LYCOMING CREEK

LYCOMING, TIOGA AND SULLIVAN COUNTIES

WATER QUALITY STANDARDS REVIEW

DRAFT STREAM EVALUATION REPORT

Segment: Basin
Stream Code: 20501
Drainage List: L

WATER QUALITY MONITORING SECTION
WATER QUALITY DIVISION
BUREAU OF CLEAN WATER
DEPARTMENT OF ENVIRONMENTAL PROTECTION

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TABLE OF CONTENTS

INTRODUCTION

The Department of Environmental Protection (DEP) conducted an evaluation of the Lycoming Creek basin in response to a rulemaking petition submitted by the Lycoming Creek Watershed Association and accepted by the Environmental Quality Board (EQB) on August 18, 2009. The petitioner requested that the mainstem be redesignated to High Quality (HQ). The Lycoming Creek mainstem is currently designated Cold Water Fishes, Migratory Fishes (CWF, MF) from the source to Long Run. Tributaries to Lycoming Creek from the source to and including Long Run are currently designated High Quality – Cold Water Fishes, Migratory Fishes (HQ-CWF, MF). The entire Lycoming Creek basin, including the mainstem and tributaries, from Long Run to the mouth is currently designated Warm Water Fishes, Migratory Fishes (WWF, MF). Components of this evaluation include surveys conducted spring 2011 and winter 2011-12.

The stream redesignation process begins with an evaluation of the "existing uses" and the "designated uses" of a stream. "Existing uses" are water uses actually attained in the waterbody. Existing uses are protected through permit or approval actions taken by the DEP. "Designated uses" are water uses identified in regulations that protect a waterbody. Candidates for stream redesignation may be identified by the DEP based on routine waterbody investigations or based on requests initiated by other agencies or from the general public through a rulemaking petition to the EQB.

GENERAL WATERSHED DESCRIPTION

Lycoming Creek is a freestone tributary to the West Branch Susquehanna River. The Lycoming Creek mainstem originates near the area where Bradford, Tioga and Lycoming county boundaries meet. From here it flows southwest and is the county and township boundary between Union Township, Tioga County and McNett Township, Lycoming County. Just before reaching McIntyre Township, Lycoming County, Lycoming Creek turns and flows south and confluences with Roaring Branch. The Roaring Branch basin drains about 30 square miles of Union and Liberty townships, Tioga County and McIntyre and Jackson townships, Lycoming County. Lycoming Creek continues south through McIntyre Township where Rock Run flows into Lycoming Creek from the east, draining about 28 square miles of Fox Township, Sullivan County and McNett and McIntyre townships, Lycoming County. From Rock Run, Lycoming Creek continues south through McIntyre, Lewis, Lycoming, Hepburn, Loyalsock and Old Lycoming townships where tributary basins including Pleasant Run (27 square miles), Grays Run (20 square miles), Trout Run (15 square miles), Hoagland Run (23 square miles) and Mill Creek (14 square miles) empty into Lycoming Creek before it reaches Williamsport where it confluences with the West Branch Susquehanna River (Figure 1). The Lycoming Creek basin drains a total of about 272 square miles. Land cover throughout the basin is mostly forested (75%), with some agriculture (15%) and developed areas (5%) with other land cover like wetlands and barren land cover (5%) scattered throughout (Dewitz 2019). There are a total of 51 National Pollutant Discharge Elimination System (NPDES) permitted discharges, including industrial waste (14), sewage (19), stormwater (13), mining (1) and concentrated animal feed operations (4). In addition, there is a single permitted pesticide treatment area and 368 active gas wells.

Figure 1. Lycoming Creek Basin.

WATER QUALITY

Physicochemical

Discrete physicochemical data including field meter and water chemistry data were collected from most surveyed stations throughout the Lycoming Creek basin during 2011-2012 survey (Appendix B). Water quality conditions throughout the basin ranged from excellent to impaired. Low pH values were found at several tributary stations throughout the middle portion of the basin including Abbot Run (6AR, 5.29), Red Run (7RR, 4.64), Yellow Dog Run (9YR, 5.11), Miners Run (10MR, 5.10), Frozen Run (12FR, 4.79) and Long Run (13LR, 5.51). Alkalinity was also 0.0 mg/L at all these stations with the exception of Red Run (7RR, 4.0 mg/L) and Long Run (13LR, 0.2 mg/L). Physicochemical data throughout the remainder of the basin, including Lycoming Creek mainstem stations indicates excellent water quality conditions.

Biological

Benthic macroinvertebrate samples were collected using the DEP Rapid Bioassessment Protocols (RBP) benthic sampling protocols, which is a modification of EPA's RBP (Barbour et al. 1999, Plafkin et al. 1989, Shull 2017; Appendix C). DEP staff collected benthic macroinvertebrate data at 33 stations (29 candidate and 4 reference) during the spring 2011 and winter 2011-2012 surveys (Figures 2-4 and Appendix A). Generally, samples collected throughout the Lycoming Creek basin were dominated by pollution intolerant taxa with few exceptions. The same tributary stations identified as having low pH values (6AR, 7RR, 9YR, 10MR and 12FR) as well as two additional stations (17LGR and 22LGR) exhibited an increase in taxa (*Amphinemura* and *Leuctra*) that are fairly tolerant to acidic conditions. One additional exception, Unnamed Tributary (UNT) 20524 to Beautys Run (25UBR), was dominated by pollutant tolerate Chironomidae, which is typically an indication of some degree of impact caused by sediment or siltation.

Physical

Instream habitat was assessed at each station where benthic macroinvertebrates were sampled (Appendix D). The habitat evaluation consists of rating twelve parameters to derive a station habitat score. The total habitat scores ranged from 152 (25UBR) to 230 (9YR) with optimal scores at all but two stations (25UBR and 29LC). The suboptimal score (186) at 29LC, the farthest downstream Lycoming Creek station, was a result of low scores for embeddedness, channel alteration, sediment deposition and riparian vegetative zone width. Low scores for channel alteration and riparian vegetative zone width are indicative of the extensive levee system built in the 1950's as a flood mitigation effort, which affects the downstream reaches of Lycoming Creek. The suboptimal score (152) at 25UBR, Unnamed Tributary to Beautys Run was the result of low scores for ten of the twelve habitat parameters evaluated.

INTEGRATED BENTHIC MACROINVERTEBRATE SCORING TEST

The qualifying criterion applied to the Lycoming Creek basin was the DEP integrated benthic macroinvertebrate scoring test described at 25 Pa. Code § 93.4b(a)(2)(i)(A) and § 93.4b(b)(1)(v). Selected benthic macroinvertebrate community metrics from Lycoming Creek basin were compared to

available reference stations with comparable drainage areas from Kettle Creek basin located in Potter and Clinton counties. Stations were grouped based on watershed area with small watersheds < 25 square miles, mid-order watersheds 25-100 square miles, and large watersheds > 100 square miles. The Kettle Creek basin was used as a reference because it has demonstrated an existing use of Exceptional Value (EV) based on biological measures and the macroinvertebrate community has demonstrated best attainable biological communities by scoring well above the top 25th percentile of Pennsylvania EV reference streams. In addition, the Kettle Creek basin has optimal habitat and similar gradient, drainage area, pH and alkalinity to the candidate stream stations (DEP 2003). Comparisons with the following metrics were used as an indicator of community health: taxa richness, modified Ephemeroptera (mayflies), Plecoptera (stoneflies), and Trichoptera (caddisflies) (EPT) index, modified Hilsenhoff Biotic Index (HBI), percent dominant taxon, and percent modified mayflies (Appendix E).

Based on these five metrics, the following candidate surface waters exceeded the EV qualifying criterion of 92% (§ 93.4b(b)(1)(v)):

- Mill Creek basin (2MC);
- Lycoming Creek basin from Mill Creek to Grays Run, excluding Red Run (7RR) Frozen Run (12FR) and Slacks Run (15SR);
- Grays Run basin (16GR, 18GR), excluding Long Run (17LGR);
- Lycoming Creek basin from Grays Run to Hoagland Run, excluding Wolf Run and Daugherty Run;
- Hoagland Run (21HR, 23HR), excluding Stony Gap Run;
- Lycoming Creek basin from Hoagland Run to Mill Creek, excluding Long Run
- Mill Creek (24MLC) basin from UNT 20532 (Fisher Hollow) to mouth;
- Lycoming Creek basin from Mill Creek to Beautys Run;
- Beautys Run (26BR) from UNT 20524 to mouth;
- Lycoming Creek basin from Beautys Run to mouth, excluding Bottle Run

A total of 247 stream miles qualify as EV Waters under this criterion.

ADDITIONAL EXCEPTIONAL VALUE WATERS QUALIFYING CRITERIA

Outstanding State Resource Waters - § 93.4b(b)(1)(iii)

The DEP evaluated water quality protective measures developed by the Pennsylvania Department of Conservation and Natural Resources (DCNR) – Bureau of Forestry's State Forest Resource Management Plan. The Plan contains "Aquatic Habitat Buffer Guidelines" that provide operating procedures to be followed when conducting management activities in or near aquatic habitats. One purpose of the guidelines is to protect water quality. The procedures utilize inner buffers zones as a critical area of protection that allow only minimal human activity (e.g. tree cutting can only occur to protect property and human safety). The inner buffer zones range from 30 feet to 200 feet. Inner buffer zones of 200 feet are applied to Wilderness Trout Streams and Wild Rivers, whereas an inner buffer zone of 135 feet is applied to EV streams. For HQ streams, a 30-foot inner buffer zone is required, and coupled with a requisite 105-foot outer buffer zone, provides a total habitat buffer of 135 feet. Stream

buffer protections qualify as water quality protective measures that are incorporated into a resource management plan.

The DEP also evaluated water quality protective measures developed by the Pennsylvania Game Commission (PGC) to protect aquatic and adjacent riparian areas as important habitats on state game lands. The PGC has issued aquatic habitat buffer guidelines with inner buffer zones of 100 feet for EV and 50 feet for HQ streams and with outer buffer zones of 50 and 100 feet respectively, for a total of 150 feet of protection. The management plans allow limited activities within the buffered areas, recommend elimination or minimization of existing roads or parking areas and encourage restoration of riparian areas.

The water quality protective measures described in DCNR – Bureau of Forestry and PGC resource management plans meet the "outstanding National, State, regional or local resource waters" definition (Appendix F) and apply to stream segments where State Game Lands 133, the Tiadaghton State Forest and the Wyoming State Forest are situated along watershed corridors in a manner that provide protection to substantial reaches of the corridor within the Lycoming Creek basin. These include (Figures 2 & 3):

- Unnamed Tributaries (UNTs) to Lycoming Creek from Roaring Branch to Glendenen Run,
- Abbott Run,
- Rock Run,
- portions of Frozen Run,
- portions of Pleasant Stream,
- UNT 20645 (Slaughter Hollow) to Slacks Run,
- Shoemaker Run,
- portions of Grays Run,
- Hagerman Run,
- Glendenen Run.

