

ENVIRONMENT

WATER POLLUTION IDENTIFICATION & CORRECTION PROGRAM

2014 ANNUAL WATER QUALITY MONITORING REPORT



Protecting Public Health and Improving Water Quality



KITSAP PUBLIC
HEALTH DISTRICT

345 6th Street
Suite 300
Bremerton, WA 98337

360-337-5235 t.
360-337-5291 f.



Clean Water Kitsap
Partners in Stormwater Solutions

2014 WATER QUALITY MONITORING REPORT

INTRODUCTION

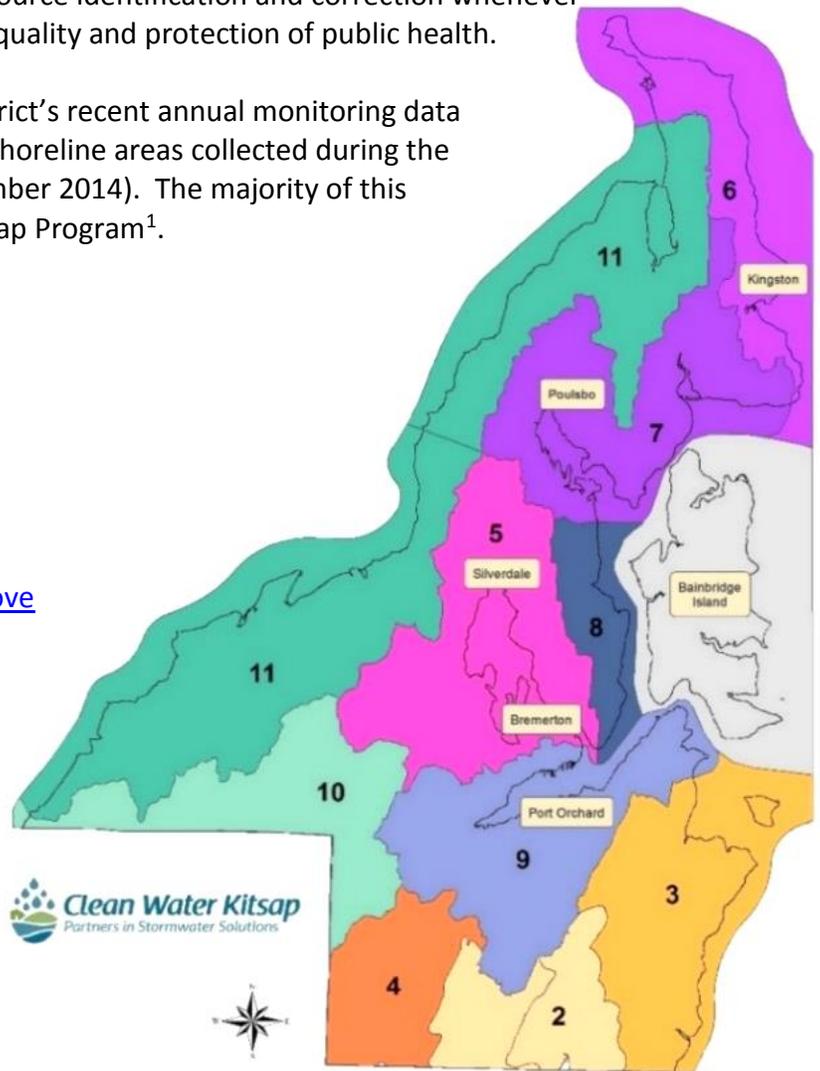
Protecting people from waterborne illness and other water quality related health hazards is one of the goals of the Kitsap Public Health District’s Pollution Identification and Correction (PIC) Program. To accomplish this we have been monitoring the water quality of our streams, lakes and marine waters since 1996. These efforts enable us to identify areas affected by bacterial pollution, usually from animal or human waste.

Kitsap Public Health PIC staff conduct source identification and correction whenever possible that result in improved water quality and protection of public health.

