during this period was 15.6°C for the 7-day period centered on 6/1/2007 ; (External Data Source: King County Database)

Location ID: KC_T_26a -- In 2006, between 7/2/2006 and 9/14/2006, the 7-day mean of daily maximum values (7DADmax) exceeded the criterion for this waterbody (16°C) on 35 of 75 days (47%); The maximum exceedance during this period was 18.57°C for the 7-day period centered on 7/24/2006 ;
{Supplemental Spawning Period}: Location ID: KC_T_26a -- In 2006, during the supplemental criteria period, the 7-day mean of daily maximum values (7DADmax) exceeded the criterion for this waterbody (13°C) on 55 of 290 days (19%); The maximum exceedance during this period was 16.01°C for the 7-day period centered on 6/27/2006 ; (External Data Source: King County Database)

King County unpublished data from station D320 (Jenkins Creek RM 2.2) show temperature criterion was met in all years 1998 and 2002.

Remarks

Unknown if critical temporal period adequately captured to conclude non-impairment based on WQP Policy 1-11. -mh
There is insufficient data to meet minimum requirements according to Policy 1-11.
Historical Remarks: There is insufficient data to meet minimum requirements according to Policy 1-11. Unknown if critical temporal period adequately captured to conclude non-impairment based on WQP Policy 1-11. -mh
Supplemental Criteria apply from Sep 15 - Jul 1

Data Sources

Study Id	Location Id
KCstrm-1	KCM-D320

Map Link

Map Link (https://apps.ecology.wa.gov/waterqualityatlas/wqa/map?lstid=7045)

Main Listing Information

Listing ID: 4684
Waterbody Name: PIPE LAKE
Medium: Habitat
Parameter: Invasive Exotic Species
WQI Project: None
Designated Use: None

Year	Category
2014	4C
2012	4C
2008	4C
2004	4C
1998	N
1996	N

Assessment Unit

Assessment Unit ID: 17110013000391 **County:** King
WRIA: 9 - Duwamish-Green

Basis Statement

Ecology survey (Parsons and O'Neal, 2000) found hydrilla (Hydrilla verticillata)

Ecology survey (Parsons and O'Neal, 2000) found Eurasian water-milfoil (Myriophyllum spicatum)

Remarks

No Remarks Entered

Data Sources

No Source Records

Map Link

Map Link (https://apps.ecology.wa.gov/waterqualityatlas/wqa/map?lstid=4684)

Main Listing Information

Listing ID: 4690
Waterbody Name: WILDERNESS LAKE
Medium: Habitat
Parameter: Invasive Exotic Species
WQI Project: None
Designated Use: None

Year	Category
2014	4C
2012	4C
2008	4C
2004	4C
1998	N
1996	N

Assessment Unit

Assessment Unit ID: 17110013002023 **County:** King
WRIA: 9 - Duwamish-Green

Basis Statement

Ecology survey (Parsons and O'Neal, 2000) found Eurasian water-milfoil (Myriophyllum spicatum)

Remarks

No Remarks Entered

Data Sources

No Source Records

Map Link

Map Link (https://apps.ecology.wa.gov/waterqualityatlas/wqa/map?lstid=4690)

Main Listing Information

Listing ID: 70169
Waterbody Name: CRISP CREEK
Medium: Other
Parameter: Bioassessment
WQI Project: None
Designated Use: None

Year	Category
2014	5
2012	3
2008	3
2004	3
1998	N
1996	N

Assessment Unit

Assessment Unit ID: 17110013002286 **County:** King
WRIA: 9 - Duwamish-Green

Basis Statement

Location ID [09MID1495] was sampled by King County - the Benthic Index of Biotic Integrity (B-IBI) score was 30 in 2006, 30 in 2007, 20 in 2008, 24 in 2009, 20 in 2010

Remarks

The listing has been reassessed under the current Policy 1-11 and has been moved from Category 3 to Category 5 based on new data.

The listing has been placed in Category 5 because the two most recent data points indicate that biological integrity is degraded or because two or more B-IBI/RIVPACS data points in the most recent five data points indicate biological degradation and the scores do not qualify for Category 1 or Category 2. A B-IBI score ≤ 27 and a RIVPACS score less than 0.73 indicates degraded biological integrity.

The source of the benthic macroinvertebrate community data and associated B-IBI scores is the Puget Sound Stream Benthos database, which is maintained by King County.

Data Sources

No Source Records

Map Link

Map Link (https://apps.ecology.wa.gov/waterqualityatlas/wqa/map?lstid=70169)

Main Listing Information

Listing ID: 70170
Waterbody Name: CRISP CREEK
Medium: Other
Parameter: Bioassessment
WQI Project: None
Designated Use: None

Year	Category
2014	5
2012	3
2008	3
2004	3
1998	N
1996	N

Assessment Unit

Assessment Unit ID: 17110013002285 **County:** King
WRIA: 9 - Duwamish-Green

Basis Statement

Location ID [09MID1537] was sampled by King County - the Benthic Index of Biotic Integrity (B-IBI) score was 32 in 2006, 26 in 2007, 28 in 2008, 30 in 2009, 18 in 2010

Remarks

The listing has been placed in Category 5 because the two most recent data points indicate that biological integrity is degraded or because two or more B-IBI/RIVPACS data points in the most recent five data points indicate biological degradation and the scores do not qualify for Category 1 or Category 2. A B-IBI score ≤ 27 and a RIVPACS score less than 0.73 indicates degraded biological integrity.

The listing has been reassessed under the current Policy 1-11 and has been moved from Category 3 to Category 5 based on new data.

The source of the benthic macroinvertebrate community data and associated B-IBI scores is the Puget Sound Stream Benthos database, which is maintained by King County.

Data Sources

No Source Records

Map Link

Map Link (https://apps.ecology.wa.gov/waterqualityatlas/wqa/map?lstid=70170)

Main Listing Information

Listing ID: 70171
Waterbody Name: UNNAMED CREEK (TRIB TO GREEN RIVER)
Medium: Other
Parameter: Bioassessment
WQI Project: None
Designated Use: None

Year	Category
2014	5
2012	3
2008	3
2004	3
1998	N
1996	N

Assessment Unit

Assessment Unit ID: Unmappable - UNNAMED CREEK (TRIB TO GREEN RIVER)-21N-6E-27 **County:** King
WRIA: 9 - Duwamish-Green

Basis Statement

Location ID [09MID1704] was sampled by King County - the Benthic Index of Biotic Integrity (B-IBI) score was 16 in 2006, 16 in 2007, 14 in 2008, 18 in 2009, 14 in 2010

Remarks

The listing has been reassessed under the current Policy 1-11 and has been moved from Category 3 to Category 5 based on new data.

The listing has been placed in Category 5 because the two most recent data points indicate that biological integrity is degraded or because two or more B-IBI/RIVPACS data points in the most recent five data points indicate biological degradation and the scores do not qualify for Category 1 or Category 2. A B-IBI score ≤ 27 and a RIVPACS score less than 0.73 indicates degraded biological integrity.

The source of the benthic macroinvertebrate community data and associated B-IBI scores is the Puget Sound Stream Benthos database, which is maintained by King County.

Data Sources

No Source Records

Map Link

Map Link (https://apps.ecology.wa.gov/waterqualityatlas/wqa/map?lstid=70171)

Main Listing Information

Listing ID: 12708
Waterbody Name: GREEN RIVER
Medium: Water
Parameter: Dissolved Oxygen
WQI Project: None
Designated Use: None

Year	Category
2014	5
2012	2
2008	2
2004	5
1998	N
1996	Y

Assessment Unit

Assessment Unit ID: 17110013002277 **County:** King
WRIA: 9 - Duwamish-Green

Basis Statement

Location ID: [KCM-B319] -- In 2010, 0 of 12 sample values (0%) showed an excursion of the criterion (9.5 mg/L) for this waterbody;

Location ID: [KCM-B319] -- In 2009, 0 of 12 sample values (0%) showed an excursion of the criterion (9.5 mg/L) for this waterbody;

Location ID: [KCM-B319] -- In 2008, 0 of 12 sample values (0%) showed an excursion of the criterion (9.5 mg/L) for this waterbody;

Location ID: [KCM-B319] -- In 2007, 1 of 12 sample values (8%) showed an excursion of the criterion (9.5 mg/L) for this waterbody;

Location IDs: [KCM-B319], [09-GRE-WHI] -- In 2006, 4 of 16 sample values (25%) showed an excursion of the criterion (9.5 mg/L) for this waterbody;

Location ID [KCM-B319] -- In 2005, 1 of 14 sample values (7.1%) showed an excursion of the criterion for this waterbody, (criterion = 9.5 mg/L).

Location ID [KCM-B319] -- In 2004, 1 of 13 sample values (7.7%) showed an excursion of the criterion for this waterbody, (criterion = 9.5 mg/L).

King County unpublished data from station B319 (Green RM 41.5) show excursions beyond the dissolved oxygen criterion in 1998, 1999, and 2000

Remarks

Historic Remarks: Fewer than ten percent of the samples collected in a each year were excursions of the criterion.

Ten percent or more of the samples collected in a single year were excursions of the criterion, and at least 3 excursions exist from all data considered.

