

**UPPER LEHIGH RIVER
LACKAWANNA, LUZERNE, MONROE
AND WAYNE COUNTIES**

**WATER QUALITY STANDARDS REVIEW
STREAM REDESIGNATION EVALUATION REPORT**

**Segment: Basin
Stream Code: 03335
Drainage List D**

**WATER QUALITY MONITORING SECTION (GLW)
DIVISION OF WATER QUALITY STANDARDS
BUREAU OF WATER STANDARDS AND FACILITY REGULATION
DEPARTMENT OF ENVIRONMENTAL PROTECTION**

MAY 2010

INTRODUCTION

The Department conducted an evaluation of the upper Lehigh River basin (source to Tobyhanna Creek) in response to a petition from the North Pocono Citizens Alert Regarding the Environment (North Pocono CARE). This petition, which was accepted for study by the Environmental Quality Board on May 22, 2002, requests this basin be redesignated as Exceptional Value waters (EV). The current Chapter 93 designated use for the Lehigh River headwaters is High Quality-Cold Water Fishes (HQ-CWF), Migratory Fishes (MF). This evaluation is based on a field survey conducted on April 14 and 15, and May 5, 2003.

GENERAL WATERSHED DESCRIPTION

The upper Lehigh River basin, located northeast of White Haven, Pennsylvania, is a tributary to the Delaware River (Figure 1). The candidate basin is located in Buck Township, Luzerne County; Tobyhanna and Coolbaugh Townships, Monroe County; Thornhurst, Clifton, and Covington Townships, Lackawanna County; and Lehigh and Sterling Townships, Wayne County. The upper Lehigh River and its tributaries are freestone streams that drain approximately 93.8 mi² of the Glaciated Pocono Plateau. The mainstem flows for 22.9 miles in a southwesterly direction from its origin in Lehigh Township, Wayne County to the confluence with Tobyhanna Creek southwest of the village of Stoddartsville (Figure 1).

There are limited impacts to the upper Lehigh River headwater basin from human disturbance. Land uses primarily consist of forest management activities with some low-density residential development. Approximately 43.8% of the lands in the basin are in public ownership (Lackawanna State Forest, Gouldsboro and Tobyhanna State Parks, and State Game Lands 91, 127, 135, and 312). A significant portion of the upper Lehigh River petition area is further characterized by the abundant distribution of natural wetlands; a condition that typifies streams draining the Glaciated Pocono Plateau.

There are five NPDES (National Pollution Discharge Elimination System) -permitted systems (4 privately-owned wastewater treatment works, and 1 industrial stormwater), two surface water withdrawals, and fourteen ground water withdrawals in the study area. The four

wastewater treatment works in the basin (Arrowhead Sew. Co. Inc., Eagle Lake Community Association Inc., Thornhurst Country Club Estates, and Lake View Estates Inter. Corp.) are permitted to discharge a maximum of 0.525, 0.500, 0.070, and 0.054 MGD respectively.

WATER QUALITY AND USES

Surface Water Quality

Sufficient long-term water quality data were available from the Department's Water Quality Network (WQN) stations on the mainstem of the Lehigh River at Stoddartsville (WQN 126) and on Choke Creek (WQN 190) to allow a direct comparison to water quality criteria (Table 2). These WQN stations are situated near the downstream terminus of their respective drainage areas. With the exception of naturally low alkalinity and occasional occurrences of acidity and low pH measurements, an analysis of approximately 5 years of data collected bimonthly from September 1998 to May 2005 (47 observations) shows that water quality was better than established criteria 99% of the time for most of the other measured parameters. The low alkalinity values, sporadic detections of acidity, and pH values <6 reflect the natural influence of the abundant wetlands and ponds found in the petition area, which limits the buffering capacity of the upper Lehigh River basin. The excellent and natural water quality found at both WQN 126 and 190, which are situated near the downstream terminus of their respective drainage areas (the upper Lehigh River petition area and the Choke Creek tributary), reflects the lack of negative impacts from land uses upstream of these stations.

Additional water quality data were available from the Monroe County Planning Commission for 3 tributaries (Blexley Run - 1 sample, Tripup Run - 2 samples and unnamed tributary (UNT) to Trout Creek - 6 samples) from 1997 to 2001. While the instantaneous nature of these grab samples does not allow for a meaningful comparison to established water quality criteria, analysis of these data suggests the water quality of these sub-basins is excellent. Alkalinity in these streams reflects low buffering capacity similar to that found in the Lehigh River mainstem. Alkalinity values were very low – varying from below method detection limits (MDL) for Blexley and Tripup Runs up to 13.5 mg/l for UNT Trout Creek. Nutrient concentrations of ammonia, nitrite, and phosphorus were below respective MDLs for Tripup Run and UNT Trout

Creek and are indicative of limited human impact in these tributary basins. No water chemistry data were available from other tributaries in the petition study area.

In addition to the available water quality data, biological data were collected to further evaluate the long-term water quality conditions in the upper Lehigh River study area. Field water quality parameters were measured at most of the stations in the upper Lehigh River basin on April 14 and 15 and May 5, 2003 (Table 2A).

Aquatic Biota

The indigenous aquatic community is an excellent indicator of long-term conditions and is used as a measure of both water quality and ecological significance. Department staff collected habitat and benthic macroinvertebrate data at 22 sampling locations in the upper Lehigh River basin (Figure 1 and Table 1). Fishery data for the Lehigh River and Ash Creek were provided by the Pennsylvania Fish and Boat Commission (PFBC) (Table 5).

Habitat. Instream habitat was assessed at each station where benthic macroinvertebrates were sampled (Table 3). The habitat evaluation consists of rating twelve habitat parameters to derive a station habitat score. The total habitat scores for the upper Lehigh River headwater basin ranged from 172 at 12PC to 231 at 9BR, which reflect suboptimal-to-optimal habitat conditions.

Benthos. Benthic macroinvertebrate samples were collected at all stations (Table 4) using Pa-DEP's Rapid Bioassessment Protocols (RBP) benthic macroinvertebrate sampling technique, which is a modification of the US Environmental Protection Agency's (EPA) RBPs (Plafkin, et al 1989 and Barbour, et al 1999). Taxonomic richness (total number of taxa) scored very good-to-excellent at all 6 mainstem stations (22 to 37 taxa) and at 11 tributaries (20 to 35 taxa). At the remaining 5 stations, taxonomic richness was good (14 to 19).

The upper Lehigh River basin supports a diverse benthic macroinvertebrate population dominated by a number of pollution-sensitive genera. The macroinvertebrate samples revealed relatively high taxa richness values that ranged from 14 to 37 (Table 4) at the 22

candidate basin stations. The benthic samples for the 6 mainstem and 11 of the 16 tributaries contained many pollution sensitive taxa (Table 4) of the Ephemeroptera (mayflies), Plecoptera (stoneflies) and Trichoptera (caddisflies) groups. Despite the presence of many pollution sensitive taxa, a single pollution tolerant taxonomic family, the Simuliidae (black flies), dominated many of the stations (Table 4). Headwater ponds, wetlands, and low gradient conditions are prevalent throughout the basin and are optimal habitat for simuliids, which filter feed on suspended particulate material. Many of the small tributaries and the mainstem originate as outflow from glacial ponds. As a result of these natural conditions, the aquatic biological communities are composed of individuals that are adapted for the low pH and tannic conditions that characterize these streams.

Fishes. Fishery data, supplied by the PFBC, were collected from 3 sites (River Mile 87.8, 89.5 and 92.8) on the Lehigh River on July 10, 1997. A total of 13 species were collected (Table 5). The fishery at all three sites exhibited good diversity. Wild brown trout were collected at all three sites and wild brook trout were collected at the 2 upstream locations. Currently, PFBC has designated a 1.9 mile section of Ash Creek as Class A Wild Trout waters and other headwater tributaries and the mainstem of the upper Lehigh River as wild trout waters.

BIOLOGICAL USE QUALIFICATIONS

The biological use qualifying criterion applied to the upper Lehigh River basin was the Department's integrated benthic macroinvertebrate scoring test described at 25 Pa. Code § 93.4b(b)(1)(v). Selected benthic macroinvertebrate community metrics calculated for the upper Lehigh River stations (Figure 1) were compared to those from EV reference streams of comparable drainage areas including: Kettle Creek (1KCR) in Clinton County, Saw Kill Creek (1SKC) and Dimmick Meadow Brook (1DMB) in Pike County (Table 6). The aforementioned streams were used as references because they are freestone streams, have drainage areas (86.6, 24.7 and 2.7 mi² respectively) similar to the compared study streams, and are found in similar geologic settings as the study streams. In addition, these streams have served as EV reference streams in several other Departmental surveys. Stations 10LR, 13LR and 22LR were compared to reference station 1KCR; stations 3LR, 6LR and 18TC were compared to reference station 1SKC; and stations 1LR, 2UNT, 4TMC, 5FR, 7SC, 8AC, 9BR, 11SR, 12PC,

14SSC, 15BS, 16TR, 17TC, 19CC, 20CC and 21KC were compared to reference station 1DMB. The comparisons were done using the following metrics that were selected as being indicative of community health: taxa richness; modified EPT index; modified Hilsenhoff Biotic Index; percent dominant taxon; and percent modified mayflies.

Based on these five metrics, only one station, 14SSC (Sand Spring Creek) with a Biological Condition Score of 100%, exceeded the EV qualifying criterion of 92% (§ 93.4b(b)(1)(v)). The metric score calculated for Station 14SSC, being located near the mouth of Sand Spring Creek, reflects the cumulative influence of upstream land uses that are dominated by undisturbed areas of the Lackawanna State Forest and Spruce Swamp Natural Area. The remainder of the candidate stations scored less than 92% of the reference stations (Table 6).

