

DEPARTMENT OF ECOLOGY

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**SUBJECT: Drayton Harbor Watershed FC TMDL
QUARTERLY PROGRESS REPORT #1 (Dec. 2007 - March 2008)
PROJECT CODE: 06-021-01**

Introduction

Drayton Harbor is an enclosed estuary located within Water Resource Inventory Area 1 and Whatcom County just south of the Canadian border. The Drayton Harbor watershed drains approximately 35,372 acres, 90% of which empties into either California or Dakota Creek before entering the harbor. The watershed houses approximately 10,465 people including the city of Blaine and hosts diverse land uses including: (1) commercial and industrial development, (2) low density residential land, (3) commercial dairies and berry farms, (4) non-commercial hobby farms, (5) agriculture, (6) surface mining, and (7) forestland.

Ecology is conducting a TMDL study in this watershed because there is strong evidence of bacterial contamination that is affecting beneficial uses in the area, such as shellfish harvesting and recreation. Several study-area waterbodies are included on Ecology's 303(d) list of impaired waters, including Drayton Harbor, California Creek, Dakota Creek, and a small unnamed creek that drains to Drayton Harbor between the mouth of Dakota Creek and the city of Blaine. The field work for the study began in December 2007 and will continue through December 2008. The goal is to assess the current condition of waterbodies and to identify and quantify factors contributing to these impairments.

This memorandum summarizes the progress for December 2007 and the first quarter of 2008 (January - March) regarding data collection and project communications. Data presented are provisional; data quality has not been checked.

Progress to Date

Communications

- The Quality Assurance (QA) Project Plan was submitted for internal and external review, revised, and approved for sampling in November and December of 2007. The QA Project Plan was finalized and published to the web in March 2008 and is available at: <http://www.ecy.wa.gov/biblio/0803105.html>

- Plans to develop a model of bacteria transport in the harbor were dropped from the scope of the project. Ecology staff met in January 2008 and decided that model development was not necessary given certain factors. For example, the mouths of Dakota and California Creek will be expected to meet more stringent marine water quality standards. This means that a model will not be needed to determine what limits will be placed on the mouths of the creeks for the water in the harbor to meet marine limits.
- An overview of the TMDL effort was presented to the Drayton Harbor Shellfish Advisory Committee on January 16th, 2008. The committee had significant concerns about how the TMDL would assess marine water quality listings without the modeling effort. Ecology is currently developing an addendum to the QAPP to address these concerns and additional data needs.
- A grant proposal to conduct a microbial source tracking (MST) study, using DNA ribotyping analysis, within the Blaine Harbor marina was submitted to EPA in February and approved for funding in March, 2008. DNA ribotyping will be used to identify FC sources present in the marina by species (e.g. human, cow, seagull, rat, seal, etc).
- The MST study will be coordinated with follow-up work done for the recently completed Drayton Harbor MST Pilot Study. The pilot study was conducted by the Puget Sound Restoration Fund and EPA's Manchester laboratory. Key sites in Drayton Harbor and the California Creek watershed were assessed for FC sources present using *Bacteroides* host specific polymerase chain reaction (PCR) analysis as the primary method. EPA currently uses this method to distinguish between human and ruminant sources.
- Notification of fecal coliform results over 200 cfu/100 mL was sent within one week following each sampling event to Ecology's regional staff, Whatcom County, and other interested parties. These notifications were, and will continue to be, used to help direct follow-up activities within the watershed.

Data Collection

- Fecal coliform samples were collected at 30 sites during seven sampling events from December 2007 to March 2008. These samples were collected in the Dakota, California, and Cain Creek watersheds, as well as from several drainages that discharge directly to Drayton Harbor. Flow measurements were collected wherever possible.
- A shoreline and marina sampling survey was conducted on January 14th during a storm event. Bacteria samples were collected at 41 sites along the Drayton Harbor shoreline and at 16 sites within the Blaine Harbor and Semiahmoo marinas.
- Two continuous streamflow gages were installed by Ecology in November 2007. One each on Dakota and California Creek above their respective tidal influences.
- Whatcom County Public Works contracted work out to Hirsch Consulting Services to assist with the TMDL effort and build upon a monitoring program they initiated in 2006 by sampling sites located within the California Creek watershed. For the first two months of the project, Ecology sampled these sites with assistance from Whatcom County, during

which time the county was completing the contract process. In February, staff members from Hirsch Consulting were trained on the sampling run and Ecology protocols.

Table 1 presents the fecal coliform data collected during the first quarter of 2008.

