Coldwater Conservation Plan

For

Hunts Run

Prepared by

The Bucktail Watershed Association

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INTRODUCTION

Amid the growing water quality concerns of property owners within the Driftwood Branch of the Sinnemahoning Creek and First Fork of the Sinnemahoning Creek Watersheds, the Bucktail Watershed Association (BWA) was formed in the fall of 2002. The group was incorporated in 2003, and during the summer 2004 the Bucktail Watershed Association received its 501C3 nonprofit status from the United States Internal Revenue Service.

The mission statement of the Bucktail Watershed Association reads, "The Bucktail Watershed Association is a concerned group of citizens united to promote wise watershed stewardship for property and stream protection in the Driftwood Branch and First Fork of the Sinnemahoning Creek Watersheds." In December 2004 the Bucktail Watershed Association applied to the Coldwater Heritage Partnership for a Coldwater Conservation Grant for Hunts Run, a High Quality-Cold Water Fishery (HQ-CWF) located primarily in Cameron County, Pennsylvania.

Members of the Bucktail Watershed Association desired to begin a monitoring program within the Driftwood Branch and First Fork Watersheds. Hunts Run was chosen as the stream upon which to begin these monitoring efforts due to it being an exceptional and popular wild trout fishery. Concerns about the possibility of future mining activities and development activities within the Hunts Run Watershed also weighed in on this stream being chosen as the focus of the group's Coldwater Conservation Grant study.

As part of the development of the Coldwater Conservation Plan for Hunts Run, stream flow and water quality monitoring were conducted on Hunts Run and its tributaries, the benthic macroinvertebrate community within Hunts Run was surveyed, and existing agency data on Hunts Run was gathered. Additionally, stream walks and watershed "drive-throughs" were conducted to determine potential problems within the watershed. Lack of riparian forests, problems with dirt and gravel roads, severe erosion and stream channel instability problems were some of the items looked into during this portion of the study.

Water monitoring occurred along three sample points on the main stem of Hunts Run and on six sample points located on Hunts Run tributaries (nine total monitoring points) on a bimonthly average occurrence. At the end of the study, seven additional sample points were added during the last two sampling rounds. At the nine original monitoring points, field conductivity, temperature, and pH were measured. Water samples were also collected to be analyzed by Mahaffey Laboratories, Ltd. of Grampian, PA. At each of these nine sites flows were calculated by stretching a tape measure across the stream and measuring flow depth and flow velocities at one foot or one-half foot increments across the stream. These measurements were then used to calculate the flow rate in gallons per minute. On the seven sites added during the final two rounds of monitoring, no field or flow data was gathered, only water samples for laboratory analysis.

Benthic macroinvertebrate data was collected twice by volunteers at the nine sample point stations, once in the fall of 2005 and once in the spring 2006. Kelley Flaherty, Ph. D. student at West Virginia University and Bucktail Watershed Association member, and Jim Zoschg identified benthic macro invertebrates down to family level. During the course of the study the Bucktail Watershed Association was able to get a Technical Assistance Grant from Pennsylvania's Consortium for Scientific Assistance to

Watersheds (CSAW). Kristen Travers of the Stroud Water Research Center came out to Hunts Run in August of 2005 to put on a benthic macroinvertebrate sampling training event for BWA volunteers through Pennsylvania's CSAW program. Several local high school students also attended the event.

Additionally, agency historical data on Hunts Run was collected from the Pennsylvania Fish and Boat Commission, the Pennsylvania Department of Environmental Protection (DEP), and the Pennsylvania Department of Conservation and Natural Resources (DCNR) Bureau of Forestry. This included fish survey data from the Pennsylvania Fish and Boat Commission, benthic macroinvertebrate survey data from the Pennsylvania Department of Environmental Protection, and historical data on land use and forestry practices within the Hunts Run Watershed from the DCNR, Bureau of Forestry, and Elk State Forest District.

Public meetings were held in October of 2005 to inform the public about the Hunts Run Study and in August of 2006 to present the findings of the study. Although the October 2005 meeting was not well attended, there were approximately 50 people in attendance at the August 2006 meeting. The comments of those in attendance were incorporated into this Coldwater Conservation Plan.

WATERSHED CHARACTERISTICS AND HISTORY

Hunts Run is a tributary to the Driftwood Branch of the Sinnemahoning Creek. Its confluence with the Driftwood Branch is located in the village of Cameron on the east side of Pennsylvania State Route 120, several yards downstream from the Route 120 Bridge over the Driftwood Branch. After its confluence with Hunts Run, the Driftwood Branch of the Sinnemahoning Creek flows approximately 12 miles downstream, where it joins the Bennett Branch of the Sinnemahoning Creek in the town of Driftwood to form the Sinnemahoning Creek. The Sinnemahoning Creek Watershed (SWP 8A) is located within the watershed of the West Branch of the Susquehanna River, which lies in the Chesapeake Bay Watershed.

The vast majority of the Hunts Run Watershed lies within Lumber Township, Cameron County, but the watershed also includes small portions of Portage Township in Cameron County and Portage and Wharton Townships in Potter County. Portions of the Hunts Run Watershed can be located on the Wharton, First Fork, Emporium, and Cameron Quadrants of the USGS 7.5 Minute Topographical Map series. The majority of the Hunts Run Watershed lies within the Elk State Forest. However, significant tracts of private land lie near the mouth of Hunts Run in the village of Cameron, in its headwaters (Hunts Run Subdivision), and within the McKinnon and Steammill Branches (Slyder property, Emporium Water Company property, and several smaller property owners).

Prior to European settlement in the mid 1800's the Hunts Run Watershed was virgin forestland. Logging within the Hunts Run Watershed started in the mid to late 1800's with the Mayo and Russell logging operations. The first of these operations focused on harvesting large white pine spars that were used for ship masts. The largest of these taken from the Hunts Run Watershed was a 112-foot long log that had a 22-inch diameter at its small end and was taken from Mckinnon. Another 100-foot white pine spar log was taken out of Russell Hollow (*The History of Cameron County, Pennsylvania).*

Subsequent logging operations focused on other timber species, including eastern hemlock, whose bark was used in tanneries located in nearby Emporium. By the early 1900's most of the Hunts Run Watershed had been cut over. Destructive forest fires during the subsequent decades left scars that still have not healed today. According to Assistant District Forester for the Elk State Forest, John Sidelinger, many of these fires damaged the soils and led to some of the unproductive areas of the watershed that are present today. These fires destroyed much of the productivity and buffering capabilities of the soils in these areas. In many cases the heat from these fires also reacted with the clay soils to bake the clay and create a hard pan that is difficult for tree roots to penetrate. Portions of the headwaters of Steammill and Hunts Run have poor soil conditions that resulted from these fires. As a result, today these areas have still not recovered and have little forest cover growing on them.

These soil conditions that resulted from wild fire damage include the conditions surrounding the HUNT3 monitoring site, which experienced elevated water temperatures and acidic conditions during the course of the study. They also include extensive areas within the headwaters of the Steammill Branch. The STEM monitoring point at the mouth of Steammill also showed acidic conditions during the course of this study.

Clear cuts conducted by the Bureau of Forestry during the 1950's and 1960's in the headwaters of Mckinnon, on the east side of Hunts Run between Whitehead Run and Russell Hollow, in portions of the McNuff Branch drainage, and in the area on top of the mountain between Steammill, McNuff, and Hunts Run experienced poor regeneration due to extremely high deer populations during those times. These conditions have led to these portions of the watershed remaining unforested or partially unforested today, fifty years later. In many cases due to the deer browsing pressure, plant species such as sweet fern, huckleberry, and ferns replaced the trees (*Department of Conservation and Natural Resources)*.

Historically there has been some coal mining within the watershed in the Steammill and McKinnon drainages. During the late 1800's and early 1900's coal was mined via small drift mines on the left (west) side of McKinnon. Much of this coal was used at the nearby coke oven operation located on the banks of the Driftwood Branch of the Sinnemahoning Creek between the town of Emporium and the village of Cameron. During the mid 1900's a small surface mine operated on a shallow coal seam on the east (right) side of the Steammill Branch on the mountain between Steammill and Hunts Run. Fortunately, these mining operations have left no significant water quality impairments within the Hunts Run Watershed (*The History of Cameron County)*.

Another interesting historical activity within the Hunts Run watershed was brick making. During the early 1900's the Calder Brick Company operated in the valley just below the confluence of the McKinnon and Steammill Branches. The ruins of this brick factory can still be seen today, approximately 100 yards below the confluence of the two streams (*The History of Cameron County)*.

Due to the remote nature of much of the Hunts Run Watershed and the minimal amount of human disturbance that has occurred within its boundaries, Hunts Run is home to many animals that are not commonly found throughout the Commonwealth of Pennsylvania. Most notable of these are fishers, elk, and timber rattlesnakes. Populations of timber rattlesnakes—a species of special concern in Pennsylvania—are especially healthy within the watershed.