Combined Listing: Listing ID 47552 was rolled into this listing

Data Sources

Study Id	Location Id
KCstrm-1	KCM-B319
KCstrm-1	KCM-B319
MROB003	09-GRE-WHI

Map Link

Map Link (https://apps.ecology.wa.gov/waterqualityatlas/wqa/map?lstid=12708)

Main Listing Information

Listing ID: 70696
Waterbody Name: HORSESHOE LAKE
Medium: Water
Parameter: Total Phosphorus
WQI Project: None
Designated Use: None

Year	Category
2014	5
2012	3
2008	3
2004	3
1998	N
1996	N

Assessment Unit

Assessment Unit ID: 17110013000407 **County:** King
WRIA: 9 - Duwamish-Green

Basis Statement

Location ID [KC-A773] -- In 2008 the summer epilimnetic mean concentration of total phosphorus samples exceeded the action value for this ecoregion (20 ug/L).

Location ID [KC-A773] -- In 2007 the summer epilimnetic mean concentration of total phosphorus samples exceeded the action value for this ecoregion (20 ug/L).

Location ID [KC-A773] -- In 2006 the summer epilimnetic mean concentration of total phosphorus samples did not exceed the action value for this ecoregion (20 ug/L).

Remarks

No Remarks Entered

Data Sources

Study Id	Location Id
KC_Minor_Lakes	KC-A773

Map Link

Map Link (https://apps.ecology.wa.gov/waterqualityatlas/wqa/map?lstid=70696)

Main Listing Information

Listing ID: 7043
Waterbody Name: GREEN RIVER
Medium: Water
Parameter: Temperature
WQI Project: Green River Temperature Watershed
Designated Use: None

Year	Category
2014	4A
2012	4A
2008	5
2004	5
1998	N
1996	Y

Assessment Unit

Assessment Unit ID: 17110013002277 **County:** King
WRIA: 9 - Duwamish-Green

Basis Statement

Location ID: KCM-B319 -- In 2010, 0 of 3 sample values (0%) showed an excursion of the criteria (16°C) for this waterbody;

{Supplemental Spawning Period}: Location ID: KCM-B319 -- In 2010, 1 of 9 sample values (11%) showed an excursion of the criteria (13°C) for this waterbody;

Location ID: KCM-B319 -- In 2009, 1 of 3 sample values (33%) showed an excursion of the criteria (16°C) for this waterbody;

{Supplemental Spawning Period}: Location ID: KCM-B319 -- In 2009, 0 of 9 sample values (0%) showed an excursion of the criteria (13°C) for this waterbody;

Location ID: KCM-B319 -- In 2008, 1 of 3 sample values (33%) showed an excursion of the criteria (16°C) for this waterbody;

{Supplemental Spawning Period}: Location ID: KCM-B319 -- In 2008, 1 of 12 sample values (8%) showed an excursion of the criteria (13°C) for this waterbody;

Location ID: KC_T_GRT10 -- In 2008, between 7/2/2008 and 9/14/2008, the 7-day mean of daily maximum values (7DADmax) exceeded the criterion for this waterbody (16°C) on 50 of 75 days (67%); The maximum exceedance during this period was 20.18°C for the 7-day period centered on 8/14/2008; (External Data Source: King County Database)

Location ID: KC_T_GRT10 -- In 2007, between 7/2/2007 and 9/14/2007, the 7-day mean of daily maximum values (7DADmax) exceeded the criterion for this waterbody (16°C) on 69 of 75 days (92%); The maximum exceedance during this period was 20.34°C for the 7-day period centered on 7/13/2007; (External Data Source: King County Database);

Location ID: KCM-B319 -- In 2007, 1 of 3 sample values (33%) showed an excursion of the criteria (16°C) for this waterbody;

{Supplemental Spawning Period}: Location ID: KCM-B319 -- In 2007, 0 of 9 sample values (0%) showed an excursion of the criteria (13°C) for this waterbody;

Location ID: KC_T_GRT10 -- In 2006, between 7/2/2006 and 9/14/2006, the 7-day mean of daily maximum values (7DADmax) exceeded the criterion for this waterbody (16°C) on 69 of 75 days (92%); The maximum exceedance during this period was 22.63°C for the 7-day period centered on 7/24/2006; (External Data Source: King County Database);

Location ID [09-GRE-WHI] -- between 6/21/2006 and 9/5/2006 there were 65 occurences in which the 7-day mean of daily maximum values (7DADmax) exceeded the temperature criterion for this waterbody, (criterion = 16°C); the maximum exceedance during this period was 21.83°C for the 7-day period ending July 27, 2006;

Location IDs: KCM-B319 / 09-GRE-WHI -- In 2006, 4 of 7 sample values (57%) showed an excursion of the criteria (16°C) for this waterbody;

{Supplemental Spawning Period}: Location ID: KCM-B319 -- In 2006, 0 of 9 sample values (0%) showed an excursion of the criteria (13°C) for this waterbody;

Location ID: KC_T_GRT10 -- In 2005, between 7/2/2005 and 9/14/2005, the 7-day mean of daily maximum values (7DADmax) exceeded the criterion for this waterbody (16°C) on 69 of 75 days (92%); The maximum exceedance during this period was 21.28°C for the 7-day period centered on 7/28/2005; (External Data Source: King County Database)

Location ID: KC_T_GRT10 -- In 2004, between 7/2/2004 and 9/14/2004, the 7-day mean of daily maximum values (7DADmax) exceeded the criterion

for this waterbody (16°C) on 69 of 75 days (92%); The maximum exceedance during this period was 22.3°C for the 7-day period centered on 7/26/2004; (External Data Source: King County Database)

King County unpublished data from station B319 (Green RM 41.5) show temperature criterion was exceeded in all years between 1998 and 2002.

Caldwell, 1994, multiple excursions beyond the criterion at RM 41.5 in 1992.

Remarks

The temperature impairment in this water body is addressed by the Green River Temperature TMDL, approved by EPA 8/11/11.
As a result of merging of two stream reaches into a single assessment unit in 2014, this record was merged with the record formerly associated with the Listing ID 7481. This does not affect the existing Category 4A determination for this assessment unit, but does extend it through the reach associated with former Listing ID 7481.
The Core Summer Salmonid Habitat temperature criterion (16°C) applies to this assessment unit. Supplemental Spawning criterion (13°C) applies from Sept. 15 through July 1.
Combined Listing: Listing IDs 48627, 7481 were rolled into this listing

Data Sources

Study Id	Location Id
KCstrm-1	KCM-B319
MROB003	09-GRE-WHI
MROB003	09-GRE-WHI

Map Link

Map Link (https://apps.ecology.wa.gov/waterqualityatlas/wqa/map?lstid=7043)

Main Listing Information

Listing ID: 10824
Waterbody Name: GREEN RIVER
Medium: Water
Parameter: Dissolved Oxygen
WQI Project: None
Designated Use: None

Year	Category
2014	5
2012	5
2008	5
2004	1
1998	N
1996	N

Assessment Unit

Assessment Unit ID: 17110013002278 **County:** King
WRIA: 9 - Duwamish-Green

Basis Statement

Location ID: [09A190] -- In 2009, 0 of 9 sample values (0%) showed an excursion of the criterion (9.5 mg/L) for this waterbody;

Location ID: [09A190] -- In 2008, 0 of 11 sample values (0%) showed an excursion of the criterion (9.5 mg/L) for this waterbody;

Location ID: [09A190] -- In 2007, 0 of 12 sample values (0%) showed an excursion of the criterion (9.5 mg/L) for this waterbody;

Location IDs: [09A190], [09-GRE-KAN], [09-GRE-GOR /09-GRE-FLA] -- In 2006, 4 of 16 sample values (25%) showed an excursion of the criterion (9.5 mg/L) for this waterbody;

Location ID: [09A190] -- In 2005, 0 of 12 sample values (0%) showed an excursion of the criterion (9.5 mg/L) for this waterbody;

Location ID [09A190] -- In 2004, 3 of 22 sample values (13.6%) showed an excursion of the criterion for this waterbody, (criterion = 9.5 mg/L).

Hallock (2001) Dept. of Ecology Ambient Monitoring Station 09A190 (GREEN RIVER AT KANASKAT) shows 0 excursions beyond the criterion out of 63 samples collected between 1993 - 200
1.

Remarks

Ten percent or more of the samples collected in a single year were excursions of the criterion, and at least 3 excursions exist from all data considered.