A total of 142 stream miles qualify as EV waters under this criterion.

PUBLIC RESPONSE AND REQUEST FOR TECHNICAL DATA

The DEP provided public notice of this stream redesignation evaluation and requested any technical data from the general public on the DEP website and through publication in the *Pennsylvania Bulletin* on May 12, 2012 (42 Pa.B. 2539). In addition, each local municipality within the Lycoming Creek basin as well as the Lycoming and Tioga county conservation districts were notified of the redesignation evaluation in a letter dated March 16, 2012. No data on water chemistry, instream habitat, or the aquatic community were received in response to these notices.

RECOMMENDATIONS

Based on applicable regulatory definitions and requirements of 25 Pa. Code § 93.4b(b)(1)(iii) (Outstanding State Resource Waters) and/or § 93.4b(b)(1)(v) (the DEP's integrated benthic macroinvertebrate scoring test) the DEP recommends that the following surface waters be redesignated to Exceptional Value, Migratory Fishes (EV, MF) (Figures 2-4):

- Mill Creek basin;
- Lycoming Creek basin from Mill Creek to Red Run;
- Lycoming Creek basin from Red Run to Frozen Run;
- Frozen Run from source to and including UNT 20713;
- Mill Hollow Run basin (tributary to Frozen Run);
- Lycoming Creek basin from Frozen Run to Slacks Run;
- UNT 20654 (Slaughter Hollow) to Slacks Run;
- Lycoming Creek basin from Slacks Run to Grays Run;
- Grays Run basin, excluding Long Run;
- Lycoming Creek basin from Grays Run to Hoagland Run, excluding Wolf Run and Daugherty Run;
- Hoagland Run basin, excluding Stony Gap Run;
- Lycoming Creek basin from Hoagland Run to Mill Creek, excluding Long Run;
- Mill Creek basin from UNT 20532 (Fisher Hollow) to mouth,
- Lycoming Creek basin from Mill Creek to Beautys Run,
- Beautys Run basin from UNT 20524 to mouth;
- Lycoming Creek basin from Beautys Run to mouth, except Bottle Run.

This recommendation includes approximately 70 miles that qualify based on Outstanding State Resource waters, 247 miles that qualify based on the DEP's integrated benthic macroinvertebrate scoring test, 72 miles that qualify for both and adds approximately **389** total stream miles of EV waters to Chapter 93.

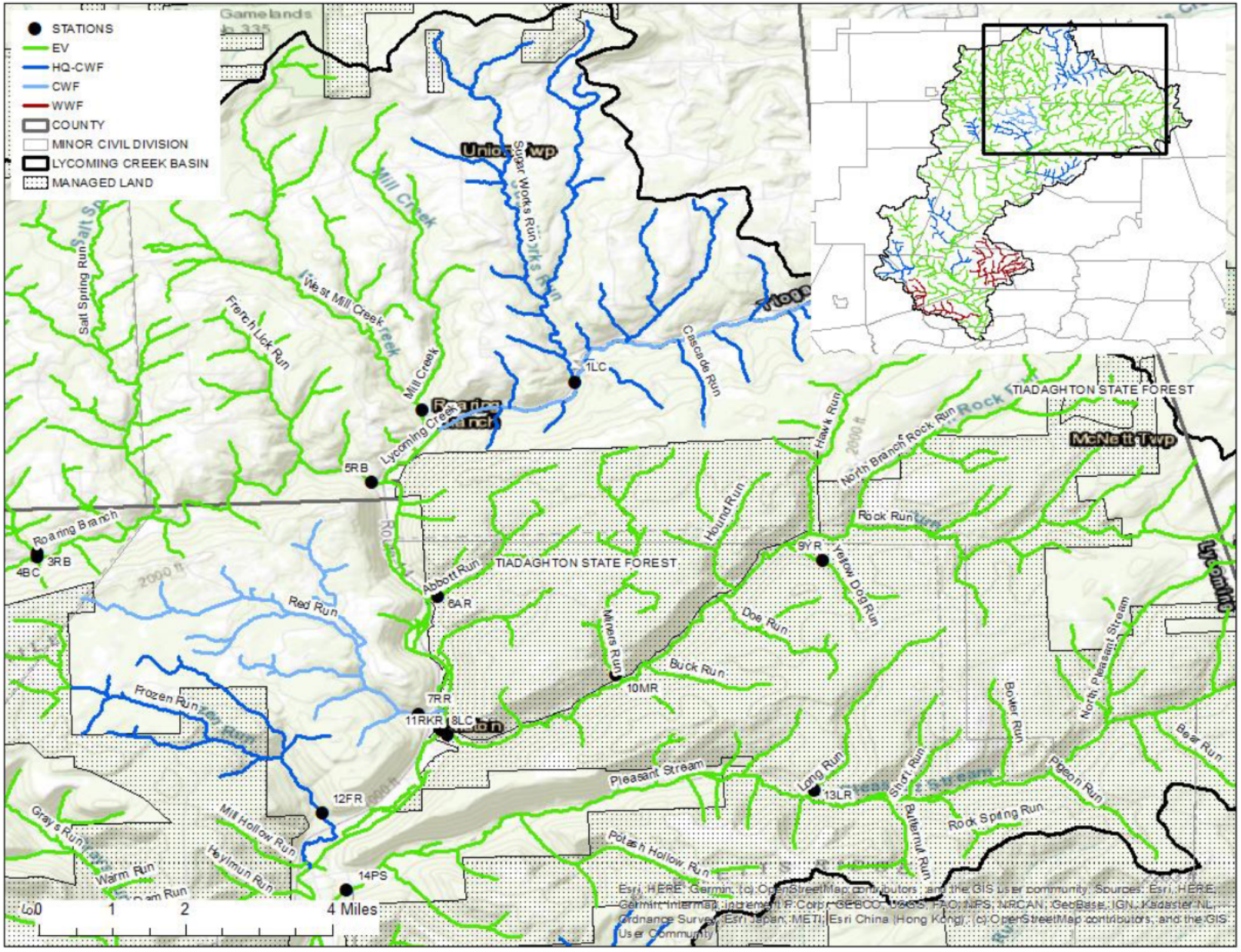

Figure 2. Upper Lycoming Creek Basin Redesignation Recommendations.

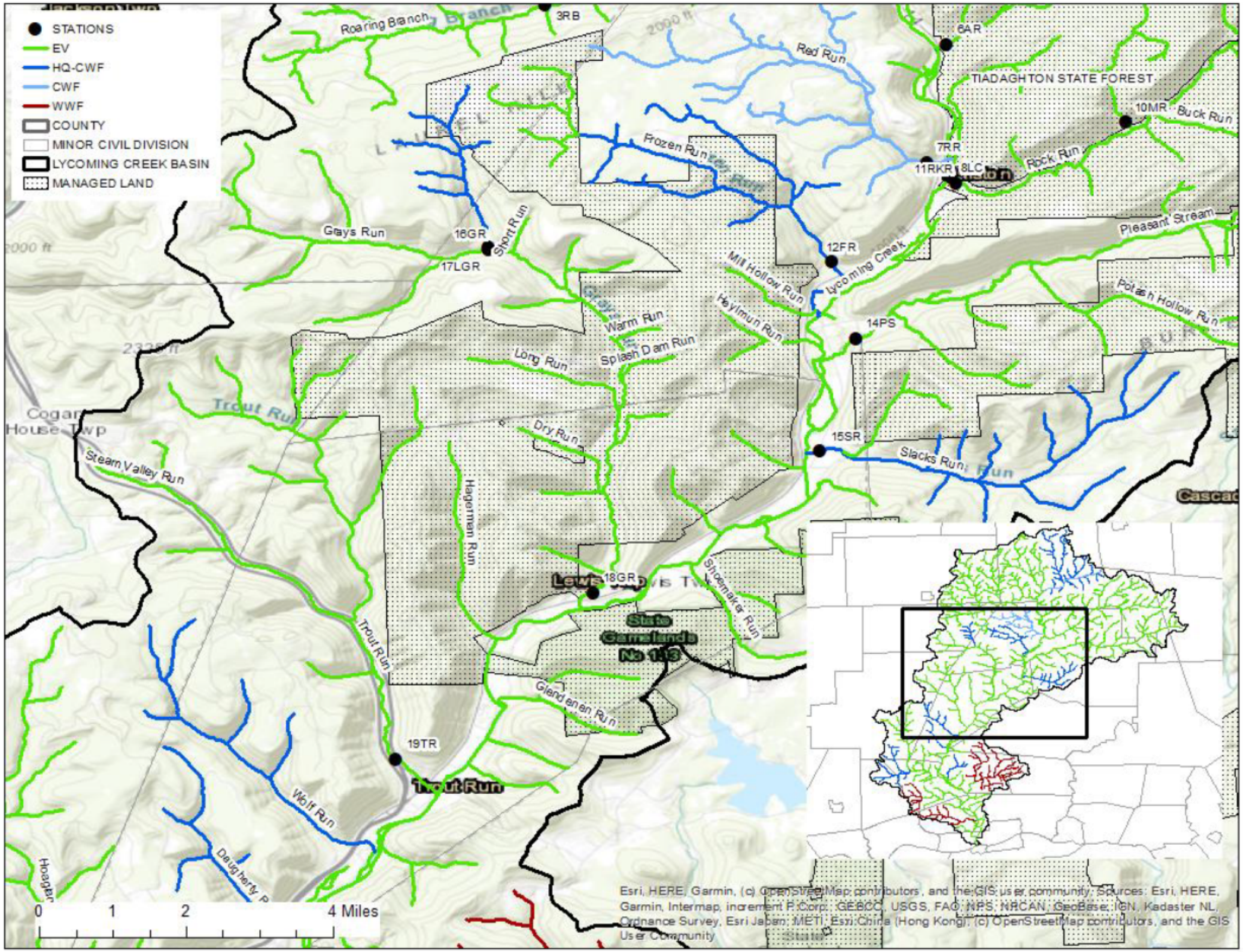

Figure 3. Middle Lycoming Creek Basin Redesignation Recommendations.

