REYNOLDS RUN

LANCASTER COUNTY

WATER QUALITY STANDARDS REVIEW

DRAFT STREAM EVALUATION REPORT

Segment: Basin
Stream Code: 06995
Drainage List: O

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

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INTRODUCTION

The Department of Environmental Protection (DEP) conducted an evaluation of Reynolds Run from its source to confluence with Octoraro Creek. The evaluation is in response to the Environmental Protection Agency's (EPA) partial approval of the Environmental Quality Board's (EQB) adoption of the 2017 Triennial Review of Water Qualty Standards published the *Pennsylvania Bulletin* at 50 Pa.B. 3426 (July 11, 2020), which did not include approval of the revision to the designated use for Reynolds Run in 25 Pa. Code § 93.9o.

The Reynolds Run basin was initially designated a Conservation Area (3.5) and Cold Water Fishes (1.1) in the final rulemaking at 3 Pa.B. 768 published on April 28, 1973. The Conservation Area designation was converted to High Quality (HQ) in the 1979 final rulemaking (9 Pa.B. 3051). Results of a 1989 study, which included a Use Attainability Analysis (UAA), recommended retention of HQ, special protection status based on "good water quality despite agricultural impacts" (DEP 1989). The 1989 study also recommended redesignation from CWF to TSF based on absence of cold water fish species and instream temperature. The 1989 report describes:

> *Although they [Reynolds and Mcreary Run] are not currently stocked with trout, they are capable of seasonal use by salmonids; in late spring, the temperature and dissolved oxygen levels are still adequate for trout.*, and *…good quality water despite some agricultural impacts. While they [Reynolds and Mcreary Run] maintain a warm-water fishery, they could support seasonal use by salmonids* (DEP 1989).

At that time, American Eel was also documented throughout the watershed providing supporting evidence for recommending the addition of the Migratory Fishes (MF) protected use. Reynolds Run was redesignated from High Quality – Cold Water Fishes (HQ-CWF) to High Quality – Trout Stocking, Migratory Fishes (HQ-TSF, MF) in the final rulemaking at 48 Pa.B. 5513 published on November 30, 1991. In a subsequent 1997 rulemaking, the designated use of Reynolds Run was incorrectly published as HQ-CWF, MF on June 28, 1997 at 27 Pa.B. 3050. The DEP's 2017 Triennial Review corrected this error and updated the designated use from HQ-CWF, MF to HQ-TSF, MF. This error was corrected in the 2017 Triennial Review but was not identified by EPA as a simple correction and was instead identified as a redesignation to a less restrictive use (HQ-CWF to HQ-TSF). As such, 25 Pa. Code § 93.4(b) and 40 CFR § 131.10(g), (h) & (j) require that less restrictive use redesignations be accompanied by a UAA and public participation.

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

Reynolds Run is a freestone tributary to Octoraro Creek located in Little Britain Township, Lancaster County. The Reynolds Run basin includes 8.1 stream miles and drains approximately 4.7 square miles of the Piedmont Upland physiographic province. The majority of the basin is typified by riffle/run habitat with higher slopes located in the downstream reaches. The majority of land cover is agricultural (58%) with an additional 25% forested and 15% developed (Dewitz 2019). There are currently two National Pollutant Discharge Elimination System (NPDES) permits, including one groundwater cleanup facility and one pesticide treatment area.

WATER QUALITY

Discrete Physicochemical

DEP staff collected in-situ field meter data and water chemistry data in December 2014 and August 2021 from two stations on Reynolds Runs (Table 1, Figure 1). Field meter data (temperature, specific conductance, pH, dissolved oxygen) were collected at stations through time (Table 2). Additional discrete water chemistry samples were also collected. Data from 1989 at stations 1RR and 2RR is limited to only a few parameters. Additional parameters were added to the 2014 water chemistry sampling effort conducted at station 1RR (Table 3).

