ENVIRONMENTAL HEALTH

WATER POLLUTION IDENTIFICATION & CORRECTION PROGRAM

2017 ANNUAL WATER QUALITY REPORT

Protecting Public Health and Improving Water Quality

KITSAP PUBLIC
HEALTH DISTRICT

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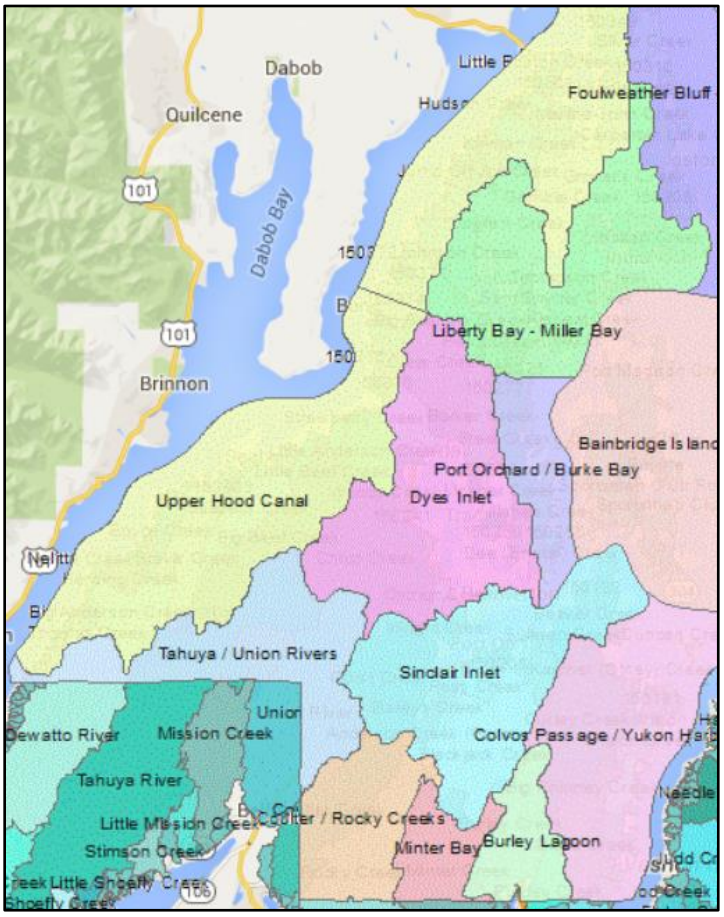
Clean Water Kitsap
Partners in Stormwater Solutions

INTRODUCTION

The overall goal of the Water Pollution Identification and Correction (PIC) program is to protect public health and prevent pollution of Kitsap County surface waters. To accomplish this, we have been monitoring the water quality of our streams, lakes and marine waters since 1995. We use monitoring data to identify areas affected by bacterial pollution, usually from human or animal waste. Then we work to find the sources and correct them by providing education, technical assistance and regulatory enforcement when necessary.

This report summarizes the Kitsap Public Health District's (Health District) recent annual water quality data for streams, lakes, marine waters and shoreline areas collected during the 2017 water year (October 2016-September 2017), and includes highlights of our clean-up efforts. The majority of this work is funded by Clean Water Kitsap[1] with grant funding provided by the Washington State Department of Ecology (Ecology) and the Department of Health (DOH).

The introductory section provides background information and explains our methods of data collection and analysis. Use the links below to access chapters discussing each of the watersheds shown on the adjacent map, plus our shoreline monitoring results, and lake sampling.