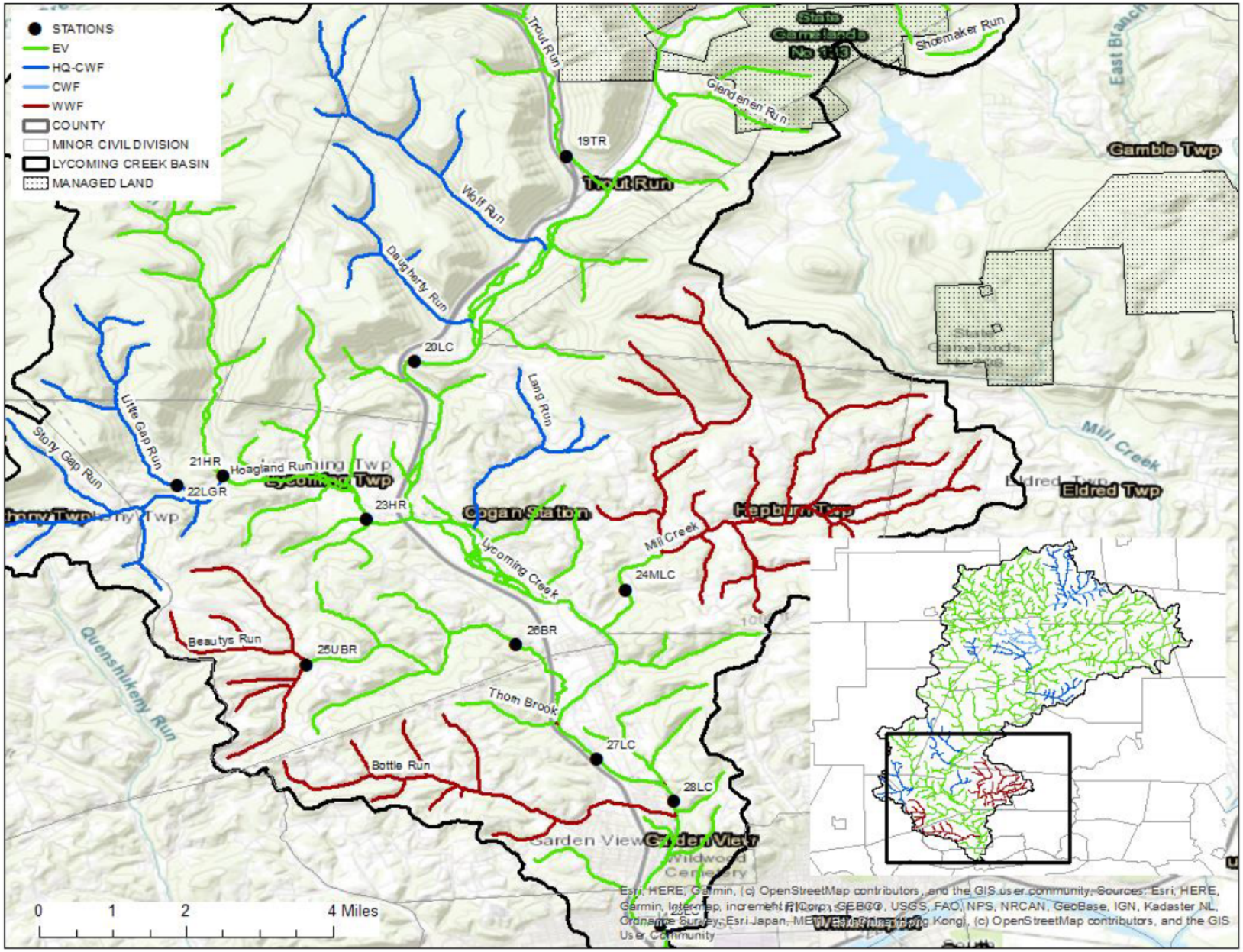

Figure 4. Lower Lycoming Creek Basin Redesignation Recommendations.

REFERENCES

Barbour, M. T., Gerritsen, J., Snyder, B. D., Stribling, J. B. 1999. Rapid Bioassessment Protocols for Use in Streams and Wadeable Rivers: Periphyton, Benthic Macroinvertebrates, and Fish. Second Edition. United States Environmental Protection Agency. EPA 841-B-99-002.

DEP. 2003. Water quality antidegradation implementation guidance. Pennsylvania Department of Environmental Protection. Harrisburg, Pennsylvania. http://www.depgreenport.state.pa.us/elibrary/GetDocument?docId=7842&DocName=WATER%20QUALITY%20ANTIDEGRADATION%20IMPLEMENTATION%20GUIDANCE.PDF%20

Dewitz, J., 2019, National Land Cover Database (NLCD) 2016 Products (ver. 2.0, July 2020): U.S. Geological Survey data release, https://doi.org/10.5066/P96HHBIE.

Plafkin, J. L., Barbour, M. T., Porter, K. D., Gross, S. K., Hughes, R. M. 1989. Rapid Bioassessment Protocols for use in streams and rivers: Benthic Macroinvertebrates and Fish. United States Environmental Protection Agency. EPA/444/4-89-001.

Shull, D. R. (editor). 2017. Wadeable riffle-run stream macroinvertebrate data collection protocol. Chapter 3.1, pages 2–8 in M. J. Lookenbill, and R. Whiteash (editors). Water quality monitoring protocols for streams and rivers. Pennsylvania Department of Environmental Protection, Harrisburg, Pennsylvania.

APPENDIX A – STATION LOCATION TABLES

Table A1. Lycoming Creek Basin – Station Locations, Source to Slacks Run.

STATION	DESCRIPTION
1LC	Lycoming Creek, 500 meters downstream of McNett Hill Road. McNett Township, Lycoming County Lat: 41.5744 Long: -76.9255
2MC	Mill Creek, 30 meters upstream of Ogdensburg Road. Union Township, Tioga County Lat: 41.5690 Long: -76.9558
3RB	Roaring Branch, 50 meters upstream of Brion Creek. Jackson Township, Lycoming County Lat: 41.5398 Long: -77.0319
4BC	Brion Creek, 60 meters upstream of Roaring Branch. Jackson Township, Lycoming County Lat: 41.5405 Long: -77.0319
5RB	Roaring Branch, 200 meters upstream of State Route 14. Union Township, Tioga County Lat: 41.5546 Long: -76.9658
6AR	Abbott Run, 140 meters upstream of State Route 14. McIntyre Township, Lycoming County Lat: 41.5321 Long: -76.9528
7RR	Red Run, 300 meters upstream of State Route 14. McIntyre Township, Lycoming County Lat: 41.5087 Long: -76.9566
8LC	Lycoming Creek, 100 meters upstream of Rock Run. McIntyre Township, Lycoming County Lat: 41.5057 Long: -76.9519
9YR	Yellow Dog Run, 700 meters upstream of Rock Run. McIntyre Township, Lycoming County Lat: 41.5046 Long: -76.9508
10MR	Miners Run, 220 meters upstream of Rock Run. McIntyre Township, Lycoming County Lat: 41.5166 Long: -76.9175
11RKR	Rock Run, 140 meters upstream of Lycoming Creek. McIntyre Township, Lycoming County Lat: 41.5046 Long: -76.9508
12FR	Frozen Run, 340 meters upstream of State Route 14. McIntyre Township, Lycoming County Lat: 41.4891 Long: -76.9755
13LR	Long Run, 210 meters upstream of Pleasant Run. McIntyre Township, Lycoming County Lat: 41.4936 Long: -76.8783
14PS	Pleasant Stream, 90 meters downstream of Upper Bodines Road. McIntyre Township, Lycoming County Lat: 41.4739 Long: -76.9707
15SR	Slacks Run, 40 meters upstream of Upper Bodines Road. Lewis Township, Lycoming County Lat: 41.4517 Long: -76.9777

Table A2. Lycoming Creek Basin – Station Locations, Grays Run to Mouth.

STATION	DESCRIPTION
16GR	Grays Run, 65 meters upstream of Long Run. McIntyre Township, Lycoming County Lat: 41.4915 Long: -77.0433
17LGR	Long Run, 65 meters upstream of Grays Run. McIntyre Township, Lycoming County Lat: 41.4920 Long: -77.0430
18GR	Grays Run, 300 meters upstream of State Route 14. Lewis Township, Lycoming County Lat: 41.42382 Long: -77.0226
19TR	Trout Run, 10 meters upstream of State Route 15 North-bound Lane. Lewis Township, Lycoming County Lat: 41.3909 Long: -77.0615
20LC	Lycoming Creek, 530 meters upstream of Unnamed Tributary 20590. Lewis Township, Lycoming County Lat: 41.3503 Long: -77.0914
21HR	Hoagland Run, 20 meters upstream of State Route 973. Lycoming Township, Lycoming County Lat: 41.3277 Long: -77.1291
22LGR	Little Gap Run, 30 meters upstream of Horn Road. Lycoming Township, Lycoming County Lat: 41.3258 Long: -77.1383
23HR	Hoagland Run, 65 meters upstream of Unnamed Tributary 20562. Lycoming Township, Lycoming County Lat: 41.3191 Long: -77.1010
24MLC	Mill Creek, 10 meters downstream of State Route 973. Hepburn Township, Lycoming County Lat: 41.3052 Long: -77.0490
25UBR	Unnamed Tributary 20524 Beautys Run, 80 meters upstream Beautys Run. Lycoming Township, Lycoming County Lat: 41.2904 Long: -77.1127
26BR	Beautys Run, 950 meters upstream of State Route 15. Lycoming Township, Lycoming County Lat: 41.2944 Long: -77.0713
27LC	Lycoming Creek, 830 meters upstream of Lycoming Creek Road. Loyalsock Township, Lycoming County Lat: 41.2718 Long: -77.0554
28LC	Lycoming Creek, 860 meters downstream of Lycoming Creek Road. Loyalsock Township, Lycoming County Lat: 41.2634 Long: -77.0403
29LC	Lycoming Creek, 240 meters upstream of West Third Street. Williamsport City, Lycoming County Lat: 41.2389 Long: -77.0428

Table A3. Reference (REF) – Station Locations.

STATION	DESCRIPTION
SB	Sliders Branch, 80 meters upstream of Kettle Creek. Ogle Township, Somerset County Lat: 41.6158 Long: -77.6035
1KC	Kettle Creek, 500 meters upstream of State Route 44. Stewardson Township, Potter County Lat: 41.5605 Long: -77.6809
2KC	Kettle Creek, 75 meters upstream of State Route 144. Stewardson Township, Potter County Lat: 41.5007 Long: -77.7707
3KC	Kettle Creek, 400 meters downstream of the Village of Leidy. Leidy Township, Clinton County Lat: 41.4023 Long: -77.9208

APPENDIX B – PHYSICOCHEMICAL DATA

Table B1. Upper Lycoming Creek Basin Physicochemical Data – Mill Creek to Frozen Run.