Combined Listing: Listing IDs 48003, 48002, 48001, 47550 were rolled into this listing

Data Sources

Study Id	Location Id
AMS001	09A190
AMS001	09A190
AMS001E	09A190
KCSTRM-1	KCM-A319
KCSTRM-1	KCM-A319
MROB003	09-GRE-KAN
MROB003	09-GRE-GOR
MROB003	09-GRE-FLA
MROB003	09-GRE-FLA
MROB003	09-GRE-GOR
MROB003	09-GRE-KAN

Map Link

Map Link (https://apps.ecology.wa.gov/waterqualityatlas/wqa/map?lstid=10824)

Main Listing Information

Listing ID: 6574
Waterbody Name: GREEN RIVER
Medium: Water
Parameter: Temperature
WQI Project: Green River Temperature Watershed
Designated Use: None

Year	Category
2014	4A
2012	4A
2008	5
2004	5
1998	N
1996	N

Assessment Unit

Assessment Unit ID: 17110013002278 **County:** King
WRIA: 9 - Duwamish-Green

Basis Statement

Location ID: 09A190 -- In 2010, between 7/2/2010 and 9/14/2010, the 7-day mean of daily maximum values (7DADmax) exceeded the criterion for this waterbody (16°C) on 6 of 75 days (8%); The maximum exceedance during this period was 16.97°C for the 7-day period centered on 8/15/2010 ;

{Supplemental Spawning Period}: Location ID: 09A190 -- In 2010, during the supplemental criteria period, the 7-day mean of daily maximum values (7DADmax) exceeded the criterion for this waterbody (13°C) on 9 of 16 days (56%); The maximum exceedance during this period was 15.61°C for the 7-day period centered on 9/18/2010 ;

Location IDs: KC_T_GRT14 / 09A190 / KC_T_GRT16 -- In 2008, between 7/2/2008 and 9/14/2008, the 7-day mean of daily maximum values (7DADmax) exceeded the criterion for this waterbody (16°C) on 21 of 74 days (28%); The maximum exceedance during this period was 17.45°C for the 7-day period centered on 8/14/2008 ; (Location ID KC_T_GRT14 from External Data Source: King County Database)

{Supplemental Spawning Period}: Location ID: 09A190 -- In 2008, during the supplemental criteria period, the 7-day mean of daily maximum values (7DADmax) exceeded the criterion for this waterbody (13°C) on 10 of 16 days (63%); The maximum exceedance during this period was 15.26°C for the 7-day period centered on 9/18/2008 ;

Location ID: KC_T_GRT36 -- In 2007, between 7/2/2007 and 9/14/2007, the 7-day mean of daily maximum values (7DADmax) exceeded the criterion for this waterbody (16°C) on 69 of 75 days (92%); The maximum exceedance during this period was 19.86°C for the 7-day period centered on 7/13/2007 ; (External Data Source: King County Database)

{Supplemental Spawning Period}: Location ID: 09A190 -- In 2007, during the supplemental criteria period, the 7-day mean of daily maximum values (7DADmax) exceeded the criterion for this waterbody (13°C) on 10 of 16 days (63%); The maximum exceedance during this period was 15.71°C for the 7-day period centered on 9/21/2007 ;

Location ID: KC_T_GRT36 -- In 2006, between 7/2/2006 and 9/14/2006, the 7-day mean of daily maximum values (7DADmax) exceeded the criterion for this waterbody (16°C) on 69 of 75 days (92%); The maximum exceedance during this period was 21.88°C for the 7-day period centered on 7/24/2006 ; (External Data Source: King County Database)

{Supplemental Spawning Period}: Location IDs: 09A190 / 09-GRE-KAN -- In 2006, during the supplemental criteria period, the 7-day mean of daily maximum values (7DADmax) exceeded the criterion for this waterbody (13°C) on 7 of 17 days (41%); The maximum exceedance during this period was 14.67°C for the 7-day period centered on 6/27/2006 ;

Location ID [09-GRE-FLA] -- between 6/21/2006 and 9/5/2006 there were 51 occurences in which the 7-day mean of daily maximum values (7DADmax) exceeded the temperature criterion for this waterbody, (criterion = 16.0°C); the maximum exceedance during this period was 19.74°C for the 7-day period ending July 27, 2006.

Location ID [09-GRE-KAN] -- between 6/21/2006 and 9/5/2006 there were 51 occurences in which the 7-day mean of daily maximum values (7DADmax) exceeded the temperature criterion for this waterbody, (criterion = 16.0°C); the maximum exceedance during this period was 19.22°C for the 7-day period ending July 27, 2006.

Location ID: KC_T_GRT36 -- In 2005, between 7/2/2005 and 9/14/2005, the 7-day mean of daily maximum values (7DADmax) exceeded the criterion for this waterbody (16°C) on 64 of 75 days (85%); The maximum exceedance during this period was 20.34°C for the 7-day period centered on 7/28/2005 ; (External Data Source: King County Database)

{Supplemental Spawning Period}: Location ID: 09A190 -- In 2005, during the supplemental criteria period, the 7-day mean of daily maximum values (7DADmax) exceeded the criterion for this waterbody (13°C) on 0 of 5 days (0%); ;

Raforth, et al. 2002. show no excursions beyond the criterion from samples collected in 2000 and 2001.

Raforth, et al. 2002. show no excursions beyond the criterion from samples collected in 2000 and 2001. (second location

Dept. of Ecology unpublished data from core ambient monitoring station 09A190 (AT BRIDGE ON CUMBERLAND-PALMER RD.AT K) shows a 7-day mean of daily maximum values of 18.6 for mid-week 10 August 2001.

Hallock (2001) Dept. of Ecology Ambient Monitoring Station 09A190 (GREEN RIVER AT KANASKAT) shows 0 excursions beyond the criterion out of 63 samples collected between 1993 - 2001.

Remarks

The temperature impairment in this water body is addressed by the Green River Temperature TMDL, approved by EPA 8/11/11.
The Core Summer Salmonid Habitat temperature criterion (16°C) applies to this assessment unit. Supplemental Spawning criterion (13°C) applies from Sept 15 through July 1.
As a result of merging of three stream reaches into a single assessment unit in 2014, this record was merged with the records formerly associated with the Listing IDs 15147 and 48628. This does not affect the existing Category 4A determination for this assessment unit.
Combined Listing: Listing IDs 48629, 48628, 15147 were rolled into this listing

Data Sources

Study Id	Location Id
AMS001	09A190
AMS001	09A190
AMS001E	09A190
AMS004	09A190
MROB003	09-GRE-FLA
MROB003	09-GRE-KAN
MROB003	09-GRE-FLA
MROB003	09-GRE-KAN

Map Link

Map Link (https://apps.ecology.wa.gov/waterqualityatlas/wqa/map?lstid=6574)

Table A2-1. Water Quality Assessment Listings by Receiving Water

Receiving Water	Category	Listing ID	Listing Parameter
Covington Creek	5	51577	2,3,7,8-TCDD (Dioxin)
Covington Creek	5	13162	Bacteria
Covington Creek	5	74201	Bacteria
Covington Creek	5	47477	Dissolved Oxygen
Covington Creek	5	52691	Polychlorinated Biphenyls (PCBs)
Covington Creek	5	73256	Temperature
Covington Creek	4A	8182	Total Phosphorus
Covington Creek	4C	4685	Invasive Exotic Species
Covington Creek	5	70150	Bioassessment
Covington Creek	5	7048	Temperature
Jenkins Creek	5	70161	Bioassessment
Jenkins Creek	5	70162	Bioassessment
Jenkins Creek	5	7045	Temperature
Jenkins Creek	4C	4684	Invasive Exotic Species
Jenkins Creek	4C	4690	Invasive Exotic Species
Lower Green River	5	70169	Bioassessment
Lower Green River	5	70170	Bioassessment
Lower Green River	5	70171	Bioassessment
Lower Green River	5	12708	Dissolved Oxygen
Lower Green River	5	70696	Total Phosphorus
Lower Green River	4A	7043	Temperature
Middle Green River, Lower Green River	5	10824	Dissolved Oxygen
Middle Green River, Lower Green River	4A	6574	Temperature

TMDL

The following links have been provided for the known TMDLs and water quality improvement projects that have been identified as part of the Receiving Water Assessment:

Covington Creek:

Soos Creek Subbasin Multiparameter TMDL

Sawyer Lake Total Maximum Daily Load for Phosphorus

Jenkins Creek:

Soos Creek Subbasin Multiparameter TMDL

Lower & Middle Green River:

Green River Temperature Total Maximum Daily Load: Water Quality Improvement Report

BIOLOGIC INTEGRITY (B-IBI)

The table below describes the biological condition for identified overall score ranges as they were applied to the water quality analysis. For the purpose of this analysis, the classification of no data was added to identify areas within a basin that lack sufficient data to provide a score.

Table A-6. Range Definitions for Biological Condition Scores

Overall Score Range	Biological Condition	Description
[80, 100]	Excellent	Comparable to least disturbed reference condition. High overall diversity in taxa (mayflies, caddisflies, stoneflies, long-lived, clingers, and intolerant species specifically measured), high relative abundance of predators.
[60, 80)	Good	Diverges slightly from least disturbed condition. Absence of some long-lived and intolerant species; noticeable decline in mayflies, stoneflies, and caddisflies; the proportion of tolerant taxa is greater than the Excellent condition.
[40, 60)	Fair	Overall taxa richness is reduced, especially intolerant, long-lived, stonefly, and clinger species. The proportion of tolerant taxa is greater than the Good condition. Relative abundance of predator taxa is lower than the Good condition.
[20, 40)	Poor	Overall taxa diversity has declined. The proportion of predators and long-lived species has greatly reduced. Few stoneflies and intolerant species identified. The three most abundant taxa are shown to be dominant.
[0, 20)	Very Poor	Overall taxa diversity is very low and dominated by a few highly tolerant taxa. Mayfly, stonefly, caddisfly, clinger, long-lived, and intolerant taxa are largely absent. The relative abundance of predators is very low.