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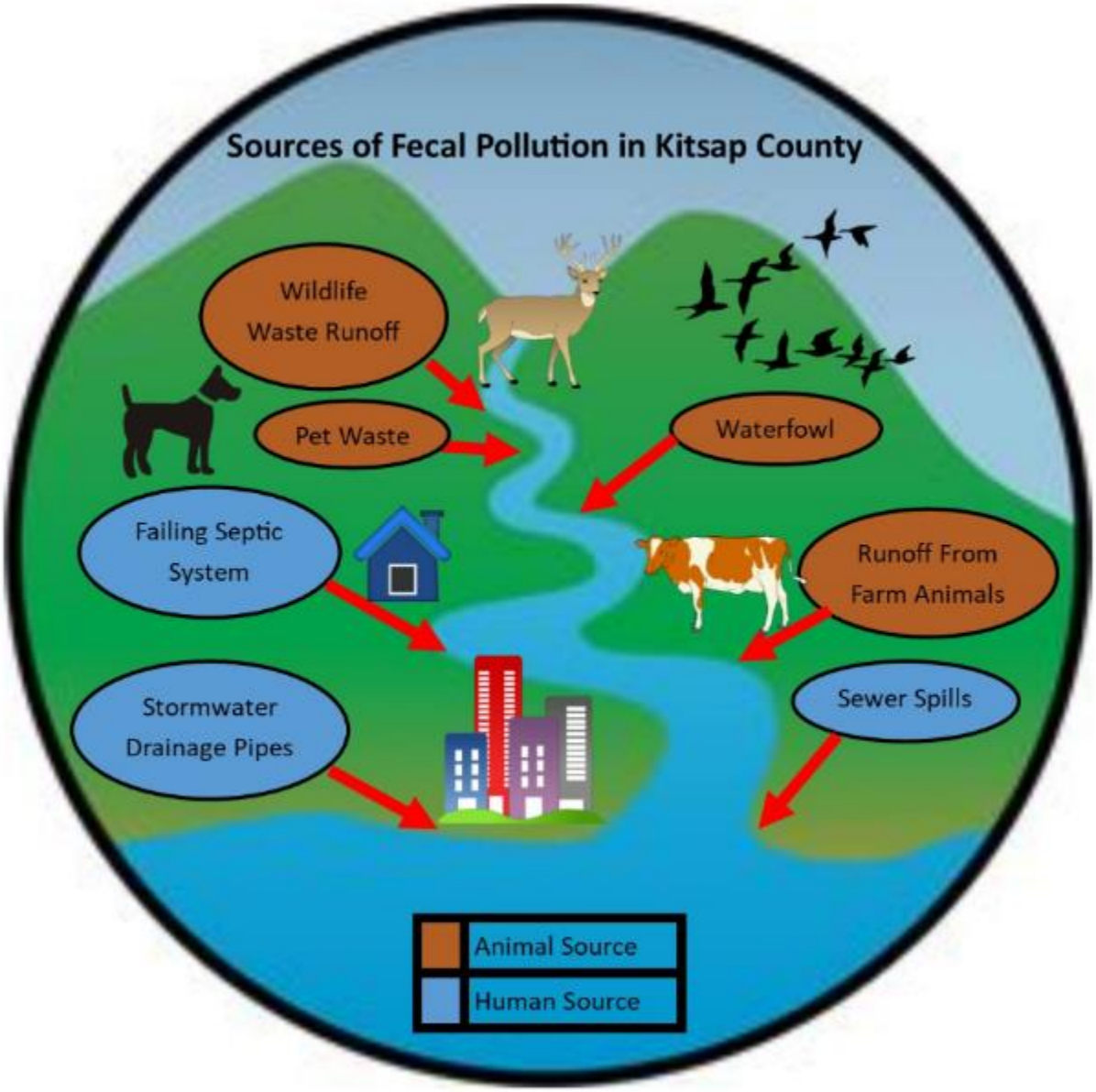
[1] Stormwater management fees from unincorporated Kitsap County fund a unique multiagency partnership managed by Kitsap County Public Works. Programs are implemented by Public Works Stormwater Division and partner agencies; Kitsap Public Health District, Kitsap Conservation District and Washington State University Extension Kitsap.

SOURCES OF WATER POLLUTION IN KITSAP COUNTY

The Health District focuses on fecal coliform (FC) bacteria as the primary indicator of surface water quality. High levels of this bacteria have been correlated with the presence of viruses or other pathogens that can cause human illness.

The primary cause of pollution in Kitsap County's streams, lakes, and marine water is "nonpoint source" pollution. Nonpoint source pollution can generally be defined as pollutants that come from many smaller sources, rather than a few large sources. This accumulation of fecal pollution sources occurs in both urban and rural areas and can often be prevented by using best management practices. Some major sources of fecal pollution are shown below.