	PARAMETER	UNITS	STATIONS[1]										
			2MC	3RB	4BC	5RB	6AR	7RR	8LC	9YR	10MR	11RKR	12FR
			8/3/2011	8/3/2011	8/3/2011	8/1/2011	4/14/2011	4/13/2022	8/1/2011	4/14/2011	1/5/2012	8/3/2011	4/14/2011
METALS AND IONS	ALUMINUM D	ug/L	<200	<200	<200	<200	-	-	<200	-	331	<200	-
	ALUMINUM T	ug/L	<10	<10	<10	12	<200	-	184	213	-	10	286
	ARSENIC D	ug/L	<3	<3	<3	<3	-	-	<3	-	-	<3	-
	ARSENIC T	ug/L	<3	<3	<3	<3	<3	-	<3	<3	-	<3	<3
	BARIUM T	ug/L	61	51	36	34	31	-	40	29	-	21	37
	BORON T	ug/L	-	-	-	-	<200	-	-	<200	-	-	<200
	BROMIDE	mg/L	<0.2	<0.2	<0.2	<0.2	<50	-	<0.2	<50	<0.2	<0.2	<50
	CADMIUM D	ug/L	<0.2	<0.2	<0.2	<0.2	-	-	<0.2	-	-	<0.2	-
	CADMIUM T	ug/L	<0.2	<0.2	<0.2	<0.2	-	-	<0.2	-	-	<0.2	-
	CALCIUM T	mg/L	12	14.2	10	12.2	1.311	-	11	1.328	-	4.955	1.48
	CHLORIDE T	mg/L	11.9	3.8	4.2	5.5	0.59	-	5.3	<0.5	<1	2.1	0.52
	CHROMIUM T	ug/L	<50	<50	<50	<50	-	-	<50	-	-	<50	-
	COPPER D	ug/L	<4	<4	<4	<4	-	-	<4	-	-	<4	-
	COPPER T	ug/L	<4	<4	<4	<4	-	-	<4	-	-	<4	-
	IRON D	ug/L	<20	<20	<20	<20	-	-	<20	-	38	<20	-
	IRON T	ug/L	23	22	<20	22	<20	-	26	<20	-	<20	44
	LEAD D	ug/L	<1	<1	<1	<1	-	-	<1	-	-	<1	-
	LEAD T	ug/L	<1	<1	<1	<1	-	-	<1	-	-	<1	-
	MAGNESIUM T	mg/L	2.196	2.457	2.014	2.089	0.613	-	3.043	0.371	-	1.123	0.534
	MANGANESE T	ug/L	<10	21	<10	<10	52	-	89	83	-	<10	102
	NICKEL D	ug/L	<4	<4	<4	<4	-	-	6.1	-	-	<4	-
	NICKEL T	ug/L	<4	<4	<4	<4	-	-	6.6	-	-	<4	-
	SELENIUM T	ug/L	-	-	-	-	<7	-	-	<7	-	-	<7
	SODIUM T	mg/L	-	-	-	-	0.406	-	-	0.325	-	-	0.55
	STRONTIUM T	ug/L	122	43	42	53	11	-	56	<10	-	36	12
	SULFATE T	mg/L	<15	<15	<15	<15	6.55	-	21	5.64	<15	<15	7.89
	ZINC D	ug/L	6.9	<5	<5	<5	-	-	12.5	-	-	7.4	-
	ZINC T	ug/L	5.6	<5	5.1	<5	30	-	14.9	16	-	7.3	107
NUTR.	AMMONIA T	mg/L	<0.02	<0.02	<0.02	<0.02	<0.02	-	<0.02	<0.02	0.03	<0.02	<0.02
	NITRATE & NITRITE T	mg/L	-	-	-	-	<0.04	-	-	0.08	-	-	0.06
	NITRATE T	mg/L	0.68	0.21	0.18	-	-	-	0.16	-	<0.04	0.38	-
	NITRITE T	mg/L	<0.01	<0.01	<0.01	<0.01	-	-	<0.01	-	<0.01	<0.01	-
	PHOSPHORUS T	mg/L	<0.01	<0.01	<0.01	<0.01	-	-	<0.01	<0.01	<0.01	<0.01	<0.01
PHYSICAL/OTHER	ACIDITY T	mg/L	-20.2	-35.8	-18	-23.8	-	-	-9.8	-	3.6	-4.8	-
	ALKALINITY T	mg/L	28.6	42.4	28	34	0	4.0	16.6	0	0	11	0
	CBOD	mg/L	-	-	-	-	0.9	-	-	0.4	-	-	0.3
	DISSOLVED OXYGEN	mg/L	-	-	-	-	-	-	-	11.05	-	-	10.75
	HARDNESS T	mg/L	39	46	33	39	6	-	40	5	-	17	6
	OSMOTIC PRESSURE	mosm/kg	-	-	-	-	3	-	-	4	-	-	2
	pH	pH units	7.3	7.4	7.3	7.9	5.29	4.64	7.4	5.11	5.1	7	4.79
	SPEC COND	umhos/cm	126.5	117.2	93.8	107	22.2	24.0	114.8	19.56	20.6	46.5	24.2
	TDS	mg/L	74	72	62	74	18	-	78	16	18	42	24
	TSS	mg/L	<5	<5	<5	<5	<5	-	<5	<5	<5	<5	<5

[1] Refer to Appendix A for station locations

"<" indicate concentrations below the reporting limit.

"-" indicate parameter was not tested

Table B2. Lycoming Creek Basin Physicochemical Data – Long Run to Beautys Run.

	PARAMETER	UNITS	STATIONS[1]								
			13LR	14PS	15SR	18GR	19TR	20LC	23HR	24MLC	26BR
			4/14/2011	8/2/2011	4/14/2011	8/2/2011	8/3/2011	5/11/2011	1/5/2012	8/2/2011	8/2/2011
METALS AND IONS	ALUMINUM D	ug/L	-	<200	-	<200	<200	-	<200	<200	<200
	ALUMINUM T	ug/L	214	<10	<200	<10	<10	<200	-	72.9	142
	ARSENIC D	ug/L	-	<3	-	<3	<3	-	-	<3	<3
	ARSENIC T	ug/L	<3	<3	<3	<3	<3	<3	-	<3	<3
	BARIUM T	ug/L	26	27	18	24	49	22	-	45	47
	BORON T	ug/L	<200	-	<200	-	-	<200	-	-	-
	BROMIDE	mg/L	<50	<0.2	<50	<0.2	<0.2	<50	<0.2	<0.2	<0.2
	CADMIUM D	ug/L	-	<0.2	-	<0.2	<0.2	-	-	<0.2	<0.2
	CADMIUM T	ug/L	-	<0.2	-	<0.2	<0.2	-	-	<0.2	<0.2
	CALCIUM T	mg/L	1.491	6.016	4.426	4.288	16.5	5.383	-	20.3	17.2
	CHLORIDE T	mg/L	0.51	1.3	2.67	1.1	16.2	2.46	1.7	19.4	10.7
	CHROMIUM T	ug/L	-	<50	-	<50	<50	-	-	<50	<50
	COPPER D	ug/L	-	<4	-	<4	<4	-	-	<4	<4
	COPPER T	ug/L	-	<4	-	<4	<4	-	-	<4	<4
	IRON D	ug/L	-	<20	-	<20	<20	-	22	<20	<20
	IRON T	ug/L	21	<20	31	59	<20	123	-	158	399
	LEAD D	ug/L	-	<1	-	<1	<1	-	-	<1	<1
	LEAD T	ug/L	-	<1	-	<1	<1	-	-	<1	<1
	MAGNESIUM T	mg/L	0.519	1.109	0.778	0.916	2.293	1.177	-	4.198	4.35
	MANGANESE T	ug/L	53	<10	<10	<10	<10	38	-	22	103
	NICKEL D	ug/L	-	<4	-	<4	<4	-	-	<4	<4
	NICKEL T	ug/L	-	<4	-	<4	<4	-	-	<4	<4
	SELENIUM T	ug/L	<7	-	<7	-	-	<7	-	-	-
	SODIUM T	mg/L	0.308	-	2.058	-	-	1.912	-	-	-
	STRONTIUM T	ug/L	12	32	18	21	74	26	-	69	75
	SULFATE T	mg/L	6.46	<15	7.84	<15	<15	9.32	<15	<15	<15
	ZINC D	ug/L	-	5.98	-	6.02	6.7	-	-	5.92	6.63
	ZINC T	ug/L	18	6.69	<10	6.72	18.2	12	-	5.31	7.71
NUTR.	AMMONIA T	mg/L	<0.02	<0.02	<0.02	<0.02	<0.02	0.03	0.02	<0.02	<0.02
	NITRATE & NITRITE T	mg/L	0.07	-	0.07	-	-	0.16	-	-	-
	NITRATE T	mg/L	-	0.21	-	0.13	0.47	-	0.38	1.5	0.11
	NITRITE T	mg/L	-	<0.01	-	<0.01	<0.01	-	<0.01	<0.01	<0.01
	PHOSPHORUS T	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01	0.011	<0.01	0.024	0.027
PHYSICAL/OTHER	ACIDITY T	mg/L	-	-8.6	-	-3.4	-27	-	-6.8	-40.6	-44.6
	ALKALINITY T	mg/L	0.2	13.8	6.6	8.4	36	9.8	8.8	49.8	54.2
	CBOD	mg/L	0.4	-	1	-	-	0.4	-	-	-
	DISSOLVED OXYGEN	mg/L	8.84	-	-	-	-	-	-	-	-
	HARDNESS T	mg/L	6	20	14	14	51	18	-	68	61
	OSMOTIC PRESSURE	mosm/kg	1	-	2	-	-	1	-	-	-
	pH	pH units	5.51	7.1	6.91	6.9	7.6	7.5	7.2	7.9	7.5
	SPEC COND	umhos/cm	20.3	51.8	46.9	40.6	158.5	51.9	45.6	195.7	169.6
	TDS	mg/L	20	40	<5	34	104	48	12	136	102
	TSS	mg/L	<5	<5	6	<5	<5	12	6	<5	<5

[1] Refer to Appendix A for station locations

"<" indicate concentrations below the reporting limit.

"-" indicate parameter was not tested

Table B3. Lycoming Creek Basin Physicochemical Data – Lower Lycoming Creek Mainstem.