Source: King County 2021

Attachment A3

Puget Sound Stream Benthos

Row	Site Code, Location	Year, Project	Quantities												Scores										
			Taxa Richness	*Ephemeroptera Richness*	*Plecoptera Richness*	*Trichoptera Richness*	*EPT Richness*	*Clinger Richness*	*Long-Lived Richness*	*Intolerant Richness*	*Percent Dominant*	*Predator Percent*	*Tolerant Percent*	*Organisms*	*Overall Score*	*Taxa Richness*	*Ephemeroptera Richness*	*Plecoptera Richness*	*Trichoptera Richness*	*Clinger Richness*	*Long-Lived Richness*	*Intolerant Richness*	*Percent Dominant*	*Predator Percent*	*Tolerant Percent*
1	R320_MK, Covington Creek	1996, KC Historical	24	1	2	2	5	8	3	0	1	0	0	499	20.0	0.0	0.0	1.4	1.2	0.6	1.2	0.0	3.1	6.0	6.4
2	09COV1798, Covington Creek	2012, Ambient Monitoring	36	3	6	5	14	13	7	1	1	0	0	500	50.5	3.1	2.9	7.1	5.0	3.5	6.2	1.4	4.9	10.0	6.3
3	09COV1756, Covington Creek	2020, Ambient Monitoring	50	3	11	6	20	19	12	4	0	0	0	500	74.5	7.9	2.9	10.0	6.2	7.1	10.0	5.7	9.5	5.9	9.3
4	E333, Covington Creek	2010, ESA Water Quality	36	7	8	7	22	22	7	5	0	0	0	500	77.9	9.5	8.6	10.0	7.5	10.0	6.2	7.1	9.4	4.6	4.9
5	09COV1864, Rock Creek tributary (Covington)	2021, Ambient Monitoring	38	4	6	6	16	19	6	2	1	0	0	500	56.8	3.8	4.3	7.1	6.2	7.1	5.0	2.9	0.9	10.0	9.6
6	09COV1862, Rock Creek tributary (Covington)	2021, Ambient Monitoring	45	3	6	7	16	19	8	3	0	0	0	500	67.3	6.2	2.9	7.1	7.5	7.1	7.5	4.3	7.5	7.7	9.5
7	09COV1753, Rock Creek (Covington)	2002, Ambient Monitoring	21	2	4	3	9	6	5	1	1	0	0	500	37.9	2.4	1.4	4.3	2.5	0.6	3.8	1.4	6.2	5.5	9.9
8	09COV1418, Covington Creek	2020, Ambient Monitoring	47	7	5	8	20	26	8	5	1	0	0	500	66.4	6.9	8.6	5.7	8.8	10.0	7.5	7.1	3.7	3.9	4.3
9	E349, Ginder Creek	2010, ESA Water Quality	28	3	5	6	14	13	6	1	1	0	0	500	59.2	5.7	2.9	5.7	6.2	4.7	5.0	1.4	7.5	10.0	10.0
10	C320 Covington, Covington Creek	2001, KC Historical	35	7	6	8	21	23	7	3	0	0	0	500	78.2	9.0	8.6	7.1	8.8	10.0	6.2	4.3	10.0	5.8	8.4
11	E3516, Covington Creek	2010, ESA Water Quality	27	6	6	6	18	19	5	5	0	0	0	500	68.7	5.2	7.1	7.1	6.2	8.2	3.8	7.1	8.9	4.9	9.9
12	soos04, Covington Creek	2002, KC Historical	28	6	6	9	21	20	6	7	1	0	0	500	72.2	5.7	7.1	7.1	10.0	8.8	5.0	10.0	3.2	5.2	10.0
13	C320_MK, Covington Creek	1996, KC Historical	48	7	11	7	25	25	8	7	0	0	0	485	88.5	7.2	8.6	10.0	7.5	10.0	7.5	10.0	8.6	10.0	9.1
14	Soos Creek at 168th Way, Soos Creek	2012, TMDL Studies	40	6	5	7	18	23	7	8	1	0	0	500	71.4	4.5	7.1	5.7	7.5	9.4	6.2	10.0	2.6	8.5	9.8
15	Soos Creek and SR 58 Crossing Kent-Black Diamond R, Soos Creek	2012, TMDL Studies	43	5	8	10	23	26	11	7	0	0	0	500	86.9	5.5	5.7	10.0	10.0	10.0	10.0	10.0	6.2	10.0	9.5
16	09COV1165, Covington Creek	2020, Ambient Monitoring	40	6	4	9	19	24	7	6	0	0	0	500	69.3	4.5	7.1	4.3	10.0	10.0	6.2	8.6	5.6	4.9	8.1
17	CV, Covington Creek	1995, B. Kleindl's Thesis	27	8	7	3	18	19	6	7	0	0	0	500	72.0	5.2	10.0	8.6	2.5	8.2	5.0	10.0	10.0	2.8	9.6
18	soos07, Jenkins Creek	2001, KC Historical	26	3	6	3	12	12	6	2	1	0	0	500	47.9	4.8	2.9	7.1	2.5	4.1	5.0	2.9	5.1	4.1	9.5
19	09JEN1358, Jenkins Creek	2012, Ambient Monitoring	51	4	8	6	18	18	8	3	0	0	0	500	62.4	8.3	4.3	10.0	6.2	6.5	7.5	4.3	7.4	5.4	2.6
20	09JEN1357, Jenkins Creek	2021, Ambient Monitoring	48	6	9	5	20	16	6	3	0	0	0	499	63.6	7.2	7.1	10.0	5.0	5.3	5.0	4.3	8.9	2.6	8.0
21	09JEN1318, Jenkins Creek	2021, Ambient Monitoring	54	6	8	11	25	24	10	5	0	0	0	500	84.4	9.3	7.1	10.0	10.0	10.0	10.0	7.1	6.2	5.3	9.3
22	soos05, Jenkins Creek	2002, KC Historical	23	5	4	6	15	14	5	3	0	0	0	500	54.9	3.3	5.7	4.3	6.2	5.3	3.8	4.3	9.0	4.2	8.7
23	D320 Jenkins, Jenkins Creek	2001, KC Historical	35	8	8	8	24	23	10	7	0	0	0	500	90.5	9.0	10.0	10.0	8.8	10.0	10.0	10.0	10.0	4.1	8.7
24	E216, Jenkins Creek	2010, ESA Water Quality	23	5	6	3	14	12	8	6	1	0	1	500	39.1	3.3	5.7	7.1	2.5	4.1	7.5	8.6	0.0	0.2	0.0
25	09MID1958, Icy Creek	2020, Ambient Monitoring	48	6	11	7	24	17	8	8	0	0	0	500	75.9	7.2	7.1	10.0	7.5	5.9	7.5	10.0	7.5	3.3	9.9
26	09MID1817, Cristy Creek	2021, Ambient Monitoring	54	2	7	9	18	13	6	1	1	0	0	500	61.9	9.3	1.4	8.6	10.0	3.5	5.0	1.4	3.3	10.0	9.3
27	09MID1744, Cristy Creek	2020, Ambient Monitoring	38	6	9	6	21	20	7	6	1	0	0	500	61.8	3.8	7.1	10.0	6.2	7.6	6.2	8.6	0.0	3.6	8.5
28	09MID1704, Green River - Middle tributary	2011, Ambient Monitoring	20	1	0	0	1	3	2	0	1	0	0	492	12.6	1.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.5	8.3
29	B319 Green Whitney, Green River	2001, KC Historical	31	12	4	6	22	22	5	2	1	0	0	500	60.9	7.1	10.0	4.3	6.2	10.0	3.8	2.9	5.8	0.8	10.0
30	09MID1537, Crisp Creek tributary	2020, Ambient Monitoring	47	3	6	4	13	11	7	2	1	0	1	500	38.2	6.9	2.9	7.1	3.8	2.4	6.2	2.9	3.1	3.0	0.0
31	0321 Crisp Cr, Crisp Creek	2001, KC Historical	22	2	3	3	8	9	4	0	1	0	0	500	30.5	2.9	1.4	2.9	2.5	2.4	2.5	0.0	5.8	0.2	10.0
32	09MID1495, Crisp Creek	2011, Ambient Monitoring	24	1	5	5	11	8	4	1	1	0	0	500	34.1	3.8	0.0	5.7	5.0	1.8	2.5	1.4	1.2	3.2	9.5
33	09MID1374, O'Grady Creek	2020, Ambient Monitoring	48	3	9	8	20	18	7	4	0	0	0	500	71.4	7.2	2.9	10.0	8.8	6.5	6.2	5.7	5.4	10.0	8.7
34	09MID2426, Green River - Middle tributary	2020, Ambient Monitoring	55	6	10	10	26	23	11	8	0	0	0	500	87.5	9.7	7.1	10.0	10.0	9.4	10.0	10.0	8.5	3.2	9.6
33	E2538, Green River - Middle tributary	2010, ESA Water Quality	30	6	8	5	19	13	7	3	1	0	0	500	64.1	6.7	7.1	10.0	5.0	4.7	6.2	4.3	4.8	5.4	9.9

Legend:				
Excellent	Excellent/Good – Good	Good/Fair – Fair	Fair/Poor – Poor	Poor/Very Poor – Very Poor