Historical data compiled by the PA Fish and Boat Commission shows that Hunts Run has a healthy population of wild trout the source to the mouth. It is designated as Class A wild brown trout from the confluence of McNuff Branch downstream to the

mouth where Hunts Run enters the Driftwood Branch of the Sinnemahoning Creek. Native brook trout are also very abundant throughout the watershed. Other common species of fish found in Hunts Run are blacknose dace, longnose dace, slimy sculpin, white sucker, river chub, creek chub, cutlips minnow, tessellated darter, marginated madtom, and the common shiner. A stream of that diversity shows what a great stream Hunts Run is. The lower end of Hunts Run has been designated as an artificial lures only catch and release area and furthers the protection of the abundant game (*Pennsylvania Fish and boat Commission).*

DATA COLLECTION

As part of the development of the Coldwater Conservation Plan for Hunts Run, stream flow and water quality monitoring were conducted on Hunts Run and its tributaries, the benthic macro-invertebrate community within Hunts Run was surveyed, and existing agency data on Hunts Run was gathered. Additionally, stream walks and watershed "drive-throughs" were conducted to determine potential problems within the watershed. Lack of riparian forests, problems with dirt and gravel roads, severe erosion, and stream channel instability were some of the items looked at during this portion of the study.

WATER CHEMISTRY MONITORING

In its headwaters at the HUNT3 monitoring point, Hunts Run shows acidic conditions and low buffering capabilities. The average pH for the HUNT3 monitoring point was 5.4 with an average alkalinity of 6 mg/l and an average net acidity of 5 mg/l. Dissolved metals (Iron, Aluminum, and Manganese) at this site were very low, as well as the specific conductivity. The headwaters of Hunts Run surrounding this site are characterized by a large meadow showing sparse tree regeneration. Soils in this meadow appear poor, and there are many rock outcroppings. Located in the headwaters of Hunts Run above this meadow is a very large Norway spruce/red pine plantation planted by Civilian Conservation Corps crews in the 1930's. Above the HUNT3 monitoring site, Hunts Run splits into four tributaries, which were monitored during the last two rounds of monitoring at the monitoring sites SHBK (Shanty Brook), HUNT4 (Headwaters of Hunts Run), HUNT5 (State Road Branch), SHBR (Shanty Branch). For the most part, each of these monitoring points exhibited the acidic, low buffering capabilities noted at HUNT3. Although there were some variations in water quality, it seemed no single one of these four tributaries was the main culprit for the marginal water quality at HUNT3.

A lack of shade and tree canopy over the headwaters of Hunts Run led to high water temperatures during the study period. On July 25, 2005, water temperatures of approximately 75 degrees Fahrenheit were recorded at the HUNT3 site. There was a severe drought during 2005. Air temperatures higher than those experienced on July 25 were recorded later that summer, while the stream was experiencing even lower flow conditions than those recorded on July 25. It's likely that on certain days in August water temperatures climbed above those recorded on July 25, sampling date. Such conditions are at the mortality threshold for wild brook trout surviving in this section of stream.

However, during the course of this study brook trout fry and adults were observed in sparse densities throughout this stretch of stream.

Traveling downstream, several heavily shaded tributaries enter Hunts Run, bringing with them cooler water temperatures and higher alkalinity. The net effect is that conditions improve in Hunts Run as Colbert Hollow (COLB), Deloy Hollow (DELO), and McNuff Run (MCNF) enter Hunts Run. After McNuff enters Hunts Run, Hunts Run has good water quality as was noted at the HUNT2 monitoring site. McNuff Run and Colbert Hollow also both showed good water quality during the study period as noted by their healthy pH readings and low net acidities, as well as their having moderate alkalinities.

Farther downstream, Whitehead Run, Russell Hollow (RUSS), and Mooley Hollow (MOOL) enter Hunts Run from the east. These three tributaries all exhibit the highest pH levels found within the Hunts Run Watershed, as well as the highest alkalinity readings. The average pH for these three tributaries was around 7.0, while the average alkalinities were just under 20 mg/l of calcium carbonate.

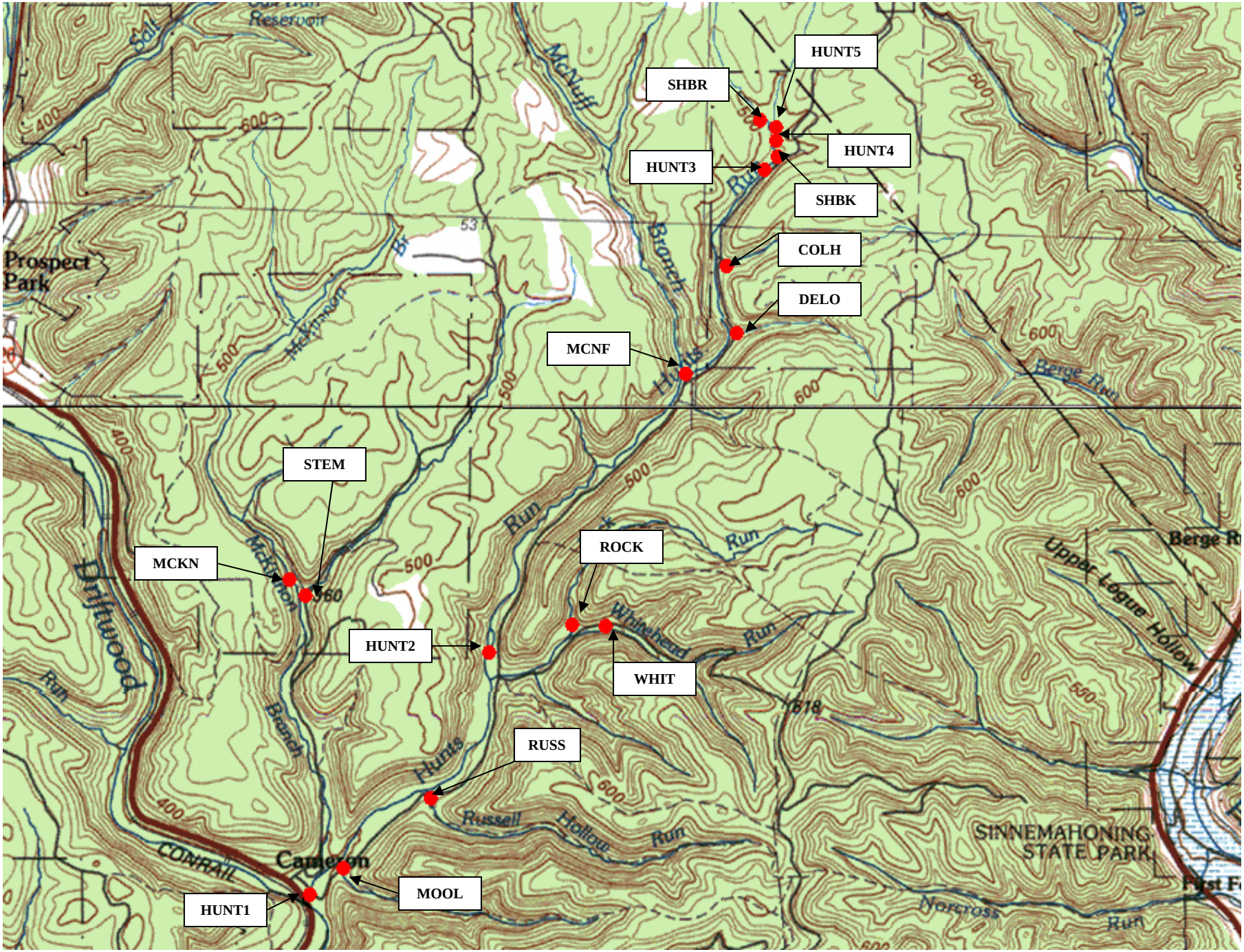
Within the Whitehead Run Subwatershed of Hunts Run, both Whitehead Run (WHIT) and Rock Run (ROCK) were monitored above the confluence with each other. Rock Run experienced decent flows even during the drought period that occurred during the summer of 2005. Conversely, Whitehead Run's flows were dry during this period, resulting in the moving of the WHIT monitoring site several hundred yards upstream from the confluence with Rock Run to where Whitehead Run was flowing above ground. It seems that as a result of the September 2004 flooding caused by the remnants of Hurricane Ivan, there was considerable aggregation of gravel within this section of Whitehead Run. This resulted in the stream running beneath this built up gravel during the drought conditions of 2005 in places where it previously flowed on the surface.

Near the bottom of Hunts Run, the McKinnon Branch enters Hunts Run. McKinnon has one significant tributary, the Steammill Branch. Locally, below the confluence of McKinnon and Steammill many people call this stream the Steammill Branch, but USGS topographical maps name this section of stream below the confluence, McKinnon Branch.

During the water quality monitoring the McKinnon Branch exhibited average alkalinities and pH, with low metals. It exhibited the same water quality characteristics of the numerous healthy streams within the Hunts Run Watershed. On the other hand, Steammill exhibited slightly acidic conditions. The average pH of Steammill was approximately 5.8, with average alkalinities depressed (6 mg/l) and average acidities slightly elevated (5 mg/l). Although Steammill exhibited these moderately acidic conditions, dissolved metals and conductivities were very low at this sample site and sulfate levels were average, indicating that although there is a small abandoned surface mine located within the Steammill subwatershed, this abandoned mine land does not appear to be adversely affecting the water quality within Steammill Run. The acidic conditions are more likely linked to the same factors that are creating the acidity observed in the headwaters of Hunts Run.

