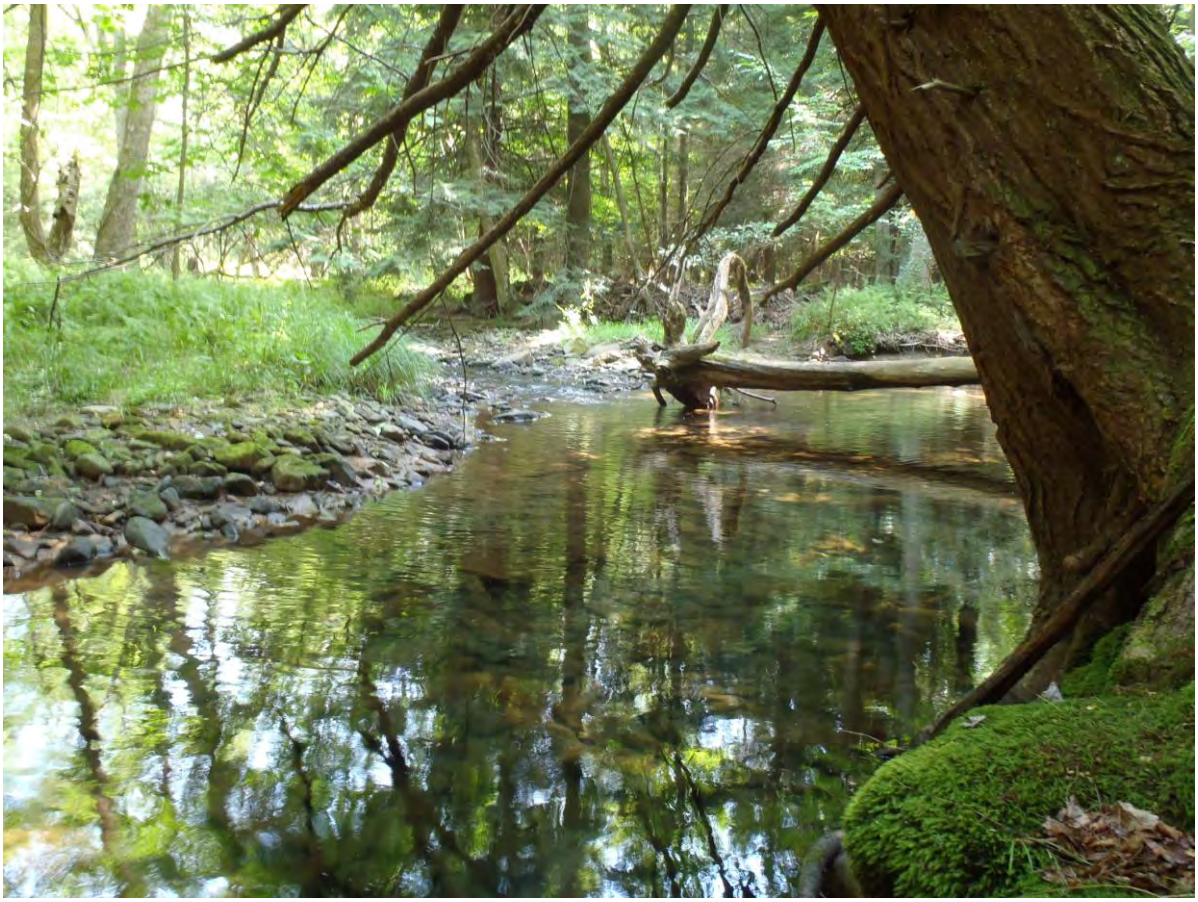
WHITES CREEK COLDWATER CONSERVATION PLAN

SOMERSET COUNTY, PA



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Pennsylvania Fish and Boat Commission Southwest Regional Office

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•Digital copies of this plan can be downloaded on the District's website and at www.coldwaterheritage.org/

COVER PHOTO BY GJS – PUZZLEY RUN

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Introduction

Somerset County is situated along the eastern border of the Allegheny Plateau which is characterized by gently folded to flat-lying sedimentary rock of the middle to late Paleozoic age. The eastern border of the county lies approximately along the Allegheny Front, a geological boundary between Pennsylvania's Allegheny Plateau and the Ridge and Valley Province.

The main drainages in the southwestern portion of Somerset county are the Casselman River and Laurel Hill Creek which flow into the Youghiogheny River along the southwest border. In the northwest portion of the county the Stonycreek River, Shade Creek, and Quemahoning Creek are the three major tributaries of the Conemaugh River. These drainages are part of the Mississippi / Ohio River Watershed. In the southeast corner, Wills Creek flows east into Bedford County and then into Maryland where it joins the Potomac River. In addition, the extreme headwaters of the Raystown Branch of the Juniata River are located in the southeastern corner of the county and flow to the Susquehanna drainage. The Potomac and Juniata rivers are both part of the Chesapeake Bay Watershed.

Whites Creek is the last of the major tributaries and one of the largest drainages to enter the Casselman River. Whites Creek is a third order stream, the watershed basin drains just shy of 34 square miles and encompasses 46 stream miles of waterway within the basin. The watershed cascades from 2355 feet off the ridgeline dividing southern Pennsylvania and northern Maryland. Whites Creek flows from Elk Lick Township, Somerset County and Savage State Forest in Maryland. The main stem is approximately seven miles long. The watershed is over 85% forested, with little to no development within the basin. The remaining 15% of the watershed is made up of Agriculture fields, wetlands and rural properties. Whites Creek originates at the confluence of two headwater tributaries, Christner and Zehner Run, just upstream of Whites Creek Road (T-864). Whites Creek has five sizable tributaries that hold wild trout populations: Enos, Christner, Zehner, Puzzley and Laurel Run. Other smaller named tributaries include: Beckett, Hoy and Bucks all of which are located in the foot hills of Mount Davis, the highest point in Pennsylvania. The entire main stem of Whites Creek flows through Addison Township, Somerset County. Whites Creek provides the Casselman River with clean cold water which further dilutes water quality impairments associated with coal mining within the Casselman basin. Whites Creek enters the Casselman River in the Village of Hardnesville nearly seven miles from its headwater's origin.

Whites Creek is designated as a High Quality (HQ) Cold Water Fishery (CWF) by the Pennsylvania Department of Environmental Protection (PADEP). The Pennsylvania Fish & Boat Commission (PFBC) classifies the upper reaches of the system as a Wild Trout Fishery. The lower section is stocked with trout by the agency and managed as a put and take fishery.

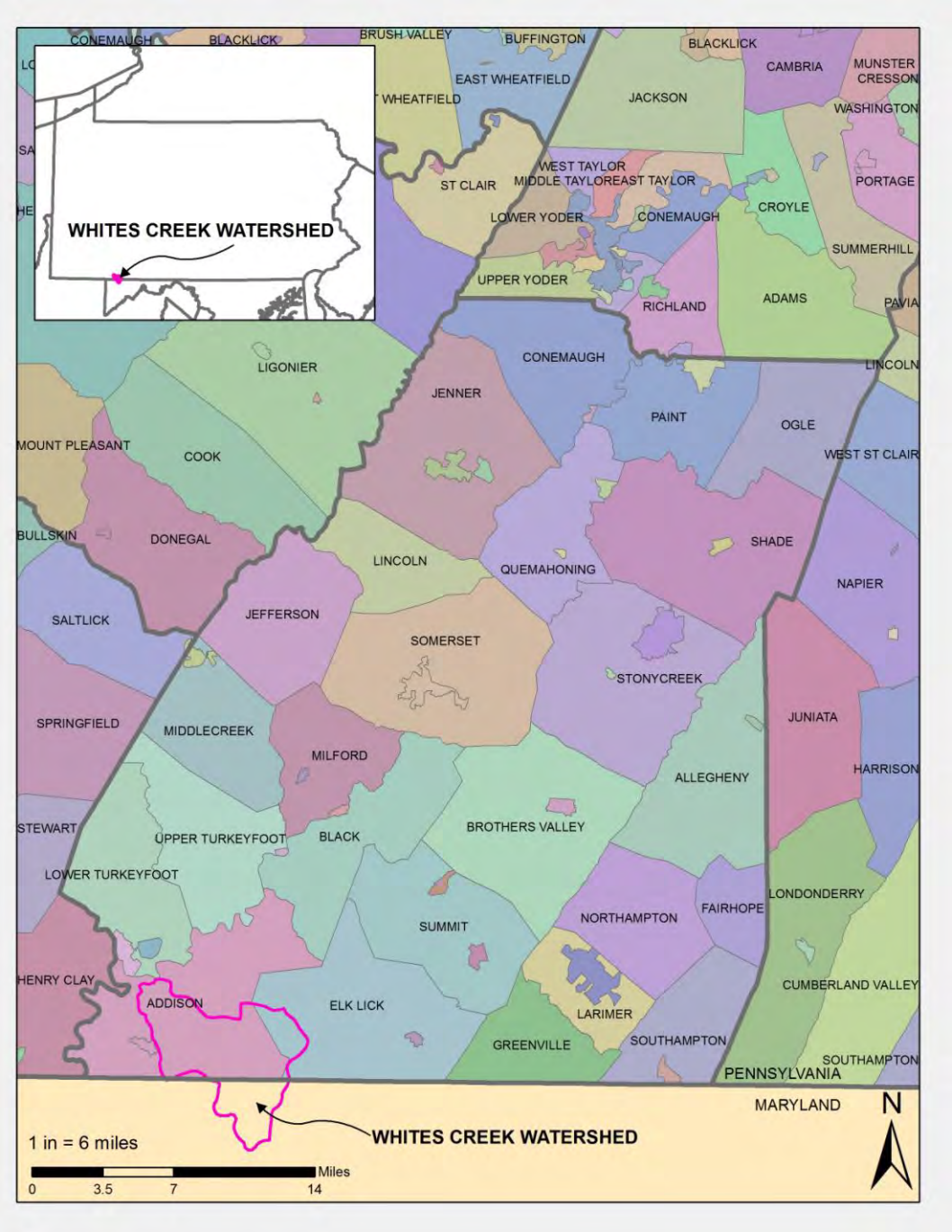


Figure 1. Whites Creek lies in the Southwest portion of Somerset County and extends into Garret County Maryland. The stream drains 34 square miles.

Somerset County Geology

Geologic records of sedimentary rocks within Somerset County span from the Devonian Scherr Formation to the Pennsylvanian Monongahela Formation. Most of these rocks are conglomerate, sandstone and shale and there is very little limestone exposed at the surface. No igneous or metamorphic rock formations are found within Somerset County.

The primary formations that exist within the Whites Creek basin include the Mississippian, Atokan and Morrowan Series, Des Moinesian Series, Missourian and the Devonion Series.

Somerset County has a number of gentle folds, the axes of which trend north-northeast. Synclines in the county include the following: Youghiogheny Syncline, New Lexington/Johnstown Syncline, Somerset Syncline, Berlin Syncline, and the Wellersburg Syncline. The southern end of Wilmore Syncline is at the town of Windber. Anticlines within the county include the Laurel Hill Anticline, Centerville Dome, Boswell Dome, Negro Mountain Anticline, and an anticline between the Berlin and Wellersburg Synclines, which is unnamed.

The larger mountains in the county are listed from west to east: Laurel Hill, Negro Mountain, Meadow Mountain, Savage Mountain and Allegheny Mountain. Negro Mountain includes the highest peak in Pennsylvania, Mount Davis, reaching 3213′. The origins of Whites Creek flow from its southwest face. All of Somerset County lies far to the south of the glacial boundary, no portion of the county has been glaciated.

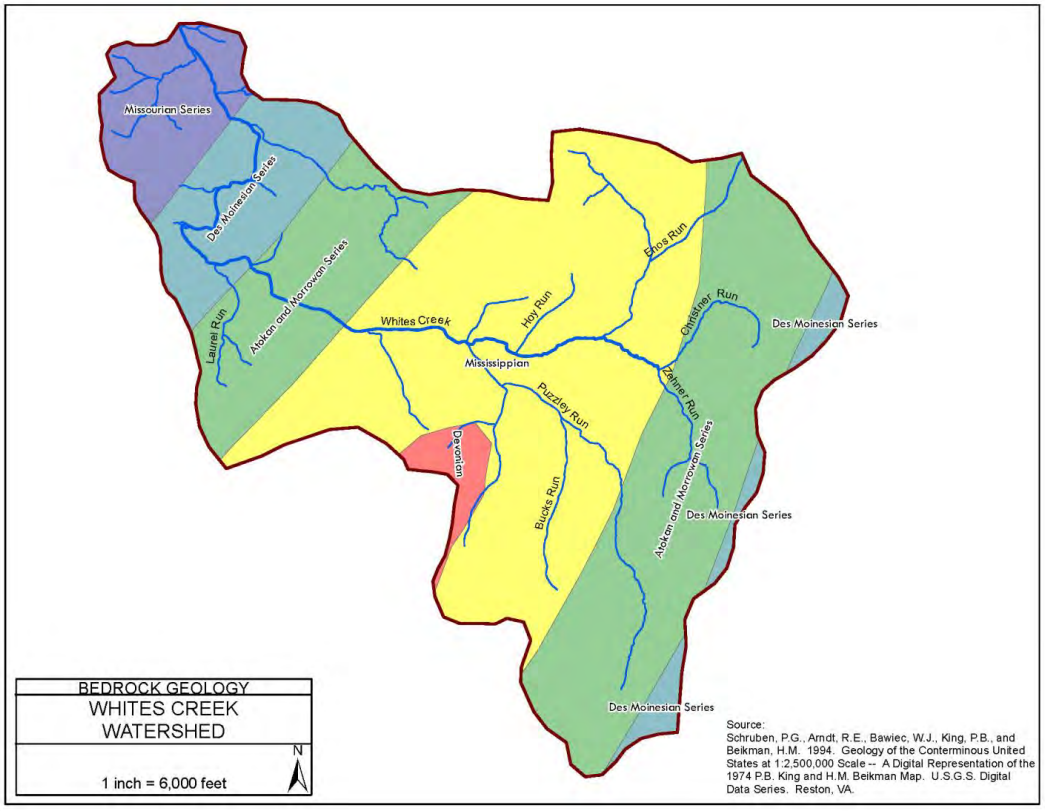


Figure 2. Geologic formation within the Whites Creek Basin

Soils of Somerset County

The soils within the county are complex and together form an intricate pattern across the landscape. The soils are comprised of weathered material from shale, siltstone and sandstone. The majority of the soils within Somerset County are suitable for cropland, hay and fruit production. The soils that lie on steeper facing slopes are prone to severe erosion if disturbed and left unprotected by vegetation. The primary limitations of the soils within the county are steepness of slope, wetness, depth to bedrock and rocky surface.

The soils within the Whites Creek basin are primarily comprised of Hazleton-Cookport which are level to very steep, deep soils that are well to moderately drained. Rayne-Gilpin-Wharton-Cavode soil groups are also present within the drainage. These soil types are also level to very steep soils and deep and range from well to poorly drained. This soil group is suitable for farming practices, however, a seasonal high water table, steepness of some slopes and depth to bedrock are the limiting factors of this soil group.

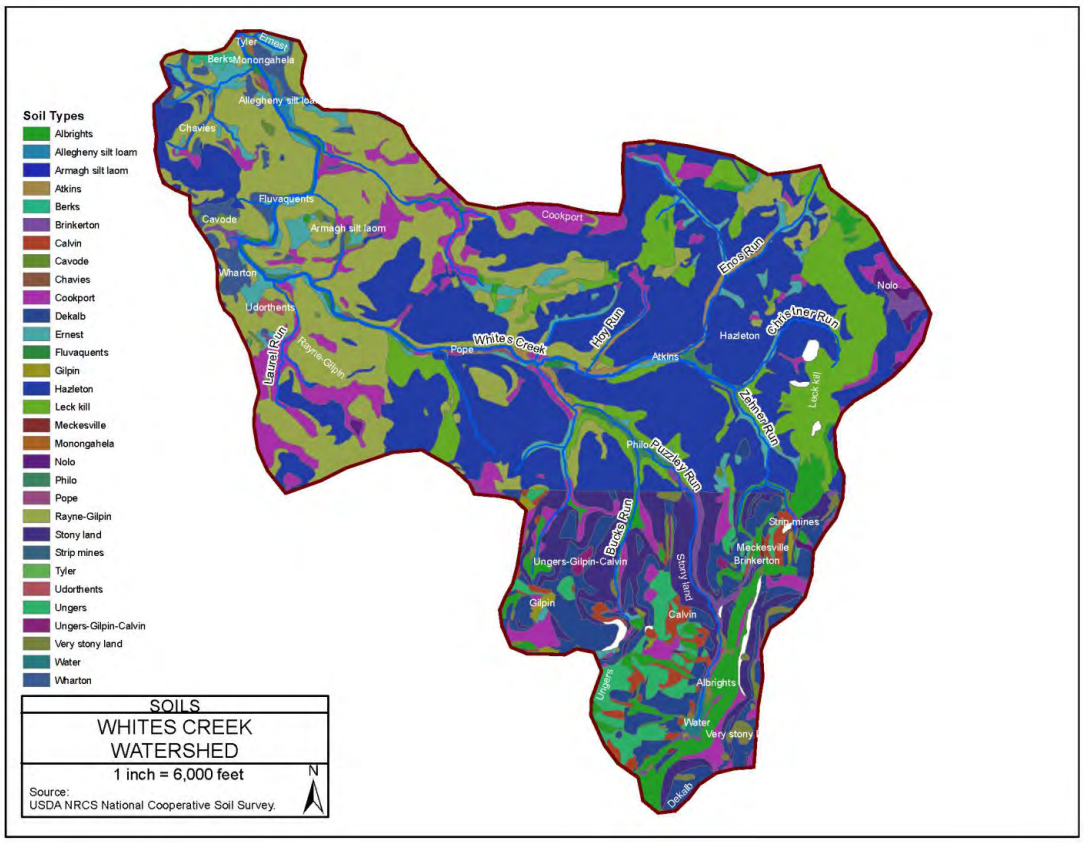


Figure 3. The map above shows the numerous soil types that lie within the Whites Creek watershed. Although over 30 soil types are listed. The Hazelton-Cookport and Rayne-Gilpin-Wharton- Cavode families are the most common.

Land Use

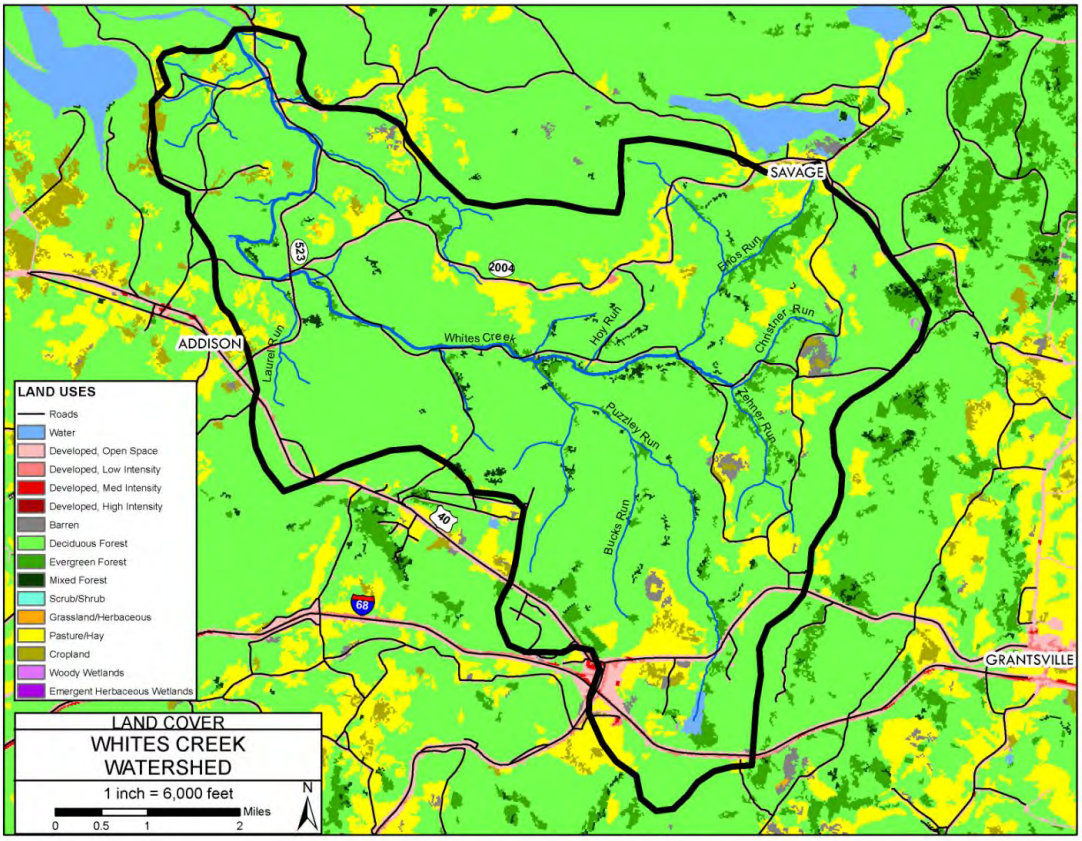


Figure 4. The Whites Creek basin is a heavily forested watershed with minimal urbanization. The map above depicts the general land use within the Whites Creek watershed.

The majority of the Whites Creek basin is forested and lies in a remote section of the county. The upper reaches of the watershed are dotted with seasonal camps and a few homes. Farms, sawmills and small businesses are located throughout the upper watershed. The lower portion of the watershed is more residential and includes the small towns of Listonburg, Dumas and Hardensville.

Eighty seven percent of the landscape of the Whites Creek basin is covered by forest. Lakes, ponds and wetlands cover 0.5% of the drainage and another 0.4% is covered with impervious surface. Urban lands encompass 4% of the landscape, with the remaining 7.2% covered by cropland and open space. The stream density of the watershed is 1.3:1 (stream miles/square miles).

Macroinvertebrates

Whites Creek is the most unimpacted and diverse of the Somerset County streams outside of the Wills Creek watershed. Whites Creek has the second most diverse macroinvertebrate community in Somerset County. Due to the lack of impairment, Whites Creek contains species of aquatic insects not found in many Somerset County streams.

Whites Creek possesses a higher diversity of macro invertebrates in a single season sample than any other stream in Somerset County. In the Somerset Conservation District's macro-invertebrate sampling in 2009, Whites Creek contained thirty-two different macroinvertebrate taxa, of which over 82% of the specimens were Ephemeroptera (mayflies), Tricoptera (caddis flies) and Plicoptera (stoneflies). This signifies the high quality of the water within the basin. The majority of these individuals need clean, cold, well-oxygenated water with a diverse substrate of detritus, mixed woody debris, sand, gravel and cobble unimpacted by sediments. The Whites Creek watershed is primarily forested and sustains the required micro-habitats needed by these organisms. The sampling completed in 2012 shows similar results as the 2009 with a large portion of the species composition made up of EPT taxa.