A total of 5.5 stream miles qualify as EV Waters under this criterion.

ADDITIONAL EXCEPTIONAL VALUE WATERS QUALIFYING CRITERIA

Based on petitioner information suggesting that additional EV regulatory criteria may apply, DEP evaluated additional antidegradation criteria listed in § 93.4b(b). These additional criteria include:

- A. The water is located in a designated State park natural area or State forest natural area, National natural landmark, Federal or State wild river, Federal wilderness area or National recreation area [§ 93.4b(b)(1)(ii)];
- B. The water is an outstanding National, State, regional or local resource water [§ 93.4b(b)(1)(iii) – see Appendix A¹];
- C. The water is a surface water of exceptional ecological significance [§ 93.4b(b)(2) – see Appendix A²].

Areas of the upper Lehigh River basin that satisfy these EV qualifying criteria are depicted in Figure 1 (basin overview) and Figures 2-6 (basin close-up views) and are discussed below:

A. Waters in Natural Areas qualifying as EV under § 93.4b(b)(1)(ii):

This criterion may be applied to petitioned waters located in natural areas since they already have the prerequisite HQ designation. The Black Bear and Bender Swamps Natural Area in Tobyhanna State Park and the Spruce Swamp Natural Area in Lackawanna State Forest have been designated by the Department of Conservation & Natural Resources (DCNR) to be maintained in a natural condition. See 17 Pa. Code § 17.5 (relating to State Parks natural area designation procedures) and 17 Pa. Code § 27.5 (relating to State Forest natural area

designation procedures). Based on the Department's review of these natural area designations, the HQ designated waters located in a designated State Park natural area or State Forest natural area¹ qualify for designation as EV as provided by § 93.4b(b)(1)(ii).

A total of 2.3 stream miles qualify as EV Waters under this criterion.

B. Waters qualifying as EV as outstanding National, State, regional or local resource waters under § 93.4b(b)(1)(iii):

The outstanding resource waters EV criterion may be applied to the petitioned waters since they already have the prerequisite HQ designation. The definition of "Outstanding National, State, regional or local resource waters" in § 93.1 requires adoption of "water quality protective measures". "Coordinated water quality protective measures", also defined at § 93.1, are required for regional or local governments. (See Appendices A¹ and A³ for the definitions). Such water quality protective measures have been applied through management activities implemented on lands draining to the upper Lehigh River in Lackawanna, Luzerne, Monroe and Wayne Counties as described below:

Outstanding State Resource Waters

The Department evaluated water quality protective measures included in resource management plans prepared by DCNR's Bureau of Forestry. The Bureau of Forestry has issued Aquatic Habitat Buffer Guidelines (DCNR 2007) for all state forest lands that apply both "outer" and "inner" buffer zones, which provide differing levels of water quality protection. Inner buffers zones function as a critical area of protection that allow only minimal human activity (e.g. tree cutting can only occur to protect property and human safety) and have been applied to the Lackawanna State Forest lands. The inner buffer zones range from 30 feet to 200 feet. Inner buffer zones of 200 feet are applied to Wilderness Trout Streams and Wild Rivers, whereas an inner buffer zone of 135 feet is applied to EV streams. For HQ streams, a 30 foot inner buffer zone is required, and coupled with a requisite 105-foot outer buffer zone, provides a total habitat buffer of 135 feet.

¹ A "natural area" is generally defined as one of unique scenic, geologic, or ecological value and which is maintained in a natural condition, usually without direct human intervention.

A review of DCNR's Bureau of State Parks management plans for Gouldsboro and Tobyhanna State Parks found that there were no water quality protection measures specifically for streams for either park. However, Bureau of State Parks will be updating their management plans for individual parks to include specific water quality protective measures for all surface waters within park boundaries in the future. Therefore at this time, no recommendations in this report rely on state park resource management plans.

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

The water quality protective measures described in DCNR – Bureau of Forestry and PGC resource management plans meet the “outstanding National, State, regional or local resource waters” definition and apply to stream segments within State Game Lands 91, 127, 135 and 312; and the Lackawanna State Forest within the upper Lehigh River basin.

A total of 79.1 stream miles qualify as EV Waters under this criterion.

Outstanding Local Resource Waters

The Department evaluated local ordinances described below, as “coordinated water quality protective measures” adopted by local governments along the Lehigh River watershed corridor.

1. Coolbaugh Township, Monroe County has adopted sound land use water quality protective measures through ordinances that include the following:
 - a. Regulations to conserve natural features, including land or water resource areas (e.g. wetlands, groundwater recharge zones, springs, and streams). The purpose of the regulations is to ensure that land uses minimize disturbances to natural features and that reasonable measures are taken to mitigate any adverse impacts from such uses.

- b. Conservation plan approval when any person, corporation or other entity proposes certain defined activities that disturb or impact any natural feature.
 - c. Site planning requirements designed to conserve woodlands and other vegetation. Except in conjunction with routine property maintenance or safety precautions, the requirements minimize disturbance or removal of vegetation occupying environmentally sensitive areas, including stream and pond banks. Such disturbance or removal may only be undertaken when necessary and on a limited, selective basis to minimize the adverse impacts of such actions and to maintain the natural integrity of these sensitive areas.
 - d. Regulations to conserve open space. Wherever possible, land containing prime wildlife habitat must be left as permanent open space. The regulations include the protection of wildlife corridors, wherever possible, that are contiguous to environmentally sensitive areas such as wetlands, watercourses and steep slopes.
2. Bear Creek Township, Luzerne County has adopted sound land use water quality protective measures through ordinances that include the following:
- a. A subdivision and land development ordinance that requires care to be taken to preserve natural features such as watercourses and bodies of water. The ordinance recognizes that stream channels are resources that warrant restrictive land use controls because of 1) flooding hazards to human life and property, 2) ground water recharge functions, 3) importance to water quality and the health of the aquatic communities, and 4) importance to associated wildlife habitats. The ordinance further requires the minimization of disturbance to streams and drainage swales to the greatest practical extent.
 - b. A zoning ordinance and supplemental regulations limit forestry activities within the 100-year floodway and require a minimum riparian buffer of 100 feet from any natural watercourse for any form of development and/or improvements in all zoning districts.
3. Thornhurst Township, Lackawanna County has adopted sound land use water quality protective measures that include the following:

- a. A zoning ordinance that states no alteration of watercourses, whether by excavation, filling, grading, clearing, draining, or otherwise, may be made that affects the water levels or flow of such watercourses without careful review and study of the effect of such alteration and any related facilities on water recharge areas, water table levels, water pollution, aquatic animal and plant life, temperature change, drainage, flooding runoff and erosion. Review and approval of such alterations must be made by the Board in consultation with the County Conservation District and DEP.
 - b. The ordinance also mandates a stream buffer of 100 feet, on both sides of the stream, limiting activities that may occur within the buffer area.
4. Covington Township, Lackawanna County has adopted sound land use water quality protective measures, which include a zoning ordinance that requires a minimum buffer zone of 50 feet shall be maintained from any body of water or stream. No buildings, structures, sewage disposal systems or impervious surfaces can be placed within these zones. In residential subdivisions, these zones will be protected via a protective easement.

Although the protective measures provided by these townships will enhance water quality protection, the regulations require that such measures be “coupled with” an interest in real estate, as described at § 93.1. Definitions - “*Coordinated water quality protective measures*”. It is not necessary to delineate such interests in real estate for this report since other antidegradation criteria apply to these waters.

C. Waters Qualifying as EV as Surface Waters of Exceptional Ecological Significance under § 93.4b (b)(2):

Information gathered for the Pennsylvania Natural Heritage Program and reported in County Natural Areas Inventories for Lackawanna (1997, 2003), Luzerne (2001, 2006), Monroe (1991, 1999), and Wayne (1991) Counties identified a total of 22 areas with statewide or local ecological significance that is based upon the rarity and uniqueness of the areas’ endemic ecological community types. Seven rare ecological community types have been associated with these 22 ecologically significant upper Lehigh River watershed areas. These 7 rare community types are:

1. Natural pond (exceptionally rare)

2. Mesic scrub oak-heath-pitch pine barrens (exceptionally rare)
3. Northern conifer swamp – highest number of PA occurrences are in Monroe Co.
4. Acidic glacial lake
5. Acidic shrub swamp – PA occurrences found only in the northeast; 1/3 of which are in upper Lehigh River basin
6. Boreal conifer swamp
7. Oligotrophic glacial kettlehole bog– one in the upper Lehigh River basin supports 8 “species of special concern”)

Many of these unique endemic plant communities are relics of past glaciations and are typical of the more northern latitudes of northern New England and Canada. In Pennsylvania, most of these endemic communities are found only in the Pocono region and are dependent on water quality and/or hydrology for their continued existence.

Of the 22 ecologically significant areas noted above, 10 are wetlands hydrologically connected to riverine surface waters and therefore, are water quality dependent. One of these wetlands is characterized by an Acidic Glacial Lake community, which is known only from Carbon, Lackawanna, Pike and Wayne Counties. The only known Pennsylvania occurrence of the natural pond wetland community type is from the upper Lehigh River watershed.

