DEPARTMENT OF ECOLOGY

8/3/2009

TO: Steve Hood, Bellingham Field Office

THROUGH: George Onwumere, Environmental Assessment Program

FROM: Nuri Mathieu, Environmental Assessment Program

SUBJECT: **Drayton Harbor Watershed FC TMDL**
QUARTERLY PROGRESS REPORT #4 (October 2008 – January 2009)
PROJECT CODE: 06-021-04

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 developments, (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 January 2009. The goal is to assess the current condition of waterbodies and to identify and quantify factors contributing to these impairments. The Quality Assurance (QA) Project Plan is available online at: http://www.ecy.wa.gov/biblio/0803105.html.

This memorandum summarizes the progress for the third quarter of 2008 (October - December) and January 2009 regarding data collection and project communications. Data presented are provisional; data quality has not been checked.

Progress to Date

Communications

- With the exception of the final routine sampling run in December 2008, 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.

Data Collection

- Collected fecal coliform samples at all sites, with sufficient flow, during five sampling events from October to December 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.

- Surface flow returned to several sites that had no flow during the previous quarter. These sites include: 1-TribDak-N1, 1-TribDak-1, 1-Cal-SD1, 1-TribCal-4, 1-TribCal-3, 1-TribCal-1, 1-TribCal-0, 1-Cain-1.3, 1-TribDray-1, and 1-Dray-SD4.

- In late September, Ecology began sampling all sites above the confluence of the north and south forks of Dakota on the day before the main sample run. The change was made due to decreasing daylight and low tide windows for sampling.

- In October, Ecology began sampling the mouths of Dakota, California, and Cain Creeks on both days of the sample run. The change was made to help assess variability related to time and tidal patterns at these sites.

- Completed five Blaine Harbor Marina MST sampling events. Ecology coordinated the sampling with the three final sampling events for Whatcom County's Drayton Harbor Pilot MST Study.

- Completed the final shoreline survey on January 12-13th, 2009.

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 to date. Preliminary data in tables and figures were compared to Washington State Surface 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 Creeks indicates that the applicable standards are the marine standards. The mouths of Dakota and California Creeks 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 that will be 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 1-8 show box plots for each station.

- For the entire data set, 32 out of 36 sites exceeded water quality standards. Of those 32 sites, all exceeded the 90th percentile criterion and 19 sites exceeded the geometric mean criterion.

- When the data set was analyzed separately for both the wet and dry seasons, 34 out of 36 sites exceeded water quality standards.

- Several observed wet vs. dry season trends continued during the final quarter; including:

    - A large decrease in FC counts at the tidally-influenced sites on Dakota and California Creeks from the wet to the dry season (Figure 9).
    - Conversely, FC counts increased during the dry season at the majority of the mainstem (outside the tidal influence) and tributary sites throughout both the Dakota and California systems (Figures 10-12).
    - High FC concentrations continued in the Cain Creek sub-basin. The large increase in FC counts continued between 1-Cain-1.3 and 1-Cain-0.4.

Project Schedule and Upcoming Tasks

- Ecology may sample an extra MST event in February 2009, provided there are funds left within the project budget for an additional event.

Environmental Information System (EIM) Data Set	
EIM Data Engineer	Nuri Mathieu
EIM User Study ID	NMat0001
EIM Study Name	Drayton Harbor Watershed Fecal Coliform TMDL
EIM Completion Due	December 2009
Final Report	
Draft Due to Supervisor	December 2009
Draft Due to Client/Peer Reviewer	January 2010
Draft Due to External Reviewer	March 2010
Final Report Due	July 2010

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		20.5	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	17.5	49	44	28	24	21.5	36
3/3/2008	11.5 U	145	88	120	405	34	108
4/30/2008	6	11	35	120	15	220	230
5/12/2008	5	9	72	150	160	97	260
5/28/2008	19	79	76	120	51	160	235
6/12/2008	9	33	270	180	100	415	280
6/24/2008	5	13	57	37	81	46	140
7/7/2008	6	13	61	63	65	420	180
7/21/2008			33	31	59	58.5	120
8/4/2008	1.5	6	28	48	60	92	120
8/27/2008	2.5	5	110	72	36	60	190
9/2/2008	19	23	21	16	32	20	140
9/22/2008	17	15	24	38	59	67.5	210
10/13/2008	110	540			120	39	3400 J
10/14/2008	110		160	76			
11/3/2008	1400	1600			650	2200 J	3700 J
11/5/2008	8		540 J	615 J			
11/17/2008	69.5	140			25 U	53	25
11/18/2008	31		29 J	15			
12/2/2008	130	70			1	75	67 J
12/3/2008	44		69 J	23 J			
12/15/2008	96	130					
12/16/2008	66		54	23	1 U	25 J	25

Table 1 Continued. . .

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	54.5	44 J
1/15/2008	220	47	150	130	16.5	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
4/30/2008	150	46	101	91	9	57	430
5/12/2008	490	32	190	120	86	300	280 J
5/28/2008	54	1000 J	160	425	53	57	650
6/12/2008	350	970	210	945	52	430	300
6/24/2008	9	140	240	110	55	3 U	1300
7/7/2008		340	220	220	295		480
7/21/2008		725	500	110	320		300
8/4/2008		480	330	1600 J	330		260
8/27/2008		900	730	600	170	375	3300
9/2/2008		2800	1300	77	630		180
9/22/2008		280	430	640	160		490
10/14/2008	400	1900	505	92	75	980	675
11/4/2008	54	230	265	84	63	500	2900
11/17/2008	46	205 J	69 J	27 J	45 J	37.5	23
12/4/2008	84	180	140	33	63	90.5	67 U
12/16/2008	42 J	77 J	140 J	31 J	14 J	92 J	35

Date	SFDak-2.2	TribDak-S1	TribDak-S2
4/30/2008		63	
5/12/2008		1800 J	
5/28/2008	100 J	770	350
6/12/2008	100 J	85	520 J
6/24/2008	130	470	320
7/7/2008	150	500	390
7/21/2008	340	15	970
8/4/2008	1100 J	110	255
8/27/2008	150	470	120
9/2/2008	33	170	31
9/22/2008	96	850	170
10/14/2008	88	23	240
11/4/2008	6900 J	390	1400
11/17/2008	4	12	9
12/4/2008	25	62	50
12/16/2008	10	18	14

Table 1 Continued. . .