Bacteria Results and Comparison to Washington Water Quality Standards

- Results were reviewed for all samples collected in the first quarter (December 2007 – March 2008). Preliminary data in tables and figures were compared to Washington State Water Quality Standards for primary contact recreation (WAC-173-201A) which state:
 - *Fecal coliform organism levels must not exceed a geometric mean value of 100 colonies /100 mL, with not more than 10 percent of all samples (or any single sample when less than ten sample points exist) obtained for calculating the geometric mean value exceeding 200 colonies /100 mL.*
 - For 1-Cain-0.1 and 1-Cain-SD1, the FC levels must not exceed a geometric mean of 50 colonies/100mL and 100 colonies/100mL for 10 percent of the samples.
 - The salinity of the water at the sampling location at the mouths of Dakota and California Creek indicate the applicable standards are the marine standards. The mouths of Dakota and California Creek will be expected to meet the marine water quality standards where FC levels must not exceed a geometric mean of 14 colonies/100mL and 43 colonies/100mL for 10 percent of the samples.
- Geometric means and log-transformed 90th percentile statistics were calculated for all sites. The log-transformed 90th percentile has been identified as representative of the *not more than 10 percent of all samples* criteria, provided the data fits a log-normal distribution. **These statistics are preliminary and not representative of final statistics used for analysis of the project. For the purpose of the quarterly reports, they are meant to help prioritize areas for follow-up actions and to identify sites and waterbody segments that may exceed water quality standards.** For the final data analysis, results will be statistically analyzed both for an entire year and by season after data collection has been completed. Figures 1-7 show box plots for each station.
- 14 out of 30 sites were projected to exceed water quality standards. Of those 14 sites, all exceeded the 90th percentile criterion and 8 sites exceeded the geometric mean criterion.
- For Dakota Creek outside of the tidal influence, 90th percentiles are a problem throughout the watershed, ranging from 163 to 382. Geometric means in this stretch are fairly consistent and range from 58 to 74.
- There is a large jump in concentrations from Dakota Creek at river mile 3.1 to Dakota Creek at the mouth. There are several possible factors influencing this increase:
 - Higher concentrations in the marine water derived from other sources within Drayton Harbor.
 - High concentrations from station 1-TribDak-1 and to a lesser extent 1-TribDak-2.
 - Unmeasured/unknown sources entering the creek within this stretch.
 - Archiving and re-suspension of bacteria in sediments from tidal action and the hydrodynamics of the creek entering the harbor.

- A similar jump in FC concentrations occurs from California Creek at river mile 3.1 to California Creek at the mouth, with a small increase occurring from 1-Cal-3.1 to 1-Cal-0.8 and a larger increase occurring from 1-Cal-0.8 to 1-Cal-0.1.
- The small increase from river mile 3.1 to 0.8 may be due to:
 - Higher concentrations in the marine water derived from other sources within Drayton Harbor.
 - Unmeasured/unknown sources entering the creek within this stretch.
 - High concentrations from station 1-TribCal-2.
- The larger increase from river mile 0.8 to 0.1 may be due to:
 - Higher concentrations in the marine water influenced by other sources within Drayton Harbor.
 - Unmeasured/unknown sources entering the creek within this stretch.
 - Archiving and re-suspension of bacteria in sediments from tidal action and the hydrodynamics of the creek entering the harbor.
- The highest FC concentrations occur on Cain Creek, where precipitation runoff events resulted in concentrations greater than 1000 colonies/ 100 mL. A large increase in FC counts occurs between 1-Cain-1.3 and 1-Cain-0.4.

Project Schedule and Upcoming Tasks

- Data collection at the 30 routine freshwater sites will continue through December 2008. Additional sites may be added on tributaries/inputs to Dakota, California, and Cain Creeks within the stretches where concentrations increase noticeably. One or more sites will likely be added in the South Fork Dakota Creek watershed based on high FC concentrations observed at its mouth.
- Two to three additional shoreline surveys will be conducted. The next survey is scheduled to take place in May.
- Starting in May, project staff will begin targeting sampling for a dry season storm event for the Dakota and California Creek watersheds.
- Continuous data loggers will be deployed to collect dissolved oxygen, pH, conductivity, and temperature data at key sites throughout the Dakota and California Creek watersheds.
- Ecology will begin working with EPA to scope the Blaine Marina MST Study and secure a contractor to complete the analysis work.
- An addendum to the QA Project Plan will be completed within the next quarter, outlining additional data collection necessary to address marine water quality issues.

Tables and Figures

Table 1. Fecal coliform bacteria data (colonies/100 mL) for Quarter 1 of 2008 (see Table 2 for site descriptions). Replicate sample values were averaged together.

