November 18, 2013

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Re: Petition Report – Perkiomen Creek (Montgomery, Bucks, Berks, Lehigh Counties); Findings and Recommendations for Public Review and Comment

Dear Mr. Shaw,

On behalf of more than 120 co-petitioners and the hundreds more who subsequently expressed support for the Upper Perkiomen upgrade petition, the lead co-petitioners thank you for the Pennsylvania Department of Environmental Protection's (DEP's) work in this important region. The 45-page Upper Perkiomen redesignation petition (hereafter referred to as "the Petition") with additional appendices and Stroud Water Research Center (SWRC) benthic data, among other data, was submitted in December 2006 and accepted for DEP study by the Environmental Quality Board (EQB) in February 2007. We appreciate the time and attention that has gone into DEP's research and the preparation of the *Perkiomen Creek: Berks, Montgomery and Lehigh Counties Water Quality Standards Review Stream Redesignation Evaluation Report* (hereafter referred to as "the Report") that was shared with the co-petitioners on September 18th, 2013.

The receipt of the Report marked the first time that co-petitioners have had an opportunity to review the work undertaken by the DEP regarding the Petition. The co-petitioners have reviewed the Report and our comments follow. In addition, out of recognition for the amount of time that has passed since the submission of the Petition as well as for the large geographic area covered by the petition (95 square miles and 141 stream miles), we are writing now to share some additional data, highlight important attributes, and bring to DEP's attention information about the Upper Perkiomen that we believe is important for the agency to review before moving forward. We believe this additional information should be considered before any final recommendations are made or rulemaking is recommended. We also believe, as indicated in our past two letters to the DEP, that the petitioners should be provided more time to gather and collect additional data and information.

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Reference Stream Selection

The co-petitioners support the study of the indigenous aquatic community as an indicator of long-term conditions and as a measure of water quality. DEP staff collected habitat and benthic macroinvertebrate data at 20 locations within the petitioned basin between March 26th and March 28th, 2007. One additional sample was collected May 17th, 2007, on an Unnamed Tributary to Hosensack Creek. In addition, samples were collected from one station each on those creeks used as references streams: Muncy Creek in Sullivan County (April 11th, 2007) and Pine Creek in Berks County (May 9th, 2007).

The co-petitioners question the use of Muncy Creek as a reference stream for the Upper Perkiomen Creek. When undertaking an antidegradation assessment, DEP should make every effort to match the natural conditions of the candidate stream with a reference. The two streams should possess the same, or very similar, characteristics when in a natural condition because taxonomic composition of stream communities will differ depending on ecoregion, stream order and stream elevation.

Physiographic Provinces

Six different physiographic provinces comprise the shape of Pennsylvania landscape. The reach of Muncy Creek sampled by DEP is located in the Appalachian Plateaus physiographic province. However, the Upper Perkiomen Creek watershed is located in a distinctly different landscape within the New England and Piedmont physiographic provinces.

Appalachian Plateaus Province

> The Deep Valleys Section [of the Appalachian Plateaus Province] consists of many very deep, steep-sloped valleys that are separated by narrow, flat to sloping uplands. In the deepest valleys, the stream at the valley bottom is more than 1,000 feet below the top of an adjacent upland. At the head of a valley, the valley merges with the upland with only a few 10's of feet of elevation difference between the valley bottom and the upland. The valley slopes are always steep in the main part of the valley. In most valleys the slope is fairly uniform from top to bottom. In some valleys the slopes have a large-scale, stairstep appearance. This appearance results from erosion of sandstones and shales, rocks with different resistances to erosion. The sandstones are resistant to erosion and form very steep slopes and flat steps on the slopes. The shales are much less resistant to erosion and form sloping risers between steps.[1]

New England Province

> The Reading Prong Section [of the New England Province] consists of circular to linear, rounded low hills or ridges that project upward in significant contrast to the surrounding lowlands. The hills and ridges are made up of granitic gneiss, granodiorite, and quartzite. These rocks are very resistant to erosion and thus the hills and ridges stand higher than the softer sedimentary rocks that surround them. The slopes of these hills and ridges are steep and have a very well defined change in slope where the bases of the hills and ridges meet the lower and gentler slopes of adjacent Sections. The streams eroding into the hills and ridges are short and steep. Local relief is 300 to 600 feet and elevations range from 140 to 1,364 feet.[2]

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[1] Pennsylvania Department of Conservation and Natural Resources. n.d. Deep Valleys Section, Appalachian Plateaus. Retrieved from http://www.dcnr.state.pa.us/topogeo/field/map13/13dvs/index.htm.

[2] Pennsylvania Department of Conservation and Natural Resources. n.d. Reading Prong Section, New England Province. Retrieved from http://www.dcnr.state.pa.us/topogeo/field/map13/13rps/index.htm.

Piedmont Province

> The Gettysburg-Newark Lowland Section [of the Piedmont Province] consists mainly of rolling low hills and valleys developed on red sedimentary rock. There are also isolated higher hills developed on diabase, baked sedimentary rock (hornfels), and conglomerates. Almost all of the underlying sedimentary rock dips to the north or northwest and many of the smaller drainageways are oriented normal to the direction of dip so that some of the topography has a northeast-southwest linearity. However, the basic drain-age pattern is dendritic. Soils are usually red and are often have a visually striking contrast to the green of vegetation. Relief is generally in the area of 100 to 200 feet, but locally is up to 600 feet on some of the isolated hills. Elevation in the Section ranges from 20 to 1,355 feet. The Section is made up of sedimentary rocks that were deposited in a long, narrow, inland basin that formed when the continents of North America and Africa separated more than 200 million years ago.[3]

In addition to the distinctions in landform described above, it should be noted that the within these different provinces, streams tend to have different drainage patterns. In the Deep Valleys of the Appalachian Plateaus, drainages are angulate and rectangular. By contrast, in the Reading Prong section the New England Province, drainages are described as dendritic. Similarly, drainages in the Gettysburg-Newark Lowland Section of the Piedmont are described as dendritic and trellis.[4]

Ecoregions

Muncy Creek is located in Sullivan County in the Glaciated Allegheny High Plateau ecoregion. The Upper Perkiomen watershed takes in parts of three different Level III and IV ecoregions (U.S. EPA): the Reading Prong, the Triassic Lowlands and the Diabase and Conglomerate Uplands. The natural conditions of Muncy Creek differ significantly from those in the Upper Perkiomen watershed. Excerpts below from descriptions of these ecoregions[5] help characterize how much these locations differ:

Glaciated Allegheny High Plateau

> The soils, climate, and ruggedness make the area well suited to trees and poorly suited to agriculture. Hardwood forests are predominant. The natural vegetation was primarily Northern Hardwoods (dominants: sugar maple, yellow birch, beech, and hemlock) with some intermixed bogs, swamps, and marshes. Appalachian Oak Forest (dominants: white and red oaks) also occurred, especially on the eastern margin of Ecoregion 62c (Cuff and others, 1989, p. 52). Rickets Glen State Park in northwestern Luzerne County contains approximately 2,000 acres of virgin northern hardwood forest, as well as numerous hemlock swamps (Erdman and Wiegman, 1974, p. 43). Pennsylvania's only spruce bald occurs on Bartlett Mountain, western Wyoming County (Roger Latham, Department of Geology, University of Pennsylvania, written communication, 1995).

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[3] Pennsylvania Department of Conservation and Natural Resources. n.d. Gettysburg-Newark Lowland Section, Piedmont Province. Retrieved from http://www.dcnr.state.pa.us/topogeo/field/map13/13gnls/index.htm.

[4] Pennsylvania Department of Conservation and Natural Resources. n.d. Physiographic Provinces of Pennsylvania. Retrieved from http://www.dcnr.state.pa.us/cs/groups/public/documents/document/dcnr_016202.pdf.

[5] Woods, A.J, et. Al. 1999. Level III and IV Ecoregions of Delaware, Maryland, Pennsylvania, Virginia, and West Virginia. U.S. Environmental Protection Agency. Retrieved from http://training.fws.gov/EC/Resources/stream_habitat_measurement_tech/documents/epa_region_3_eco_desc.pdf.

Reading Prong

> The metamorphic and igneous rocks are covered by slightly acidic, moderately fertile, residual soils which originally supported a native vegetation of Appalachian Oak Forest, dominated by white and red oaks (Cunningham and Ciolkosz, 1984; Cuff and others, 1989, p. 52). Today, we see a mosaic of rural residential development, woodland, and general farmland.

Triassic Lowlands

> The soils of Ecoregion 64a were derived from Triassic sandstone, shale, siltstone, and argillite of the Brunswick, Stockton, Lockatong, Gettysburg, and New Oxford formations; lithology is distinct from the metamorphic rocks of the surrounding portions of the Piedmont . . . They supported a potential natural vegetation of Appalachian Oak Forest (dominated by white and red oaks) (Kuchler, 1964).
>
> Today, the native Appalachian oak forest has been replaced by a mosaic of farms, houses, and woodland. Agriculture is favored by nearness to market, fairly fertile soils, and a long growing season of 170-183 days.

Diabase and Conglomerate Uplands

> Thin, fine-textured clayey soils have commonly developed over diabase and are non-acidic and shallow. They are hard to till and best suited for forest or pasture . . . Soils are mostly Alfisols and originally supported Appalachian Oak Forest (dominated by white and red oaks) (Cuff and others, 1989, p. 52). The flora on soils derived from the diabase intrusions which are basic in character are distinctive; acid loving plants are absent from diabase areas (Allard and Leonard, 1962).
>
> Today, woodland is still common in Ecoregion 64b, especially where the surface is steep or covered in rocks or boulders. In other areas, the land is more suitable to agriculture. Here general farms occur, typically scattered among woodland and idle land. Camps and resort cottages are locally common, for example, in eastern Montgomery County (Smith and others, 1967, p. 9).

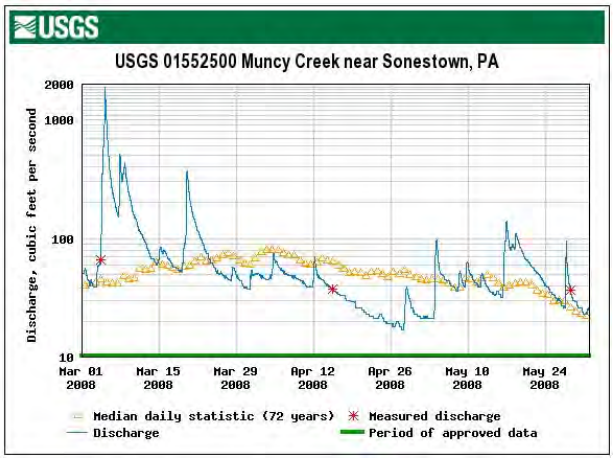
Stream Order

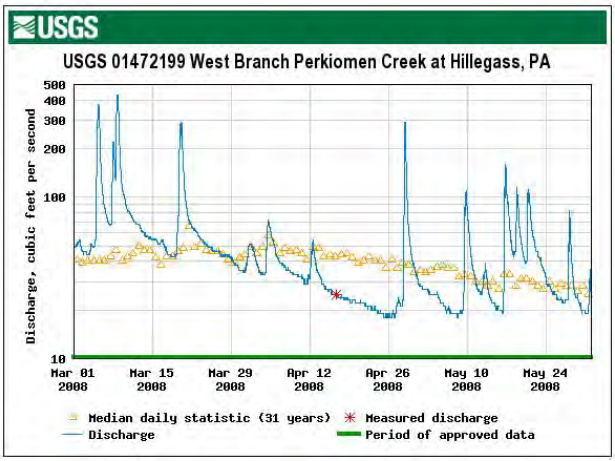
The Report states that DEP made an effort to compare data from candidate sampling streams to reference streams with a comparable drainage area. The co-petitioners question why that portion of the West Branch Perkiomen Creek that is already designated an Exceptional Value (EV) stream—the West Branch from SR 1022 Bridge to SR 2069 Bridge—was not used as a reference stream for Stations 1PC, 2PC, 1UNT, 2UNT, 1UNTHC, 1HC, 1IC, 2UNTHC, 1MO, 1WB, 1UNTWB, 1MCB, 1MC. Certainly this location represents a comparable drainage area and presents similar natural characteristics to those stations that were compared to Pine Creek.