Although the sample size is small, discrete physicochemical data collected throughout the Reynolds Run basin appears to be consistent with land cover, with parameter concentrations decreasing from upstream to downstream. Generally, metals and ion concentrations are moderate and may be increasing through time. Total nutrient concentrations are high with decreasing phosphorus and ammonia concentrations coupled with increasing nitrite-nitrogen concentrations through time.

Table 1. Station Locations – Reynolds Run Basin.

STATION	DESCRIPTION
1RR	Reynolds Run upstream of Kirks Mill Road Little Britain Township, Lancaster County Lat: 39.7592 Long: -76.1055
2RR	Reynolds Run downstream of Kirks Mill Road Little Britain Township, Lancaster County Lat: 39.7433 Long: -76.1111

Table 2. In-Situ Physicochemical Data.

	PAREMETER	UNITS	STATIONS[1]				
			1RR			2RR	
			1989*	12/10/2014	8/9/2021	1989*	12/10/2014
PHYSICAL/ OTHER	DISSOLVED OXYGEN	mg/L	8.4	11.53	9.06	10.8	12.54
	pH	pH units	8	7.08	7.07	6.8	7.41
	SPECIFIC COND	µS/cm[c]	130	262	278	145	258
	TEMPERATURE	°C	21	6.2	20.3	17	6