Date	Dak-0.1 MF	Dak-0.1 MPN	Dak-3.1	Dak-6.8	SFDak-0.2	NFDak-0.1	NFDak-2.5
12/11/2007	285						
12/12/2007	84		21	40	16	45	63 J
12/18/2007	56	110	22	31	15	37	130
1/15/2008	250	130	150 J	160	160 J	88	49 J
1/28/2008	43/76*	49	40	66	17	84	36
2/6/2008	450 J	1100	250	270 J	300 J	245 J	200
2/19/2008	18	49	44	28	24	22	36
3/3/2008	12 U	145	88	120	405	34	108
Date	TribDak-1	TribDak-2	TribDak-3	TribDak-4	TribDak-5	TribDak-N1	TribDak-N2
12/12/2007	160	68	93	80	9	25	28 J
12/18/2007	250	80	340	100	29	55	44 J
1/15/2008	220	47	150	130	17	43 J	69 J
1/28/2008	445 J	84	130	39	17	125	170
2/6/2008	390	77	66	40	28	92	520 J
2/19/2008	150	27	32	21	19	29	12
3/3/2008	440	260	135	79	82	800	57
Date	Cain-0.1 MF	Cain-0.1 MPN	Cain-SD1	Cain-0.4	Cain-1.3	TribDray-1	Dray-SD4
12/11/2007	260		40	71 J	1 U	8	4
12/18/2007	180 J	540	190	96 J	69	55 J	24
1/15/2008	1200	1700	255	1800 J	15	175	124
1/28/2008	49/26*	110	140	71	8	29	5
2/6/2008	3200 J	1100	435	2100 J	60	41	75 J
2/19/2008	50 J	90	51	17 J	2	48	1
3/3/2008	92	70	420	180	31	61	80
Date	Cal-0.1 MF	Cal-0.1 MPN	Cal-0.8	Cal-3.1	Cal-5.0	Cal-6.2	
12/11/2007	320		3	5	11 J	37 J	
12/18/2007	100	79	29	15	5	30 J	
1/15/2008	220	175	130	110	110	140 J	
1/28/2008	240/60*	170	160	22	33	87	
2/6/2008	100	180	88	49	48	84 J	
2/19/2008	17	17	46	14	10	12 J	
3/3/2008	10	17	13	24	12	16 J	
Date	Cal-SD1	TribCal-1	TribCal-2	TribCal-3	TribCal-4	TribCal-5	
12/11/2007	2 U	440	610 J	12	14 J	5 J	
12/18/2007	3	20	23	16	49	10	
1/15/2008	3	6	29	160	27 J	32 J	
1/28/2008	1 U	2	59	61	32	26	
2/6/2008	6	5	520	68	65	60	
2/19/2008	1 U	5 J	69	14	32	3	
3/3/2008	1	10	240	2	24	26	

* High Tide Sample/ Low Tide Sample

U – Analyte was not detected at or above the reported result.

J – Analyte was positively identified. The associated numerical result is an estimate.

MF = Membrane filter analysis; Standard Methods (SM) 9222D

MPN = Most Probable Number analysis; SM9221E

Table 2. Fecal coliform bacteria sampling sites.

Site ID	Description	Latitude (°N)	Longitude (°W)
<i>Dakota Creek Watershed</i>			
1-TribDak-N2	Trib to NF Dakota Ck ≈300 ft below Delta Line Rd, joins NF Dakota at RM 2.1	48.96554	122.61708
1-NF-Dak-2.5	NF Dakota Creek @ Delta Line Road	48.96971	122.61579
1-TribDak-N1	Trib to NF Dakota Creek at Haynie Rd; joins NF Dakota at RM 2.0	48.97131	122.62618
1-NF-Dak-0.1	NF Dakota Creek @ Custer School Rd	48.95107	122.63790
1-SF-Dak-0.2	SF Dakota Creek @ Custer School Rd	48.95033	122.63792
1-Dak-6.8	Dakota Creek @ Behme Rd	48.95715	122.65964
1-TribDak-5	Trib to Dakota Cr. at Valley View Rd north of McGee St; joins Dakota at RM 2.8	48.96520	122.66007
1-Dak-3.1	Dakota Creek @ Giles Street	48.96272	122.68204
1-TribDak-3	Trib to Dakota Cr. at Rogers Road; joins TribDak-4 and then Dakota at RM 1.7	48.97034	122.69307
1-TribDak-4	Trib to Dakota Cr. at Hoier Road; joins TribDak-3 and then Dakota at RM 1.7	48.97195	122.70018
1-TribDak-2	Trib to Dakota Cr. at Blaine-Lynden Rd nr Harvey Rd; joins Dakota at RM 1.1	48.97911	122.70841
1-TribDak-1	Trib to Dakota Cr. at Blaine-Lynden Rd nr Odell St; joins Dakota at RM 0.9	48.97915	122.71960
1-Dak-0.1	Dakota Creek @ SR 548/Blaine Rd	48.97231	122.72936
<i>California Creek Watershed</i>			
1-TribCal-4	Trib to California Creek @ Bay road, just west of Bruce Rd.	48.90633	122.64965
1-Cal-6.2	California Creek @ Bruce Rd	48.90928	122.64406
1-TribCal-5	Trib to California Creek @ dead end of Main St. in Custer	48.91725	122.64927
1-Cal-5.0	California Creek @ Valley View Rd	48.92136	122.66039
1-TribCal-3	Trib to California Creek @ Arnie Rd west of Ham Rd	48.92110	122.68400
1-Cal-3.1	California Creek @ Birch Bay-Lynden Rd.	48.93575	122.68878
1-TribCal-2	Trib to California Creek @ Kickerville Rd	48.94953	122.70449
1-TribCal-1	Trib to California Creek @ Fleet Rd	48.94850	122.72206
1-Cal-0.8	California Creek @ SR548/ Blaine Rd.	48.95468	122.72617
1-Cal-0.1	California Creek @ Drayton Harbor Rd.	48.96217	122.73289
1-Cal-SD1	18" concrete culvert discharges to California Creek at the mouth	48.96230	122.73235
<i>Cain Creek Watershed</i>			
1-Cain-1.3	Cain Creek next to Blaine Public Works	48.98768	122.73432
1-Cain-0.4	Cain Creek downstream of beaver dam behind Blaine Trade Center	48.99295	122.74513
1-Cain-0.01	mouth of Cain Creek; 60" culvert off of Marine Dr, just north of boatyard	48.99697	122.75463
1-Cain-SD1	Storm drainage outfall to Semiahmoo Bay, north of the mouth of Cain Creek	48.99712	122.75439
<i>Direct Drainages to Drayton Harbor</i>			
1-TribDray-1	Mouth of trib to Drayton Harbor@ Hall & Dearborn	48.96813	122.73312
1-Dray-SD4	36" culvert on harbor shoreline, due east of Peace Portal Dr and Albert St.	48.98246	122.73935