The county natural area inventories and a search of the Pennsylvania Natural Diversity Inventory (PNDI) system illustrate a concentration of these relatively unique ecologically significant areas on the Glaciated Pocono Plateau Section and within the upper Lehigh River basin in particular. The presence of endemic plant communities dependent on water quality or hydrology and their rarity in Pennsylvania satisfies the exceptional ecological significance criterion at § 93.4b(b)(2), which qualifies the 10 areas listed below for EV designation:

Ecologically Significant Areas	Community Type	Location	County
Bradys Swamp*	Acidic Shrub Swamp	State Game Lands (SGL) 127	Monroe
Pond Swamp*	Acidic Shrub Swamp	SGL 127	Monroe

Big Marsh*	Acidic Shrub Swamp	SGL 127	Monroe
Mash Creek Marsh*	Graminoid Marsh	Lackawanna State Forest	Lackawanna
Nines Pond*	Natural Pond	Lackawanna State Forest	Lackawanna
Bear Lake/Grassy Pond	Acidic Glacial Lake/Natural Pond	Thornhurst Township	Lackawanna
English Swamp	Boreal Conifer Swamp	Covington Township	Lackawanna
Choke Creek Shrub Swamp	Acidic Shrub Swamp	Buck Township	Luzerne
Lehigh Pond*	Oligotrophic Glacial Kettlehole Bog	SGL 312	Wayne
Snag Pond	Oligotrophic Glacial Kettlehole Bog	Lehigh Township	Wayne

* Qualified as Outstanding State Resource Waters due to resource management plans

The remaining 12 ecologically significant areas listed below are upland areas with no direct connection to the Lehigh River or are wetland communities that, while not particularly rare in Pennsylvania, provide an important function as ecological filtering systems (much like riparian buffers) for the Lehigh River.

Ecologically Significant Areas	Community Type	Location	County
Sand Springs Woods	<i>not identified</i>	Thornhurst	Lackawanna
Lehigh River-Route 115 Bridge	<i>not identified</i>	Buck Township, Tobyhanna Township	Luzerne, Monroe
Johnson Pond-Westend Pond Complex	<i>not identified</i>	Clifton Township, Lehigh Township	Lackawanna, Wayne
Balsam Swamp*	Boreal Conifer Swamp	Lackawanna State Forest	Lackawanna
America Swamp*	Boreal Conifer Swamp	Lackawanna State Forest	Lackawanna
Horseshoe Swamp*	Boreal Conifer Swamp	Lackawanna State Forest	Lackawanna
Tannery Road Swamp	Boreal Conifer	Lackawanna State Forest	Lackawanna

(Spruce Swamp Natural Area)*	Swamp		
Sassafras Hill Wetlands*	Boreal Conifer Swamp	Lackawanna State Forest	Lackawanna
Oakes Swamp	<i>not identified</i>	Tobyhanna Army Depot	Monroe
Longpatch Swamp*	<i>not identified</i>	SGL 127	Monroe
Underwood Swamp*	<i>not identified</i>	SGL 127	Monroe
Birch Swale*	Northern Conifer Swamp	SGL 127	Monroe

*Qualified as Outstanding State Resource Waters due to resource management plans

It is widely understood that the larger a buffer area is surrounding a body of water, the more effective it is in filtering pollutants; preventing them from entering the water. Thus, it is not just wetlands that are important but upland areas as well, in filtering potential pollutants. One of these endemic ecologically significant upland areas found in the upper Lehigh River watershed is the Mesic-Scrub Oak-Heath-Pitch Pine Barrens community type, which is only known in Luzerne, Monroe and Carbon counties. In Pennsylvania, there are only four known occurrences of this natural community type - one of which occurs within the upper Lehigh River petitioned area.

The co-occurrence of the 12 upland and other wetland communities with the 10 hydrologically connected/ecologically significant areas demonstrates an important ecological connectance that supports the natural diversity found in the Lehigh River petition area, which has resulted in the ecology and hydrology of the upper Lehigh River basin remaining largely intact and undisrupted over the 93.8 mi² area. Currently, there are only a few small residential communities and one quarry operation (near the lower end of the basin) that could have potential impacts on this unique environment. Because of the distribution and high concentration of the ecologically significant rare and unique endemic natural communities (both aquatic-based and uplands) in the upper Lehigh River basin and the ecological connectivity they provide to the aforementioned natural areas, the tributary waters flowing in these additional 12 upland and other wetland areas are also recommended for EV designation.

A total of 132.4 stream miles qualify as EV Waters under this criterion.

D. Areas Protected by Private Organizations

Many of the residential communities have taken the upper Lehigh River into consideration in their land use practices. Buffer requirements in effect for communities in the Big Bass Lake Community Association (Big Bass Lake Community Association, 2006) in Covington and Clifton Townships of Lackawanna County and in Riverside Estates (Coolbaugh Township, Monroe County) require buffers and building setbacks that must be maintained between all structures and waterbodies. Other lands have been preserved by Wildlands Conservancy (609 acres) in Lackawanna and Luzerne Counties along the Lehigh River and by The Nature Conservancy's Thomas Darling Preserve at Two-Mile Run in Monroe County. In addition, both the Wildlands Conservancy and The Nature Conservancy hold conservation easements in portions of the petitioned area in Lackawanna, Luzerne and Monroe Counties. In addition, a conservation easement held by the North Branch Land Trust, Inc. includes lands adjacent to Tamarack Creek and provides for a riparian buffer of 300 feet for any permanent or intermittent watercourse. Tamarack Creek is located in Covington Township, Lackawanna County.

Although these protective measures will enhance water quality protection, such measures must be coupled with local or regional government protective measures to meet the EV qualifiers in Chapter 93.

It is not necessary to delineate where the private water quality protective measures are coupled with local government measures for this report since other antidegradation criteria apply to these waters.

PUBLIC RESPONSE AND PARTICIPATION SUMMARY

The Department provided public notice of this stream redesignation evaluation and requested any technical data from the general public through publication in the Pennsylvania Bulletin on June 8, 2002 (32 Pa.B 2162). A similar notice was published in the Pocono Record and the Scranton Times on June 7, 2002. In addition, Clifton, Covington, Thornhurst, Buck, Coolbaugh, Tobyhanna, Lehigh and Sterling Townships and the Lackawanna (Regional), Luzerne, Monroe, and Wayne County Planning Commissions were notified of the redesignation evaluation in a letter dated June 7, 2002. Data on water chemistry, instream

habitat, and the aquatic community were received from the Monroe County Planning Commission in response to these notices. Letters supporting this proposed redesignation were received from Thornhurst and Buck Townships, Lackawanna County and the Monroe County Conservation District. Letters in opposition to this proposed redesignation were received from Clifton Township, Lackawanna County and the developers of Big Bass Lake, Gouldsboro, PA.

Subsequent to receiving the support letters noted above, DEP received a letter of support from the Monroe County Conservation District in July 2009. In addition, Tobyhanna Township submitted a letter in opposition to an EV redesignation in which they state that the current HQ designation provides adequate protection.

The petitioner and local municipality and planning commission representatives were notified by a postcard mailing that the report was available on the Department's web page for review with a 30-day comment period, which closed on April 16, 2010. In response, letters were received from the Lackawanna, Luzerne, and Wayne Conservation Districts; the Pennsylvania Council of Trout Unlimited; the local Brodhead and Stanley Cooper Sr. Chapters of Trout Unlimited; the Lehigh Coldwater Fishery Alliance; Wildlands Conservancy; Riverside Estates Community Association; and Thornhurst Township indicating their support of the EV recommendations below. These supportive letters were provided by Barbara Smith who represents the petitioners (North Pocono CARE). Letters were submitted by Tobyhanna Township to restate their original opposition to the EV recommendation. Further, they infer that the petition marginally meets the EV Criteria and does not meet EV chemistry criteria. However, the Department's report clearly demonstrates overwhelming qualification of the Upper Lehigh River as EV waters under numerous EV criteria and it must be noted that there is no chemistry criterion that needs to be met for EV consideration.

RECOMMENDATIONS

Based on applicable regulatory definitions and requirements of § 93.4b, the Department recommends that the upper Lehigh River basin, from the source to Tobyhanna Creek should be redesignated Exceptional Value, Migratory Fishes (EV, MF). This recommendation adds approximately 219.2 stream miles of EV waters to Chapter 93. This recommendation reflects the EV designation requested by the petitioner.

The EV qualifying waters and their associated § 93.4b(b) criteria are presented in the Figure 1 basin overview and Figures 2-6 close-up views.

APPENDIX A

¹Definition at § 93.1: *Outstanding National, State, regional or local resource water*—A surface water for which a National or State government Agency has adopted water quality protective measures in a resource management plan, or regional or local governments have adopted coordinated water quality protective measures³ along a watershed corridor.

² Definition at § 93.1: *Surface water of exceptional ecological significance*—A surface water which is important, unique or sensitive ecologically, but whose water quality as measured by traditional parameters (for example, chemical, physical or biological) may not be particularly high, or whose character cannot be adequately described by these parameters. These waters include:

- (i) Thermal springs.
- (ii) Wetlands which are exceptional value wetlands under § 105.17(1) (relating to wetlands).