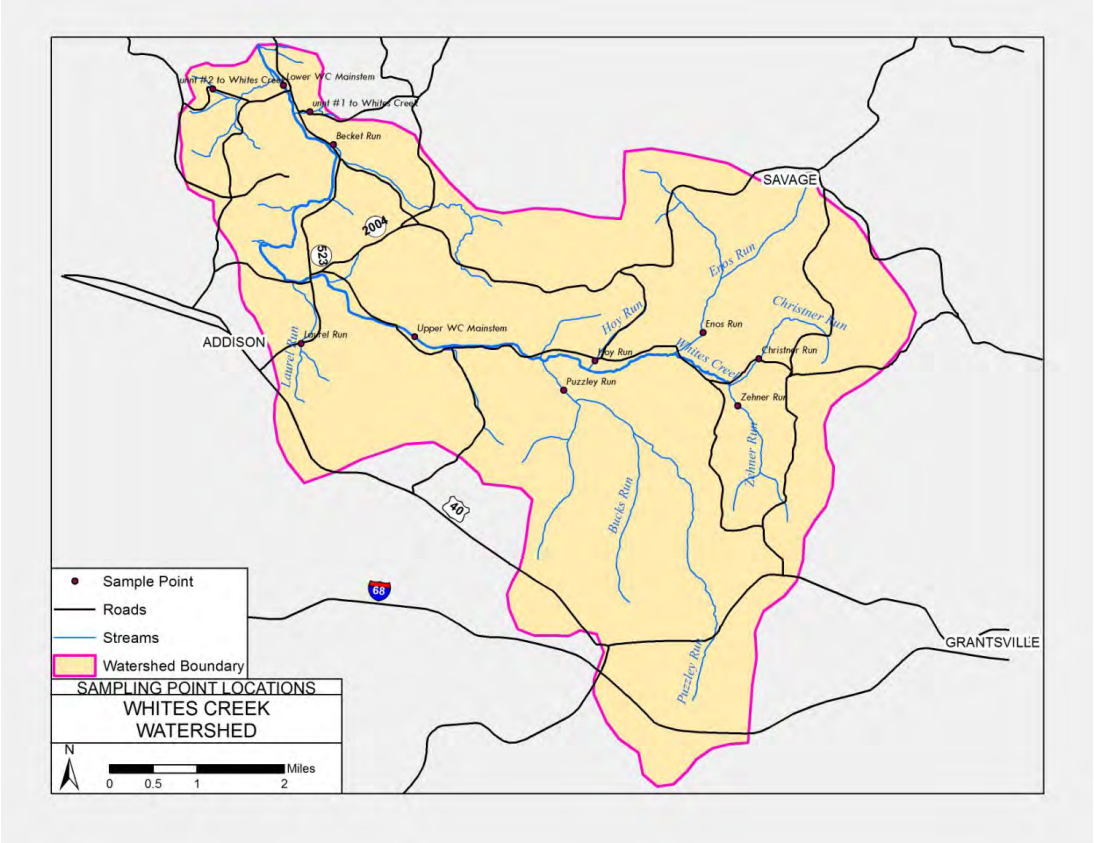
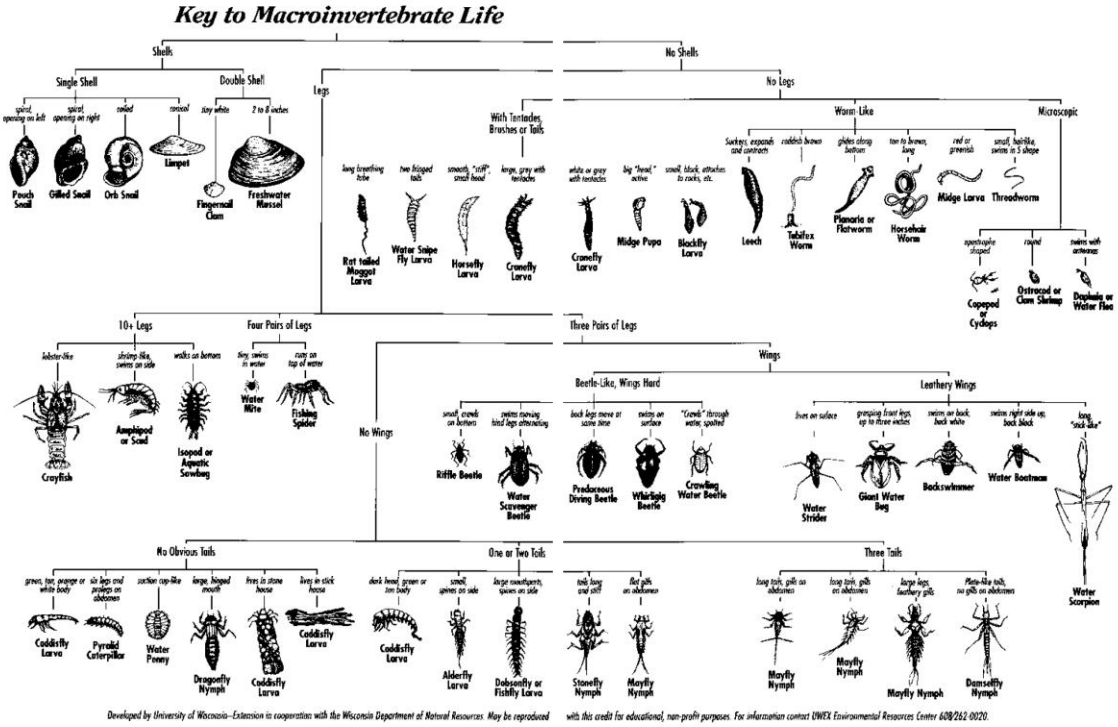


Figure 5. The above map is an outline of the Whites Creek Watershed boundary and indicates macroinvertebrate sample points throughout the basin.

Macroinvertebrates are key indicator species for water quality, which includes pH, alkalinity, acidity, temperature regimes and oxygen levels. Clean, cold, well oxygenated water should have a diverse community of aquatic life. The most commonly surveyed taxa include the mayflies, stoneflies and caddis flies or EPT.

A biotic sample was completed for each of the tributaries Whites Creeks. The two charts found on page 17, display the results for all combined sample sites. The first chart **Figure 12,** represents the diversity of taxa collected. The sample included the six invertebrate families: Mayflies (Ephemeroptera), Stoneflies (Plecoptera), Caddis Flies (Trichoptera), Beetles (Coleoptera), True Flies (Diptera) and Worms (Oligochaeta).

The second chart, **Figure 13,** found on page 17, indicates the quality of the overall watershed based on disturbance sensitive and disturbance tolerant taxa. The families *Ephemeroptera*, *Plecoptera*, *Tricoptera* (EPT) are generally more disturbance sensitive than non-EPT taxa. The biologic samples indicated that 59% of the invertebrates collected were disturbance sensitive EPT taxa and 41% were non-EPT taxa. However, there are some exceptions where some genera of EPT can be tolerant to disturbance within the water system. For the sake of this study the EPT group was not broken into sensitive and tolerant taxa.



Produced by the University of Wisconsin

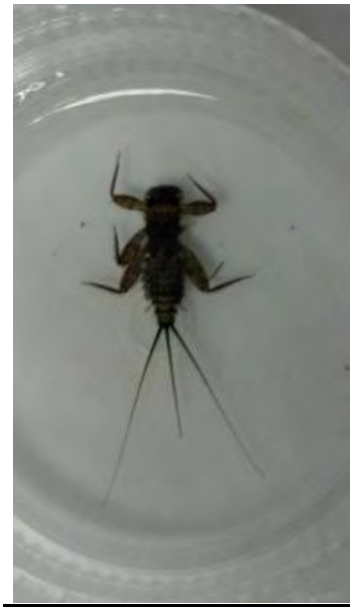
Figure 6. Aquatic invertebrates are a very diverse order of organisms and can be difficult to properly identify without a microscope. This key separates invertebrates by anatomical characteristics which is a useful tool for general family identification.

Figure 7. A diverse macroinvertebrate sample PHOTO BY GJS

Burrowing Mayfly
Family: *Ephemera*

Figure 8. PHOTO BY GJS

Figure 9. PHOTO BY GJS



Clinger Mayfly
Family: *Heptegenieda*

Figure 10. A Dragonfly Nymph family *Gomphidae* PHOTO BY GJS

PHOTO BY GJS

Figure 11. Mayflies, caddis and crustaceans are among common organisms found in the Whites Creek drainage.

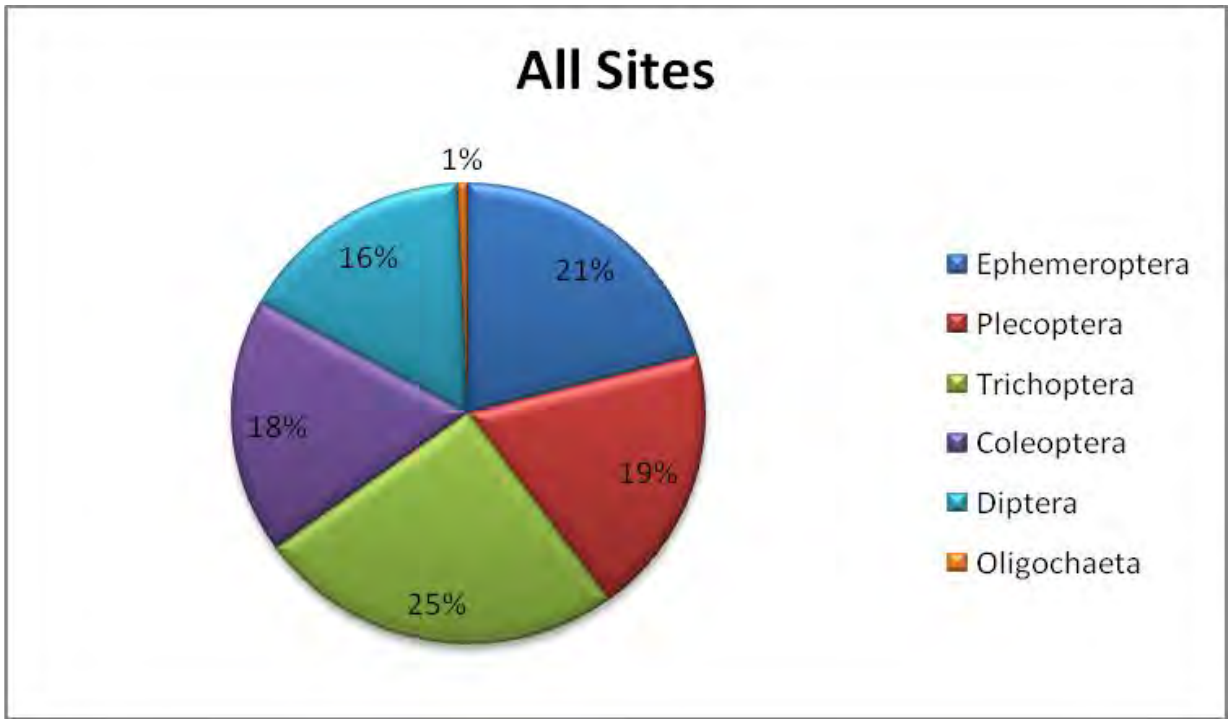


Figure 12. The above chart displays benthic invertebrate data for the entire Whites Creek watershed (All sites combined).

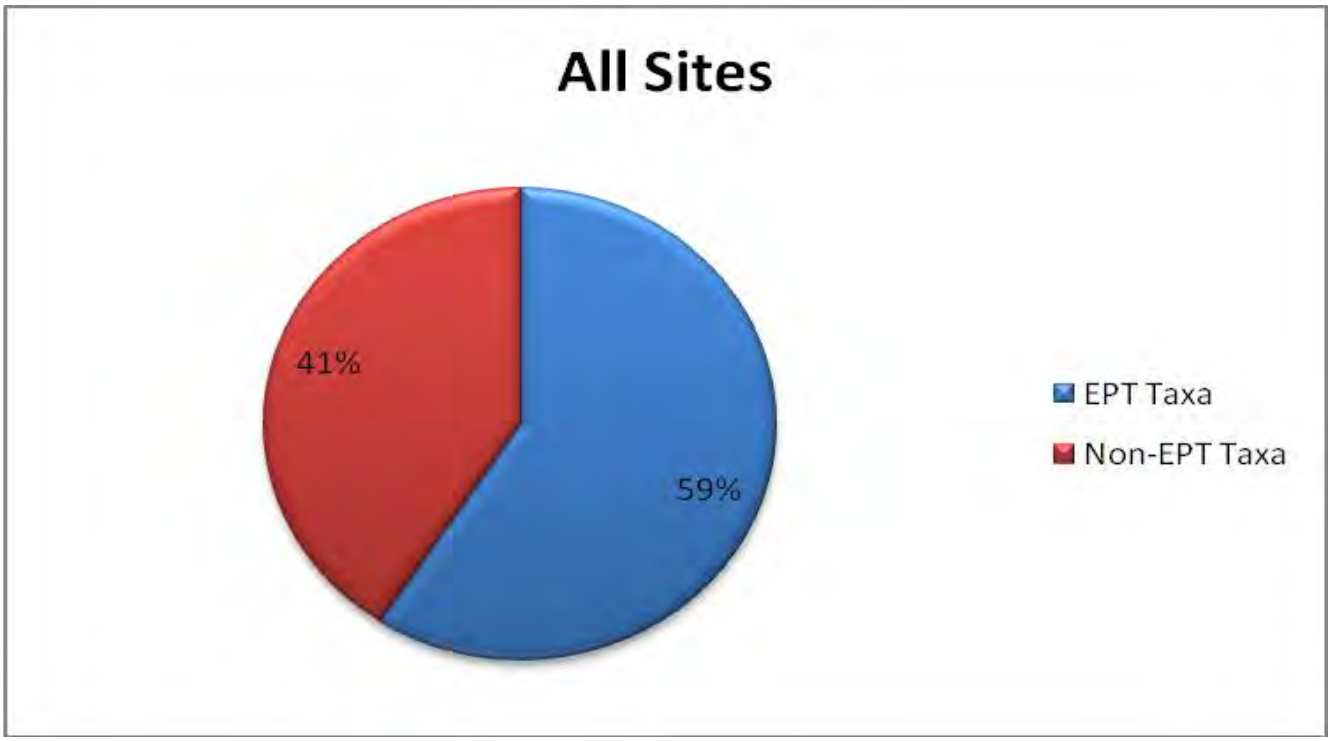


Figure 13. This chart shows the percent of pollution-tolerant (Non-EPT) and pollution-intolerant (EPT) taxa included at all invertebrate sample sites within the Whites Creek basin. EPT stands for Ephemeroptera, Plecoptera, and Trichoptera

HEADWATERS

Puzzley Run

Puzzley Run is the largest of the Whites Creek tributaries with a drainage area of just over eight and one-half square miles. The extreme headwaters of this tributary originate in the Savage National Forest in Maryland. The average elevation of the Puzzley Run watershed is 2564 feet above sea level. Over 85% of the basin is forested and 1% covered by lakes, ponds and wetlands. Furthermore, less than 8% of the watershed is urbanized by development and less than 1% of impervious surface exists within the Puzzley Run basin. The remaining 6% of the watershed is comprised of open space and agriculture fields.

Although this sub-watershed is fairly remote with a large forested buffer, no trout were collected during the routine PFBC 2011 fish survey. However, other cold water species such as mottled sculpin (Cottus bairdii) were captured during the survey. The PFBC regional biologists believe thermal pollution from existing small impoundments within the drainage are the limiting factors to the lack of trout within Puzzley Run.

The Somerset Conservation District staff performed a macroinvertebrate sample on Puzzley Run in the summer of 2011. All individuals collected were identified and classified to the lowest possible taxa. A total of 121 individuals were collected during the sample and the species composition included thirteen genera of Ephemeroptera, Plecoptera and Trichoptera (ETA). However, over 65% of the total sample included non-EPT taxa that are tolerant to disturbance.

PUZZLEY RUN FIELD WATER DATA	
Date	**8/1/2011**
Coordinates	**39.74104 N/ 79.26269W**
pH	**7.76**
Conductivity	**461**
Temperture ºC	**20.9**
Disolved Oxygen	**7mg/L**

Figure 14 . This table lists the field readings of Puzzley Run during the 2011 macroinvertebrate sampling.

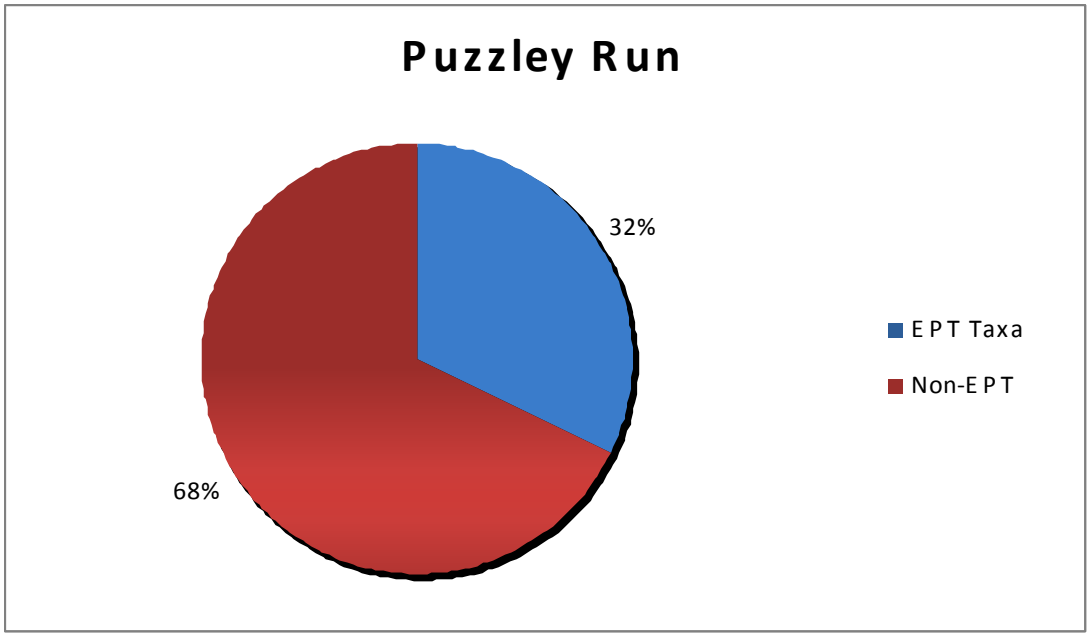


Figure 15. This chart shows the percent of disturbance-tolerant (Non-EPT) and disturbance-intolerant (EPT) taxa included Puzzley Run in 2011 invertebrate samples.

PHOTO BY GJS

Figure 16. Somerset Conservation District manager Len Lichvar collects an invertebrate sample on Puzzley Run.

Enos Run

Enos Run is the second largest tributary to Whites Creek, it is approximately 2.8 miles long and supports a wild population of Brook Trout. Enos Run is classified by the PADEP as a High-Quality Coldwater Fishery. The PFBC, labels the stream a Class D Wild Brook Trout fishery. The stream flows from the south west into Whites Creek approximately eight miles east of the town of Listonburg, Pa. The four square mile basin is 88% forested and 3% covered by urban development. The remaining portion of the watershed has been converted to agriculture lands and open space. The majority of this watershed is on private property and stream access is walk-in only.

During the PFBC survey in the 1990s, Enos Run supported a Class A wild brook trout population. However, the resident brook trout population has decreased the fishery to a Class D. During the most recent fish survey performed by the PFBC in November of 2011 thirty-seven brook trout were collected ranging in size from 25mm to 225mm and only six of these fish were of legal length. The estimated biomass of wild brook trout in Enos Run is approximately 8.4 kg/ha or 167 trout /km. In the 1990 survey the results of the survey were 1,111 trout/km and 37.5 kg/ha. The reason for this evident decrease in the brook trout population of Enos Run is unknown. However, there are speculations of over-harvest of fish and illegal introductions of stocked brown trout.

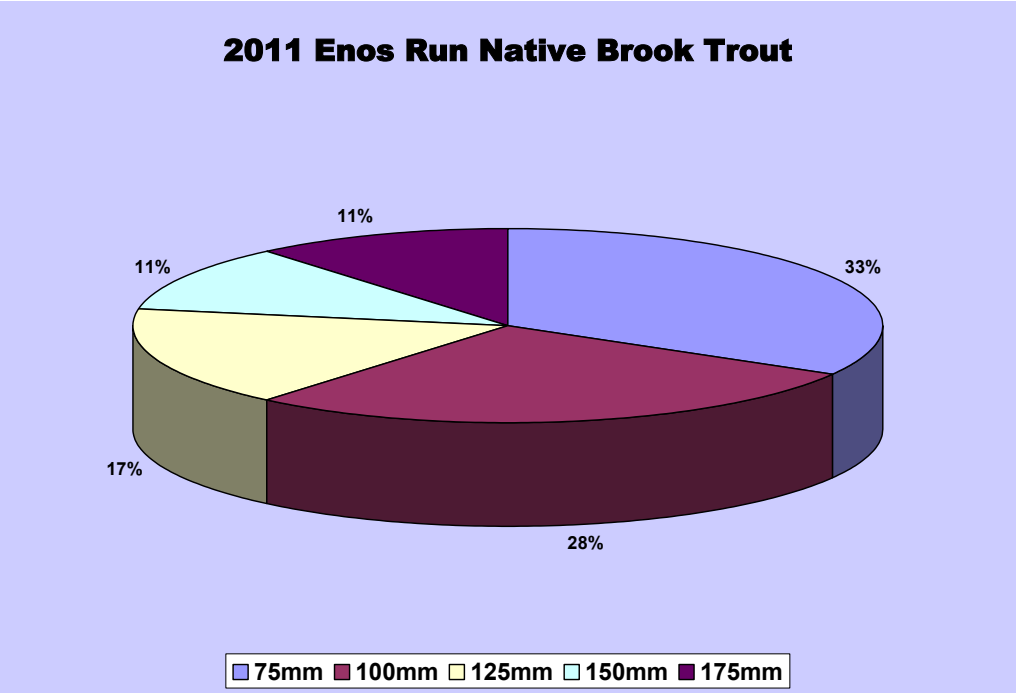


Figure 17. This pie chart shows the sizes of native brook trout captured in Enos Run during the 2011 PFBC fish sampling survey.

Even though the brook trout population has decreased greater than 75% since the 1990 survey, the fish community has grown to be more diverse. Seven species were collected during the 2011 fish survey. The results of the 1990 survey only turned up two fish species. See **Figure 18.**

ENOS RUN FISH SURVEY RESULTS		
Fish Species	**2011**	**1990**
Brook Trout - *Salvelinus fontinalis*	**X**	**X**
Brown Trout Hatchery - *Salmo trutta*	**X**	
Blacknose Dace - *Rhinichthys atratulus*	**X**	
Longnose Dace - *Rhinichthys cataractea*	**X**	
Creek Chub - *Semotilus atromaculatus*	**X**	
Mottled Sculpin - *Cottus bairdii*	**X**	**X**
White Sucker - *Catostomus commersoni*	**X**	

Figure 18. The table lists the fish species composition of Enos Run.

Enos Run Macroinvertebrates

The macroinvertebrate community of Enos Run is rich in addition a more pollution sensitive than the Puzzley Run community. Nearly 42% of the total macro sample was disturbance intolerant EPT taxa. The remaining 58% are taxa that are less sensitive to disturbance. During the sampling in August of 2011, performed by the Somerset Conservation District, twenty genera of EPT were collected.

ENOS RUN FIELD WATER DATA	
Date	**8/1/2011**
Coordinates	**39.74582 N/ 79.23000**
pH	**6.97**
Conductivity	**89.1**
Temperature ºC	**18.8**
Dissolved Oxygen	**9mg/L**

Figure 19. The above chart lists the existing field data for Enos Run at the time of the macro sampling.