	PARAMETER	UNITS	STATIONS[1]				
			27LC	27LC	27LC	28LC	29LC
			5/11/2011	8/2/2011	12/21/2011	12/21/2011	12/21/2011
METALS AND IONS	ALUMINUM D	ug/L	-	<200	<200	<200	<200
	ALUMINUM T	ug/L	<200	37.8	-	-	-
	ARSENIC D	ug/L	-	3	3	<3	<3
	ARSENIC T	ug/L	<3	<3	-	-	-
	BARIUM T	ug/L	26	33	-	-	-
	BORON T	ug/L	<200	-	-	-	-
	BROMIDE	mg/L	<50	<0.2	<0.2	<0.2	<0.2
	CADMIUM D	ug/L	-	<0.2	<0.2	<0.2	<0.2
	CADMIUM T	ug/L	-	<0.2	-	-	-
	CALCIUM T	mg/L	6.228	13.1	-	-	-
	CHLORIDE T	mg/L	3.78	7.9	3.2	3.3	3.6
	CHROMIUM T	ug/L	-	<50	-	-	-
	COPPER D	ug/L	-	<4	<4	<4	<4
	COPPER T	ug/L	-	<4	-	-	-
	IRON D	ug/L	-	28	26	48	31
	IRON T	ug/L	53	75	-	-	-
	LEAD D	ug/L	-	<1	<1	<1	<1
	LEAD T	ug/L	-	<1	-	-	-
	MAGNESIUM T	mg/L	1.345	2.164	-	-	-
	MANGANESE T	ug/L	22	29	-	-	-
	NICKEL D	ug/L	-	<4	<4	15.5	<4
	NICKEL T	ug/L	-	<4	-	-	-
	SODIUM T	mg/L	2.476	-	-	-	-
	STRONTIUM T	ug/L	30	55	-	-	-
	SULFATE T	mg/L	9.55	<15	<15	<15	<15
	ZINC D	ug/L	-	<5	39.9	11.1	59.3
	ZINC T	ug/L	10	5.68	-	-	-
NUTR.	AMMONIA T	mg/L	0.03	<0.02	<0.02	<0.02	0.03
	NITRATE & NITRITE T	mg/L	0.28	-	-	-	-
	NITRATE T	mg/L	-	0.18	0.4	0.41	0.42
	NITRITE T	mg/L	-	<0.01	<0.01	<0.01	<0.01
	PHOSPHORUS T	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
PHYSICAL/OTHER	ACIDITY T	mg/L	-	-26.2	-10.4	-11	-10.6
	ALKALINITY T	mg/L	11.6	31.2	12.4	12.6	13.2
	CBOD	mg/L	0.6	-	-	-	-
	DISSOLVED OXYGEN	mg/L	-	-	-	-	-
	HARDNESS T	mg/L	21	42	-	-	-
	OSMOTIC PRESSURE	mosm/kg	2	-	-	-	-
	pH	pH units	7.5	7.6	7.2	7.2	7.3
	SPEC COND	umhos/cm	60.6	120.3	63.2	65.3	66.8
	TDS	mg/L	50	66	54	52	60
	TSS	mg/L	8	<5	<5	<5	<5

[1] Refer to Appendix A for station locations

"<" indicate concentrations below the reporting limit.

"-" indicate parameter was not tested

APPENDIX C – BENTHIC MACROINVERTEBRATE DATA

Table C1. Lycoming Creek Basin, Source to Rock Run – Benthic Macroinvertebrate Data.

TAXA		STATIONS[1]									
		1LC	2MC	3RB	4BC	5RB	6AR	7RR	8LC	9YR	10MR
Ephemeroptera											
Amelitidae	*Ameletus*	-	-	1	1	-	5	-	-	8	-
Baetidae	*Baetis*	3	3	1	1	1	1	-	-	-	-
Baetidae	*Diphetor*	-	1	-	1	-	-	-	-	-	-
Isonychiidae	*Isonychia*	-	-	-	1	1	-	-	1	-	-
Heptageniidae	*Epeorus*	63	31	51	52	43	-	-	60	-	-
Heptageniidae	*Leucrocuta*	-	6	3	-	5	-	-	1	-	-
Heptageniidae	*Rhithrogena*	-	1	-	5	1	-	-	1	-	-
Heptageniidae	*Stenacron*	-	1	1	2	1	-	-	2	-	-
Heptageniidae	*Maccaffertium*	-	-	3	1	-	-	-	-	2	-
Heptageniidae	*Cinygmula*	29	70	16	20	56	-	-	38	-	-
Ephemerellidae	*Drunella*	1	-	1	-	3	-	-	5	-	-
Ephemerellidae	*Ephemerella*	2	4	8	15	9	-	-	7	-	-
Ephemerellidae	*Eurylophella*	-	6	4	5	3	4	-	5	-	-
Ephemerellidae	*Serratella*	-	-	6	4	5	-	-	2	-	-
Leptophlebiidae	*Paraleptophlebia*	4	9	49	20	45	-	-	25	-	-
Ephemeridae	*Ephemera*	-	-	-	-	1	-	-	-	-	-
Plecoptera											
Pteronarcyidae	*Pteronarcys*	-	5	-	1	-	-	-	-	2	-
Peltoperlidae	*Peltoperla*	-	-	-	-	-	9	-	-	23	-
Peltoperlidae	*Tallaperla*	-	-	-	1	-	-	-	-	-	-
Taeniopterygidae	*Taenionema*	2	2	4	4	4	-	-	7	-	-
Nemouridae	*Amphinemura*	19	3	-	-	-	68	46	1	38	53
Nemouridae	*Ostrocerca*	-	-	-	-	-	27	2	-	-	6
Nemouridae	*Paranemoura*	-	-	-	-	-	-	-	-	12	-
Nemouridae	*Prostoia*	6	-	2	1	-	-	-	-	-	-
Leuctridae	*Leuctra*	-	-	1	-	-	12	70	-	44	91
Leuctridae	*Paraleuctra*	-	-	-	-	-	-	1	-	3	-
Perlidae	*Agnetina*	-	2	6	5	3	-	-	2	-	-
Perlidae	*Hansonoperla*	-	-	-	-	-	-	1	-	-	-
Perlidae	*Paragnetina*	-	-	-	2	-	-	-	-	-	-
Perlidae	*Acroneuria*	-	1	2	2	-	-	-	1	-	-
Perlodidae	*Isoperla*	2	5	2	2	2	-	1	2	-	2
Chloroperlidae	*Haploperla*	-	6	7	1	2	-	-	20	-	-
Chloroperlidae	*Sweltsa*	-	8	7	6	1	4	-	1	19	-

[1] Refer to Appendix A for station locations

"-" indicate taxa was not identified at a particular station

Table C1 (cont.). Lycoming Creek Basin, Source to Rock Run – Benthic Macroinvertebrate Data.

TAXA		STATIONS[1]									
		1LC	2MC	3RB	4BC	5RB	6AR	7RR	8LC	9YR	10MR
Trichoptera											
Philopotamidae	*Dolophilodes*	-	-	-	-	-	-	-	-	-	1
Philopotamidae	*Wormaldia*	2	-	-	-	-	4	-	-	5	-
Polycentropidae	*Polycentropus*	-	-	-	-	-	-	-	-	1	-
Hydropsychidae	*Parapsyche*	-	-	-	-	-	1	-	-	2	-
Hydropsychidae	*Diplectrona*	-	-	-	-	-	-	-	-	1	-
Hydropsychidae	*Ceratopsyche*	-	3	2	2	-	-	-	1	-	-
Hydropsychidae	*Cheumatopsyche*	2	-	-	1	-	-	-	1	-	-
Rhyacophilidae	*Rhyacophila*	2	1	4	7	1	7	2	2	10	2
Odontoceridae	*Psilotreta*	-	-	3	-	-	-	-	-	-	-
Lepidostomatidae	*Lepidostoma*	-	-	-	-	-	1	-	-	4	2
Uenoidae	*Neophylax*	5	3	3	3	-	2	5	-	5	7
Megaloptera											
Corydalidae	*Nigronia*	1	-	-	-	-	-	-	-	-	-
Odonata											
Gomphidae	*Stylogomphus*	-	-	1	-	-	-	-	-	-	-
Diptera											
Ceratopogonidae	*Probezzia*	-	1	-	-	1	2	-	1	2	-
Empididae	*Clinocera*	1	-	-	-	-	-	-	-	-	-
Tipulidae	*Dicranota*	-	-	-	-	-	1	-	-	1	-
Tipulidae	*Hexatoma*	-	2	3	4	8	2	-	3	2	2
Tipulidae	*Limnophila*	-	-	-	-	-	1	-	-	-	-
Tipulidae	*Molophilus*	-	-	1	-	-	-	-	-	-	-
Simuliidae	*Prosimulium*	56	5	2	10	10	24	68	12	2	13
Simuliidae	*Stegopterna*	-	-	-	-	1	-	1	-	2	-
Chironomidae		20	8	2	5	2	20	9	7	9	12
Dolichopodidae		-	-	-	-	-	-	-	-	1	-
Coleoptera											
Psephenidae	*Psephenus*	-	-	-	1	-	-	-	-	-	-
Psephenidae	*Ectopria*	-	-	-	-	1	-	-	-	-	-
Elmidae	*Optioservus*	1	-	-	-	1	-	-	-	-	-
Elmidae	*Oulimnius*	1	2	-	1	-	-	1	2	-	-
Non-Insect Taxa											
Oligochaeta		3	-	2	-	-	-	1	3	-	-
Cambaridae	*Cambarus*	-	-	-	-	-	-	-	-	1	1
Taxa Richness		21	26	30	32	26	19	13	27	24	12
Total Organisms		225	189	198	187	211	195	208	213	199	192

[1] Refer to Appendix A for station locations

"-" indicate taxa was not identified at a particular station

Table C2. Lycoming Creek Basin, Rock Run to Trout Run – Benthic Macroinvertebrate Data.

TAXA		STATIONS[1]								
		11RKR	12FR	13LR	14PS	15SR	16GR	17LGR	18GR	19TR
Ephemeroptera										
Amelitidae	*Ameletus*	3	4	2	1	2	-	-	-	1
Baetiscidae	*Baetisca*	1	-	-	-	-	-	-	-	-
Baetidae	*Baetis*	4	-	-	9	-	6	-	18	1
Baetidae	*Diphetor*	-	-	-	-	-	-	-	-	4
Isonychiidae	*Isonychia*	-	-	-	3	-	-	-	1	2
Heptageniidae	*Epeorus*	55	-	21	43	50	54	-	56	35
Heptageniidae	*Heptagenia*	-	-	1	-	-	-	-	-	-
Heptageniidae	*Leucrocuta*	4	-	-	2	-	-	-	-	1
Heptageniidae	*Rhithrogena*	-	-	-	-	1	-	-	1	-
Heptageniidae	*Stenacron*	-	-	-	-	-	1	-	-	4
Heptageniidae	*Maccaffertium*	1	-	3	-	-	-	-	-	1
Heptageniidae	*Cinygmula*	10	-	-	39	30	40	-	4	16
Ephemerellidae	*Drunella*	1	-	-	7	-	13	1	3	18
Ephemerellidae	*Ephemerella*	7	-	-	41	8	6	1	87	17
Ephemerellidae	*Eurylophella*	4	6	1	-	1	-	-	1	1
Ephemerellidae	*Serratella*	1	-	-	1	-	-	-	1	-
Leptophlebiidae	*Paraleptophlebia*	8	-	-	19	13	3	-	9	30
Ephemeridae	*Ephemera*	-	-	-	-	-	-	-	1	-
Plecoptera										
Pteronarcyidae	*Pteronarcys*	2	-	1	1	-	5	-	1	-
Peltoperlidae	*Peltoperla*	-	-	-	-	-	-	44	-	-
Peltoperlidae	*Tallaperla*	-	-	36	-	-	-	-	1	-
Taeniopterygidae	*Taenionema*	3	-	-	3	-	-	-	3	10
Nemouridae	*Amphinemura*	2	29	13	2	-	3	52	-	3
Nemouridae	*Ostrocerca*	-	4	-	1	-	1	-	-	-
Nemouridae	*Soyedina*	-	-	-	-	-	-	3	-	-
Leuctridae	*Leuctra*	1	45	25	-	-	4	44	-	1
Leuctridae	*Paraleuctra*	-	-	-	-	-	-	3	-	-
Perlidae	*Agnetina*	-	-	-	1	-	-	-	1	1
Perlidae	*Acroneuria*	3	2	2	-	1	-	-	-	1
Perlidae	*Paragnetina*	1	-	-	-	-	-	-	-	-
Perlodidae	*Cultus*	1	-	-	-	-	-	-	1	-
Perlodidae	*Isogenoides*	1	-	-	-	-	-	-	1	-
Perlodidae	*Malirekus*	-	1	-	-	-	3	-	-	-
Perlodidae	*Yugus*	-	-	-	3	-	-	-	-	-
Perlodidae	*Clioperla*	-	2	-	-	-	-	-	-	-
Perlodidae	*Isoperla*	-	-	-	-	-	-	-	3	6
Chloroperlidae	*Alloperla*	1	-	-	-	-	-	-	-	-
Chloroperlidae	*Haploperla*	1	4	6	1	-	4	-	2	14
Chloroperlidae	*Rasvena*	2	-	-	-	-	-	-	-	-
Chloroperlidae	*Suwallia*	-	-	-	3	-	4	-	-	-
Chloroperlidae	*Sweltsa*	6	6	16	1	-	8	30	2	2

[1] Refer to Appendix A for station locations

"-" indicate taxa was not identified at a particular station

Table C2 (cont.). Lycoming Creek Basin, Rock Run to Trout Run – Benthic Macroinvertebrate Data.