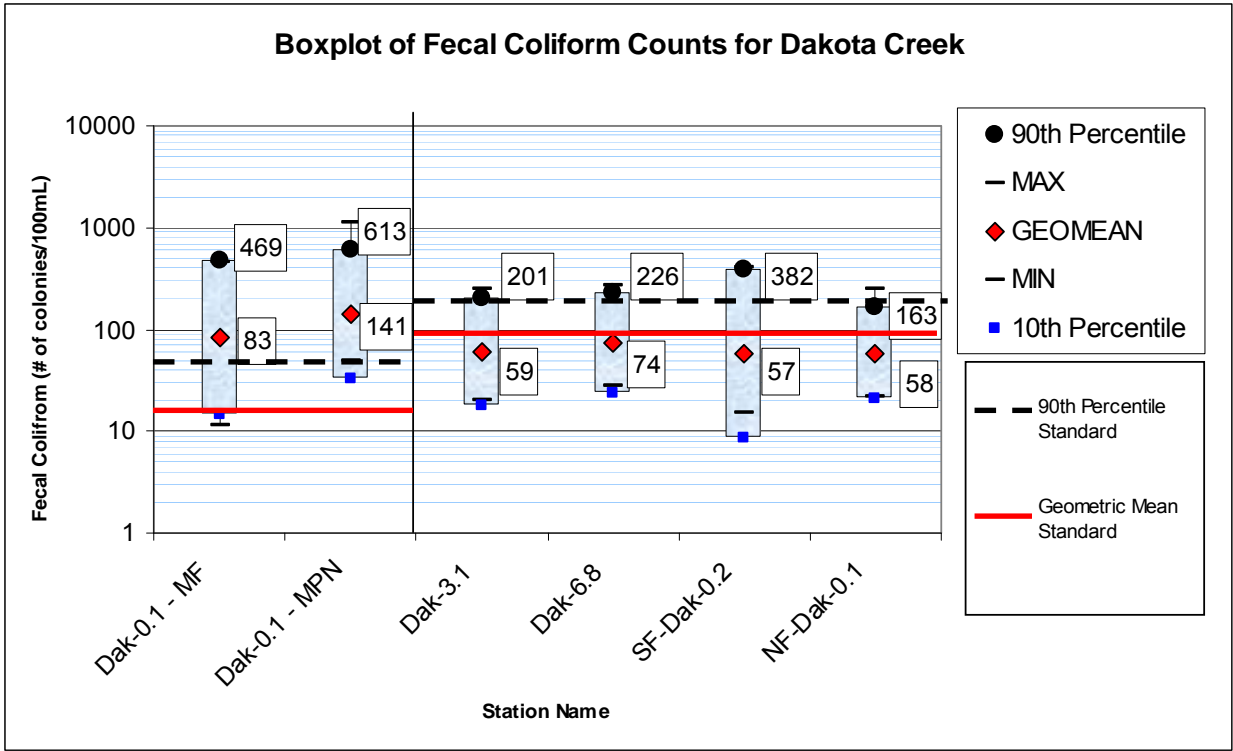


Figure 1. Illustrates the geometric mean and 90th percentile for Dakota Creek stations and their relation to corresponding state standards.

