Loyalsock Creek Bacterial Coliforms

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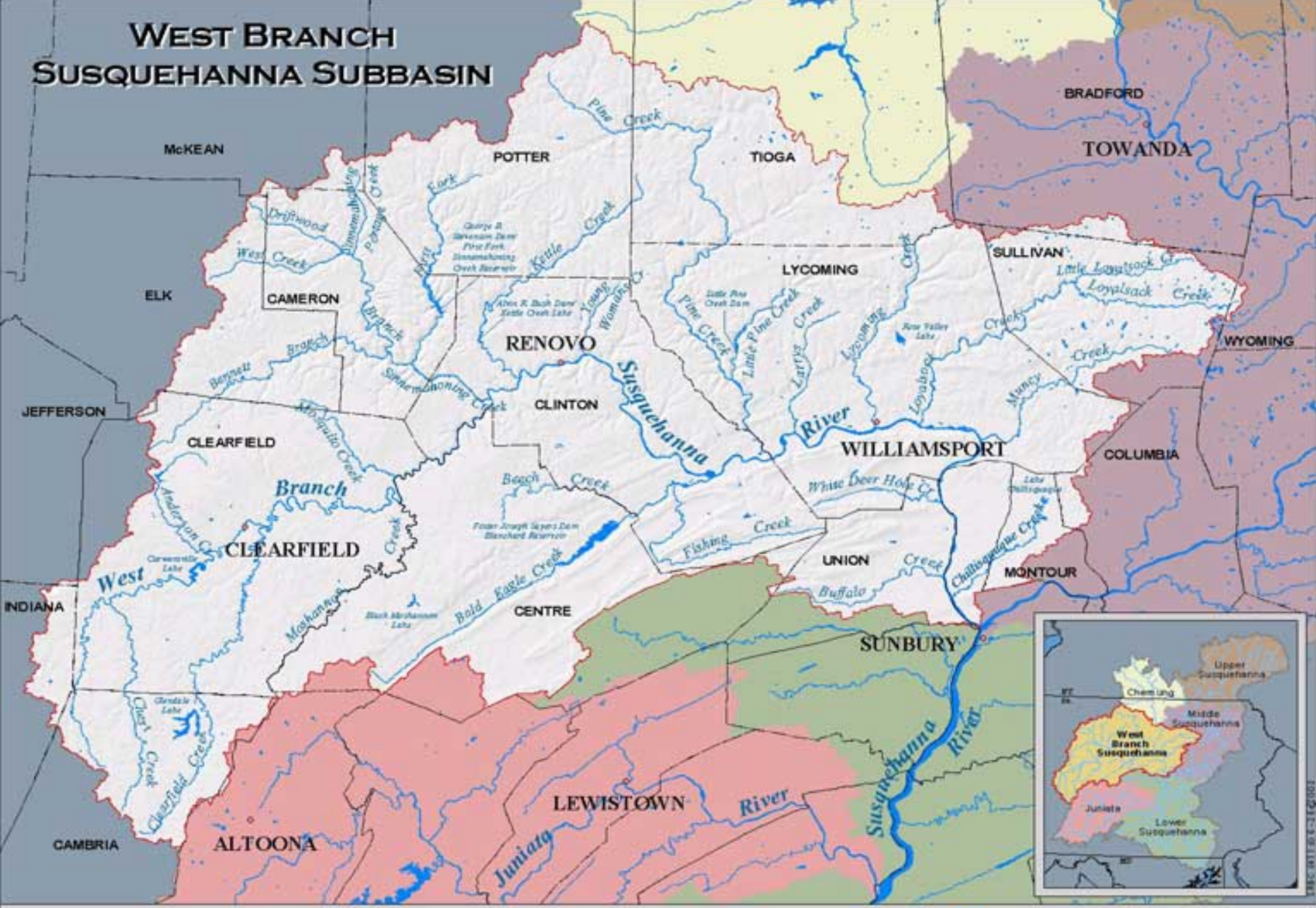

SOURCES:
STREAMS: ENVIRONMENTAL RESOURCES RESEARCH INSTITUTE, 1998, SCALE 1:24,000
STATE LINE: PENNSYLVANIA DEPARTMENT OF TRANSPORTATION, 1997, SCALE 1:24,000
COUNTY LINE: NY STATE DEPARTMENT OF TRANSPORTATION MAP INFORMATION UNIT, 1997, SCALE 1:24,000
PA DEPARTMENT OF TRANSPORTATION, CARTOGRAPHIC INFORMATION DIVISION, 1997, SCALE 1:24,000

