

After 24-28 hours, the tray is removed, and under normal light, the number of yellow wells is counted as positive for total coliform. The tray is then placed in a fluorescence analysis cabinet (Spectroline® Model CM-10) with a 6-watt 365 nm UV lamp (Spectroline® E-Series Ultraviolet Hand Lamp). Wells that fluoresce yellow are counted as positive for *E. coli*. Results for both total coliform and *E. coli* were recorded in bound log books with the sample date, time tray was placed in the incubator and time and date tray was removed, and samplers names and tray readers names. A software package available from Idexx was used to calculate the most probable number of total coliform and *E. coli* per sample.

QA/QC

Each sampling run consisted of duplicate samples, field blanks, and laboratory analytical blanks. As stated above, each new batch of dilution water was tested for contamination. All of the equipment was maintained and calibrated per manufacturers' instructions and recorded in a bound log book.

II. WATERSHED RESULTS

Data for each watershed is presented in tables as well as 2 watershed maps. The first map shows *E. coli* data at each sampling site in the watershed along with land use data and the second map shows *E. coli* data at each sampling site along with slope. Both maps are to illustrate watershed conditions compared to *E. coli* data.

Toms Run

Toms Run watershed is located within Kilbuck Township along the Ohio River downstream from the Emsworth Lock and Dam. This relatively small watershed, 1,448 acres or 2.26 square miles with 1% of the land impervious. It has a simple stream order and relative undeveloped landscape. As shown on the Toms Run map, land use is primarily low density housing on the fringes of the watershed, with much of it undeveloped, steep hillsides. Near its mouth, a 4-lane roadway, Route 65, crosses the watershed. An abandoned state hospital facility known as Dixmont, sits along Route 65.

Table 1 is a summary of the data for Toms Run. Each site is listed on the Toms Run maps. Appendix A contains all of the data collected for Toms Run including field parameters. Laboratory error for the August 14, 2003 *E. coli* samples rendered the results unreportable.

**TABLE 1: GEOMETRIC MEANS OF TOMS RUN *E. COLI* DATA
FROM JULY 15 TO AUGUST 12, 2003**

Sampling Locations	MPN/100ML
4A - Toms Run	162
4BB - Toms Run	213
4C – Tributary	127
4D - Toms Run	326

All locations have 4 data points within 30 days -
5th sampling event invalid due to lab error

Sampling Dates: 7/15/03, 8/7/03, 8/11/03, 8/12/03

All data considered dry weather

Sampling locations are shown on the Toms Run maps.

- Location 4A: Lower end of Toms Run
- Location 4BB: Toms Run downstream from the confluence of the 2 upper branches, 0.77 miles upstream of 4A
- Location 4C: Tributary
- Location 4D: Toms Run

Rainfall data for the sampling dates for Tom's Run were obtained from 3 Rivers Wet Weather, Inc.'s calibrated rain fall system (<http://www.3riverswetweather.org>.) Three rain gauges were used to assess the rainfall amounts for Toms Run: gauge 1 at West View and gauge 21, Moon Township across the river. No rainfall beyond trace amounts (<0.01 inches) was recorded within 48 hours of sampling Toms Run for all sampling dates, except for August 11, 2003: gauge 1 recorded 0.68 inches of rain 48-49 hours prior to sampling, gauge 21 recorded no rain for that period. All sampling dates are considered dry weather.

Referencing Maps 1 and 2 of Toms Run, site 4D at upper Toms Run has the highest *E. coli* results. However, a geometric mean of 326 is not unexpected in an undeveloped watershed. The sources in such a watershed would most likely be animal waste. Septic systems are also present in this watershed and may also be a source of *E. coli*. The field parameters are within state water quality criteria, though the pH is slightly elevated in Location 4A.

In 2003, sampling also occurred at Toms Run five times in dry weather during the recreational season as part of the river monitoring program of 3 Rivers 2nd Nature (3R2N Water Quality Report, 2003, draft). This sampling site is at the mouth of Toms Run, below the overpass for Route 19 and downstream of Location 4A. Toms Run was sampled for *E. coli*. The results ranged from 67 to 248 MPN/100ML with a geometric mean of 147 MPN/100ML. Toms Run was also

sampled for fecal coliform at the same time as *E. coli*. Fecal coliform results ranged from 35 to 685 CFU/100ml with a geometric mean of 148 CFU/100ml. These results are similar to the watershed data presented above.

The Army Corps of Engineers along with 3R2N conducted a macroinvertebrate survey in the Ohio River in 2003 (Biological Assessment Of Aquatic Invertebrate Communities Of Streams Tributary To The Ohio River In Allegheny County, Pennsylvania, 2003). More than 6,558 invertebrate organisms from 68 different taxa were collected, identified, and enumerated at 18 Ohio River tributary stations. Condition scores were then developed from the invertebrate data for each station, where a score greater than 80% indicates that a stream is non-impaired, 60-79% slightly impaired, 40-59% moderately impaired, and less than 39% severely impaired. Toms Run had a condition score of 77% indicating slight impairment, the highest score for the Ohio River tributary streams surveyed in 2003. The authors also observed Northern dusky salamanders in Toms Run as well as Louisiana Waterthrushes, generally associated with high quality streams.