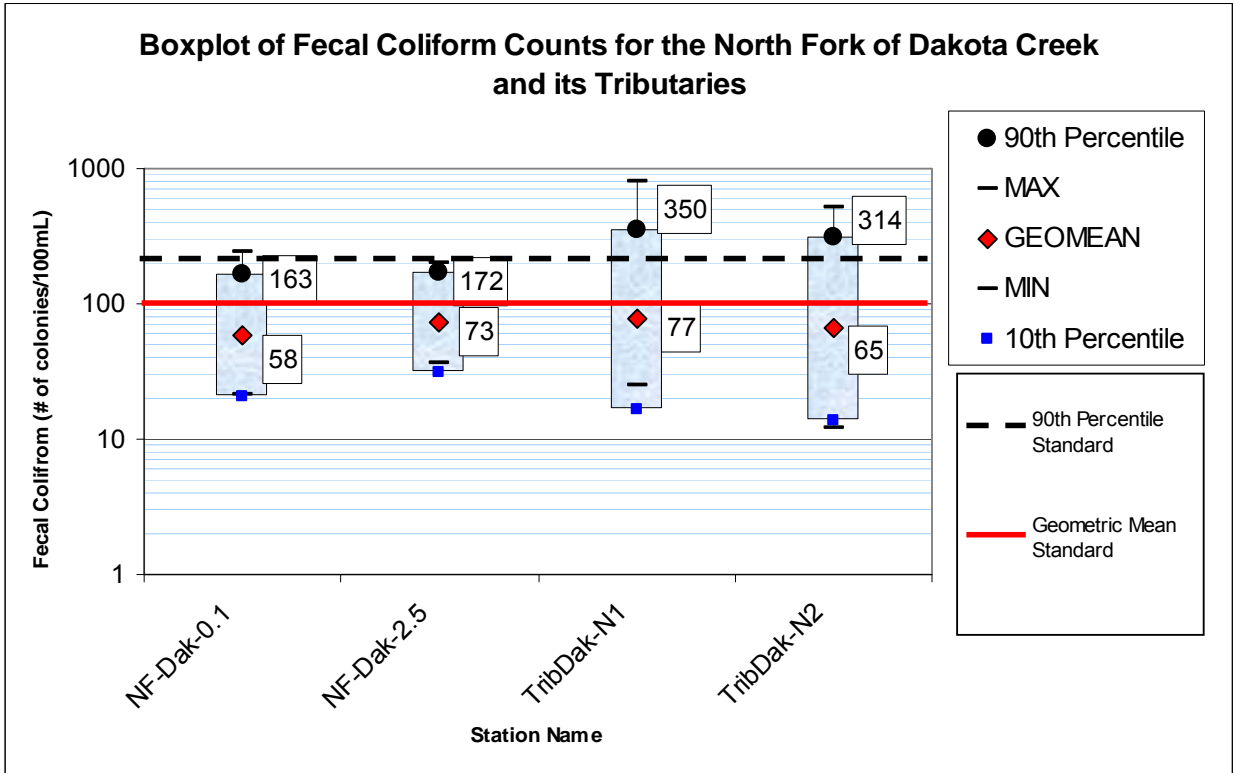


Figure 2. Illustrates the geometric mean and 90th percentile for stations on the North Fork of Dakota Creek and its tributaries and their relation to corresponding state standards.