[1] Refer to Figure 1 and Table 1 for station locations

"*" indicate date undocumented

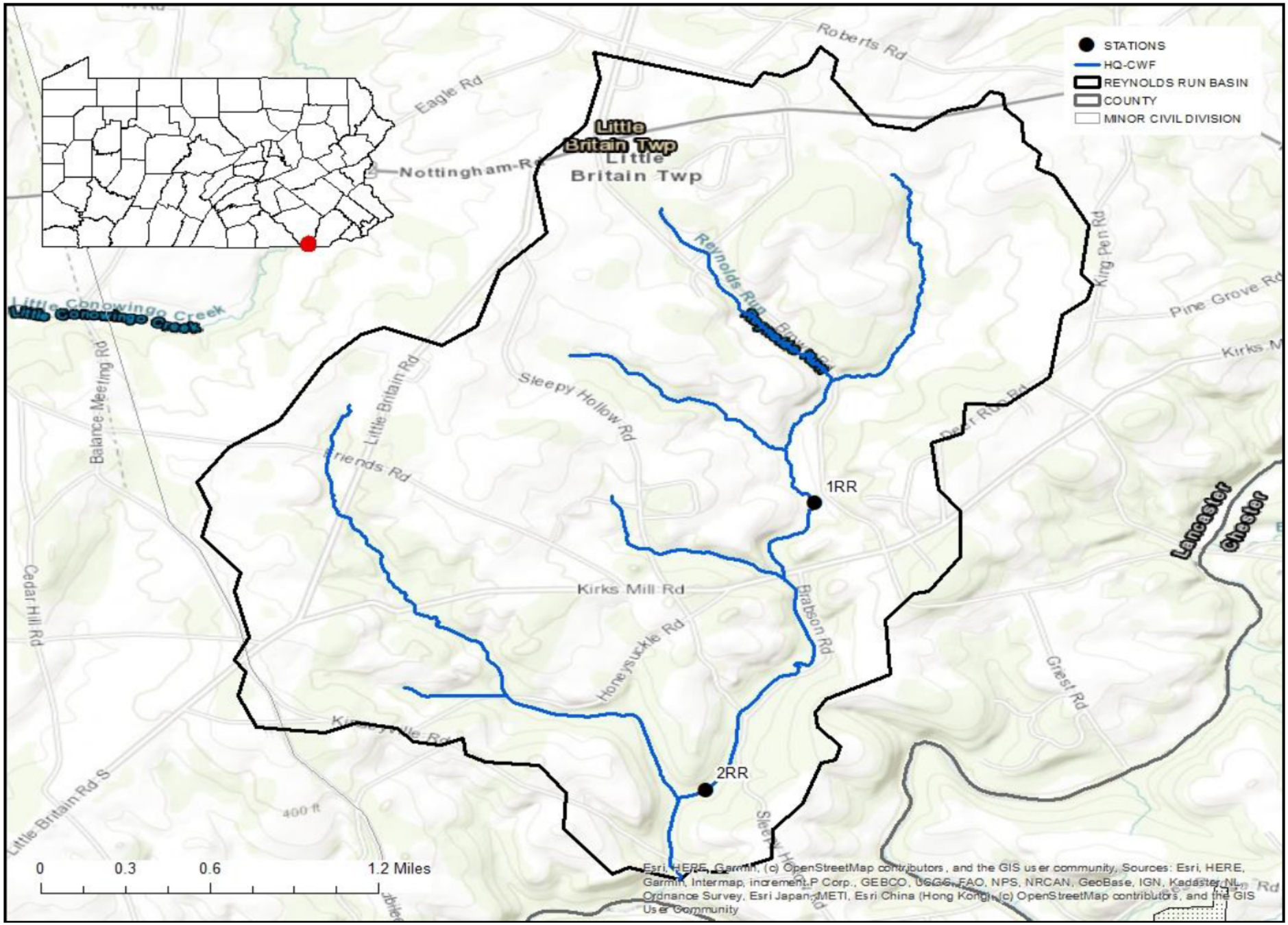

Figure 1. Reynolds Run Basin and Station Locations and Redesignation Recommendation.

Table 3. Discrete Physicochemical Data.

	PARAMETER	UNITS	STATIONS[1] 1RR 1989*	1RR 8/9/2021	2RR 1989*
METALS AND IONS	ALUMINUM T	ug/L	149	122	<135
	BARIUM T	ug/L	-	47	-
	BORON T	ug/L	-	<200	-
	BROMIDE	ug/L	-	<25	-
	CALCIUM T	mg/L	14.1	22.5	13.7
	CHLORIDE T	mg/L	11	23.86	11
	COPPER T	ug/L	-	<4	-
	IRON T	ug/L	235	206	151
	LEAD T	ug/L	-	<1	-
	LITHIUM T	ug/L	-	<25	-
	MAGNESIUM T	mg/L	6	10.9	5.6
	MANGANESE T	ug/L	-	13	-
	NICKEL T	ug/L	-	<50	-
	POTASSIUM T	mg/L	-	2.48	-
	SELENIUM T	ug/L	-	<4	-
	SODIUM T	mg/L	-	11.03	-
	STRONTIUM T	ug/L	-	154	-
	SULFATE T	mg/L	14	17.96	16
	ZINC T	ug/L	-	<30	-
NUTRIENTS	AMMONIA D	mg/L	-	<0.02	-
	AMMONIA T	mg/L	0.05	0.02	0.04
	NITRATE & NITRATE D	mg/L	-	13.23	-
	NITRATE & NITRITE T	mg/L	8.4	13.5	7
	ORTHO PHOSPHORUS D	mg/L	-	0.021	-
	ORTHO PHOSPHORUS T	mg/L	-	0.024	-
	NITROGEN D	mg/L	-	12.43	-
	NITROGEN T	mg/L	-	12.46	-
	PHOSPHORUS D	mg/L	-	0.019	-
	PHOSPHORUS T	mg/L	0.09	0.031	0.08
PHYSICAL/OTHER	ALKALINITY T	mg/L	20	25.6	22
	DIC	mg/L	-	-	-
	DOC	mg/L	-	-	-
	DISSOLVED OXYGEN	mg/L	-	-	-
	HARDNESS T	mg/L	58	101	55
	OSMOTIC PRESSURE	mosm/kg	-	3	-
	pH	pH units	7.5	7.3	7.6
	SPECIFIC COND	µS/cm°	-	284	-
	TEMPERATURE	°C	-	-	-
	TDS	mg/L	124	176	110
	TOC	mg/L	-	1.33	-
	TSS	mg/L	6	<5	6