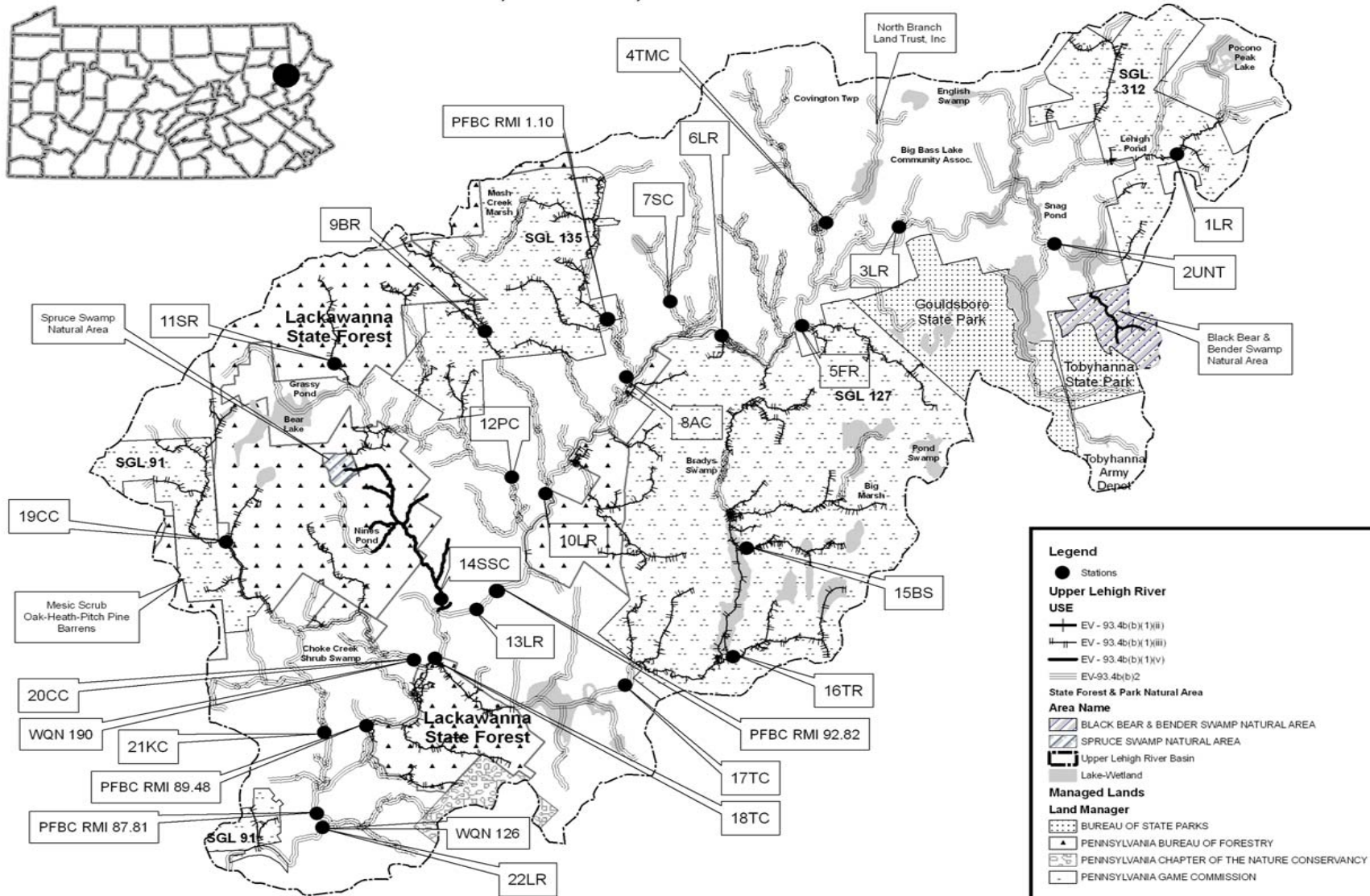
³ Definition at § 93.1: *Coordinated water quality protective measures*—

- (i) Legally binding sound land use water quality protective measures coupled with an interest in real estate which expressly provide long-term water quality protection of a watershed corridor.
- (ii) Sound land use water quality protective measure include: surface or ground water protection zones, enhanced stormwater management measures, wetland protection zones or other measures which provide extraordinary water quality protection.
- (iii) Real estate interests include:
 - (A) Fee interests.
 - (B) Conservation easements.
 - (C) Government owned riparian parks or natural areas
 - (D) Other interests in land which enhance water quality in a watershed corridor area.

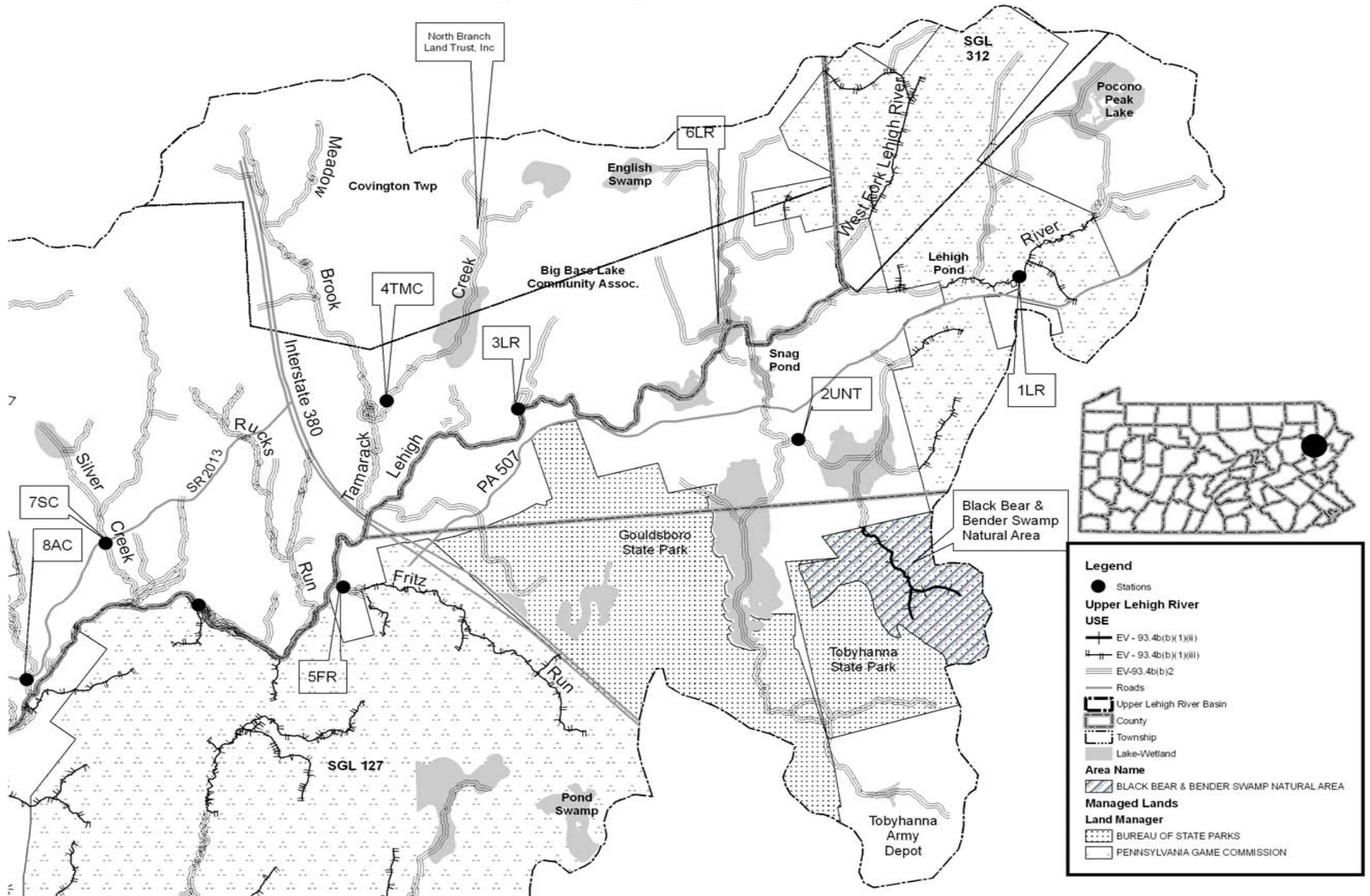
REFERENCES

- Plafkin, JL, MT Barbour, KD Porter, SK Gross, & RM Hughes. 1989. Rapid Bioassessment Protocols for use in streams and rivers: Benthic Macroinvertebrates and Fish. United States Environmental Protection Agency. EPA/444/4-89-001.
- Barbour, Michael T., Jeroen Gerritsen, Blaine D. Snyder, James B Stribling. 1999. Rapid Bioassessment Protocols For Us in Streams and Wadeable Rivers: Periphyton, Benthic Macroinvertebrates, and Fish. Second Edition. United States Environment Protection Agency. EPA 841-B-99-002
- Big Bass Lake Community Association. 2006. Architecture Review Rules and Regulations for Building and Waterfront Improvement
- Covington Township. 1995. Covington Township Zoning Ordinance. §508 Buffer for Waterbodies and Wetlands. Page V-27.
- Pa Department of Conservation and Natural Resources. 2007. Aquatic Habitat Buffer Guidelines, Effective January 1, 2007. Bureau of Forestry.
- The Nature Conservancy (Pennsylvania Science Office). 1991. A Natural Areas Inventory of Monroe County, Pennsylvania. The Monroe County Planning Commission.
- _____. 1991. A Natural Areas Inventory of Wayne County, Pennsylvania. Wayne County Department of Planning.
- _____. 1997. A Natural Areas Inventory of Lackawanna County, Pennsylvania. The Lackawanna Heritage Valley Authority.
- _____. 1999. A Natural Areas Inventory of Monroe County, Pennsylvania, Update 1999. The Monroe County Planning Commission.
- _____. 2001. A Natural Areas Inventory of Luzerne County, Pennsylvania. Luzerne County Board of Commissioners
- _____. 2003. A Natural Areas Inventory of Lackawanna County, Pennsylvania Update 2003. The Lackawanna Heritage Valley Authority.
- _____. 2006. A Natural Areas Inventory of Luzerne County, Pennsylvania, Update 2006. Luzerne County Board of Commissioners