Stations 3PC, 2HC, 4PC, 2WB, 3WB, 4WB, and 2MC were compared to the Muncy Creek reference station. The co-petitioners assert that these are not comparable drainage areas. Although the locations drain areas of comparable size, the volume of flow and flow variability for Muncy Creek and the Upper Perkiomen demonstrate considerable differences. This is demonstrated by a comparison of flow data from two U.S. Geological Survey (USGS) gaging stations: USGS 01552500 Muncy Creek near Sonestown, PA, and USGS 01472199 West Branch Perkiomen Creek at Hillegass, PA. USGS 01552500, located 2.0 miles downstream from DEP's Muncy Creek sampling location drains a 28.8 square mile area. USGS 01472199,

located downstream less than 1.0 mile from the DEP's 4WB sampling station, drains 23 square miles. Figure 1 below compares the flow data from 2008 to 2013 for the sampling window DEP used for its 2007 macroinvertebrate sampling.

March 1 – May 31, 2008





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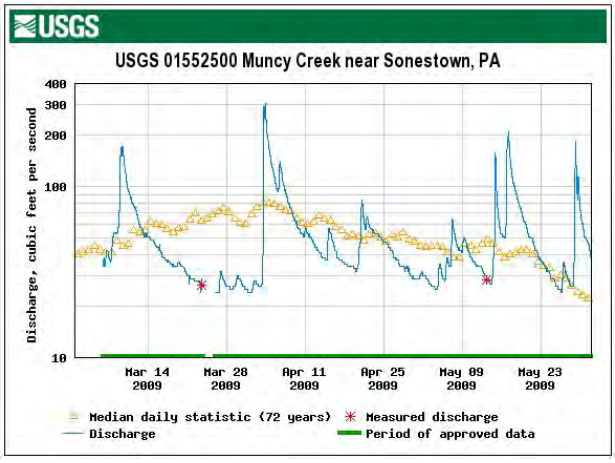

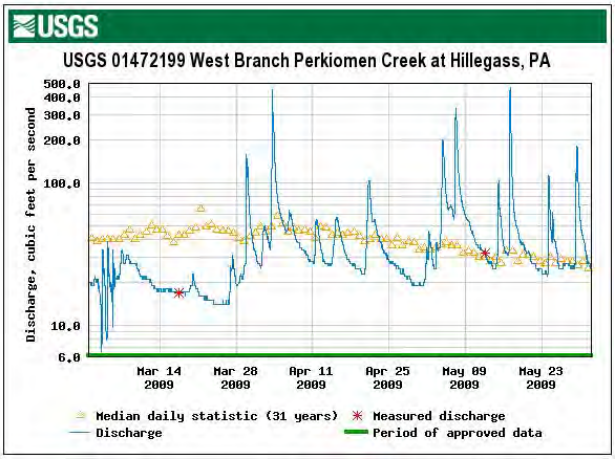

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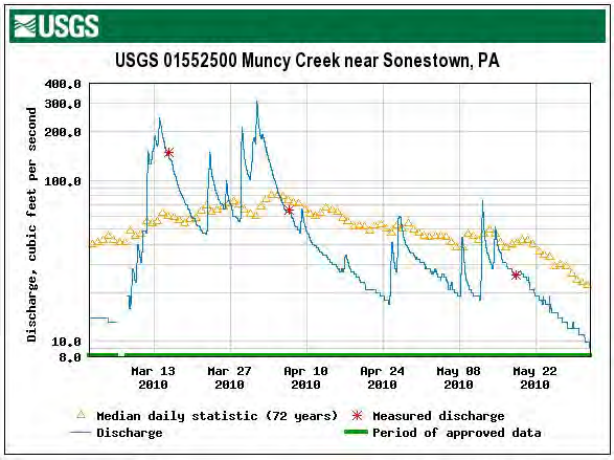

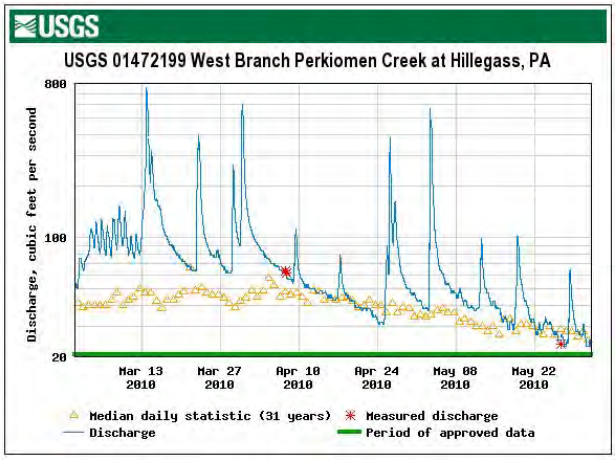

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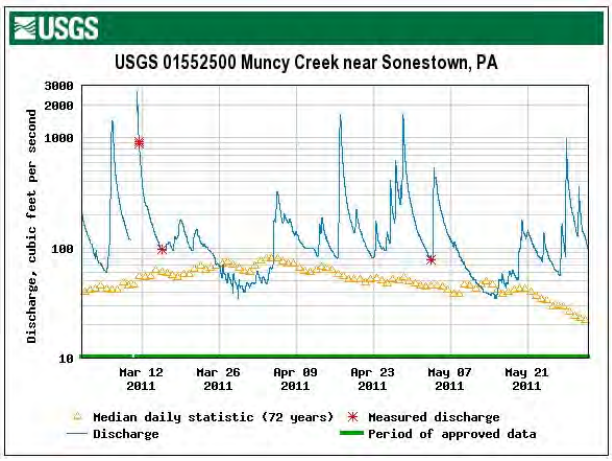

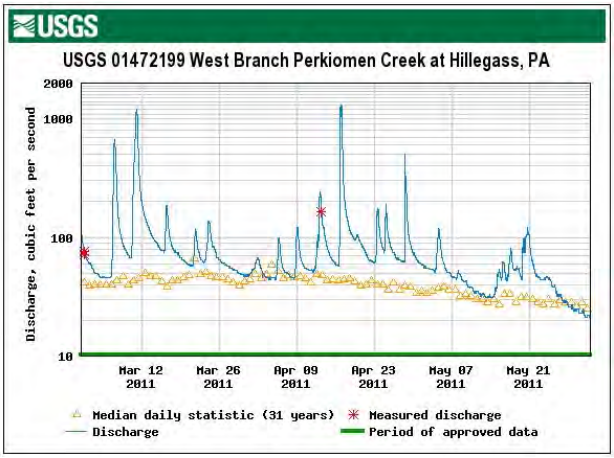

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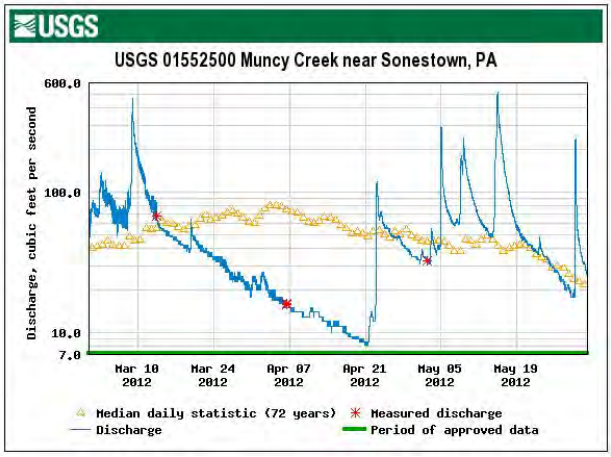

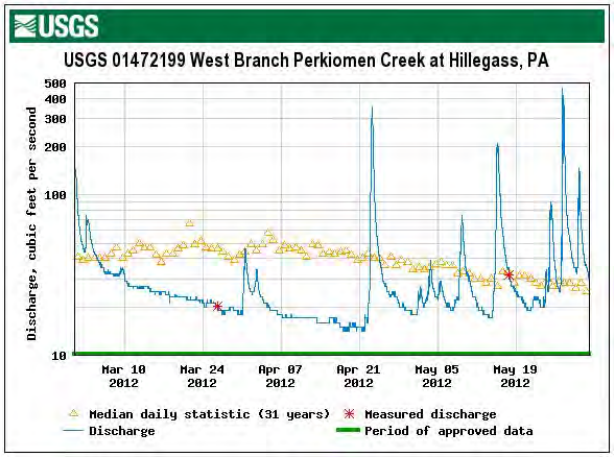

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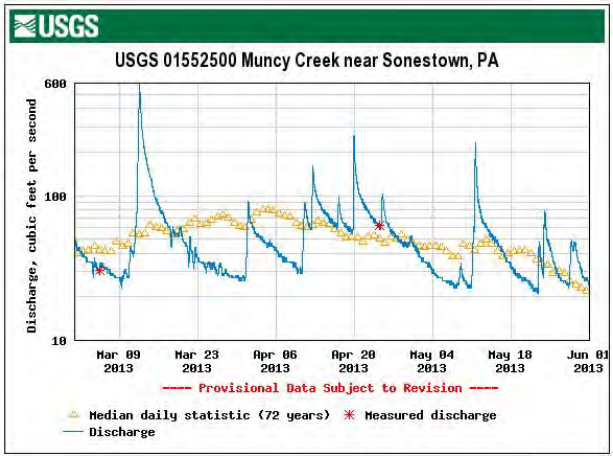

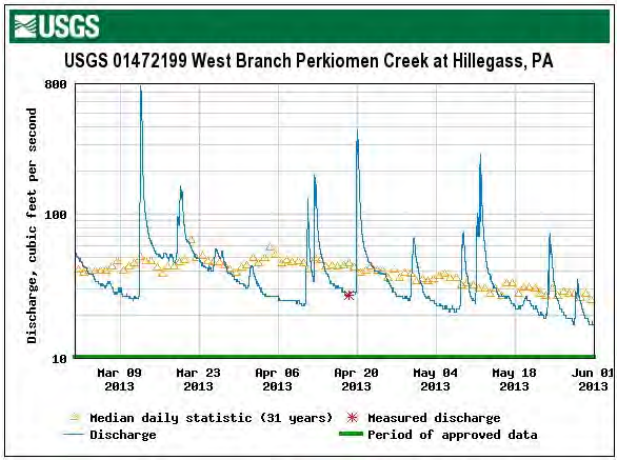

Figure 1. Flow Data Comparison, 2008 to 2013

Median daily flows may appear comparable over the period of record for the stations, but over the six year period Muncy Creek demonstrated greater variability in flow during DEP's sampling window, with significantly higher peak discharges than those seen along the West Branch Perkiomen. During the sampling window, from 2008 to 2013, total flow volumes for Muncy Creek exceed total flow volumes for

the West Branch for all years, but 2010. The margins by which Muncy Creek total flows exceeded West Branch flows during the sampling window from 2008 to 2013 range from approximately 1,000 cubic feet to as much as 7,000 cubic feet. Despite the similarity in drainage area, the total flow volumes and variability in flows suggest that Muncy Creek may not represent a comparable drainage.