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	254.5	1800 J	15	175	123.75
1/28/2008	49/26*	110	140	71	8	29	5
2/6/2008	3200 J	1100	435	2100 J	60	41	74.5 J
2/19/2008	49.5 J	90	51	17 J	2	48	1
3/3/2008	92	70	420	180	31	61	80
4/30/2008	255 J	110	46	450	15 J	84	7
5/12/2008	147	130	74	620	29	340	34.5 J
5/28/2008	170		41	66	41	46	150
6/12/2008	200	350	110	240	83	81	260
6/24/2008	370	240	19	31	215		120
7/7/2008	340	350	58	395			
7/21/2008	4800	9200	290	54			
8/4/2008	540	1600	84	1200 J			
8/27/2008	1000	920	110	1600	275		
9/2/2008	66	205	76	190			
9/22/2008	470	540	340	2050			220
10/13/2008	1900	1600					
10/14/2008	1565 J		200	1400	200		220
11/3/2008	1270 J	1950	830	1050	290		
11/5/2008	156 J		77 J	930	8 U	270	17
11/17/2008	50	49					
11/18/2008	300		140	560	3	11000 G	18.5
12/2/2008	380	340					
12/3/2008	300		18	830	19	26	15.5
12/15/2008	190	155					
12/16/2008	120		36	150	49 J	20	5.5

Table 1 Continued. . .

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	29.5 J	
1/15/2008	220	175	130	110	110	140 J	
1/28/2008	240/60*	170	160	22	33	86.5	
2/6/2008	100	180	88	49	48	84 J	
2/19/2008	17	17	46	14	10	11.5 J	
3/3/2008	10	17	12.5	24	12	16 J	
4/30/2008	2	5	15	35	140	85.5 J	
5/12/2008	36	79	89	180	120	140 J	
5/28/2008	8 J		32	235	100	200 J	
6/12/2008	3	2	56	280	340	140 J	
6/24/2008	14	11	19.5	240	170	235 J	
7/7/2008	16	17	13.5	200	190	280 J	
7/21/2008	13	64	68	280	430	230	
8/4/2008	16	70	45	54	200	235	
8/27/2008	31	79	84	300	1200	1200	
9/2/2008	29	49	53	40	66	180 J	
9/22/2008	3	2	3.5	73	255	140	
10/13/2008	5	11					
10/14/2008	39		24	240	830	1200	
11/3/2008	75	79					
11/5/2008	60		200	330	900	1100	
11/17/2008	33	49					
11/18/2008	28		18	96	100 J	50 J	
12/2/2008	23	140					
12/3/2008	8 J		11 J	8	38	23	
12/15/2008	81	240					
12/16/2008	77 J		54 J	31 J		46 J	

Table 1 Continued. . .

Date	Cal-SD1	TribCal-1	TribCal-2	TribCal-3	TribCal-4	TribCal-5	TribCal-0
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	
4/30/2008	1 U	74	57	10	200 J	103	7
5/12/2008	1 U	24	320	120	34 J	160	
5/28/2008	63	7	100	3500 J	40 J	210 J	
6/12/2008	28	180	145	92	160 J	120	250
6/24/2008	1 U		330	130	4600 J	80	54
7/7/2008			69		480	2400 J	6
7/21/2008			300			14000 J	
8/4/2008			69			4100	
8/27/2008	88		620 J		2400	1700	1100 J
9/2/2008	44		120		245 J	400	92
9/22/2008	36		790		170	770	
10/14/2008	43		185		54	185 J	120
11/4/2008	6	110	235	3 U	410	115	150
11/17/2008	5	8	33	46	22 J	26	
12/4/2008	8 J	6	57	15.5	6	26	
12/16/2008	1 J	11 J	75 J	32 J	8 J	88 J	3 J

*** 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)
Dakota Creek Watershed			
1-TribDak-S2	Trib to SF Dakota Creek @ Sunrise Rd; just north of SF Dakota Creek	48.94463	122.59646
1-TribDak-S1	Trib to SF Dakota Creek @ Delta Line Rd near Loomis Trail Rd	48.94784	122.61629
1-SFDak-2.2	SF Dakota Creek at Sunrise Rd	48.94306	122.59647
1-TribDak-N2	Trib to NF Dakota Ck approx. 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 @Valley View 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	Dakorta Creek @ SR 548/Blaine Rd	48.97231	122.72936
California Creek Watershed			
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-TribCal-0	Trib to California Creek @ SR 548/ Blaine Rd; next to Dakota Ck. Christian Center	48.95827	122.73005
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
Cain Creek Watershed			
1-Cain-1.3	Cain Creek @ Pipeline Rd south of airport	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, just north of the mouth of Cain Creek	48.99712	122.75439
Direct Drainages to Drayton Harbor			
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

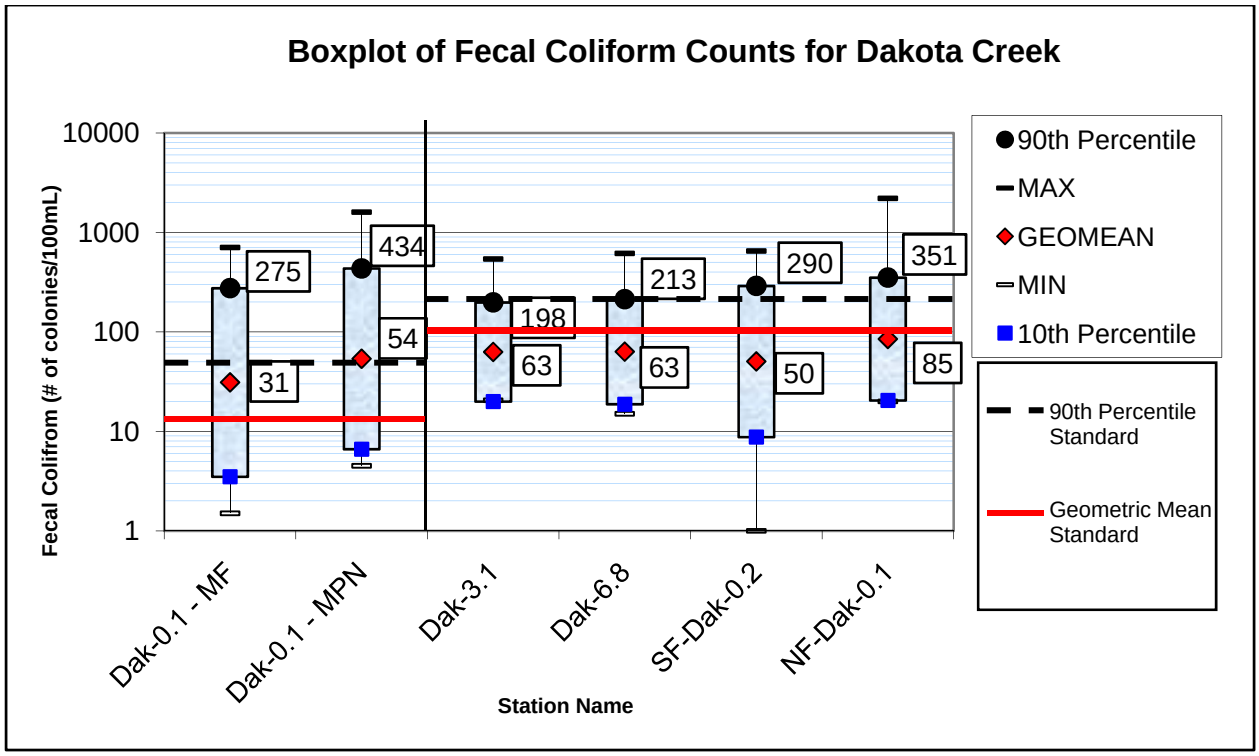

Figure 1. Illustrates the geometric mean and 90th percentile for Dakota Creek stations and their relation to corresponding state standards.