POPULATION: US ENVIRONMENTAL PROTECTION AGENCY
WATERSHED: PA DEPARTMENT OF TRANSPORTATION, SCALE 1:24,000
SUBBASIN USGS, 1996, SCALE 1:24,000
DEM: USGS, 1999, 90 M RES

1:750000

PROJECTION: UTM 83, Zone 18

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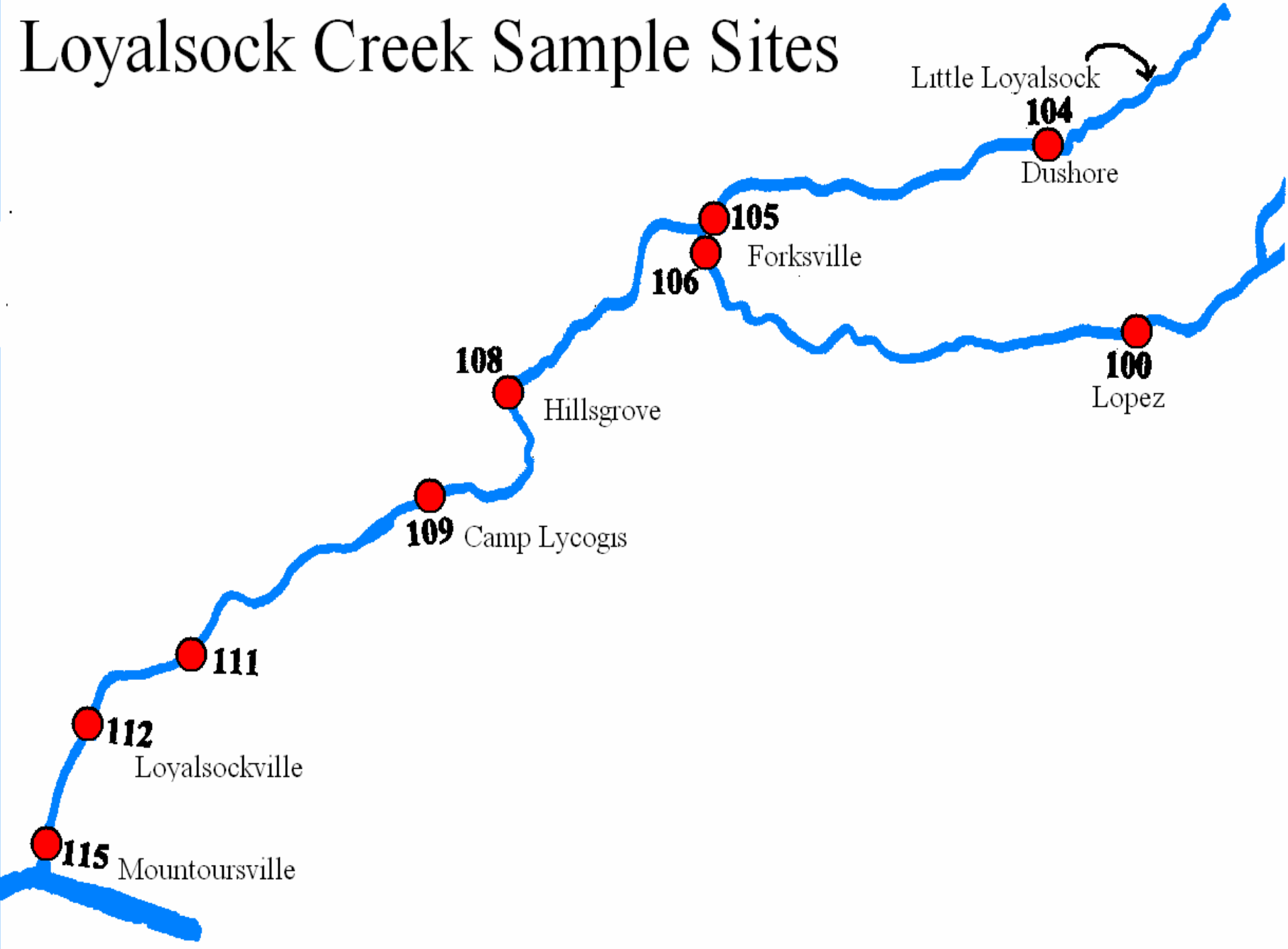
SRBC

Loyalsock Creek Sample Sites



What is *E. coli*?