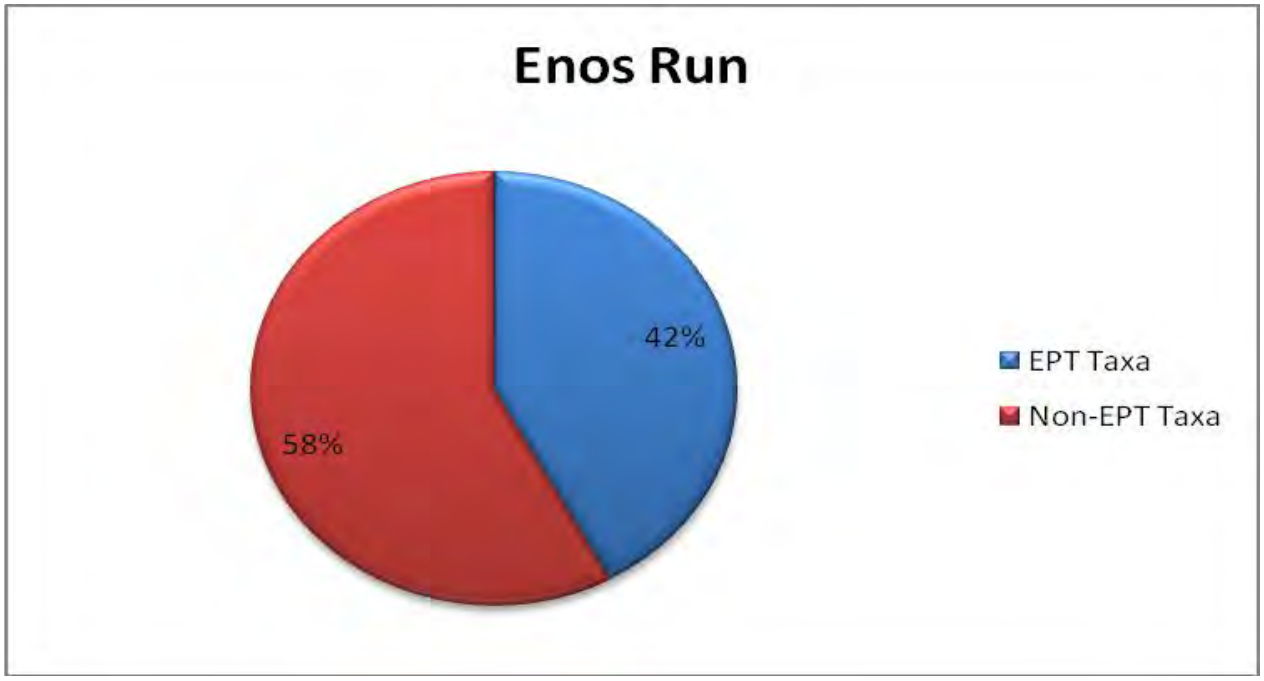


Figure 10. This chart shows the percent of disturbance-tolerant (Non-EPT) and disturbance-intolerant (EPT) taxa identified in the 2011 Enos Run invertebrate samples.

Zehner Run

Zehner Run is a designated HQ CWF by PADEP and is classified as a Class D wild brook trout fishery by PFBC. The origin of the stream flows northwest into Pennsylvania from Garret County Maryland. Zehner Run drains an area of 2.2 miles and flows approximately the same distance before it converges with Christner Run. The drainage area is 83.7% forested, 0.1% covered by ponds and wetlands, 2.7% covered by urban development, 0.1% impervious surface and 13.4% agriculture and open space. The entire watershed is privately owned, but open to walk in only fishing.

Prior to the November 2011 survey, Zehner Run was last surveyed for wild trout in July of 1990. At that time, the stream contained a Class A wild brook trout population. Since that time no significant changes have occurred to the stream or adjacent lands. However, the brook trout population has reduced in number by six times. At the time of the 1990 survey, the biomass of brook trout was 38.32 kg/ha. The results of the November survey show 6.85kg/ha of wild brook trout.
The invertebrate life, the true indicator of water quality, is rich and diverse. The aquatic insect samples were comprised of 54% disturbance sensitive EPT taxa. Furthermore, a more specific breakdown of the sample showed 17 genera of mayflies, 4 genera of stoneflies and 7 genera of caddis flies. Although the trout populations were lower than previously recorded, the quantity and assortment of insect life indicates the high level of water quality.

The in-stream habitat of Zehner Run was also assessed under the same protocols as previously mentioned. The total score for the existing stream habitat conditions of Zehner Run was 9.5 or "excellent". All components of the habitat are suitable for fish and other forms of aquatic life.

It is unknown why the trout population has reduced in the stream. It is speculated that water temperature, and extreme conditions such as drought or floods have impacted the recruitment class of brook trout. Other factors that may have influenced the population could be illegal stocking of brown trout and over harvest of wild brook trout in these waters.

ZEHNER RUN FIELD WATER DATA	
Date	**8/1/2011**
Coordinates	**39.74242 N / 79.23398 W**
pH	**7.75**
Conductivity	**112.9**
Temperature ºC	**22.5**
Dissolved Oxygen	**8mg/L**

Figure 21. The table above lists field readings recorded during the 2011 macroinvertebrate sampling on Zehner Run.

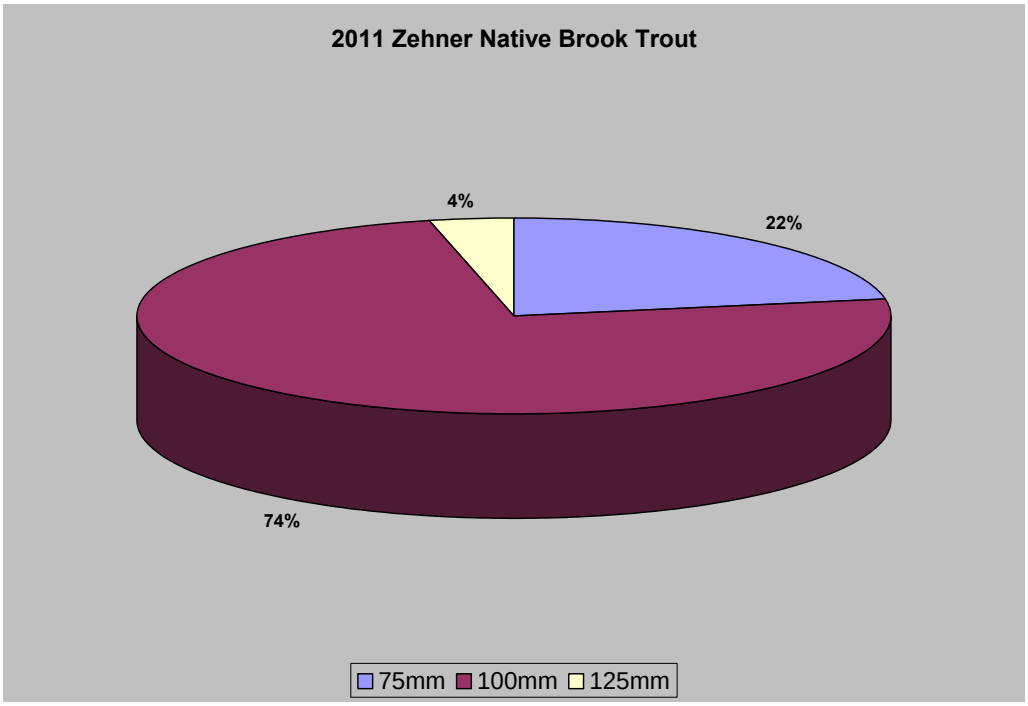


Figure 22. The chart above represents the native brook trout collected during the 2011 PFBC fish sampling survey on Zehner Run.

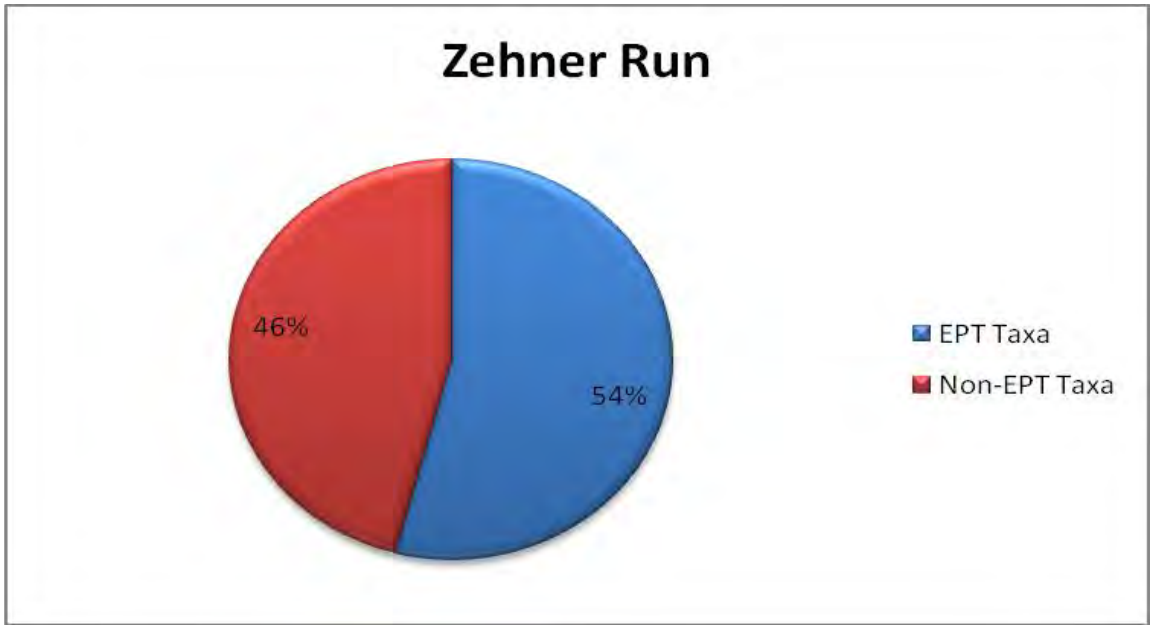


Figure 22. The percent of disturbance-tolerant (Non-EPT) and disturbance-intolerant (EPT) taxa, included in the 2011 Zehner Run invertebrate sample are illustrated in this graph.

Christner Run

Christner Run is the fourth largest tributary to Whites Creek with a drainage area of 2.2 square miles. Over 80% of the watershed is forested land and 4% of the land has been developed by urbanization. The remaining portions of the watershed are utilized be agriculture operations and open space.

Christner Run is classified by the PFBC as a Class D wild trout fishery and High Quality Cold Water Fishery (HQ_CWF) by the PADEP. The population of native brook trout has fluctuated over the past twenty years. The PFBC survey in the 1990s turned up 122 wild brook trout and an estimated population at that time was 7.5 Kg/Ha622 fish/ kilometer. During the most recent survey completed in September of 2012, only 16 wild brook trout were recorded in the sample. The sizes ranged from 50-150mm (1.9″-5.9″). The results of the most recent PFBC sampling show a biomass of 2.92 kg/ha of brook trout.

The aquatic bug life of Christner Run is less than that of Zehner and Enos Runs. The invertebrate samples show a greater percentage of disturbance tolerant species present in this waterway. The lower portions of Christner Run have sparse tree canopy and thermal impacts may be influencing aquatic life.

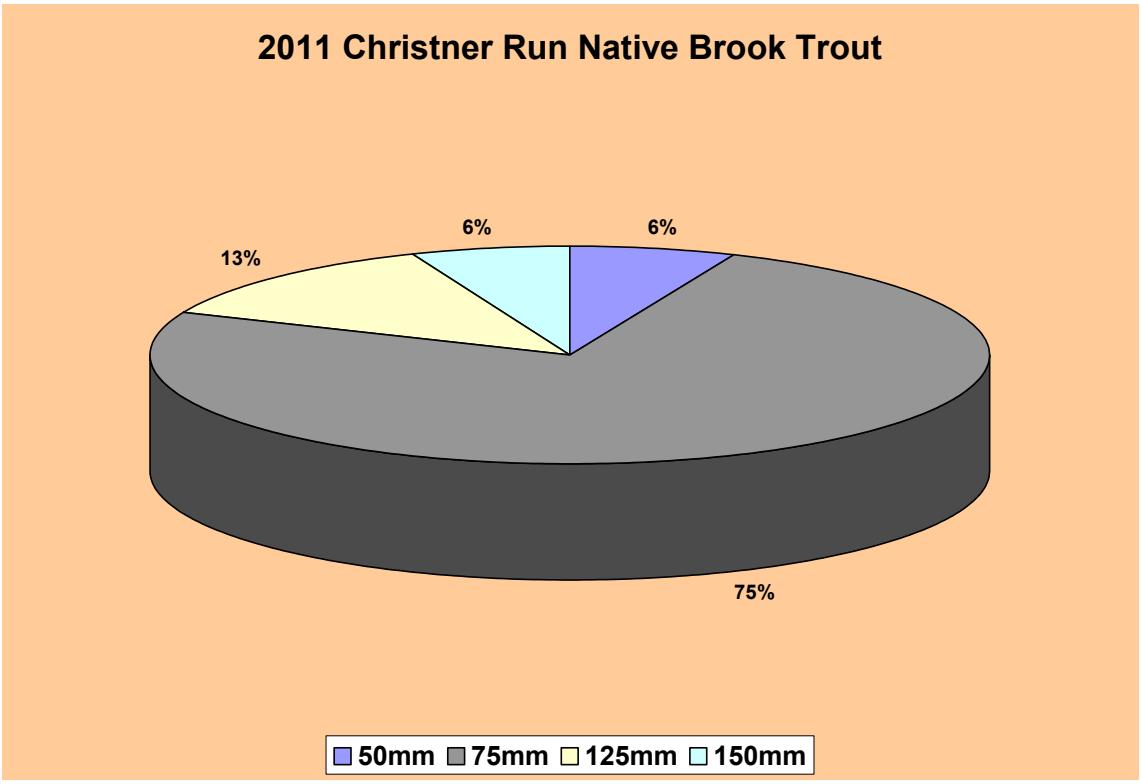


Figure 24. This graph shows the native brook trout collected in Christner Run during the PFBC 2011 sampling survey.

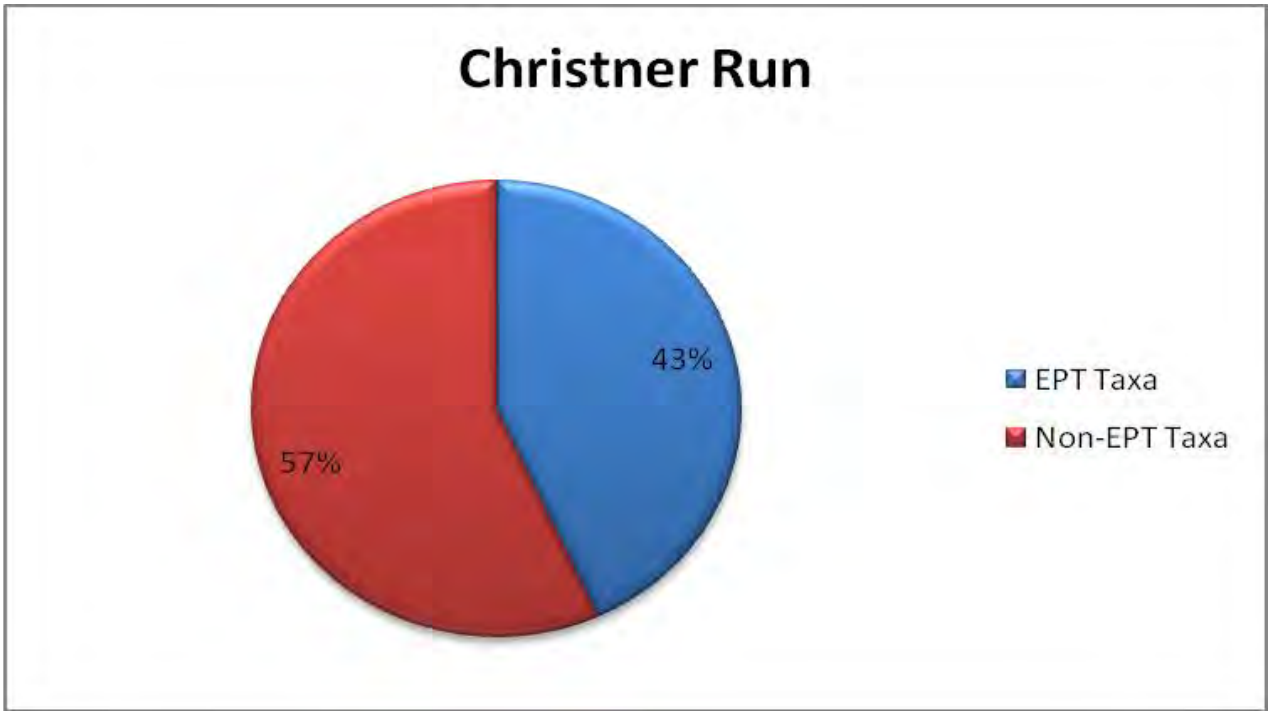


Figure 25. The percent of pollution-tolerant (Non-EPT) and pollution-intolerant (EPT) taxa included in the Christner Run 2011 invertebrate sample is shown above.

CHRISTNER RUN FIELD WATER DATA	
Date	**8/1/2011**
Coordinates	**39.74218 N/ 79.21750 W**
pH	**7.93**
Conductivity	**61.2**
Temperature ºC	**18.9**
Dissolved Oxygen	**7mg/L**

Figure 26. The table above lists the field readings taken during the macroinvertebrate sampling for Christner Run.

Laurel Run

Laurel Run is another of the small mountain headwaters that feeds Whites Creek. It is designated as a HQ CWF by PADEP and a Class D wild trout stream by the PFBC. The stream enters Whites Creek a short distance from SR 532 before the road intersects US 40. Laurel Run, drains 2.04 square miles of area and is less than two miles in length. The basin is 94% forested, 0.3% covered by impervious surface, 0.3% covered by ponds and wetlands, 4% urban development and the remaining 1.4% of land is agriculture and open space.

Laurel Run was surveyed by the PFCB as part of the unassessed waters program in search of naturally reproducing wild trout populations. The agency captured a total of 16 native brook trout ranging in size from 50-200mm. The estimated brook trout biomass is 9.39 kg/ha which is just shy of Class C designation. The stream was recently added to the wild trout waters list.

The stream was visually assessed according to the "NRCS Stream Visual Assessment Protocol" and received a total score of 9.6. Under the protocol guidelines, this labels the existing habitat conditions as excellent. Although this was the only Whites Creek tributary identified to have an active livestock stream access, there is no supporting evidence the livestock are negatively impacting the watercourse.

The aquatic invertebrate life of Laurel Run is primarily dominated by disturbance sensitive caddis and stonefly taxa. No mayflies were present in the sample which may be related to the low pH and conductivity of the stream. At the time of the macroinvertebrate sampling in June of 2011, the pH reading was 4.9 with a conductivity reading of 26. There is no evidence of abandoned mine drainage into or adjacent to Laurel Run. The geology is most likely naturally acidic and a limiting factor to the diversity and density of aquatic life this stream can support.

PHOTO BY GJS

Figure 27. The upper reaches of Laurel Run are blanketed with a thick canopy of rhododendron, this shades the stream, provides stream bank stabilization and overhead cover for fish, all of which are important characteristics of mountain trout streams.

PHOTO BY GJS

Figure 28. Somerset Conservation District Resource Specialist aid Aimee Steele performs water chemistry testing on Laurel Run.

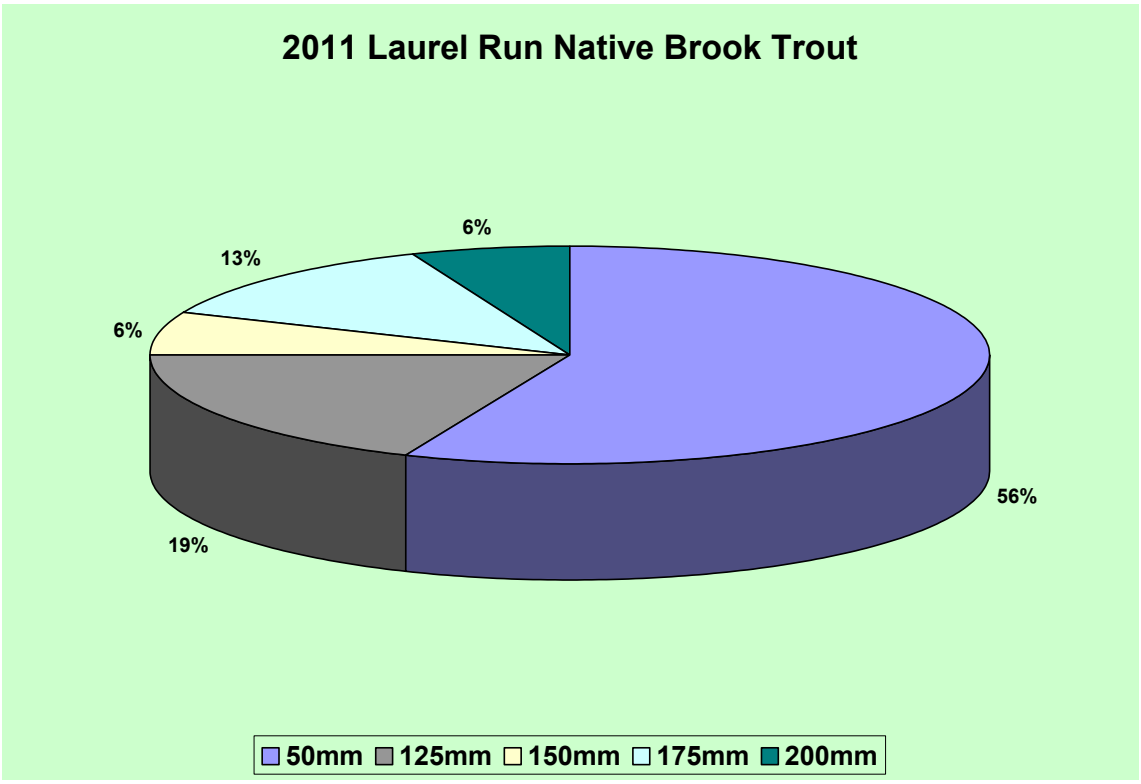


Figure 29. This chart shows the number of wild brook trout collected during the 2011 PFBC sampling of Laurel Run.

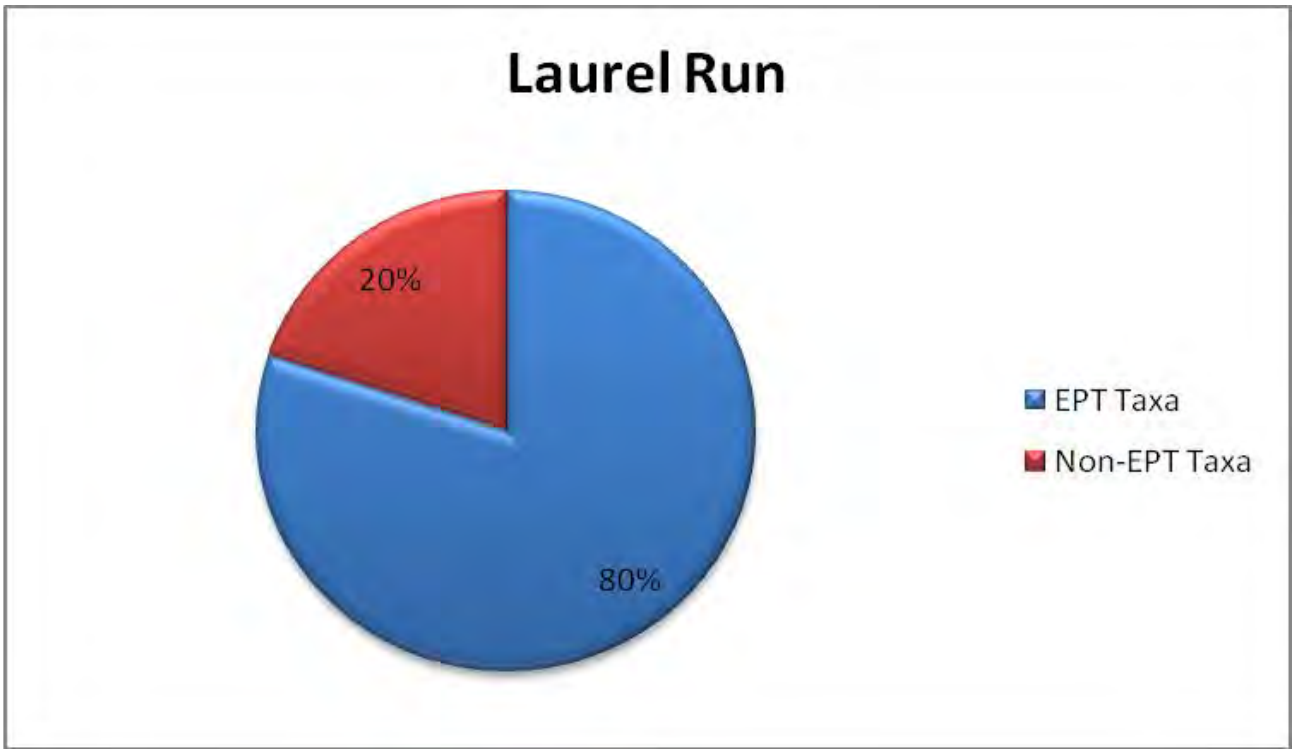


Figure 30. The percent of disturbance-tolerant (Non-EPT) and disturbance-intolerant (EPT) taxa included in the Laurel Run 2012 invertebrate samples is shown in this chart.