**FIGURE 1
LEHIGH RIVER
LACKAWANNA, LUZERNE, MONROE AND WAYNE COUNTIES**



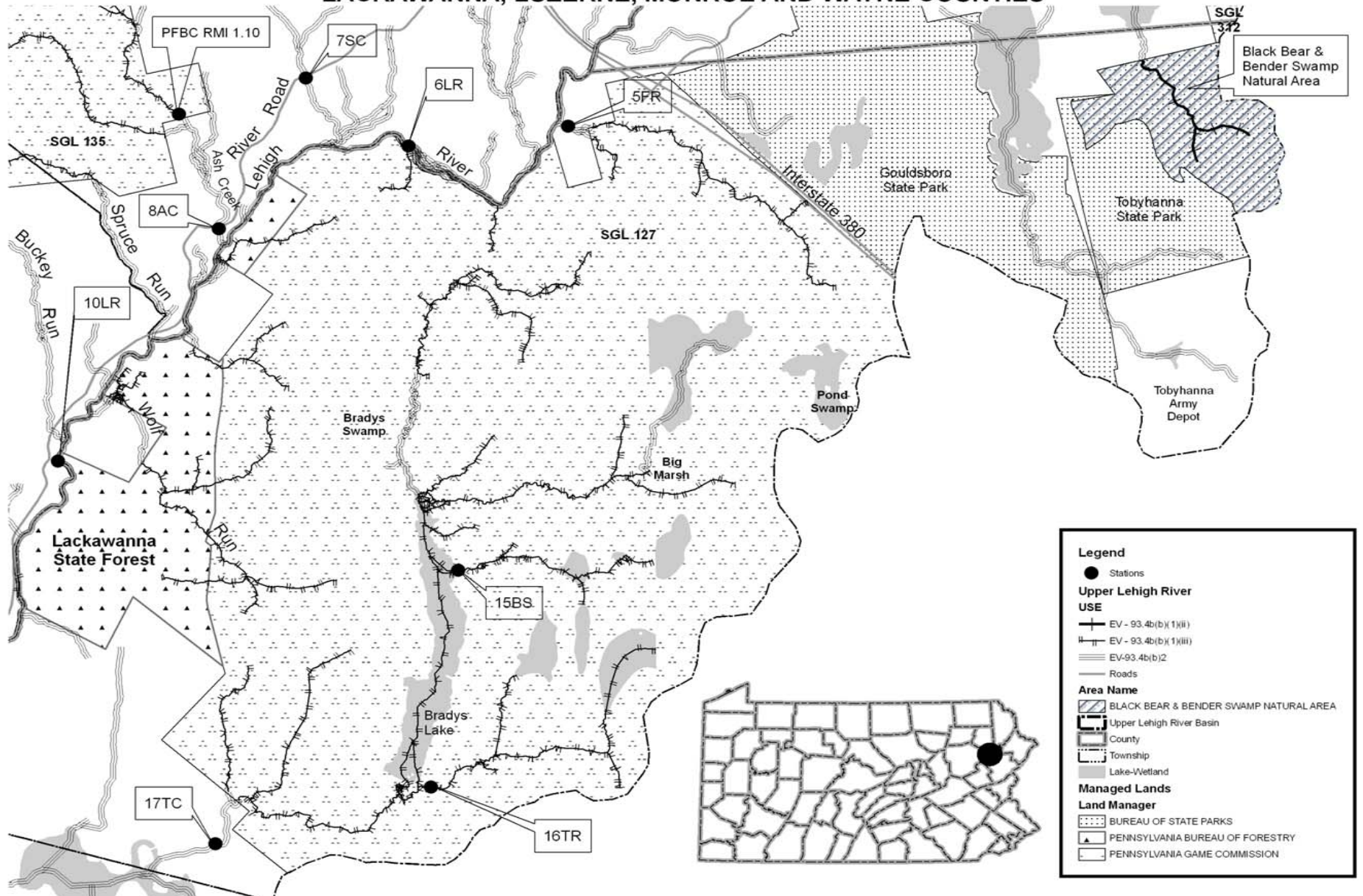
**FIGURE 2
LEHIGH RIVER
LACKAWANNA, LUZERNE, MONROE AND WAYNE COUNTIES**



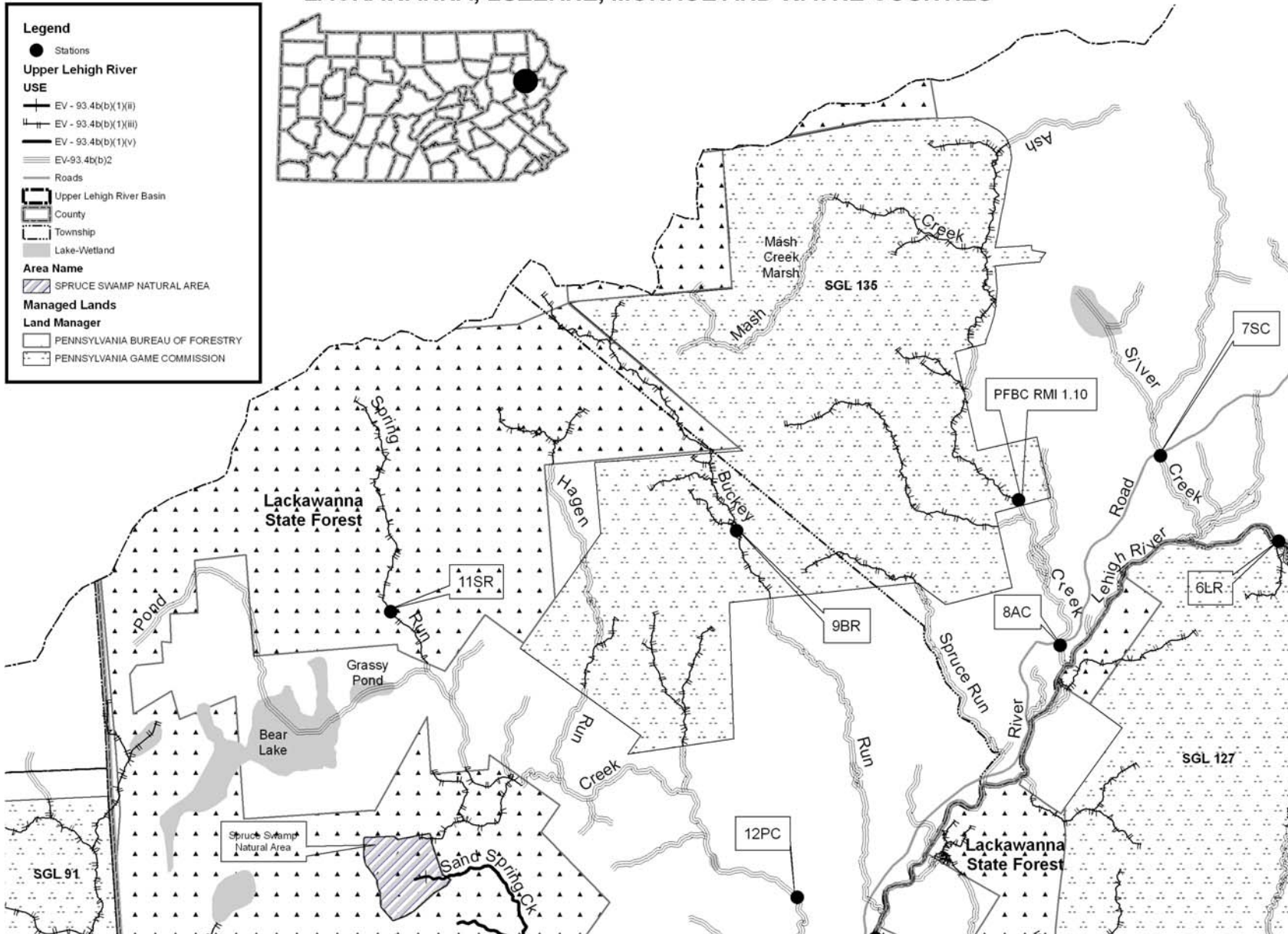
Legend

- Stations
- Upper Lehigh River USE**
 - EV - 93.4b(b)(1)(ii)
 - EV - 93.4b(b)(1)(iii)
 - EV-93.4b(b)2
 - Roads
- ▭ Upper Lehigh River Basin
- ▭ County
- ▭ Township
- ▭ Lake-Wetland
- Area Name**
 - ▨ BLACK BEAR & BENDER SWAMP NATURAL AREA
- Managed Lands**
- Land Manager**
 - ▨ BUREAU OF STATE PARKS
 - ▨ PENNSYLVANIA GAME COMMISSION