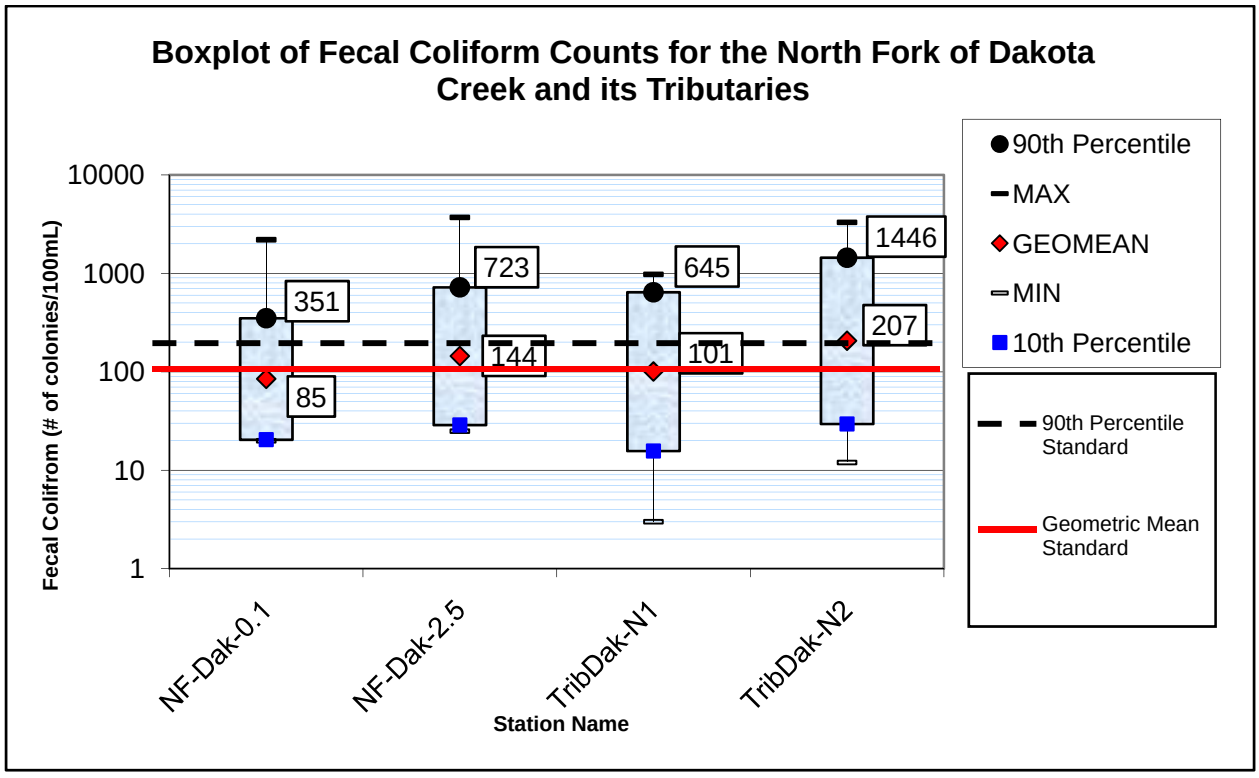

Figure 2. Illustrates the geometric mean and 90th percentile for stations on the North Fork of Dakota Creek and its tributaries and their relation to corresponding state standards.

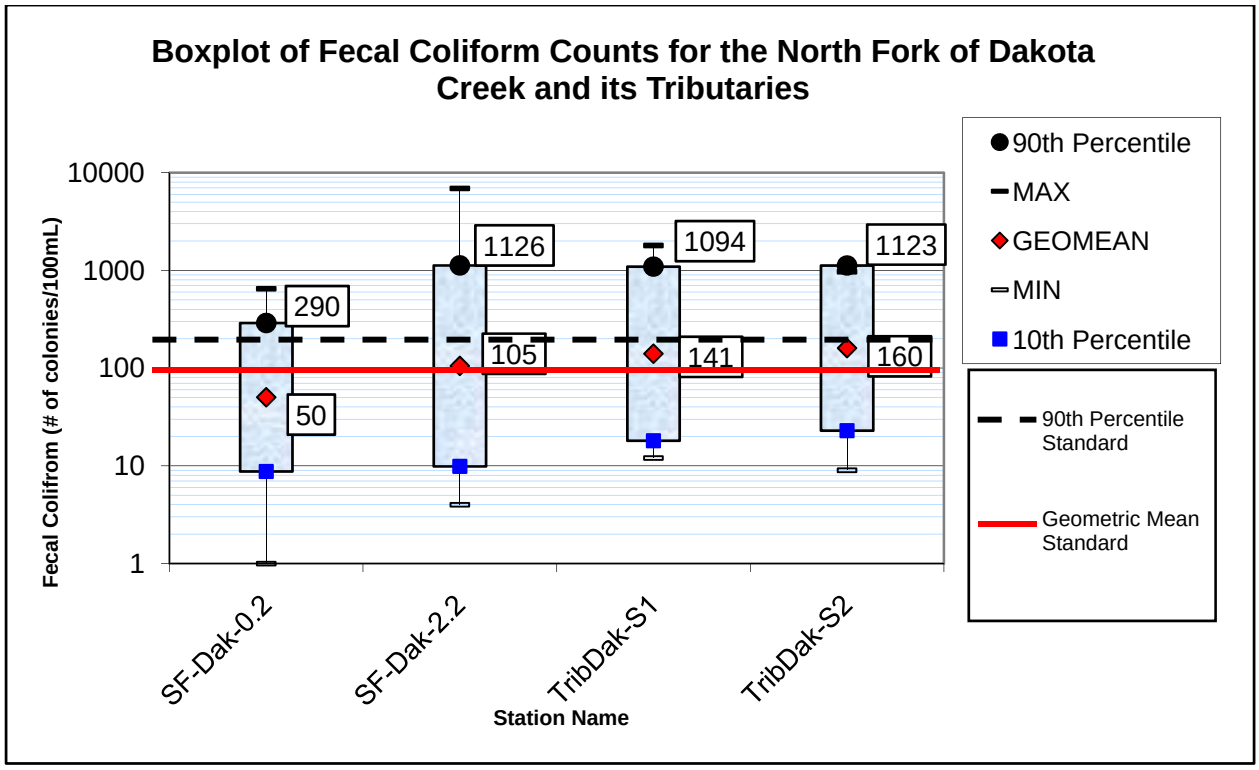

Figure 3. Illustrates the geometric mean and 90th percentile for stations on the South Fork of Dakota Creek and its tributaries and their relation to corresponding state standards.