Monitoring Site Descriptions

Site	Latitude	Longitude	Description
HUNT1	41* 27.128'	78* 10.497'	Hunts Run approximately 50 yds above the confluence with the Driftwood Branch
STEM	41* 28.891'	78* 10.529'	Steammill Run at the confluence with McKinnon Branch
MCKN	41* 28.893'	78* 10.837'	McKinnon Branch 25 ft above the confluence with Steammill, under Slyder's Bridge
ROCK	41* 28.664'	78* 08.434'	Rock Run sixty feet upstream from the confluence with Whitehead
WHIT	41* 28.704'	78* 08.018'	Whitehead Run directly below the confluence with the first hollow on the left upstream of Rock Run
HUNT2	41* 28.556'	78* 09.086'	Hunts Run approximately 150 yds above the confluence with Whitehead Run
MCNF	41* 30.174'	78* 07.538'	McNuff Branch approximately 15 ft above the confluence with Hunts Run
COLH	41* 30.835'	78* 07.232'	Colbert Hollow approximately sixty feet above the Hunts Run Road
HUNT3	41* 31.475'	78* 06.819'	Hunts Run fifty feet below the confluence with Shanty Brook
SHBK	41* 31.482'	78* 06.824'	1st unnamed trib at the top of Hunts Run, (Shanty Brook), approximately 20 feet above the confluence with Hunts Run
HUNT4	41* 31.569'	78* 06.837'	2nd Unnamed Trib at the top of Hunts Run, next tributary on right side after Shanty Brook, sampled 20 feet up trib
HUNT5	41* 31.650'	78* 06.844'	Hunts Run headwaters, approximately 50 feet upstream from confluence with Shanty Branch
SHBR	41* 31.645'	78* 06.865'	Shanty Branch, approximately 20 feet above the confluence with Hunts Run
DELO	41* 30.440'	78* 07.153	Deloy Hollow at Hunts Run Road Crossing
RUSS	41* 27.742'	78* 09.542'	Russell Hollow at Hunts Run Road Crossing
MOOL	41* 27.287'	78* 10.234'	Mooley Hollow at Hunts Run Road Crossing


HUNT5
SHBR
HUNT4
HUNT3
SHBK
COLH
DELO
MCNF
STEM
MCKN
ROCK
HUNT2
WHIT
RUSS
MOOL
HUNT1
Prospect Park
Reservoir
McNuff Run
Hunts Run Branch
Berge Run
McKinnon Run
Driftwood Run
Whitehead Run
Upper League Hollow
Hunts Branch
Russell Hollow Run
Norcross Run
CONRAIL
Cameron
SINNEMAHONING STATE PARK
400
500
600
618

HUNT1 (Hunts Run) Site Data

Date	Flow	DO	Temp (*C)	Field Cond	Lab Cond	Field pH	Lab pH	Alkalinity	Acidity	Fe	Mn	Al	Sulfates	TSS
7/25/2005	2049	NA	22.2	45	44	6.6	6.7	13	-1	0.6	0.03	0.08	7	7.1
11/8/2005	6801	NA	7.3	58	43	6.4	7.1	11	3	0.05	0.02	0.05	15	6.2
12/12/2005	16755	NA	2.5	NA	40	NA	6.6	8	2	0.05	0.02	0.05	7	6.2
3/21/2006	21550	NA	2.4	39	44	6.4	6.6	8	-1	0.05	0.02	0.05	8	6.2
6/9/2006	24417	NA	NA	NA	58	NA	6.7	10	3	0.05	0.02	0.05	11	11.4
7/10/2006	16359	9.1	16.1	NA	38	NA	6.8	11	-1	0.07	0.02	0.05	12	6.2
Average	14655	NA	10.1	47	45	6.5	6.8	10	1	0.15	0.02	0.06	10	7.2

STEM (Steam Mill Run) Site Data

Date	Flow	DO	Temp (*C)	Field Cond	Lab Cond	Field pH	Lab pH	Alkalinity	Acidity	Fe	Mn	Al	Sulfates	TSS
7/25/2005	133	NA	18.8	33	34	6.3	5.9	6	4	0.05	0.02	0.05	7	8.6
11/8/2005	646	NA	6.7	37	36	6.0	6.2	6	5	0.05	0.02	0.06	15	6.2
12/11/2005	1818	NA	2.5	38	41	5.4	5.5	5	5	0.05	0.04	0.1	8	6.2
3/21/2006	2134	NA	1.8	39	45	5.9	5.6	6	2	0.08	0.04	0.15	9	6.2
6/9/2006	2154	NA	NA	NA	34	NA	5.7	6	7	0.13	0.04	0.19	10	15.7
7/10/2006	1400	9.2	16.1	NA	32	NA	5.9	6	5	0.11	0.05	0.14	12	6.2
Average	1381	NA	9.2	37	37	5.9	5.8	6	5	0.08	0.04	0.12	10	8.2

MCKN (McKinnon Branch) Site Data

Date	Flow	DO	Temp (*C)	Field Cond	Lab Cond	Field pH	Lab pH	Alkalinity	Acidity	Fe	Mn	Al	Sulfates	TSS
7/25/05	486	NA	18.8	34	35	6.7	6.6	11	2	0.06	0.02	0.05	6	7.1
11/8/05	1089	NA	6.4	35	34	6.4	6.5	9	3	0.05	0.02	0.05	14	6.2
12/12/05	3627	NA	2.1	32	35	5.3	6.3	7	3	0.05	0.02	0.05	6	6.2
3/21/06	4025	NA	2.4	30	45	6.8	6.4	7	2	0.05	0.02	0.05	7	6.2
6/9/06	3893	NA	NA	NA	38	NA	6.3	7	5	0.18	0.02	0.20	9	14.3
7/10/06	2973	9.1	16.1	NA	29	NA	6.4	8	4	0.15	0.02	0.08	11	6.2
Average	2682	NA	9.2	33	36	6.3	6.4	8	3	0.09	0.02	0.08	9	7.7

ROCK (Rock Run) Site Data

Date	Flow	DO	Temp (*C)	Field Cond	Lab Cond	Field pH	Lab pH	Alkalinity	Acidity	Fe	Mn	Al	Sulfates	TSS
7/25/2005	188	NA	18.1	46	46	6.6	6.7	15	-3	0.71	0.05	0.34	6	6.2
11/8/2005	323	NA	7.6	46	45	6.8	6.7	13	-3	0.07	0.02	0.05	14	6.2
12/12/2005	963	NA	2.5	NA	38	NA	6.7	9	-1	0.05	0.02	0.05	7	6.2
3/21/2006	1528	NA	3.1	37	41	6.5	6.7	10	-2	0.05	0.02	0.05	7	6.2
6/9/2006	1749	NA	NA	NA	36	NA	6.7	10	2	0.12	0.02	0.08	10	11.4
7/10/2006	803	9.2	15.0	NA	37	NA	6.8	11	1	0.08	0.02	0.05	11	6.2
Average	926	NA	9.3	43	41	6.7	6.7	11	-1	0.18	0.025	0.10	9	7.1

WHIT (Whitehead Run) Site Data

Date	Flow	DO	Temp (*C)	Field Cond	Lab Cond	Field pH	Lab pH	Alkalinity	Acidity	Fe	Mn	Al	Sulfates	TSS
7/25/2005	5	NA	14.1	75	74	6.3	6.6	24	-10	0.05	0.02	0.05	9	6.2
11/8/2005	94	NA	7.6	78	74	6.4	6.8	18	-9	0.05	0.02	0.05	17	6.2
12/12/2005	236	NA	2.5	NA	54	NA	6.9	13	-3	0.05	0.02	0.05	9	6.2
3/21/2006	374	NA	3.3	52	52	6.8	6.8	12	-3	0.28	0.02	0.17	10	6.2
6/9/2006	388	NA	10.2	52	50	6.8	6.8	14	-1	0.05	0.02	0.05	12	6.2
7/10/2006	150	8.9	12.2	NA	54	NA	6.9	19	-9	0.05	0.02	0.05	13	6.2
Average	208	NA	8.3	64	60	6.6	6.8	17	-6	0.09	0.02	0.07	12	6.2

HUNT2 (Hunts Run) Site Data

Date	Flow	DO	Temp (*C)	Field Cond	Lab Cond	Field pH	Lab pH	Alkalinity	Acidity	Fe	Mn	Al	Sulfates	TSS
7/25/2005	1134	NA	20.6	38	39	6.6	6.6	12	1	0.05	0.02	0.05	6	6.2
11/8/2005	3894	NA	6.9	37	35	6.7	6.6	9	1	0.05	0.02	0.05	13	6.2
12/12/2005	7692	NA	2.5	NA	36	NA	6.5	7	1	0.05	0.02	0.05	6	6.2
3/21/2006	9741	NA	1.9	33	37	6.4	6.5	8	0	0.05	0.02	0.05	7	6.2
6/9/2006	10738	NA	11.3	33	33	6.5	6.6	9	5	0.07	0.02	0.05	9	7.1
7/10/2006	7222	9.1	16.1	NA	31	NA	6.7	9	2	0.12	0.02	0.05	11	6.2
Average	6737	NA	9.9	35	35	6.6	6.6	9	2	0.07	0.02	0.05	9	6.4

MCNF (McNuff Branch) Site Data

Date	Flow	DO	Temp (*C)	Field Cond	Lab Cond	Field pH	Lab pH	Alkalinity	Acidity	Fe	Mn	Al	Sulfates	TSS
7/25/2005	651	NA	19.8	41	41	6.2	6.7	13	-1	0.17	0.02	0.05	6	6.2
11/8/2005	1645	NA	8.2	36	36	6.4	6.6	10	1	0.08	0.02	0.05	13	6.2
12/12/2005	2891	NA	2.5	NA	36	NA	6.6	8	1	0.05	0.02	0.05	6	6.2
3/21/2006	4009	NA	2.9	34	35	7.0	6.6	8	1	0.06	0.02	0.05	7	6.2
6/9/2006	4321	NA	10.5	33	33	6.6	6.6	9	4	0.12	0.02	0.05	9	11.4
7/10/2006	3451	8.9	16.1	NA	31	NA	6.7	10	2	0.16	0.02	0.05	11	6.2
Average	2828	NA	10	36	35	6.5	6.6	10	1	0.11	0.02	0.05	9	7.1