TAXA		STATIONS[1]								
		11RKR	12FR	13LR	14PS	15SR	16GR	17LGR	18GR	19TR
Trichoptera										
Philopotamidae	*Wormaldia*	-	4	4	-	-	-	6	1	-
Polycentropidae	*Polycentropus*	-	1	2	-	-	-	1	-	-
Hydropsychidae	*Diplectrona*	-	4	7	-	1	-	-	-	1
Hydropsychidae	*Ceratopsyche*	4	-	7	2	2	2	1	1	6
Hydropsychidae	*Cheumatopsyche*	6	-	-	3	1	-	-	-	17
Rhyacophilidae	*Rhyacophila*	4	7	4	3	1	12	9	4	1
Lepidostomatidae	*Lepidostoma*	1	-	2	1	1	2	1	-	1
Uenoidae	*Neophylax*	1	2	-	1	5	4	4	1	4
Diptera										
Ceratopogonidae	*Probezzia*	1	-	1	-	-	1	-	-	-
Psychodidae	*Pericoma*	-	1	-	-	-	-	-	-	-
Empididae	*Oreogeton*	-	-	-	-	-	1	-	-	-
Tabanidae	*Chrysops*	-	-	1	-	-	-	-	-	-
Tipulidae	*Antocha*	-	-	-	-	-	2	-	-	-
Tipulidae	*Dicranota*	-	-	-	-	1	-	-	1	-
Tipulidae	*Hexatoma*	5	1	3	-	1	2	-	-	5
Tipulidae	*Limnophila*	-	1	3	-	-	-	-	-	-
Tipulidae	*Pseudolimnophila*	-	-	-	-	-	-	-	1	-
Simuliidae	*Prosimulium*	13	30	6	3	44	1	23	17	15
Chironomidae		5	9	8	3	51	6	10	-	9
Coleoptera										
Psephenidae	*Psephenus*	-	-	-	-	-	-	-	-	1
Psephenidae	*Ectopria*	-	-	-	1	-	-	-	-	
Elmidae	*Oulimnius*	1	2	-	-	3	17	-	5	1
Non-Insect Taxa										
Oligochaeta		-	2	-	2	1	-	-	-	-
Cambaridae	*Cambarus*	-	-	4	-	-	-	3	-	-
Asellidae	*Lirceus*	-	1	-	-	-	-	-	-	-
Taxa Richness		34	23	25	28	20	26	17	28	32
Total Organisms		164	168	179	200	218	205	236	228	230

[1] Refer to Appendix A for station locations

"-" indicate taxa was not identified at a particular station

Table C3. Lycoming Creek Basin, Trout Run to Mouth – Benthic Macroinvertebrate Data.

TAXA		STATIONS[1]									
		20LC	21HR	22LGR	23HR	24MLC	25UBR	26BR	27LC	28LC	29LC
Ephemeroptera											
Amelitidae	*Ameletus*	-	-	-	-	-	-	3	-	-	-
Baetidae	*Acentrella*	-	-	-	-	-	-	-	4	-	-
Baetidae	*Acerpenna*	-	-	-	-	-	7	-	-	-	-
Baetidae	*Baetis*	-	1	-	4	-	-	-	-	-	1
Baetidae	*Diphetor*	-	2	-	-	-	-	-	-	1	1
Isonychiidae	*Isonychia*	-	-	-	6	-	-	-	6	14	18
Heptageniidae	*Epeorus*	9	9	-	14	22	5	31	10	6	5
Heptageniidae	*Leucrocuta*	1	-	-	-	1	-	1	1	3	10
Heptageniidae	*Rhithrogena*	-	-	-	-	-	-	-	-	1	-
Heptageniidae	*Stenacron*	1	-	-	-	-	-	2	-	-	-
Heptageniidae	*Stenonema*	-	-	-	-	-	-	2	-	-	-
Heptageniidae	*Maccaffertium*	4	1	-	3	-	-	-	3	5	17
Heptageniidae	*Cinygmula*	2	1	-	3	20	-	-	14	1	1
Ephemerellidae	*Drunella*	2	-	-	-	-	-	2	35	1	-
Ephemerellidae	*Ephemerella*	117	53	-	9	41	6	51	74	2	3
Ephemerellidae	*Eurylophella*	7	1	1	-	2	1	3	-	1	2
Ephemerellidae	*Serratella*	4	8	-	-	1	-	-	2	-	5
Caenidae	*Caenis*	-	-	-	-	-	-	-	1	-	-
Leptophlebiidae	*Paraleptophlebia*	-	16	-	24	14	2	-	2	4	-
Plecoptera											
Pteronarcyidae	*Pteronarcys*	-	-	-	-	-	-	-	1	-	-
Peltoperlidae	*Tallaperla*	1	-	-	-	-	-	-	-	-	-
Taeniopterygidae	*Taeniopteryx*	1	-	-	2	-	-	-	-	22	38
Taeniopterygidae	*Strophopteryx*	-	-	-	-	-	-	-	-	11	7
Taeniopterygidae	*Taenionema*	1	-	-	23	1	-	-	-	3	-
Nemouridae	*Amphinemura*	-	7	48	-	4	19	1	-	-	-
Nemouridae	*Ostrocerca*	-	-	-	-	-	2	-	-	-	-
Nemouridae	*Prostoia*	-	-	-	9	-	1	-	-	35	10
Leuctridae	*Leuctra*	-	1	83	1	-	1	-	-	-	1
Capniidae	*Allocapnia*	-	-	-	53	-	-	-	-	70	31
Perlidae	*Acroneuria*	-	6	1	4	1	-	-	-	-	-
Perlodidae	*Diploperla*	-	-	-	1	-	-	-	-	-	-
Perlodidae	*Helopicus*	-	-	-	-	-	-	-	-	-	1
Perlodidae	*Isogenoides*	1	-	-	-	-	-	-	-	-	-
Perlodidae	*Isoperla*	4	5	-	11	4	1	23	3	1	2
Chloroperlidae	*Sweltsa*	-	-	4	2	2	-	1	-	-	-
Chloroperlidae	*Alloperla*	-	2	-	-	-	-	-	-	-	-
Chloroperlidae	*Haploperla*	-	7	-	-	6	-	-	3	-	-

[1] Refer to Appendix A for station locations

"-" indicate taxa was not identified at a particular station

Table C3 (cont.). Lycoming Creek Basin, Trout Run to Mouth – Benthic Macroinvertebrate Data.

TAXA		STATIONS[1]									
		20LC	21HR	22LGR	23HR	24MLC	25UBR	26BR	27LC	28LC	29LC
Trichoptera											
Philopotamidae	*Chimarra*	1	-	-	-	-	7	1	6	-	2
Philopotamidae	*Dolophilodes*	-	-	-	3	-	-	-	-	-	-
Psychomyiidae	*Lype*	-	-	1	-	-	-	-	-	-	-
Polycentropidae	*Polycentropus*	-	1	3	2	-	-	-	-	-	-
Hydropsychidae	*Diplectrona*	-	4	7	2	1	-	-	-	-	-
Hydropsychidae	*Ceratopsyche*	4	2	-	2	3	-	1	1	2	10
Hydropsychidae	*Cheumatopsyche*	5	11	-	5	3	6	5	2	4	10
Rhyacophilidae	*Rhyacophila*	5	5	4	1	2	-	-	1	1	1
Glossosomatidae	*Micrasema*	2	-	-	-	-	-	-	-	-	-
Lepidostomatidae	*Lepidostoma*	2	1	3	1	-	-	-	-	-	-
Apataniidae	*Apatania*	-	-	-	-	-	-	-	-	-	1
Uenoidae	*Neophylax*	16	2	-	1	1	6	1	1	-	-
Megaloptera											
Corydalidae	*Sialis*	-	-	-	-	1	-	-	-	-	-
Corydalidae	*Corydalus*	-	-	-	-	-	-	-	2	-	-
Corydalidae	*Nigronia*	-	1	-	1	-	-	-	-	-	-
Odonata											
Gomphidae	*Lanthus*	1	-	-	1	-	-	-	-	-	-
Gomphidae	*Ophiogomphus*	-	-	-	-	-	-	-	-	-	1
Gomphidae	*Stylogomphus*	1	4	-	-	-	-	-	-	-	-
Cordulegastridae	*Cordulegaster*	-	-	1	-	-	-	-	-	-	-
Coenagrionidae	*Argia*	-	-	-	-	-	-	-	-	-	2
Diptera											
Empididae	*Clinocera*	-	-	-	-	-	-	1	-	-	-
Tipulidae	*Tipula*	1	-	-	1	-	-	-	1	-	-
Tipulidae	*Antocha*	-	-	-	1	-	-	-	-	-	-
Tipulidae	*Dicranota*	1	1	1	-	-	-	-	-	-	-
Tipulidae	*Hexatoma*	-	1	4	1	-	-	-	-	-	-
Tipulidae	*Pseudolimnophila*	-	2	-	-	-	-	1	-	-	-
Simuliidae	*Prosimulium*	4	9	1	6	22	21	25	-	16	4
Chironomidae		1	17	7	29	49	90	11	3	19	12

[1] Refer to Appendix A for station locations

"-" indicate taxa was not identified at a particular station

Table C3 (cont.). Lycoming Creek Basin, Trout Run to Mouth – Benthic Macroinvertebrate Data.