[1] Refer to Figure 1 and Table 1 for station locations
"<" indicate concentrations below the reporting limit.
"-" indicate parameter was not tested
"*" indicate date undocumented

Biological

The indigenous aquatic community is an excellent indicator of long-term conditions and is used as a measure of water quality. Qualitative macroinvertebrate data was collected at two stations during the 1989 study (DEP 1989). DEP staff collected macroinvertebrate data from the two stations throughout the Reynolds Run basin in 2014. Data were collected using the DEP's *Wadeable Riffle-Run Stream Macroinvertebrate Data Collection Protocol* (Shull 2017).

Macroinvertebrate data from Reynolds Run stations in 2014 are consistent with land cover and water quality conditions. The sample from 2RR, representing the downstream portion of Reynolds Run basin, had an Ephemeroptera Plecoptera Trichoptera (EPT) richness of 19 taxa with 8 Ephemeroptera (mayfly) taxa, 5 Plecoptera (stonefly) taxa and 6 Trichoptera (caddisfly) taxa with an overall sample Hilsenhoff Biotic Index (HBI) of 3.5. The sample from 1RR representing the upstream portion had EPT richness values of 15, with less mayfly taxa (6), less stonefly taxa (4) and less caddisfly taxa (5) than the downstream sample (Table 4). The upstream sample at 1RR had an HBI of 4.01. The differences in the macroinvertebrate communities are consistent with differences expected from the higher-gradient, higher percent forested conditions located in the downstream reaches (Table 5). When comparing Presence/Absence macroinvertebrate data from 1989, taxanomic richness showed dramatic increases through time. Far fewer taxa where observed in 1989 at both sites when compared to 2014. Taxa richness at 1RR in 1989 was 9 taxa; and, taxa richness at 2RR in 1989 was 11 taxa (Table 4).

Fish data were collected from 1RR following DEP's *Fish Data Collection Protocol* (Wertz 2021a) in August 2021. The 1RR location was chosen to be representative of Reynolds Run based on the small drainage size (< 5mi^2) and fairly homogenous habitat availability. Historic fish data were available from the 1989 study (DEP 1989), these data were included even though they were classified by presence/absence, for species-level comparisons. Themal Fish Index (TFI) scores were calculated following DEP's, *Stream Fish Assemblage Assessment Method* (Wertz 2021b).

Fish data from Reynolds Run are consistent with improving habitat and water quality conditions through time. At 1RR, two species with thermal preference of cool-warm have been replaced by two species with thermal preference of cold-cool. Naturally reproducing Brown Trout, with a thermal preference for cold-cool water habitats (Coker 2001, Wertz 2021c), were evidenced by multiple length classes and young-of-year individuals. Rosyside Dace, with a thermal preference of cold-cool water habitats (Wertz 2021c), were also observed. Creek Chub, Longnose Dace, and Tesselated Darter were additional species observed in 2021 that were not documented at 1RR in the 1989 study (Table 6). Presence/Absence data reported in the 1989 study only allow for general TFI scoring unless all species collected are in the same thermal preference group, as was the case with 2RR. Specific TFI scores for 1RR from the 1989 study are unknown but are, at a minimum, greater than 6.0.

Table 4. Benthic Macroinvertebrate Data.