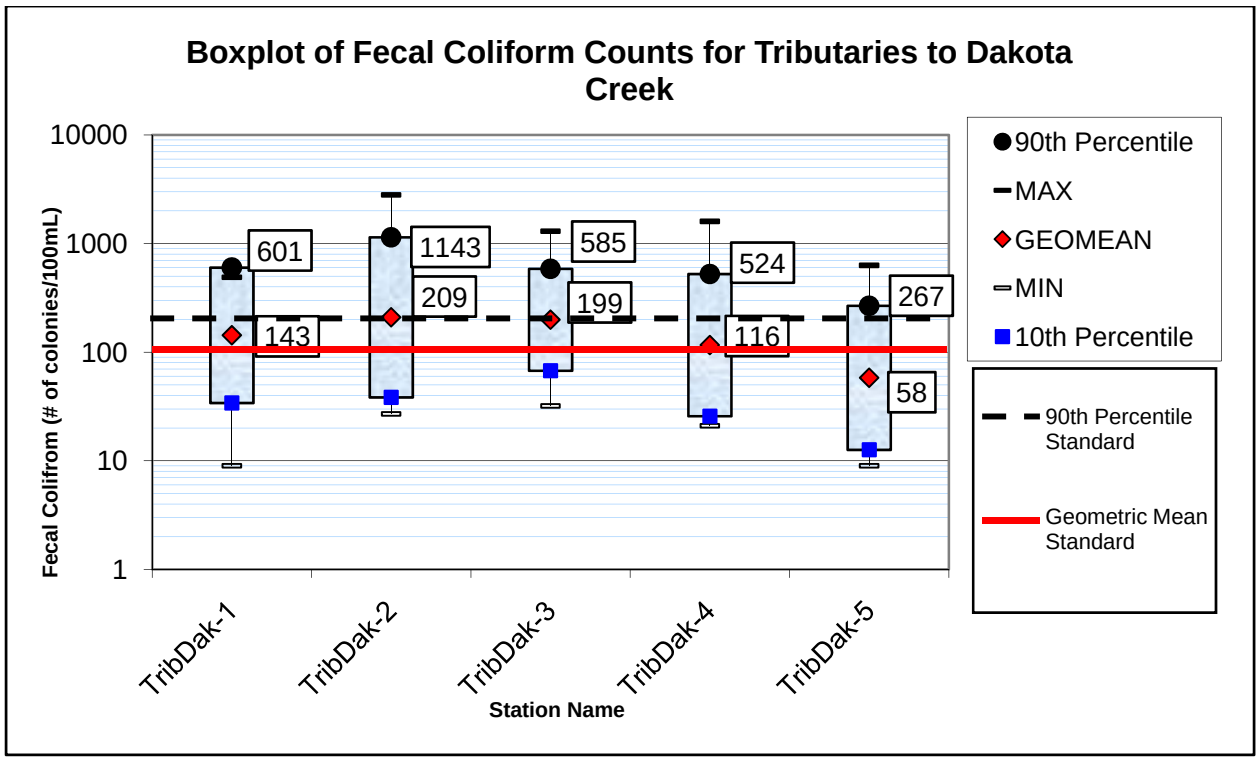

Figure 4. Illustrates the geometric mean and 90th percentile for tributaries to Dakota Creek and their relation to corresponding state standards.

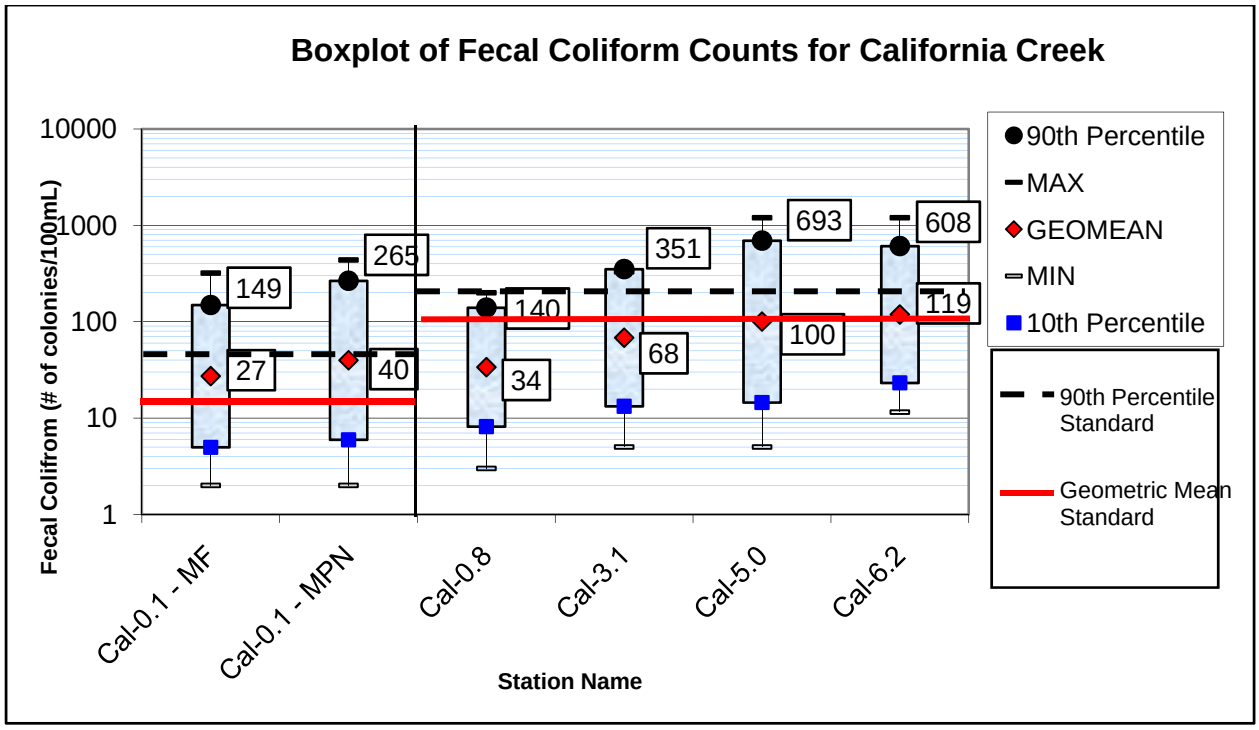

Figure 5. Illustrates the geometric mean and 90th percentile for California Creek stations and their relation to corresponding state standards.