SQUAW RUN

Squaw Run is located along the Allegheny River with in Fox Chapel borough and O'Hara Township. It has 5,472 acres, or 8.55 square miles of watershed, with a total of 3.5% of the land impervious with primarily low density residential in the upper watershed, and a commercial corridor near the mouth of the stream. Table 2 contains data for Squaw Run. Each site is listed on each of the maps for Squaw Run.

Table 2 is a summary of the data for Squaw Run breaking out wet weather and dry weather data from the combined database. Each site is listed on the Squaw Run maps. Appendix A contains all of the data collected for Squaw Run including field parameters.

Table 2: Geometric Means of Squaw Run *E. coli* Data from August 12 to September 8, 2003

Sampling Locations	Combined Data MPN/100ML	Wet Weather Data MPN/100ML	Dry Weather Data MPN/100ML
20A - Squaw Run	586	7,272	166
20B - Squaw Run	225	2,235	72
20C - Tributary	575	3,662	228
20D - Tributary	542	5,629	168
20E - Squaw Run	279	6,694	57
20F - Stony Camp Run	201	9,221	44
20G - Squaw Run	629	16,461	123
20H - Glade Run	238	5,555	49
20I - Squaw Run	222	24,196	69

All locations have 6 data points within 30 days unless noted

20I: 5 total points, 1 wet, 4 dry

Sample dates:

8/12/03, 8/18/03, 8/25/03, 8/27/03, 9/3/03, 9/8/03

8/29/03 and 9/3/03 are wet weather days as defined as rain within 24 hours

- 20A: Lower end of Squaw Run along Old Freeport Road
- 20B: Squaw Run below confluence of Squaw Run and small tributary at Rockwood Drive, 1.36 miles upstream of 20A
- 20C: Small tributary at Deer Brooke Lane
- 20D: Small tributary flowing next to a tennis club
- 20E: Squaw Run below confluence of Squaw Run and Stony Camp Run, 0.91 miles upstream of 20B\
- 20F: Stony Camp Run on Squaw Run Road in the Trillium nature preserve
- 20G: Squaw Run in upper watershed along Old Mill Road, 1.08 miles upstream of 20I
- 20H: Lower end of Glade Run
- 20I: Squaw Run below confluence of Squaw Run and Glade Run, 0.61 miles upstream of 20E

Rainfall data for the sampling dates for Squaw Run were obtained from 3 Rivers Wet Weather, Inc.'s calibrated rain fall system (<http://www.3riverswetweather.org>.) Three rain gauges were used to assess the rainfall amounts for Squaw Run: gauge 3, Shaler, in the Pine Creek watershed just west of Squaw Run and gauges 10, Highland Park, and 19, Penn Hills North, across the Allegheny River. Either no rain or trace amounts of rain were recorded for all dates except for two sampling occasions, 8/27/03 and 9/3/03. According to the three gauges, an average of 1.13 inches of rain fell during the 12 hours prior to and during sampling on 8/27/03. For the

9/3/03 event, an average of 0.48 inches of rain fell during the 48 hours prior to and during sampling. These two dates are considered wet weather sampling events.

The results for Squaw Run indicate that during the dry weather sampling events, the geometric means of all sites are below 225 MPN/100ML. However, when rain occurred during 2 sampling events, *E. coli* results increased 10, sometimes 100-fold. The sections of stream most impacted by the wet weather events were 20G and 20I. Location 20G is the upper portion of the watershed with mostly low density residential developments and 40 acres of agricultural land. 20I is downstream of the upper watershed and Glade Run.

Location 20H is along Glade Run which is 74% forest and 16% open grasslands which consist of golf courses and playing fields. Glade Run's watershed is 1504 acres or 2.3 square miles with 9.6% impervious surfaces mostly from low density housing. This site has an *E. coli* geometric mean in dry weather of 49 MPN/100ML and in wet weather 11,199 and 2,755 MPN/100ML.

Location 20F is along Stony Camp Run, with a 573 acre or 0.9 square mile watershed that is 83% forested with 5.4% impervious surfaces mostly from low density housing. Most of the stream valley runs through the Trillium Trial nature preserve. In dry weather, the geometric mean is 46, in wet weather, the concentrations increased to 5,475 and 15,531 MPN/100ML. Even locations along small unnamed tributaries (20C and 20D) with very little development showed a 10 fold increase in *E. coli* in wet weather.

The increase in *E. coli* results in wet weather could be the result of both animal waste runoff, (deer are notoriously overpopulated) and human waste. However, with wet weather *E. coli* results exceeding 10^3 and even 10^4 at some sites, human sewage and septic systems are most likely major the culprit.