Significant risks to our health can come from pollution caused by human sewage and animal waste. Sources of this pollution include failing on-site sewage systems, inadequate livestock keeping practices, pet and wildlife waste, sewage spills, combined sewer overflows, and sewage discharges from boats. Human and animal waste may contain organisms that can cause a variety of diseases and illnesses including giardia, cholera, hepatitis A, shigella, salmonella, and viral gastroenteritis. Humans are exposed to these pathogens through activities such as swimming in contaminated water, or eating shellfish that have been grown in polluted areas.

MONITORING FREQUENCY

During the 2016-17 water year, both stream and marine stations were sampled once each month. Fewer samples may be collected at a monitoring station due to lack of flow during the dry season, hazardous weather conditions, equipment failures, or other circumstances. Sampling frequency for lake swimming beaches is based on beach usage; popular lakes are sampled more frequently during the summer, e.g. weekly.

BACTERIAL ANALYSIS METHOD

The Health District contracts with a laboratory for analysis of water samples. The contract lab uses the membrane filtration (or MF) method for bacterial analysis of water samples. The MF results for marine water range from less than one (<1) to greater than two hundred (>200). Freshwater samples are diluted by a factor of 1:10 so the results range from less than ten (<10) to greater than two thousand (>2000).

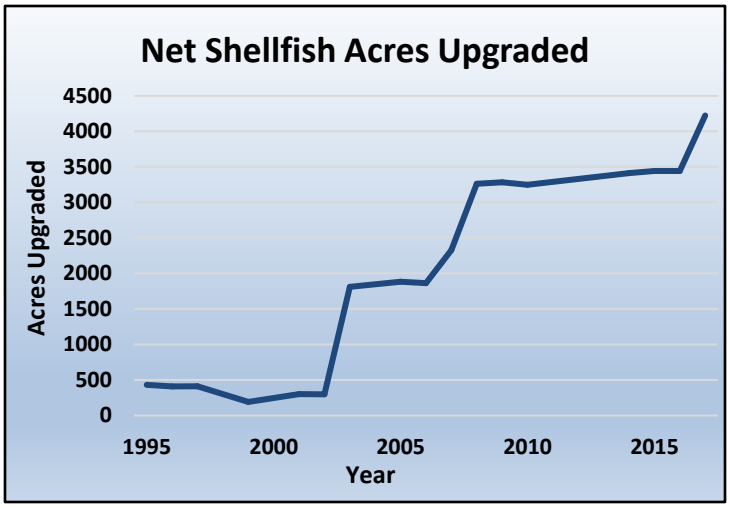
BACTERIAL WATER POLLUTION CLEANUP PROGRAMS

Pollution Identification and Correction (PIC) projects are conducted in an effort to improve the water quality in a polluted waterbody. The goal of each project is to identify possible pollution sources and correct them to reduce the overall amount of bacteria and other potential human health risks. This work helps ensure that people can safely enjoy recreational activities on our streams, lakes, marine water, and harvest shellfish from local beaches. Clean up projects are funded from the Clean Water Kitsap Program and from State or Federal government grants.

SHELLFISH CLASSIFICATIONS

The Washington State Department of Health (DOH) Office of Shellfish and Water Protection is responsible for classifying commercial shellfish growing areas in Washington State. Areas are classified as *Approved, Conditionally Approved, Restricted,* or *Prohibited.* These classifications are based on DOH shoreline investigations for potential contamination sources, and marine water monitoring for bacterial pollution. Applicable shellfish classifications are listed in each chapter.

Since Pollution Identification and Correction efforts began approximately 22 years ago, there has been a net **increase of shellfish growing areas approved for harvest of 4,224 acres** in Kitsap County! This is one benefit of completing comprehensive pollution source identification and correction projects.



BACTERIA LEVELS IN KITSAP COUNTY STREAMS

The following table summarizes stream monitoring results for the 2017 water year. Streams are listed by watershed. A map of the watersheds is shown on page 1-2. The colors used in the sampling "Station" column indicate whether each stream met the applicable state water quality standard for fecal coliform bacteria, as explained on page 1-11.

Red - the stream had high levels of bacteria and failed Part 1 & 2 of the standard.
Yellow - the stream had periodic bacteria problems and failed only part 2 of the standard.
Green - the stream had low levels of bacteria & met both parts of the standard.

The Health District began sampling all the major streams in Kitsap County in 1995. At that time our monitoring program included 56 streams, and only 13 of them met the state water quality standard for fecal coliform bacteria. In 2017 our program included 66 streams, and 21 of those met the state standard, although this number varies from year to year.