LAUREL RUN FIELD WATER DATA	
Date	**3/9/2011**
Coordinates	**39.443758 N/ 79.185671 W**
pH	**4.86**
Conductivity	**37.4**
Temperature ºC	**14.4**
Disolved Oxygen	**11mg/L**

Figure 31. The table above lists the field readings recorded during the invertebrate sampling on Laurel Run

Becket Run

Becket Run is a small tributary that enters Whites Creek after it crosses SR 523, approximately 1000 feet past Lenhart Hill Road near the village of Beachly. Becket Run drains 2.3 square miles. The watershed is 91.4% forested, 5.3% urbanized, 0.1% covered by impervious surface and 3.2% covered by open space.

The PFBC surveyed Becket Run in 2012 as part of the unassessed waters program in search of streams containing wild trout populations. No trout were found during the survey. It was noted that black-nosed dace, creek chubs, mottled sculpin, and white suckers were present in the survey.

The stream habitat of Becket Run was also surveyed under the same protocols as previously mentioned in this report. The stream was given a score of 9.0 which is still considered excellent under the assessment guidelines.

The aquatic life of Becket Run is much less diverse than other streams in the watershed. It is suspected that due to the close proximity of SR 523, road salt and other pollutants carried by storm water run-off have influenced the water chemistry. The geology of the stream may be more acidic and similar to its sister stream Laurel Run. The invertebrate sample had a greater number of disturbance tolerant species than disturbance sensitive. Less than half of the sample contained EPT taxa. **See Figure 32**.

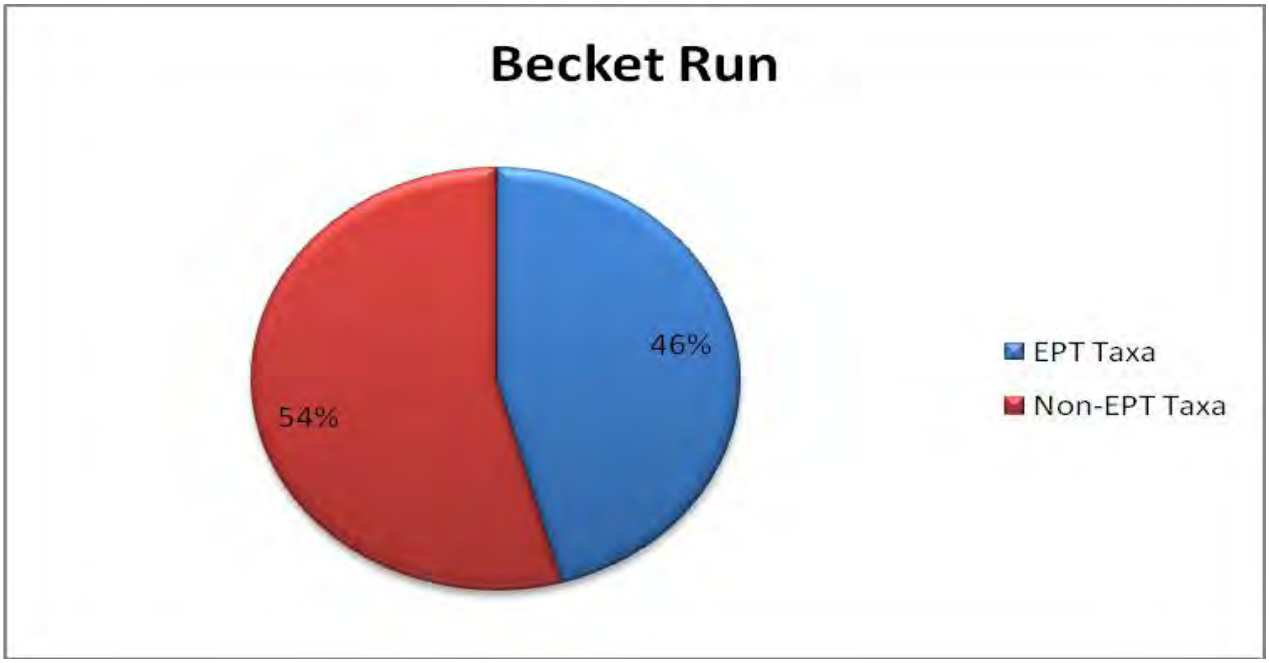


Figure 32. This graph shows the percent of disturbance-tolerant (Non-EPT) and disturbance-intolerant (EPT) taxa in Becket Run included in the 2012 invertebrate samples.

BECKET RUN FIELD WATER DATA	
Date	**3/9/2011**
Coordinates	**39.4460 N/ 79.2002 W**
pH	**6.1**
Conductivity	**64.6**
Temperature ºC	**16**
Disolved Oxygen	**10mg/L**

Figure 33. The table above lists the field readings taken during the invertebrate sampling on Becket Run.

PHOTO BY GJS

Figure 34. Becket Run near State Route 523

Hoy Run

Hoy Run is one of Whites Creek's smallest tributaries. It enters the mainstem of Whites Creek along Whites Creek Road less than one-half mile upstream from where Puzzley Run enters Whites Creek. Hoy Run was not assessed by the PFBC in the 2012 sampling season. No fish data is recorded for this waterway. However, macroinvertebrate samples were collected by the District as part of this comprehensive plan in order to document taxa present within this small tributary.

The aquatic invertebrate life of Hoy Run is diverse for the size of the watershed. Greater than 60% of the species collected were disturbance sensitive EPT taxa and represented 9 genera of mayflies, caddis flies and stoneflies.

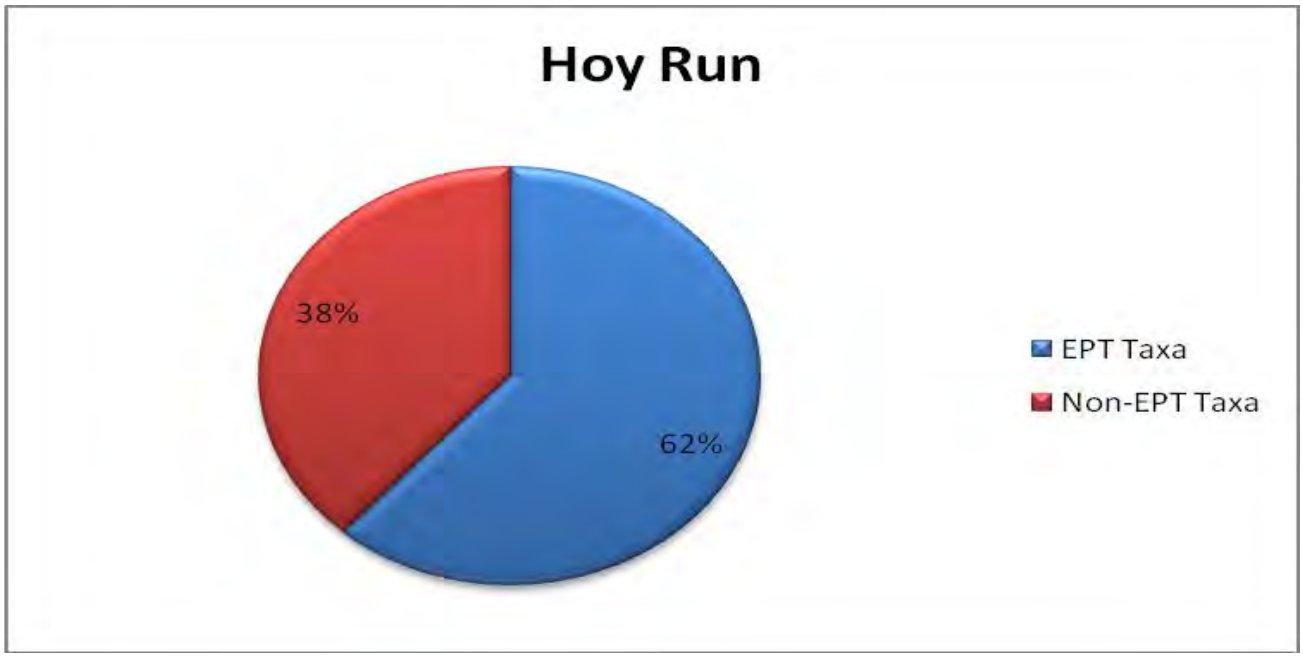


Figure 35. The percent of disturbance-tolerant (Non-EPT) versus disturbance-intolerant (EPT) taxa in Hoy Run in the 2011 invertebrate samples is shown here.

HOY RUN FIELD WATER DATA	
Date	**8/1/2011**
Coordinates	**39.74506 N/ 79.24920 W**
pH	**7.73**
Conductivity	**122**
Temperature ºC	**20.8**
Disolved Oxygen	**6mg/L**

Figure 36. The table above contains the field readings recorded during the invertebrate samples taken on Hoy Run.

UNAMED TRIBUTARIES

Two unnamed tributaries were sampled for macroinvertebrates during this study. The first unnamed tributary (UNT1), is located at the top of Campground Road on the west side of the Whites Creek drainage. This stream had the third largest sample of individuals, 337 invertebrates were collected from this stream. The sample was also one of the richest and diverse of the samples collected. Twenty-one genera of EPT were collected and identified. No fish data is available for this drainage.

The second unnamed tributary (UNT2) is located along Fort Hill Road. This stream has been degraded by surface mine seeps, which have substantially impaired the aquatic life. Although **Figure 38** appears to hold a quality invertebrate population, the low numbers of individuals collected skew the percentages of EPT taxa. Only 18 individuals were collected in the sample. Although the sample did include stoneflies and caddis flies, no mayflies were present. A total of only 14 genera were included in the entire sample. This is incredibly low when compared to the other waters of the Whites Creek drainage.

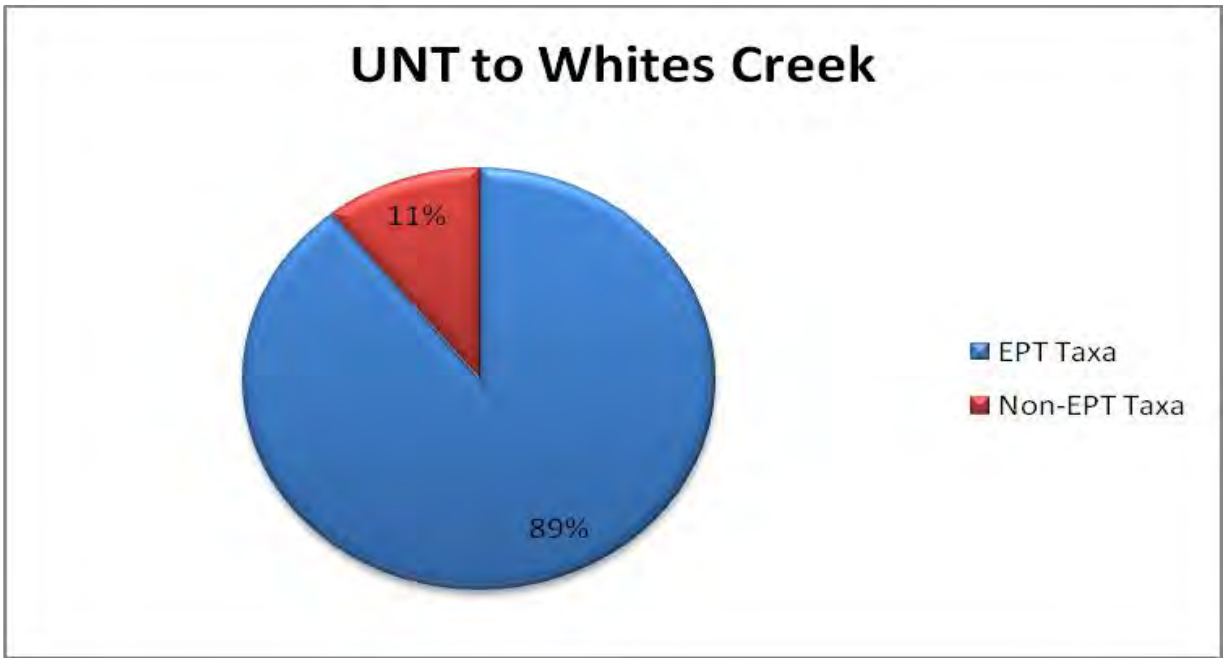


Figure 37. The Percent of disturbance-tolerant (Non-EPT) versus disturbance-intolerant (EPT) taxa in Unnamed tributary 1 (UNT1) to Whites Creek in 2012 is shown above.

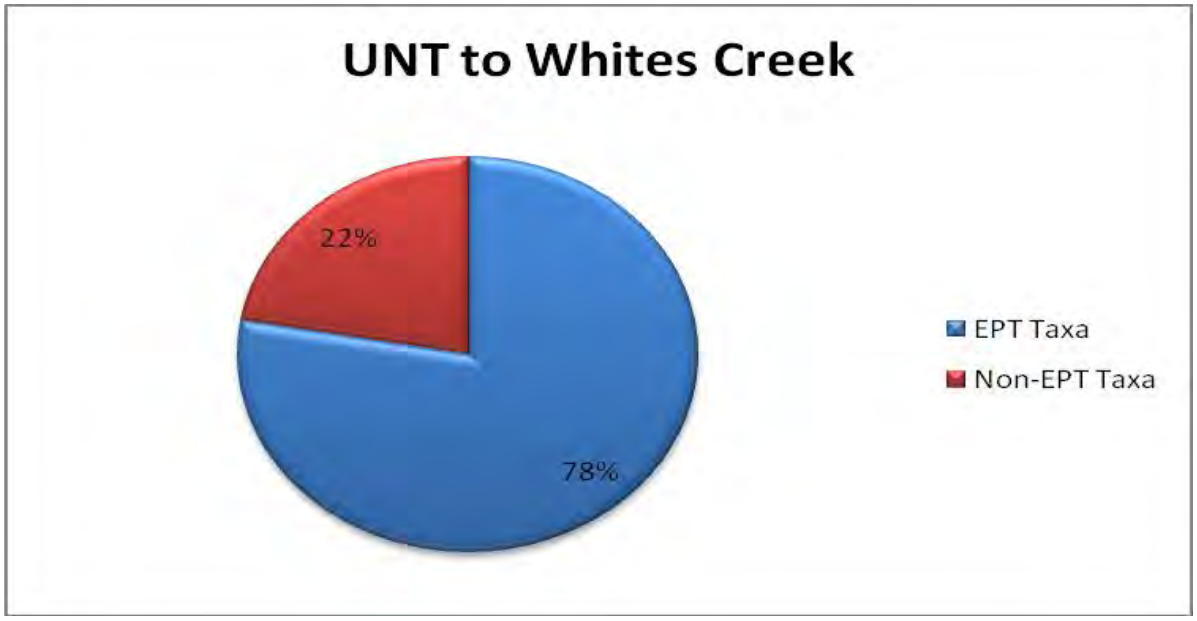


Figure 38. This chart represents the percent of disturbance-tolerant (Non-EPT) versus disturbance-intolerant (EPT) taxa in a unnamed tributary 2(UNT2) to Whites Creek in 2012.

Whites Creek Main Stem

Whites Creek below the major tributaries holds one of the richest samples that was gathered during this study. The stream is cool, shaded, well oxygenated and has a variety of micro-habitats within the system. All of these components combined present the appropriate living conditions for a healthy aquatic community. Sixty-six percent of the sample included disturbance sensitive EPT taxa. The disturbance sensitive portion of the sample includes 34 genera of stoneflies, mayflies and caddisflies. This sample is living proof of the excellent water quality of Whites Creek.

This section of Whites Creek was also scored according to the visual stream assessment guide. The overall physical and biological components were considered excellent according to the scoring system.

The PFBC performed routine fish surveys for this section of Whites Creek. Please refer to the "Fisheries" section of this report.

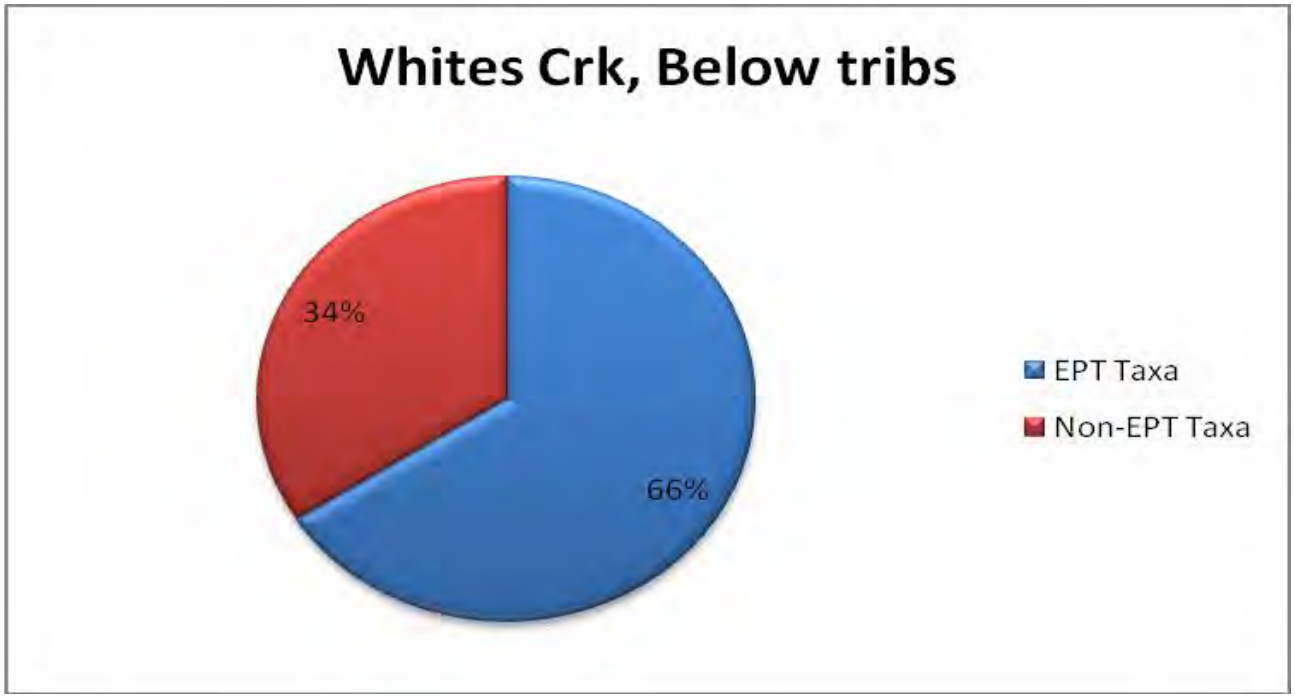


Figure 39. The percent of disturbance-tolerant (Non-EPT) versus disturbance-intolerant (EPT) taxa in Whites Creek, below Enos, Zehner, Christner and Puzzley Runs is presented above.

WHITES CREEK FIELD WATER DATA	
Date	**8/1/2011**
Coordinates	**39.74365 N/ 79.27799 W**
pH	**7.9**
Conductivity	**229**
Temperature ºC	**21.7**
Disolved Oxygen	**8mg/L**

Figure 40. The table above contains the field readings recorded during the invertebrate sampling taken from the main stem of Whites Creek.

The Fishery

Whites Creek is classified as a High Quality (HQ) Cold Water Fishery (CWF) by the Pennsylvania Department of Environmental Protection (PADEP) and Pennsylvania Fish & Boat Commission (PFBC) and classifies the headwaters of the system a Wild Trout Fishery and the lower reaches are managaed as a trout stocked fishery. The Pennsylvania Fish and Boat Commission biological surveys from 1977, 1987 and 2005, all indicate wild reproducing trout within the main stem drainage.

Whites Creek is stocked by the PFBC in the lower portion of the stream from the first bridge cross on T-864 Whites Creek Road to the mouth, with hatchery raised brook *Salvelinus fontinalis* and brown trout *Salmo trutta*. The headwaters of the streams: Enos, Zehner, Puzzley, Christner, and Laurel Run are managed as wild trout streams. In addition, the PFBC have historically collected wild brook trout from the main stem of Whites Creek. Two headwater tributaries, Zehner and Enos Run, have historically held Class A wild producing populations of brook trout.
Other fish species that inhabit the main stem and its tributaries include black nose dace, creek chubs, white suckers, small mouthed bass, northern hog suckers, long nosed dace, long nosed suckers and mottled sculpin.

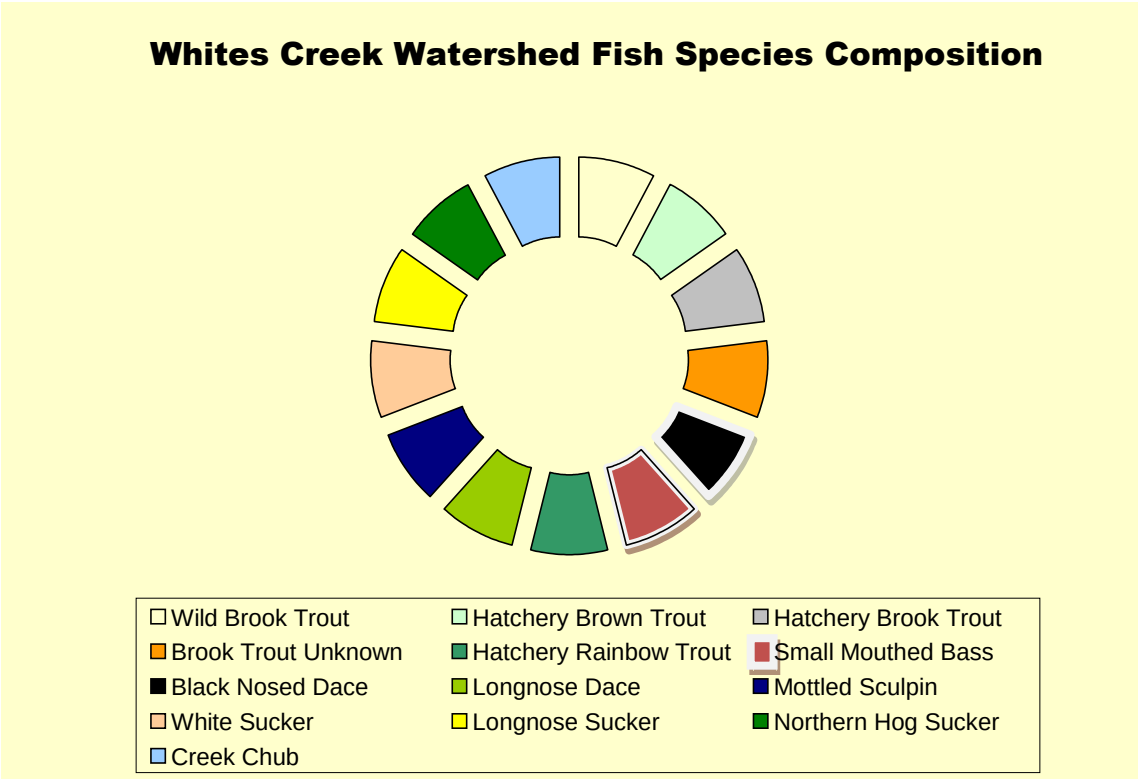


Figure 41. Above is the species composition of the Whites Creek drainage. Thirteen fish species have been collected by the PFBC during routine fish surveys within the watershed.