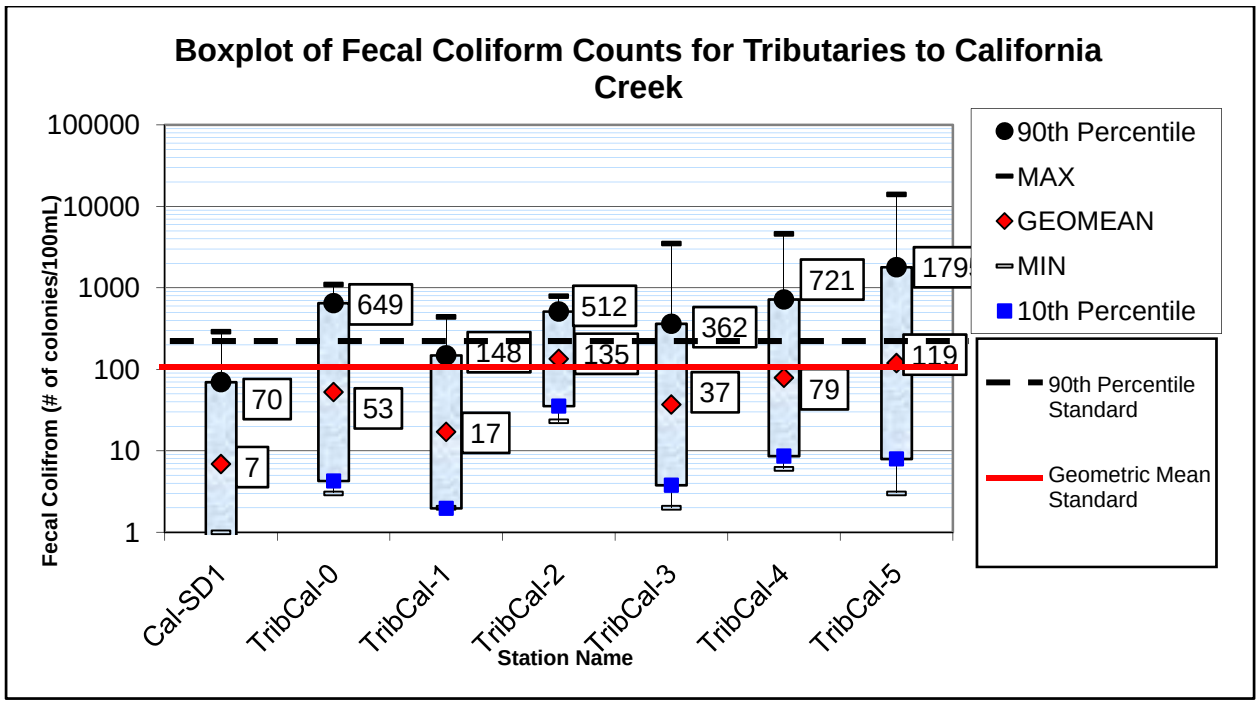

Figure 6. Illustrates the geometric mean and 90th percentile for tributaries to California Creek and their relation to corresponding state standards.

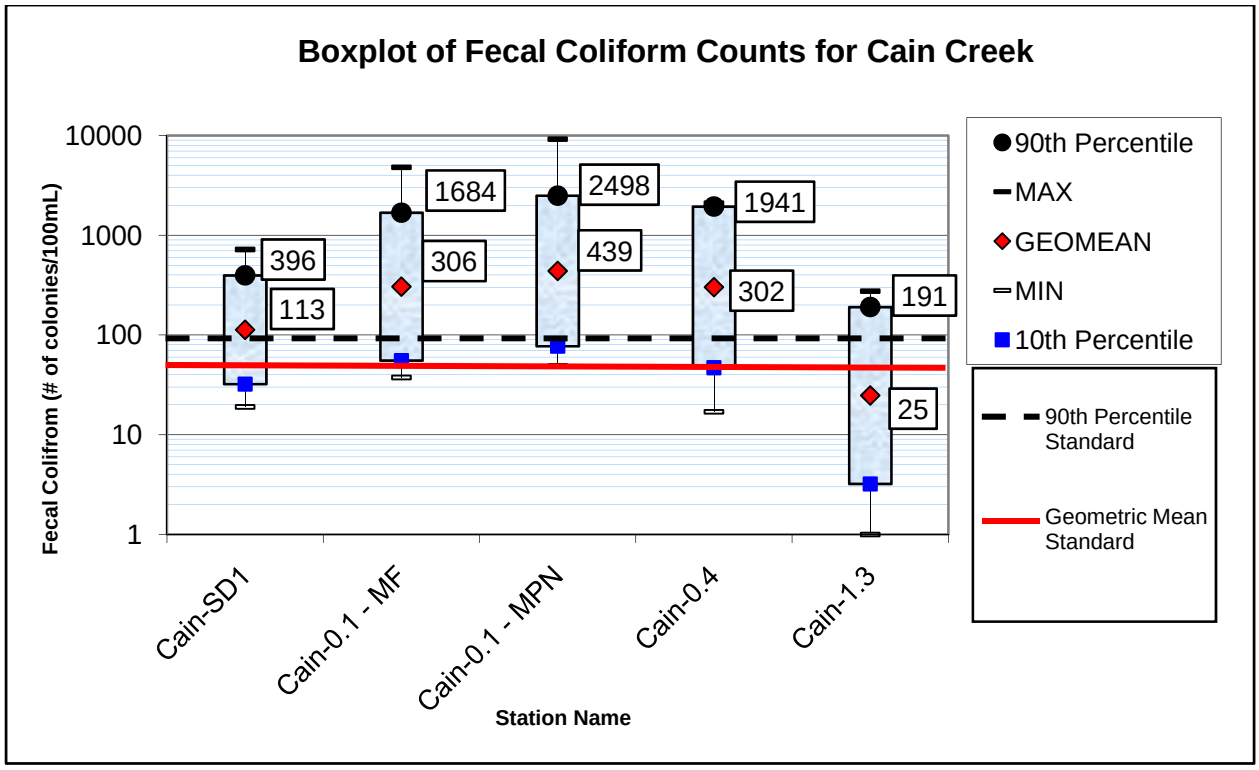

Figure 7. Illustrates the geometric mean and 90th percentile for Cain Creek stations and their relation to corresponding state standards.