Elevation

At DEP's Muncy Creek reference sampling location, elevations are around 1,200 feet above sea level with peaks nearby reaching to 2,400 feet above sea level. By contrast, the Report describes the Upper Perkiomen watershed as having "relatively flat topography with some gently rolling hills of low relief." Peaks in this region of the Upper Perkiomen may reach over 1,000 feet, but most elevations are in the 400 to 600 foot range.

In addition, the differences in topography raise questions as to the suitability of Muncy Creek as reference stream for the Upper Perkiomen Creek because of variations in stream gradient. The steep slopes of the Muncy Creek in the vicinity of DEP's sampling location contrast with the "relatively flat topography: of the Upper Perkiomen. Stream gradient can be correlated with factors that affect assemblages of macroinvertebrates such as stream flow velocity, substrate material, channel morphology and stream habitat types (pools, riffles, runs, etc).[6] When considered in combination with canopy cover, stream gradient has been found to affect food sources which can then affect functional feeding-group composition and density.[7] In acknowledgement of how stream gradient can affect macroinvertebrate assemblages, other states have developed macroinvertebrate specific reference conditions for varying gradient conditions. New Jersey has developed three tools to evaluate biological degradation: a High Gradient Macroinvertebrate Index for streams of the Highlands, Ridge and Valley, and Piedmont; a Coastal Plain Macroinvertebrate Index for the Coastal Plain excluding the Pinelands; and the Pinelands Macroinvertebrate Index.[8]

Timing of Sampling

Delays between Reference and Candidate Sampling

DEP should make every effort to match the natural conditions of the candidate stream with a reference. However in 2007, DEP allowed 43 days to pass between sampling the Upper Perkiomen sites and sampling of the Pine Creek reference stream. For this reason, the co-petitioners question the use of the Pine Creek data presented for the reference stream. The co-petitioners urge re-sampling when a tighter sampling, window can be scheduled and both candidate and reference stations can be sampled during comparable conditions.

Weather

A review of weather and USGS gage station flow data suggest that weather varied considerably at sampling locations. Stream temperatures correlate positively with air temperatures and stream temperatures are known to influence macroinvertebrate abundance and composition as well as hatch out rates and times.

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[6] Walsh, M., et al. 2007. User's Manual and Data Guide to the Pennsylvania Aquatic Community Classification. Pennsylvania Natural Heritage Program and Western Pennsylvania Conservancy. Retrieved from http://www.naturalheritage.state.pa.us/docs/aquatics/UsersManual.pdf.

[7] Hawkins, C.P., et al. Effects of Canopy, Substrate Composition, and Gradient on the Structure of Macroinvertebrate Communities in Cascade Range Streams of Oregon. Ecology, 63(6), 1982, pp. 1840-1856. Retrieved from http://andrewsforest.oregonstate.edu/pubs/pdf/pub1867.pdf.

[8] New Jersey Department of Environmental Protection. 2008. New Jersey Integrated Water Quality Monitoring and Assessment Report, 2008 DRAFT. Retrieved from http://www.state.nj.us/dep/wms/bwqsa/draft_2008_integrated_report.pdf.

Therefore significant variation in weather conditions during sampling may have affected biological conditions scores and negatively affected the comparisons of candidates to reference streams.

Twenty of the candidate locations were sampled between March 26th and March 28th, 2007. In the week before this sampling took place, over 0.75 inches of rain were recorded in nearby Reading, PA.[9] In the days preceding the sampling in the Upper Perkiomen area, high temperatures ranged from the mid-high 50s to the low 70s. On March 27th, a high of 83°F was recorded.

By contrast, high temperatures in the Muncy Creek area in the week preceding sampling averaged 42°F. Low temperatures in this area were all below freezing. Traces of snow fall were recorded on three days in the week preceding DEP's sampling of the reference station. Even with temperatures warming to 53°F on April 11th, the day DEP sampled, any melting snow would have mitigated the effect of warmer air temperatures on stream temperatures.

Although flows for Muncy Creek and the West Branch for the sampling window in 2007 may appear similar at first glance, a closer look shows variation in daily discharges values during key times (see figure 2 below). In the week preceding sampling in the Upper Perkiomen, West Branch flows averaged nearly 110 cubic feet per second (cfs). The median daily discharge for this gage for March 26th is 46 cfs. In the week prior to sampling along Muncy Creek, the daily discharge averaged just over 40 cfs. The median daily discharge for this gage is 60 cfs.

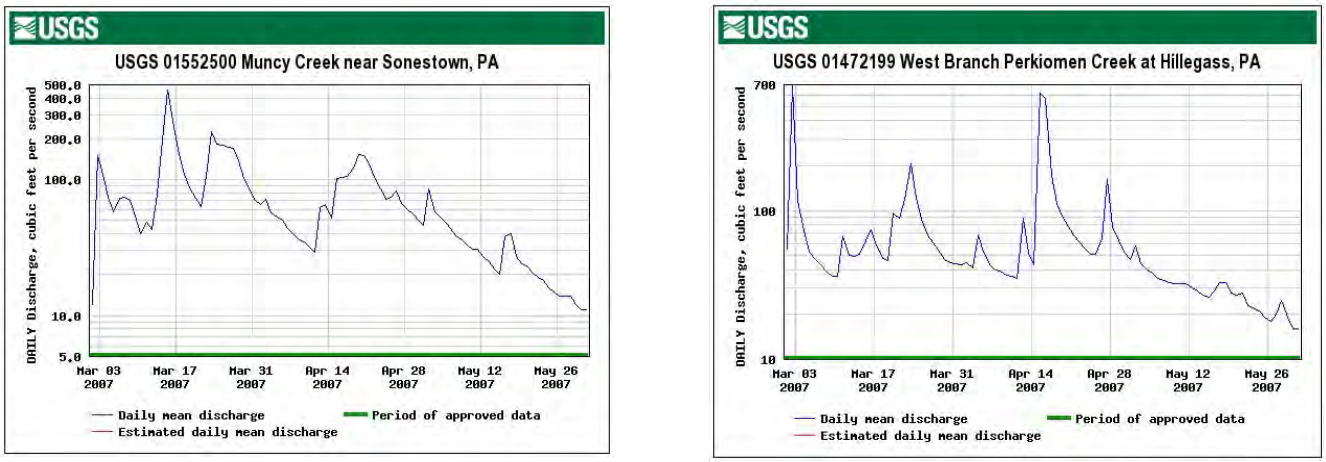

Figure 2. Flow Data Comparison, DEP Sampling Window 2007

In the week preceding sampling on Pine Creek, temperatures recorded in nearby Reading, PA, averaged 70°F. On the day sampling took place, the high temperature hit 81°F. The total rainfall recorded in this week at Reading was 0.01 inches and that was recorded on April 5th. The six days immediately preceding the sampling were dry. No gage station is located along the Pine Creek to provide flow data.

The co-petitioners believe the weaknesses we have highlighted regarding the selection of references stations and the timing of sampling make a strong argument for the need to re-assess the benthic macroinvertebrate communities of the Upper Perkiomen Watershed. We strongly urge that plans be made now for a spring sampling so that candidate sites and reference locations be sampled in a tight window when conditions are comparable for all streams.

[9] All weather data retrieved from www.wundergound.com

We also recommend that DEP use the existing EV section of the West Branch as a more appropriate reference stream. In addition to Berks County's Pine Creek, we recommend consideration of one of the many other EV streams found in Berks and Chester counties. These include:

- Sacony Creek, Basin, Source to SR 1029 Bridge in Rockland Township (Berks)
- Peters Creek, Basin (Berks)
- Northkill Creek, Basin, Source to I-78 Bridge (Berks)
- Hay Creek, Basin, Source to Unnamed Tributary (UNT) 63882 at River Mile 8.1 (Berks)
- Hay Creek, Basin, Beaver Run to Birdsboro Boundary (Berks)
- Oysterville Creek, Basin, Source to T 634 Bridge (RM 2.6) (Berks)
- Trout Run, Basin (Berks)
- French Creek, Basin, Source to and including Beaver Run (Chester)
- French Creek, Main Stem, Beaver Run to Birch Run (Chester)
- Birch Run, Basin (Chester)
- French Creek, Main Stem, Birch Run to T522 bridge (Kennedy Covered Bridge)

We believe that sampling locations along these EV streams can be identified that will represent comparable drainages to the candidate sampling locations. Moreover we believe that these streams offer a much better match to the ecoregion and stream elevation of the candidate streams and therefore present a better comparison of the candidate and reference streams. Since the geology of a watershed strongly influences the local landscape and the biological environment of a stream, there are better reference streams available nearby. The proximity of these sites to the Upper Perkiomen watershed also make it more likely to accomplish sampling within a reasonable window appropriate for making the necessary comparisons.

The co-petitioners believe that every effort should be made to compare the taxonomic composition of candidate streams to that of streams functioning as naturally as possible in the candidate stream's region. DEP's policy of using only the top scoring of EV streams unfairly raises the bar for streams that would otherwise qualify if regional streams were used as reference. There is demonstrable taxa variation across Pennsylvania (SWRC, Personal Communication, 16 July 2009) and DEP has indicated that in locations like Monroe County, where conservation district staff have begun using the new Index of Biotic Integrity, they have already seen that additional indices will be needed to accurately assess streams in different ecoregions (DEP staff, Personal Communication, 16 July 2009).

The Pennsylvania Natural Heritage Program (PNHP) identified least disturbed stream (LDS) reaches for use as reference streams. To select appropriate reference streams, PNHP's LDS analyzed landscape-level attributes of watersheds including:

- Catchment Urbanization (impervious)
- Catchment Agriculture (non-row crop)
- Catchment Agriculture (row crop)
- Catchment Forest Cover
- Number of Catchment Point Sources
- Riparian Urbanization (impervious)
- Riparian Agriculture
- Riparian Forest Cover
- Number of Catchment Road Crossings
- Number of Catchment Dams

In addition, PNHP considered unique geologies and it is worth noting their discussion of the unique geologies that apply to the Upper Perkiomen:

Crystalline Silicic and Crystalline Mafic Geology Streams: These two geology types are found in the southeast corner of Pennsylvania (Figure 8-1). Crystalline rocks are formed from solution, such as igneous rock. This is in contrast to sedimentary rock like sandstone, which is formed from the layering and compaction of sediments. Both crystalline rock types contain certain elements that can leave unique signatures in stream water; crystalline silicic rock contains high amounts of silica, while crystalline mafic rocks can leave traces of calcium, sodium, iron and magnesium in surface water. Furthermore, these geology types are found in highly populated areas of southeastern Pennsylvania; water quality issues associated with urban streams (e.g., stormwater runoff and municipal discharges) may compound or mask the effects of these unique geologies.[10]

PNHP went on to identify reference streams appropriate for Crystalline Silicic and Crystalline Mafic Geology Streams (see Appendix A). The co-petitioners note that the West Branch Perkiomen Creek was identified as a LDS reference stream for watersheds ranging from 11 to 100 square miles area (see Table 1 below).