COLH (Colbert Hollow) Site Data

Date	Flow	DO	Temp (*C)	Field Cond	Lab Cond	Field pH	Lab pH	Alkalinity	Acidity	Fe	Mn	Al	Sulfates	TSS
7/25/2005	140	NA	17.1	32	33	6.4	6.4	9	2	0.21	0.02	0.08	6	6.2
11/8/2005	295	NA	9.2	30	30	6.4	6.4	7	3	1.64	0.02	0.05	13	6.2
12/12/2005	481	NA	2.5	NA	32	NA	6.2	7	2	0.05	0.02	0.05	5	6.2
3/21/2006	625	NA	3.7	29	30	6.7	6.3	6	2	0.05	0.02	0.05	6	6.2
6/9/2006	864	NA	9.9	27	28	6.2	6.3	7	5	0.07	0.02	0.06	8	7.1
7/10/2006	385	8.7	14.4	NA	27	NA	6.4	7	4	0.4	0.02	0.07	10	6.2
Average	465	NA	9.5	30	30	6.4	6.3	7	3	0.40	0.02	0.06	8	6.4

HUNT3 (Hunts Run) Site Data

Date	Flow	DO	Temp (*C)	Field Cond	Lab Cond	Field pH	Lab pH	Alkalinity	Acidity	Fe	Mn	Al	Sulfates	TSS
7/25/2005	265	NA	24.1	23	31	5.2	5.3	6	7	0.18	0.04	0.08	6	6.2
11/8/2005	794	NA	9.2	26	26	5.4	5.3	5	6	0.07	0.07	0.09	13	6.2
12/11/2005	1342	NA	NA	NA	31	NA	5.2	5	2	0.10	0.06	0.10	6	6.2
3/21/2006	1214	NA	3	28	29	5.4	5.4	5	4	0.26	0.06	0.19	6	6.2
6/8/2006	1066	NA	15.3	24	38	5.0	5.3	5	9	0.63	0.09	0.30	9	8.6
7/10/2006	960	8.6	18.9	NA	22	NA	5.6	6	5	0.13	0.04	0.09	10	6.2
Average	940	NA	14.1	25	30	5.2	5.4	5	6	0.23	0.06	0.14	8.3	6.6

MOOL (Mooley Hollow) Site Data

Date	Temp (*C)	Lab Cond	Lab pH	Alkalinity	Acidity	Fe	Mn	Al	Sulfates	TSS
6/9/2006	NA	58	6.9	15	-2	0.06	0.02	0.06	15	11.4
7/10/2006	14.4	62	7.0	18	-7	0.15	0.02	0.12	14	6.2
Average	NA	60	7.0	17	-5	0.11	0.02	0.09	15	8.8

RUSS (Russell Hollow) Site Data

Date	Temp (*C)	Lab Cond	Lab pH	Alkalinity	Acidity	Fe	Mn	Al	Sulfates	TSS
6/9/2006	NA	55	7	16	-2	0.06	0.02	0.05	13	12.9
7/10/2006	15	61	7.1	19	-9	0.1	0.02	0.05	14	6.2
Average	NA	58	7.1	18	-6	0.08	0.02	0.05	14	9.6

DELO (Deloy Hollow) Site Data

Date	Temp (*C)	Lab Cond	Lab pH	Alkalinity	Acidity	Fe	Mn	Al	Sulfates	TSS
6/9/2006	8.9	33	6.6	9	3	0.05	0.02	0.05	9	10.0
7/10/2006	13.3	33	6.7	10	2	0.05	0.02	0.05	11	7.1
Average	11.1	33	6.7	10	3	0.05	0.02	0.05	10	8.6

SHBK (Shanty Brook) Site Data

Date	Temp (*C)	Lab Cond	Lab pH	Alkalinity	Acidity	Fe	Mn	Al	Sulfates	TSS
6/8/2006	14.2	33	5.5	6	9	0.31	0.04	0.20	9	11.4
7/9/2006	16.7	22	5.6	5	5	0.15	0.04	0.09	10	6.2
Average	15.5	28	5.6	6	7	0.23	0.04	0.15	10	8.8

HUNT4 (Hunts Run) Site Data

Date	Temp (*C)	Lab Cond	Lab pH	Alkalinity	Acidity	Fe	Mn	Al	Sulfates	TSS
6/8/2006	15.1	30	5.1	5	8	0.14	0.07	0.12	9	8.6
7/9/2006	18.3	20	5.3	6	7	0.16	0.04	0.11	10	6.2
Average	16.7	25	5.2	6	8	0.15	0.06	0.12	10	7.4

HUNT5 Hunts Run) Site Data

Date	Temp (*C)	Lab Cond	Lab pH	Alkalinity	Acidity	Fe	Mn	Al	Sulfates	TSS
6/8/2006	15.8	25	5.3	5	9	0.24	0.05	0.15	8	7.1
7/9/2006	18.3	22	5.1	5	7	0.14	0.07	0.11	11	6.2
Average	17.1	24	5.2	5	8	0.19	0.06	0.13	10	6.7

SHBR (Shanty Branch) Site Data

Date	Temp (*C)	Lab Cond	Lab pH	Alkalinity	Acidity	Fe	Mn	Al	Sulfates	TSS
6/8/2006	15.3	28	5.4	6	7	0.18	0.05	0.11	8	10
7/9/2006	17.8	21	5.2	5	8	0.18	0.04	0.09	10	6.2
Average	16.6	25	5.3	6	8	0.18	0.05	0.10	9	8.1

BENTHIC MACROINVERTEBRATE COMMUNITY SAMPLING

Methods

We selected seven sites for sampling in the fall of 2005. These included one first order stream (Rock Run), four second order streams (Steammill, Upper Hunt's Run, Colbert Hollow and Whitehead Run), one third order stream (McKinnon Branch) and the mouth Hunt's Run before it emptied into the Driftwood Branch of the Sinnemahoning Creek. An additional site was sampled at the mouth of the McNuff Branch in the spring of 2006. Sites were sampled using a 12-inch by 12-inch Surber sampler. Five subsamples were collected along a transect perpendicular to stream flow at each site. Samples were collected by directing the mouth of the net into the current and disturbing the substrate within the frame. Macroinvertebrates were preserved in 70% isopropanol and later identified to the family level. We calculated the abundance and taxa richness (number of families) at each site as well as the richness of Ephemeroptera, Plecoptera and Tricoptera families (EPT richness), the percent EPT (percent of organisms from EPT families) and the percentage of the sample that was due to the dominant family.

Results

Overall, most streams sampled in the Hunt's Run watershed had healthy benthic macroinvertebrate communities. However, the seasonal results for four streams, Whitehead Run, Steammill Branch, Upper Hunt's Run and Colbert Hollow, suggest that these streams may need to be examined more closely.

Whitehead Run

The Whitehead Run samples were collected just upstream from the mouth of Rock Run. This point was located below a road crossing on this tributary. A portion of the stream downstream from the road currently flows underground. However, this was not always the case as evidenced by the above ground streambed. Fall sampling of Whitehead Run resulted in low diversity with no Ephemeroptera present and the dominant taxa being Chironomidae (Table 1). The spring sampling, however, resulted in higher diversity with Ephemeroptera families dominating. All of the new taxa collected from Whitehead Run in the spring were detected in either the fall or spring samples from the nearby mouth of Rock Run suggesting that this might have been a source of colonizers. This change in macroinvertebrate communities suggests the possibility that the sampling point on Whitehead Run may have dried up at some point during the summer or fall of 2005. While periodic drying at this point probably does not affect Whitehead Run either upstream of the point or downstream from the confluence with Rock Run, it may have the potential to affect upstream movement of fish and amphibians such as salamanders. Further periodic monitoring would be needed to determine if a) periodic drying does occur in this portion of Whitehead Run and b) if such events are natural or are influenced by the road crossing directly upstream.

Upper Hunt's Run

A low diversity of benthic macroinvertebrates was found in both the fall and spring samples at the upper Hunt's Run sampling site. While, the % EPT was high in the

fall sample, this was primarily due to one family, Capniidae which was the dominant taxa in the sample. A much lower % EPT was observed in the spring with this family absent.

The substrate at this site was markedly different from all other sites sampled and was predominantly silt, gravel and bedrock. Substrate composition may be the most likely factor contributing to the lack of diversity. However, testing of physical and chemical water parameters at this site revealed abnormally high temperatures in the summer and depressed pH when compared to other watershed sites. Both the substrate composition and high temperatures are likely related to the lack of tree cover at and upstream from this site.

Steammill Branch

Sampling at the mouth of the Steammill Branch, we detected a low abundance and low taxa richness in the macroinvertebrate community in the fall of 2005. The number of taxa detected increased in the spring of 2006, however, abundance continued to be relatively low. The sampling site was characterized by large cobble and gravel and a high gradient directly up and downstream. Additionally, the pH and alkalinity measured at this site were relatively low compared to other sampled streams. Both factors may have contributed to the low abundance of insects detected at this site. Additional sampling upstream, in a more ideal substrate, may help determine the role of habitat in the insect abundance of the Steammill Branch.