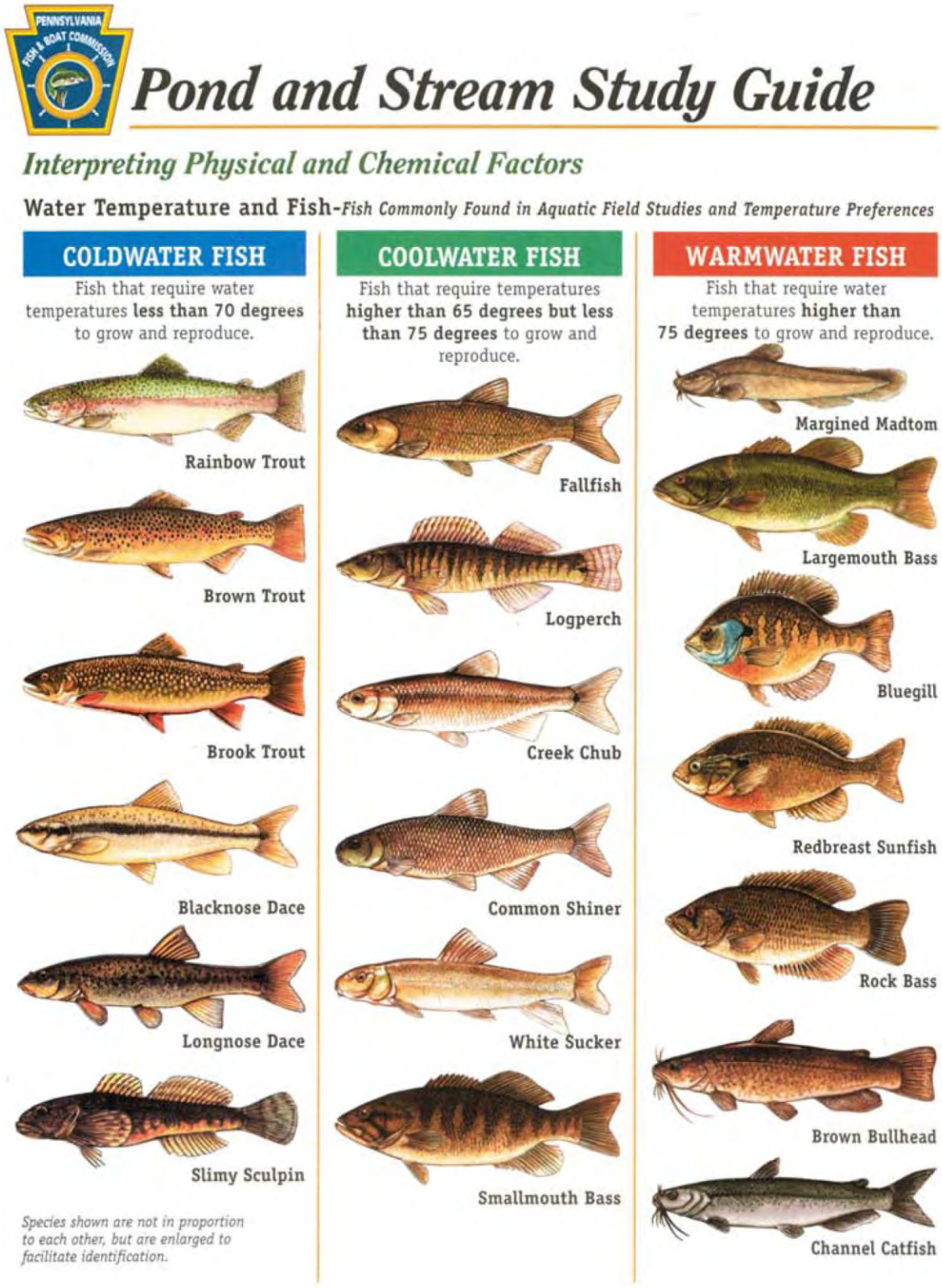


Chart by the PFBC

Figure 42. Above is a PFBC publication of Pennsylvania fish species according to their preferred water temperature. Whites Creek is considered a Cold/Cool water fishery.

Photo by GJS

Figure 43. Native brook trout, black-nosed dace and mottled sculpin are among the most common cold water fish species living in the basin.

Trout

PFBC Wild Trout Stream Classification	
Class	**Kilograms per Hectare (Kg/Ha)**
A	**>30 Kg/Ha**
B	**>20 < 30 Kg/Ha**
C	**>10 < 20 Kg/ Ha**
D	**< 10 Kg/Ha**
E	**No Wild Trout Present**

Figure 44. The figure above explains the PFBC wild trout stream classification system based on biomass, or total weight of all wild trout collected per area of land covered by water.

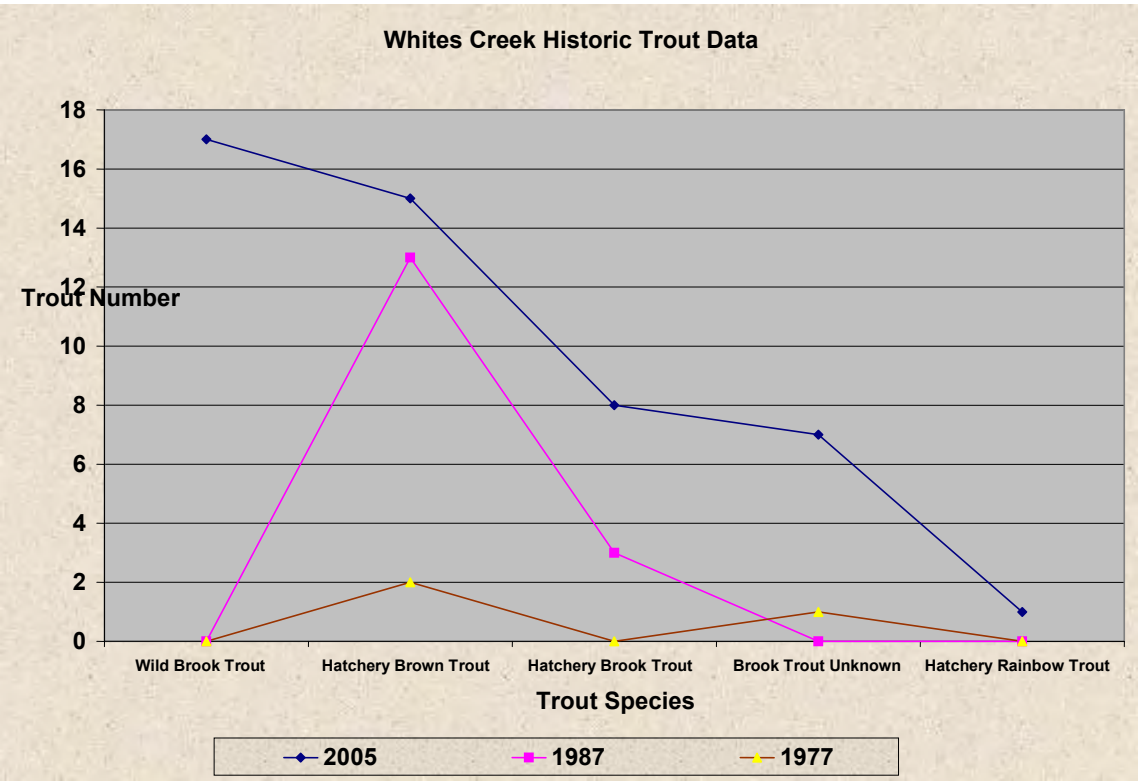


Figure 45. The above line chart displays the historic trout population numbers within the mainstem of Whites Creek at historic PFBC sampling points. All fish were captured between July and September. These numbers represent holdover fish remaining in stream after the traditional "trout season". This data proves there are still recreational fishing opportunities into the fall of the year. Data provided by the PFBC.

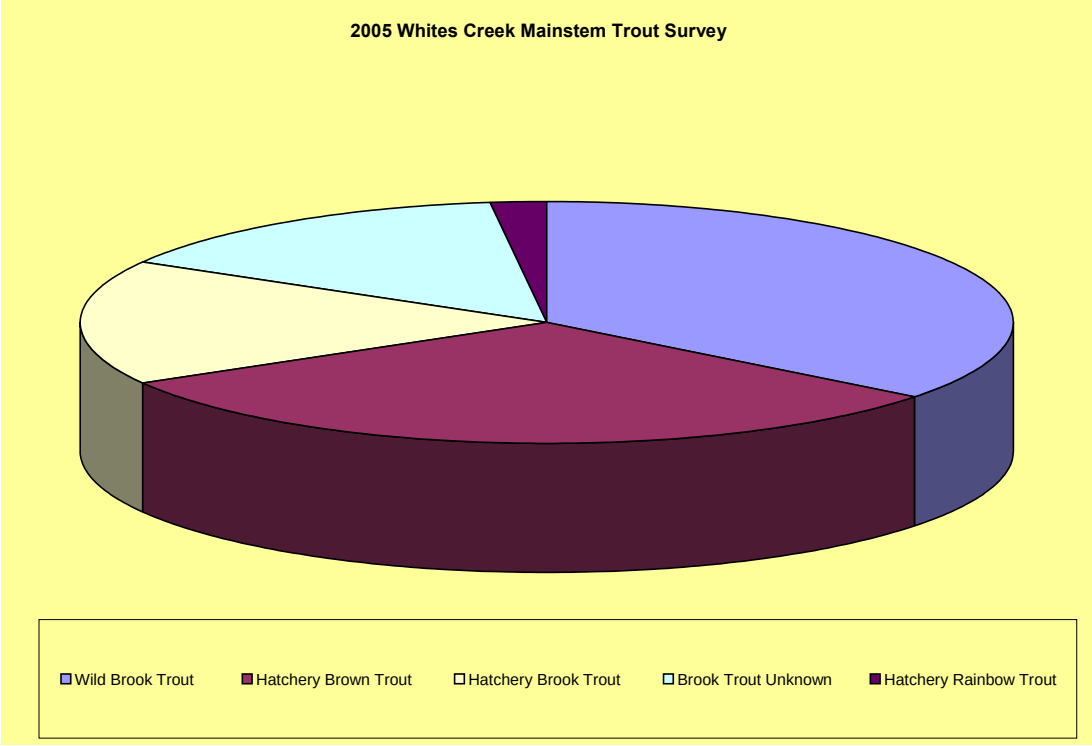


Figure 46. The above chart shows trout captured within Whites Creek main stem by PFBC biologists.

Photo by GJS

Figure 47. Native Brook trout hold a sustainable population within the Whites Creek basin.

Endangered / Threatened Fish

The Monongahela River watershed, of which Whites Creek waters drain into, is home to the last remaining population of one of Pennsylvania's rarest and endangered fish species. The Longnose Sucker (*Catostomus catostomus*), is an endangered sucker species that lives within several tributaries of this river system. The PFBC have identified Longnose Sucker populations in Whites Creek, Blue Lick Creek, Elk Lick Creek, Flaugherty Creek, and Piney Creek.

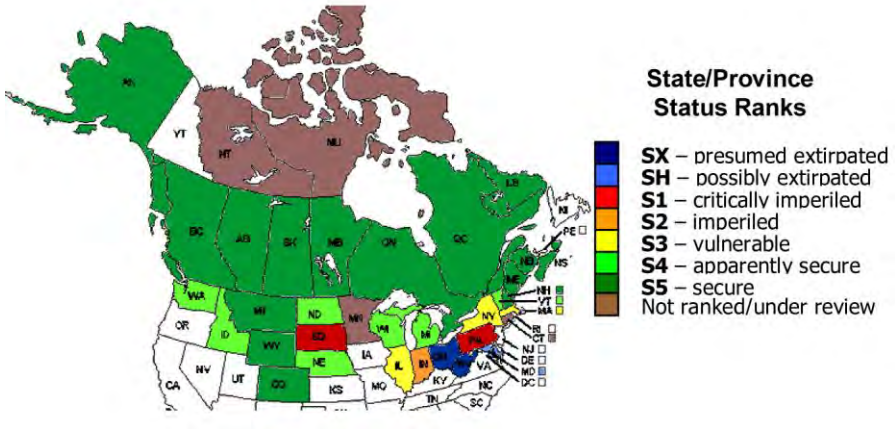
Environmental threats have pushed this species to the PFBC endangered fish list. The primary reason is the lack of suitable habitat and water quality which has been lost to abandoned mine drainage and thermal pollution. The longnose sucker requires extremely clean, cold, well-oxygenated water and is more fragile and sensitive than our native brook trout.

The longnose sucker is a streamlined fish with a very distinctive horizontal mouth and a long protruding snout. Colors vary from olive to dark gray above and the underside from cream to white. The fish feed mainly on aquatic insects, especially midge larvae.

This fish has been extirpated throughout most of the majority of its historic Pennsylvania range due to acid mine drainage, acid rain and thermal pollution caused by impoundments and reduction of streamside tree canopy. Increased water temperatures, and reduction in water chemistry, particularly pH and alkalinity, have greatly diminished the range and suitable environments for this species.

JOSEPH TOMERLLERI

Figure 48. Longnose Sucker (*Catostomus catostomus)*



Map by NatureServe

Figure 49. The above map shows current Longnose Sucker status in North America.

Fishing

Whites Creek is managed by the PFBC in two sections. Section 2 extends from the first bridge on Whites Creek Road (T-864) where it crosses Enos Run, downstream to the mouth of Whites Creek at the confluence of the Casselman River. This section is stocked with adult trout under the Optimum Yield II- Rural Option of the PFBC Approved Trout Water guidelines. Section 2 is accessible throughout most of its path. Six road crossings and numerous established parking areas allow for public access. Whites Creek Road and SR 523 follow the stream; however at sites where the stream ventures away from the road "walk in" fisherman access is welcomed. Ninety-six percent of the drainage is privately owned ground that is left open to fishing access by the generous cooperation of land owners. The remaining four percent of the watershed is closed to fishing and public access.

Whites Creek can provide an angler with yearlong hatches and fishing opportunities. While the PFBC stocks Whites Creek, wild trout are present in this sub watershed. However, even the stocked trout in Whites Creek can be a challenge to catch in the peak hatch season due to the gin-clear water of the stream. A stealthy approach and accurate casting are valuable skills when fishing this stream in the latter part of the season.

The majority of the major insect hatches on Whites Creek are common throughout Pennsylvania. General caddis, mayfly, stonefly imitations will consistently take fish. However, the insect diversity of the stream includes populations of Eastern Salmonflies, Green Drakes and numerous micro caddis species. Based on the time of year, anything can be expected to be hatching.

Hatches of the Whites Creek Basin

Insect	Size of Hatch
Winter Stone Fly	M
Mottled Wing Caddis	M
Solid Wind Caddis	M
Slate Drake	M
March Brown	P
Blue Winged Olive	M
Sulphur	X
Little Black Sedge	X
Green Drake	X
Golden Stone Fly	M
Micro Caddis	P
Midges	M
Crane Fly	M

M= Major hatch X = Minor Hatch P = Present

Figure 50. Fly hatches of the Whites Creek

Water Quality Monitoring

Whites Creek and selected tributaries were monitored for water temperature from August 2011 to January 2013. The method that was used was the deployment of submersible HOBO temperature loggers. A total of five loggers were deployed at specific locations throughout the watershed, typically within small pools to ensure water coverage during low flows. The following tables show the minimum, maximum and median water temperature for Enos Run, Zehner Run, Puzzley Run and two sites on Whites Creek.

The data loggers showed that all maximum water temperatures occurred in the month of July in 2012. The temperatures of the streams monitored exceeded or touched the upper limits of suitable water temperature for trout. In extreme cases where these temperatures last for more than a few days, fish kills could be a result. When water temperatures are high, fish will seek refuge in deep shaded pools or close to spring seeps. Several degrees difference in water temperature can greatly influence fish survivability.

PHOTO BY GJS

Figure 51. Above, a HOBO water temperature logger is shown attached to PVC housing.

Water Temperature Monitoring

ENOS RUN	
32.8°F	MINIMUM WATER TEMPERATURE
70.6°F	MAXIMUM WATER TEMPERATURE
52.6°F	AVERAGE WATER TEMPERATURE

ZEHNER RUN	
32.8°F	MINIMUM WATER TEMPERATURE
76.8°F	MAXIMUM WATER TEMPERATURE
48.2°F	AVERAGE WATER TEMPERATURE

PUZZLEY RUN	
31.9°F	MINIMUM WATER TEMPERATURE
72.1°F	MAXIMUM WATER TEMPERATURE
50.6°F	AVERAGE WATER TEMPERATURE

WHITES CREEK BELOW ENOS, ZEHNER AND PUZZLEY RUN	
31.9°F	MINIMUM WATER TEMPERATURE
75.6°F	MAXIMUM WATER TEMPERATURE
50.8°F	AVERAGE WATER TEMPERATURE

WHITES CREEK at CAMPGROUD ROAD	
31.9°F	MINIMUM WATER TEMPERATURE
74.3°F	MAXIMUM WATER TEMPERATURE
54.1°F	AVERAGE WATER TEMPERATURE

FIGURE 52. The tables above depict the average, minimum and maximum water temperature for the streams listed. The temperature loggers were deployed from August 2011 to January 2013.

Specific Conductance

In addition to water temperature, specific conductance or conductivity (K) was also monitored and measured as part of the Somerset Conservation District's Water Quality Monitoring Joint Venture (WQMJV). The program was adopted in 2010 with the intent to collect baseline water chemistry data on select streams throughout Somerset County.

The monitoring of specific conductance reflects the Total Dissolved Solids (TDS) within the waterway. This is the amount of organic or inorganic material suspended in the water. The monitoring of the streams conductivity can aid in the detection of water pollution from a multitude of sources including but not limited to industrial waste, nutrient loading, abandoned mine drainage and road runoff.

The instrument currently being used to collect the specific conductance is a Solinst Level Logger. The instrument was deployed into Whites Creek in August of 2011. The datalogger measures conductivity, water temperature and water level every fifteen minutes and is reviewed by staff on a biweekly basis. The graph below depicts the average conductivity readings from August 2011 to January 2013. Whites Creek has a relatively low conductivity compared to other streams throughout the county, mainly due to the geology and lack of storm water runoff.

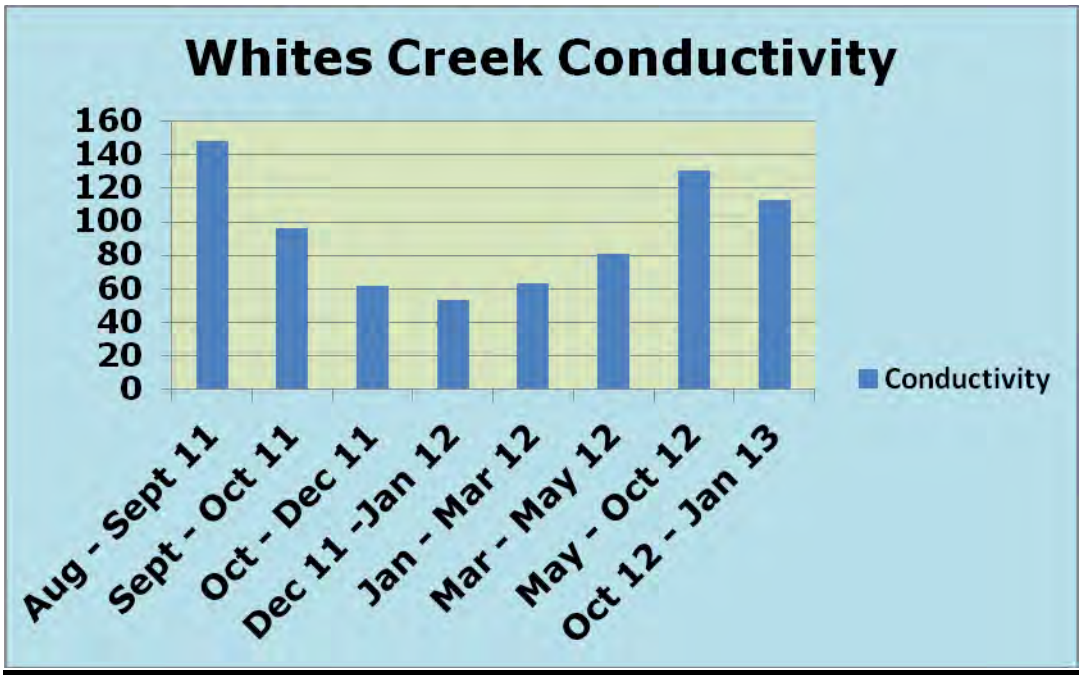


Figure 53. The graph above shows the fluctuation of water conductivity of Whites Creek from August 2011 through January 2013.

Figure 54. Above is a picture of a the datalogger used to measure and monitor specific conductance within Whites Creek.

DATALOGGER SAMPLE DATASET

Date	Time	LEVEL	TEMPERATURE	CONDUCTIVITY
9/19/2011	11:53:49	93.94	14.303	129
9/19/2011	12:08:49	123.7	12.308	129.4
9/19/2011	12:23:49	123.4	12.404	129.82
9/19/2011	12:38:49	123.1	12.464	129.82
9/19/2011	12:53:49	122.9	12.56	130.24
9/19/2011	13:08:49	123.3	12.598	130.24
9/19/2011	13:23:49	122.8	12.643	130.66
9/19/2011	13:38:49	123.2	12.689	130.66
9/19/2011	13:53:49	122.4	12.728	130.66
9/19/2011	14:08:49	122	12.773	130.66
9/19/2011	14:23:49	122.1	12.795	131.08
9/19/2011	14:38:49	122.4	12.815	131.08
9/19/2011	14:53:49	121.7	12.862	131.08
9/19/2011	15:08:49	121.6	12.905	131.08

Figure 55. Above pictured is an example of the recorded Solinst datalogger readout.

Erosion, Siltation and Nutrient Loading

Erosion is a natural process and generally occurs by way of wind and water. However, accelerated erosion can lead to stream impairments and create unsuitable conditions for the organisms that live there. Excessive siltation can choke the streambed and fill the voids between gravel and rocks where fish and invertebrates lay eggs, forage and shelter themselves from predators and the sun.

Erosion can occur in many forms and originate from many sources. One of the common sources of erosion in Pennsylvania originates from unstable stream banks caused by the removal of vegetation. Other sources include: mismanaged logging operations, unpaved roads and poor agriculture practices. Erosion caused by the aforementioned can be greatly reduced, if not prevented, by careful planning through the use of Best Management Practices (BMPs). All earth disturbances are potential sources of erosion, and by the use of BMPs the threat is greatly diminished. Several examples of BMPs are silt fencing, silk socks, detention basins and water bars. However, a vegetated stream side buffer is also considered a BMP, whether it is planted or existing naturally.