Drainage Area	**Size 1 (0-3 mi^2 watershed area)**	**Size 2 (4-10 mi^2 watershed area)**	**Size 3 (11-100 mi^2 watershed area)**	**Size 4 (100+ mi^2 watershed area)**
Crystalline Silicic Geology-Dominated Streams				
Example Streams	Headwaters of Rocky Mountain Creek and Carbaugh Run (Conococheague Creek); Headwaters of Little Lehigh, Swabia and Manatawny Creeks; Mountain Lake Brook (Pequest River)	Headwaters tributaries to Yellow Breeches Creek; portions of Manatawny Creek; Sacony Creek and Beaver Run	West Branch Brandywine Creek; South Branch French Creek; West Branch Perkiomen Creek	Brandywine Creek; Musconetcong River (New Jersey)
Crystalline Mafic Geology-Dominated Streams				
Example Streams	Tributaries to Tohickon Creek; Butter Creek (Unami Creek); Headwaters of Toms Creek	Ridge Valley Creek (Unami Creek); Dimple Creek (Tohickon Creek); Rapp and Beaver Creeks (Tinicum Creek)	Muddy, Otter and Fishing Creeks (Susquehanna River); West Branch Brandywine Creek (near mouth)	Brandywine Creek, below Buck Run confluence

Table 1. Pennsylvania Natural Heritage Program's LDS for Crystalline Silicic and Crystalline Mafic Geology Streams

Analysis of DEP's Benthic Macroinvertebrate Data

As indicated in our petition, macroinvertebrate data collected by SWRC formed the basis for our request to DEP and was supplemented with water quality data collected by the Delaware River Basin Commission (DRBC) and the Delaware Riverkeeper Network (DRN) water quality data. SWRC conducted monitoring at 146 locations in the Schuylkill River Basin from 1996 to 2007. SWRC sampling protocols[11] included:

[10] Walsh, M., et al. 2007. User's Manual and Data Guide to the Pennsylvania Aquatic Community Classification. Pennsylvania Natural Heritage Program and Western Pennsylvania Conservancy. Retrieved from http://www.naturalheritage.state.pa.us/docs/aquatics/UsersManual.pdf.

[11] Stroud Water Research Center. n.d. Sampling Methods. Schuylkill River Project. Retrieved from: http://www.stroudcenter.org/schuylkill/methods.htm.

> Macroinvertebrate samples were collected annually (between late March and late April) for 12 years (1996-2007) at the 19 Long-Term study sites. The other 127 sites were sampled only once, between late March and late April from 2001 to 2007. Five quantitative samples were collected randomly from a single riffle at each site using a modified Hess sampler (0.088 m2 sample area; 500 µm mesh net). During sample collection, the substrate was disturbed and dislodged macroinvertebrates were collected in the sampler's net. Each stone (large gravel to cobble) in the sampling area was scrubbed with a brush and then inspected for any remaining attached macroinvertebrates, which were then removed by hand. Although substrates were generally similar across all samples (mostly small to large cobble), the quantity of leaves, woody debris, and sand/silt associated with the cobbles varied among sites and years.
>
> After collection, macroinvertebrate samples were preserved in 95% Ethanol, transported to the laboratory, and split into four or more equal subsamples. Subsampling reduced the number of individuals examined from each sample towards our target of 200 individuals per subsample. Because macroinvertebrate densities varied greatly across sites and years, the subsample size processed varied from whole samples to 1/16 of a sample.
>
> Macroinvertebrates were removed from subsamples under magnification and identified to family (most insects) or order/class (most non-insects) using keys in Peckarsky et al. (1990) and Merritt and Cummins (1996). The samples were processed in the laboratory by 88 college students (5-14 summer interns per year) recruited from 43 colleges or universities. The students were provided initial training in macroinvertebrate identification techniques, and they quickly acquired the skills needed to collect data with taxonomic content similar to family-level data commonly collected by state and federal agencies. All identifications and counts in every sample were rechecked after initial processing.
>
> Water samples were collected at each of the study sites (one sample per site) during baseflow. Nitrate (NO3), total dissolved phosphorus (TDP), pH, conductivity, and alkalinity were measured for each sample.

SWRC scientists reported that stations they monitored in the Upper Perkiomen were among the best in the entire Schuylkill River drainage area, year after year. Given the contradictory findings presented by DEP in the Report, SWRC undertook a preliminary comparison of DEP and SWRC data. SWRC uses Macroinvertebrate Aggregated Index for Streams (MAIS) scores for gaging stream health.[12]

> MAIS Scores range from 0-20, where scores greater than 13.1 (Good) indicate macroinvertebrate assemblages are characteristic of clean, healthy streams; scores less than 6.0 (Poor) indicate macroinvertebrate assemblages have lost many pollution-sensitive species and are characteristic of streams experiencing severe environmental stress; scores between 13.1 and 6.0 (Fair) indicate the streams are experiencing moderate environmental stress.

The MAIS score looks at comparable but different metrics than DEP uses in its antidegradation assessment. In order to compare DEP and SWRC data, SWRC applied the MAIS metrics to the DEP raw data.

[12] Stroud Water Research Center. 2009. Understanding Stream Conditions: Lessons from an 11-Year Study of Macroinvertebrates in Eastern Pennsylvania's Schuylkill River Watershed, with a Focus on Exceptional-Value and High-Quality Streams. Retrieved from http://www.stroudcenter.org/schuylkill/Schuylkill_Summary.pdf.

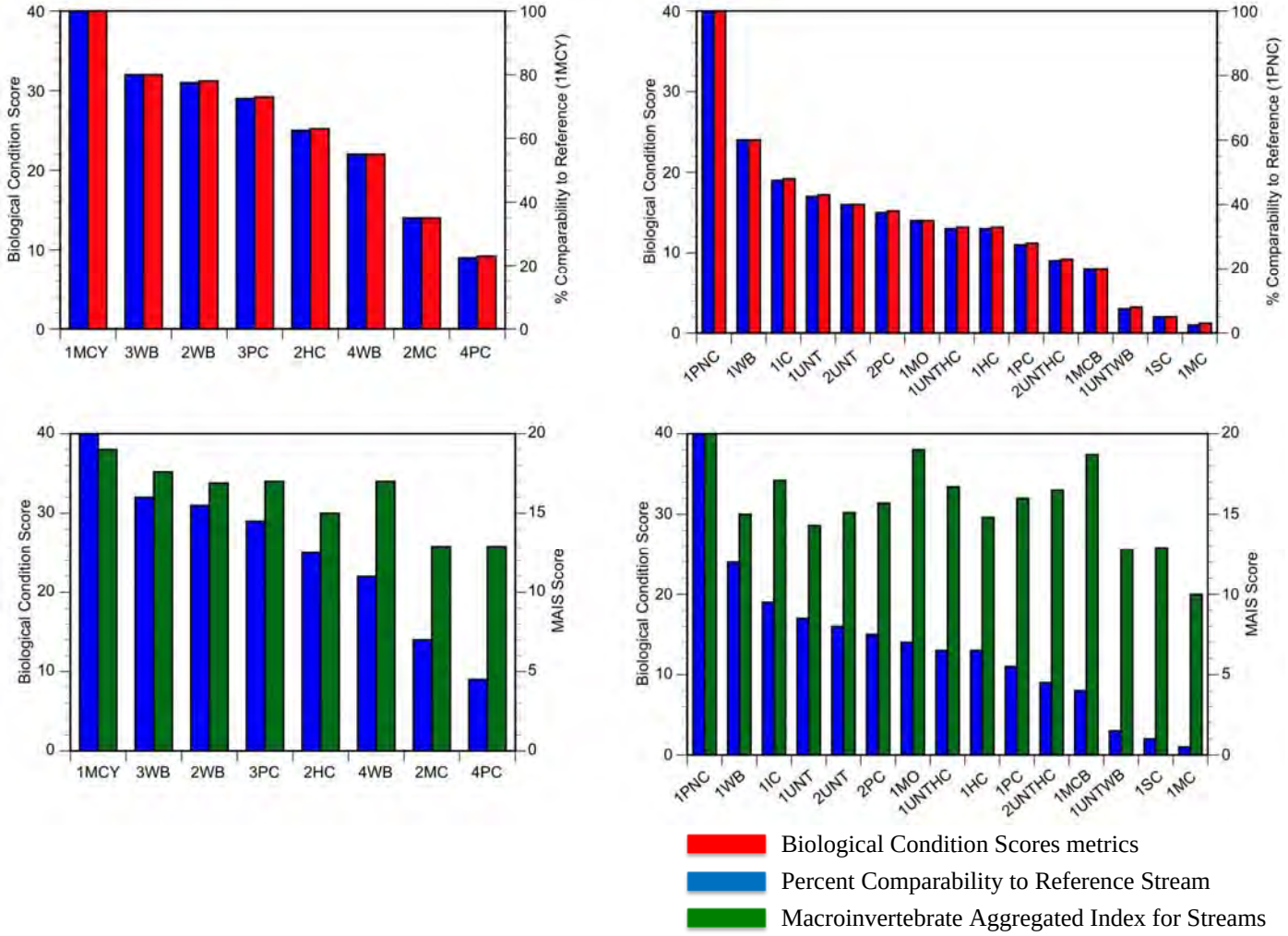

Figure 3. Comparison of Metrics Analyzing DEP Semi-Quantitative Benthic Macroinvertebrate Data for the Upper Perkiomen

Figure 3 shows the relationships between the DEP special protection methods metrics scores (hereinafter referred to as the Biological Condition Score, or BCS) and the same date scores using the MAIS. The resulting MAIS scores do not contradict SWRC's earlier data; rather they support them, and in fact indicate these are good quality streams. SWRC speculates that differences arise in scoring the macroinvertebrate data because the BCS excludes some mayflies, stoneflies and caddisflies (referred to as EPT, an acronym for the orders for these insect, Ephemeroptera, Plecoptera, and Trichoptera), primarily mayflies, as not being pollution sensitive, where MAIS does not. Thus, sites with higher numbers of EPT tend to score well on the MAIS, but not on the BCS.