This report summarizes the Health District’s recent annual monitoring data for streams, lakes, marine waters and shoreline areas collected during the 2014 water year (October 2013-September 2014). The majority of this work is funded by the Clean Water Kitsap Program¹.

WATERSHED CHAPTERS

1. [Report Overview](#)
2. [Burley /Minter](#)
3. [Colvos Passage / Yukon Harbor](#)
4. [Coulter Creek / Rock Creek](#)
5. [Dyes Inlet](#)
6. [Foulweather Bluff / Appletree Cove](#)
7. [Liberty Bay / Miller Bay](#)
8. [Port Orchard / Burke Bay](#)
9. [Sinclair Inlet](#)
10. [Tahuyeh / Union Rivers](#)
11. [Upper Hood Canal](#)
12. [Shoreline Monitoring Program](#)
13. [Lakes & Swimming Beaches1](#)
14. [Lakes & Swimming Beaches2](#)
15. [Lakes & Swimming Beaches3](#)



¹ Stormwater management fees from unincorporated Kitsap County fund a unique multiagency program 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.

PURPOSE OF HEALTH DISTRICT WATER QUALITY MONITORING

The quality of water in our lakes, streams, and rivers often reflects whether human activities are being managed to effectively protect public health and the environment. Since most of our streams are relatively small, impacts from pollution are more apparent, and damage occurs more quickly. Because all our streams eventually flow into Puget Sound or Hood Canal, polluted streams also have the potential to impact marine water and shellfish growing areas.

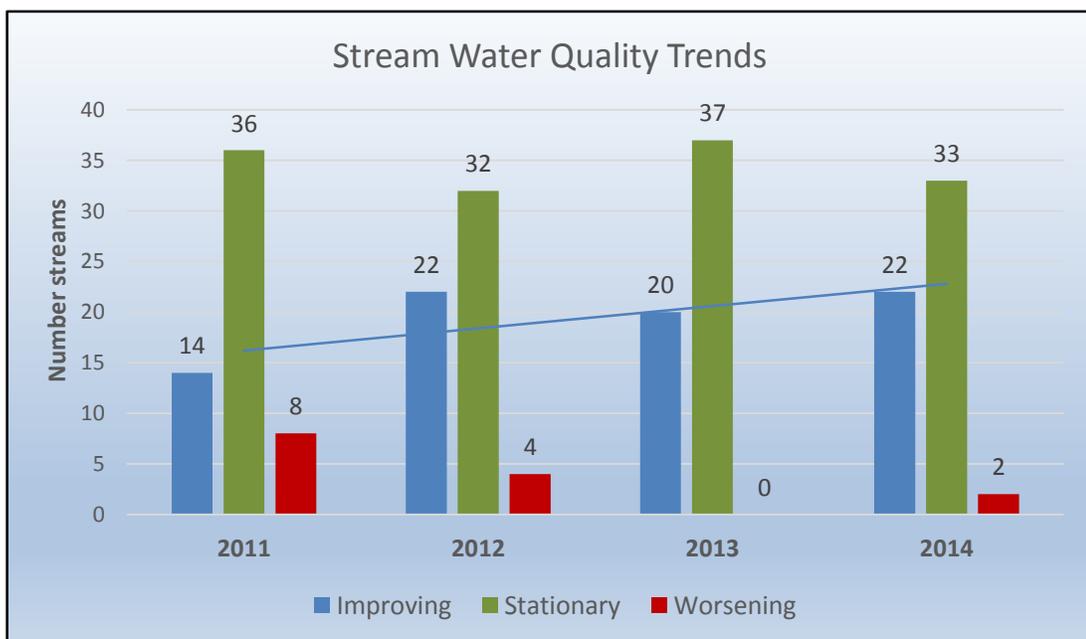
To protect public health and prevent pollution of Kitsap County surface waters, the Health District conducts water quality monitoring, pollution source identification and correction projects, public education, and regulatory enforcement. These activities must continue if we are to protect and improve the water quality where we live.