Each stream is also evaluated to determine whether there is a statistically significant trend in bacteria levels over time. A long term trend is calculated for each stream using all the data collected since the trend monitoring program began roughly 22 years ago, and is shown as either; **improving, worsening,** or stationary. See page 1-8 for a comparison of changes in stream trends over time.

An unusual aspect of the trend analysis this year is that several of the streams with statistically worsening trends have very low levels of bacteria, and still meet the state water quality standard. These streams; Coulter Creek, Stavis Creek, and Tahuyeh River, are all in watersheds with large forested areas and tend to have relatively little development.

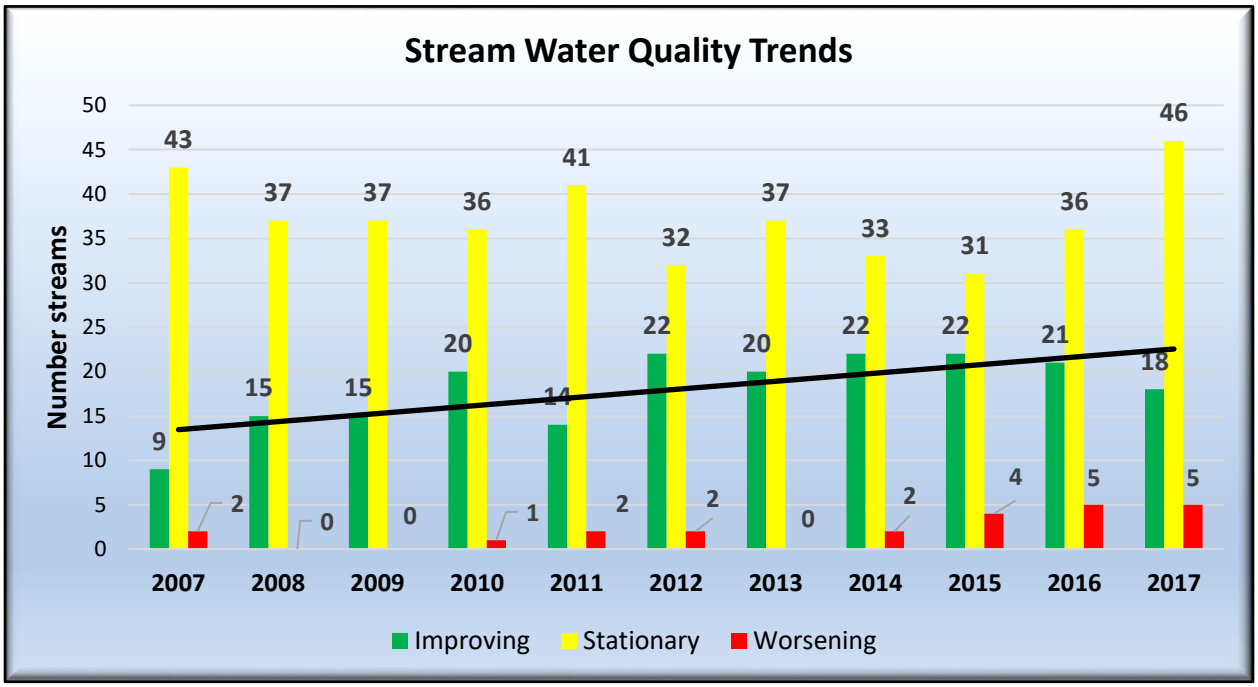
2017 KITSAP STREAM WATER QUALITY SUMMARY