Due to the high percentage of forest that surrounds the Whites Creek Basin, there is a low percentage of erosion and siltation occurring. The majority of siltation comes from unpaved roads within the drainage; however unstable stream banks also contribute to the siltation. Nutrient loading, from agriculture runoff and faulty septic systems is present but minimal. The placement of BMPs could greatly reduce the impacts of these water quality impairments.

PHOTO BY GJS

Figure 56. Although no ill effects to aquatic life were identified from this livestock stream access point, this site is a source of added nutrients and sediment, both of which can be detrimental to aquatic systems.

PHOTO BY JNR

Figure 57. Sediment laden water enters Whites Creek from an unpaved roadway drainage pipe. A number of road drainage pipes and turn-outs are sources of sediment pollution to Whites Creek.

Energy Exploration

Coal and natural gas resources have a long history in Somerset County. The coal within the county is all bituminous. Modern mining techniques and recent price increases in coal have increased mining activities within the county. This has also made re-mining of smaller coal reserves cost effective. Natural gas has also been extracted within the county, but has not yet been as widely developed as coal. Traditional shallow gas wells are dotted throughout the county. However, the recent "discovery" of shale gas, in addition to the advances in drilling techniques, has moved shale gas to the front of the line. Marcellus and Utica shale formations both lie under Somerset County and hold enormous natural gas reserves.

Natural Gas

Natural gas occurs as a natural hydrocarbon gas mixture consisting of methane, carbon dioxide, nitrogen and hydrogen sulfide. Natural gas is used as an energy source to produce heat and electricity. It is also used as fuel for vehicles and in the manufacturing of plastics and other commercial organic chemicals. Natural gas is found deep underground in rock formations or associated with other hydrocarbon reservoirs such as coal.

Shale gas in the United States is rapidly increasing as a source of natural gas. In recent years, new applications of hydraulic fracturing and horizontal drilling have resulted in the development of new sources of shale gas and has reduced production from conventional shallow gas reservoirs.

There are many small, deep natural gas fields in the northwestern region of the county, however, new developments of Marcellus and Utica Shale gas are being explored throughout the county. The majority of the wells are in the south western quad of the county and into Fayette County. At this time there are less than 50 drilled or fractured "fracked" shale gas wells in Somerset County.

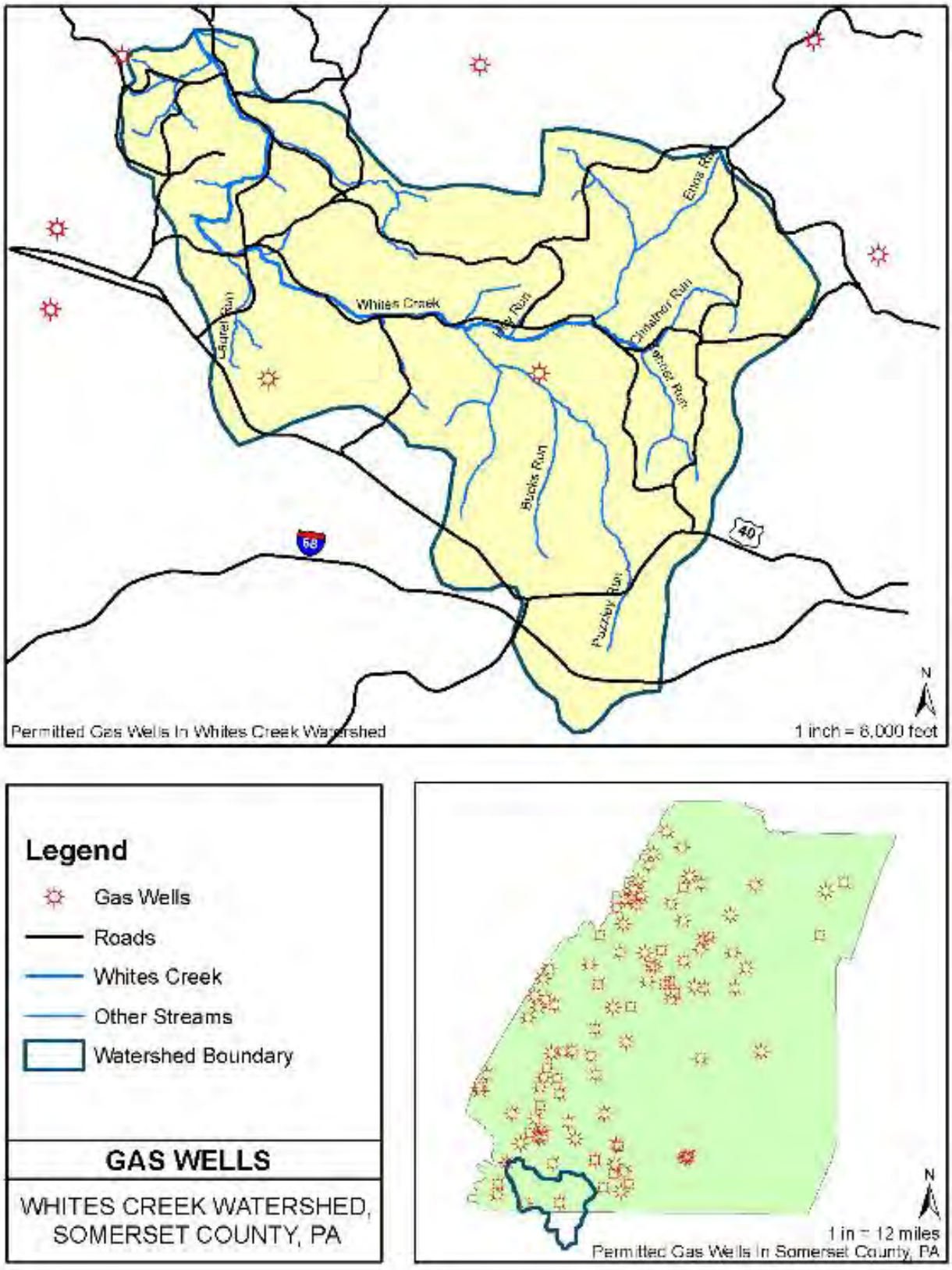


Figure 58. This map shows conventional shallow gas wells and Marcellus shale gas wells in Somerset county.

MARCELLUS SHALE FORMATION

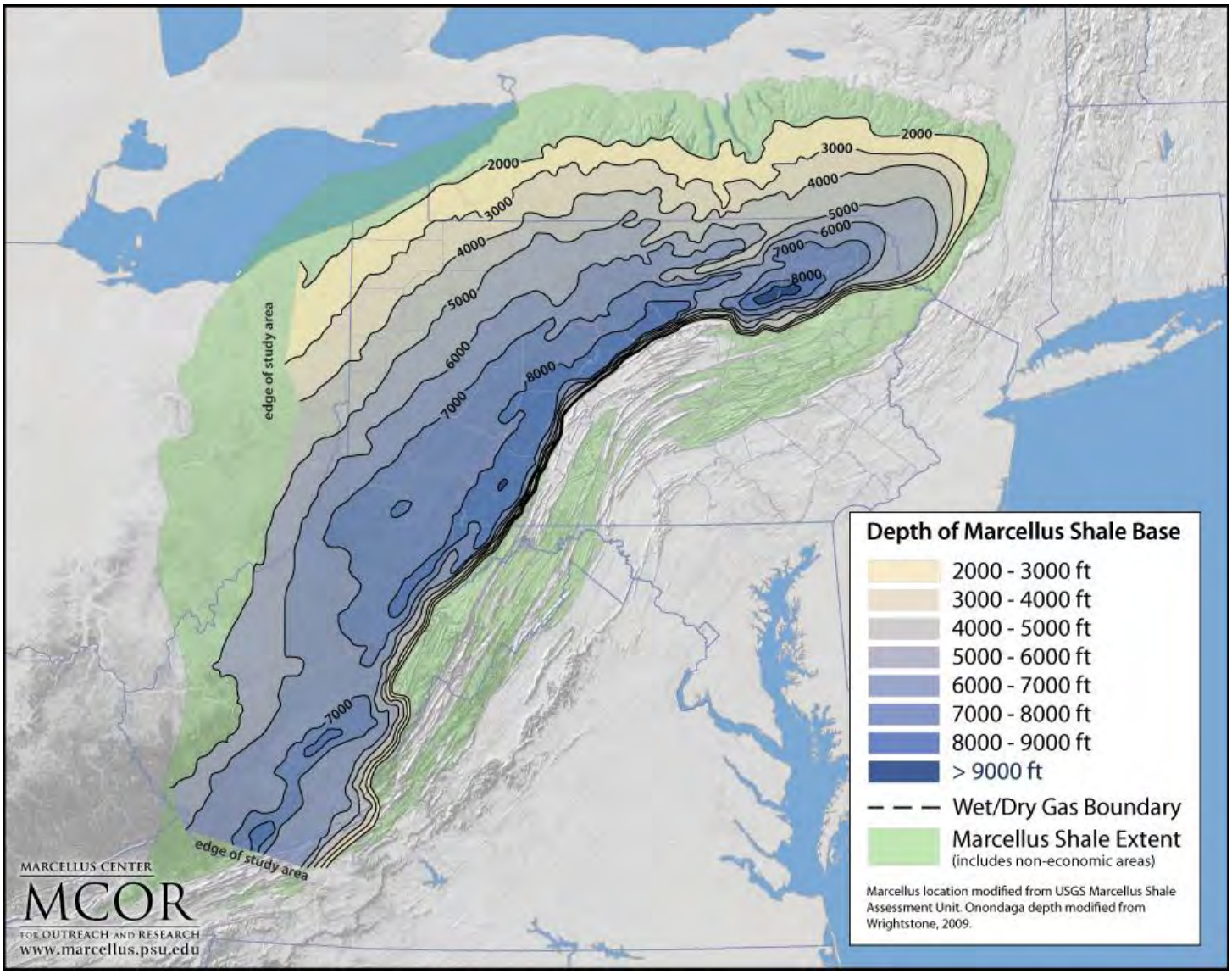


Figure 59. The map above shows the Marcellus Shale formation which extends in the from Kentucky north east into New York.

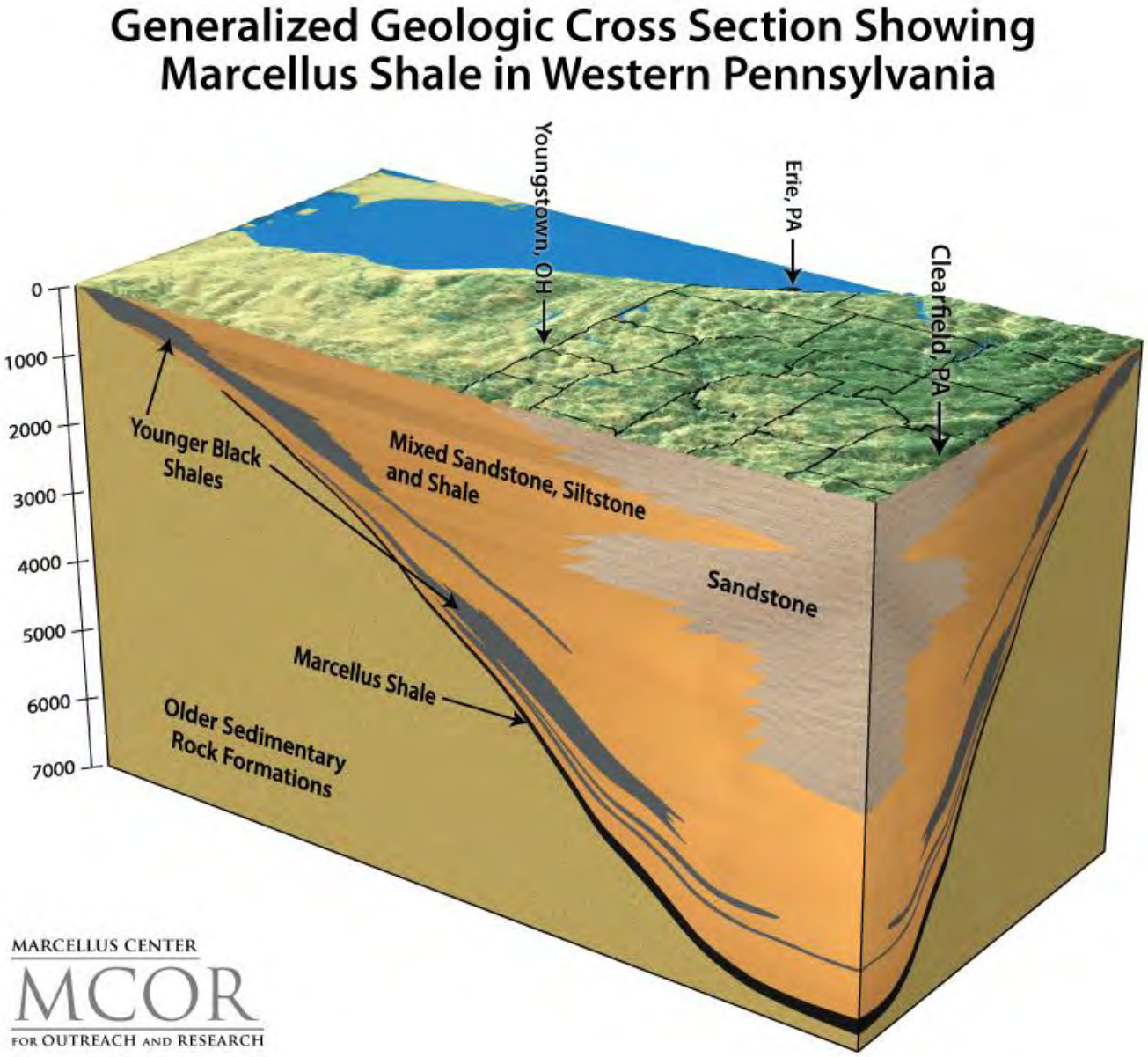


Figure 60. The diagram above shows a cross-sectional view of the Marcellus Shale Formation.

Utica Shale Formation

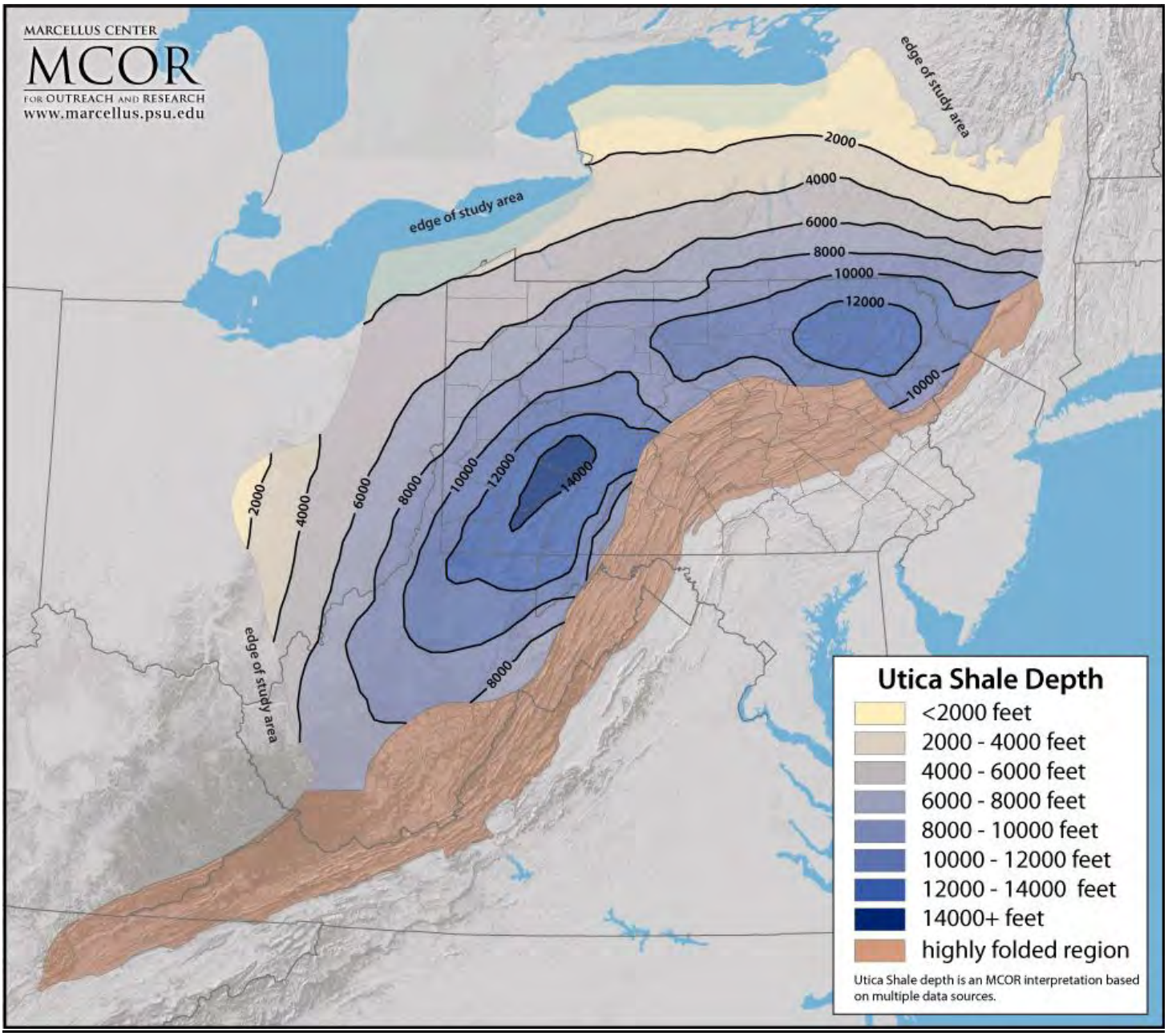


Figure 61. The Utica Shale formation extends from Kentucky to New York. This formation lies beneath the Marcellus Shale formation.

Natural Gas Transmission Lines

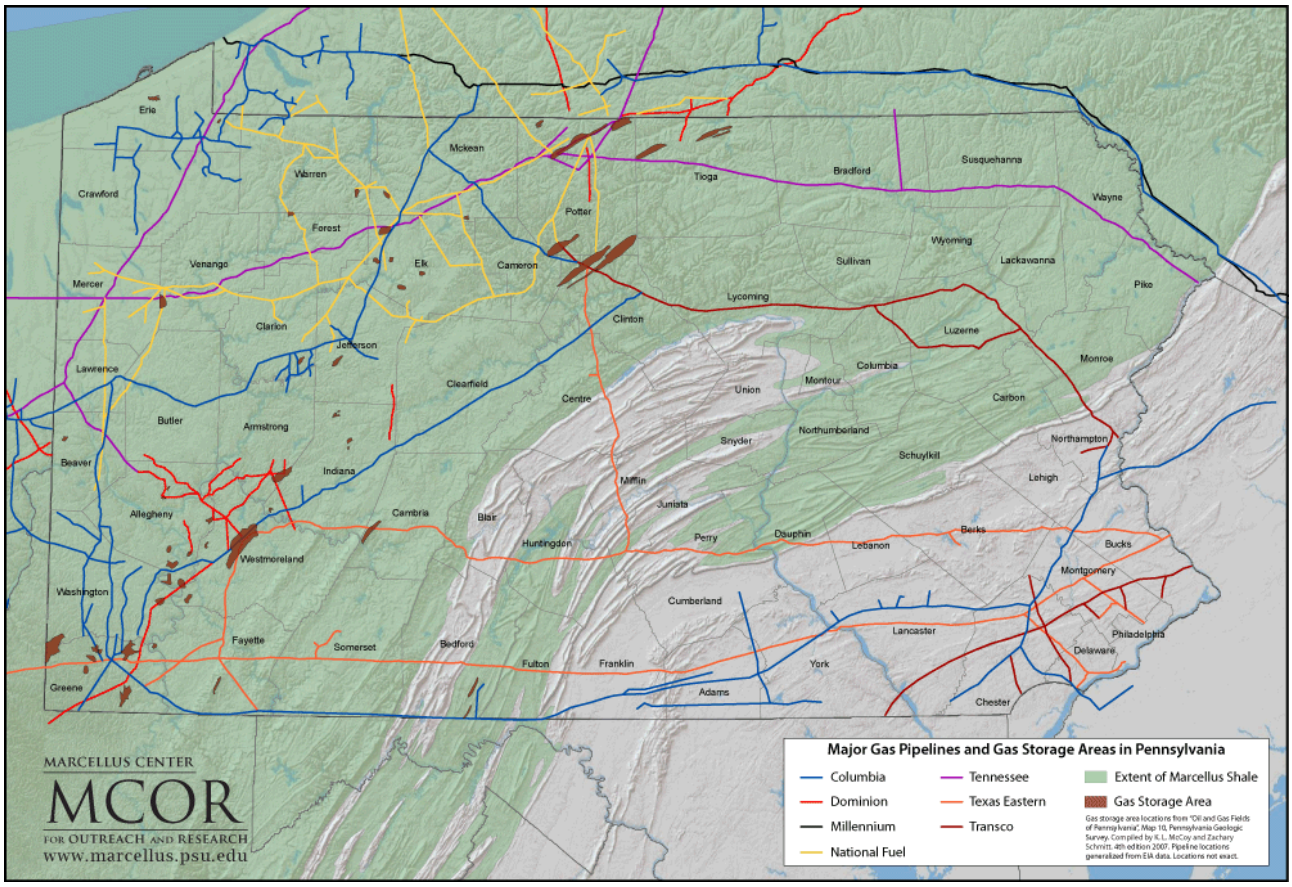


Figure 62. Above, seven major shale gas transmission lines will transport natural gas throughout the state of Pennsylvania.

Coal

Coal fields exist throughout all of Somerset County. The coal is entirely bituminous, and much of it has been mined or is being actively mined by surface mining. However, recent hikes in coal prices have led to new deep mine entrances and interest in smaller tracts of un-mined shallow coal reserves. Most of the coal is within the Main Bituminous Field, which stretches north and west to adjacent counties and southward into Maryland and West Virginia. The rest is within the Georges Creek Field.

Abandoned Mine Drainage

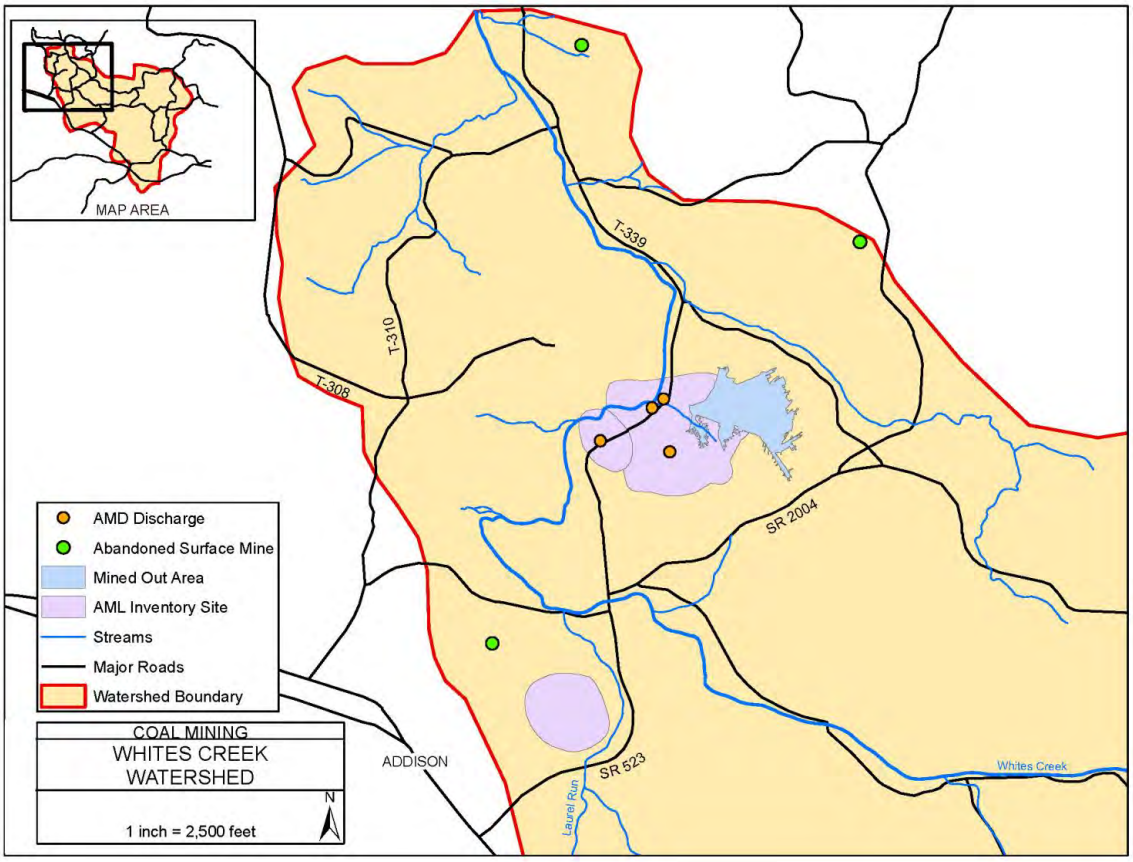


Figure 63. The map above identifies abandoned mine lands and seeps within the Whites Creek basin.