- Short for *Escherichia coli (a bacteria)*
- *It is a type of fecal coliform found in the intestine of animals and humans.*
- *The presence of E. coli* in water supplies indicate animal waste contaminations

Fecal Coliforms

- Subgroup of total coliform bacteria
- Fecal coliforms themselves are not pathogenic
- However, when contaminating a body of water diseases and illneses can be contracted
  - ie. Typhoid fever, hepatitis, dysentery, gastroentetis, and ear infections

Total Coliforms

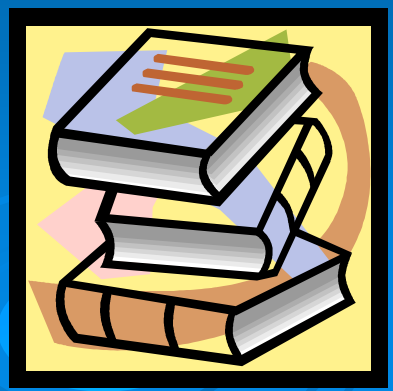
- Include fecal coliforms as well as bacteria from cold blooded animals and various soil organisms
- Other types of total coliforms
  - *Escherichia, Enterobacter, Citsobacter, and Kiebsiella*
- Outside of the intestine coliforms only live for approximately 48 hours

How does *E.coli* get into the water?

- During rain falls
- Snow melts and other types of precipitation
- It may be washed into our creeks and streams
- If water is not treated properly it may get into drinking water supplies

E. Coli in Drinking Water

- One of hundreds of strains of *E. coli, type* O157:H7 can cause foodborne and waterborne illnesses
- Although most are harmless to humans, this strain produces powerful toxins that can cause sever illnesses
- *History:*
  - *E. coli* O157:H7 was first found contaminating hamburgers in 1982, since then most have been found from undercooking beef products
  - 1999- People became sick after drinking contaminated water
- Information to protect yourself can be found at the Food and Drug Administration's Bad Bug Book



Coliform Water Quality Standards

	Total Coliforms	Fecal Coliforms	*E. coli*
Drinking Water	<1/100ml	Absent	Absent
Swimming Pool	<1/100ml	Absent	Absent
Primary Contact		200/100ml	
Boating and General enjoyment (non-swimming)		2000/100ml	

- During May 1 through September 30 a geometric mean of 200/100ml based on a 5 sample test in a 30 day period. 10% of the samples may not exceed 400/100ml for primary contact (PA DEP – Chapter 93)

Values are mean #/100ml

Treated Effluent Water

- Treated sewage may have a fecal coliform range of 200 – 1,000/100ml
- A NPDES permit sets the range of coliforms allowed seasonally for discharges points

Past Studies

- DEP Monitoring of Loyalsock Creek
- Thompson's Bacteriological Study on the Loyalsock Creek 1977,1978, & 1982
- DER (now DEP) Study 1990,1992, 1993 Under guidance of William Parsons and 7 interns including Corey Richmond
- Lycoming College - Dewing Independent Study 1996
- Pennsylvania College Of Technology – 2002
- Lycoming College – Lycoming College Clean Water Institute – Matthew Bennett - 2003

DEP Intensive Monitoring of Loyalsock Creek 1962 - 1982

- Data corresponds with site numbers 106 and 112.
- Methods for collection are unknown.
- Data has been broken down into seasonal (winter, spring, summer and fall) categories for the site 112 data.
- Winter season can be either the first or last few months of the year.
- Units are #/100ml of water tested.

DEP Intensive Monitoring of Loyalsock Creek 1962 - 1982

- Site 112 Loyalsockville (Total coliforms*)

Year	Winter	Spring	Summer	Fall
1962		150	-	-
1963	0	0	150	230
1964	-	0	0	110
1965	490	2,400	200	68
1966	5,400	99,990		
1968	9,200			99,990
1969	310	20	260	5,400
1970	790	140		330
1971		330		
1972				930
1975				35
1976	2		50	165.5