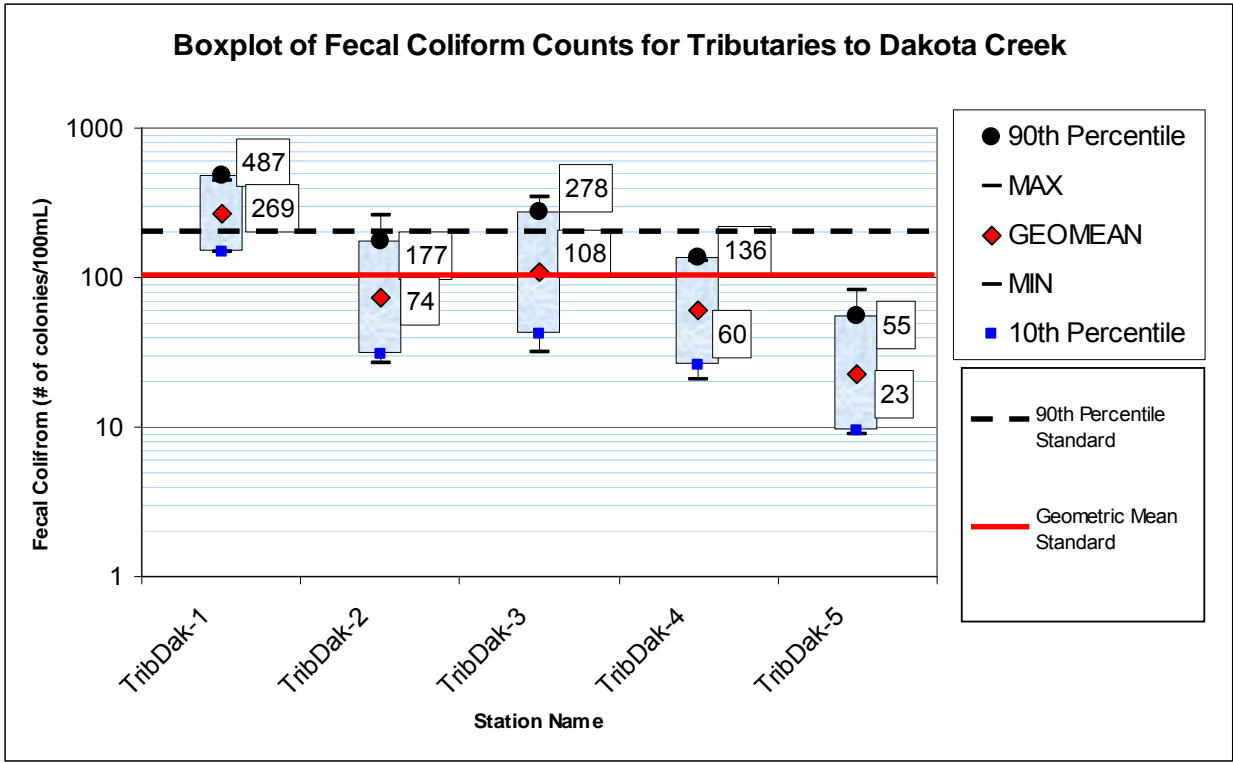


Figure 3. Illustrates the geometric mean and 90th percentile for tributaries to Dakota Creek and their relation to corresponding state standards.

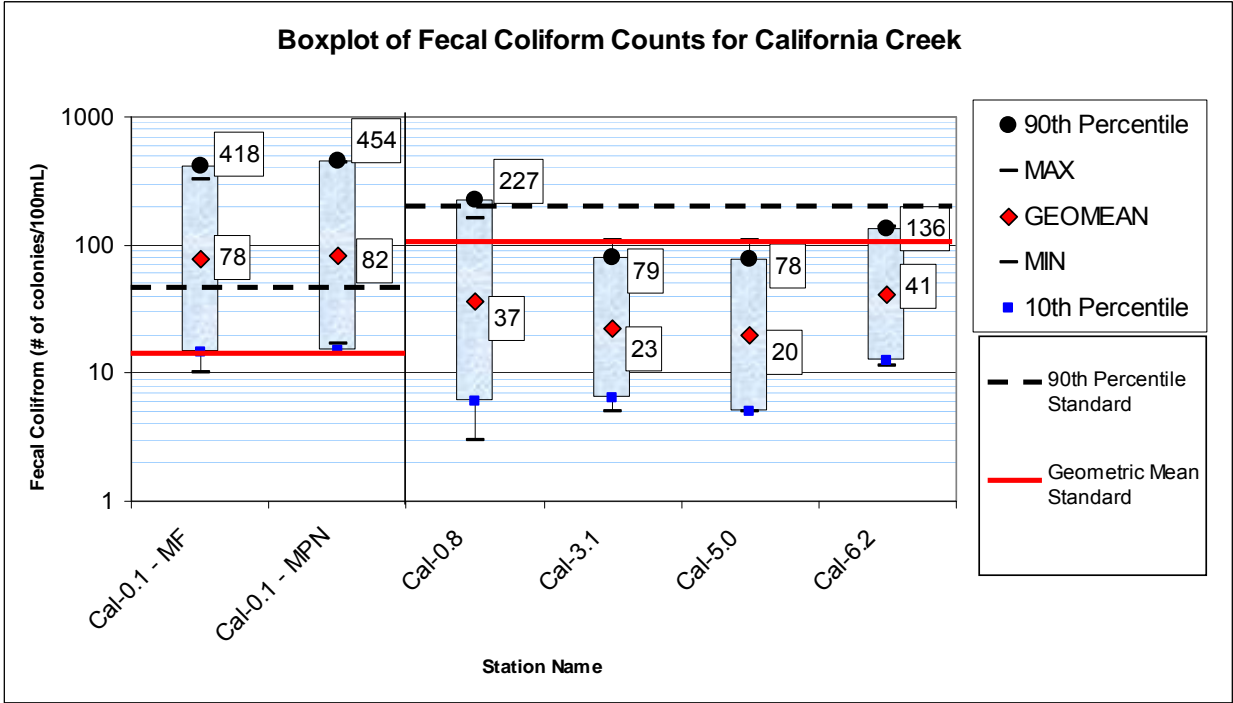


Figure 4. Illustrates the geometric mean and 90th percentile for California Creek stations and their relation to corresponding state standards.