The co-petitioners are also to sharing macroinvertebrate and water quality data covering a timeframe from 2007 through 2013 collected by the Upper Perkiomen High School (UPHS) environmental science program under the guidance of Environmental Science Teacher, James Coffey. Coffey has been recognized by: the Perkiomen Watershed Conservancy (PWC) with its Teaching Excellence award, the Montgomery County Intermediate Unit as a finalist for its Inspiration Award for Teaching Excellence; and the Schuylkill Action Network (SAN) with its Most Valuable Partner Award. The Schuylkill Action Network also recognized UPHS with its Drinking Water Scholastic award.

Data gathered by UPHS was previously shared with DEP as part of our original petition. The UPHS environmental science program collects data about twice a year in May and October using EPA's volunteer

monitoring protocols and metrics as outlined in *Volunteer Stream Monitoring: A Methods Manual* (1997) designed for use in Mid-Atlantic States. The station at Church Road along Perkiomen Creek in Upper Hanover Township scored >40 for every sampling period conducted from 2007 to 2013. For these EPA metrics, stations with >40 scores are ranked as "good"; scores of 20-40 are ranked as "fair" and scores less than 20 are ranked as "poor". These high scores, with diverse EPT organisms counted, indicate consistently good macroinvertebrate diversity for this station. Macoby Creek was also sampled by the students but not as regularly. Several sampling periods for the Macoby Creek indicated a score of greater than 40 for the Macoby Creek stations as well. We include the data in Appendix B and below a summary.

Sampling Location	**Sampling Date**	**Water Quality Score**
Perkiomen Creek, Church Road	5/16/07	48.2
	5/15/08	45.6
	10/23/08	43.4
	5/29/09	54.6
	10/20/09	43.4
	5/20/10	47.9
	10/22/10	42.2
	5/23/11	43.5
	10/21/11	42.8
	10/12/12	45.0
	5/14/13	49.6
Macoby Creek, Pennsburg Nature Preserve/5th Street		
	5/29/09	59.7
	10/20/09	47.8
Macoby Creek, Macoby Run Park/11th Street		
	5/20/10	45.0
	5/23/11	45.6
	10/21/11	50.4
	5/15/13	45.2

Table 2. Summary of Upper Perkiomen High School water quality data

Additional Biological Qualifiers

Under 25 Pa. Code §§ 93.4b(a)(2)(ii) and 93.4b(b)(1)(vi) of the Pennsylvania Code,[13] a stream may qualify for High Quality (HQ) designation or EV designation based on the designation of the stream by Pennsylvania Fish and Boat Commission (PFBC). However, streams deserving HQ or EV protection based on trout qualifiers are given the designation only after designation by the PFBC following public notice and comment. DEP is charged with protecting "uses actually attained in the water body on or after Nov. 28, 1975, whether or not they are included in the water quality standards." When data is available demonstrating that a waterbody supports uses in addition to the designated uses, DEP must protect those uses as well. Therefore, the co-petitioners support the protection of streams deserving HQ or EV protection based on trout qualifiers when it can be shown that data collected justify the designation even if the designation had not yet been made by the PFBC following public notice and comment.

[13] In particular, 25 Pa. Code § 93.4b(a)(2)(ii) states that if "[t]he surface water has been designated a Class A wild trout stream by the Fish and Boat Commission following public notice and comment," then the waterway is a High Quality Water. Additionally, 25 Pa. Code § 93.4b(b)(1)(vi) states that if "[t]he water is designated as a 'wilderness trout stream' by the Fish and Boat Commission following public notice and comment," then the waterway is an Exceptional Value Water.

For a study on the use of hydroecological indices for setting environmental flow standards, PFBC provided wild trout density and biomass estimates that were linked to flow records for USGS gages on a number streams in Pennsylvania including the West Branch Perkiomen Creek. The results of 13 samples of wild trout abundance, gathered from 1978 to 2002 were provided. The average adult wild trout biomass for the West Branch Perkiomen Creek at Hillegass, located downstream less than 1.0 mile from DEP's 4WB sampling station, was 61.29 kilograms per hectare (kg/ha).[14] As this average exceeds the total wild brown trout biomass of at least 40 kg/ha necessary to qualify for Class A wild trout stream,[15] this suggests that the West Branch from the EV section, SR2069 bridge Old Route 100 downstream to the reservoir should qualify at least for HQ status. Thirteen years of data, all collected before 2002, would seem to support this. Yet the PFBC has not moved to change the stream's designation. DEP should have used this long available data to support HQ existing use protection for the West Branch.

USGS station number	Stream Name	Drainage Area	Starting Year for Flow Records	Ending Year of Flow Records	Number of Trout Samples	First Year of Fish Sampling	Last Year of Fish Sampling	Average Adult Wild Trout Biomass	Average Young of Year Wild Trout Biomass
1472199	West Branch Perkiomen Creek at Hillegass, PA	23.0	1981	2007	13	1978	2002	61.29	3.99

Table 3. West Branch Perkiomen wild trout biomass data provided by Pennsylvania Fish and Boat Commission

The PFBC data is also supported by surveys undertaken by co-petitioner Perkiomen Valley Trout Unlimited (PVTU) which has undertaken annual surveys of trout in the area covered by the Petition, and regularly documented the presence of trout.

Fall 2007

> On May 19 the chapter held its most recent anglers survey on the West Branch Perkiomen Creek below Route 100. During our survey we found brown trout from Route 100 down to the mouth of the creek at Green Lane Reservoir.[16]

Spring 2011

> Recent data from the Environmental Protection Agency shows there are wild browns [in the West Branch] down to the Green Lane Reservoir. Our own surveys and a quick check by the Pennsylvania Fish and Boat Commission last year confirmed wild populations down to the big lake. The Main Branch holds a good population of wild browns too, though it hasn't been surveyed recently.[17]

The co-petitioners referenced the presence of trout in our Petition and believe that DEP needed to investigate available PFBC data regarding trout biomass for the Upper Perkiomen Creek watershed.

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[14] V'Combe, P. and Najjar, K. 2009. Appendix D: An Evaluation of Wild Trout Abundance and Hydroecological Indices for Streams in Pennsylvania in Framework for Sustainable Management of the Pocono Creek Watershed Final Report. Delaware River Basin Commission.

[15] 58 Pa. Code § 57.8a.

[16] MacDonald, C. 2007. *From the Chapter President*. Streamside Happenings. Perkiomen Valley Trout Unlimited. Retrieved from http://www.pvtu.net/newsletters/Fall%202007%20Pub07%20Version.pdf.

[17] MacDonald, C. 2011. *From the Chapter President*. Streamside Happenings. Perkiomen Valley Trout Unlimited. Retrieved from http://www.pvtu.org/Documents/Newsletters/Spring2011.pdf.

The PFBC has designated some streams in the geographic area covered by the Petition designated as Class A Wild Trout Waters (see Table 4 below). In addition to those waters already designated as Class A, the co-petitioners believe that there are other streams in the Upper Perkiomen that may hold Class A biomass trout populations, but that have not been officially designated as such by PFBC, like the West Branch Perkiomen. For much of the Upper Perkiomen, PFBC stream designations are based on biomass estimates as most surveys producing measured biomass were conducted prior to 2000. No survey has been conducted in the Upper Perkiomen since 2009. At this time, the co-petitioners support further study on the wild trout biomass before making designation recommendations in order to ensure adequate water quality protection for these waters and consistent application of fisheries management strategies.

County	Water	Sec	Trout Fishery	Section Limits	Length (miles)	% Public Open	% Public Closed	% Private Open	% Private Closed	USGS Quad Name	T_Alk
Berks	UNT to West Branch Perkiomen Creek	1	Brown	Headwaters -868m upstream SR1030-downstream to mouth	2.4	0	0	0	0	Manatawny	39
Berks	West Branch Perkiomen Creek	2	Brown	SR1022 bridge at Huffs Church downstream to SR2069 bridge Old Rt 100	4.8	0	0	100	0	Manatawny / East Greenville	47
Berks / Lehigh	Perkiomen Creek	1	Brown	Headwaters downstream to SR1010 at Hereford	5.3	0	0	46	54	East Greenville	46

Table 4. Pennsylvania Class A Wild Trout Waters, October 2013

Streams that deserve particular attention include those streams designated by PFBC as Wild Trout Waters for management purposes. PFBC has designated some streams in the Upper Perkiomen as Wild Trout Waters (see Table 5 below). Also, those portions of the West Branch Perkiomen upstream of the SR1022 bridge should be considered classified as wild trout streams, because they are upstream of documented wild trout waters. As it is the policy of the PFBC to manage such upstream waters as wild trout streams because they function as habitat for segments of wild trout populations, including nurseries and refuges, and in sustaining water quality necessary for wild trout, these waters also deserve special attention and appropriate protections.

County	Water	Tributary To:	Wild Trout Limits	Lower Limit Lat	Lower Limit Lon
Lehigh	UNT To Hosensack Creek (nw of Hosensack)	Hosensack Creek	Headwaters dnst to mouth	40.450832	-75.508888
Lehigh	Indian Creek	Hosensack Creek	Headwaters dnst to mouth	40.443890	-75.515556
Montgomery	Hosensack Creek	Perkiomen Creek	Headwaters dnst to mouth	40.424168	-75.526665
Berks	Pachwechen Run	Perkiomen Creek	Headwaters dnst to first tributary dnst T-926	40.432426	-75.575798

Table 5. Pennsylvania Wild Trout Waters (Natural Reproduction), October 2013

Species of Concern Present in the Upper Perkiomen Basin

Under 25 Pa. Code §93.4b(a)(2)(i)(C), DEP is given discretion to consider "additional biological information which characterizes or indicates the quality of a water in making its determination." This is analogous to the PFBC Class A Wild Trout Stream designation [18] which qualifies a stream for HQ

[18] 25 Pa. Code §93.4b(a)(2)(ii).

designation or the wilderness trout stream designation[19] which qualifies a stream for EV designation. The co-petitioners request that DEP consider using the presence of the Pennsylvania endangered and federally threatened bog turtle (*Glyptemys muhlenbergii*) and the Pennsylvania threatened redbelly turtle (*Pseudemys rubriventris*) to designate the Upper Perkiomen, at a minimum, HQ, preferably EV.

Precedent for adoption of this approach also can be found in other states: Iowa includes the presence of threatened and endangered species (T&E) species among its criteria for consideration as Tier 3 waters, which is equivalent to Pennsylvania's EV designation, or Tier 2.5, which is a designation more protective than Pennsylvania's HQ designation but less protective than Pennsylvania's EV designation.[20] Arizona also provides special protection designation if threatened or endangered species are known to be associated with the surface water and the existing water quality is essential to the maintenance and propagation of a T&E species. Arkansas specifically lists T&E species and can designate waters with these species as outstanding, or Tier 3, waters. Rhode Island includes waterbodies containing critical habitats for rare or endangered species as qualifying for their "Special Resource Protection Waters".[21]

In the Report, DEP states that T&E species are provided protection through the agency's permitting process. However, the introduction of the Endangered Species Coordination Act (HB 1576/SB 1047) now making its way through the Pennsylvania General Assembly would weaken endangered species protection in Pennsylvania. Under this legislation, the redbelly turtle, threatened in Pennsylvania but secured federally, could lose protection. The layers of bureaucracy and political influence the bill would add to protection of T&E species in Pennsylvania would certainly result in gaps in protection for species that may not be addressed by the permitting process. The addition of at least federally threatened species as a qualifier for EV designation would go far to close gaps in protection.