TAXA		STATIONS[1]									
		20LC	21HR	22LGR	23HR	24MLC	25UBR	26BR	27LC	28LC	29LC
Coleoptera											
Psephenidae	*Psephenus*	2	-	-	1	1	4	10	22	3	7
Psephenidae	*Ectopria*	1	-	-	-	-	-	-	-	-	-
Elmidae	*Optioservus*	-	19	-	2	7	-	13	5	1	13
Elmidae	*Oulimnius*	3	2	3	2	2	-	-	-	-	-
Elmidae	*Promoresia*	4	1	3	2	1	4	-	1	-	9
Elmidae	*Stenelmis*	1	3	-	-	-	10	7	14	-	1
Non-Insect Taxa											
Oligochaeta		4	2	-	-	3	1	3	3	1	-
Cambaridae	*Cambarus*	-	1	-	-	-	-	-	-	-	-
Taxa Richness		33	35	17	35	26	19	23	27	25	30
Total Organisms		214	209	175	233	215	194	199	221	228	226

[1] Refer to Appendix A for station locations
"-" indicate taxa was not identified at a particular station

Table C4. Reference Station – Benthic Macroinvertebrate Data.

TAXA		REF STATIONS[1]			
		SB	1KC	2KC	3KC
Ephemeroptera					
Baetidae	*Acentrella*	-	-	3	-
Baetidae	*Baetis*	15	3	2	-
Baetidae	*Diphetor*	7	-	-	-
Isonychiidae	*Isonychia*	-	1	8	4
Heptageniidae	*Epeorus*	29	20	2	1
Heptageniidae	*Heptagenia*	-	1	-	-
Heptageniidae	*Leucrocuta*	-	1	-	2
Heptageniidae	*Rhithrogena*	4	-	1	-
Heptageniidae	*Stenacron*	-	-	2	-
Heptageniidae	*Maccaffertium*	-	2	1	2
Heptageniidae	*Cinygmula*	22	11	1	-
Ephemerellidae	*Drunella*	9	25	72	1
Ephemerellidae	*Ephemerella*	16	28	50	1
Ephemerellidae	*Serratella*	-	5	5	3
Leptophlebiidae	*Paraleptophlebia*	6	43	5	-
Ephemeridae	*Ephemera*	-	-	1	-
Plecoptera					
Pteronarcyidae	*Pteronarcys*	2	1	-	-
Taeniopterygidae	*Taeniopteryx*	-	-	-	11
Taeniopterygidae	*Strophopteryx*	-	-	-	62
Taeniopterygidae	*Taenionema*	-	-	-	3
Nemouridae	*Amphinemura*	6	-	-	-
Nemouridae	*Prostoia*	-	-	-	9
Leuctridae	*Leuctra*	5	-	1	-
Capniidae	*Allocapnia*	-	-	-	39
Perlidae	*Agnetina*	1	-	-	-
Perlidae	*Paragnetina*	-	3	-	-
Perlidae	*Acroneuria*	1	3	4	6
Perlodidae	*Isoperla*	5	4	1	1
Chloroperlidae	*Alloperla*	1	-	-	-
Chloroperlidae	*Haploperla*	5	-	-	-
Chloroperlidae	*Sweltsa*	2	-	-	-

[1] Refer to Appendix A for station locations

"-" indicate taxa was not identified at a particular station

Table C4 (cont.). Reference Station – Benthic Macroinvertebrate Data.

TAXA		REF STATIONS[1]			
		SB	1KC	2KC	3KC
Trichoptera					
Philopotamidae	*Chimarra*	-	-	-	3
Philopotamidae	*Dolophilodes*	1	-	-	-
Polycentropidae	*Polycentropus*	-	2	1	-
Hydropsychidae	*Diplectrona*	2	-	-	-
Hydropsychidae	*Ceratopsyche*	-	6	3	8
Hydropsychidae	*Cheumatopsyche*	1	11	11	3
Rhyacophilidae	*Rhyacophila*	3	-	-	-
Lepidostomatidae	*Lepidostoma*	-	1	-	3
Uenoidae	*Neophylax*	2	3	1	1
Leptoceridae	*Ceraclea*	-	-	1	-
Megaloptera					
Corydalidae	*Nigronia*	1	1	1	-
Odonata					
Gomphidae	*Lanthus*	-	-	2	-
Gomphidae	*Ophiogomphus*	-	-	-	2
Diptera					
Athericidae	*Atherix*	1	-	-	1
Tipulidae	*Antocha*	6	2	1	-
Tipulidae	*Dicranota*	2	1	-	-
Tipulidae	*Hexatoma*	-	1	1	-
Tipulidae	*Pseudolimnophila*	-	1	-	-
Simuliidae	*Prosimulium*	5	14	4	31
Simuliidae	*Simulium*	2	-	1	-
Chironomidae		5	26	15	8
Coleoptera					
Psephenidae	*Psephenus*	-	-	-	6
Elmidae	*Optioservus*	12	6	-	2
Elmidae	*Oulimnius*	27	1	-	-
Elmidae	*Stenelmis*	2	-	-	-
Non-Insect Taxa					
Oligochaeta		-	-	1	-
Cambaridae		1	-	-	-
Taxa Richness		33	29	29	25
Total Organisms		209	227	202	213

[1] Refer to Appendix A for station locations

"-" indicate taxa was not identified at a particular station

APPENDIX D – HABITAT EVALUATION DATA

Table D1. Lycoming Creek Basin, Source to Rock Run – Habitat Evaluation Data.

PARAMETER	STATIONS[1]									
	1LC	2MC	3RB	4BC	5RB	6AR	7RR	8LC	9YR	10MR
1. INSTREAM COVER	17	19	17	16	20	19	18	19	20	18
2. EPIFAUNAL SUBSTRATE	16	19	19	20	20	20	18	19	20	19
3. EMBEDDEDNESS	16	19	19	17	18	18	18	16	19	19
4. VELOCITY/DEPTH	15	17	19	19	19	15	15	15	15	16
5. CHANNEL ALTERATIONS	20	15	18	20	15	15	20	15	20	20
6. SEDIMENT DEPOSITION	16	17	16	16	15	16	19	16	17	16
7. RIFFLE FREQUENCY	15	17	19	20	19	20	19	16	19	20
8. CHANNEL FLOW STATUS	20	20	20	20	20	20	20	20	20	20
9. BANK CONDITION	16	20	20	20	20	16	20	15	20	20
10. BANK VEGETATIVE PROTECTION	16	18	20	20	16	16	19	18	20	20
11. GRAZING/DISRUPTIVE PRESSURES	18	18	20	20	20	16	19	16	20	20
12. RIPARIAN VEG. ZONE WIDTH	16	20	20	20	20	14	20	15	20	20
Total Score	201	219	227	228	222	205	225	200	230	228
Rating[2]	OPT	OPT	OPT	OPT	OPT	OPT	OPT	OPT	OPT	OPT

[1] Refer to Figures 2-4 and Appendix A for station locations
[2] OPT = Optimal (≥192); SUB = Suboptimal (132-192)

Table D2. Lycoming Creek Basin, Rock Run to Trout Run – Habitat Evaluation Data.

PARAMETER	STATIONS[1]								
	11RKR	12FR	13LR	14PS	15SR	16GR	17LGR	18GR	19TR
1. INSTREAM COVER	18	20	19	18	16	19	19	19	17
2. EPIFAUNAL SUBSTRATE	19	20	20	19	18	19	20	20	19
3. EMBEDDEDNESS	19	19	20	19	19	17	19	18	18
4. VELOCITY/DEPTH	16	16	15	16	15	16	15	15	15
5. CHANNEL ALTERATIONS	18	15	20	18	16	18	20	15	17
6. SEDIMENT DEPOSITION	17	17	16	17	15	18	18	19	16
7. RIFFLE FREQUENCY	19	20	20	19	18	20	20	19	19
8. CHANNEL FLOW STATUS	20	20	20	20	19	20	20	20	20
9. BANK CONDITION	20	20	18	20	15	20	18	18	15
10. BANK VEGETATIVE PROTECTION	20	17	18	20	15	20	20	17	18
11. GRAZING/DISRUPTIVE PRESSURES	16	16	20	16	14	20	20	17	20
12. RIPARIAN VEG. ZONE WIDTH	18	18	20	18	15	20	20	16	17
Total	220	218	226	220	195	227	229	213	211
Rating[2]	OPT	OPT	OPT	OPT	OPT	OPT	OPT	OPT	OPT

[1] Refer to Figures 2-4 and Appendix A for station locations
[2] OPT = Optimal (≥192); SUB = Suboptimal (132-192)

Table D3. Lycoming Creek Basin, Trout Run to Mouth – Habitat Evaluation Data.

PARAMETER	STATIONS[1]									
	20LC	21HR	22LGR	23HR	24MLC	25UBR	26BR	27LC	28LC	29LC
1. INSTREAM COVER	16	16	18	18	18	8	13	17	18	17
2. EPIFAUNAL SUBSTRATE	18	18	19	19	18	14	13	18	17	15
3. EMBEDDEDNESS	15	17	17	16	17	10	15	19	16	14
4. VELOCITY/DEPTH	18	15	15	19	15	12	19	15	18	18
5. CHANNEL ALTERATIONS	15	18	19	16	20	13	20	16	15	10
6. SEDIMENT DEPOSITION	14	19	17	17	16	14	15	16	17	15
7. RIFFLE FREQUENCY	18	19	19	17	18	17	15	18	15	16
8. CHANNEL FLOW STATUS	20	20	20	20	20	20	20	20	20	20
9. BANK CONDITION	16	20	20	16	20	10	16	15	15	16
10. BANK VEGETATIVE PROTECTION	19	20	20	16	20	16	16	16	17	16
11. GRAZING/DISRUPTIVE PRESSURES	17	18	17	11	16	8	15	16	14	15
12. RIPARIAN VEG. ZONE WIDTH	16	20	16	12	15	10	18	14	15	14
Total	202	220	217	197	213	152	195	200	197	186
Rating[2]	OPT	OPT	OPT	OPT	OPT	SUB	OPT	OPT	OPT	SUB

[1] Refer to Figures 2-4 and Appendix A for station locations
[2] OPT = Optimal (≥192); SUB = Suboptimal (132-192)

Table D4. Reference Station – Habitat Evaluation Data.