OVERALL KITSAP COUNTY WATER QUALITY ISSUES

There are water quality problems in many areas of Kitsap County. These are generally more common in developed areas, where stream and marine water quality can be significantly impacted by human activity. The good news is that bacteria levels are improving in more areas than ever before, often due to projects focused on finding and correcting pollution sources.

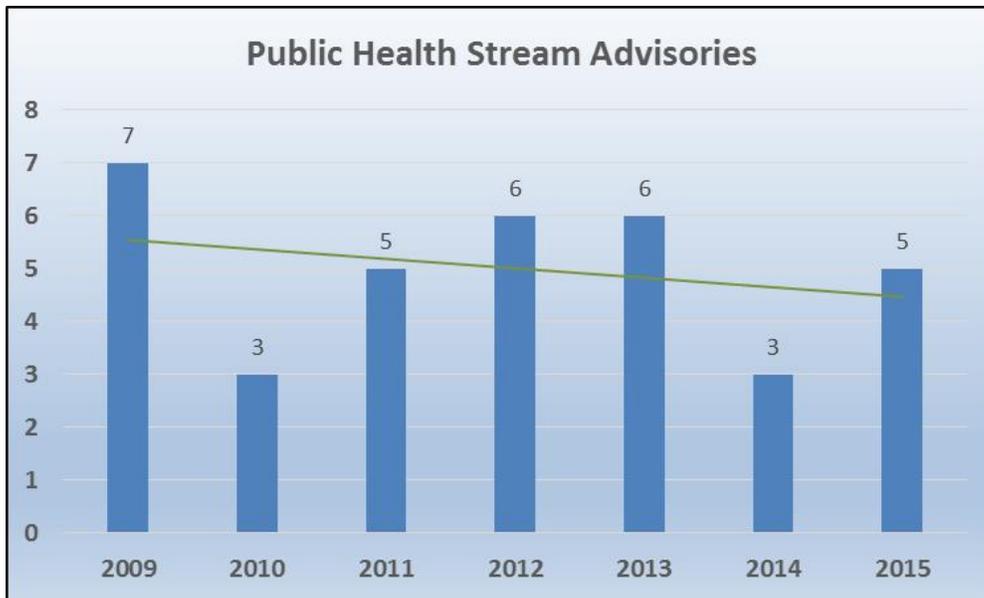
STREAM WATER QUALITY TRENDS

Streams are sampled monthly to determine which are being affected by bacterial pollution, and whether conditions are getting better or worse. This data is also used to prioritize areas for our Pollution Investigation and Correction projects. Long term trend analysis showed the number of streams with statistically significant improvements in water quality increased in 2014.



STREAM PUBLIC HEALTH ADVISORIES

The Health District issues public health advisories when streams have chronic water quality problems that increase the risk of people getting sick, especially children who might play in the streams during the summer months. These are evaluated each year once more recent water quality data from our trend monitoring is available. Clean up work has been done on many of these streams, with water quality improvements in some areas. Based on the water quality sampling results from 2013-14, 5 streams will have health advisories in 2015.



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 bacterium 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 pollutants is typically caused by problems, in both urban and rural areas, that can often be prevented by using best management practices. Major types of nonpoint source pollution are described below.

Human Sewage and Animal Waste from 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, to name a few. Humans are exposed to these pathogens through direct water contact, such as swimming, or eating shellfish from contaminated waters.



Soil erosion and sedimentation from improper land clearing activities, poor construction practices, inadequate livestock keeping practices, insufficient stream buffers, high stormwater flows, wetlands elimination, and the re-channeling of natural streams.

Sedimentation buries salmon and shellfish habitat.

Insufficient stream buffers can increase stream temperatures (due to a lack of shade) and decrease dissolved oxygen levels (due to elevated stream temperatures). Fine sediments may also increase survival of bacteria within stream beds and beaches.

Chemicals from vehicles, excess fertilizer, pesticides, industrial and military wastewater discharges, urban runoff, and the illegal dumping or mismanagement of solid and hazardous wastes can all pollute storm water, streams and Puget Sound.