There are many abandoned mines in the county, and abandoned mine drainage is one of the greatest environmental impairments to many watersheds in Somerset county. Abandoned mine seeps negatively impact streams and leave them with little to no life and scar the landscape rusty orange. Some of Somerset County's major watersheds impacted by such discharges include parts of the Casselman River, Shade Creek, the Stonycreek River, and Quemahoning Creek, in addition to many of their headwater tributaries.

Although the majority of the Whites Creek watershed is unimpaired by abandoned mine discharges and supports a diverse macroinvertebrate community, abandoned mine discharges exist and impair portions of the stream. The macroinvertebrate sample point labeled UNT#1, is negatively impacted by mine drainage seeping from abandoned surface mines higher in the water shed. The abundance of organisms and species composition of the invertebrate community is reflected by these impairments. Recent efforts by the Pennsylvania Department of Environmental Protection are being directed to further treat these abandoned mine discharges.

There are three reclaimed surface mines within Addison Township that are in forfeiture status. Five major post mine seeps had previously been treated with caustic soda within existing treatment ponds. In January of 2006 the owner and operator ceased treatment of these seeps. In action to, the Pennsylvania DEP conducted a "Whites Creek Impact Study". The study identified no mine related impacts to the watershed. Nonetheless, the Department is requiring the owner and operator to upgrade the treatment system by generating a trust with posted bond monies.

Discharge	Acidity	Alkalinity	pH	Iron	Aluminum	Manganese	Flow
56773136	186.9 mg/L	3 mg/L	3.5	1.17mg/L	20.49 mg/L	29.99 mg/L	35.4 gpm
567911	47.6 mg/L	0.00	3.9	0.41 mg/L	4.83 mg/L	7.04 mg/L	92 gpm
40A77SM11	56.9 mg/L	0.00	3.6	0.30 mg/L	6.93 mg/L	2.76 mg/L	270 gpm

Figure 64. The table above displays the data of the three treatment ponds collecting water from the five AMD seeps.

Figure 65.

Abandoned Mine Seep of SR 523

Figure 66.

Abandoned caustic soda tank on abandoned mine lands.

PHOTO BY GJS

Figure 67. The above discharge enters the main stem of Whites Creek along SR 523. The pH of this discharge is 3.9 with acid levels of 146 mg/L. This discharge has been monitored by PADEP.

PHOTO BY GJS

Figure 68. Pictured above, an abandoned caustic treatment pond situated on abandoned surface mine lands within the Whites Creek drainage. This is one on the treatment ponds to be rehabilitated by PADEP.

Total Maximum Daily Load

In January of 2009, the Pennsylvania Department of Environmental Protection adopted a Total Maximum Daily Load (TMDL) for Whites Creek. When a TMDL is set in place by a state or regulatory agency it is water body specific for any given pollutants affecting the water quality of said watercourse. TMDL pollution guidelines are set for the maximum amount of pollution, regardless of the source, that the given waterway can receive in a 24 hour period without further degrading the water quality and still meet safety standards for its designated use.

Several sections of Whites Creek were identified in the 1996 Pennsylvania Section 303(d) impaired waters list as being degraded by acid mine water pollution. The aforementioned sections of Whites Creek were listed as impaired with metals from abandoned coal mines; the metals include iron, manganese, and aluminum. The pH of Whites Creek was also addressed in the TMDL as being low in these sections of the stream.

Streams placed on the 1996 303 (d) list with a designated use of high quality (HQ) will be subject to Pennsylvania's anti-degradation policy. Therefore, DEP must establish instream goals for TMDLs that restore the waterbody to existing (pre-mining) quality. This is accomplished by sampling an unaffected stretch of stream to use as a reference. This stretch typically is the headwaters segment of the high quality stream in question. If an unaffected stretch isn't available, a nearby-unimpaired stream will function as a surrogate reference. The reference stream data will be selected from statewide ambient Water Quality Network (WQN) stations. To determine which WQN station represents existing water quality appropriate for use in developing TMDLs for HQ waters, alkalinity and drainage area are considered.

***The following information was taken from the PADEP Whites Creek TMDL document and is a summary of the water chemistry samples and allowable metal loadings for each stream section. The full document can be viewed at the following web address:**

http://www.dep.state.pa.us/dep/deputate/watermgt/wqp/wqstandards/tmdl/Whites%20Creek%20Final%20TMDL.pdf

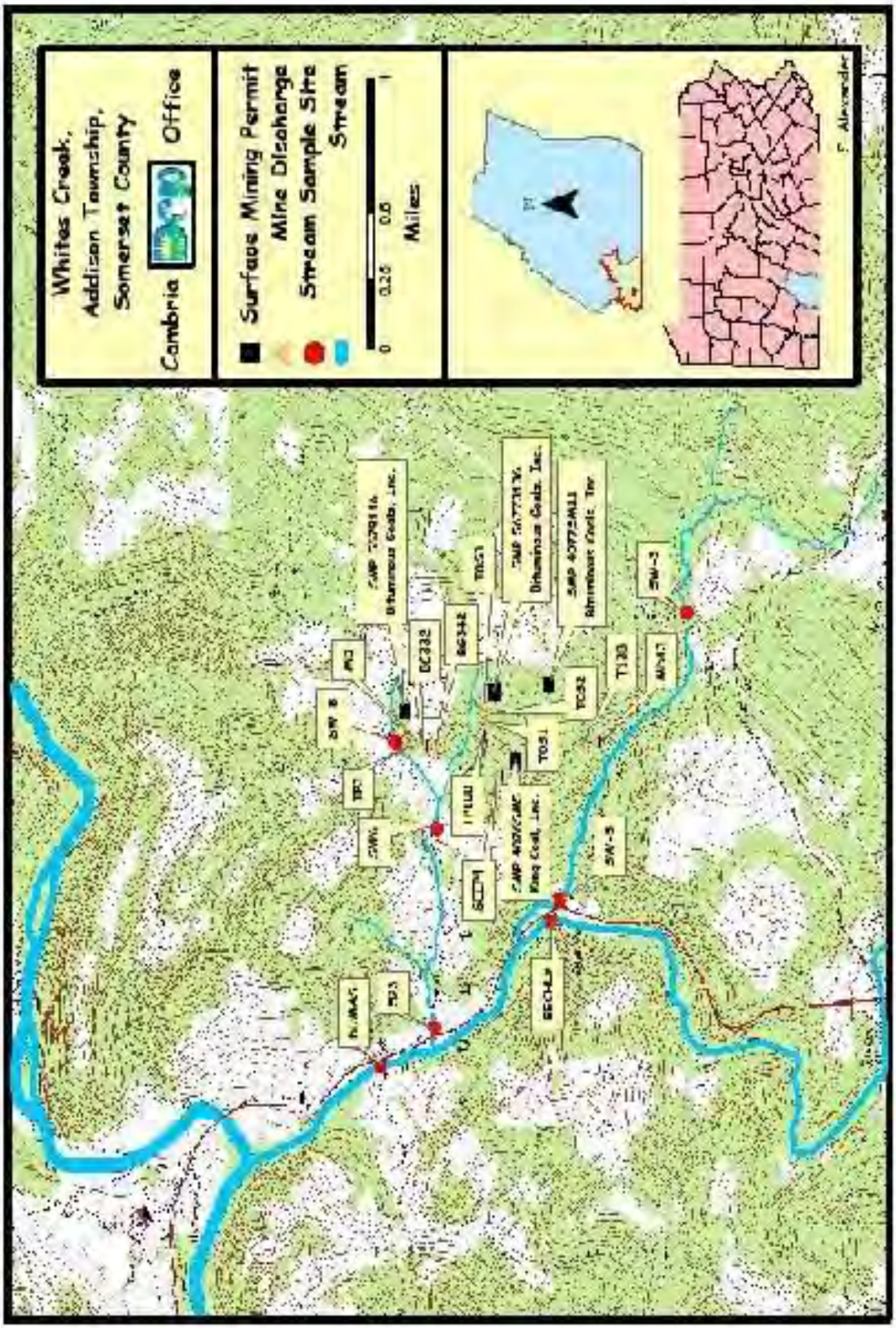


Figure 69. This map identifies the Whites Creek TMDL sample points.

Table D1 shows the measured and allowable concentrations and loads at SW3. Table D2 shows the percent reductions for aluminum, iron, manganese, and acidity.

Table D1		Measured		Allowable	
		Concentration	Load	Concentration	Load
		mg/L	lbs/day	mg/L	lbs/day
	Aluminum	0.25	3.15	0.25	3.15
	Iron	0.14	1.81	0.08	0.96
	Manganese	0.04	0.47	0.04	0.47
	Acidity	5.40	68.00	1.40	17.68
	Alkalinity	8.67	109.14		

Table D2. Allocations SW3		
SW3	Fe (Lbs/day)	Acidity (Lbs/day)
Existing Load @ SW3	1.81	68.00
Allowable Load @ SW3	0.96	17.68
Load Reduction @ SW3	0.85	50.32
% Reduction required @ SW3	47%	74%

Table D3 shows the measured and allowable concentrations and loads at BECHLY. Table D4 shows the percent reduction for aluminum, iron, manganese, and acidity needed at BECHLY

Table D3		Measured		Allowable	
		Concentration	Load	Concentration	Load
		mg/L	lbs/day	mg/L	lbs/day
	Aluminum	0.29	95.23	0.05	16.19
	Iron	0.93	302.13	0.02	6.04
	Manganese	0.09	27.82	0.09	27.82
	Acidity	7.96	2587.08	0.40	129.35
	Alkalinity	20.96	6812.21		

Table D4. Allocations BECHLY			
BECHLY	Al (Lbs/day)	Fe (Lbs/day)	Acidity (Lbs/day)
Existing Load @ BECHLY	95.23	302.13	2587.08
Allowable Load @ BECHLY	16.19	6.04	129.35
Load Reduction @ BECHLY	79.04	296.09	2457.73
% Reduction required @ BECHLY	83%	98%	95%

Table D5 shows the measured and allowable concentrations and loads at SW8. Table D6 shows the percent reduction for aluminum, iron, manganese, and acidity needed at SW8

Table D5		Measured		Allowable	
		Concentration	Load	Concentration	Load
		mg/L	lbs/day	mg/L	lbs/day
	Aluminum	15.49	23.38	0.11	0.16
	Iron	0.11	0.17	0.08	0.12
	Manganese	15.61	23.56	0.47	0.71
	Acidity	126.42	190.84	2.53	3.82
	Alkalinity	5.26	7.94		

Table D6. Allocations SW8				
SW8	Al (Lbs/day)	Fe (Lbs/day)	Mn (Lbs/day)	Acidity (Lbs/day)
Existing Load @ SW8	23.38	0.17	23.56	190.84
Allowable Load @ SW8	0.16	0.12	0.71	3.82
Load Reduction @ SW8	23.22	0.05	22.85	187.02
% Reduction required @ SW8	99.3%	33%	97%	98%

Table D7 shows the measured and allowable concentrations and loads at SW6. Table D8 shows the percent reduction for aluminum, iron, manganese, and acidity needed at SW6.

Table D7		Measured		Allowable	
		Concentration	Load	Concentration	Load
		mg/L	lbs/day	mg/L	lbs/day
	Aluminum	2.71	13.44	0.03	0.13
	Iron	0.19	0.94	0.06	0.28
	Manganese	5.04	25.01	0.35	1.75
	Acidity	29.74	147.47	0.89	4.42
	Alkalinity	4.34	21.51		

Table D8. Allocations SW6				
SW6	Al (Lbs/day)	Fe (Lbs/day)	Mn (Lbs/day)	Acidity (Lbs/day)
Existing Load @ SW6	13.44	0.94	25.01	147.47
Difference in measured loads between the loads that enter and existing SW6	-9.94	0.77	1.45	-43.37
Additional load tracked from above samples	0.16	0.12	0.71	3.82
Total load tracked between SW8 and SW6	0.09	0.89	2.16	2.94
Allowable Load @ SW6	0.13	0.28	1.75	4.42
Load Reduction @ SW6	0	0.61	0.41	0
% Reduction required at SW6	0%	69%	19%	0%

Table D9 shows the measured and allowable concentrations and loads at DUMAS.

Table D9		Measured		Allowable	
		Concentration	Load	Concentration	Load
		Mg/L	lbs/day	mg/L	lbs/day
	Aluminum	0.36	132.49	0.04	13.25
	Iron	3.46	1265.70	0.02	7.59
	Manganese	0.10	36.75	0.10	36.75
	Acidity	8.40	3074.40	0.34	122.98
	Alkalinity	20.96	7671.36		

WATERSHED RECOMMENDATIONS

Like many streams within Pennsylvania, Whites Creek is not untouched by man and evidence of unnatural impairments can be found throughout the watershed. However Whites Creek is one of cleanest, coldest and marginally impaired watersheds in South western Pennsylvania and Somerset County. The negative impacts are relatively low due to the large size of the uninhabited land surrounding the drainage. For this reason the stream continues to maintain water quality. The majority of the existing stream impairments can be abated or greatly reduced through cooperative conservation efforts by state and federal agencies, conservation groups and most importantly the citizens of the county and local municipalities.

The following are implementation recommendations for the Whites Creek watershed, based on the findings of this cold water comprehensive plan.

- ***Rehabilitate and monitor abandoned mine treatment systems.***

- ***Continue to monitor the status of the native brook trout populations within Whites Creek, Enos Run, Zehner Run, Puzzley Run, Christner Run, Laurel Run, Becket Run and Unnamed tributaries.***

- ***Reduce erosion and siltation from unpaved roads by the use of Best Management Practices (BMPs).***

- ***Reduce sources of nutrient loading through the use of Best Management Practices (BMPs).***

- ***Investigate potential thermal impacts to Whites Creek, Enos Run, Zehner Run, Christner Run and Puzzley Run.***

- ***Establish vegetated stream side buffers within the Whites Creek basin.***

- ***Stabilize eroding stream banks within the Whites Creek basin, particularly in the upper portion of the watershed.***

- ***Prevent the introduction of stocked brown trout into wild trout waters.***

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- M.A. DEPEW AND R.D. LORSON. *ZEHNER RUN, SECTION 01 (819F) MANAGEMENT REPORT.* MARCH 2012.
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APPENDICIES

APPENDIX I MACROINVERTEBRATE TAXA REPORTS

	Stream	**UNT 1 to Whites Creek**
	Site ID	**001**
	Collection Date	**03-07-2012**
	Device	**surber**
	Habitat	**riffle**
Ephemeroptera	Acentrella turbida	1
	Ameletus sp.	3
	Epeorus sp.	94
	Ephemera sp.	9
	Ephemerella excrucians	92
	Maccaffertium meririvulanum	3
	Maccaffertium modestum	2
	Maccaffertium vicarium	24
	Paraleptophlebia sp.	5
	Stenacron interpunctatum	6
Odonata	Stylogomphus sp.	1
Plecoptera	Acroneuria sp.	12
	Clioperla clio	1
	Isoperla sp.	6
	Leuctra sp.	7
	Sweltsa sp.	7
Coleoptera	Optioservus sp.	2
	Psephenus herricki	4
Diptera-Chironomidae	Orthocladius sp.	1
	Pagastia sp.	1
	Parachaetocladius sp.	1
	Parametriocnemus sp.	1
	Tvetenia bavarica gr.	1
Diptera	Hexatoma sp.	2
	Prosimulium sp.	15
	Tipula sp.	2
Trichoptera	Cheumatopsyche sp.	2
	Diplectrona sp.	18
	Hydropsyche ventura	4
	Neophylax sp.	2
	Pycnopsyche sp.	1
	Rhyacophila invaria gr.	2
Crustacea	Caecidotea sp.	4
	Cambarus sp.	1
	TOTAL	**337**

	Stream	**UNT 2 to Whites Creek**
	Site ID	**002**
	Collection Date	**03-07-2012**
	Device	**surber**
	Habitat	**riffle**
Plecoptera	Clioperla clio	1
	Sweltsa sp.	2
	Taeniopterygidae	1
Diptera	Dicranota sp.	1
	Molophilus sp.	1
	Tipula sp.	2
Trichoptera	Cheumatopsyche sp.	1
	Diplectrona sp.	4
	Hydropsyche betteni	3
	Polycentropus sp.	2
	TOTAL	**18**

	Stream	***Laurel Run***
	Site ID	**003**
	Collection Date	**03-03-2012**
	Device	**surber**
	Habitat	**riffle**
Odonata	Cordulegaster erronea	1
Plecoptera	Amphinemura sp.	12
	Leuctra sp.	35
	Nemouridae	1
	Peltoperla sp.	14
	Perlodidae	1
	Taeniopterygidae	13
Coleoptera	Oulimnius sp.	1
Megaloptera	Nigronia fasciatus	1
Diptera-Chironomidae	Eukiefferiella brevicalcar gr.	1
Diptera	Prosimulium sp.	27
	Stegopterna sp.	1
	Tipula sp.	1
Trichoptera	Diplectrona sp.	29
	Neophylax sp.	2
	Pycnopsyche sp.	1
	Rhyacophila fuscula	1
	Rhyacophila invaria gr.	4
	Rhyacophila minora	20
	Wormaldia sp.	8
Crustacea	Cambarus sp.	2
	TOTAL	**176**

	Stream	**Becket Run**
	Site ID	**004**
	Collection Date	**03-03-2012**
	Device	**surber**
	Habitat	**riffle**
Ephemeroptera	Eurylophella funeralis	1
Plecoptera	Acroneuria sp.	1
	Leuctra sp.	6
	Nemouridae	1
Diptera	Dicranota sp.	1
	Hexatoma sp.	1
	Prosimulium sp.	1
	Tipula sp.	1
Trichoptera	Diplectrona sp.	2
	Hydropsyche betteni	1
	Hydropsyche ventura	1
	Rhyacophila invaria gr.	3
Crustacea	Caecidotea sp.	13
	Cambaridae	2
	TOTAL	**35**

	Stream	Zehner Run
	Site ID	005
	Collection Date	08-01-2011
	Device	surber
	Habitat	riffle
Ephemeroptera	Acentrella turbid	7
	Acerpenna pygmaea	2
	Baetis flavistriga	39
	Baetisca sp.	1
	Caenis sp.	1
	Diphetor hageni	2
	Drunella cornutella	7
	Epeorus sp.	4
	Ephemera sp.	2
	Ephemerella sp.	3
	Heptageniidae	1
	Heterocloeon sp.	8
	Isonychia sp.	12
	Leucrocuta sp.	5
	Maccaffertium sp.	36
	Paraleptophlebia sp.	17
	Plauditus sp.	4
Odonata	Gomphidae	1
Plecoptera	Acroneuria sp.	4
	Leuctra sp.	57
	Perlodidae	1
	Tallaperla sp.	3
Hemiptera	Microvelia sp.	1
	Rhagovelia sp.	5
Coleoptera	Optioservus ovalis	110
	Optioservus trivittatus	18
	Oulimnius sp.	17
	Psephenus herricki	5
Megaloptera	Nigronia serricornis	18
Diptera-Chironomidae	Cladotanytarsus sp.	1
	Epoicocladius sp.	1
	Eukiefferiella pseudomontana gr.	1
	Micropsectra sp.	6
	Microtendipes pedellus gr.	1
	Phaenopsectra sp.	1
	Stempellinella sp.	1
	Thienemannimyia gr. sp.	9
Diptera	Antocha sp.	5
	Atherix sp.	2
	Hexatoma sp.	2
Trichoptera	Cheumatopsyche sp.	5
	Glossosoma sp.	1
	Goera sp.	10
	Hydropsyche sp.	7
	Nyctiophylax sp.	1
	Polycentropus sp.	3
	Pycnopsyche sp.	1
Bivalvia	Sphaeriidae	1
Acari	Lebertia sp.	1
	TOTAL	**451**