*Mean # / 100ml

DEP Intensive Monitoring of Loyalsock Creek 1962 - 1982

- **Site 106 Forksville (Fecal Coliforms- Except 1976 and 1977*)**

Year	Winter	Spring	Summer	Fall
1976		335(100)		
1977	8(4)	10,000	50	
1978	10,000			
1979	25,000	40	25,000	10,000
1980	20,000	20,000	40	20,000
1981	25	25	700	25
1982	25,000	25,000	120	250

*Mean # / 100ml

Thompson's (Overdorff and Warster)Bacteriological Study on the Loyalsock Creek 1977,1978, & 1982

- Thompson used sites 100 through 116 for testing.
- A Millipore filtration system was used for sampling.
- He would filter 100ml of stream water on periodical dates.
- He counted Fecal Coliforms, Fecal Strep. and Total Coliforms.
- Biweekly samples June to Sept./Nov.

Thompson's Site List

Station	Location
100	Bridge on 487 at Lopez
101	2 miles downstream from Lopez
102	Ringdale Bridge on Route 220
103	4 miles above Worlds End
104	1 mile downstream from Dushore at bridge on Route 87
104a	10 yards downstream from station 104
105	½ mile upstream from confluence with Loyalsock Creek
105a	200 yards upstream from station 105
106	Route 87 bridge at Forksville
107	1 mile upstream from Hillsgrove at bridge on Route 87
108	¼ mile downstream from Hillsgrove at bridge on Route 87
109	Trimtex Beach
110	½ mile downstream from Barbours
111	Off Cove Road at Mosteller's Ford
112	Below swimming area at Loyalsockville
113	1 mile downstream from Loyalsockville
114	At County Home
114a	¼ mile downstream from County Home
115	Loyalsock Bridge at Montoursville
116	300 yards above confluence with Susquehanna River

Thompson's Bacteriological Study

(mean # / 100ml)

1977 / 1978

Site #	Total Coliforms	Fecal Coliforms	Fecal Strep.	FC/ FS
100	3,816 / 5200	52 / 100	4 / 39	11.3 / 20
101	4,980 / 920	52 / 0	6 / 3	2.6 /
102	3,128 / 4463	194 / 40	15 / 2	1.6 / 20
103	3,273 / 1610	23 / 3	7 / 31	1.4 /
104a	7,324 / 11,437	796 / 367	282 / 254	1.4 / 8.7
104	ND / 13,587	ND / 528	ND / 211	ND / 10.4
105a	2,510 / 2,900	43 / 295	21 / 38	.7 / 15.9
105	ND / 2,703	ND / 333	ND / 51	ND / 15.1
106	613 / 1,047	4 / 2	21 / 12	.24 / .2
107	1,730 / 5,563	25 / 80	92 / 33	.4 / 5.5

Thompson's Data Continued
(mean # / 100ml)

1977 / 1978

Site #	Total Coliforms	Fecal Coliforms	Fecal Strep.	FC/ FS
108	4,870 / 4,167	24 / 58	40 / 56	1.3 / 1.3
109	2,155 / 4,312	25 / 375	8 / 99	.59 / 6.2
110	2,275 / 3,708	18 / 40	18 / 34	1.3 / .8
111	5,566 / 3,390	53 / 40	46 / 60	10.3 / 2
111a	4,358 / ND	78 / ND	65 / ND	5.9 / ND
112a	5,395 / 3,673	48 / 18	31 / 10	.53 / 4.3
112	1,725 / 2,367	45 / 65	25 / 12	2.8 / 5.7
113	5,773 / 2,790	35 / 13	50 / 19	2 / 1.1
114	6,006 / 14,253	14 / 95	25 / 34	1.6 / 1.2
115	6,156 / 15,517	146 / 213	76 / 183	3.2 / 307
116	6,914 / 4,230	167 / 232	81 / 204	2.6 / 4.2

DER (now DEP) Study 1990,1992, 1993

- Samples taken on designated 20-25 days throughout the year.
- 500 samples collected from 1990 and 1992, and 625 were collected in 1993.
- Means were used in conjunction with the state standards for bathing beaches and pools to determine the severity of the streams pollution.
- A geometric mean of over 200 would bare a foreclosure on that portion of beach.
- An additional side study was conducted investigating the building's waste disposal methods.