Source: https://pugetsoundstreambenthos.org/Biotic-Integrity-Map.aspx

Appendix B

Watershed Characterization Analysis

PUGET SOUND WATERSHED CHARACTERIZATION PROJECT

The Washington State Department of Ecology has developed a mapping tool, the Puget Sound Watershed Characterization Project, that can be used to support stormwater management planning. The watershed characterization project mapping tool includes different categories for water flow, water quality, and fish and wildlife habitats. The Watershed Characterization tool provides color-coded maps that show the relative value of small watersheds, also known as analysis units (AU), and marine shorelines in the Puget Sound Basin. The relative value is determined by the potential importance of the area to ecological processes or values, such as water delivery, sediment delivery, or habitat/species conservation. For purposes of a map display, the analysis units are grouped into evenly distributed quartiles, which are labeled high, moderate-high, moderate and low. For this analysis the quartile rankings were converted to numeric values to sum for each ecological process value as well as for an overall analysis unit score. The quartiles were converted as follows:

- High – 4
- Moderate-high – 3
- Moderate – 2
- Low – 1

Water Flow Assessments

The water-flow model integrates two distinct sub-models, one sub-model for importance and one sub-model for degradation. For this analysis, the degradation sub-model has not been included because it evaluates the watershed in an "altered" state by considering the impact of human actions on flow processes across all landscape groups, but it fails to consider the presence of existing mitigation to offset the impacts of those actions. The importance sub-model evaluates each analysis unit in an unaltered state, based on its physical attributes of topography, soil, geology, and hydrology and without any consideration of land use changes or human modifications that may have occurred. The importance sub-model considers the following four fundamental groups of water-flow processes:

- Delivery – This group assesses the physical features that control how precipitation is delivered to the landscape. This includes the quantity of precipitation, area of forest cover, and rain on snow zones. Changes to these controls are also evaluated including percent of forest and impervious cover.
- Surface storage – This group assesses features that control the movement of water at the surface, including depressional wetlands and floodplains. Changes to storage are assessed based on the type of adjoining development and the changes to areas that decrease the capacity to store water.
- Recharge – This group assesses areas that control the infiltration of precipitation into groundwater. The model calculates the decrease in recharge based on the intensity of development.
- Discharge – This group assesses areas that control the movement of groundwater back to the surface, including the area of slope wetlands and floodplains with permeable deposits. Changes to discharge controls are evaluated based on road density, number of water wells, and type of adjacent development.

Water Quality Assessments

Export Potentials and Combined Effect

Water Quality is a key element used to inform resource management decisions when performing a watershed-level assessment. The model has five individual water quality models, each of which has an export potential sub-model and a degradation sub-model. The degradation model has not been included because it evaluates the capacity of an area to generate load pollutant constituents but does not account for existing treatment or infrastructure in place providing mitigation for the effects of the loading.

The model defines export potential as a measure of an analysis unit's relative capacity (if it were disturbed) to generate and transport contaminants to aquatic areas downstream and ultimately to Puget Sound. The export potential sub-model evaluates each analysis without any consideration of land use changes or human modifications, and it considers four fundamental groups of processes: delivery, storage, movement, and loss of a particular water quality constituent in any given watershed (Ecology 2016a). The export potential sub-model was selected for this analysis because it is analogous to the selection of the importance sub-model for water flow.

This analysis evaluated water quality using sub-models for sediments, metals, phosphorus, and nitrogen constituents. These constituents were chosen because, in excess quantities, they degrade beneficial uses of the state's aquatic ecosystems.

Sediment Sub-Model

The Sediment Export Potential sub-model assesses the relative capacity of an area under natural conditions to transport sediment and to potentially act as a sink for sediment. The transport of soil particles downstream is based on the density of streams and connected wetlands and the relative area of sources of sediment (soil erosivity and landslides). The sub-model also considers the relative area that can remove sediment, which is achieved by evaluating areas with potential to act as sources and sinks of sediment. Sources of sediment can be from land clearing activities associated with land development, forestry, and agriculture.

Metals Sub-Model

The Metals Export Potential sub-model assesses the relative capacity of an area to generate and transport toxic metals downstream, based on an evaluation of areas that act as sinks that can trap metals. Analysis for metals in the Watershed Characterization tool include copper and zinc. Copper can be introduced into the environment through natural sources, such as volcanic eruptions, windblown dust, and forest fires. Copper can also be introduced from copper mining activities, metal manufacturing, agricultural and domestic use of pesticides and fungicides, leather processing, and automotive brake pads. Zinc can be introduced into the environment through tire wear and from leaching of galvanized surfaces.

Areas with high export potential for metals have relatively fewer lakes, wetlands, and floodplain storage areas and less extent of soils with high organic and clay content

Phosphorus and Nitrogen Sub-Models

The Phosphorous Export Potential sub-model assesses the relative capacity of an area under natural conditions to transport phosphorous downstream based on areas that act as sources and sinks of

phosphorous. The Nitrogen Export Potential sub-model assesses the relative capacity of an area to transport nitrogen downstream, based on an evaluation of areas that act as sinks that facilitate denitrification. Sources of nutrients, such as nitrogen, can be from fertilizers and animal waste. Phosphorus is present in soil and geologic materials, is typically generated by the same sources as sediments, and enters water bodies along with sediments through processes such as surface erosion, mass wasting, and in-channel erosion. The analysis gives a reduced weighting factor to each constituent so that the combined nutrient transport effect is equal to that of metal elements when scoring.

Areas with high export potential for phosphorus typically have relatively:

- Higher intensity rainfall
- Steeper topography
- More erosive soils
- Greater extent of areas subject to landslide hazards and higher stream density
- More erosive stream channels
- Fewer depressional wetlands, lakes, and floodplain storage areas to trap phosphorus
- Less extent of soils with a high clay content

Areas with high export potential for nitrogen are typically:

- Wetlands and lakes
- Riparian areas with hydric soils

Fish and Wildlife Habitats

Hydrogeomorphic Features

The Freshwater Index Components considered for this analysis were hydrogeomorphic features, which are crucial to maintaining the quality of salmonid habitats. The scoring for hydrogeomorphic features is based on the relative extent of all existing wetlands and undeveloped floodplains in the assessment unit. The Index was created using Ecology's spatial data that was refined through overlays onto land cover data layers from various sources and removing areas coincident with urban, agricultural, or developed lands (WDFW 2013). A data gap was noted in a portion of the West Lake Washington Basin for the index when performing the analysis. For hydrogeomorphic features, the index is arranged from 0 to 10, with 0 being the lowest density and 10 being the highest density, meaning that high scores have a relatively greater extent of wetlands and floodplains than other assessment units. The 0 to 10 values were normalized based on the same 1 to 4 scale used for other sub-models.

Overall Score

The overall scores were determined by summing the scores for the selected ecological processes or values, which were weighted by sub-model according to the details in Table B-1. For the basin area within City boundaries, the model AUs were clipped to the City Boundary and summed according to their relative contribution (see Table B-2). The same process was used to find scores for the watersheds, clipping according to the watershed boundaries delineated by King County (King County 2018).

Figures B-1, B-2, and B-3 show the respective sub-model inputs and model outputs for the basins withing the City boundary and for the watersheds.

Table B-1. Combined Score Weighting

Ecological Process/Value	Sub-Model	Weighting Factor	Potential Scoring Range	
			Low	High
Water Flow	Overall Importance	1.00	1.00	4.00
Water Quality	Sediment Export Potential	1.00	1.00	4.00
Water Quality	Metals Export Potential	0.50	0.5	2.00
Water Quality	Nitrogen Export Potential	0.25	0.25	1.00
Water Quality	Phosphorus Export Potential	0.25	0.25	1.00
Fish and Wildlife Habitat	Hydrogeomorphic Features	1.00	1.00	4.00
Summed Total		**4.00**	**4.00**	**16.00**

Scoring summations would be translated to quartiles as follows: High – 16; Moderate-high -12; Moderate – 8; and Low – 4

Table B-2. Puget Sound Watershed Characterization Model Outputs

Basin Name	Basin Area Within City Boundary (square miles)	Overall Score Within City Boundary	Total Watershed Area (square miles)	Overall Score of Watershed
Covington Creek	5.86	11.41	22.35	11.39
Jenkins Creek	0.01	10.06	16.45	10.52
Lower Green River	1.24	11.70	31.71	11.17
Middle Green River	0.09	9.00	27.06	9.36

Source: Ecology 2016b

Stormwater Management Influence

Per Ecology's SMAP Guidance document, a receiving water basin with low stormwater management influence can be disregarded for future prioritization efforts. Ecology recommends considering both the hydrologic impact and pollutant loading impact of each receiving water basin to assess the stormwater management influence on their respective receiving waters. To summarize the hydrologic and pollutant loading impacts of each receiving water basin, a score was assigned to each based on the sub-model outputs described in the previous sections of this Appendix document.

The output from the water-flow overall importance sub-model was used to assign a hydrologic impact score to each receiving water. The model AUs were clipped to the City Boundary and the resultant water-flow scores for each AU were averaged according to their relative contribution to the corresponding receiving water basin.