Field parameters showed that temperature, pH and DO fall within state water quality criteria. Conductivity ranged from 600 to 1600 $\mu\text{mhos/cm}$ with the highest site being 20C, a small unnamed tributary to Squaw Run. On the wet weather events, most sites showed a decrease in conductivity.

In 2002, Squaw Run was sampled five times during the recreational season in dry weather as part of the river monitoring program of 3 Rivers 2nd Nature (3R2N Water Quality Report, 2002). The sampling site was accessed by boat and was just downstream of Location 20A, and also downstream of an ALCOSAN pump station. The *E. coli* results ranged from 184 to 1,986 CFU/100ML with a geometric mean of 490 CFU/100ML. These results are higher than the results reported here. Squaw Run was also sampled for fecal coliform at the same time as *E. coli*. The fecal coliform results ranged from 95 to 1,800 CFU/100ml, with a geometric mean of 419 CFU/100ml.

The Army Corps of Engineers along with 3R2N conducted a macroinvertebrate survey in the Allegheny River in 2002 (Biological Assessment Of Aquatic Invertebrate Communities

study undertaken in 2001 indicated that Squaw Run is moderately impaired. This level of *E. coli* concentrations (10^3 or 10^4 MPN/100ML) would indicate a human source of fecal contamination, rather than animal runoff.

Wet weather also impacted Pine Creek. The lower end of Pine Creek at 18A and C and West Little Pine Creek were most affected by the rain events, reaching *E. coli* concentrations of 10^4 . This is not surprising due to sewer problems in these area including sanitary sewer overflows. Other locations had increased *E. coli* concentrations during the rain events, though sources cannot be confirmed.

The methodology used here, as well as other methods that enumerate *E. coli* or fecal coliform do not differentiate between human or animal sources of the bacteria. There are more expensive and sophisticated methodologies available and being developed to determine sources, called Bacterial Source Testing, using molecular techniques (DNA fingerprinting) and non-molecular chemical and biochemical techniques (EPA, 2002). These techniques were beyond the budget and scope of this project and most routine monitoring projects. However, they would be most useful when performing Total Maximum Daily Load analyses for bacteria and determining the efficacy of wet weather controls.

The project was not initially designed to determine wet weather effects on watershed *E. coli* concentrations. Rather, the program was designed to sample each watershed 5 times within a 30-day period to meet the ORSANCO regulatory standard for *E. coli*. However, because rain events in the summer of 2003 were frequent, sampling occurred regardless of weather conditions. The disadvantage to sampling this way is that wet weather impacts cannot be more systematically determined. Because of the regional sewer issues and *E. coli* contributions from runoff, studying wet weather impacts should be a goal for any watershed monitoring plan. For example, without the wet weather data, Squaw Run would have been determined to have very low *E. coli* concentrations. Wet weather sampling illustrated that there are large contributions of *E. coli* that affect the stream quality. Designing a wet weather monitoring program may be difficult for a volunteer community group due to the unpredictability and frequency of sampling.

Improvements in water quality were seen when comparing dry weather results from this sampling program to dry weather sampling performed in past years by 3 Rivers 2nd Nature river monitoring program (3R2N Water Quality Report, 2000, 2002, 2003). In the river monitoring program, some of the *E. coli* data exceeded the maximum detection limit and fecal coliform results reached 10^4 - 10^5 CFU/100ml – indicating human sewage contamination. This level of contamination was not seen in this sampling program. But because of the small data sets for both programs and the differences in sampling locations, it is impossible to determine what may have caused the decreases in contamination.

Overall, the *E. coli* data collected here are some of the first for these watersheds. This is only a very small subset of the total water resources in Allegheny County. Watersheds are plagued

by sewer problems, mine drainage, urban runoff and physical disturbances. It is doubtful that regulatory agencies will study the 56 or so watersheds in the county to assess these problems. Community and watershed groups may be the only ones working in these watersheds. However, *E. coli* and fecal coliform sampling has not been part of community projects due to the expertise and equipment needed for analysis. The *E. coli* method used here can be performed by trained volunteers. Equipment used was purchased by ALCOSAN on a PA Department of Environmental Resources Growing Greener grant and should be made available to other community groups. Regulatory agencies should support and assist these groups in developing sampling plans, especially for bacteria.

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USEPA. "Wastewater Technology Fact Sheet: Bacterial Source Tracking." EPA 832-F-02-101. May 2002

APPENDIX A

Tributary Data

TOMS RUN

Location 4A	<i>E. coli</i> MPN/100ml	Temperature °C	Conductivity µmhos/cm	DO mg/L	pH SU
7/15/2003	166	16.83	518	9.68	8.18
8/7/2003	86	17.15	585	9.78	8.08
8/11/2003	231	19.38	595	10.80	8.16
8/12/2003	210	18.19	593	9.01	8.18
8/14/2003	NA	18.74	593	9.27	8.03
Geometric Mean	162				
Average		18.06	580	9.71	8.13