DER (now DEP) Study 1990,1992, 1993

Station #	Location
2	Camp Lycogis
3	Norton Road, Hillsgrove
4	Covered Bridge Road, Hillsgrove
5	Below Forksville Inn, Forksville
6	Forksville, steel bridge (Route 87)
7	Rt. 220 bridge, Ringdale
8	Below Lopez
21	State Game Land, Barbours
22	Near Rt. 973 bridge
23	Mountoursville, Rt 180 bridge

DER (now DEP) Study 1990,1992, 1993

Loyalsock Creek Study

Mean # / 100ml

Stations / Year >		1990*	1992*	1993*
1		143	33	49
2	Camp Lycogis	125	38	33
3		178	34	153
4	Hillsgrove	186	46	132
5		194	56	50
6	Forksville	64	17	34
7	Ringdale	46	6	25
8	Lopez	89	36	127
9		30	14	13
10		27	11	23
11		114	19	51
12		124	16	31

DER (now DEP) Study 1990,1992, 1993 Cont…

		Mean # / 100ml		
	Stations / Year >	**1990***	**1992***	**1993***
13		36	26	53
14		404	279	2721
15		90	25	92
16		21	11	33
17		122	42	33
18		56	32	36
19		553	188	698
20		212	34	45
21	**Barbours**	54	28	53
22	**Loyalsockville**	25	31	122
23	**Mountoursville**	229	92	759
24		910	286	498
25		289	178	236

Lycoming College - Dewing Independent Study 1996

- Gridded gels (Millipore Co.) were used to count coliform quantities
- Gel container was filled with 1 ml of creek water from the specified site, inverted 20 times, and then emptied.
- Gels were stored on ice until they were returned to lab, where they were incubated.
- Two samples were taken at each site and averaged.
- Samples were taken in February, March, and April of 1996.

Lycoming College - Dewing Independent Study 1996

Mean # / 100ml

Sites Used	Feb	Mar	Apr
100	-	-	150
102	-	-	50
104	950	1,600	250
105	-	-	250
105a	-	-	250
108	-	-	400
109	-	-	250
111	-	50	150
115	-	250	350

Pennsylvania College Of Technology – 2002

- 100 ml of sample was collected and tested for fecal and total coliforms.
- Samples were collected for two days in June and July.
  - Half of all sites sampled one day and the other half the following day

Pennsylvania College Of Technology – 2002

Date	Site ID	Fecal Coliforms *	Total Coliforms *	Date	Fecal Coliforms *	Total Coliforms *
06/04/02	100		4	07/01/02	142	50
	101	14	18		64	101
	102		2		10	164
	103		100,000		10	32
	104		76		372	82
	105	260	200		946	64
	106	20	4		14	30
	107	74	26		70	136
	108	60	18		98	132

* # / 100ml

**100,000 was used when there were too many to count

Pennsylvania College Of Technology – 2002

Date	Site ID	Fecal Coliforms *	Total Coliforms *	Date	Fecal Coliforms *	Total Coliforms *
06/05/02	109	100,000	54	07/02/02	58	60
	110	52	36		98	216
	111	80	78		240	4
	112	176	38		66	110
	113	32	32		64	122
	114	100,000	76		46	44
	115	70	20		42	138
	116	82	28		8	82