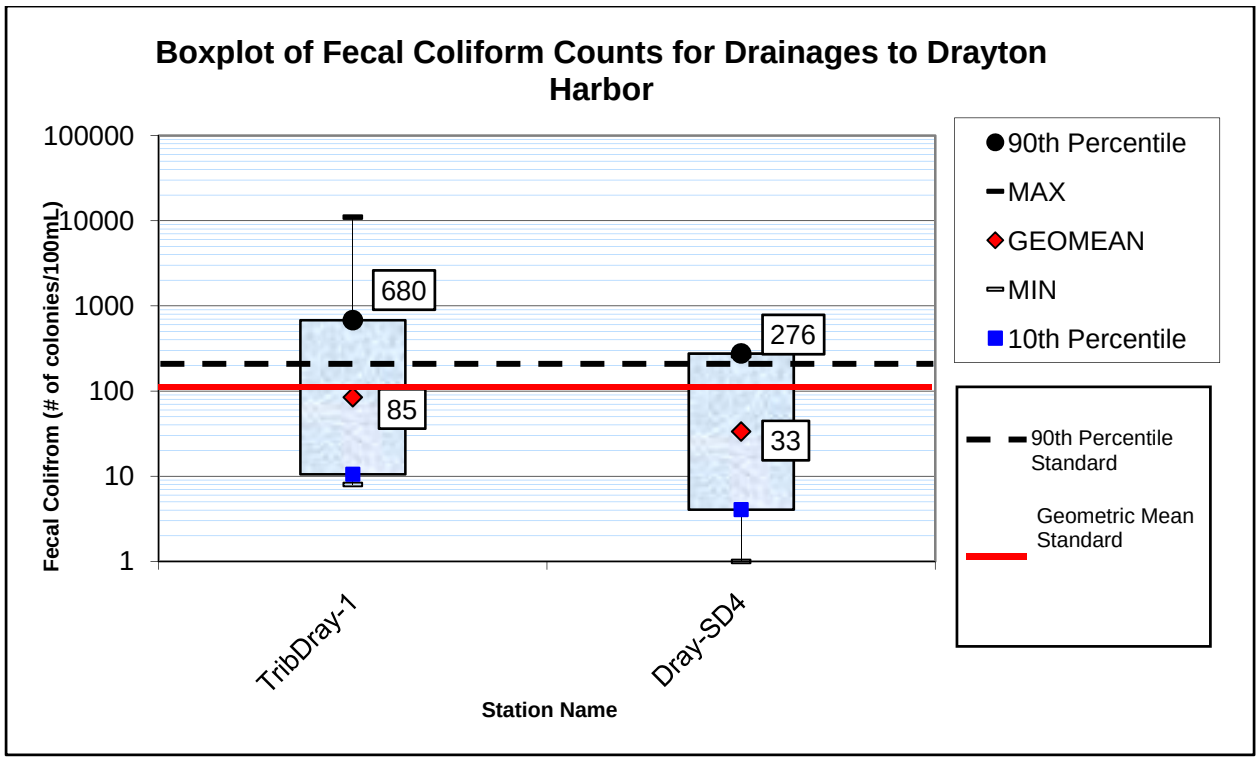

Figure 8. Illustrates the geometric mean and 90th percentile for two direct drainages to Drayton Harbor and their relation to corresponding state standards.

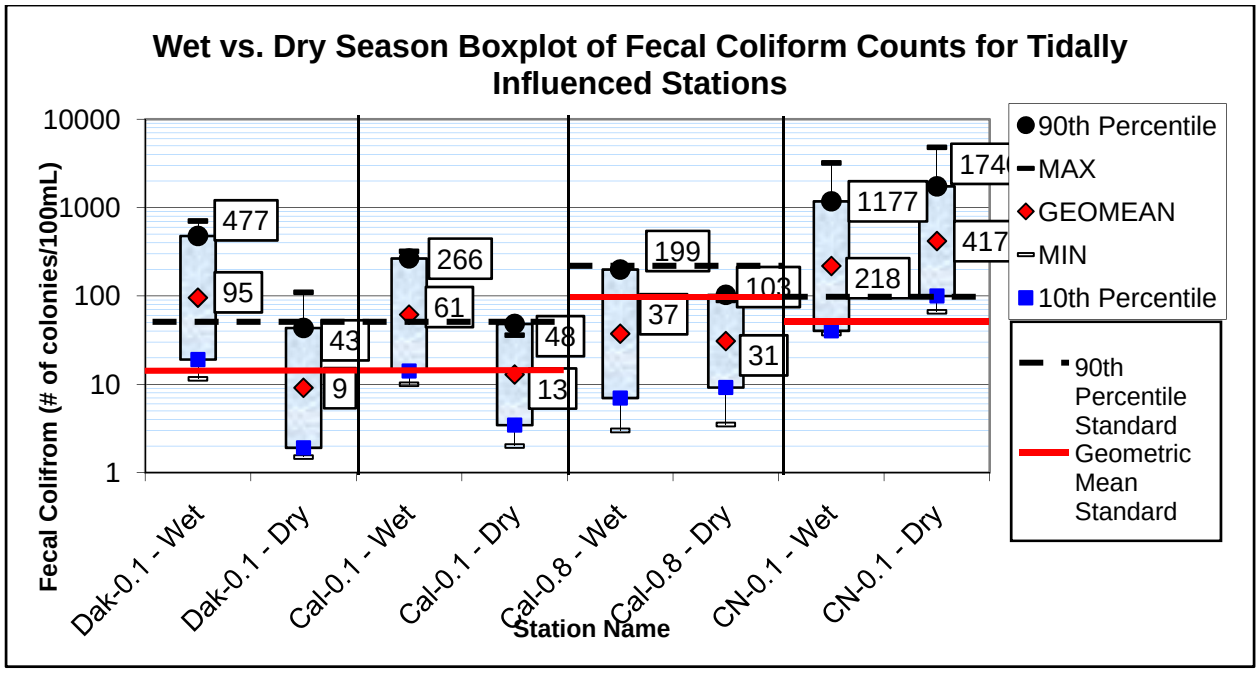

Figure 9. Compares the fecal coliform statistics between the wet (December to March) and dry (April to September) seasons at the four tidally influenced stations.