It should also be noted that the Upper Perkiomen area is home to the nesting locations of a bird species imperiled at the state level due to rarity.

> Site SA506 is located in the southwest corner of Hereford Township. It marks the nesting location of a bird species imperiled at the state level (S2). Such a ranking means that the species is imperiled in Pennsylvania because of its rarity (6 – 20 occurrences or few remaining individuals or acres) or vulnerability to extirpation from the state. It was observed nesting among boulders and rock outcrops in a tulip poplar, ash, and maple woodlot. This rare and a more common species will continue to use the site if the surrounding area remains undisturbed.[22]

Surface waters are important to birds in the forests through which they flow. The imperiled bird species in site SA506 likely rely on streams in the Upper Perkiomen for drinking and bathing through the dryer summer. Many species of birds also feed on invertebrates that spend part of their life cycle in streams. Protection of the Upper Perkiomen watershed also means protection for this rare bird species.

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[19] 25 Pa. Code § 93.4b(b)(1)(vi).

[20] Iowa Department of Natural Resources. 2010. Iowa Antidegradation Implementation Procedure. Retrieved from http://www.iowadnr.gov/water/standards/files/antideg_2_17.pdf.

[21] River Network. 2009. Antidegradation Report Query. Retrieved from http://www.rivernetwork.org/rn/antidegradation.

[22] Gannett Fleming, Inc. 2006. Technical Memorandum No. 3 - Environmental Resources Analysis. Hereford-Washington Joint Municipal Comprehensive Plan.

Water Chemistry

DEP may consider not only biological but also chemical data for an antidegradation assessment. Although a limited amount of water chemistry data was submitted by the co-petitioners, the data collected by SWRC that were included in the Petition do appear to compare favorably with the requirements that water quality in the candidate stream be better than the water quality criteria in 25 Pa. Code § 93.7, Table 3. Of the SWRC data submitted, nitrate (milligrams per liter, or mg/L), pH and alkalinity (as mg/L CaCO3) compare with parameters in § 93.7, Table 3 for nitrite plus nitrate, which should be a maximum of 10 mg/L as nitrogen, pH which should from 6.0 to 9.0 inclusive, and alkalinity which should be a minimum of 20 mg/L as CaCO3.

SWRC Site #	Site Name	Nitrate (mg/L)	pH	Alkalinity (as mg/L CaCO3)
18	Upper Perkiomen Creek	2.4	8.2	57
19	West Branch Perkiomen	1.3	8.0	38
90	Molasses Creek	1.2	8.5	58
93	Hosensack Creek	2.2	8.1	53
94	Upper Perkiomen at Tollgate	1.8	8.1	48
95	Macoby Creek	1.1	9.1	55
96	Indian Creek	1.4	8.0	42
97	West Hosensack Creek	2.4	8.1	53
98	East Hosensack Creek	2.8	8.5	84
99	Upper Perkiomen at Yeakel Mill	1.7	7.9	42
100	West Branch Perkiomen at Bob White	1.9	7.6	27

Table 6. Stroud Water Research Center Water Chemistry

As such, the co-petitioners disagree with DEP's characterization of the SWRC data: "Results indicate slightly elevated nitrate and total dissolved phosphorus levels, pH hovering in the 7 – 8 range, with moderate alkalinity."

Nitrate

The SWRC nitrate levels are all considerably better than the 10 mg/L requirement for nitrite plus nitrate from § 93.7, Table 3. Moreover, DEP recently suggested that base levels of nitrate-N in precipitation and groundwater in Pennsylvania already may be 1 mg/L.[23] If true, then DEP's description of the SWRC's measured nitrate levels at the Upper Perkiomen monitoring stations, seven of which were under 2.0 mg/L, as slightly elevated is inaccurate.

pH

The pH range for the SWRC monitoring stations was 7.6 to 9.1, but pH values at eight of the 11 stations sampled were between 8.0 and 8.5 with the average pH as well as the most commonly occurring value being 8.1. For Muncy Creek, the average pH range for data collected from 2002 to 2005 was 6.9 to 7.8,[24] which again raises questions as to the suitability of Muncy Creek as reference stream for the Upper Perkiomen Creek watershed and further shows the variation possibly caused by geological differences.

Alkalinity

[23] Pennsylvania Department of Environmental Protection. 2013. Sewage Facilities Planning Module Review for Onlot Sewage Systems Proposed in High Quality and Exceptional Value Watersheds.

[24] Pennsylvania Department of Environmental Protection. 2006. Water Quality Network Reference Candidate Streams. Retrieved from http://files.dep.state.pa.us/Water/Drinking%20Water%20and%20Facility%20Regulation/WaterQualityPortalFiles/Stream_Packages/Blue_Eye_Run/BlueEyeRunetalReport.pdf.

The range for alkalinity for the SWRC monitoring stations was 27 mg/L to 84 mg/L all of which surpass the minimum of 20 mg/L as CaCO3.

Given the water quality data submitted with the Petition, DEP could have chosen to collect water chemistry data for the Upper Perkiomen for comparison against the Muncy Creek reference site. As a Water Quality Network (WQN) station, chemical data is already collected for Muncy Creek. The co-petitioners recommend that DEP consider collecting at least one year of water chemistry data for the candidate streams in the Petition before making any recommendations.

Qualifying as Exceptional Value Waters

The co-petitioners believe we have made a case for further study and reconsideration of the recommendations proposed in the Report. We believe we have made a case for reconsideration of the Upper Perkiomen Creek watershed and designation, at a minimum as a HQ watershed. And when additional factors are considered, the co-petitioners believe it is clear that the Upper Perkiomen deserves EV status. We begin to outline these other factors below.

Outstanding National, State, regional or local resource water

National Significance

The geographic area covered by the Petition makes up part of the Schuylkill Highlands, which is part of the Pennsylvania Highlands. The four state Highlands region, including the Pennsylvania Highlands, was recognized as a region of national importance by the 2004 Highlands Conservation Act (HCA). The purpose of the HCA was in part to recognize the importance of the water, forest, agricultural, wildlife, recreational, and cultural resources of the Highlands region, as well as the national significance of the Highlands region to the United States. To demonstrate the federal government's commitment to protecting the Highlands, the HCA authorized spending up to $100 million in federal matching funds over 10 years for land preservation and protection in the Highland states. In addition, the HCA authorized the USDA Forest Service in the Highlands region to assist the Highlands States, local units of government, and private forest and farm landowners in the conservation of land and natural resources in the Highlands region. Through the HCA, the federal government has demonstrated an interest in real estate intended to provide long-term protection of the Highlands region as well as an interest in the implementation of sound land use that protects water resources. This interest in real estate and implementation of sound land use practices we believe meets the requirements of 25 Pa. Code § 93.4b(b)(iii).

State Significance

As noted in the Petition, the Schuylkill Highlands takes in the Upper Perkiomen Creek watershed. The Schuylkill Highlands is one of only seven Conservation Landscape Initiative (CLI) regions in Pennsylvania. These areas are identifying values at a landscape scale, revitalizing communities, and engaging local and regional partners in conservation and economic development. CLIs are established by the Pennsylvania Department of Conservation and Natural Resources (DCNR) to save special regions in the state. The goal behind the establishment of a CLI is to motivate local citizens and elected officials to take on the challenge of effective land use planning, investment, civic engagement and revitalization. The presence of DCNR-owned lands provides the foundation for a CLI. In addition to the DCNR-owned lands such as French Creek in the western part of the Schuylkill Highlands, DCNR holds an easement on land that is partially in the West Branch Perkiomen (the easement is held by DCNR, but administered by the Berks County Conservancy).

The Schuylkill Highlands CLI is recognized for natural resources that are significant to America's history, from iron and steel, coal and foundry industries, to the headwater streams that today provide drinking water to the Philadelphia regional area. Over the past few years, the establishment of the Schuylkill Highlands CLI has moved the Schuylkill Highlands Partnership—local, regional, and state partners made up of non-profits, local and state governments and businesses—to implement conservation practices that will better protect and preserve this unique landscape.

The Schuylkill Highlands are described as "home to critical unprotected lands such as source water, head waters, riparian buffers, watershed lands, natural areas, contiguous forested lands and key habitats, farmland, and greenway connectors . . ."[25] Goals established by DCNR for the Schuylkill Highlands CLI are to:

- protect what is special to this area by saving a significant amount of remaining land in this landscape
- connect residents and visitors to the outdoors
- implement sustainable land use practices in local municipalities in the landscape

Regional Significance

The Schuylkill Highlands Partnership has committed to "Conserving, protecting, and stewarding lands, watersheds, greenways, and habitats through conservation of at least 50% of the region's most critical habitat and watershed headwaters and stewardship of the key natural resources." [26] To assist in advancing targeted project work within the region that support the goals and vision, the Schuylkill Highlands administers a mini-grant program to provide financial support to municipalities, non-profits, watershed associations, and friends groups working to realize the goals of the Schuylkill Highlands CLI. The grants made to date include funding for PerkUp Wayfinding outdoor programming.

> A partnership of seven municipalities led by Upper Hanover Township and the Upper Perkiomen Valley Chamber of Commerce will develop and install a unified system of town gateways, including wayfinding and identification signs assisting users in locating outdoor amenities and trail networks.[27]

Among the initiatives of the Schuylkill Highland Partnership is the establishment of a greenway within the Schuylkill Highlands that "conserves the best natural and agricultural areas, promotes history, provides recreation, and enhances the economy and quality of life for residents."[28]

The co-petitioners also noted in the Petition that the Schuylkill Watershed Conservation Plan (2001) submitted as part of the original petition, shows the regional importance of the Upper Perkiomen area. The Schuylkill Watershed Conservation Plan lists the Upper Perkiomen as a "high priority site" for its high habitat value. The Natural Land Trust's Smart Conservation project combined 15 land cover classes and, for each of six taxa classes (mammals, birds, reptiles and amphibians, invertebrates, plants, and aquatics),

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[25] Pennsylvania Department of Conservation and Natural Resources. n.d. Schuylkill highlands. Retrieved from http://www.dcnr.state.pa.us/cli/schuylkillhighlands/index.htm.

[26] Natural Lands Trust. 2012. A Path Forward: Schuylkill Highlands Greenway Plan. Schuylkill Highlands Conservation Landscape Initiative. Retrieved from http://www.natlands.org/publications/a-path-forward-schuylkill-highlands-greenway-plan/.

[27] Schuylkill Highlands Partnership. 2013. Partner Resources and Grant Information. Natural Lands Trust. Retrieved from http://www.schuylkillhighlands.org/partners_grants.php.

[28] Natural Lands Trust. 2012. A Path Forward: Schuylkill Highlands Greenway Plan. Schuylkill Highlands Conservation Landscape Initiative. Retrieved from http://www.natlands.org/publications/a-path-forward-schuylkill-highlands-greenway-plan/.

assigned each a habitat potential rating ranging from very poor to good. The Upper Perkiomen was listed as a priority for conservation due to its habitat value and was one of only twelve sub-watersheds listed in the Schuylkill Basin under this special value designation.