Watershed	Stream Name	Station	Range	FC GMV	Long Term Trend
Burley / Minter Creeks	Burley	BL01	20.0-2001.0	184	Stationary
Burley / Minter Creeks	Bear	BR01	10.0-2001.0	112	Stationary
Burley / Minter Creeks	Huge	HG01	10.0-860.0	63	Stationary
Burley / Minter Creeks	Minter	MN01	10.0-730.0	65	Stationary
Burley / Minter Creeks	Purdy	PR01	20.0-1550.0	87	Stationary
Coulter Creek / Rock Creek	Coulter	CU01	4.0-710.0	26	**Worsening**
Colvos Passage / Yukon Harbor	Olalla	OC02	50.0-2001.0	241	Stationary
Colvos Passage / Yukon Harbor	Salmonberry	SM01	4.0-70.0	15	**Improving**
Colvos Passage / Yukon Harbor	Wilson	WN01	10.0-2001.0	112	Stationary
Colvos Passage / Yukon Harbor	Curley	CY01	4.0-1060.0	25	Stationary
Colvos Passage / Yukon Harbor	Fragaria	FG01	4.0-380.0	40	Stationary
Colvos Passage / Yukon Harbor	Duncan	DU01	4.0-760.0	29	Stationary
Dyes Inlet	Barker	BK01	20.0-340.0	89	Stationary
Dyes Inlet	Chico	CH01	4.0-330.0	36	Stationary
Dyes Inlet	Clear	CC01	4.0-400.0	29	Stationary
Dyes Inlet	Kitsap Mall West	KW01	4.0-660.0	53	Stationary
Dyes Inlet	Kitsap Mall	KM01	4.0-2001.0	37	Stationary
Dyes Inlet	Mosher	MS01	4.0-830.0	59	Stationary
Dyes Inlet	Ostrich Bay	OB01	30.0-2001.0	263	Stationary
Dyes Inlet	Pahrmann	PA01	4.0-2001.0	84	Stationary
Dyes Inlet	Phinney	PH01	4.0-2001.0	42	**Improving**
Dyes Inlet	Strawberry	SR01	4.0-670.0	25	**Improving**
Foulweather Bluff / Appletree Cove	Carpenter	CA02	4.0-410.0	26	Stationary
Liberty Bay / Miller Bay	Barrantes	BAR01	4.0-540.0	38	Stationary
Liberty Bay / Miller Bay	Big Scandia	BS01	10.0-850.0	76	Stationary
Liberty Bay / Miller Bay	Bjorgen	BN01	4.0-1010.0	118	Stationary
Liberty Bay / Miller Bay	Cowling	CW01	4.0-180.0	40	Stationary
Liberty Bay / Miller Bay	Daniels	DC01	20.0-2001.0	132	**Improving**
Liberty Bay / Miller Bay	Dogfish	DF01	4.0-540.0	67	**Improving**
Liberty Bay / Miller Bay	Grovers	GC01	20.0-1070.0	116	Stationary
Liberty Bay / Miller Bay	Indianola	IN01	4.0-350.0	32	**Improving**
Liberty Bay / Miller Bay	Johnson	JC01	4.0-440.0	30	**Improving**
Liberty Bay / Miller Bay	Kitsap	KT01	4.0-170.0	27	Stationary
Liberty Bay / Miller Bay	Little Scandia	LS01	20.0-1470.0	125	Stationary

Watershed	Stream Name	Station	Range	FC GMV	Long Term Trend
Liberty Bay / Miller Bay	South Dogfish	SF01	10.0-1160.0	59	**Improving**
Liberty Bay / Miller Bay	Perry Creek	PER01	4.0-670.0	81	Stationary
Liberty Bay / Miller Bay	Sam Snyder	SAM01	4.0-110.0	19	Stationary
Liberty Bay / Miller Bay	Lemolo	LEM01	4.0-400.0	52	Stationary
Port Orchard Passage / Burke Bay	Enetai	DE01	4.0-650.0	45	**Improving**
Port Orchard Passage / Burke Bay	Illahee	IC01	4.0-580.0	43	Stationary
Port Orchard Passage / Burke Bay	State Park	SP01	4.0-580.0	23	**Improving**
Port Orchard Passage / Burke Bay	Steele	ST01	10.0-740.0	63	**Improving**
Sinclair Inlet	Beaver	BV01A	4.0-170.0	23	Stationary
Sinclair Inlet	Karcher	KA01	4.0-180.0	35	**Improving**
Sinclair Inlet	Anderson	AN01	4.0-30.0	11	Stationary
Sinclair Inlet	Annapolis	AP01	4.0-2001.0	68	**Improving**
Sinclair Inlet	Blackjack	BJ01	4.0-400.0	48	Stationary
Sinclair Inlet	Gorst	GR01	4.0-350.0	19	**Improving**
Sinclair Inlet	Ross	RS02	4.0-140.0	17	**Improving**
Sinclair Inlet	Sacco	SC01	10.0-230.0	60	**Improving**
Sinclair Inlet	Wright	WR01	4.0-280.0	16	Stationary
Tahuyeh / Union River	Dewatto River	DW01	4.0-100.0	10	Stationary
Tahuyeh / Union River	Tahuyeh	TR01	4.0-480.0	25	**Worsening**
Tahuyeh / Union River	Union	UN01	10.0-220.0	77	Stationary
Upper Hood Canal	Big Anderson	BA01	4.0-80.0	19	Stationary
Upper Hood Canal	Big Beef	BB01	4.0-170.0	16	Stationary
Upper Hood Canal	Boyce	BY01	4.0-180.0	32	Stationary
Upper Hood Canal	Jump Off	JJ01	4.0-200.0	35	**Improving**
Upper Hood Canal	Kinman	KN01	10.0-840.0	160	**Worsening**
Upper Hood Canal	Little Anderson	LA02	4.0-381.0	23	Stationary
Upper Hood Canal	Lofall	LF01	140.0-1300.0	432	**Worsening**
Upper Hood Canal	Martha John	MJ01	10.0-150.0	45	**Improving**
Upper Hood Canal	Port Gamble	PG01	4.0-770.0	54	Stationary
Upper Hood Canal	Seabeck	SB01	4.0-90.0	14	Stationary
Upper Hood Canal	Stavis	SV01	4.0-300.0	14	**Worsening**
Upper Hood Canal	Vinland	VC01	30.0-880.0	159	Stationary