Location 4BB	<i>E. coli</i> MPN/100ml	Temperature °C	Conductivity µmhos/cm	DO mg/L	pH SU
7/15/2003	225	17.24	519	9.12	8.03
8/7/2003	82	17.24	585	9.46	7.89
8/11/2003	326	18.85	596	10.35	7.95
8/12/2003	345	18.21	598	8.45	7.90
8/14/2003	NA	18.87	596	8.82	7.83
Geometric Mean	213				
Average		18.08	580	9.24	7.92

Location 4C	<i>E. coli</i> MPN/100ml	Temperature °C	Conductivity µmhos/cm	DO mg/L	pH SU
7/15/2003	69	16.57	497	9.18	8.05
8/7/2003	140	16.84	582	9.53	7.82
8/11/2003	172	18.55	642	10.01	7.98
8/12/2003	154	17.68	626	8.28	7.82
8/14/2003	NS	18.41	610	8.74	7.67
Geometric Mean	127				
Average		17.61	590	9.15	7.87

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Location 4D	<i>E. coli</i> MPN/100ml	Temperature °C	Conductivity µmhos/cm	DO mg/L	pH SU
7/15/2003	411	17.53	535	9.11	7.95
8/7/2003	260	17.31	593	9.09	7.74
8/11/2003	387	18.87	581	10.40	7.88
8/12/2003	272	18.48	581	8.24	7.81
8/14/2003	NA	19.18	592	8.60	7.67
Geometric Mean	326				
Average		18.27	580	9.09	7.81

SQUAW RUN

Location 20A	<i>E. coli</i> MPN/100ml	Temperature °C	Conductivity µmhos/cm	DO mg/L	pH SU
8/12/2003	109	21.47	870	8.31	8.13
8/18/2003	345	22.07	871	10.92	8.58
8/25/2003	153	18.32	1077	9.40	8.03
8/27/2003	7,701	21.39	609	8.23	7.81
9/3/2003	6,867	21.25	549	9.35	7.98
9/8/2003	133	17.87	709	10.16	8.17
Geometric Mean	586				
Geomean-Dry	166	Average			
Geomean-Wet	7,272	20.40	781	9.40	8.12

Location 20B	<i>E. coli</i> MPN/100ml	Temperature °C	Conductivity µmhos/cm	DO mg/L	pH SU
8/12/2003	172	21.62	817	8.20	8.07
8/18/2003	41	23.53	807	12.05	8.64
8/25/2003	151	17.84	982	9.50	7.95
8/27/2003	6,488	20.98	590	8.32	7.73
9/3/2003	770	20.58	601	9.81	8.02
9/8/2003	25	18.35	671	10.45	8.10
Geometric Mean	225				
Geomean-Dry	72	Average			
Geomean-Wet	2,235	20.48	745	9.72	8.09

Location 20C	<i>E. coli</i> MPN/100ml	Temperature °C	Conductivity µmhos/cm	DO mg/L	pH SU
8/12/2003	548	19.59	1274	8.10	7.93
8/18/2003	270	19.76	1400	8.23	8.01
8/25/2003	148	17.01	1596	8.88	7.88
8/27/2003	2,909	19.81	666	8.70	7.75
9/3/2003	4,611	19.86	1040	9.84	8.12
9/8/2003	122	16.87	1236	8.51	8.29

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Geometric Mean	575				
Geomean-Dry	228	Average			
Geomean-Wet	3,662	18.82	1202	8.71	8.00

Location 20D	<i>E. coli</i> MPN/100ml	Temperature °C	Conductivity µmhos/cm	DO mg/L	pH SU
8/12/2003	236	19.92	970	7.77	7.92
8/18/2003	387	19.69	985	8.07	7.97
8/25/2003	99	17.16	1089	8.72	7.98
8/27/2003	6,488	21.49	1223	6.89	7.71
9/3/2003	4,884	19.62	513	9.87	8.03
9/8/2003	89	17.00	810	9.17	8.24
Geometric Mean	542				
Geomean-Dry	168	Average			
Geomean-Wet	5,629	19.15	932	8.42	7.98

Location 20E	<i>E. coli</i> MPN/100ml	Temperature °C	Conductivity µmhos/cm	DO mg/L	pH SU
8/12/2003	88	22.11	680	8.27	8.14
8/18/2003	119	21.59	718	8.75	8.26
8/25/2003	16	17.90	779	9.48	8.08
8/27/2003	5,172	21.14	546	8.27	7.65
9/3/2003	8,664	20.44	480	9.60	8.04
9/8/2003	62	18.10	601	9.41	8.41
Geometric Mean	278				
Geomean-Dry	57	Average			
Geomean-Wet	6,694	20.21	634	8.96	8.10

Location 20F	<i>E. coli</i> MPN/100ml	Temperature °C	Conductivity µmhos/cm	DO mg/L	pH SU
8/12/2003	36	20.51	785	7.55	7.96
8/18/2003	132	19.84	794	7.40	7.99