More recently, the William Penn Foundation has included the Upper Perkiomen as part of the Schuylkill Highlands sub-watershed that the Foundation plans to target for restoration or preservation efforts that will address specific local stressors. For the Schuylkill Highlands sub-watershed, the Foundation will target funding toward land conservation.

Local Significance

To evaluate the application of the National, State, regional or local resource water qualifier, DEP reported looking for municipally-owned lands or other municipal real estate interests in land along the watershed corridor. The co-petitioners believe that DEP is using a narrow definition "real estate interests" than is provided in 25 Pa Code § 93.1. Definitions, where real estate interests include: a) Fee interests; b) Conservation easements, c) Government owned riparian parks or natural areas, and d) Other interests in land which enhance water quality in a watershed corridor area. DEP looked only at municipal owned land, but the use of the word "government owned" to qualify riparian parks or natural areas, suggests that preserved interests in land that protect the watershed need not be government owned.

The Schuylkill Highland Partnership provides support to municipalities to implement appropriate land use ordinances and practices that steward the Schuylkill Highlands and move the greenway plan forward at local and site levels. Schuylkill highlands mapping documents an extensive network of publicly and privately protected lands, preserved by collaboration among non-profits, businesses, and local, county and state governments. The Schuylkill Highland Partnership has documented the municipal capacity and readiness to preserve and protect land in the Schuylkill Highlands. The co-petitioners include in Appendix C mapping that documents active municipal land protection efforts in the Schuylkill Highlands, including in those municipalities in the geographic area covered by the Petition, as well as the use of zoning to preserve land, percent protected land, public and private protected lands and protected farmland. Contrary to DEP's assertion, these maps show a significant percentage of land protected and a commitment to land protection.

It should also be noted that a significant part of the Upper Perkiomen is a rural area. As such, in these areas, municipalities are relying on agricultural preservation (via zoning, the Clean and Green program and county public and private agriculture preservation programs) to preserve open space. Streams in these areas should not be penalized as not being "municipally-owned lands or other municipal real estate interests in land" when these municipalities are clearly recognizing that preservation of natural features also helps preserve the rural area of their communities.

> The planning area contains 1,315 acres of floodplains, 258 acres of wetlands, 3,764 acres of hydric soils, and 1,020 acres of steep slopes (greater than 15 percent**); these areas not suitable for development and are key to the preservation of rural character in the planning area**. [emphasis added][29]

Local efforts to preserve open space through agriculture preservation tools are documented on the map of protected lands from the 2006 *Hereford-Washington Joint Municipal Comprehensive Plan* (Appendix D)

[29] Gannett Fleming, Inc. 2006. Hereford-Washington Joint Municipal Comprehensive Plan.

which also indicated a Berks County Conservancy easement along the Upper Perkiomen and agricultural conservation easement along the West Branch Perkiomen.

The co-petitioners are working to identify and inventory specific parcels to further underscore local efforts to preserve lands that enhance water quality in the Upper Perkiomen, but we require more time to do so. In the interim, we have attached as Appendix E the Upper Perkiomen Valley Park & Recreation Amenities which provides a map with general information map about public open space, private recreation lands and trails—all lands with the potential to enhance water quality in the Upper Perkiomen—within the proposed upgrade area. Below a listing of some of these preserved spaces by municipal and county governments.

- Mill Hill Preservation Area
- Hosensack Creek area
- Soffa Road Open Space
- Peevy Road Open Space
- Camelot Park
- Township Woods
- Green Lane Reservoir Park
- Green Lane Park
- Green Lane Nature Center
- Macoby Run Park
- Vineyards Open Space
- Pennsburg Nature Preserve
- Pennsburg Community Park
- Green Lane Borough Open Space

There are two State Game Lands (SGL) parcels, referred to as SGL 315, located within the Upper Perkiomen. A map showing these parcels is attached in Appendix F. In addition, Lower Milford Township just shared with the co-petitioners that it also owns 18 acres of preserved land in the Upper Perkiomen.

The co-petitioners wish to remind DEP that in December 2008 we shared data inventoried by the Montgomery County Land Trust of preserved acreages in the geographic area covered by the Petition. The co-petitioners are also aware of easements held in this area by the Berks County Conservancy and believe it is likely easements in this area are also held by the Wildlands Conservancy.

Protective Ordinances

The co-petitioners recognize the forgoing interests in land must be coupled with sound land use water quality protective measures. The majority of the municipalities in the Upper Perkiomen have a subdivision and land development ordinances (SALDO) and stormwater and land disturbance ordinances to protect lands within their jurisdictions. In 2008, the co-petitioners submitted a listing of some of the protective ordinances that various townships had in place at that time.

Since 2008, ordinances with additional or stronger protections have been adopted by many of the municipalities in the Upper Perkiomen area. In 2012, Longswamp Township adopted a well protection ordinance with provisions for water conservation and to protect water quality. Also in 2012, District Township updated its floodplain ordinance in response to the Federal Emergency Management Agency's (FEMA's) updating of Flood Insurance Rate Maps (FIRMs) for Montgomery County. Upper Milford

Township updated its subdivision and land development ordinance (SALDO) in 2009 and adopted the Perkiomen Creek Headwaters Act 167 stormwater management ordinance in 2013. The co-petitioners are compiling for DEP review a full list of the strengthened ordinances that are now in place for the municipalities in the Upper Perkiomen, however more time is needed to accomplish this effort. Preliminary information from our review is attached (see Appendix G).

A survey of municipal officials completed in 2001 as part of the Schuylkill Watershed Conservation Plan indicated that 12 of the 14 municipalities responding thought that stream quality was important to their municipality. With recent work by the Schuylkill Highlands partnership, municipalities have been working to better protect the Schuylkill Highlands. The attached map (see Appendix H) documents the Upper Perkiomen municipalities that recognizes the Schuylkill Highlands in plans demonstrates the broad commitment in the region to the protect this unique landscape.

Another example of this protection work includes the recent Upper Perkiomen Green Up Plan, a green infrastructure and sustainability plan for the Upper Perkiomen area finalized in 2013 by Montgomery County Land Trust with support from DCNR (see plan attached). The Green Up effort emphasizes preservation and protection of the Upper Perkiomen region:

> Why the name GreenUp? You would think that communities with town names such as East Greenville and Green Lane would suggest "a rural wooded area." Driving through the area reinforces this notion. But the ten townships and boroughs in the Upper Perkiomen Valley are greater than the sum of their municipal parts. It's a place that has avoided many development problems and a place that is well worth saving. It's where Mother Nature would like to stay and play. GreenUp is the community-wide environmental process for managing and enhancing this healthy rural oasis. GreenUp is both a practice and a philosophy about living in a place that values and appreciates a vital economy and quality of life that is due to the relationship between green business practices, natural system stewardship, nature-based tourism, and green jobs. It recognizes that we all have a shared responsibility to protect our natural environment, to use only what we need, and to make smart choices.[30]

Exceptional Ecological Significance

In the Report, the DEP asserts that it did not identify any surface waters with statewide or local ecological significance, nor did it identified any rare or endemic ecological community types tied to the surface waters. The co-petitioners disagree. In the Petition, the co-petitioners referenced Section E6 of the 2001 *Upper Perkiomen Creek Watershed Conservation Plan* which includes a description of each of the specific sites in the Natural Areas Inventories for Lehigh and Montgomery counties as well as noting that District and Hereford townships in Berks County contain the nesting locations for a bird species that is imperiled at the state level due to rarity.

In December 2008, the co-petitioners provided greater detail regarding the natural resources in the geographic area covered by the Petition that are of significance in the Pennsylvania Natural Areas Inventory and considered to be of the highest priority for preservation for biodiversity. Listed by the resource areas

[30] Montgomery County Lands Trust. 2013. GreenUp: Creating a Community Where People Love To Live, Work and Visit.

established during the Schuylkill Highlands greenway planning,[31] these include:

Schuylkill Highlands Resource Area	Pennsylvania Natural Heritage Inventory Rank	Site Name	Listed Resources
Green Lane Resource Area	1	Green Lane Marsh / Goshenhoppen Meadows	Green Lane Marsh is a Graminoid marsh near Green Lane Reservoir Goshenhoppen Meadows Breeding habitat for multiple animal species of concern
	Medium Local Significance	Church Road Floodplain	Locally significant floodplain forest and upland woods along creek Contiguous with New Goshenhoppen Meadows site
Route 100 Agricultural Resource Area	1	Swabia/Indian/Hosensack Watershed	Northern Appalachian Circumneutral Seeps natural community Two plant species of concern Vernal pools that are important breeding habitat for amphibians Beech woods maturing 2nd growth forest
	2	Niantic NE Woods	Fair population of a plant species of concern in diabase woodland
	Medium Local Significance	Mill Hill Woods	A several mile long diabase ridge with extensive diverse second growth forest
Perkiomen Uplands/Hereford Hills Resource Area	1	Swabia/Indian/Hosensack Watershed	Northern Appalachian Circumneutral Seeps natural community Two plant species of concern Vernal pools that are important breeding habitat for amphibians Beech woods maturing 2nd growth forest
	3	West Branch Perkiomen Creek Watershed	Habitat supports an animal species of concern

Table 7. Pennsylvania Natural Heritage Inventory sites in the Upper Perkiomen Watershed

The Pennsylvania Natural Heritage Inventory (PNHI) ranks natural resource sites according to the need for protection of diversity. The rarity and quality of the species or habitats of concern, potential threats, and protection needs have been considered for natural areas at both the state and local level. Sites with statewide significance are ranked from 1 to 5 with 1 being the highest priority sites for protection with state or national significance. Sites with local significance are ranked High to Low. These sites may lack species of special concern or high quality natural communities, but they can still be of significant value for biological diversity at the local level.

Full descriptions of these natural resource areas belie the DEP assertions that no areas of statewide or local ecological significance and no rare or endemic ecological community could be linked to surface waters in the geographic area covered by the Petition.