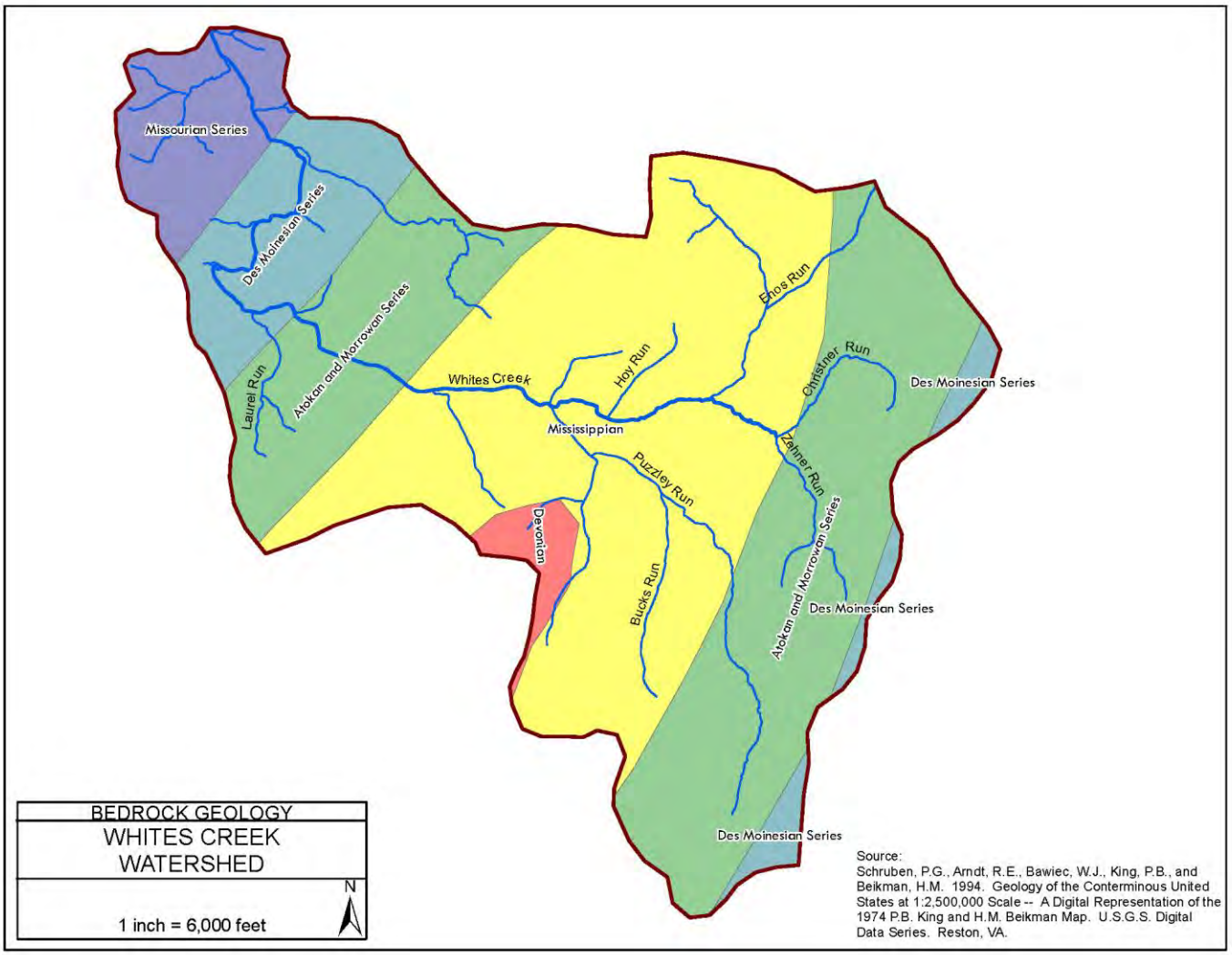
	Stream	Whites Crk, Bleow tribs
	Site ID	006
	Collection Date	08-01-2011
	Device	surber
	Habitat	riffle
Ephemeroptera	Acentrella turbida	31
	Baetis flavistriga	28
	Baetis pluto	7
	Baetis tricaudatus	81
	Baetisca sp.	1
	Epeorus sp.	29
	Ephemerellidae	1
	Heptagenia sp.	1
	Heterocloeon sp.	2
	Isonychia sp.	24
	Leucrocuta sp.	2
	Maccaffertium sp.	17
	Paraleptophlebia sp.	2
	Plauditus sp.	11
	Procloeon sp.	1
	Serratella deficiens	2
	Serratella serrata	11
Odonata	Gomphidae	1
Plecoptera	Acroneuria sp.	12
	Leuctra sp.	23
	Paragnetina media	6
	Perlodidae	10
	Tallaperla sp.	1
Hemiptera	Rhagovelia sp.	27
Coleoptera	Optioservus ovalis	14
	Optioservus trivittatus	86
	Oulimnius sp.	1
	Promoresia tardella	4
	Psephenus herricki	16
Megaloptera	Nigronia serricornis	13
Diptera-Chironomidae	Cardiocladius sp.	1
	Cricotopus bicinctus gr.	1
	Cricotopus sp.	2
	Diamesa sp.	4
	Eukiefferiella devonica gr.	1
	Eukiefferiella pseudomontana gr.	1
	Microtendipes pedellus gr.	1
	Orthocladius (Symp.) lignicola	1
	Orthocladius Complex	4
	Orthocladius sp.	1
	Pagastia sp.	1
	Parametriocnemus sp.	2
	Polypedilum aviceps	2
	Polypedilum flavum	2
	Tanytarsus sp.	1
	Thienemannimyia gr. sp.	15
	Tvetenia bavarica gr.	1
Diptera	Antocha sp.	23
	Atherix sp.	82
	Chelifera/Metachela sp.	1
	Dicranota sp.	4
	Hexatoma sp.	6
	Simulium sp.	22
Trichoptera	Cheumatopsyche sp.	15
	Dolophilodes sp.	27
	Glossosoma sp.	16
	Goera sp.	1
	Hydropsyche bronta	1
	Hydropsyche morosa	2
	Hydropsyche sp.	33

	Whites Creek Below Tribs Cont'd	
	Hydropsyche sparna	272
	Neophylax sp.	1
	Psilotreta sp.	1
	Rhyacophila fuscula	3
	Rhyacophila mainensis	1
Annelida	Lumbricina	7
Acari	Torrenticola sp.	1
Other Organisms	Nematoda	1
	TOTAL	**1,026**

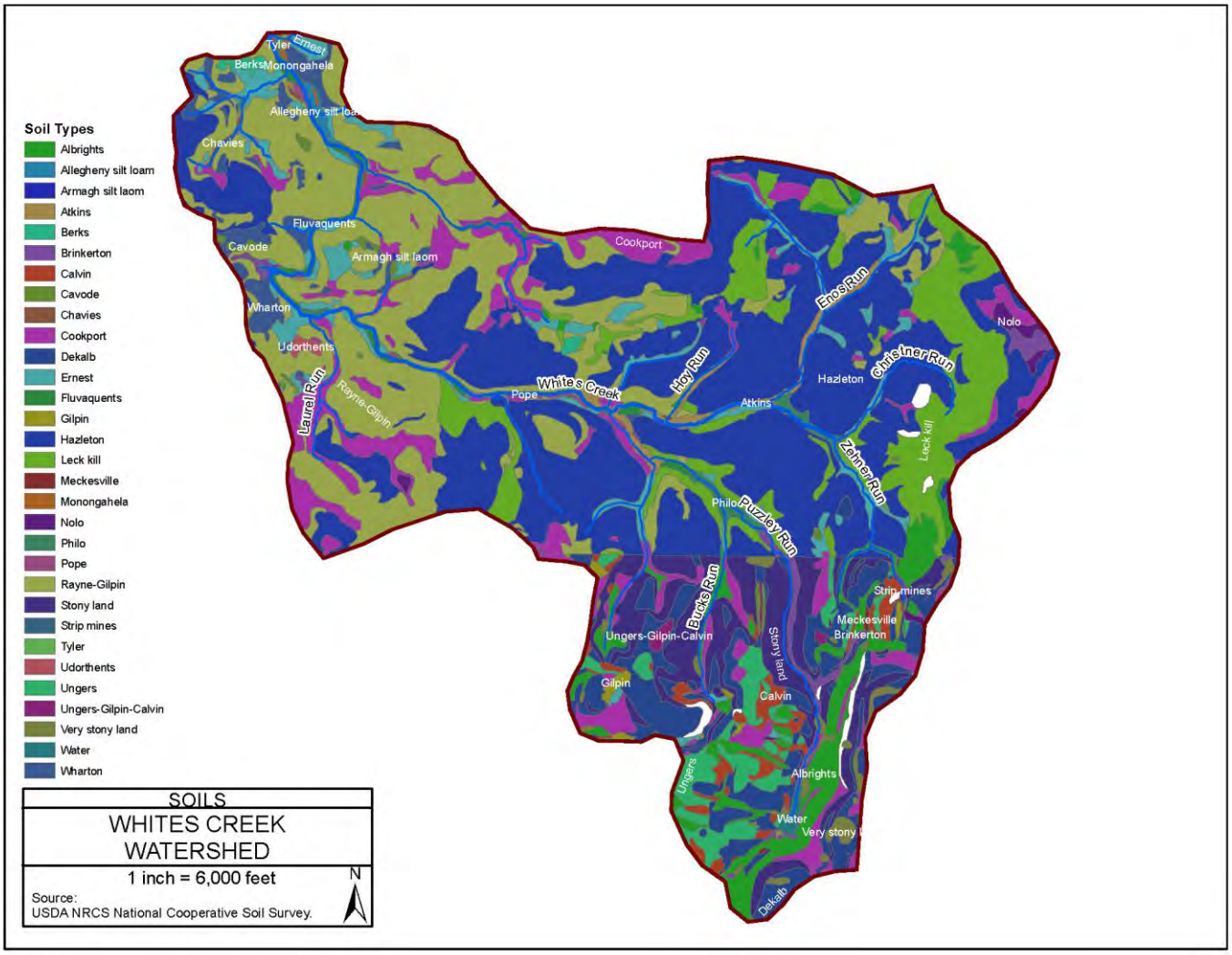
	Stream	**Hoy Run**
	Collection Date	**08-01-2011**
	Device	**surber**
	Habitat	**riffle**
	EcoAnalysts Sample ID	**6020.1-3**
Ephemeroptera	Ephemera sp.	4
	Eurylophella sp.	1
	Paraleptophlebia sp.	1
Odonata	Lanthus sp.	1
Plecoptera	Acroneuria sp.	3
	Leuctra sp.	4
	Tallaperla sp.	4
Hemiptera	Rhagovelia sp.	3
Coleoptera	Optioservus ovalis	4
	Oulimnius sp.	5
Diptera-Chironomidae	Diamesa sp.	1
	Micropsectra sp.	1
	Thienemannimyia gr. sp.	1
Diptera	Atherix sp.	1
	Chrysops sp.	1
	Hexatoma sp.	1
Trichoptera	Diplectrona sp.	12
	Goera sp.	2
	Lepidostoma sp.	1
Annelida	Lumbricina	1
	TOTAL	**52**

	Stream	**Puzzley Run**
	Site ID	**007**
	Collection Date	**08-01-2011**
	Device	**surber**
	Habitat	**riffle**
Ephemeroptera	Epeorus sp.	2
	Leucrocuta sp.	1
	Maccaffertium sp.	5
	Paraleptophlebia sp.	1
	Serratella deficiens	1
Odonata	Gomphidae	1
Plecoptera	Acroneuria sp.	5
	Leuctra sp.	8
Hemiptera	Rhagovelia sp.	6
Coleoptera	Dubiraphia sp.	2
	Ectopria sp.	1
	Optioservus ovalis	9
	Promoresia tardella	31
	Psephenus herricki	2
Megaloptera	Nigronia serricornis	5
Diptera-Chironomidae	Microtendipes pedellus gr.	1
	Microtendipes rydalensis gr.	1
	Parachaetocladius sp.	1
	Polypedilum aviceps	1
	Thienemannimyia gr. sp.	15
Diptera	Atherix sp.	2
	Chelifera/Metachela sp.	3
	Hexatoma sp.	1
Trichoptera	Cheumatopsyche sp.	7
	Dolophilodes sp.	2
	Glossosoma sp.	1
	Neophylax sp.	2
	Polycentropus sp.	3
	Psychomyia flavida	1
	TOTAL	**121**

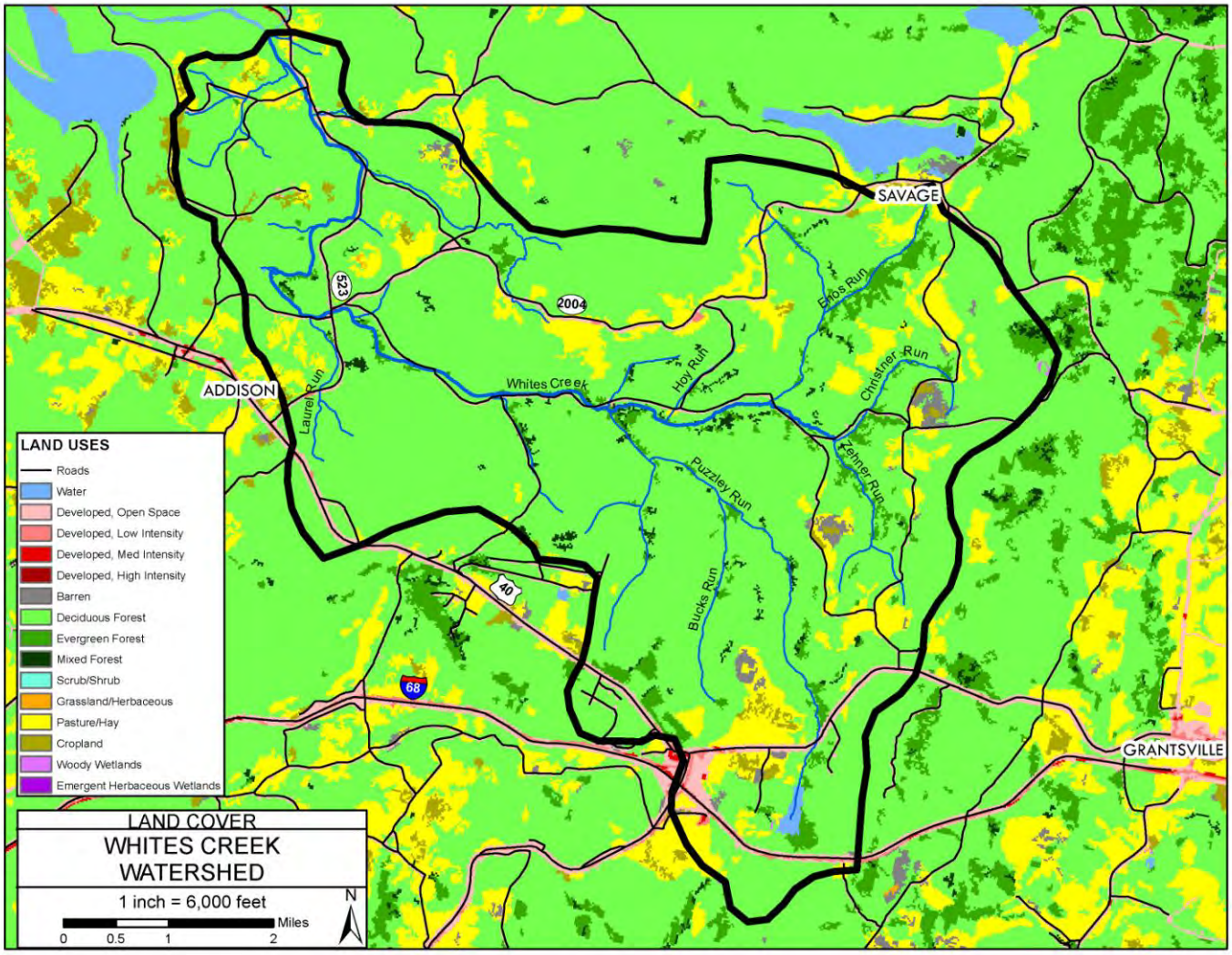
APPENDIX II GEOLOGIC FORMATION MAP



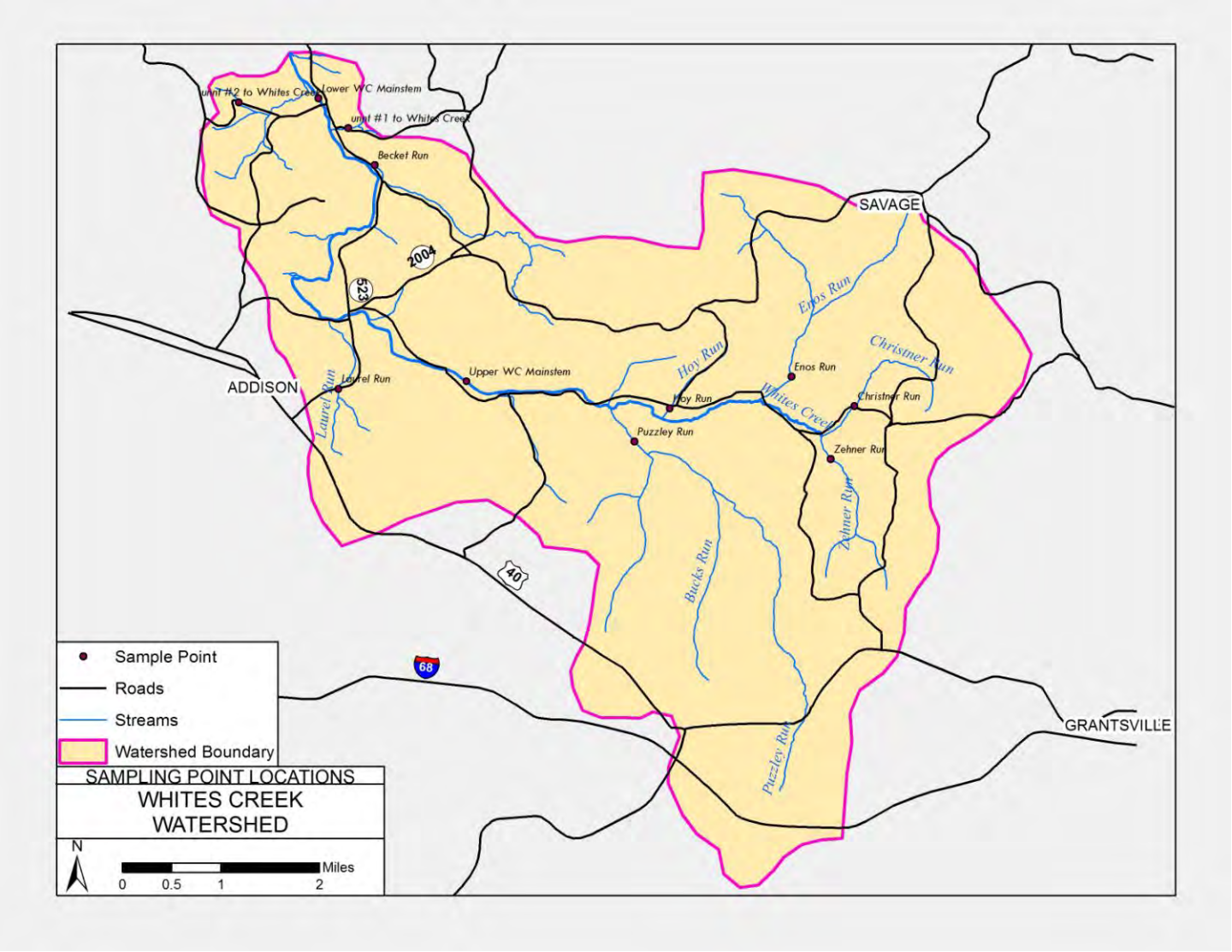
APPENDIX III WATERSHED SOILS MAP



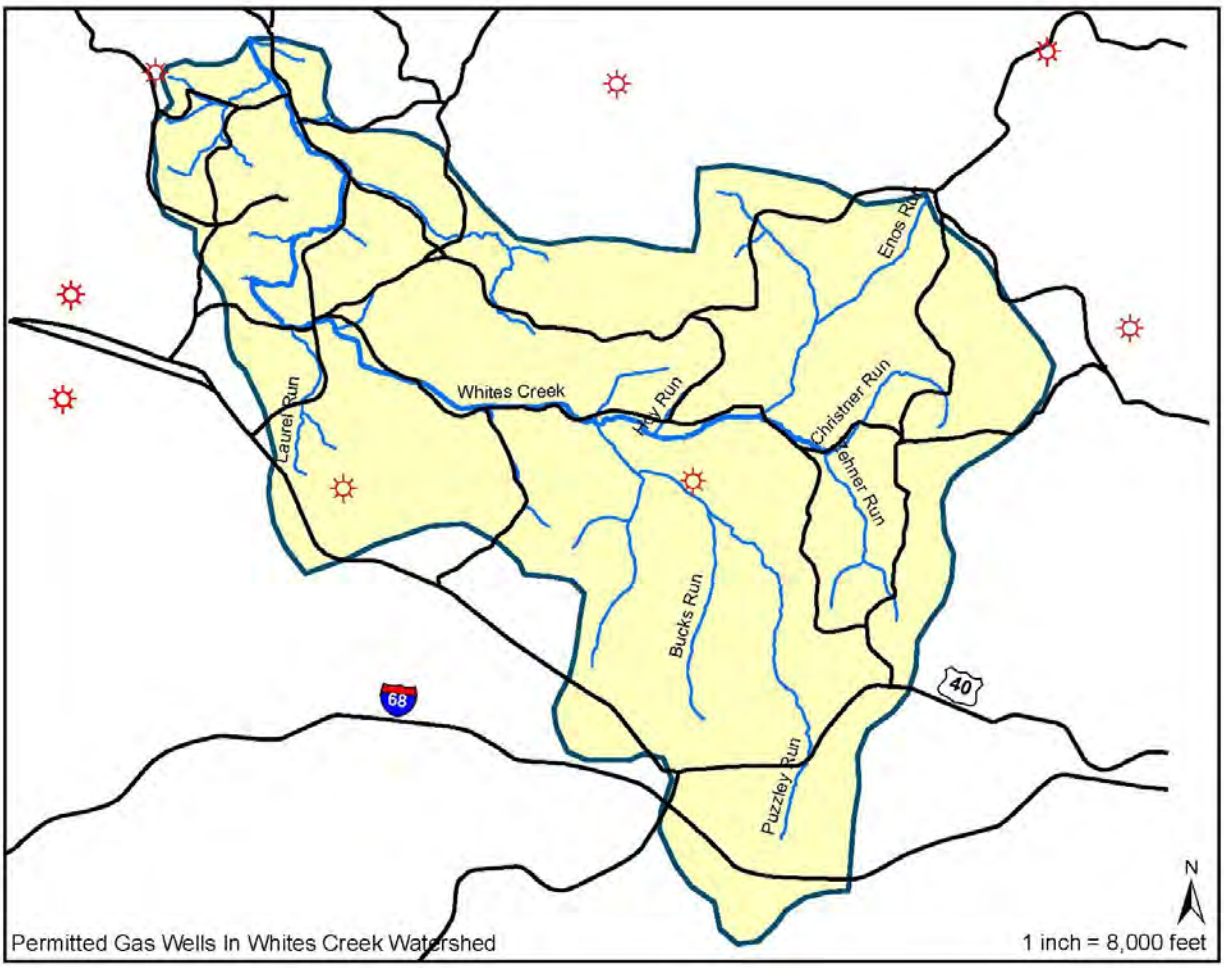
APPENDIX IV WATERSHED LAND USE MAP

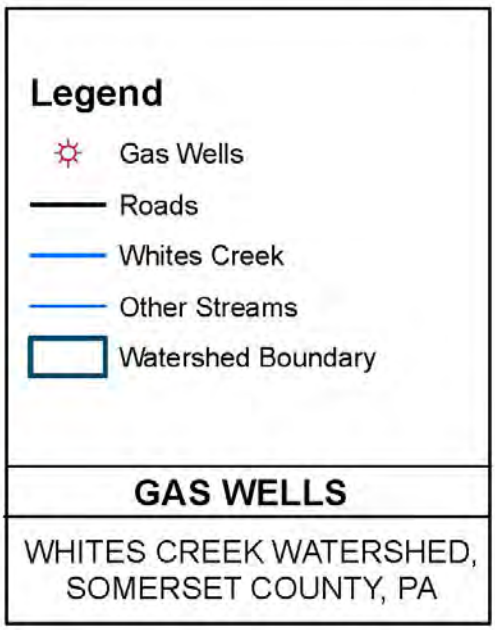


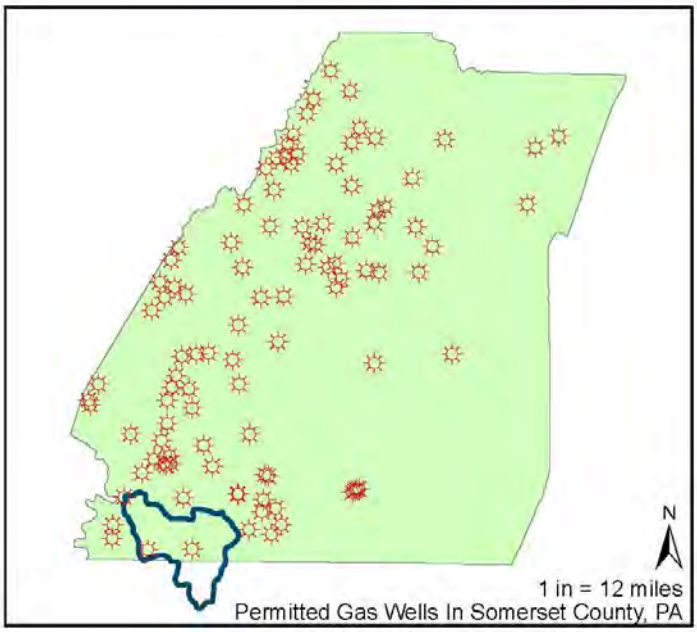
APPENDIX V MACROINVERTEBRATE SAMPLE POINTS



APPENDIX VI NATURAL GAS WELLS







APPENDIX VII WATERSHED ABANDONED MINES