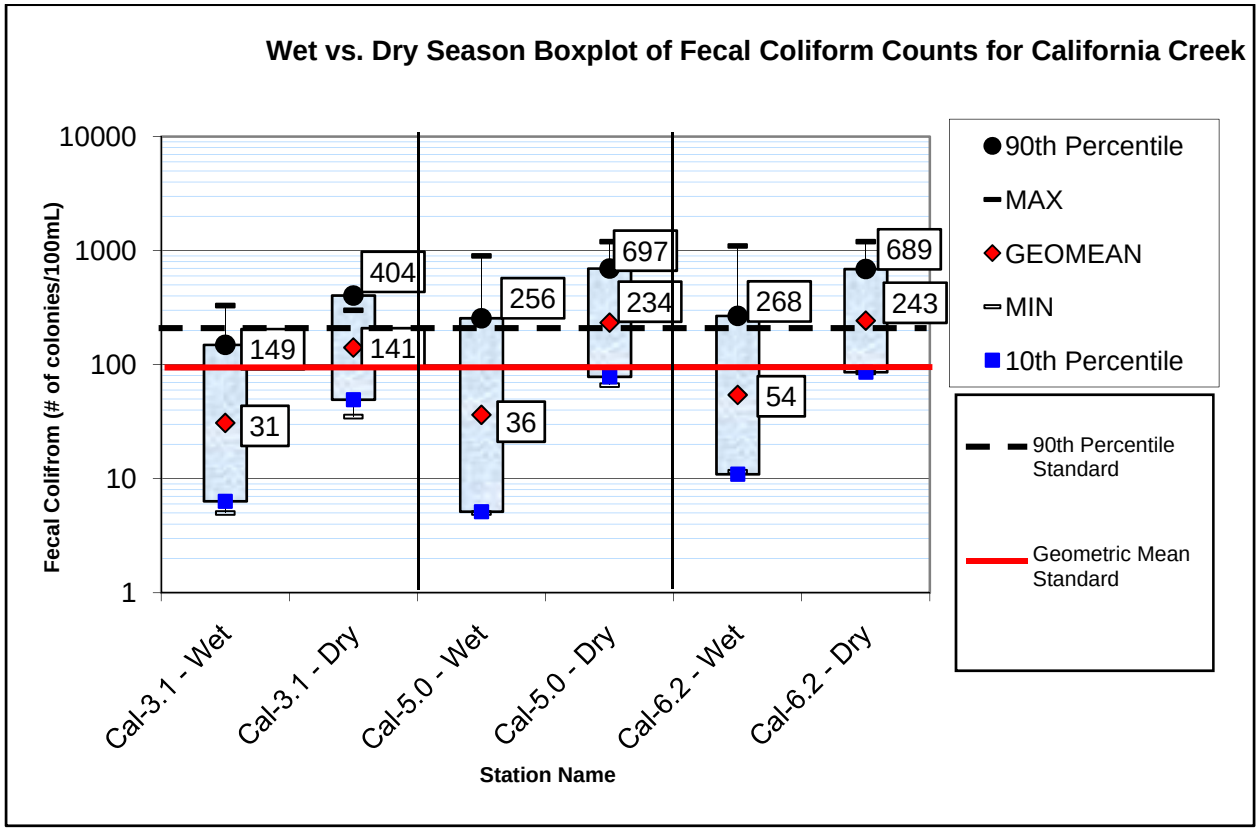

Figure 10. Compares the fecal coliform statistics between the wet (December to March) and dry (April to September) seasons at the three California Creek mainstem stations above the tidal influence.

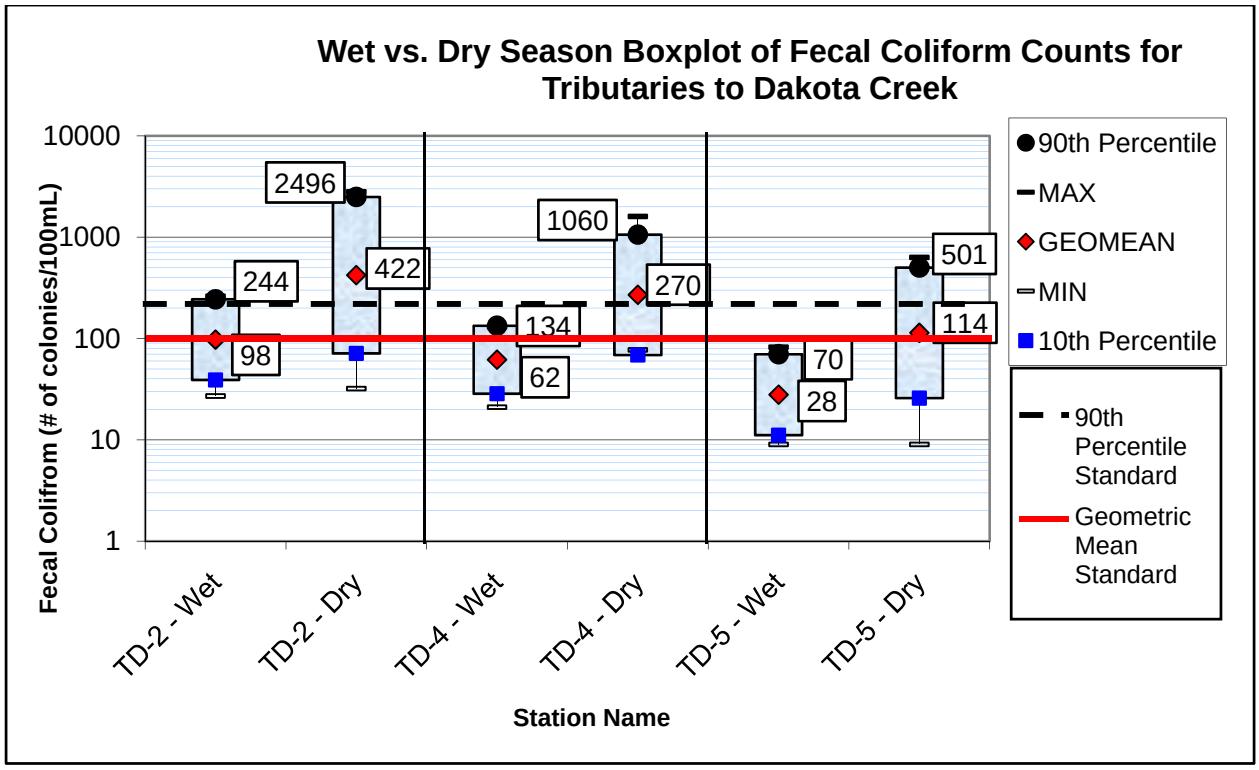

Figure 11. Compares the fecal coliform statistics between the wet (December to March) and dry (April to September) seasons at three tributaries to Dakota Creek.