TAXA		STATIONS[1]			
		1RR		2RR	
		1989*	12/10/2014	1989*	12/10/2014
Ephemeroptera (Mayflies)					
Baetidae	*Acentrella*	-	-	-	1
	Baetis	-	3	x	6
	Diphetor	-	2	-	-
Ephemerellidae	*Ephemerella*	-	49	-	58
	Teloganopsis	-	1	-	2
Heptageniidae	*Epeorus*	-	-	-	4
	Leucrocuta	-	-	-	1
	Maccaffertium	-	11	-	5
	Stenonema	-	-	x	-
Isonychiidae	*Isonychia*	-	2	-	1
Plecoptera (Stoneflies)					
Capnidae	*Allocapnia*	-	2	x	2
Leuctridae	*Leuctra*	-	1	-	-
Perlidae	*Acroneuria*	-	-	-	1
	Isoperla	-	1	-	1
	Neoperla	-	-	x	-
	Sweltsa	-	-	-	1
Taeniopterygidae	*Strophopteryx*	-	1	-	6
Trichoptera (Caddisflies)					
Hydropsychidae	*Cheumatopsyche*	-	56	-	21
	Hydropsyche	x	21	x	40
Philopotamidae	*Chimarra*	-	17	x	11
	Dolophilodes	-	-	-	5
Polycentropodidae	*Polycentropus*	-	-	-	2
Rhyacophilidae	*Rhyacophila*	-	1	-	3
Thremmatidae	*Neophylax*	-	1	-	-
Coleptera (Aquatic Beetles)					
Elmidae	*Optioservus*	-	21	-	5
	Oulimnius	-	-	-	2
	Stenelmis	-	8	-	6
Diptera (True Flies)					
Chironomidae		x	21	x	23
Simuliidae	*Prosimulium*	x	-	-	1
Tipulidae	*Antocha*	-	-	-	7
	Dicranota	-	-	-	2
	Hexatoma	x	-	x	-
	Tipula	-	-	x	-
Megaloptera (Dobsonflies)					
Corydalidae	*Nigronia*	-	1	-	-
Sialidae	*Sialis*	x	-	x	-
Non-Insect Taxa					
Decapoda		x	-	-	-
Isopoda		x	-	-	-
Oligochaeta		x	-	X	-
Turbellaria		x	-	-	-
Total Richness		9	19	11	26
Total Organisms			220		217

[1] Refer to Figure 1 and Table 1 for station locations

"*" indicate date undocumented

"x" indicate taxa present

"-" indicate taxa was not identified in sample

Table 5. Benthic Macroinvertebrate Metrics and IBI Scores.

METRIC	STATIONS[1]			
	1RR		2RR	
	1989*	12/10/2014	1989*	12/10/2014
EPT RICHNESS (PTV 0-4)	1	11	0	15
BECKS INDEX V.3	-	10	-	21
HILSENHOFF INDEX	-	4.07	-	3.5
SHANNON DIVERSITY	-	2.18	-	2.47
% SENSITIVE INDIV. (PTV 0-3)	-	32.3	-	46.1
IBI SCORE	-	54.9	-	72.3

[1] Refer to Figure 1 and Table 1 for station locations
"-" indicate metric was not calculated

Table 6. Fish Assemblage Data and Thermal Fish Index (TFI) Scores.

THERMAL PREF.	TAXA		STATIONS[1]		
			1RR		2RR
			1989*	8/9/2021	1989*
Cold-Cool	Brown Trout (wild)	*Salmo trutta*	-	13	-
Cold-Cool	Rosyside Dace	*Clinostomus funduloides*	-	8	-
Cool	American Eel	*Anguilla rostrate*	x	4	x
Cool	Creek Chub	*Semotilus atromaculatus*	-	2	-
Cool	Cutlips Minnow	*Exoglossum maxillingua*	-	-	x
Cool	Eastern Blacknose Dace	*Rhinichthys atratulus*	x	60	x
Cool	Longnose Dace	*Rhinichthys cataractae*	-	13	-
Cool	Tessellated Darter	*Etheostoma olmstedi*	-	6	-
Cool	White Sucker	*Catostomus commersonii*	x	1	-
Cool-Warm	Common Shiner	*Luxilus cornutus*	x	-	-
Cool-Warm	Fallfish	*Semotilus corporalis*	x	-	-
	Taxa Richness		5	8	3
	Total Individuals			107	
	TFI		> 6.0	5.6	6.0