Colbert Hollow

A healthy macroinvertebrate community was found in Colbert Hollow in the fall of 2005. However, in spring 2006, no Ephemeroptera was detected and the sample was dominated by one family of Plecoptera, Capniidae. This may have been due to the abundance of leaf pack in the 2006 sample, which favors Capniidae species

		Lower Hunts	Steammill	McKinnon	Whitehead	Rock	Colbert	Upper Hunts
Ephemeroptera	**Heptagenniidae**	**13**	**2**	**16**		**8**	**1**	
	Ephemerellidae	**31**		**2**		**36**	**3**	**1**
	Leptophlebidae	**67**		**10**		**12**	**6**	
	Baetidae	**9**				**1**		
	Oligoneuridae	**16**						
	Caenidae	**4**						
	Siphloneuridae					**1**	**1**	
Plecoptera	**Capniidae**			**2**	**1**	**2**		**13**
	Nemouridae	**5**			1	**1**		**3**
	Perlodidae	**4**		**4**		**1**		
	Pteronarcydae	**1**				**2**		
	Chloroperlidae	**2**			**12**	**7**	**10**	1
	Perlidae	**4**		**4**		**1**		
	Peltoperlidae					**2**	**1**	
	Pteronarcydae	**1**				**2**		
	Leutricidae		**2**	**3**				**1**
Trichoptera	**Hydropsychidae**	**27**	**3**	**3**		**12**	**3**	
	Polycentropodidae	**8**	**3**	**3**	**3**	**7**		
	Hydroptilidae					**1**		
	Limnephilidae	1		**3**		**2**	**3**	
	Philopotamidae						**1**	
	Lepidostomatidae	**23**		**3**		**7**	**5**	
Diptera	**Tipulidae**	**3**	**2**	**1**	**3**	**6**		
	Chironomidae		**1**	**3**	**30**	**3**	**2**	**1**
Coleoptera	**Elmidae**	**3**						
	Psephenidae	**1**				**1**		
Odonata	**Gomphidae**		**1**			**3**	**1**	
Megaloptera	**Corydalidae**			**1**				
	Sialidae					**1**		
Oligochaeta	**Oligochaeta**	**2**			**6**			
Decapoda	**Cambaridae**						**1**	
	# Organisms	**225**	**14**	**58**	**56**	**119**	**38**	**20**
	Taxa Richness	**20**	**7**	**14**	**7**	**23**	**13**	**6**
	EPT Taxa Richness	**16**	**4**	**11**	**4**	**18**	**10**	**5**
	% EPT	**96**	**71**	**91**	**30**	**88**	**89**	**95**
	% Dominant Taxa	**30**	**21**	**28**	**21**	**30**	**26**	**65**

Table 1. Results from fall sampling of the benthic macroinvertebrate community of the Hunt's Run Watershed, Cameron County, Pennsylvania.

		Lower Hunts	Steammill	McNuff	McKinnon	Whitehead	Rock	Colbert	Upper Hunts
Ephemeroptera	Heptagenniidae	30	2	16		90	23		
	Ephemerellidae	24	2	3		8	19		
	Leptophlebidae	47	4	24		3	14		
	Baetidae								
	Oligoneuridae	10		3					
	Caenidae								
	Ephemeridae			1					
	Siphloneuridae					9			
Plecoptera	Capniidae		1	2			2	42	
	Nemouridae	11						2	
	Perlodidae	6	1	6		9	17		
	Pteronarcydae								
	Chloroperlidae	2	1	2		17	8		1
	Perlidae	3	2	2			2	1	1
	Peltoperlidae							1	
	Pteronarcydae								
	Leutricidae	2		1					2
Trichoptera	Hydropsychidae	12	3				6	1	
	Polycentropodidae	7	1			4	7		
	Hydroptilidae								
	Limnephilidae	6		1		3			
	Philopotamidae								
	Lepidostomatidae	11	1	4					
Diptera	Tipulidae	4	4	7		8	3		2
	Simulidae	76	1						9
	Athericidae	1		4					
	Ceratophogonidae	1							
	Chironomidae	9	1	8		22	10	2	3
Coleoptera	Elmidae	1	2	2			1		2
	Psephenidae			1					
Odonata	Gomphidae		1			1	3	1	1
Megaloptera	Corydalidae	4	2					1	
	Sialidae								
Oligochaeta	Oligochaeta	3							
	Hirundinea								
Decapoda	Cambaridae			2				2	2
	# Organisms	264	29	89		174	115	53	23
	Taxa Richness	22	16	18		11	13	9	8
	EPT Taxa Richness	13	10	12		8	9	5	3
	% EPT	65	62	72		82	85	89	13
	% Dominant Taxa	29	14	27		52	20	79	39

Table 2. Results from spring sampling of the benthic macroinvertebrate community of the Hunt's Run Watershed, Cameron County, Pennsylvania.

RECOMMENDATIONS

Dirt and Gravel Roads

One of the main sources of the degradation of the water quality within the Hunts Run Watershed is caused by the sediment-laden runoff from dirt and gravel roads located within the stream's watershed. Within Hunts Run's watershed there are numerous dirt and gravel roads. The majority or the road miles within the Hunts Run Watershed are maintained by the Pennsylvania Bureau of Forestry or Lumber Township. However, there are also many private roads.

The Bureau of Forestry maintains the Whitehead Road, the Ridge Road, the Hunts Run Road from the Cameron/Potter County Line to where it joins the Ridge Road, and approximately 6 miles of the Steammill Road. Additionally, the Bureau of Forestry maintains numerous miles of gated roads that are only open to public traffic briefly for the fall rifle season for deer hunting. Lumber Township maintains approximately 7 miles of the Hunts Run Road and approximately a mile of the Steammill Road, as well as approximately three-quarters of a mile of the Britton Hill Road. The private roads within the Hunts Run Watershed are concentrated mainly within the headwaters of Hunts Run in the Hunts Run Subdivision and in the Steammill/McKinnon Subwatersheds on the private land located there.

The impacts of dirt and gravel roads on Hunts Run were studied during investigations conducted on two separate occasions during rain events in the fall of 2005. Several problem areas were noted. The majority of the problems seemed to be concentrated on the Lumber Township roads within the watershed and on the Bureau of Forestry's Whitehead Road. (Other than the major roads located in the Hunts Run Subdivision, the majority of the privately owned roads within the watershed are not open to public traffic and therefore, were not studied during the rainy day road investigations.) During the course of this study in October of 2006, the Elk State Forest District applied limestone aggregate along the entire length of the Whitehead Road, essentially eliminating sedimentation pollution from this road. They also applied limestone aggregate on the portion of the Hunts Run Road that they maintain. About fifty yards of this section of the Hunts Run Road, the section right at the Potter/Cameron County Line, drains directly into a watercourse and previously was contributing to sedimentation runoff.

The Hunts Run Road, which runs the entire length of Hunts Run, was the main source of sedimentation nonpoint source pollution during this study. The Hunts Run Road runs adjacent to or upslope of Hunts Run along much of its length. Currently Lumber Township, with the help of the Cameron County Conservation District's Dirt and Gravel Road Program, is addressing many sites that are causing sedimentation runoff to enter the stream. However, many additional sites were noted during this study.

The Hunts Run Road below Russell Hollow contributes very little sedimentation to Hunts Run. The road is located several hundred feet from the stream and the terrain between the two is relatively flat allowing for sufficient time for the filtering of sedimentation from road runoff. At Russell Hollow there is a section of road approximately one-tenth of a mile long that does contribute sedimentation. This section starts at the Russell Hollow culvert and extends upstream. Runoff along this section enters the ditch and travels towards Russell Hollow where it enters a culvert that carries it into a collection of spring seeps that empty into Hunts Run.

Above Russell Hollow the next problem area starts at the upper end of the old Hunts Run clearcut at the bend in the road, and extends upstream for about one-third of a mile to where Whitehead Run crosses the Hunts Run Road. Along most of this section Hunts Run is located at the base of the mountain directly down slope of the Hunts Run Road. Sedimentation from this road section easily enters Hunts Run because the steepness of the gradient of the slope separating it from the road. The Whitehead Run crossing has been a work site of the Cameron County Conservation District's Dirt and Gravel Road Program, having culverts replaced and limestone driving surface aggregate applied to one hundred feet of the Hunts Run Road on both approaches to the culverts.

The next problem area on the Hunts Run Road starts at Whitehead Run and extends upstream for approximately one-tenth of a mile to where the first culvert crosses under the road. Along this section of road the sediment-laden runoff from the road runs into the ditch, which carries it downhill and empties directly into Whitehead Run. During periods or rain the water in this ditch was causing half of Whitehead to turn muddy below where the ditch empties its water into the stream. Above this point limestone aggregate has been applied to approximately one-third of a mile of the road by Lumber Township.

Between Whitehead Run and McNuff Run the Hunts Run Road generally runs on the opposite side of the valley from the stream. However, there are a handful of stream segments where the stream does cross over and runs directly down slope from the Hunts Run Road. One section in particular, along the old beaver meadow, does have a small stream that runs down slope from the road. Along these stream segments, limestone aggregate would reduce sedimentation entering the stream.

Upstream starting at the McNuff Branch running to Deloy Hollow, the Hunts Run Road runs adjacent to a side channel of Hunts Run that flows year round with water from various springs. This section of the Hunts Run Road contributes significant sedimentation nonpoint source pollution to Hunts Run via this side channel.