8/25/2003	14	17.47	814	8.22	7.95
8/27/2003	5,475	19.21	483	8.47	7.75
9/3/2003	15,531	19.84	333	9.82	7.97
9/8/2003	69	17.16	604	9.03	8.27
Geometric Mean	268				
Geomean-Dry	46	Average			
Geomean-Wet	9,221	19.01	636	8.42	7.98

Location 20G	<i>E. coli</i> MPN/100ml	Temperature °C	Conductivity µmhos/cm	DO mg/L	pH SU
8/12/2003	260	21.34	712	7.76	7.90
8/18/2003	225	20.15	724	7.31	7.80
8/25/2003	68	17.70	760	8.80	7.84
8/27/2003	24,196	20.55	303	8.55	7.68
9/3/2003	11,199	20.95	323	9.44	7.90
9/8/2003	57	18.28	593	8.94	8.13
Geometric Mean	629				
Geomean-Dry	123	Average			
Geomean-Wet	16,461	19.83	569	8.47	7.88

Location 20H	<i>E. coli</i> MPN/100ml	Temperature °C	Conductivity µmhos/cm	DO mg/L	pH SU
8/12/2003	42	23.14	679	7.17	7.91
8/18/2003	52	22.53	761	7.61	8.04
8/25/2003	27	17.39	836	8.45	8.07
8/27/2003	11,199	21.97	513	7.85	7.57
9/3/2003	2,755	21.12	519	9.34	7.82
9/8/2003	101	19.22	664	8.81	8.21
Geometric Mean	238				
Geomean-Dry	49	Average			
Geomean-Wet	5,555	20.90	662	8.21	7.94

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Location 20I	E. coli MPN/100ml	Temperature °C	Conductivity µmhos/cm	DO mg/L	pH SU
8/12/2003	35	22.50	668	7.77	8.20
8/18/2003	145	21.95	711	8.01	8.20
8/25/2003	57	18.47	739	8.88	8.02
8/27/2003	NS	21.37	540	8.40	7.74
9/3/2003	24,196	20.91	371	9.59	7.91
9/8/2003	78	19.03	605	9.32	8.36
Geometric Mean	222				
Geomean-Dry	69	Average			
Wet	24,196	20.71	606	8.66	8.07

STREETS RUN

Location ST01	E. coli MPN/100ml	Temperature °C	Conductivity µmhos/cm	DO mg/L	pH SU
7/14/2003	548	20.45	1052	8.60	7.88
7/15/2003	659	17.68	1124	8.78	7.72
7/17/2003	NS	22.59	502	7.89	7.51
8/5/2003	483	20.61	1203	7.86	7.90
8/7/2003	214	22.12	1291	7.74	7.92
Geometric Mean	440				
Geomean Wet	483	Average			
Geomean Dry	426	20.69	1034	8.17	7.79

Location ST02	E. coli MPN/100ml	Temperature °C	Conductivity µmhos/cm	DO mg/L	pH SU
7/14/2003	1011	20.76	855	9.09	8.01
7/15/2003	500	19.39	1164	9.00	8.13
7/17/2003	1046	20.49	1149	8.97	7.99
8/5/2003	921	22.03	1234	8.49	8.19
8/7/2003	2420	22.19	1351	8.99	8.18
Geometric Mean	1033				
Geomean Wet	981	Average			
Geomean Dry	1069	20.97	1151	8.91	8.10

Location ST03	E. coli MPN/100ml	Temperature °C	Conductivity µmhos/cm	DO mg/L	pH SU
7/14/2003	866	21.73	1231	8.67	7.94
7/15/2003	1120	17.81	1259	9.05	7.91
8/5/2003	397	20.67	1232	8.91	7.93
7/17/2003	89	21.35	1319	8.42	8.08
8/7/2003	1011	21.63	1466	8.65	7.99
Geometric Mean	510				
Geomean Wet	188	Average			
Geomean Dry	994	20.64	1301	8.74	7.97

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Location ST04	E. coli MPN/100ml	Temperature °C	Conductivity µmhos/cm	DO mg/L	pH SU
7/14/2003	135	22.36	1220	8.50	8.16
7/15/2003	248	19.36	1226	8.79	8.28
7/17/2003	54	21.06	1177	8.65	8.22
8/5/2003	488	22.14	1165	8.54	8.35
8/7/2003	204	21.56	1315	8.47	8.32
Geometric Mean	179				
Geomean Wet	163	Average			
Geomean Dry	190	21.30	1221	8.59	8.27

Location ST05	E. coli MPN/100ml	Temperature °C	Conductivity µmhos/cm	DO mg/L	pH SU
7/14/2003	133	22.12	1244	8.45	8.04
7/15/2003	210	18.09	1279	9.17	8.02
7/17/2003	770	20.68	1251	8.68	7.96
8/5/2003	727	21.36	1344	8.37	8.03
8/7/2003	816	20.70	1484	8.72	7.87
Geometric Mean	418				
Geomean Wet	748	Average			
Geomean Dry	284	20.59	1320	8.68	7.98