BACTERIAL POLLUTION TREND ANALYSIS FOR STREAMS

Streams are sampled monthly to determine which are being affected by bacterial pollution, and whether conditions are statistically improving, staying the same (stationary) or worsening. These streams have been monitored since 1995. Statistical analysis for long term trends began in 2007. An overall improving water quality trend is occurring in many of our streams.

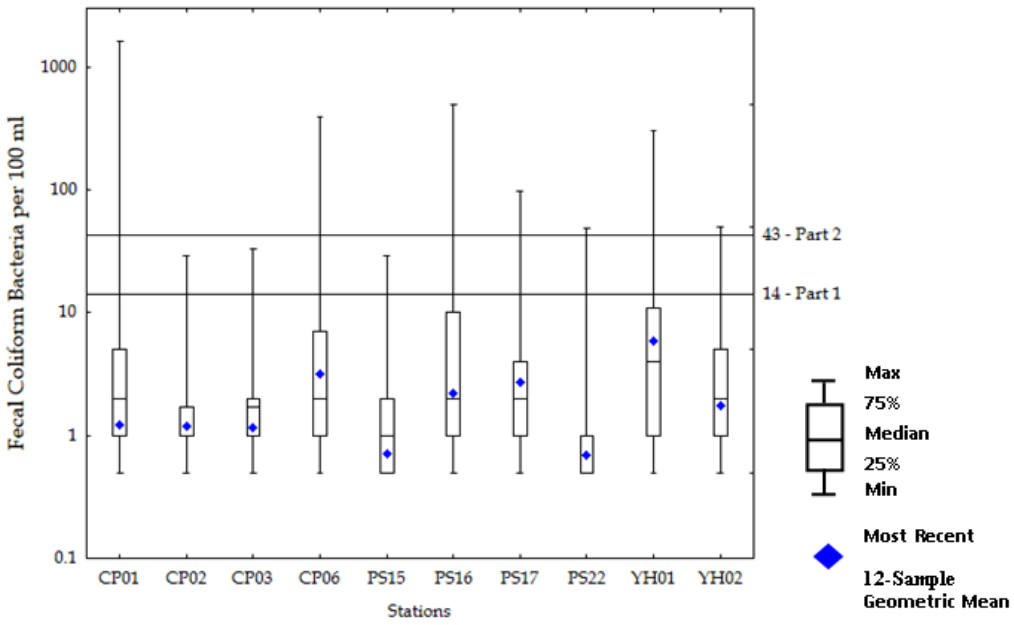


Long term and short term trend analysis is performed on the FC data collected at all stream mouth stations. For a given station, *long term trend* is determined over the entire data set (approximately 22 years) and a *short term trend* is determined over the last three (3) years. Trends are identified as “stationary”, “worsening”, or “improving”. In each watershed section, the water quality summary chart shows long term trend for each stream.