PARAMETER	REFERENCE[1]			
	SB	1KC	2KC	3KC
1. INSTREAM COVER	17	19	15	15
2. EPIFAUNAL SUBSTRATE	19	18	17	18
3. EMBEDDEDNESS	16	16	15	17
4. VELOCITY/DEPTH	18	20	18	15
5. CHANNEL ALTERATIONS	20	20	15	13
6. SEDIMENT DEPOSITION	16	15	15	14
7. RIFFLE FREQUENCY	19	16	17	16
8. CHANNEL FLOW STATUS	20	20	20	19
9. BANK CONDITION	17	17	16	17
10. BANK VEGETATIVE PROTECTION	18	16	16	15
11. GRAZING/DISRUPTIVE PRESSURES	20	16	19	15
12. RIPARIAN VEG. ZONE WIDTH	20	15	20	12
Total	220	208	203	186
Rating[2]	OPT	OPT	OPT	OPT

[1] Refer to Appendix A for station locations
[2] OPT = Optimal (≥192); SUB = Suboptimal (132-192)

APPENDIX E – BIOLOGICAL USE QUALIFICATIONS, CANDIDATE/REFERENCE TABLES

Table E1. 2011 Upper Lycoming Creek Basin < 25 square miles – RBP Metric Comparison.

METRIC	STATIONS[1]										REF[1]
	1LC	2MC	3RB	4BC	6AR	7RR	9YR	10MR	12FR	13LR	SB
1. TAXA RICHNESS	21	26	30	32	19	13	24	12	23	25	33
Cand/Ref (%)	64	79	91	97	58	39	73	36	70	76	XXX
Biol. Cond. Score	2	7	8	8	0	0	5	0	5	6	8
2. MOD. EPT INDEX	12	18	22	23	12	8	15	8	14	16	19
Cand/Ref (%)	63	95	116	121	63	42	79	42	74	84	XXX
Biol. Cond. Score	4	8	8	8	4	0	7	0	6	8	8
3. MOD. HBI	1.96	1.44	1.16	1.27	2.57	1.80	1.63	1.60	1.82	1.23	2.44
Cand-Ref	-0.48	-1.00	-1.28	-1.17	0.13	-0.64	-0.81	-0.84	-0.62	-1.21	XXX
Biol. Cond. Score	8	8	8	8	8	8	8	8	8	8	8
4. % DOMINANT TAXA	28	37.04	25.76	27.81	34.87	33.65	22.11	47.7	26.79	20.11	13.9
Cand-Ref	14.1	23.14	11.86	13.91	20.97	19.75	8.21	33.8	12.89	6.21	XXX
Biol. Cond. Score	8	8[2]	7	6	8[2]	8[2]	8	8[2]	8[2]	8	
5. % MOD. MAYFLIES	44	67.72	72.22	67.38	4.62	0	5.03	0	5.95	15.64	41.1
Ref-Cand	-2.90	-26.62	-31.12	-26.28	36.48	41.1	36.07	41.1	35.15	25.46	XXX
Biol. Cond. Score	8	8	8	8	1	0	1	0	2	4	8
TOTAL BIOLOGICAL CONDITION SCORE	30	39	39	38	21	16	29	16	29	34	40
% COMPARABILITY TO REFERENCE	**75**	**98**	**98**	**95**	**53**	**40**	**73**	**40**	**73**	**85**	

[1] Refer to Figures 2-4 and/or Appendix A for station locations

[2] Dominant Taxa ≤ 3 HBI (DEP 2003)

Table E2. 2011 Spring Lower Lycoming Creek Basin < 25 square miles – RBP Metric Comparison.

METRIC	STATIONS[1]										REF[1]
	15SR	16GR	17LGR	18GR	19TR	21HR	22LGR	24MLC	25UBR	26BR	SB
1. TAXA RICHNESS	20	26	17	28	32	35	17	26	19	23	33
Cand/Ref (%)	61	79	52	85	97	106	52	79	58	70	XXX
Biol. Cond. Score	1	7	0	8	8	8	0	7	0	5	8
2. MOD. EPT INDEX	12	17	12	22	23	17	9	16	11	13	19
Cand/Ref (%)	63	89	63	116	121	89	47	84	58	68	XXX
Biol. Cond. Score	4	8	4	8	8	8	0	8	2	5	8
3. MOD. HBI	2.35	1.46	1.71	1.39	1.93	2.45	1.45	2.63	4.47	2.28	2.44
Cand-Ref	-0.09	-0.98	-0.73	-1.05	-0.51	0.01	-0.99	0.19	2.03	-0.16	XXX
Biol. Cond. Score	8	8	8	8	8	8	8	8	0	8	8
4. % DOMINANT TAXA	23.39	26.34	22.03	38.16	15.22	25.36	47.43	22.8	46.39	25.63	13.9
Cand-Ref	9.49	12.44	8.13	24.26	1.32	11.46	33.53	8.9	32.49	11.73	XXX
Biol. Cond. Score	8	7	8	8[2]	8	7	8[2]	8	0	7	
5. % MOD. MAYFLIES	48.17	57.07	0.85	71.93	54.78	42.58	0.57	47	7.22	47.74	41.1
Ref-Cand	-7.07	-15.97	40.25	-30.83	-13.68	-1.48	40.53	-5.9	33.88	-6.64	XXX
Biol. Cond. Score	8	8	0	8	8	8	0	8	2	8	8
TOTAL BIOLOGICAL CONDITION SCORE	29	38	20	40	40	39	16	39	4	33	40
% COMPARABILITY TO REFERENCE	**73**	**95**	**50**	**100**	**100**	**98**	**40**	**98**	**10**	**83**	

[1] Refer to Figures 2-4 and/or Appendix A for station locations

[2] Dominant Taxa ≤ 3 HBI (DEP 2003)

Table E3. 2011 Spring Lycoming Creek Basin 25-100 square miles – RBP Metric Comparison.

METRIC	STATIONS[1]				REF[1]
	5RB	8LC	11RKR	14PS	1KC
1. TAXA RICHNESS	26	27	34	28	29
Cand/Ref (%)	90	93	117	97	XXX
Biol. Cond. Score	8	8	8	8	8
2. MOD. EPT INDEX	18	19	26	21	16
Cand/Ref (%)	113	119	163	131	XXX
Biol. Cond. Score	8	8	8	8	8
3. MOD. HBI	1.17	1.29	1.45	1.41	2.23
Cand-Ref	-1.06	-0.94	-0.78	-0.82	XXX
Biol. Cond. Score	8	8	8	8	8
4. % DOMINANT TAXA	26.54	28.17	33.5	21.5	18.9
Cand-Ref	7.64	9.27	14.6	2.6	XXX
Biol. Cond. Score	8[2]	8[2]	8[2]	8	8
5. % MOD. MAYFLIES	81.99	69.01	57.9	78	60.4
Ref-Cand	-21.59	-8.61	2.5	-17.6	XXX
Biol. Cond. Score	8	8	8	8	8
TOTAL BIOLOGICAL CONDITION SCORE	40	40	40	40	40
% COMPARABILITY TO REFERENCE	**100**	**100**	**100**	**100**	

[1] Refer to Figures 2-4 and/or Appendix A for station locations

[2] Dominant Taxa ≤ 3 HBI (DEP 2003)

Table E4. 2011 Spring Lycoming Creek Basin > 100 square miles – RBP Metric Comparison.

METRIC	STATIONS[1]		REF[1]
	20LC	27LC	2KC
1. TAXA RICHNESS	33	27	29
Cand/Ref (%)	114	93	XXX
Biol. Cond. Score	8	8	8
2. MOD. EPT INDEX	19	16	17
Cand/Ref (%)	112	94	XXX
Biol. Cond. Score	8	8	8
3. MOD. HBI	1.92	2.13	2.10
Cand-Ref	-0.18	0.03	XXX
Biol. Cond. Score	8	8	8
4. % DOMINANT TAXA	54.67	33.48	35.6
Cand-Ref	19.07	-2.12	XXX
Biol. Cond. Score	8[2]	8[2]	8
5. % MOD. MAYFLIES	68.69	68.33	74.8
Ref-Cand	6.11	6.47	XXX
Biol. Cond. Score	8	8	8
TOTAL BIOLOGICAL CONDITION SCORE	40	40	40
% COMPARABILITY TO REFERENCE	**100**	**95**	

[1] Refer to Figures 2-4 and/or Appendix A for station locations

[2] Dominant Taxa ≤ 3 HBI (DEP 2003)

Table E5. 2012 Winter Hoagland Run – RBP Metric Comparison.

METRIC	STATION[1]	REF[1]
	23HR	2KC
1. TAXA RICHNESS	35	33
Cand/Ref (%)	106	XXX
Biol. Cond. Score	8	8
2. MOD. EPT INDEX	20	20
Cand/Ref (%)	100	XXX
Biol. Cond. Score	8	8
3. MOD. HBI	2.77	2.31
Cand-Ref	0.46	XXX
Biol. Cond. Score	8	8
4. % DOMINANT TAXA	22.75	15.68
Cand-Ref	7.07	XXX
Biol. Cond. Score	8	8
5. % MOD. MAYFLIES	25.32	33.47
Ref-Cand	8.15	XXX
Biol. Cond. Score	8	8
TOTAL BIOLOGICAL CONDITION SCORE	40	40
% COMPARABILITY TO REFERENCE	**100**	

[1] Refer to Figures 2-4 and/or Appendix A for station locations

Table E6. 2011 Fall Lycoming Creek Lower Mainstem – RBP Metric Comparison.

METRIC	STATIONS[1]		REF[1]
	28LC	29LC	3KC
1. TAXA RICHNESS	25	30	25
Cand/Ref (%)	100	120	XXX
Biol. Cond. Score	8	8	8
2. MOD. EPT INDEX	17	18	17
Cand/Ref (%)	100	106	XXX
Biol. Cond. Score	8	8	8
3. MOD. HBI	2.86	3.02	2.84
Cand-Ref	0.02	0.18	XXX
Biol. Cond. Score	8	8	8
4. % DOMINANT TAXA	30.7	16.81	29.11
Cand-Ref	1.59	-12.3	XXX
Biol. Cond. Score	8[2]	8	8
5. % MOD. MAYFLIES	16.67	26.99	6.57
Ref-Cand	-10.1	-20.42	XXX
Biol. Cond. Score	8	8	8
TOTAL BIOLOGICAL CONDITION SCORE	40	40	40
% COMPARABILITY TO REFERENCE	**100**	**100**	

[1] Refer to Figures 2-4 and/or Appendix A for station locations

APPENDIX F – DEFINITIONS

[1]Definition at 25 Pa. Code § 93.1: *Outstanding National, State, regional or local resource water*—A surface water for which a National or State government Agency has adopted water quality protective measures in a resource management plan, or regional or local governments have adopted coordinated water quality protective measures[2] along a watershed corridor.

[2]Definition at 25 Pa. Code § 93.1: *Coordinated water quality protective measures*—

(i) Legally binding sound land use water quality protective measures coupled with an interest in real estate which expressly provide long-term water quality protection of a watershed corridor.

(ii) Sound land use water quality protective measure include: surface or ground water protection zones, enhanced stormwater management measures, wetland protection zones or other measures which provide extraordinary water quality protection.

(iii) Real estate interests include:

(A) Fee interests.

(B) Conservation easements.

(C) Government owned riparian parks or natural areas

(D) Other interests in land whish enhance water quality in a watershed corridor area.