Location STA	E. coli MPN/100ml	Temperature °C	Conductivity µmhos/cm	DO mg/L	pH SU
7/14/2003	435	20.12	717	8.29	8.00
7/15/2003	184	18.43	742	7.05	7.97
7/17/2003	65	19.64	757	7.55	7.89
8/5/2003	240	19.48	880	2.60	7.49
Geometric Mean	188				
Geomean Wet	110	Average			
Geomean Dry	323	19.42	774	6.37	7.84

Location STB	E. coli MPN/100ml	Temperature °C	Conductivity µmhos/cm	DO mg/L	pH SU
7/14/2003	4884	20.99	501	9.00	8.09
7/15/2003	411	18.44	795	8.97	8.06
7/17/2003	411	18.75	831	9.09	7.99
8/5/2003	2046	20.26	958	8.41	8.12
8/7/2003	1300	20.41	962	8.92	8.06
Geometric Mean	1170				
Geomean Wet	917	Average			
Geomean Dry	1376	19.77	809	8.88	8.06

Location STC	E. coli MPN/100ml	Temperature °C	Conductivity µmhos/cm	DO mg/L	pH SU
7/14/2003	649	20.53	1245	8.94	7.63
7/15/2003	236	16.19	1285	9.49	7.66
7/17/2003	2420	19.50	1301	8.98	7.64
8/5/2003	2755	19.17	1483	9.01	7.81
8/7/2003	2282	18.60	1525	9.04	6.65
Geometric Mean	1184				
Geomean Wet	2582	Average			
Geomean Dry	704	18.80	1368	9.09	7.48

Location STD	E. coli MPN/100ml	Temperature °C	Conductivity µmhos/cm	DO mg/L	pH SU
7/14/2003	1	17.28	1382	9.76	4.88
7/15/2003	5	15.30	1418	9.69	4.90
7/17/2003	3	16.96	1448	9.58	4.91
8/5/2003	24	16.81	1770	9.50	4.81
8/7/2003	11	17.09	1783	9.49	4.67
Geometric Mean	5				
Geomean Wet	8	Average			
Geomean Dry	4	16.69	1560	9.60	4.83

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Location STE	<i>E. coli</i> MPN/100ml	Temperature °C	Conductivity µmhos/cm	DO mg/L	pH SU
7/14/2003	59	19.61	1186	8.84	8.00
7/15/2003	86	17.98	1215	9.26	7.86
7/17/2003	75	19.85	1191	8.88	7.85
8/5/2003	42	19.44	1334	9.94	7.95
8/7/2003	308	20.23	1363	9.63	7.90
Geometric Mean	87				
Geomean Wet	56	Average			
Geomean Dry	116	19.42	1258	9.31	7.91

SAW MILL RUN

Location 16A	E. coli MPN/100ml	Temperature °C	Conductivity µmhos/cm	DO mg/L	pH SU
7/15/2003	649	25.69	1312	9.06	8.41
7/17/2003	1,300	25.23	1218	9.21	8.09
8/6/2003	2,224	20.77	1505	8.35	7.91
8/7/2003	65	21.03	1578	7.43	7.84
8/11/2003	1,553	23.40	1543	10.64	8.19
Geometric Mean	717				
Geomean-Wet	1,700	Average			
Geomean-Dry	403	23.22	1431	8.94	8.09

Location 16B	E. coli MPN/100ml	Temperature °C	Conductivity µmhos/cm	DO mg/L	pH SU
7/15/2003	727	24.14	1187	8.03	8.38
7/17/2003	1,120	23.09	1092	7.62	8.08
8/6/2003	1,011	20.16	1259	8.20	7.94
8/7/2003	NS	21.38	1318	8.34	7.99
8/11/2003	1,986	22.11	1309	10.03	8.01
Geometric Mean	1,131				
Geomean-Wet	1,064	Average			
Geomean-Dry	1,202	22.18	1233	8.44	8.08

Location 16C	E. coli MPN/100ml	Temperature °C	Conductivity µmhos/cm	DO mg/L	pH SU
7/15/2003	727	25.73	1185	8.14	8.55
7/17/2003	,203	24.62	1098	8.34	8.38
8/6/2003	1,039	19.98	1262	8.07	7.94
8/7/2003	57	20.91	1318	8.17	8.00
8/11/2003	16	22.59	1316	9.53	8.10
Geometric Mean	532				
Geomean-Wet	1,118	Average			
Geomean-Dry	324	22.77	1236	8.45	8.19

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Location 16D	<i>E. coli</i> MPN/100ml	Temperature °C	Conductivity µmhos/cm	DO mg/L	pH SU
7/15/2003	2,420	24.69	1198	9.33	8.47
7/17/2003	743	23.86	1146	9.64	8.31
8/6/2003	24,196	21.18	1303	4.60	7.69
8/7/2003	NS	23.25	1410	6.13	7.82
8/11/2003	1,414	24.12	1384	12.07	8.23
Geometric Mean	2,800				
Geomean-Wet	4,240	Average			
Geomean-Dry	1,849	23.42	1288	8.35	8.10