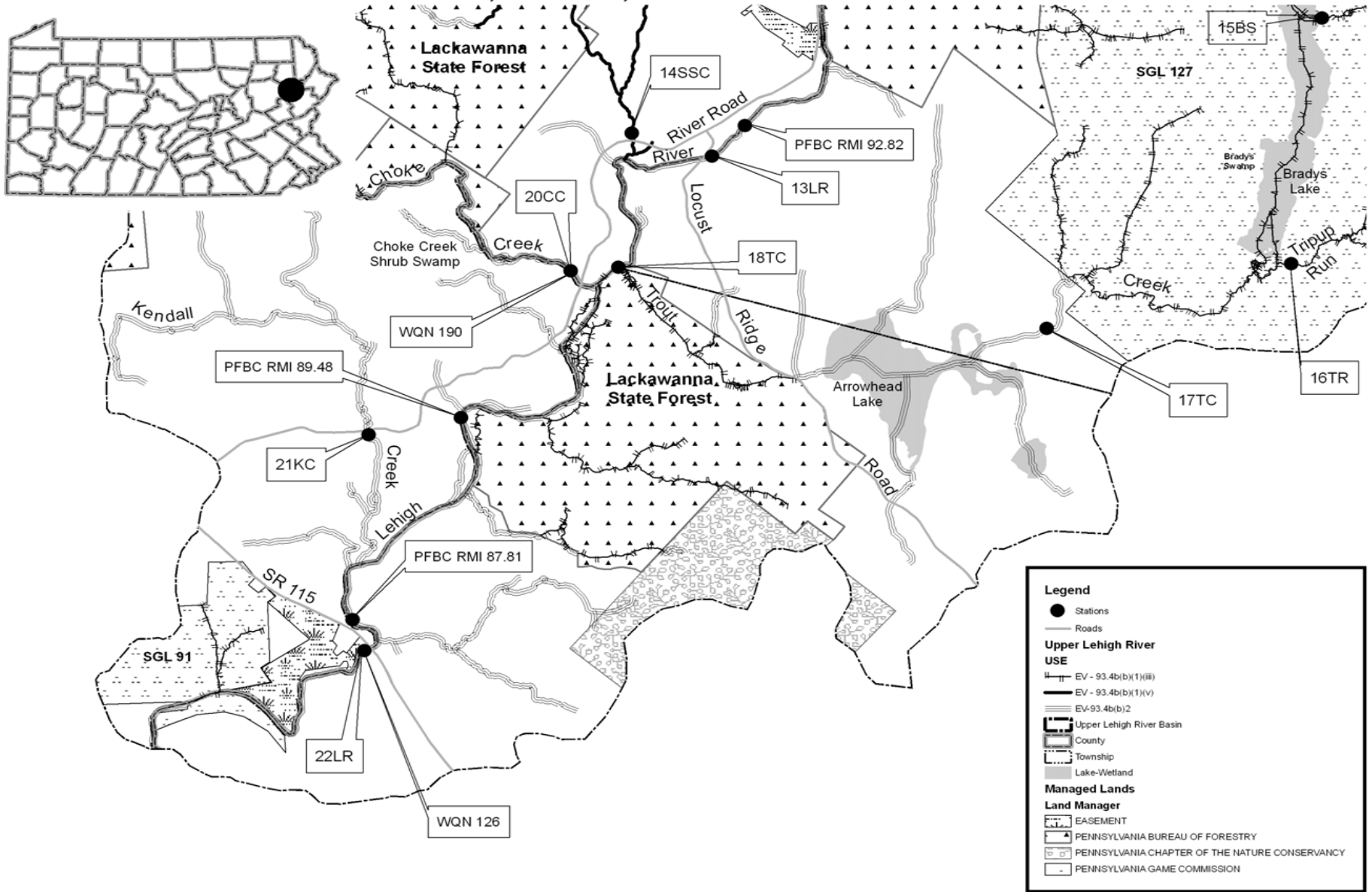
**FIGURE 3
LEHIGH RIVER
LACKAWANNA, LUZERNE, MONROE AND WAYNE COUNTIES**



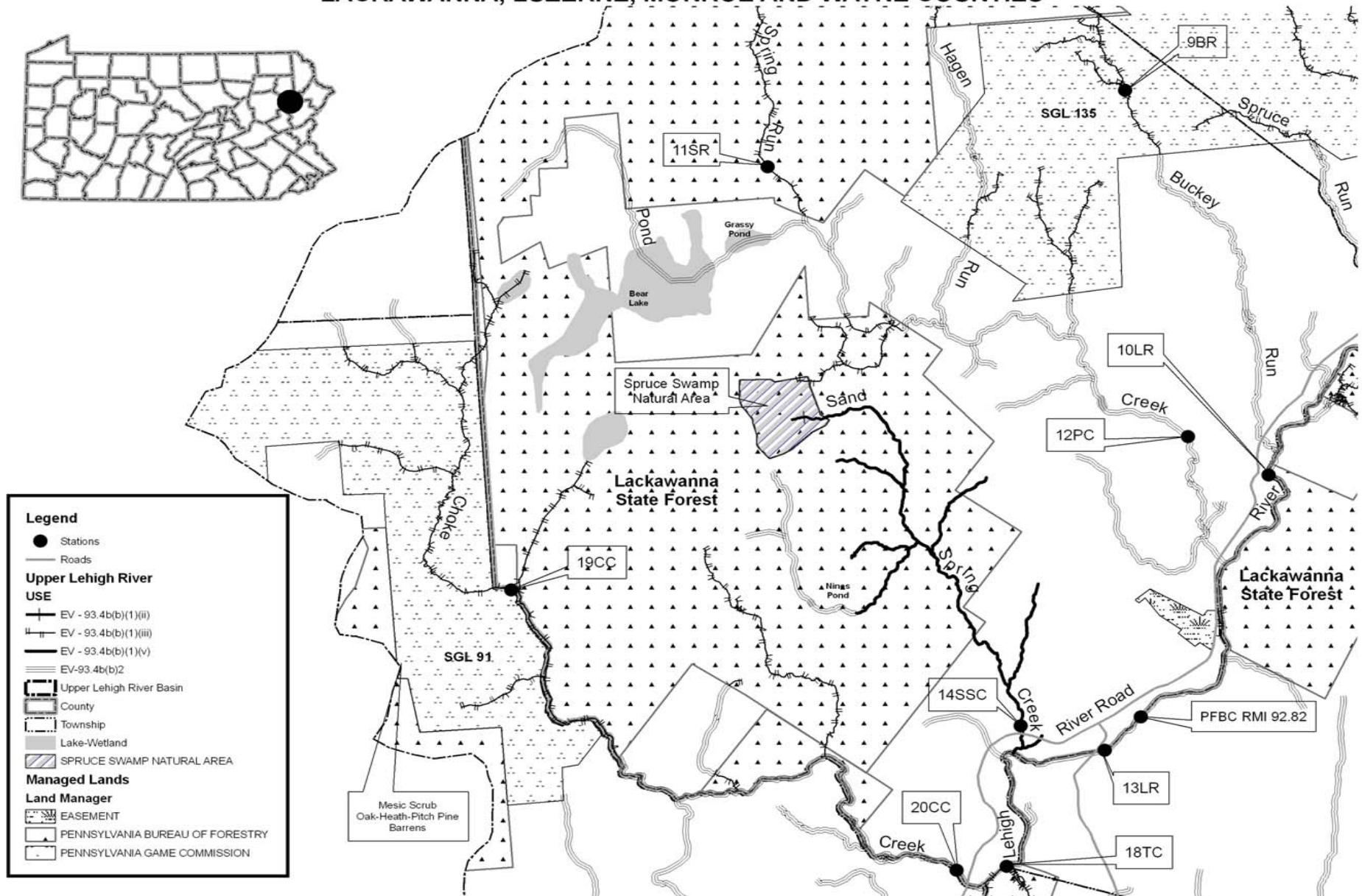
**FIGURE 4
LEHIGH RIVER
LACKAWANNA, LUZERNE, MONROE AND WAYNE COUNTIES**



**FIGURE 5
LEHIGH RIVER
LACKAWANNA, LUZERNE, MONROE AND WAYNE COUNTIES**



**FIGURE 6
LEHIGH RIVER
LACKAWANNA, LUZERNE, MONROE AND WAYNE COUNTIES**



**TABLE 1
STATION LOCATIONS
LEHIGH RIVER
LACKAWANNA, LUZERNE, MONROE AND WAYNE COUNTIES**

STATION	LOCATION
1LR	Upstream of private road. Lehigh Township, Wayne County Stream Code 03335 Lat: 41 15 31 Long: 75 25 03 RMI: 105.98
2UNT	Downstream of SR3001 approximately 150 meters. Lehigh Township, Wayne County Stream Code 04615 Lat: 41 14 28 Long: 75 26 50 RMI: 0.10
3LR	Upstream of T301/T308 approximately 50 meters. Lehigh Township, Wayne County Stream Code 03335 Lat: 41 14 45 Long: 75 29 04 RMI: 101.28
4TMC	Upstream of SR0435 approximately 25 meters. Clifton Township, Lackawanna County Stream Code 04603 Lat: 41 14 49 Long: 75 30 06 RMI: 1.05
5FR	Upstream of T597 approximately 15 meters. Coolbaugh Township, Monroe County Stream Code 04599 Lat: 41 13 36 Long: 75 30 30 RMI: 0.09
6LR	Upstream of unnamed tributary 04591 approximately 40 meters, in State Game Lands (SGL) 127. Coolbaugh Township, Monroe County Stream Code 03335 Lat: 41 13 31 Long: 75 31 38 RMI: 97.45
7SC	Upstream of SR2013 approximately 20 meters. Clifton Township, Lackawanna County Stream Code 04587 Lat: 41 13 56 Long: 75 32 23 RMI: 0.59
8AC	Upstream of SR2013 approximately 20 meters. Clifton Township, Lackawanna County Stream Code 04578 Lat: 41 13 04 Long: 75 33 03 RMI: 0.13
9BR	Upstream of road in SGL 135 approximately 20 meters. Lehigh Township, Lackawanna County Stream Code 04564 Lat: 41 13 38 Long: 75 35 02 RMI: 2.44