Similarly, the outputs from the water-quality sub-models were used to assign a pollutant loading impact score to each receiving water. The model AUs were clipped to the City Boundary and the resultant combined nutrient export potential (including metals, nitrogen, and phosphorus export potentials according to the weights assigned in Table B-1) for each AU was averaged according to their relative contribution to the corresponding receiving water basin. The same process was done for the sediment

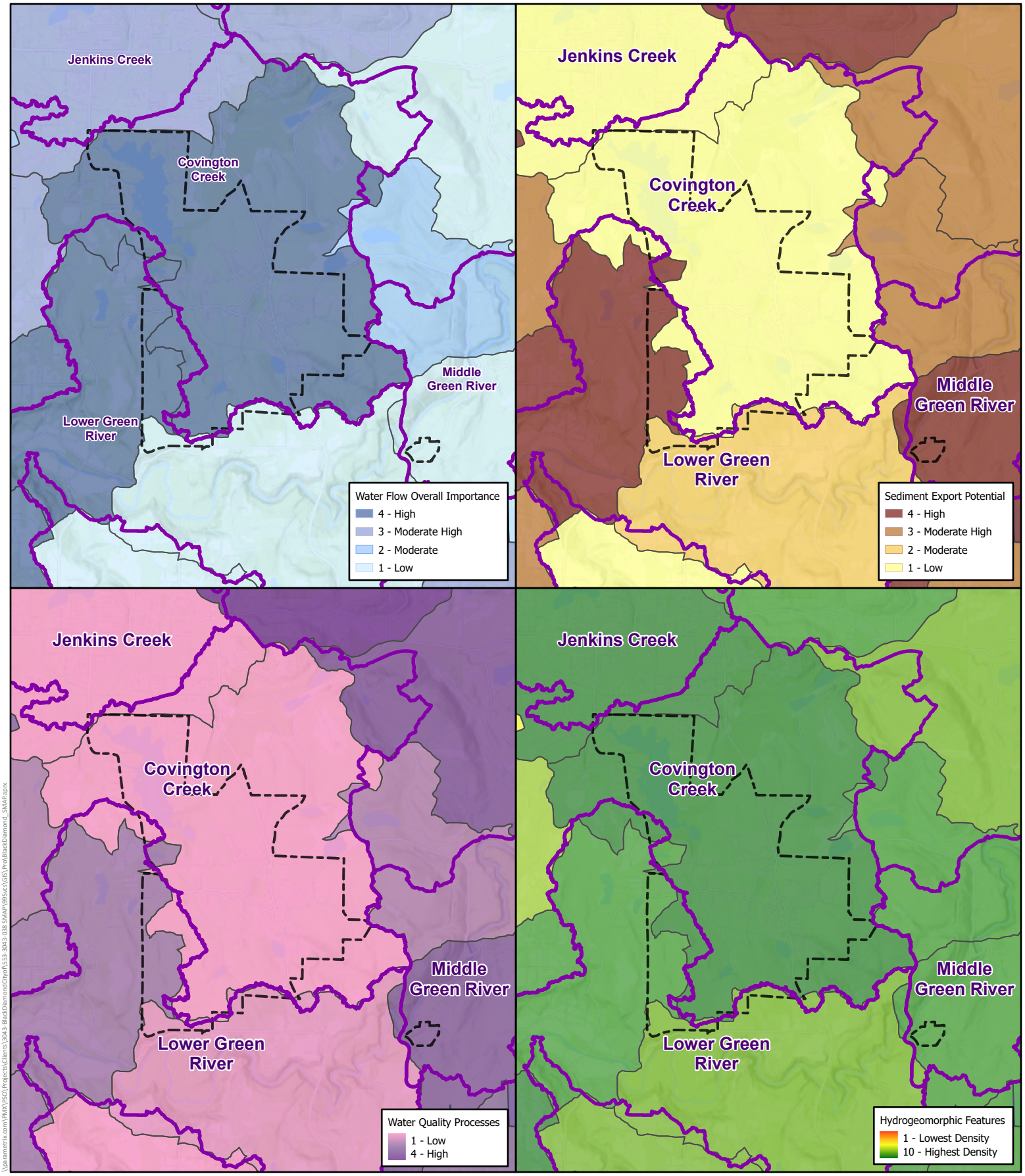
export potential. The combined nutrient export potential score and sediment export potential score for each receiving water was then averaged to assign the pollutant loading score.

Scores ranged from 1 to 4 and were rounded to the nearest whole number to obtain quartile rankings for the impact scores. A score of 1 would be representative of a receiving water basin with low hydrologic or pollutant loading impact on its respective receiving water, whereas a score of 4 would be representative of a receiving water basin with high hydrologic or pollutant loading impact on its respective receiving water. Table B-3 summarizes the resulting impact scores.

Table B-3. Hydrologic and Pollutant Loading Scores of Receiving Water Basins within City Boundary

Basin Name	Hydrologic Impact Scores	Hydrologic Impact Score Key	Pollutant Loading Impact Scores	Pollutant Loading Impact Score Key
Covington Creek	4	High	1	Low
Jenkins Creek	3	Moderate-high	1	Low
Lower Green River	3	Moderate-high	2	Moderate
Middle Green River	1	Low	4	High

Source: Ecology 2016b



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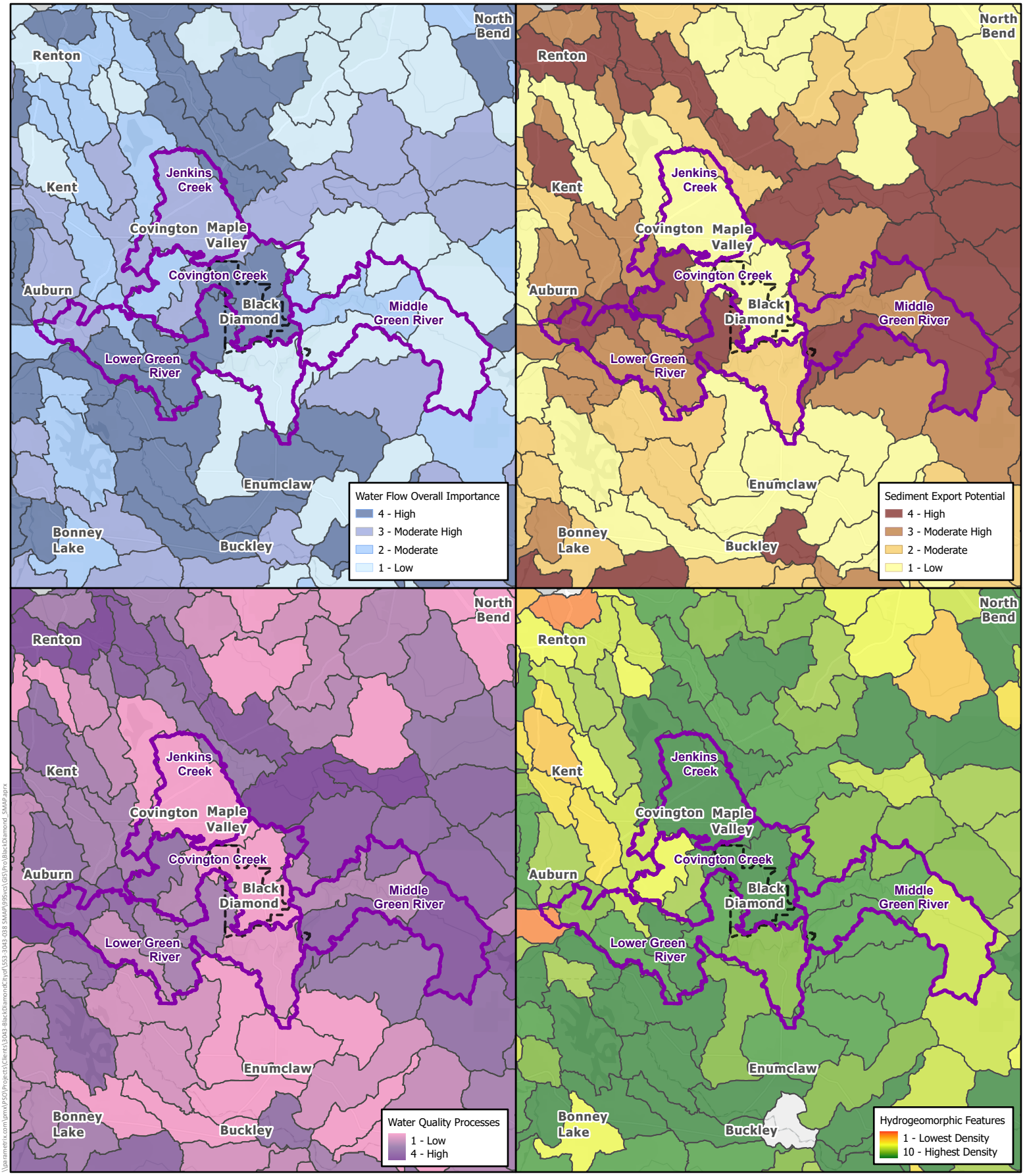
Date: 2/24/2022
Sources: Black Diamond, WA Ecology, WA DNR, USGS, ESRI
Disclaimer: This product is for informational purposes and may not have been prepared for, or be suitable for legal, engineering, or surveying purposes.

Receiving Water Basin
PSWCM Boundaries
Black Diamond City Limits

Figure B-1 - Puget Sound Watershed Characterization Sub-Model Inputs
Black Diamond SMAP
Receiving Water Assessment

0 0.5 1 2 Miles

Black Diamond, WA



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Sources: Black Diamond, WA Ecology, WA DNR, USGS, ESRI
Disclaimer: This product is for informational purposes and may not have been prepared for, or be suitable for legal, engineering, or surveying purposes.