Location 16E	<i>E. coli</i> MPN/100ml	Temperature °C	Conductivity µmhos/cm	DO mg/L	pH SU
7/15/2003	2,420	23.89	1195	9.41	8.31
7/17/2003	2,105	23.93	1150	9.87	8.28
8/6/2003	24,196	20.40	1293	3.62	7.55
8/7/2003	691	21.76	1422	5.71	7.69
8/11/2003	1,733	24.72	991	11.92	8.43
Geometric Mean	2,715				
Geomean-Wet	7,137	Average			
Geomean-Dry	1,426	22.94	1210	8.11	8.05

Location 16F	<i>E. coli</i> MPN/100ml	Temperature °C	Conductivity µmhos/cm	DO mg/L	pH SU
7/15/2003	135	15.27	1339	9.52	7.01
7/17/2003	35	15.64	1343	9.49	6.95
8/6/2003	133	15.21	1563	9.79	7.06
8/7/2003	75	15.15	1565	9.79	6.83
8/11/2003	138	14.94	1561	11.31	6.88
Geometric Mean	92				
Geomean-Wet	68	Average			
Geomean-Dry	112	15.24	1474	9.98	6.95

Location 16G	E. coli MPN/100ml	Temperature °C	Conductivity µmhos/cm	DO mg/L	pH SU
7/15/2003	687	24.20	1206	7.93	8.43
7/17/2003	109	22.24	1110	8.13	8.20
8/6/2003	727	20.67	1364	8.19	8.08
8/7/2003	185	21.83	1418	8.42	8.09
8/11/2003	285	23.81	1320	11.93	8.41
Geometric Mean	310				
Geomean-Wet	282	Average			
Geomean-Dry	331	22.55	1284	8.92	8.24

Location 16E2	E. coli MPN/100ml	Temperature °C	Conductivity µmhos/cm	DO mg/L	pH SU
7/15/2003	1,986	20.83	1249	8.65	7.56
7/17/2003	521	19.81	1222	8.99	7.49
8/6/2003	1,300	18.43	1425	8.02	7.39
8/7/2003	345	18.58	1477	8.13	7.34
8/11/2003	517	19.68	1454	10.16	7.43
Geometric Mean	752				
Geomean-Wet	823	Average			
Geomean-Dry	708	19.47	1365	8.79	7.44

PINE CREEK

Location 18A	E. coli PN/100ml	Temperature °C	Conductivity µmos/cm	DO mg/L	pH SU
8/19/2003	80	19.48	909	9.59	8.01
8/26/2003	7,270	22.71	881	11.97	7.92
9/2/2003	14,500	20.37	674	8.73	7.78
9/9/2003	435	19.84	844	12.95	8.13
Geometric Mean	1,385				
Geomean - Wet	10,267	Average			
Geomean - Dry	187	20.60	827	10.81	7.96

Location 18B	E. coli MPN/ 100ml	Temperature °C	Conductivity µmos/cm	DO mg/L	pH SU
8/13/2003	1,733	21.48	926	8.14	7.84
8/19/2003	1,986	18.09	1049	8.47	7.81
8/26/2003	24,190	21.85	558	10.78	7.85
9/2/2003	1,414	19.83	914	8.61	7.96
9/9/2003	980	19.03	1072	11.34	7.98
Geometric Mean	2,585				
Geomean - Wet	5,848	Average			
Geomean - Dry	1,500	20.06	904	9.47	7.89

Location 18C	E. coli MPN/ 100ml	Temperature °C	Conductivity µmos/cm	DO mg/L	pH SU
8/13/2003	82	22.05	919	9.86	8.16
8/19/2003	39	19.80	925	9.70	8.20
8/26/2003	10,462	21.85	806	11.07	7.86
9/2/2003	10,500	20.27	674	8.37	7.73
9/9/2003	131	19.65	847	12.52	8.08
Geometric Mean	541				
Geomean - Wet	10,481	Average			
Geomean - Dry	75	20.72	834	10.30	8.01

Location 18D	E. coli MPN/ 100ml	Temperature °C	Conductivity µmos/cm	DO mg/L	pH SU
8/13/2003	186	20.41	970	9.13	7.92
8/19/2003	308	18.22	1018	9.22	8.10
8/26/2003	1,370				
9/2/2003	411	18.50	894	8.88	7.87
9/9/2003	111	18.24	1038	12.41	7.95
Geometric Mean	324				
Geomean - Wet	750	Average			
Geomean - Dry	185	18.84	980	9.91	7.96

Location 18E	E. coli MPN/ 100ml	Temperature °C	Conductivity µmos/cm	DO mg/L	pH SU
8/13/2003	2,420	22.41	918	9.91	7.97
8/19/2003	53	19.43	917	8.88	7.85
8/26/2003	816	21.42	930	10.66	7.82
9/2/2003	2,010	20.37	651	8.19	7.68
9/9/2003	649	19.57	833	12.09	7.83
Geometric Mean	671				
Geomean - Wet	1,281	Average			
Geomean - Dry	436	20.64	850	9.95	7.83