- 10LR** Upstream of Pond Creek approximately 1200 meters.
Lehigh Township, Lackawanna County
Stream Code 03335
Lat: 41 11 42 Long: 75 34 14 RMI: 93.67
- 11SR** Upstream of SR2016 approximately 930 meters in Lackawanna State Forest.
Lehigh Township, Lackawanna County
Stream Code 04563
Lat: 41 13 17 Long: 75 37 12 RMI: 0.4563
- 12PC** Downstream of T301 approximately 25 meters.
Lehigh Township, Lackawanna County
Stream Code 04541
Lat: 41 10 29 Long: 75 35 48 RMI: 0.20
- 13LR** Upstream of SR4003 approximately 20 meters.
Coolbaugh Township, Monroe County
Stream Code 03335
Lat: 41 10 21 Long: 75 35 17 RMI: 91.47
- 14SSC** Upstream of SR2013 approximately 40 meters.
Lehigh Township, Lackawanna County
Stream Code 04515
Lat: 41 09 43 Long: 75 36 10 RMI: 0.14
- 15BS** Upstream of Brady's Lake approximately 75 meters in SGL 127.
Coolbaugh Township, Monroe County
Stream Code 04535
Lat: 41 10 59 Long: 75 31 22 RMI: 0.15
- 16TR** Upstream of game lands road in SGL 127 approximately 30 meters.
Coolbaugh Township, Monroe County
Stream Code 04534
Lat: 41 09 43 Long: 75 31 38 RMI: 0.28
- 17TC** Upstream of Lake Shore Drive (private road) approximately 150 meters.
Coolbaugh Township, Monroe County
Stream Code 04526
Lat: 41 09 24 Long: 75 33 12 RMI: 2.82
- 18TC** Upstream of confluence with Lehigh River approximately 10 meters,
Tobyhanna Township, Monroe County
Stream Code 04526
Lat: 41 09 46 Long: 75 35 52 RMI: 0.02
- 19CC** Upstream of unnamed tributary 04521 approximately 25 meters.
Buck Township, Luzerne County
Stream Code 04515
Lat: 41 11 13 Long: 75 38 51 RMI: 4.23
- 20CC** Upstream of SR2013/SR2040 approximately 20 meters.
Buck Township, Luzerne County
Stream Code 04515
Lat: 41 09 43 Long: 75 36 11 RMI: 0.13

21KC Downstream of SR2040 approximately 40 meters.
Buck Township, Luzerne County
Stream Code 04500
Lat: 41 08 55 Long: 75 37 32 RMI: 0.92

22LR Downstream of SR0115 approximately 50 meters.
Buck Township, Luzerne County
Stream Code 03335
Lat: 41 07 49 Long: 75 37 35 RMI: 86.56

LR= Lehigh River KC= Kendall Creek CC= Choke Creek TC= Trout Creek SSC= Sand Spring Creek
SR= Spring Run PC= Pond Creek BR= Buckey Run AC= Ash Creek FR = Fritz Run
TMC= Tamarack Creek UNT=Unnamed Tributary

**TABLE 2
WATER CHEMISTRY
LEHIGH RIVER
WQN 126 & 190
LUZERNE AND MONROE COUNTIES**

	WQN 126 ¹	WQN 190 ¹
Period of Record	Oct 1998 to May 2005	Sept 1998 to Jan 2005
Parameters	Range ²	Range ²
Field		
Temperature °C	0 – 25	0 – 21.7
Dissolved Oxygen	8.2 – 15.28	7.7 – 18.66
Laboratory		
pH	5.1 – 7.0	4.5-6.3
Acidity as CaCO ₃	0 – 36	0 – 36
Alkalinity as CaCO ₃	4.0 – 15.8	0 – 3.6
Hardness	12.0 – 25.4	0 – 9.26
T. Diss. Sol.	18 – 244	<2 – 430
Susp. Sol.	<2 – 58	<2 – 70
NH ₃ -N	<0.02 – 0.197	<0.02 – 0.52
NO ₂ -N	0.01 – 0.04	<0.04 – 0.07
NO ₃ -N	0.06 – 0.33	<0.01
Total P	<0.01 – 0.062	<0.01 – 0.36
Ca	3.51 – 7.63	<0.03 – 20.7
Mg	0.484 – 1.53	<0.01 – 9.95
SO ₄	4.7 – 8.8	<1 – 7.23
Cu (total/dissolved)*	<4.0 – 34.1 / <4.0 – 4.3	<4 – 4.6 / <4 – 5.3
Fe (total/dissolved)*	45 – 456 / 28 – 194	<20 – 422 / <20 – 239
Pb (total/dissolved)*	<1.0 – 1.1 / <1.0 – 1.0	<1 / <1 – 1
Mn (total/dissolved)*	12.8 – 236 / 7.9 – 124	<2 – 152 / <2 – 142
Ni (total/dissolved)*	<4 – 4 / 4 – 36.908	<4 – 6.5 / <4
Zn (total/dissolved)*	<5 – 23.5 / <5 – 16.9	<5 – 32.5 / <5 – 30.4
Al (total/dissolved)*	17.9-272 / 17 – 135	<10 – 313 / <10 – 250

¹ Refer to Figure 1 and Table 1 for station locations

² Except for pH & conductance and indicated otherwise, all values are total concentrations in mg/l

* Concentrations in µg/l

**TABLE 2A
WATER CHEMISTRY
LEHIGH RIVER
LACKAWANNA, LUZERNE, MONROE AND WAYNE COUNTIES
APRIL and MAY 2003**

STATIONS ¹													
	1LR Apr-03	2UNT Apr-03	3LR Apr-03	4TMC Apr-03	5FR Apr-03	6LR Apr-03	7SC Apr-03	8AC Apr-03	9BR Apr-03	10LR Apr-03	11SR Apr-03	12PC Apr-03	13LR Apr-03
Field Parameters													
Temp (°C)	NA	NA	9.3	9.44	NA	8.28	6.66	6.66	8.88	7.96	7.22	8.88	8.13
pH	NA	NA	5.73	6.48	NA	6.01	5.85	5.5	4.02	6.2	3.76	4.14	6.02
Cond (µS/cm)	NA	NA	70	76	NA	110	65	33	19	80	19	52	90

TABLE 2A (CONTINUED)

STATIONS ¹										REFERENCE STATIONS		
	14SSC Apr-03	15BS Apr-03	16TR Apr-03	17TC Apr-03	18TC May-03	19CC May-03	20CC Apr-03	21KC Apr-03	22LR Apr-03	1KCR ² Apr-03	1SWC ³ Apr-03	1DMB ⁴ Apr-03
Field Parameters												
Temp (°C)	10.6	10.2	NA	NA	14.8	9.45	7.77	6.66	10.2	10	NA	9.98
pH	5.88	3.82	NA	NA	6.19	NA	4.14	3.9	6.19	5.85	NA	5.31
Cond (µS/cm)	32	24	NA	NA	65	37	33	33	70	48	NA	20

¹ Refer to Figure 1 and Table 1 for station locations

³Saw Kill Creek, Pike County

NA = Not Available

²Kettle Creek, Clinton County

⁴Dimmick Meadow Brook, Pike County

**TABLE 3
HABITAT ASSESSMENT SUMMARY
LEHIGH RIVER
LACKAWANNA, LUZERNE, MONROE AND WAYNE COUNTIES
APRIL and MAY 2003**

HABITAT PARAMETER	STATIONS ¹												
	1LR Apr-03	2UNT Apr-03	3LR Apr-03	4TMC Apr-03	5FR Apr-03	6LR Apr-03	7SC Apr-03	8AC Apr-03	9BR Apr-03	10LR Apr-03	11SR Apr-03	12PC Apr-03	13LR Apr-03
1. instream cover	17	16	17	16	18	18	18	15	19	16	19	18	19
2. epifaunal substrate	19	19	18	14	18	18	19	18	18	18	16	16	19
3. embeddedness	16	16	11	15	18	12	19	16	19	15	19	18	15
4. velocity/depth	10	10	15	13	10	18	18	15	19	19	17	18	18
5. channel alterations	20	15	19	19	15	20	19	19	20	19	19	7	17
6. sediment deposition	11	18	19	16	18	18	19	19	20	17	19	18	18
7. riffle frequency	9	18	18	16	17	20	19	16	19	16	19	16	17
8. channel flow status	20	20	20	18	19	20	19	19	19	20	19	18	20
9. bank condition	18	19	19	16	16	18	17	19	19	18	19	13	19
10. bank vegetative protection	18	18	16	16	17	19	18	18	19	16	19	13	17
11. grazing/disruptive pressures	20	15	17	15	16	19	19	18	20	18	19	10	18
12. riparian vegetation zone width	20	13	15	12	14	16	18	16	20	18	19	7	17
Total Score	198	197	204	186	196	216	222	208	231	210	223	172	214
Rating ²	OPT	OPT	OPT	SUB	OPT	OPT	OPT	OPT	OPT	OPT	OPT	SUB	OPT

¹ Refer to Figure 1 and Table 1 for the station locations

² OPT=Optimal; SUB=Suboptimal;

**TABLE 3. (CONTINUED)
HABITAT ASSESSMENT SUMMARY
LEHIGH RIVER
LACKAWANNA, LUZERNE, MONROE AND WAYNE COUNTIES
APRIL 14, 15, and MAY 5, 2003**