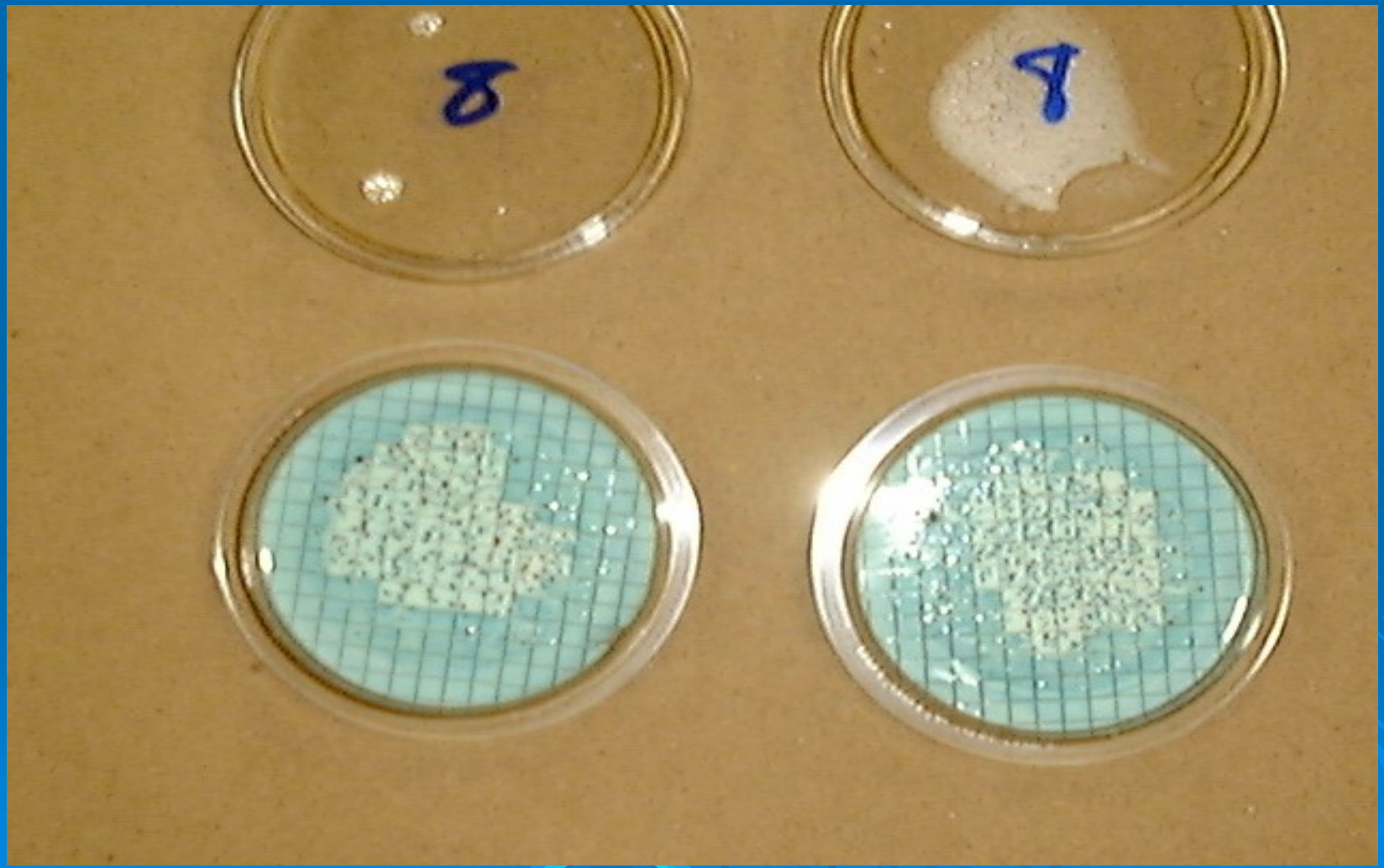
* # / 100ml

**100,000 was used when there were too many to count

Lycoming College – Lycoming College Clean Water Institute – Matthew Bennett - 2003

- 2 Samples were collected at each site in sterilized bags and transported on ice.
- 100ml of sample was filtered using the Millipore filtering system.
- mColi-Blue 24 medium was used to grow coliforms.
- Incubated overnight and counted red a blue colonies.
- Blue colonies represent E. *coli,* red and blue colonies combined result in total coliforms.
- QA/QC every 20 samples split with SeeWald Labs

Typical Coliform Culture



Lycoming College – Lycoming College Clean Water Institute – Matthew Bennett - 2003

	8/21/2003		8/26/2003	
Site ID	E. coli	Total Coliforms	E. coli	Total Coliforms
100	33	548	22.5	61.25
102	34.5	210	5.5	53.75
103	5	381.5	23.5	63.25
104	150	533	384	244
105	25	144.5	19.5	62.25
106	5	246	0	53
107	8.5	302	1.5	54.25
108	6	351.5	24.5	66.25

Mean # / 100ml

Lycoming College – Lycoming College Clean Water Institute – Matthew Bennett - 2003

	8/21/2003		8/26/2003	
Site ID	E. coli	Total Coliforms	E. Coli	Total Coliforms
110	2.5	153	1.5	55.75
111	5.5	140	16.5	63.75
112	3	161	8.5	60.25
113	5	301.5	3.5	58.25
114	5	130	11.5	62.75
115	5	69	32.5	73.75
116	6	85	22	69