[1] Refer to Figure 1 and Table 1 for station locations
"*" indicate date and time undocumented
"-" indicate taxa was not identified at a particular station

Physical

Instream habitat was evaluated at each station where benthic macroinvertebrates and fish were collected using DEP's *Stream Habitat Data Collection Protocol* (Lookenbill 2017). The habitat evaluation consists of rating twelve parameters for high-gradient reaches to derive a total habitat score. Total habitat scores for 1RR and 2RR were at suboptimal and optimal thresholds, respectively (Table 7).

Table 7. Habitat Evaluation Data.

PARAMETER	STATIONS[1]		
	1RR	1RR	2RR
	12/10/14	8/9/21	12/10/14
1. INSTREAM COVER	15	15	17
2. EPIFAUNAL SUBSTRATE	14	13	17
3. EMBEDDEDNESS	14	14	15
4. VELOCITY/DEPTH	17	16	18
5. CHANNEL ALTERATION	14	15	17
6. SEDIMENT DEPOSITION	15	14	18
7. RIFFLE FREQUENCY	16	17	18
8. CHANNEL FLOW STATUS	16	15	17
9. BANK CONDITION	15	10	16
10. BANK VEG. PROTECTION	16	11	18
11. GRAZING/DISRUPT PRES.	12	11	17
12. RIP. VEG. ZONE WIDTH	11	11	17
TOTAL SCORE	175	162	205
RATING[2]	SUB	SUB	OPT
EMBEDDEDNESS + SEDIMENT DEPOSITION	29	28	33
BANK CONDITION + BANK VEG. PROTECTION	31	21	34

[1] Refer to Figure 1 and Table 1 for station locations
[2] OPT = Optimal (≥192), SUB = Suboptimal (132-192)

BIOLOGICAL USE QUALIFICATIONS

The DEP's Biological use qualifying criterion evaluated for Reynolds Run were the aquatic life use definitions described at 25 Pa. Code § 93.3, Table 1 – *Protected Water Uses*. Table 1 defines the Cold Water Fishes (CWF) protected use as;

> *Maintenance or propagation, or both, of fish species including the family Salmonidae and additional flora and fauna which are indigenous to a cold water habitat.*

While the 1989 survey did not document cold water fish species, the 2021 survey did document the maintenance and propogation of Salmonidae (Brown Trout) and additional fauna indigenous to a cold water habitat (Rosyside Dace), which demonstrates an existing use of CWF.

A total of 8.1 stream miles qualify as CWF Waters under this criterion.

PUBLIC NOTICE AND REQUEST FOR TECHNICAL DATA

The DEP provided public notice of this redesignation evaluation and requested any technical data from the Lancaster County Conservation District, Little Britain Township and Trout Unlimited in an email dated October 1, 2021. A second notice went out to the general public on the DEP website and through publication in the *Pennsylvania Bulletin* on October 2, 2021 (51 Pa.B. 6320). In addition, notifications were distributed through the DEP eNotice. No data on water chemistry, instream habitat, or aquatic community were received in response to these notices.

RECOMMENDATION

As a result of the 2017 Triennial Review of Water Quality Standards, the designated use of Reynolds Run was changed from HQ-CWF, MF to HQ-TSF, MF in 25 Pa. Code § 93.9o. This change was made to correct an error that had occurred as a result of a 1997 rulemaking. EPA's partial approval of the 2017 Triennial Review did not include the change to the Reynolds Run designated use. Subsequently, the DEP performed a more detailed evaluation of Reynolds Run.

Based on the 1973 rulemaking, the 1979 rulemaking, the evaluation of data available, and the documented improving water quality conditions since the 1989 UAA, the DEP recommends the designated use for the entire Reynolds Run basin be updated to HQ-CWF, MF.

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