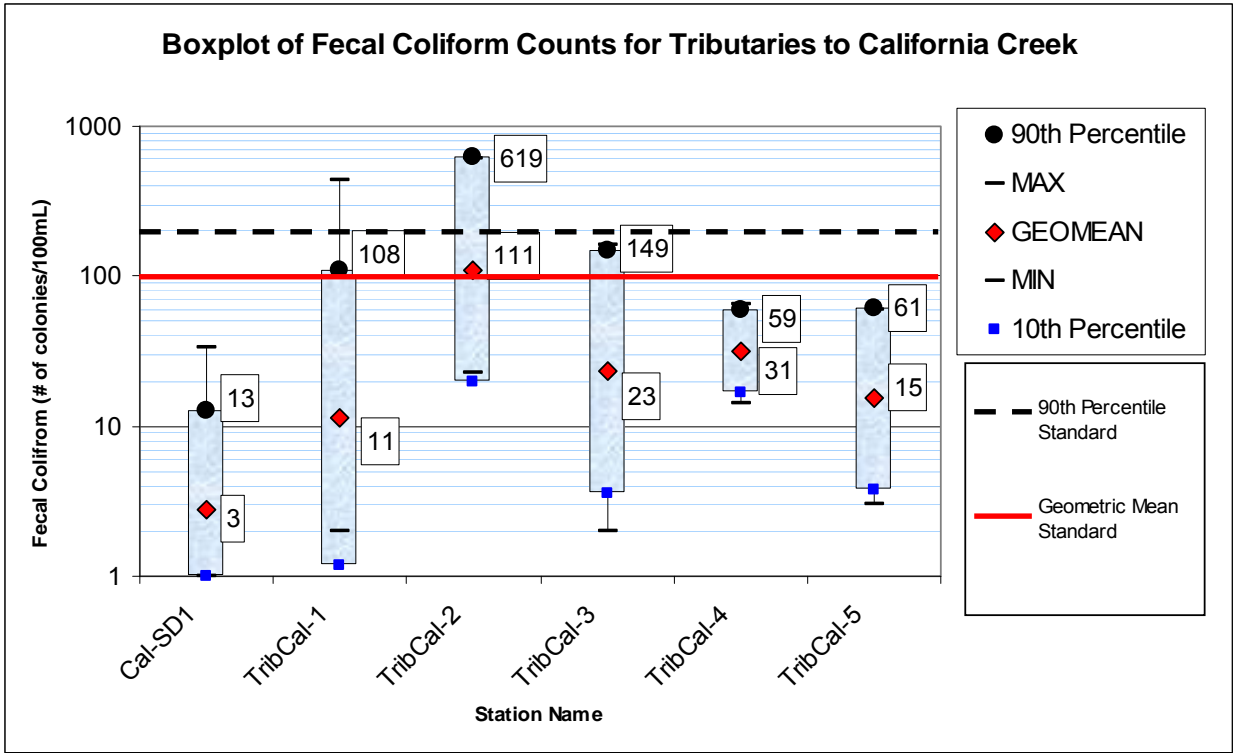


Figure 5. Illustrates the geometric mean and 90th percentile for tributaries to California Creek and their relation to corresponding state standards.