BACTERIAL POLLUTION TREND ANALYSIS FOR MARINE WATER

Trend analysis is performed on the FC data collected at all marine water sampling stations with a minimum of 36 samples. In addition to trend analysis for individual marine stations, the overall trend for the watershed is also analyzed. In each watershed section, a box plot is provided to show the distribution of all FC results. An example is shown below.

For each listed station, the diamond is the most recent 12-sample geometric mean. The horizontal line (within the box) is the median. The median is the middle value of all FC results; 50% of the FC results are below it, and 50% of the FC results are above it. The vertical lines that extend from the box show the minimum and maximum values. The lines that mark the bottom and top of the box represent the 25th percentile and 75th percentile values, respectively. Consequently, the middle 50% of the FC values fall within the box. The 25th and 75th percentile values are similar to the median value, for example the 25th percentile means that 25% of the FC values are below and 75% of the FC values are above the number.



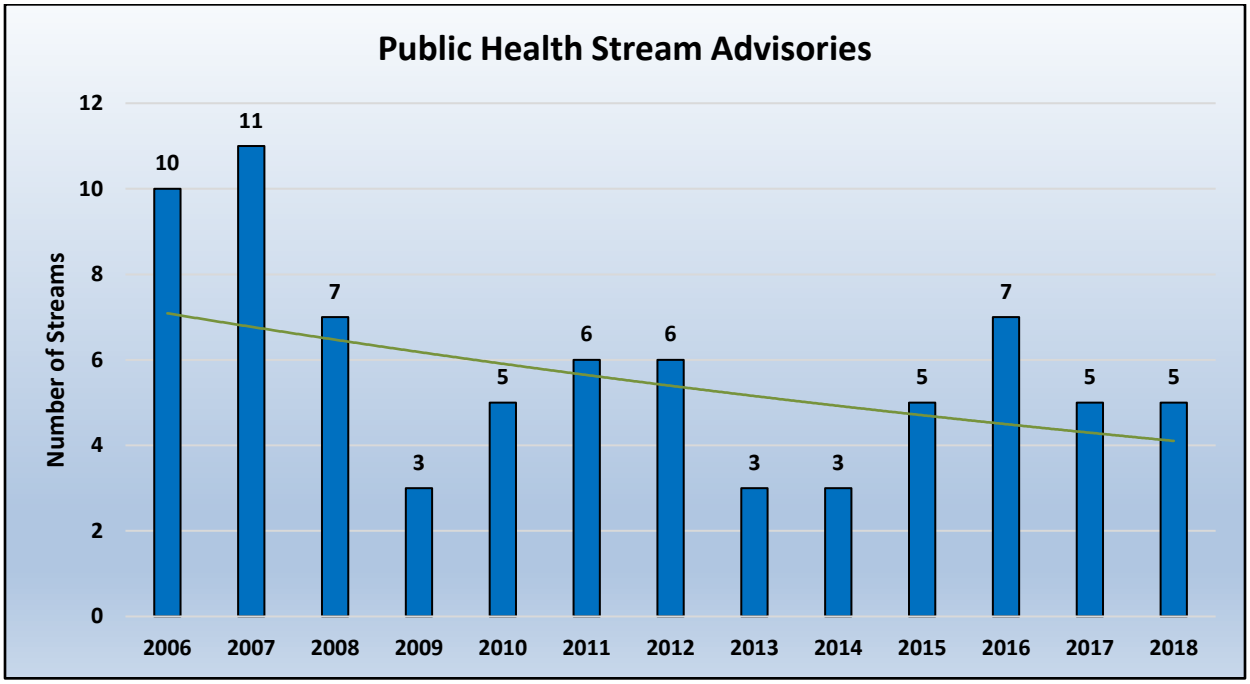
PUBLIC HEALTH STREAM ADVISORIES

The Health District issues public health advisories for streams that have chronic problems with high bacteria levels during the summer. (3-year geometric mean value > 270 FC/100 ml) High levels of fecal coliform bacteria indicate the presence of viruses and other pathogens that can make people sick. The Health District issues these advisories to protect the health of people, especially children, who may play in streams. The advisory uses data from the summer months, when people are more likely to come into contact with streams.

Based on the water quality monitoring results for 2015-17, **five**[2] streams will have public health advisories in 2018; Lofall, Phinney, Ostrich Bay, Bjorgen, and Little Scandia Creeks, all of which are continuations of 2017 health advisories.