Chemicals can be toxic to aquatic life, can alter water pH (acidity) or lower the oxygen levels that support aquatic life. Excess nutrients can trigger harmful algae blooms.



Oil spilled on beach

HEALTH DISTRICT MONITORING GOALS

Kitsap Public Health District conducts water quality monitoring to accomplish several different goals, which are summarized in the outline below. These efforts also support the goals and objectives of Clean Water Kitsap Program. For more detailed information about our monitoring plans, please contact the Health District.

Stream and Marine Water Quality Trend Monitoring:

- Assess surface water quality trends through long-term monitoring.
- Compare results against applicable standards.
- Prioritize problem areas for corrective actions.
- Identify public health concerns.
- Issue public health advisories.
- Provide input to other agencies for evaluation of Kitsap County waterbodies.
- Provide input to other agencies about shellfish resources.
- Provide water quality data to the public and other interested parties.



Shoreline Monitoring Program:

- Effectively monitor and sample shoreline areas in Kitsap County on a rotating basis for fecal pollution to identify and correct sources that impact shellfish growing areas.

Swimming Beach Monitoring (lakes):

- Monitor public swimming beaches for *E.coli* bacteria.
- Track and respond to reports of Swimmer's Itch and toxic algae blooms.
- Track and respond to reports of waterborne illness.
- Coordinate with swimming beach owners/operators regarding public health issues.
- Inform and educate swimming beach owners/operators and the public about health and safety issues at public swimming beaches.

Lake Nutrient Monitoring:

- Assess nutrient enrichment from human sources.
- Compare nutrient levels with other local lakes and state water quality standards.
- Prioritize lakes with high nutrient levels for cleanup projects.

MONITORING FREQUENCY

During the 2013-14 water year, both stream and marine stations were typically 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 was based on beach usage; more popular lakes were sampled more frequently during the summer.

BACTERIAL WATER POLLUTION CLEANUP PROGRAMS

The Health District's water quality programs have three primary functions: water quality monitoring, issuing public health advisories, and cleanup of polluted waters. Pollution Identification and Correction (PIC) projects are conducted in an effort to improve the water quality for a polluted waterbody. The goal of each project is to identify possible pollution sources and correct these problems to reduce the overall amount of bacteria and other potential pollutants. Every other year the Health District evaluates and revises the Priority Area Work List based on water quality data and a variety of other ranking factors in each watershed. Clean up projects are often supported by funds from the Clean Water Kitsap Program and from State or Federal government grants.

Each watershed section of this report contains highlights from PIC projects in that area. Other agency cleanup programs may also be mentioned in the applicable watersheds.

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 inspections for potential contamination sources, and marine water monitoring for bacterial pollution. Applicable shellfish classifications are listed in each chapter.

BACTERIAL POLLUTION TREND ANALYSIS

STREAM TREND ANALYSIS

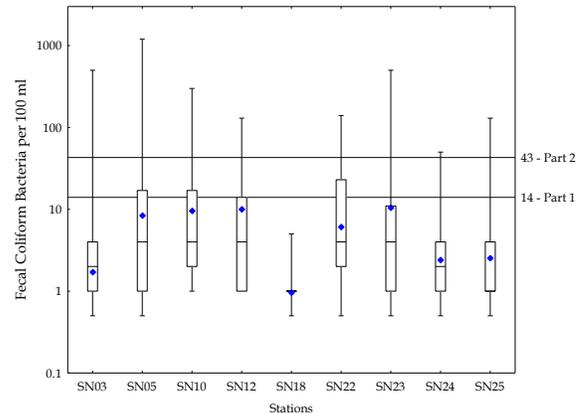
Long term and short term trend analysis is performed on the FC data collected at all stream mouth stations. For a given station, *long term trend* is determined over the entire data set (approximately 18 years) and a *short term trend* is determined over the last three (3) years. Trends are identified as "stationary", "worsening", or "improving". In each watershed section, the water quality summary chart displays both the long and short term trend for each stream.

A trend graph may also be provided for streams that have shown statistically significant trends either long or short term.

MARINE WATER TREND ANALYSIS

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.