Above Deloy Hollow work has been done on the Colbert Hollow stream crossing. The culvert at this crossing has been replaced through the Cameron County Conservation District's Dirt and Gravel Road Program. Limestone aggregate has been applied at the crossing and on the road above the crossing for about one-half of a mile.

Above this Dirt and Gravel Roads Program worksite, there were two locations in the headwaters of Hunts Run where tributaries cross under the road. It was noted during the rain events that the stream was clear above these culverts, but downstream from the crossing became murky from the sedimentation runoff from the road. Both crossings are located just below the Cameron/Potter County line. The Hunts Run Road ditches carry sedimentation runoff directly into the stream at both sites. Both sites would benefit from one-tenth of a mile of limestone aggregate applied on both approaches to the crossings.

Within McKinnon Branch there were two locations in particular where the stream would benefit from an application of limestone aggregate on the Steammill Road (Lumber Township). At the Lumber Township bridge over the McKinnon Branch limestone aggregate applied to both approaches to the bridge and on the township road for approximately 75 yards upstream of the bridge where the stream runs adjacent to the road would eliminate sedimentation pollution entering the stream at these sites. Additionally, at the stream ford where the Steammill Road crosses McKinnon, both approaches to the ford are in need of limestone aggregate to eliminate sedimentation runoff entering the stream at these sites. Additionally, upstream of the crossing, the township road is in need of an aggregate for approximately 75 yards to where the road doubles back. Currently, much of the sedimentation created by this road section flows down the road and into the McKinnon Branch at the road ford.

On private roads located within the McKinnon Branch and Steammill Branch drainages and within the Hunts Run subdivision, sedimentation nonpoint source pollution

is also being generated, especially on dirt roads that run adjacent to streams. However, during the course of this study the impacts of these roads were not studied as closely as the impacts of the public roads within the watershed. Additionally, public funding sources to improve private dirt and gravel roads are not as readily available as they are for public roads. To help address these issues, landowners should be educated with the latest Best Management Practices for dirt and gravel roads to help alleviate sedimentation pollution being produced by the dirt and gravel roads on private property.

In summary, the road sections needing addressed within Hunts Run follow the following priorities.

- Hunts Run Road at the two culvert crossings in the headwaters
- Section of Hunts Run Road directly upstream of Whitehead Run crossing
- Section of Hunts Run Road between Deloy Hollow and the McNuff Branch
- Section of Hunts Run Road from Whitehead crossing downstream to Clearcut
- Section of Hunts Run Road directly upstream from Russell Hollow
- Section of Steammill Road at stream ford through Mckinnon and upslope
- Section of Steammill Road at bridge over Mckinnon
- Various small sections downstream of McNuff where the stream or stream channel runs downslope from the road

There are also other sections of road that could be addressed with limestone aggregate to reduce sedimentation. However, these sections are the major polluters. Once these road sections are addressed, other smaller sites where sedimentation is entering the stream should then be addressed with limestone aggregate.

Riparian Buffers

The majority of the Hunts Run Watershed is forested. This has led to the majority of streams within the watershed being shaded by riparian forest buffers. These buffers, provide shade to help keep water temperatures cold. They also filter sediment from runoff, stabilize soils to prevent erosion, contribute organic matter to the stream's food chain in the form of leaf litter, and improve the overall health of the watershed.

However, there are a few portions of the watershed where the streams are lacking forest cover. During the course of the Bucktail Watershed Association's monitoring efforts on Hunts Run the lack of riparian forests in portions of the watershed led to high water temperatures in certain streams within the Hunts Run Watershed. At the HUNT3 monitoring site in the headwaters of Hunts Run, water temperatures climbed to levels dangerous for brook trout and other coldwater species in the summer of 2005. The stream upstream from this site is positioned in a large meadow and lacks significant shade from tree cover. This lack of riparian buffer contributes to the unnatural warming of stream temperatures in this reach.

To improve the health of this portion of Hunts Run, local conservation groups should seek to work with the private landowners along this stretch of stream to plant native tree species along the stream. Trees for such projects can be obtained from the Chesapeake Bay Foundation for free. Assistance in purchasing tree tubes can also be obtained from the Chesapeake Bay Foundation, or perhaps from programs with the Bureau of Forestry. Likewise, the Cameron County Conservation District is currently working on the Sinnemahoning Creek Riparian Buffer Initiative, a grant received from

the National Fish and Wildlife Foundation's Chesapeake Bay Small Watersheds Grant Program. Trees, tree tubes, and stakes for the tree tubes can be provided through this grant program for reforesting riparian areas.

Additionally, there are other portions of the watershed lacking riparian forest buffer cover. One such area is in the headwaters of Steammill. This area is very much like the headwaters of Hunts Run in that it is an area that was adversely affected by forest fires in the early 1900's. Much of its soil productivity and buffering capacity was destroyed by these intense fires and today the area still bears the scars with poor forest regeneration. Although this area was not studied to determine water temperatures, it is likely that a similar unnatural warming occurs in this portion of Steammill. Portions of the headwaters of Mckinnon experience similar soil conditions and lack of riparian forest cover. These areas should also be taken into consideration for planting native trees to improve the health of the Hunts Run Watershed.

Invasive Plants

Invasive plants have been shown to be harmful to watersheds by degrading riparian habitat and disrupting natural systems. An invasive plant is any nonnative plant that has been introduced into an area and then out-competes native vegetation, displacing native plant communities and the animals that rely on these plant communities.

During the course of the Hunts Run study, several harmful invasive plants were discovered within the watershed. Multifloral rose was found to be located throughout the entire watershed. In fact, multifloral rose has been distributed throughout all of Pennsylvania. Also found throughout many portions of the watershed was Japanese stilt grass. This invasive seems to be spreading along stream corridors as a result of the streams washing seeds downstream. Additionally, this plant seems to be using gated forestry roads as conduits for spreading deep into remote areas of the watershed. It seems that individuals walking down these forestry roads pick up seeds on their pant legs and disperse the seeds farther down the roads.

Additionally, garlic mustard, another harmful invasive plant was noticed along much of the length of Whitehead Run. It is likely that it is also found along Hunts Run below the confluence with Whitehead Run. In Hunts Run above Whitehead, garlic mustard was not present. One of the most harmful invasive plants, Japanese knotweed was located growing in a couple colonies at the mouth of Hunts Run, but was not found anywhere else in the watershed. Also, exotic bush honeysuckle was located growing in various parts of the watershed, most notably in several locations at the bottom of Hunts Run and along the Steammill Road near the McKinnon Branch ford.

Special care should be given to not spread the garlic mustard, Japanese stilt grass, bush honeysuckle, and Japanese knotweed throughout the watershed. Currently they are only located in certain portions of the Hunts Run Watershed. Vigilance is the most important key for accomplishing this task. When small colonies pop up in new areas of the watershed or in subwatersheds where these plants previously did not exist, these populations need to be identified and eliminated before they spread to infect more areas.

Dumps

During the course of the Hunts Run Study, several old dumps were noted on private lands within the watershed. One of these dumps appears to pose a threat to the health of the lower end of Hunts Run. The other two should be cleaned up, if only for the fact of improving the overall health and aesthetics of the watershed.

Between the confluence of the McKinnon Branch (also known as Steammill by many locals) and Hunts Run there is an approximately 10-acre meadow that was used as a dump about fifty years ago. Locals say that at the time the land was owned by an individual named Sonny Schwab. Individuals would pay Mr. Schwab to have him dispose of their garbage on his land. Most of the garbage was completely buried, but in a few places in the meadow it can be seen on the surface. What is most disturbing about this is that some neighbors claim that at the time he was burying barrels of material from the Sylvania plant in Emporium.

If these barrels contained waste chemicals, this would pose a significant threat to the lower end of Hunts Run and to the Driftwood Branch of the Sinnemahoning Creek if the barrels corroded and leaked the chemicals. Currently along this stretch of stream adjacent to the dump, there are several spots where rusty/oily colored water seeps enter Hunts Run.

It is recommended that the Pennsylvania Department of Environmental Protection investigate this dump and the materials that were buried in it. If the dump shows the potential for contaminating Hunts Run, DEP should work with current landowners to clean it up.

The other two dumps noted in the Hunts Run study are also on private land, but are merely unsightly and do not appear to pose potential contamination problems for Hunts Run. The first is located in Mooley Hollow just downstream from where the stream goes through the culvert on the Hunts Run Road. Over the years adjacent landowners have dumped materials over the bank along side the stream. The majority of these materials appear to be recyclable aluminum cans. It appears that volunteers could readily clean this site by hand.

The third site is located in the valley below the confluence of the McKinnon and Steammill Branches. There are several old cars that have been disposed of at this site. It is likely that these cars could be removed of at no cost to the landowner. Many recycling businesses readily remove old vehicles and equipment for free and then make a profit selling the scrap metal.

The Bucktail Watershed Association should look into trying to facilitate these cleanup efforts. Besides improving the health of the Hunts Run Watershed, cleaning up these sites would improve the overall aesthetics and pristineness of the watershed. The site at the confluence of the McKinnon Branch and Hunts Run needs to be given priority due to its potential for contamination.