The chart below shows that the number of streams with health advisories changes each year, and the trend over time is that fewer streams in Kitsap County contain this level of pollution.

Stream Name	Fecal coliform Bacteria GMV
Lofall (LF01)	461
Phinney (PH01)	294
Ostrich Bay (OB01)	793
Bjorgen (BN01)	301
Little Scandia (LS01)	291



[2] One additional stream (Pahrmann Creek) exceeded the 3-year geometric mean value > 270 FC/100 ml standard. Pahrmann Creek is a seasonal stream and dries up in the summer months, resulting in a very limited data set. The Health District does not issue public health advisories on seasonal streams.

WASHINGTON STATE WATER QUALITY STANDARDS

Surface water quality standards are established by the Washington Department of Ecology, and described in Chapter 173-201A of the Washington Administrative Code (WAC). The water quality standards which apply in Kitsap County are summarized below. State law classifies bodies of water as either Primary or Extraordinary, depending on designated beneficial uses such as human recreation and/or fish habitat.

	Freshwater Standard		**Marine Water Standard**	
Parameters	Extraordinary Primary Contact	Primary Contact	Extraordinary Aquatic, Primary Contact	Excellent Aquatic, Primary Contact
Fecal Coliform Bacteria (FC)	**Part 1**: **≤50 FC**/100 ml (geometric mean) **Part 2:** Not more than 10% of all samples obtained for calculating a geomean **>100 FC**/100 ml	**Part 1**: **≤100 FC**/100 ml (geometric mean) **Part 2:** Not more than 10% of all samples obtained for calculating a geomean **>200 FC**/100 ml	**Part 1: ≤14 FC**/100 ml (geomean) **Part 2:** Not more than 10% of all samples obtained for calculating a geomean **>43 FC**/100 ml	Same as Extraordinary Aquatic - Primary Contact waters
Dissolved Oxygen	> 9.5 mg/L	> 8.0 mg/L	> 7.0 mg/L	> 6.0 mg/L
pH	6.5 – 8.5 units	6.5 – 8.5 units	7.0 – 8.5 units	7.0 – 8.5 units
Temperature	≤16.0^0 C[3]	≤18.0^0 C[3]	≤13.0^0 C[3]	≤16.0^0 C[3]

These standards use a geometric mean value (GMV) for bacteria, which measures the central tendency of a data set. The GMV is especially useful for groups of data that contain a broad range of values. Since sample results for bacterial concentrations tend to be highly variable, the geometric mean is a more appropriate tool for analyzing this type of data than using an arithmetic mean or average.

[3] Temperatures shall not exceed standard due to *human activities*. When natural conditions exceed these standards, no temperature increases are allowed which will raise the receiving water temperature by greater than 0.30 C.

WASHINGTON STATE WATER QUALITY ASSESSMENT

The federal Clean Water Act, adopted in 1972, requires that all states restore their waters to be "fishable and swimmable." Washington's Water Quality Assessment lists the water quality status for water bodies in the state. This assessment meets the federal requirements for a report under Sections 303(d) and 305(b) of the Clean Water Act, which is submitted to the federal Environmental Protection Agency (EPA). The assessment divides waterbodies into 5 different categories based on impairment. These impairments may be due to such things as high bacteria levels, increased temperature, or low dissolved oxygen. The most current assessment was finalized and approved by the EPA in 2016. Additional information about the State's assessment may be found at www.ecy.wa.gov/programs/wq/303d.

- Category 1: meets standard for clean waters
- Category 2: waters of concern (some evidence of problems)
- Category 3: insufficient data
- Category 4A: waterbodies that have an approved TMDL in place and are actively being implemented
- Category 4B: has a pollution control program other than a TMDL
- Category 5: polluted waters that require a TMDL; traditionally known as the 303(d) list

For copies of reports on specific projects, please check our website or call us for further information.

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INTERNET ADDRESSES FOR OTHER PROGRAMS AND DOCUMENTS

Clean Water Kitsap
http://www.cleanwaterkitsap.org

Washington State Department of Health
http://www.doh.wa.gov

Washington State Department of Ecology
http://www.ecy.wa.gov

Water Quality Standards for Surface Waters of the State of Washington
Chapter 173-201A WAC

United States Environmental Protection Agency
http://www.epa.gov/