BACTERIAL ANALYSIS METHOD

The Health District 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).

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). Having specific standards also sets pollution limits, and provides goals for water clean-up projects. The water quality standards which apply in Kitsap County are summarized below. State law also places bodies of water in different classifications, i.e. Primary or Extraordinary, depending on designated beneficial uses such as human recreation or fish habitat. Classifications for more pristine areas, like Extraordinary, are generally more stringent.

Parameters	Freshwater Standard		Marine Water Standard	
	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° C ¹	≤18.0° C ¹	≤13.0° C ¹	≤16.0° C ¹

These standards use a geometric mean value (or GMV) for bacteria, which measures the central tendency of a data set. The geometric mean 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.

BACTERIA LEVELS IN KITSAP COUNTY STREAMS

The following table summarizes stream monitoring results for the 2014 water year, starting with the most contaminated streams. The table presents an alphabetical listing of all streams and includes the annual geometric mean value for fecal bacteria for the current water year. The colors used in the “Sampling Station” column indicate whether or not streams met the applicable state water quality standards for fecal coliform bacteria.

- 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.

Each stream is also evaluated to determine whether there is a statistically significant change, or trend, in bacteria levels over time. A long-term trend is calculated for the entire data set, currently over 18 years, and short-term trend for the most recent 3 year period. Please note that while stream water quality may change from year to year, it can still have a stationary trend if the changes are not statistically significant compared to the rest of the data set.

2014 Kitsap County Stream Water Quality Summary

Watershed	Stream Name	Station	Range	FC GMV	Long Term Trend	3 yr Trend
SIN	Anderson	AN01	4-200	14	Stationary	Stationary
SIN	Annapolis	AP01	30-930	125	Improving	Stationary
DYES	Barker	BK01	4-380	10	Improving	Stationary
SIN	Beaver	BV01A	4-320	40	Improving	Stationary
UHC	Big Anderson	BA01	4-370	21	Stationary	Stationary
UHC	Big Beef	BB01	4-410	11	Stationary	Stationary
LBMB	Big Scandia	BS01	4-320	37	Stationary	Stationary
LBMB	Bjorgen	BN01	4-1410	82	Stationary	Stationary
SIN	Blackjack	BJ01	20-180	65	Stationary	Stationary
UHC	Boyce	BY01	4-350	17	Stationary	Stationary
BM	Burley	BL01	10-2001	128	Stationary	Stationary
FBAC	Carpenter	CA02	4-330	28	Stationary	Stationary
DYES	Chico	CH01	4-270	28	Stationary	Stationary
DYES	Clear	CC01	4-640	43	Stationary	Stationary
CCRC	Coulter	CU01	4-50	11	Stationary	Stationary
LBMB	Cowling	CW01	4-390	40	Improving	Stationary
CPYH	Curley	CY01	4-400	39	Stationary	Stationary
LBMB	Daniels	DC01	4-300	43	Improving	Stationary
LBMB	Dogfish	DF01	4-170	29	Improving	Stationary
POBB	Enetai	DE01	4-800	55	Improving	Stationary
CPYH	Fragaria	FG01	4-70	11	Stationary	Stationary
SIN	Gorst	GR01	4-380	48	Improving	Stationary
LBMB	Grovers	GC01	4-240	41	Stationary	Stationary
BM	Huge	HG01	4-2001	35	Stationary	Stationary
POBB	Illahee	IC01	10-250	38	Stationary	Stationary
LBMB	Indianola	IN01	4-350	32	Improving	Stationary
LBMB	Johnson	JC01	4-120	18	Improving	Stationary
UHC	Jump Off	JJ01	4-2001	27	Improving	Stationary
SIN	Karcher	KA01	4-940	50	Improving	Stationary
UHC	Kinmann	KN01	10-2001	98	Stationary	Stationary
LBMB	Kitsap	KT01	4-510	64	Stationary	Stationary
DYES	Kitsap Mall West	KW01	4-1020	64	Stationary	Stationary
UHC	Little Anderson	LA02	4-500	16	Stationary	Stationary
LBMB	Little Scandia	LS01	20-790	88	Stationary	Stationary
UHC	Lofall	LF01	220-2001	636	Worsening	Stationary