Headcuts

Culverts were replaced where Mooley Hollow, Colbert Hollow, and Whitehead Run travel under the Hunts Run Road during the time period of the Coldwater Conservation Grant Study on Hunts Run. In all cases, larger culverts were installed so that these three streams would not have their flows restricted during floods. The Colbert Hollow and Whitehead Run crossings were done as part of the Cameron County Conservation District's Dirt and Gravel Road Program. The Mooley Hollow culvert

replacement was completed with FEMA funds because it was washed out during the flooding in 2004 that resulted from Hurricane Ivan.

The culvert replacements in Mooley Hollow and Colbert Hollow resulted in headcuts in these streams. A headcut creates an extremely unstable condition in streams. It occurs when the streambed elevation is over-excavated and unnaturally lowered below where it used to be. This causes the streambed to erode away upstream, causing the streambed to drop to this new elevation. This results in an enormous amount of sediment load being produced by the stream, limited access to the stream's floodplain, and eroding banks. For example, a one-foot high bank that used to be stable is now two feet high if there is a one-foot high headcut, and is likely experiencing erosion problems. Headcuts create long-term instability problems that take a very long time to heal.

When the Whitehead culverts were replaced large rock riprap was installed into the streambed at the new unnaturally steep grade where the streambed had been excavated to a lower elevation. This stabilized the streambed along this unnatural gradient and prevented a headcut from occurring.

At the Colbert Hollow culvert rock riprap was similarly installed. However, it was installed at a flat gradient upstream from the culvert, and where the stream climbed along the unnatural gradient back up to the old streambed elevation, there was no rock added to stabilize the bed. Fortunately, the headcut at Colbert Hollow did not cause any serious problems because it migrated upstream only 50 feet before it hit a solid bedrock streambed that prevented the headcut from eroding the streambed any farter upstream.

At the Mooley Hollow culvert replacement, a larger culvert was installed, and therefore, the streambed also had to be excavated to a lower elevation. No rock was installed to stabilize the streambed. When the Hunts Run Watershed experienced a 5-year storm event in November of 2005, several months later, a headcut developed and migrated a significant distance upstream, dropping the streambed elevation, and making it difficult for the stream to access its floodplain. This problem also left unstable eroding stream banks and created a considerable sediment load for this small Hunts Run tributary.

The Bucktail Watershed Association and the Cameron County Conservation District need to educate and work with local townships to make sure streambeds are properly stabilized when culvert replacement is necessary and streambeds are being excavated to a lower bed elevation to compensate for the larger culvert size. Headcuts are serious problems to stream health. Every effort possible needs to be made to prevent these problems from reoccurring in the Hunts Run Watershed and in other locations.

Acidity Problems

Several areas within the Hunts Run Watershed were observed to have moderate acidity problems during the course of this study. Although there have been mining activities within the watershed in the past, these activities have left no significant impacts on the water quality. The acidity witnessed in Hunts Run during the course of this study seems to originate from other sources than coal mining activities.

The headwaters of Hunts Run (HUNT3) and the Steammill Branch (STEM) above the confluence with Mckinnon were the two areas were acidity was noted during the course of this study. Although both areas experienced moderately acidic conditions, dissolved metals and sulfates were at normal low levels, leading to the conclusion that these acidic conditions were not a result of mining activities.

Rather, it seems that the acidity at both sites is a result of poor buffering capabilities (low alkalinities) and acidic soil conditions. It also seems that severe fires

during the past 100 years may have destroyed much of the soil productivity and natural buffering found in the soils of the drainage areas above these monitoring points. This has likely led to some of the acidic conditions that are currently present. Another factor in these acidic conditions is acid deposition (acid rain). It is possible that acid deposition has contributed indirectly to these acidic conditions by depleting what little buffering capabilities the soils in these drainage areas did have. The streams were not studied during rainfall events to see if acid rain was causing the pH to drop when rain runoff entered the stream.

The acid deposition problem on nearby Mosquito Creek has been well studied. There have been successful passive treatment technologies installed within that watershed to help alleviate those acidic conditions. If there ever was a desire to try to treat these two acid problems within the Hunts Run Watershed, conservation organizations should look closely at what has been accomplished in Mosquito Creek.

Currently, both of the sites where acidity problems were observed, HUNT3 and STEM, do sustain brook trout populations and some benthic macroinvertebrates. However, from our surveys the benthic macroinvertebrate communities were depressed compared to other sample sites within the Hunts Run Watershed. Brook trout are rather tolerant of acidity, and in the absence of dissolved metals can survive in the moderately acidic conditions experienced at both of these sites.

Because these acidity problems are isolated within small areas of the Hunts Run Watershed and seem to be neutralized when these streams join with other tributaries having higher alkalinities, addressing this acidity is not a high priority. These acidity problems appear to not have much of an effect on the water quality in the main stem of Hunts Run or the water quality in the main stem of the McKinnon Branch. However, if funding ever became available for implementing projects to alleviate this acidity, it would certainly improve the overall health of the Hunts Run Watershed to address the acidity at both of these locations. If such funding became available, conservation groups should work with the private landowners at both of these locations to implement such projects.

Stream Bank Erosion Projects/Habitat Projects

The majority of the Hunts Run and its tributaries are forested. Stream conditions are relatively stable due to the fact that the trees growing on the stream banks provide a network of roots that stabilize stream bank soils in the same way rebar is used to stabilize concrete. However, during the course of this study in Hunts Run, several stream bank erosion problems were noted, along with two sections of stream exhibiting stream instability.

The majority of the severe erosion problems were located at the bottom end of Hunts Run. Two bad bank erosion sites are located just above the bridge where the Hunts Run Road crosses Hunts Run. Both sites have heavy tree cover, but the eroding banks are high and the erosion is undercutting the trees that are growing on the banks. Large gravel bars on the inside bend at these two sites seem to add to the problem. Another bank erosion problem is located two hundred yards upstream from the confluence with the Mckinnon Branch. This site is currently being addressed with a habitat project through a cooperative effort between the landowner and the Habitat Division of the Pennsylvania Fish and Boat Commission.

Two sections of stream instability were noted within Hunts Run. One is located in Hunts Run a couple hundred yards below the confluence with Russell Hollow. At this

location there are two stream channels and from time to time the stream seems to change the channel it is in. When this occurs it appears that there are eroding conditions during the high flow event that causes the stream to change channels. The other site occurred during the flooding in September of 2004. Approximately 400 yards upstream from the confluence of Whitehead Run, there was a logjam that dammed the stream. This forced the stream to travel out through the forest for about 100 yards and carve a new channel. It appears that this new stream channel is continuing to change its course annually and that every time this happens considerable sediment is being contributed to the Hunts Run system.

Although there were some other erosion problems noted within Hunts Run, it is the recommendation of the Bucktail Watershed Association that no expensive "hard" engineering projects be considered for Hunts Run. Hard engineering is using riprap or other materials to armor banks. Such projects would involve clearing access roads to sites. At the majority of the bank erosion sites in Hunts Run that would be very difficult due to the forested conditions and the fact that there are no roads nearby.

However, it is the recommendation of the Bucktail Watershed Association that some of these sites be considered for log habitat projects. These projects are inexpensive and often very effective in preventing erosion, while at the same time improving trout habitat. Such projects are usually done in cooperation with the Pennsylvania Fish and Boat Commission's Habitat Division. Landowners provide volunteer labor and agree to allow public fishing access, while the Fish Commission helps purchase materials and provides the technical expertise for planning, permitting, and overseeing the project. Local conservation organizations should contact landowners experiencing problems and help facilitate the projects by putting interested landowners in contact with the Pennsylvania Fish and Boat Commission.

Additionally, habitat projects may be applicable in the two locations where Hunts Run is showing major stream instability. Poor habitat conditions are created when a stream divides into two channels. During summertime drought conditions, often the flows in both channels are so small that trout habitat along this stretch of stream is severely limited. Log channel blocks can be constructed so that the stream remains in one channel and thus provides suitable flows for trout habitat even during drought conditions.

Land Use Activities

Mining

Past mining within the Hunts Run Watershed has fortunately not caused any significant long-term impacts on the water quality within Hunts Run Watershed. However, due to the high quality of the Hunts Run Watershed and the existence of numerous coal reserves within the watershed, the potential for future coal mining activities that could harm the watershed is high. It is the recommendation of this study that no mining activities be permitted within this watershed. Any mining activities would have the potential to create sedimentation issues and acid mine drainage problems that would be detrimental to the health of the streams within the Hunts Run Watershed.

Remining to reclaim abandoned mine land and mine adjacent seams should also be prohibited. Currently the small amount of abandoned mine land within the watershed is causing no significant harmful effects on water quality within the Hunts Run

Watershed. There would be no benefit from remining, only the potential for future pollution, so it is our recommendation that due to the importance of this aquatic resource, all coal mining be prohibited within the Hunts Run Watershed.

One proactive measure that local conservation groups and concerned citizens could take in preventing potentially harmful future coal mining activities within the watershed is to petition to upgrade the stream's Title 25 Chapter 93 protection status under the Pennsylvania Code from a high quality-cold water fishery to an exceptional value stream. This process is described in greater length later in the *Recommendations* section of this report. Concerned citizens also have a second option. They could work with the state Department of Environmental Protection to have the Hunts Run Watershed declared unsuitable for mining. The success of either action would effectively prevent any future coal mining activities (*Department of Environmental Protection)*.

Development

Development activities within in the Hunts Run Watershed potentially could pose a problem to the health of the watershed in the future by changing stream hydrology and introducing excessive sedimentation nonpoint source pollution into the stream. For the most part, private lands lying within the watershed have remained undeveloped, except for an area in the headwaters of Hunts Run known locally as the Hunts Run Subdivision.