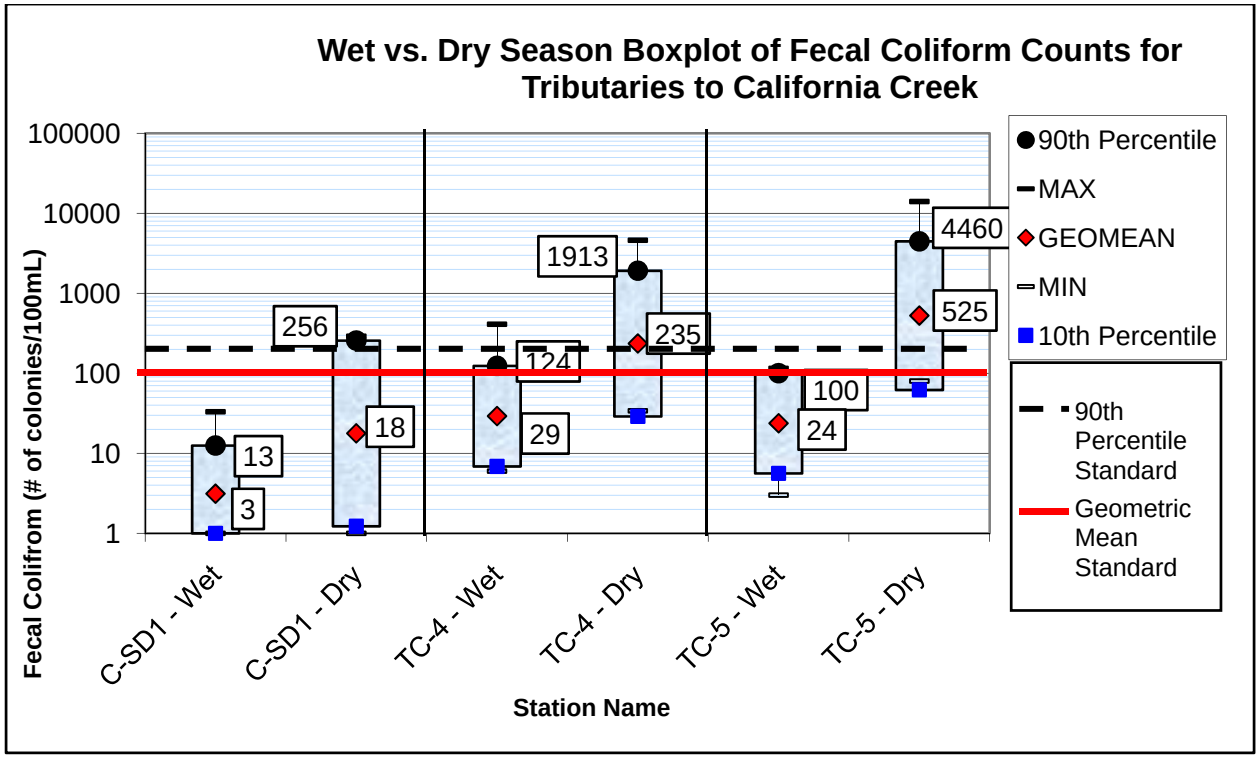

Figure 12. Compares the fecal coliform statistics between the wet (December to March) and dry (April to September) seasons at three tributaries to California Creek.

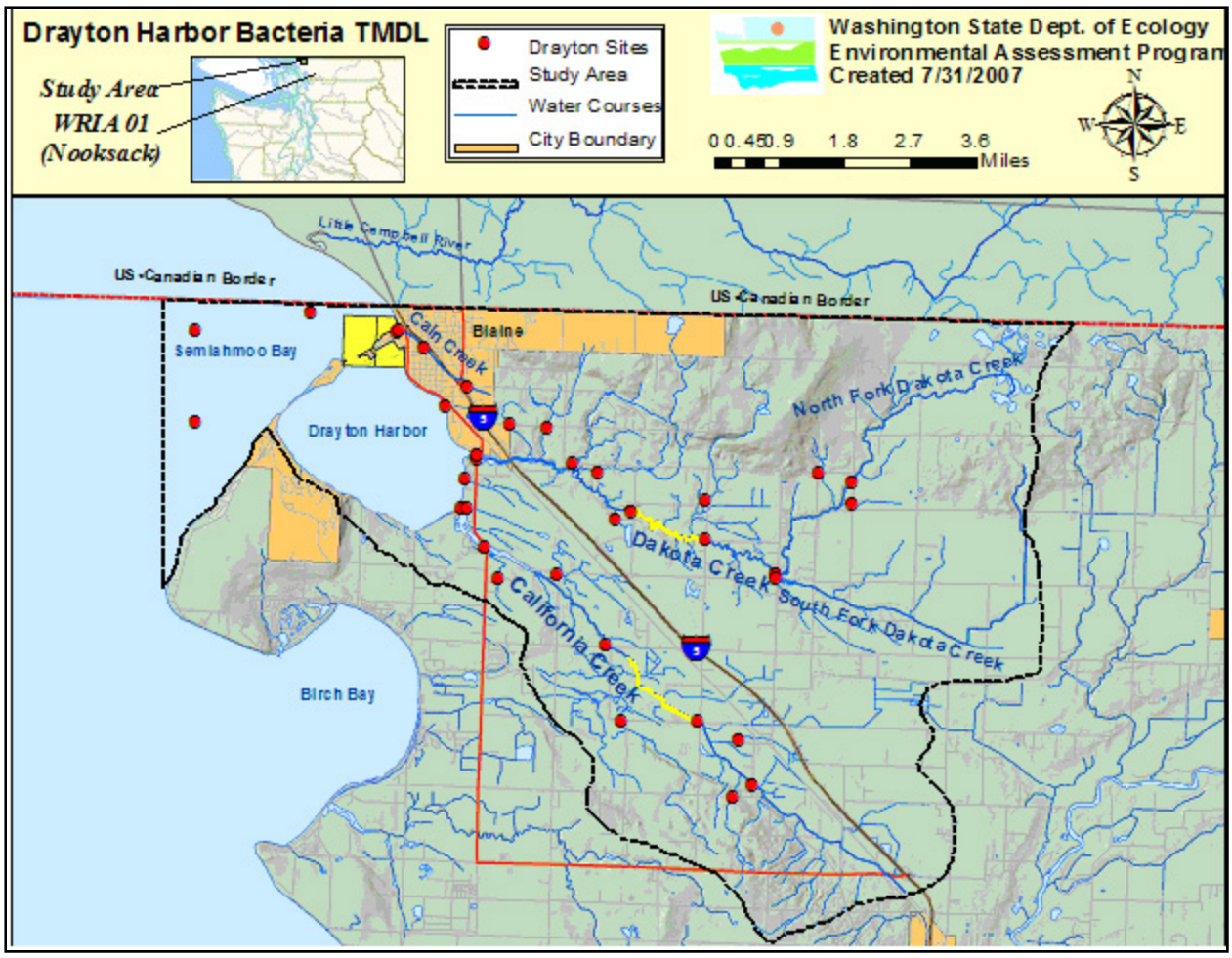

Figure 13. Drayton Harbor Watershed Fecal Coliform TMDL sampling locations.