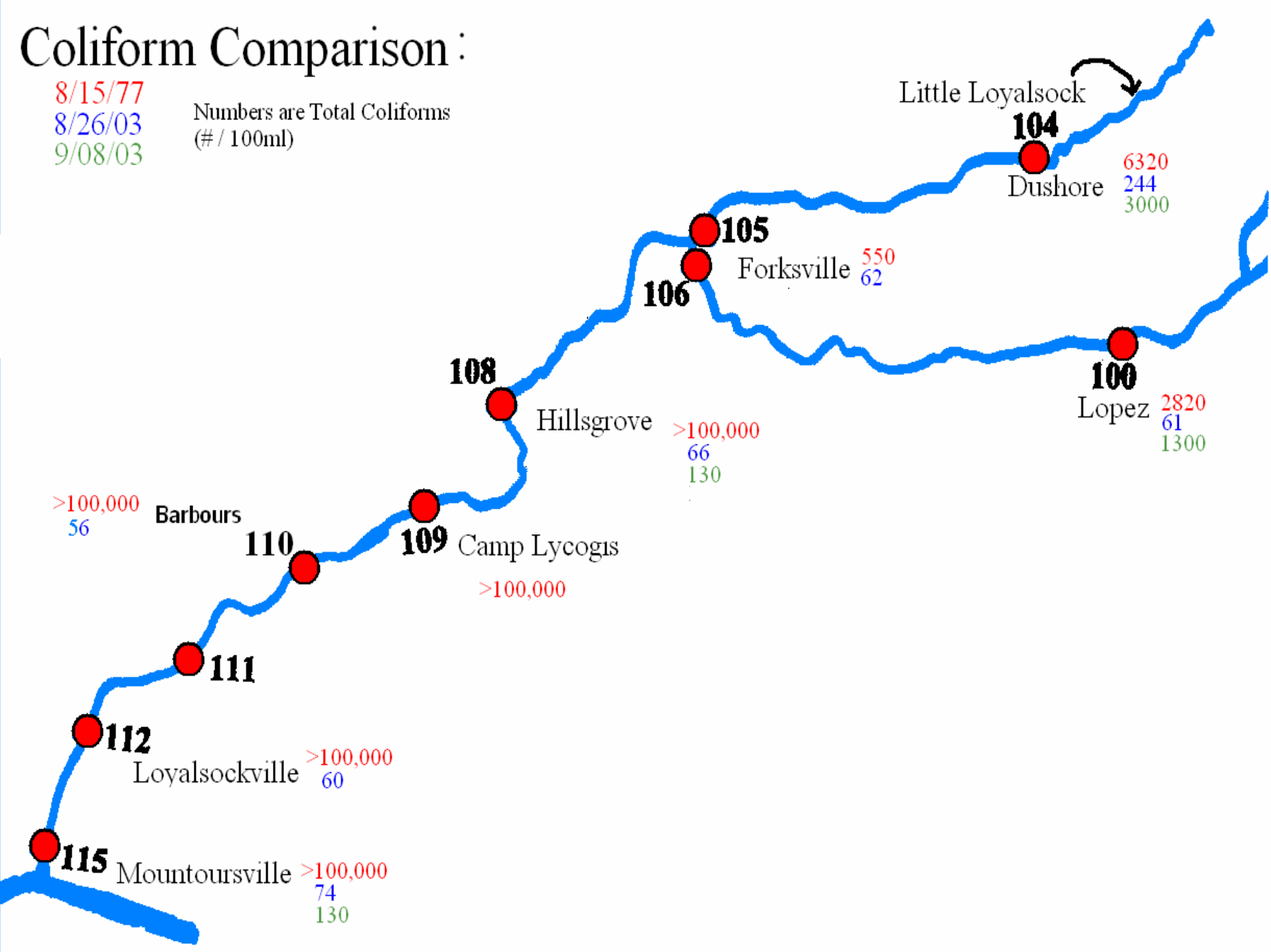
* Mean # / 100ml

Coliforms for 9/08/03

Site #	Total Coliforms	Fecal Coliforms
100	1,300	80
104	3,000	2,400
108	130	<20
115	1,300	140

Mean # / 100ml

Samples collected by Lycoming College with analyses by Seewald Labs


Coliform Comparison :
8/15/77
8/26/03
9/08/03
Numbers are Total Coliforms
(# / 100ml)
Little Loyalsock
104
Dushore
6320
244
3000
105
Forksville
550
62
106
100
Lopez
2820
61
1300
108
Hillsgrove
>100,000
66
130
>100,000
56
Barbours
110
109
Camp Lycogis
>100,000
111
112
Loyalsockville
>100,000
60
115
Mountoursville
>100,000
74
130