2014 Kitsap County Stream Water Quality Summary (cont'd)

Watershed	Stream Name	Station	Range	FC GMV	Long Term Trend	3 yr Trend
UHC	Martha John	MJ01	4-330	37	Improving	Stationary
BM	Minter	MN01	4-2001	63	Improving	Worsening
DYES	Mosher	MS01	4-540	65	Stationary	Stationary
CPYH	Olalla	OC02	4-2001	43	Improving	Stationary
DYES	Ostrich Bay	OB01	10-650	168	Improving	Stationary
DYES	Pahrmann	PA01	4-150	42	Stationary	Stationary
DYES	Phinney	PH01	4-1330	137	Stationary	Improving
UHC	Port Gamble	PG01	4-210	33	Stationary	Stationary
BM	Purdy	PR01	4-2001	63	Stationary	Stationary
SIN	Ross	RS02	4-80	16	Stationary	Stationary
SIN	Sacco	SC01	10-810	62	Improving	Stationary
CPYH	Salmonberry	SM01	4-110	18	Improving	Stationary
UHC	Seabeck	SB01	4-800	23	Stationary	Stationary
LBMB	South Dogfish	SF01	4-180	34	Improving	Stationary
POBB	State Park	SP01	4-330	32	Improving	Stationary
UHC	Stavis	SV01	4-530	26	Stationary	Stationary
POBB	Steele	ST01	4-350	44	Stationary	Stationary
DYES	Strawberry	SR01	4-340	60	Improving	Stationary
TUR	Tahuyeh	TR01	4-30	6	Worsening	Stationary
TUR	Union	UN01	4-2001	27	Stationary	Stationary
UHC	Vinland	VC01	4-2001	51	Stationary	Stationary
CPYH	Wilson	WN01	4-2001	62	Improving	Stationary

WASHINGTON STATE'S 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 303(d) list includes areas for which beneficial uses such as recreation or aquatic habitat are impaired by pollution. This impairment 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 December 2012. Streams and marine waters are listed in different categories, depending on the frequency of water quality problems;

- Category 2 (waters of concern),
- Category 4B (impaired waters with a cleanup plan), or
- Category 5 (impaired waters *without* a cleanup plan)

EXAMPLE - Water Quality Summary Table

Waterbody	Long term trend	Short term trend	Meets WQ Standard?	2013 Annual FC Bacteria GMV	2014 Annual FC Bacteria GMV	Health Advisory?
Stream Name (XX01)				##	##	No
Stream Name (XX01)				##	##	No
Stream Name (XX01)				##	##	Yes
Overall marine water		None	3 of 4 Stations			

Waterbody – Lists the stream name and associated monitoring station ID (example: Big Anderson Creek, BA01). If there are marine water quality monitoring stations in the watershed, the overall marine water quality summary will be listed in the last row.

Trends - In fecal coliform data are shown as “Long Term” (all 18 years of data) or “Short Term” (most recent 3 years) in separate columns. Only long term trends are calculated for marine water. The symbols and their meanings are:

- Green arrow **Improving** trend
- Blue, level arrow **Stationary** trend
- Red, downward arrow **Worsening** trend

Meets WQ Standard? – These symbols indicate whether a stream met the State water quality standard for fecal coliform bacteria, with the same color scheme used in the County summary table. In the overall marine water summary, the number of marine water monitoring stations that met the FC standard will be listed.

- 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 and met both parts of the standard.

Health Advisory - For Kitsap County streams that are so polluted with fecal bacteria that the Health District advises no contact with them, a health advisory is shown in this column.

[Click here to return to Watershed Chapter listing.](#)

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

More Information: **Kitsap Public Health District**
Water Pollution Investigation & Correction Program
345 6th Street, Suite 300
Bremerton, WA 98337-1866
(360) 337-5235
www.kitsappublichealth.org

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/>