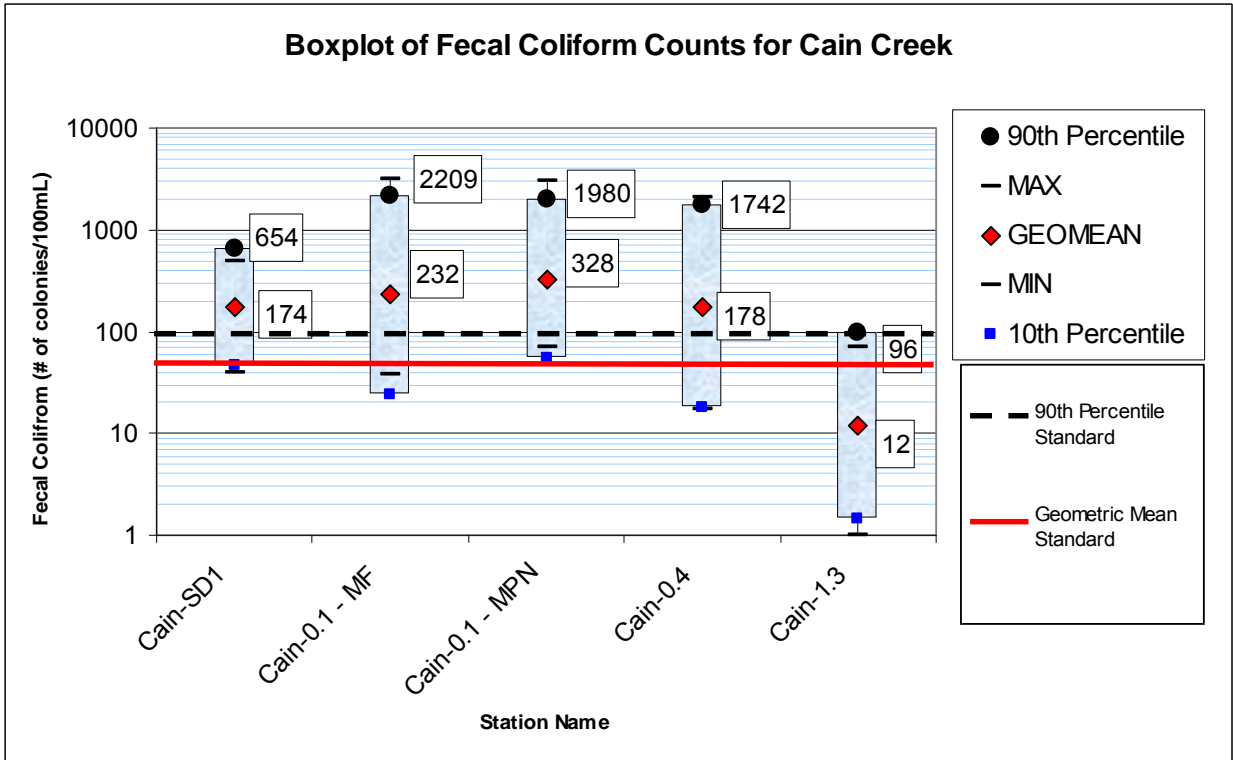


Figure 6. Illustrates the geometric mean and 90th percentile for Cain Creek stations and their relation to corresponding state standards.

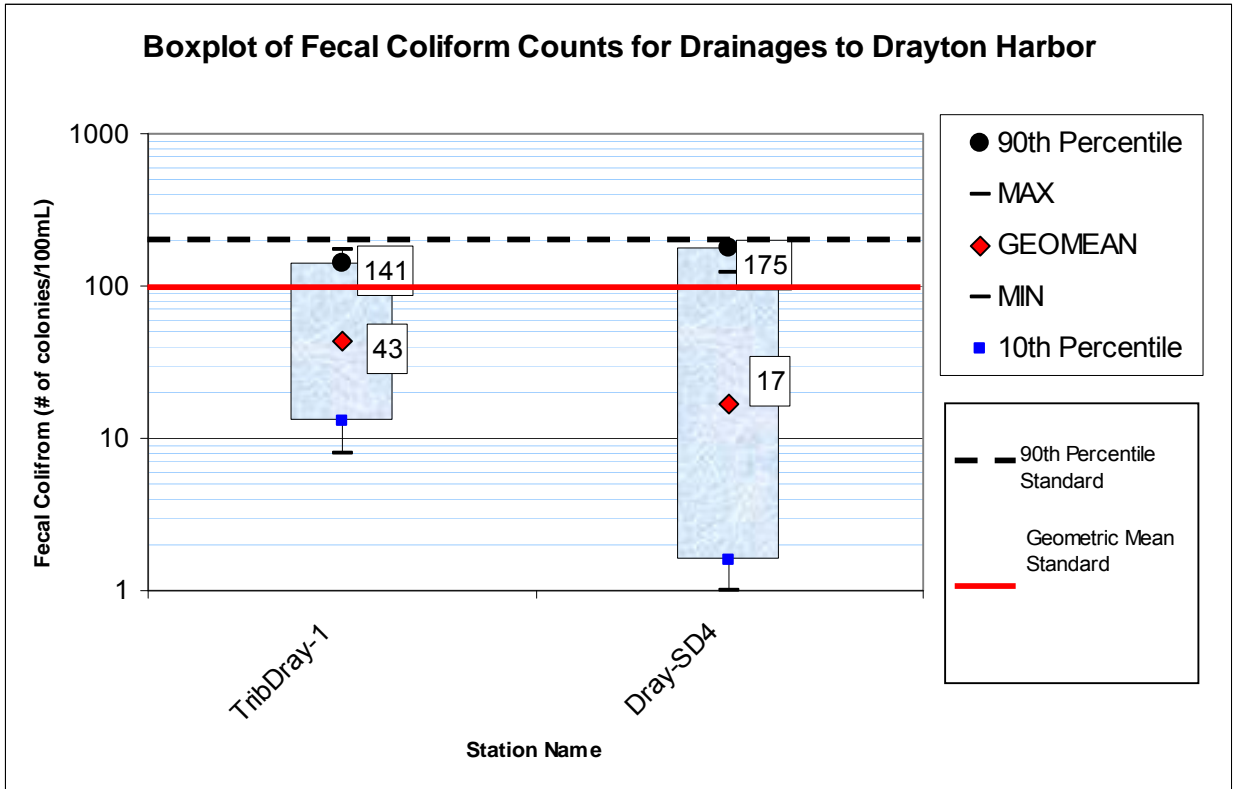


Figure 7. Illustrates the geometric mean and 90th percentile for two direct drainages to Drayton Harbor and their relation to corresponding state standards.