However, as development pressure builds within Pennsylvania and as the popularity of "The Pennsylvania Wilds" program increases, more and more people are looking towards developing lands in north central Pennsylvania into seasonal dwelling subdivision or developments. Such activities are currently occurring in a large portion of the nearby Medix Run watershed that was formerly undeveloped forestland. Development activities such as these, if they were to occur within the Hunts Run Watershed, would be detrimental to the health of the Hunts Run Watershed, as well as being detrimental to the wildlife inhabitants within the watershed. Of most concern would be the populations of fishers, elk, and rattlesnakes found within the watershed, which are not commonly found throughout Pennsylvania.

It is the recommendation of the Bucktail Watershed Association that local conservation organizations take a proactive approach to this problem and work with landowners within the Hunts Run Watershed to educate them on the importance of preserving the natural characteristics of the watershed, perhaps even putting them in touch with conservancies who could help these landowners preserve their properties for future generations if the landowners desired to do so. Also a recommendation is for townships to conduct certain land use planning. Zoning would control the physical development of the land and certain land uses.

Silviculture

Past silviculture practices have left long lasting scars on the Hunts Run Watershed, scars that in many cases are still affecting the health of the watershed today. But this need not be so. Forestry practices today have evolved to the point that many promote the sustainability of this renewable resource and do not significantly harm the environment.

Local conservation groups should educate private landowners about using best management practices when conducting silviculture activities that have the potential to introduce sediment into streams and increase stream temperatures. In all cases forested buffers should be left intact around streams when conducting timber-harvesting activities.

Additionally, the majority of the Hunts Run Watershed lies within the Elk State Forest. It is the recommendation of the Bucktail Watershed Association that the Bureau of Forestry take into special consideration the uniqueness and importance of the Hunts Run Watershed when conducting land planning and timber harvesting activities. When conducting activities related to timber harvesting, creation of skid and haul roads, or maintenance of haul roads within the Hunts Run Watershed, special consideration should be given to preserving the health of the watershed, including preventing the introduction of sedimentation nonpoint source pollution into waterways and preventing the spread of nonnative invasive plant species.

Oil and gas extraction

When conducted in an irresponsible manner, oil and natural gas extraction activities significantly harm watersheds. With the prices of fossil fuels increasing, oil and gas drilling activities within the northern tier of Pennsylvania have skyrocketed in recent years. Most of this activity has been to the north of the Hunts Run Watershed in Mckean and Potter Counties.

Traditionally, there has been low density drilling of natural gas wells within the Hunts Run Watershed. If the density of these activities were to increase, there would be the potential for large-scale disturbance within the Hunts Run Watershed that would harm the health of the watershed. It would fragment the watershed's forests and lead to increased sedimentation runoff entering receiving streams.

It is the recommendation of the Bucktail Watershed Association that any such activities be conducted in a responsible manner. Whenever possible, wells should be located adjacent to existing roads so that the creation of new roads is not necessary. With the creation of new roads arises the potential for increased sedimentation nonpoint source pollution into the stream. It is also recommended that these activities do not occur near streams, so that the surface water is buffered from the effects of oil and gas extraction activities. This may mean enforcing rather large buffers in areas with steep topography.

State agencies overseeing such activities should take special care within this watershed to make sure the correct steps are taken so that these activities don't harm the Hunts Run Watershed. In all cases the most effective best management practices should be used when constructing roads or drilling wells related to natural gas and oil extraction.

Upgrade Stream Classification

Under Title 25 of the Pennsylvania Code, Chapter 93 (The Water Quality Standards section of the Code), all waters within the Commonwealth have been classified according to present condition and use and are protected for a designated aquatic life use, as well as for a number of water supply and recreational uses. These uses are Warm Water Fishery (WWF), Trout Stocked Fishery (TSF), Cold Water Fishery (CWF), and Migratory Fishery (MF). In addition, streams with excellent water quality may be designated High Quality Waters (HQ) or Exceptional Value Waters (EV). Both the High Quality (HQ) streams and Exceptional Value (EV) streams receive special protection from state agencies. HQ and EV waters are defined as:

HQ: "A stream or watershed that has excellent quality waters and environmental or other features that require special water quality protection."

EV: "A stream or watershed which constitutes an outstanding national, state, regional or local resource, such as waters of national, state or county parks or forests, or waters which are used as a source of unfiltered potable water supply, or waters of wildlife refuges or State Game Lands, or waters which have been characterized by the Fish Commission as 'Wilderness Trout Streams,' and other waters of substantial recreational or ecological significance."

Currently the Hunts Run Watershed is protected under Title 25, Chapter 93 of the Pennsylvania State Code as a High Quality-Cold Water Fishery (HQ-CWF). Streams designated HQ-CWF can only have their water quality lowered by a permitted discharge if the discharge is the result of necessary social or economic development, the water quality criteria are met, and all existing uses of the stream are protected. However, the Hunts Run Watershed would experience even more protection under the Title 25, Chapter 93 designation of Exceptional Value (EV) status. EV waters must be protected at their existing quality; their water quality cannot be lowered (*Department of Environmental Protection).*

Local conservation groups may want to consider petitioning the Pennsylvania State Environmental Quality Board to upgrade the status of Hunts Run to Exceptional Value. Any person, agency, group, organization, municipality, or industry may submit a rulemaking petition to the Environmental Quality Board (EQB) to request a stream redesignation. An EV designation would provide even more protection to the Hunts Run Watershed against activities that could possibly degrade the stream. Hunts Run currently is an exceptional wild trout fishery. Survey data collected by the Pennsylvania Fish and Boat Commission show an unusual number of large brown trout for a stream this size. The majority of the Hunts Run Watershed lies within the Elk State Forest with portions of the lower watershed lying within the Bucktail State Park Natural Area. Thus, nearly the entire watershed is open to public fishing access. Considering these things and the productivity of the Hunts Run fishery, it would be warranted to seek a petition to upgrade the classification of Hunts Run from a HQ-CWF to an EV stream (*Department of Environmental Protection).*

Another option of citizens is to petition that the Hunts Run Watershed be classified as Unsuitable for Mining (UFM). This would potentially stop the mining in that area. There are two distinct criteria for UFMs. The 1st is Mandatory Criteria. A UFM Mandatory requires designation in the event it can be demonstrated that reclamation of an area is not technologically and economically feasible. This is used in areas where in all certainty any acid mine drainage would cause environmental degradation. The 2nd criteria are Discretionary. There are four discretionary criteria, relating to coal mining operations that may: (1) be incompatible with land use plans; (2) affect fragile or historic lands; (3) affect renewable resource lands with loss or reduction of water supply or of food or fiber products; or (4) affect natural hazard lands where surface mining operations could endanger life or property. This option would mostly likely benefit the Hunts Run watershed the most (*Department of Environmental Protection).*

CONCLUDING REMARKS

Hunts Run is recognized regionally for its outstanding recreational value as a wild trout fishery. Its productivity as a wild brown trout fishery is exceptional, and it also hosts a healthy wild brook trout population. This led the Pennsylvania Fish and Boat Commission in the late 1990's to include Hunts Run along with four other streams in the Commonwealth of Pennsylvania in its All Tackle-Selective Harvest program. This program was eliminated in 2005, and the five streams, including Hunts Run, regulated under this program were moved to the Catch and Release Program.

But the health of a stream is much more than the abundance of the fish community found within its waters. This may be evidence of a healthy stream, but a healthy stream is comprised of clean, pure water, an abundant insect community, and healthy microbial processes. All of these reflect the health of the stream's watershed, the health of the land area that the stream drains.

The Bucktail Watershed Association wishes that the Coldwater Conservation Grant study of Hunts Run and the resulting Coldwater Conservation Plan for Hunts Run will serve as a catalyst for local conservation groups to protect and improve this watershed. We hope that through the implementation of the recommendations in the Hunts Run Coldwater Conservation Plan that this stream will be improved and preserved so that future generations will find Hunts Run and its tributaries even healthier than their present day condition. We also hope that through the cooperation built between various conservation organizations through the implementation of recommended projects in the Hunts Run Watershed, Hunts Run will in turn serve as a catalyst for improving other waters throughout the Sinnemahoning Creek Watershed and in other parts of north central Pennsylvania.

Many good things are often taken for granted until they have been degraded. Only then do citizens realize what a special thing they had; but by then it is too late, their resource has been destroyed. May this Coldwater Conservation Plan move the sportsmen and citizens who use the Hunts Run Watershed to action to protect and improve this important aquatic resource.

Concerned citizens can become involved in these organizations to help protect the beautiful resources of the Hunts Run watershed.

- **Bucktail Watershed Association**
  - **814-486-9354**
- **Jim Zwald Chapter of Trout Unlimited**
  - **814-486-1955**
- **Sinnemahoning Sportsman Club**
  - **814-546-2835**
- **Bennett's Branch Watershed Association**
  - **814-787-8787**
- **Bucktail Rod and Gun Club**
  - **814-486-0941**
- **May Hollow Sportsman Club**
- **Portable Rod and Gun Club**
- **Sterling Run Rod and Gun Club**

References:

- **Hornung, S. Kempher, G. Skinner, M. Williams, D. Willianms, L. (1991).** ***History of Cameron County.*** **Curtis Media Corporation**

- ***Pennsylvania Department of Conservation & Natural Resources***

- ***Pennsylvania Department of Environmental Protection***

- ***Pennsylvania Fish & Boat Commission***