Location 18F	E. coli MPN/ 100ml	Temperature °C	Conductivity µmos/cm	DO mg/L	pH SU
8/13/2003	70	22.63	897	10.44	8.12
8/19/2003	56	20.25	946	11.05	8.27
8/26/2003	1,046	21.50	968	11.32	8.13
9/2/2003	548	20.33	642	8.05	7.60
9/9/2003	74	19.46	815	11.72	7.85
Geometric Mean	175				

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Geomean - Wet	757	Average			
Geomean - Dry	66	20.83	854	10.52	7.99

Location 18G	E. coli MPN/ 100ml	Temperature °C	Conductivity µmos/cm	DO mg/L	pH SU
8/13/2003	687	21.21	660	9.09	7.93
8/19/2003	326	19.75	685	9.13	7.94
8/26/2003	1,553	20.77	739	8.35	7.84
9/2/2003	1,414	18.35	508	8.93	7.51
9/9/2003	411	17.62	466	9.58	7.62
Geometric Mean	726				
Geomean - Wet	1,482	Average			
Geomean - Dry	451	19.54	612	9.02	7.77

Location 18H2	E. coli MPN/ 100ml	Temperature °C	Conductivity µmos/cm	DO mg/L	pH SU
8/19/2003	64	24.38	730	6.59	7.72
8/26/2003	1,733	24.39	695	5.40	7.53
9/2/2003	345	21.43	569	7.32	7.52
9/9/2003	42	21.45	530	8.31	7.65
Geometric Mean	201				
Geomean - Wet	773	Average			
Geomean - Dry	52	22.91	631	6.91	7.61

Location 18H3	E. coli MPN/ 100ml	Temperature °C	Conductivity µmos/cm	DO mg/L	pH SU
8/19/2003	308	21.76	790	6.64	7.44
8/26/2003	NS	23.06	777	5.33	7.29
9/2/2003	1300	18.10	783	8.93	7.60
9/9/2003	219	20.47	603	7.60	7.19
Geometric Mean	444				
Wet	1,300	Average			

Geomean - Dry	259	20.85	738	7.13	7.38
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Location 18H5	E. coli MPN/ 100ml	Temperature °C	Conductivity µmos/cm	DO mg/L	pH SU
8/19/2003	517	19.71	1606	9.97	7.90
8/26/2003	1,986				
9/2/2003	613	20.81	587	7.68	7.42
9/9/2003	64				
Geometric Mean	449				
Wet	1,104	Average			
Dry	183	20.26	1097	8.83	7.66

Location 18I	E. coli MPN/ 100ml	Temperature °C	Conductivity µmos/cm	DO mg/L	pH SU
8/13/2003	461	21.76	975	10.07	8.12
8/19/2003	461	18.73	1013	9.81	8.03
8/26/2003	2,420	21.27	441	7.43	7.66
9/2/2003	816	18.13	701	8.80	7.46
9/9/2003	15,531	17.82	764	9.34	7.68
Geometric Mean	1,455				
Geomean - Wet	1,406	Average			
Geomean - Dry	1,489	19.54	779	9.09	7.79

Location 18J	<i>E. coli</i> MPN/ 100ml	Temperature °C	Conductivity µmos/cm	DO mg/L	pH SU
8/13/2003	101	22.18	689	8.67	7.74
8/19/2003	435	18.79	687	8.58	7.81
8/26/2003	2,420	20.68	682	8.02	7.60
9/2/2003	1,986	18.01	509	8.89	7.44
9/9/2003	148	17.78	486	9.48	7.44
Geometric Mean	500				

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Geomean - Wet	2,192	Average			
Geomean - Dry	187	19.49	611	8.73	7.61

Location 18K	<i>E. coli</i> MPN/ 100ml	Temperature °C	Conductivity µmhos/cm	DO mg/L	pH SU
8/13/2003	276	24.03	1612	8.80	8.12
8/19/2003	488	23.43	1682	9.01	8.21
8/26/2003	2,420	22.09	704	7.87	7.90
9/2/2003	517	19.37	1078	8.65	7.90
9/9/2003	186	19.14	1351	11.03	8.09
Geometric Mean	500				
Geomean - Wet	1,119	Average			
Geomean - Dry	293	21.61	1285	9.07	8.04

Location 18L	<i>E. coli</i> MPN/ 100ml	Temperature °C	Conductivity µmhos/cm	DO mg/L	pH SU
8/13/2003	1,300	23.96	639	9.08	8.05
8/19/2003	411	22.09	633	8.83	8.21
8/26/2003	7,701	20.86	444	10.30	7.92
9/2/2003	1,203	19.17	519	8.36	7.62
9/9/2003	199	18.44	605	12.60	8.15
Geometric Mean	997				
Geomean - Wet	3,044	Average			
Geomean - Dry	473	20.90	568	9.83	7.99