<u>Green Lane Marsh/New Goshenhoppen Meadows [a priority 1 site of statewide significance]:</u>

> The northwest end of Green Lane Reservoir supports a graminoid marsh with breeding habitat for rare wildlife species, and is frequented by a diversity of birds and other animals. New Goshenhoppen Meadows adjoin the Perkiomen Creek just upstream from the Green Lane Reservoir, and also support rare wildlife species and uncommon grassland nesting birds

[31] Natural Lands Trust. 2012. A Path Forward: Schuylkill Highlands Greenway Plan. Schuylkill Highlands Conservation Landscape Initiative. Retrieved from http://www.natlands.org/publications/a-path-forward-schuylkill-highlands-greenway-plan/.

such as savannah sparrow, meadowlark and bobolink. The wet meadows contain a diversity of sedges and native wildflowers with good butterfly habitat.[32]

Hosensack Marsh [a priority 1 site of statewide significance]:

This site includes areas of marsh and shrub swamp. It supports a fair to good quality population of a PA-Endangered animal species and a fair to good population of White Trout Lily (Erythonium albidum), an S3 plant species of concern. Indian Creek Floodplain-This site also includes areas of floodplain forest and open marsh along the floodplain of Indian Creek. Evidence of a PA-Endangered animal species was observed at this site in 1996. Surveys to determine the status of the species of concern at this site are highly recommended.[33]

Niantic Northeast Woods [a priority 2 site of statewide significance]:

A fair population of a rare wildflower is found in this diabase woodland along the West Branch Perkiomen Creek. The site also supports a diverse herb layer including sweet cicely, smooth yellow violet, and false Solomon's seal. Maintaining the forest cover will help to minimize the invasion of exotic species and continue to provide the shaded habitat required by the rare wildflower. Disturbance of the herb layer should also be minimized. Deer browse is also a potential problem.[34]

The descriptions above show clear connections between the priority natural areas and the surface waters of the Upper Perkiomen. The marsh connections may be more obvious but even the deep moist woods owes its character to the West Branch Perkiomen's base-flow connection. Recently, the U.S. EPA released *Connectivity of Streams and Wetlands to Downstream Waters: A Review and Synthesis of the Scientific Evidence*, a draft report summarizing the current understanding about connectivity of streams and wetlands, the factors that influence them, and the influence of these connected waters on downstream waters. The report details the strong influences that upstream wetlands and open-waters can and do have on downstream water quality, quantity and integrity. Listed influences include streamflow, nutrient storage, and movement of amphibians, aquatic seeds, macroinvertebrates, reptiles, and mammals. Another key finding presented in the report is that even wetlands that are considered to be geographically isolated are not necessarily functionally isolated from downstream waters, even when a hydrologic connection was absent.

The co-petitioners assert the surface waters of the Upper Perkiomen streams, riparian areas, and associated wetlands are intricately linked to lands on the Pennsylvania Natural Areas Inventory and support the survival of a number of species of concern.

Additional natural areas targeted for local protection include:

[32] Natural Lands Trust, Upper Perkiomen Watershed Coalition, and Pennsylvania Environmental Council. 2001. Upper Perkiomen Creek Watershed Conservation Plan.

[33] Pennsylvania Science Office of The Nature Conservancy. 2005. A Natural Areas Inventory of Lehigh and Northampton Counties, Pennsylvania Update 2005. Lehigh Valley Planning Commission.

[34] Montgomery County Planning Commission. 2005. Open Space, Natural Features, and Cultural Resources Plan Shaping Our Future: A Comprehensive Plan for Montgomery County.

Macoby Creek Ravine [Marlborough Township] is a site containing a large population of a state-listed rare plant species. Sugar maple, flowering dogwood and a variety of wildflowers are noted at this site adjacent to the quarry. [35]

Church Road Floodplain (Upper Hanover Township). This site, located upstream of Green Lane Reservoir, represents a locally significant floodplain forest and upland woods along Perkiomen Creek. The floodplain forest on the east side of the creek supports silver maple, ash, and spicebush. The upland woods, containing sugar maple, beech, and hemlock, form a canopy on the steep shale slopes on the west side of the creek. This site is contiguous with New Goshenhoppen Meadows. The wooded buffer helps maintain the stream quality for drinking water and for fisheries. Minimizing disturbance of the woodlands will allow this area to persist as a significant natural area.. [36]

Fruitville Road Floodplain (Upper Hanover Township) Located west of Water Street, this locally significant floodplain forest (silver maple, walnut, box elder) helps to protect water quality and fisheries within Perkiomen Creek. The site also provides wildlife habitat for birds, odonates, and amphibians.[37]

Lower Milford Marsh (Lower Milford Township). This site supports a "Basin Graminoid-Forb Fen Natural Community" along the floodplain of Hosensack Creek. The northern section of this wetland includes seeps and springs, marsh, and then a forested swamp. The southern portion gradually becomes marshy and is densely vegetated by grasses and sedges. Tree species noted in the Inventory include black walnut, willow, and ash, with herbaceous plants including sweetflag iris, sensitive fern and skunk cabbage. Several species of special concern are suspected at this site, both plants and wildlife. [38]

Mill Hill Woods (Lower Milford Township and Upper Hanover Township). This wooded diabase ridge in the Hosensack Creek subwatershed supports an extensive forested area with possible plant species of special concern. Beech, tulip poplar, sugar maple, basswood, ash, hickory, and oak are dominant species on lower slopes. Herbaceous plants are diverse, with numerous species of woodland wildflowers and ferns. The upper slopes are dominated by chestnut oak, sweet birch, tulip poplar and red oak, with witchhazel, dogwood, choke-cherry and maple-leaved viburnum common in the shrub layer. A rich herbaceous plant community is present in the upper slopes. Mill Hill is noted for its diversity of forested and stream habitats. **Upper Hanover Township has acquired the majority of the Montgomery County portion of the site as a protected area**. [emphasis added] [39]

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[35] Natural Lands Trust, Upper Perkiomen Watershed Coalition, and Pennsylvania Environmental Council. 2001. Upper Perkiomen Creek Watershed Conservation Plan.

[36] Montgomery County Planning Commission. 2005. Open Space, Natural Features, and Cultural Resources Plan Shaping Our Future: A Comprehensive Plan for Montgomery County.

[37] Montgomery County Planning Commission. 2005. Open Space, Natural Features, and Cultural Resources Plan Shaping Our Future: A Comprehensive Plan for Montgomery County.

[38] Natural Lands Trust, Upper Perkiomen Watershed Coalition, and Pennsylvania Environmental Council. 2001. Upper Perkiomen Creek Watershed Conservation Plan.

[39] Natural Lands Trust, Upper Perkiomen Watershed Coalition, and Pennsylvania Environmental Council. 2001. Upper Perkiomen Creek Watershed Conservation Plan.

Big Beech Woods (Lower Milford Township). This site is a southeast-facing slope along Hosensack Creek with a maturing second growth forest of beech, tulip poplar, sugar maple, hickory, oak and birch. Some of the trees are measured at over 2 feet in diameter. Hemlock is also present in the understory, along with a diversity of shrubs and a rich herbaceous layer. The Inventory also notes the importance of protecting this woodland to support the quality of the Hosensack Marsh.[40]

The co-petitioners assert this complex of natural areas, a number of which are linked, qualifies for protection as surface waters of Exceptional Ecological Significance.

Community Support

As you know, this petition has very strong support from over 120 co-petitioners that were made up of farmers, residents, non-profits, townships, and local businesses. Seven municipalities within the proposed upgrade boundary signed on in support and even passed resolutions to support the petition. Three county conservation districts within the upgrade area all signed on as co-petitioners in support of the petition. The information the co-petitioners have compiled since the release of the Report clearly demonstrates the commitment by many of these municipalities, county conservation districts, non-profits, DCNR and others to work to protect this region's water quality.

The Upper Perkiomen serves as drinking water supply and drains into Green Lane Reservoir, Montgomery County. There have been various reports, white papers, and studies done on this region because of its importance. The 2001 completion of the Upper Perkiomen Watershed Conservation Plan placing the watershed on the Pennsylvania Rivers Conservation Registry administered by DCNR.

As outlined in the original petition, since 2000, there has been a heavy investment by the Commonwealth using Growing Greener funding and from other funding programs to implement at least 24 restoration projects in the Upper Perkiomen. We are aware of additional projects, including the 2012 removal of a dam on the main stem near Palm, that have been undertaken to protect and restore the Upper Perkiomen since the submission of the petition. The co-petitioners request more time to compile a complete list of projects. These projects were made possible by state and regional investments but also because of the local groups that work every day in this region to better restore and protect the watershed and the creek. Many of the restoration projects are being maintained on a regular basis. Benthic macroinvertebrate data being collected in proximity to the restoration projects show cleaner streams post-restoration. DEP investments in restoration are restoring streams and have helped protect and enhance the Upper Perkiomen.

Local schools, like that of the Upper Perkiomen High School (UPHS), have decades old watershed stewardship programs that are still active today. The Environmental Science Program has existed at UPHS for over 23 years. A keystone of the curriculum is community service performed by UPHS students. Every year, students perform projects that are designed to improve the Upper Perkiomen community and local watershed. UPHS have worked with organizations such as DRN, the Perkiomen Watershed Conservancy, the Partnership for the Delaware Estuary, Aqua PA, Montgomery County Parks, the Montgomery County Conservation District, Pennsburg Borough, East Greenville Borough and Upper Hanover Township.

UPHS projects include:

[40] Natural Lands Trust, Upper Perkiomen Watershed Coalition, and Pennsylvania Environmental Council. 2001. Upper Perkiomen Creek Watershed Conservation Plan.

1. Streambank remediation projects on the Northwest Branch of the Perkiomen Creek, the Main Branch of the Perkiomen Creek, the Macoby Creek, Deep Creek and the Green Lane Reservoir. UPHS has planted forest riparian buffers to reduce soil erosion, filter pollutants from stormwater runoff, reduce storm water runoff and prevent flooding. Over the past 23 years, UPHS students have planted over 3,000 trees.
2. Hereford Elementary rain garden and UPHS rain gardens. UPHS has created a 9,000 square foot rain garden at Hereford Elementary. The rain garden handles all the runoff from the front parking lot and the roof on the front side of the school. The garden filters local runoff, promotes groundwater recharge and helps to prevent flooding downstream. UPHS has four rain gardens and a 1.5 acre wildflower meadow
3. UPHS Community Service. Students have run the UPHS recycling program and our energy conservation program. They also constructed and installed blue bird boxes and a solitary bee hive in our wildflower meadow at UPHS. Student volunteers also participate in the Annual Perkiomen Watershed Stream Clean up sponsored by the Perkiomen Watershed Conservancy.

Conclusion

Upgrading the status of the Upper Perkiomen to its proper designation is an important recognition of the value of the Upper Perkiomen to local residents, businesses and organizations as well as the state, local and federal governments that have worked so hard to protect it. It is the justified and logical next step to protect the investments all in this watershed have made.

In the nearly seven-year period of time since the co-petitioners submitted the Petition and since the DEP performed benthic analysis for the Upper Perkiomen, more work has been undertaken and progress made to protect the Upper Perkiomen. Progress has been made because of the strong support for preserving the quality of waters in this region.

We have begun to compile data to update the Petition, but we are in need of more time to adequately supplement this comment with additional data. We very much look forward to meeting with DEP and assisting in this effort so as to facilitate consideration of additional information. We believe this is very important to have this cooperation, especially in light of budget cuts, staff vacancies, and limited personnel that have made it difficult to fulfill all of the responsibilities required of DEP as it pertains to the essential protection of the environment that residents need and depend on of the Commonwealth.

Per our letter of October 23rd requesting an extension to June 30th, 2014, and in light of the additional information shared here, we request that the DEP continue to work with the co-petitioners through this process to ensure the Upper Perkiomen is given the best protections possible for a thriving, healthy, and sustainable community as well as for the many individuals who rely on it for their drinking water, recreation, and livelihoods. The petitioners feel that if the DEP acts now without considering more information and data collection, this will be a premature decision for this important region.

Sincerely,

Maya K. van Rossum
the Delaware Riverkeeper

Charles MacDonald
President
Perkiomen Valley Trout Unlimited, Chapter #332

William McFadden
District Manager
Lehigh County Conservation District

Andrew Meadows
Board Chair
Perkiomen Watershed Conservancy

cc: Michele Tate, Department of Environmental Protection
Gustave Meyers, IV, Montgomery County Conservation District