Receiving Water Basin
PSWCM Boundaries
Black Diamond City Limits

Figure B-2 - Puget Sound Watershed Characterization Model Inputs
Black Diamond SMAP
Receiving Water Assessment

0 0.5 1 2
Miles

Black Diamond, WA

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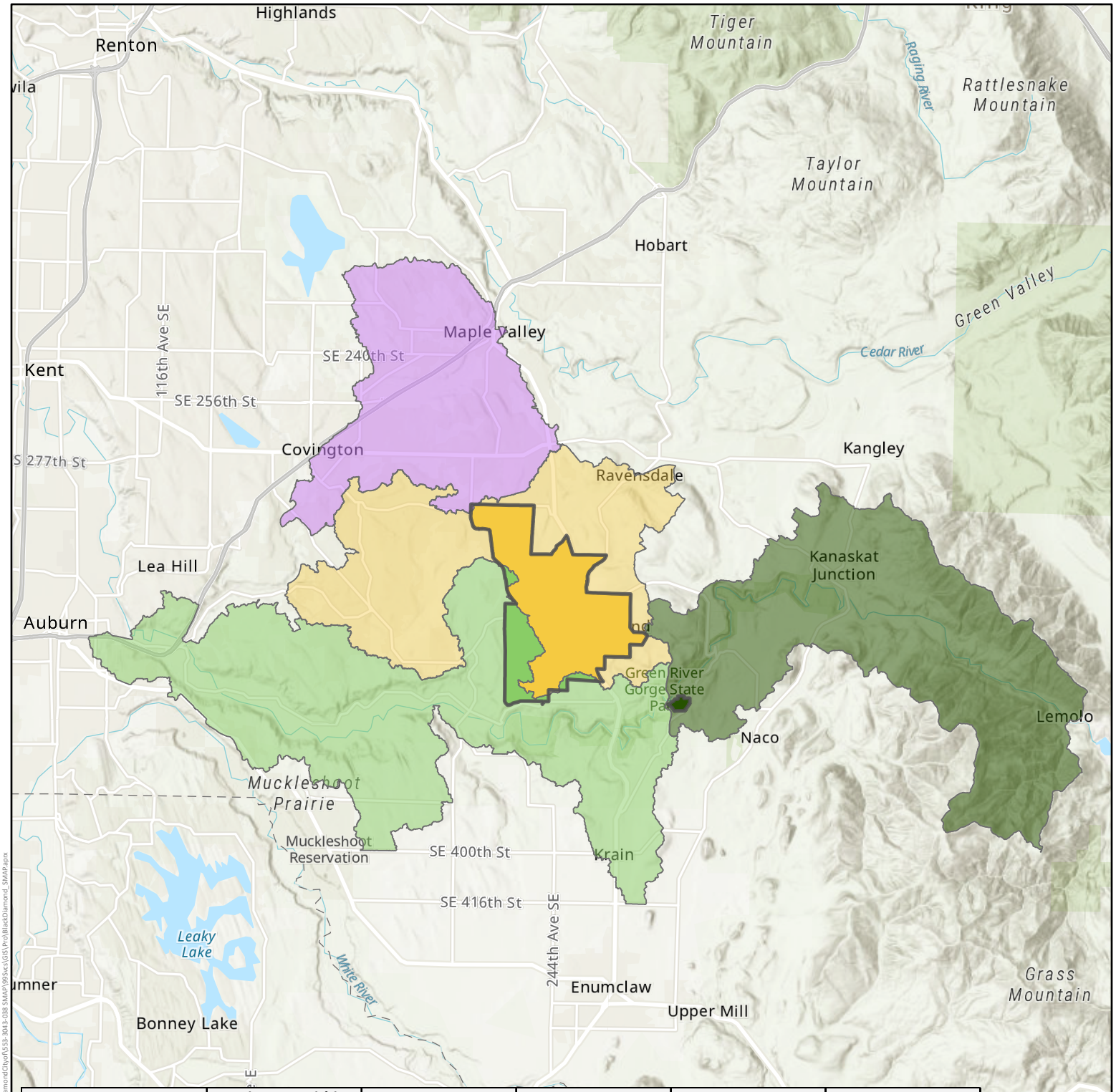

Basin Name	Basin Area within City Boundary (Square Miles)	Overall Score within City Boundary	Total Watershed Area (Square Miles)	Overall Score of Watershed	Percent contribution to watershed
Jenkins Creek	0.01	10.06	16.45	10.52	0.05%
Middle Green River	0.09	9.00	27.06	9.36	0.32%
Covington Creek	5.86	11.41	22.35	11.39	26.22%
Lower Green River	1.24	11.70	31.71	11.17	3.92%

Date: 2/24/2022
Sources: Black Diamond, King County, Pierce County, WA Ecology, WA DNR, USGS, ESRI
Disclaimer: This product is for informational purposes and may not have been prepared for, or be suitable for legal, engineering, or surveying purposes.

Black Diamond City Limits

0 0.5 1 2 Miles

Figure B-3 - Puget Sound Watershed Characterization Model Output Summary
Black Diamond SMAP
Receiving Water Assessment

Black Diamond, WA

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Appendix C

Combined Equity Index

PUBLIC HEALTH AND THE ENVIRONMENT

The Equity Layer, or the Combined Equity Index, was developed by averaging the scores from three separate indices: a Demographic Index, an Environmental Hazard Index, and an Environmental Opportunity Index. The data for the Demographic Index and Environmental Hazard Index were sourced from the Environmental Protection Agency's (EPA's) web-mapping tool, the Environmental Justice Screening and Mapping Tool (EJSCREEN Tool) (EPA 2019). The Environmental Opportunity Index was developed by Parametrix to complement the demographic and environmental hazards-based analyses by scoring canopy cover and park/open space access using GIS data obtained from the City.

Environmental Justice Screening and Mapping Tool (EJSCREEN Tool)

The Environmental Protection Agency (EPA) has developed a web-based tool that uses national data to combine environmental and demographic indicators that can be used to support a wide range of research and policy goals. The EJSCREEN Tool supports these goals by informing an understanding of where the impacts of existing pollution may be the greatest by filling certain data gaps to ensure these areas are not overlooked so they may receive appropriate consideration, analysis, and outreach when policies are developed to protect and improve public health and the environment. EJSCREEN puts each indicator or index value in perspective by reporting the value as a percentile. A percentile in EJSCREEN indicates roughly what percent of the U.S. population lives in a block group that has a lower value (or in some cases, a tied value). Block groups are defined by the U.S. Census Bureau as statistical divisions within a census tract and generally contain between 600 and 3,000 people. This means that 100 minus the percentile tells us roughly what percent of the U.S. population has a higher value (EPA 2019). The following indicators from the EJSCREEN Tool were included for further analysis during watershed prioritization.

Demographic Index

EJSCREEN Tool focuses on demographics, using them as an indicator of potential susceptibility or vulnerability to environmental pollution and recognizing that minority, low-income, and indigenous populations have historically been subject to disproportionate burden of environmental harms or risks (EPA 2019). The Demographic Index analysis considered demographic indicators, which have been summarized in Table C-1.

Table C-1. Summary of Demographic Indicators

Indicator	Detail
Minority	The number or percent of individuals in a block group who list their racial status as a race other than white alone and/or list their ethnicity as Hispanic or Latino. That is, all people other than non-Hispanic white-alone individuals. The word "alone" in this case indicates that the person is of a single race, since multiracial individuals are tabulated in another category—a non-Hispanic individual who is half white and half American Indian would be counted as a minority by this definition.
Low Income	The number or percent of a block group's population in households where the household income is less than or equal to twice the federal "poverty level."
Less Than High School Level of Education	The number or percent of people aged 25 or older in a block group whose education is short of a high school diploma.
Households (interpreted as individuals) in Linguistic Isolation	The number or percent of people in a block group living in linguistically isolated households. A household in which all members aged 14 years and over speak a non-English language and also speak English less than "very well" (have difficulty with English) is linguistically isolated.
Individuals under Age 5	The number or percent of people in a block group under the age of 5.
Individuals over Age 64	The number or percent of people in a block group over the age of 64.

Source: U.S. Census Bureau 2020

Environmental Hazards Index

The Environmental Hazards Index analysis considered the following environmental indicators, which have been summarized in Table C-2. The environmental indicators in EJSCREEN quantify proximity to and the numbers of certain types of potential sources of exposure to environmental pollutants. EPA developed the indicators through a review of data availability, health disparity information, risk-ranking studies, and a variety of other sources within the federal government (EPA 2019).

Table C-2. Summary of Environmental Indicators

Medium	Indicator	Detail	Key Exposure Source
Air	NATA Air Toxics Cancer Risk	Lifetime cancer risk from inhalation of air toxics.	Most air toxics originate from transportation and industry, including motor vehicles, industrial facilities, and power plants, and people are exposed in their daily activities. In some cases, these substances react with other constituents in the atmosphere or break down to other chemicals.
Air	NATA Respiratory Hazard Index	Air toxics respiratory hazard index (ratio of exposure concentration to health-based reference concentration).	
Air	NATA Diesel PM	Diesel particulate matter level in air, µg/m^3.	
Air	Particulate Matter	$PM_{2.5}$ levels in air, µg/m^3 annual average (2016).	Common sources of $PM_{2.5}$ emissions include power plants and industrial facilities. Secondary $PM_{2.5}$ can form from gases, such as NO_x or SO_2, reacting in the atmosphere.
Air	Ozone	Ozone summer seasonal average of daily maximum 8-hour concentration in air in parts per billion (2016).	O_3 is not usually emitted directly into the air but is created at ground level by a chemical reaction between NO_x and volatile organic compounds in the presence of sunlight. These ozone precursors are emitted by motor vehicles, industrial facilities, and power plants as well as natural sources. Ground-level ozone is the primary constituent of smog.
Air/Other	Traffic Proximity and Volume	Count of vehicles (AADT) at major roads within 500 meters, divided by distance in meters (not km).	Increased exposures to ambient noise, toxic gases, and particulate matter, including diesel particulates.
Dust/Lead paint	Lead Paint Indicator	The percentage of occupied housing units built before 1960 was selected as an indicator of the likelihood of having significant lead-based paint hazards in the home.	A key source of exposure to lead is through lead paint and lead-containing dust that accumulates indoors, in homes or in other buildings where lead paint was used. Exterior structures painted with lead-based paint are also a source of ambient lead through chipping exterior paint. Elevated short-term lead dust loadings have also been observed following demolition of old buildings. Lead-based paint was banned in the U.S. by the Consumer Product Safety Commission in 1978, but lead-based paint used in housing before the ban remains a significant source of exposure to lead for children and adults.

Table C-2. Summary of Environmental Indicators (continued)

Medium	Indicator	Detail	Key Exposure Source
Waste/Air/Water	Proximity to RMP Sites	Count of RMP (potential chemical accident management plan) facilities within 5 km (or nearest one beyond 5 km), each divided by distance in km.	The primary concerns with RMP facilities are the accidental release of substances and fires or explosions. The sudden release of relatively large quantities of acutely toxic substances can cause serious health effects, including death after inhalation or dermal exposure. These effects may be prompt or may occur or persist for some time after exposure. Fires may affect neighboring areas, and the associated smoke may expose people to toxic combustion products. Explosions may cause material damage and injuries to people in neighboring areas. Local residents, as well as workers and emergency responders, may suffer severe adverse effects.
Waste/Air/Water	Proximity to TSDFs for Hazardous Waste	Count of TSDFs (hazardous waste management facilities) within 5 km (or nearest beyond 5 km), each divided by distance in km.	Volatile contaminants may enter the atmosphere and reach individuals via the inhalation route. Particularly in dry climates or seasons, contaminants on the surface of some sites can become airborne and reach people directly through inhalation or indirectly after being deposited on surfaces that people may contact. Contaminants can also enter the food chain if the wind disperses them onto land used for agriculture. Some contaminants may migrate into groundwater. People may be exposed via drinking water derived from the aquifer, through vapor intrusion into their residences, or through other routes.
Waste/Air/Water	Proximity to NPL Sites	Count of proposed and listed NPL sites within 5 km (or nearest one beyond 5 km), each divided by distance in km.	
Water	Wastewater Discharge	Toxicity-weighted stream concentrations at stream segments within 500 meters, divided by distance in km.	People may be exposed to the discharged pollutants either directly or through indirect pathways. People swimming in the downstream waters or engaging in water-based recreation may be directly exposed dermally, orally, or through inhalation of volatized substances. If the released substances reach a downstream drinking water intake, consumers of the finished waters may consume whatever portion of the substances is not removed by the drinking water utility. Some portion of the discharged materials may enter the groundwater of neighboring areas and reach people through drinking water derived from wells that draw upon that aquifer.

Source: EPA 2019

Notes: AADT = average annual daily traffic; km = kilometers; NATA = National Air Toxics Assessment; NO_x = nitrogen oxides; NPL = National Priorities List; O_3 = ozone $PM_{2.5}$ = fine particulate matter, less than 2.5 micrometers wide; RMP = Risk Management Plan; SO_2 = sulfur dioxide; TSDFs = Treatment, Storage, or Disposal Facilities; ug/m^3 = microgram per cubic meter

Environmental Opportunity Index

The Environmental Opportunity Index was developed by Parametrix to complement the analyses performed using the EJSCREEN tool in order to create a single combined score. This Index was developed by scoring canopy cover and park/open space access using GIS data obtained from the City and joining it to the existing block groups to identify areas with the greatest need or areas that could benefit the most from gaining greater access to these resources. In this index, areas with the lowest canopy cover or the least access to parks or open spaces would be identified as having the highest need.

Combined Equity Index

The Combined Equity Index Scores were derived by averaging the scores of the Demographic, Environmental Hazards, and Environmental Opportunity Indices. Each category within its respective index was assigned an equal weight when creating the index scores, and then each of the three indices was equally weighted to create the combined score. The weighting of the indicators for each index will be further developed, which may include adjustments in the prioritization phase through public engagement and stakeholder inputs to the process in order to meet the specific needs identified by the City.

Table C-3. Environmental Justice and Opportunity Index Scores

Basin Name	Demographic Index Score	Environmental Hazard Index Score	Environmental Opportunity Index Score	Combined Equity Index Score
Covington Creek	33.1	35.8	67.4	45.4
Jenkins Creek	41.2	39.8	68.0	49.7
Lower Green River	37.7	33.4	65.1	45.4

Note: Middle Green River basin was not analyzed because the City area within this basin is not developed. Therefore, it has no demographics nor opportunity to improve access to parks and open spaces.

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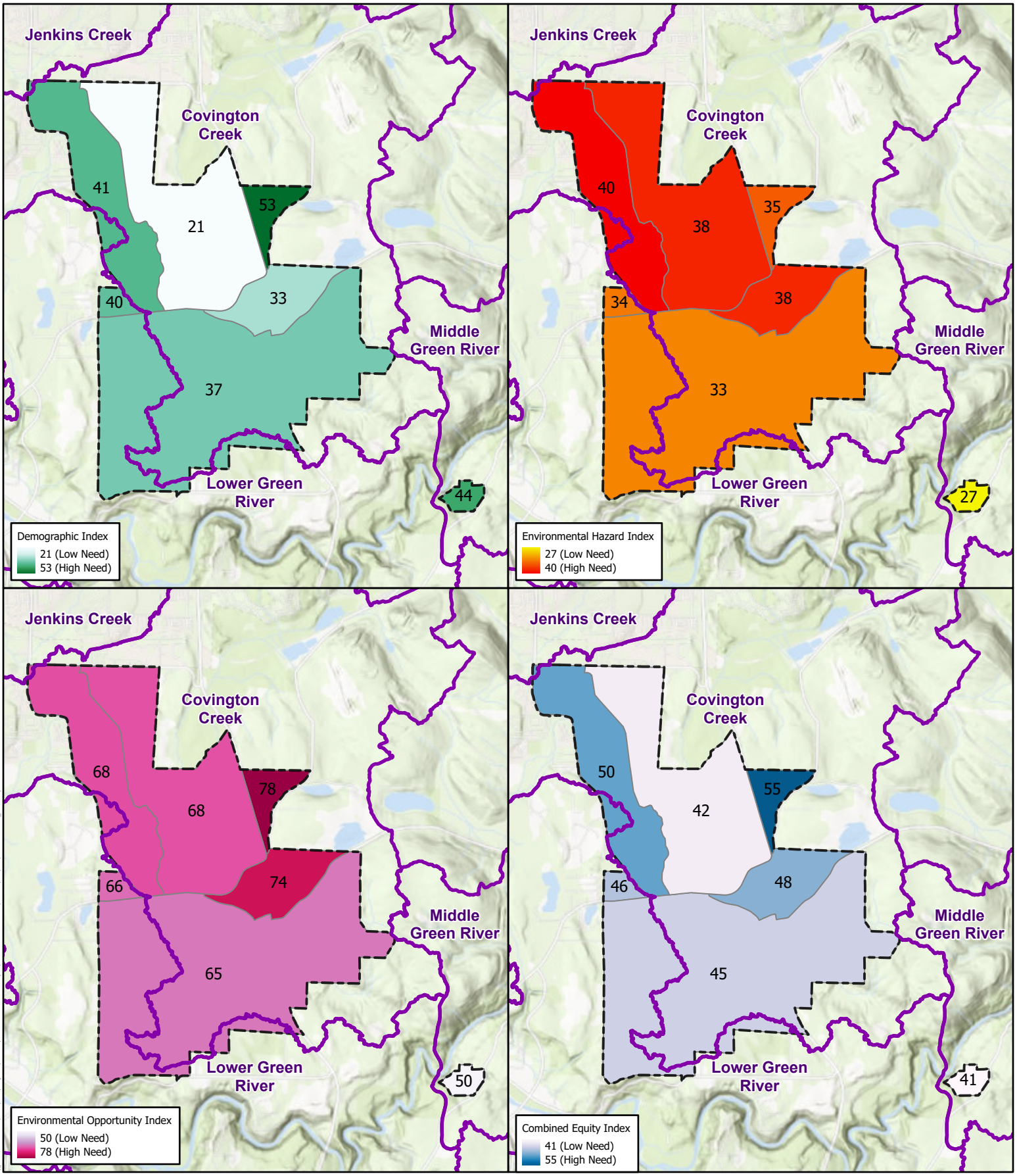

Date: 3/1/2022
Sources: EPA (EJ Screen), City of Black Diamon, WA Ecology, WA DNR, USGS, ESRI
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Receiving Water Basin
City Limits

Figure C-1 - Environmental and Social Justice Equity Indices
Black Diamond SMAP
Receiving Water Assessment

0 0.5 1 2 Miles

Black Diamond, WA

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