HABITAT PARAMETER	STATIONS ¹									REFERENCE STATIONS		
	14SSC Apr-03	15BS Apr-03	16TR Apr-03	17TC Apr-03	18TC May-03	19CC May-03	20CC Apr-03	21KC Apr-03	22LR Apr-03	1KCR ² Apr-03	1SWC ³ Apr-03	1DMB ⁴ Apr-03
1. instream cover	15	19	18	13	18	16	16	18	16	18	19	19
2. epifaunal substrate	16	16	18	14	19	18	18	19	18	20	19	19
3. embeddedness	13	17	16	13	15	16	18	19	16	19	18	16
4. velocity/depth	16	10	15	13	15	18	18	17	17	17	19	19
5. channel alterations	18	20	18	20	20	20	18	19	15	18	20	20
6. sediment deposition	15	20	19	18	20	18	19	17	18	16	19	18
7. riffle frequency	17	20	18	12	19	20	18	19	17	19	19	18
8. channel flow status	19	20	19	20	20	20	18	19	20	20	20	20
9. bank condition	18	20	19	18	19	18	16	18	16	15	19	18
10. bank vegetative protection	19	20	20	19	19	19	16	19	17	16	18	19
11. grazing/disruptive pressures	18	20	19	20	20	20	16	19	17	16	20	20
12. riparian vegetation zone width	19	20	19	18	20	20	15	19	16	14	20	20
Total Score	203	222	218	198	224	223	206	222	203	208	230	226
Rating ⁵	OPT	OPT	OPT	OPT	OPT	OPT	OPT	OPT	OPT	OPT	OPT	OPT

¹ Refer to Figure 1 and Table 1 for station locations

²Kettle Creek, Clinton County

³Saw Kill Creek, Pike County

⁴Dimmick Meadow Brook, Pike County

⁵ OPT=Optimal; SUB=Suboptimal;

TABLE 4
BENTHIC MACROINVERTEBRATE TAXA LIST
LEHIGH RIVER
LACKAWANNA, LUZERNE, MONROE AND WAYNE COUNTIES
APRIL and MAY 2003

TAXA	STATION ¹												
	1LR Apr-03	2UNT Apr-03	3LR Apr-03	4TMC Apr-03	5FR Apr-03	6LR Apr-03	7SC Apr-03	8AC Apr-03	9BR Apr-03	10LR Apr-03	11SR Apr-03	12PC Apr-03	13LR Apr-03
Ephemeroptera (mayflies)													
Ameletus; <i>Ameletus</i>													
Baetidae;	1		1										
<i>Acentrella</i>						7							
<i>Acerpenna</i>								2	2			3	1
<i>Baetis</i>							4		2				
Caenidae; <i>Caenis</i>				6									
Ephemeridae; <i>Ephemera</i>				2									
Ephemerellidae;	3												
<i>Attenella</i>										10			
<i>Drunella</i>			7			49		12		16			6
<i>Ephemerella</i>	6	7	3			4	20	26		6		3	26
<i>Eurylophella</i>	8		1			1		4	3	11	10	22	
<i>Serratella</i>			1	7		7	2	7		12			1
<i>Timpanoga</i>													3
Heptageniidae;												1	
<i>Epeorus</i>						7	3	3		3			3
<i>Cinygmula</i>													
<i>Heptagenia</i>						1							
<i>Leucrocuta</i>													
<i>Stenacron</i>						1							1
<i>Stenonema</i>	3					5			5	3			1
Isonychiidae; <i>Isonychia</i>													
Leptophlebiidae	2											1	4
<i>Choroterpes</i>							10						
<i>Leptophlebia</i>													

TAXA	STATION ¹												
	1LR Apr-03	2UNT Apr-03	3LR Apr-03	4TMC Apr-03	5FR Apr-03	6LR Apr-03	7SC Apr-03	8AC Apr-03	9BR Apr-03	10LR Apr-03	11SR Apr-03	12PC Apr-03	13LR Apr-03
<i>Habrophlebia</i>								1	1				
<i>Habrophlebiodes</i>								1					
<i>Paraleptophlebia</i>								21		3		2	2
Plecoptera (stoneflies)													
Capniidae				2									
Chloroperlidae;					1								
<i>Sweltsa</i>													
<i>Suwallia</i>												2	
Leuctridae; <i>Leuctra</i>	6				27		3		4		1	7	
Nemouridae	1												
<i>Amphinemura</i>	1			10	30	1			14		19	1	
<i>Nemoura</i>												1	
<i>Prostoia</i>			4										
<i>Shipsa</i>						1							
Perlidae;							1						
<i>Acroneuria</i>		2	1	1	2	3	1	3	1	3		3	5
<i>Agneta</i>													3
<i>Paragnetina</i>													
<i>Perlesta</i>													1
Perlodidae;													1
<i>Helopicus</i>													
<i>Isoperla</i>	1					1		1	4				2
<i>Isogenoides</i>						1							
Peltoperlidae; <i>Tallaperla</i>									1				
Pteronarcyidae; <i>Pteronarcys</i>													
Taeniopterygidae; <i>Oemopteryx</i>													
<i>Strophopteryx</i>													
Trichoptera (caddisflies)													
Brachycentridae; <i>Micrasema</i>					2					1			3
Glossosomatidae; <i>Glossosoma</i>													
Helicopsychidae; <i>Helicopsyche</i>													

TAXA	STATION ¹												
	1LR Apr-03	2UNT Apr-03	3LR Apr-03	4TMC Apr-03	5FR Apr-03	6LR Apr-03	7SC Apr-03	8AC Apr-03	9BR Apr-03	10LR Apr-03	11SR Apr-03	12PC Apr-03	13LR Apr-03
Hydropsychidae;													1
<i>Cheumatopsyche</i>	2	3	12	6		9	3	2		9	5	1	11
<i>Diplectrona</i>	5				1		6		2			1	
<i>Hydropsyche</i>		1	5	1		4	3	5	1	5		4	15
Hydroptilidae; <i>Hydroptila</i>					1	1			5		6		
<i>Palaeagapetus</i>													
<i>Oxyethira</i>				1					2				
<i>Stactobiella</i>						1							
Leptoceridae;										1			
<i>Ceraclea</i>	1												
<i>Oecetis</i>		1											
<i>Setodes</i>													1
Lepidostomatidae; <i>Lepidostoma</i>					1				1		4	1	
Limnephilidae;											1		
<i>Goera</i>								1					
<i>Pycnopsyche</i>			1									1	
Odontoceridae; <i>Psilotreta</i>										1			
Philopotamidae										1			
<i>Chimarra</i>		1	7	2		1		2		6			
<i>Dolophilodes</i>									1				
Polycentropodidae; <i>Polycentropus</i>													
Psychomyiidae; <i>Lype</i>							1						
Rhyacophilidae; <i>Rhyacophila</i>	1				2	4	2		1	1	2	3	6
Uenoidae; <i>Neophylax</i>					4					1	3		
Other Insect Taxa													
LEPIDOPTERA; <i>Langessa</i>													
DIPTERA (true flies)													
Athericidae; <i>Atherix</i>													
Ceratopogonidae	1												
<i>Alluaudomyia</i>													1
<i>Bezzia</i>				2				3					
Chironomidae	47	43	44	85	21	63	78	93	42	51	11	81	53

TAXA	STATION ¹												
	1LR Apr-03	2UNT Apr-03	3LR Apr-03	4TMC Apr-03	5FR Apr-03	6LR Apr-03	7SC Apr-03	8AC Apr-03	9BR Apr-03	10LR Apr-03	11SR Apr-03	12PC Apr-03	13LR Apr-03
Empididae;			1	1									
<i>Chelifera</i>					3		1						1
<i>Clinocera</i>	1	1				4				1			
<i>Hemerodromia</i>			1	4		1		5	1				1
Psychodidae, <i>Psychoda</i>								1					
Simuliidae; <i>Cnephia</i>				10									
<i>Prosimulium</i>	13	68	104	5	75	5	40	3	87	58	111	54	2
<i>Simulium</i>	37	12	1		2			8	43		20	1	
<i>Stegopterna</i>				8	2				4				
Tabanidae	1												
<i>Chrysops</i>													
Tipulidae; <i>Antocha</i>			2			3	1			1		1	8
<i>Dicranota</i>	1	1		1								2	
<i>Erioptera</i>									1				
<i>Hexatoma</i>							1	7					
<i>Limnophila</i>	1												
<i>Pilaria</i>													
<i>Pseudolimnophila</i>									1				
<i>Tipula</i>													
MEGALOPTERA													
Corydalidae; <i>Corydalus</i>													
<i>Nigronia</i>	6	9		4	1			1	1				
Sialidae; <i>Sialis</i>													
ODONATA (dragon-, damselflies)													
Aeshnidae; <i>Aeshna</i>													1
<i>Boyeria</i>	2	1	2					1					
Calopterygidae; <i>Calopteryx</i>	2												
Cordulegastridae; <i>Cordulegaster</i>	1											1	
Coenagrionidae; <i>Argia</i>													
Gomphidae;								1		2			2
<i>Arigomphus</i>	1												
<i>Gomphus</i>													

TAXA	STATION ¹												
	1LR Apr-03	2UNT Apr-03	3LR Apr-03	4TMC Apr-03	5FR Apr-03	6LR Apr-03	7SC Apr-03	8AC Apr-03	9BR Apr-03	10LR Apr-03	11SR Apr-03	12PC Apr-03	13LR Apr-03
<i>Lanthus</i>													
<i>Ophiogomphus</i>						1			2				
<i>Stylogomphus</i>		1	1										
COLEOPTERA (aquatic beetles)													
Elmidae; <i>Dubiraphia</i>					1								
<i>Macronychus</i>													
<i>Optioservus</i>	3			1	1	2	1	8			3	1	7
<i>Ordobrevia</i>										1			1
<i>Oulimnius</i>					2					3			
<i>Promoresia</i>	5	1		2	4	2	1	1	4		8	3	6
<i>Stenelmis</i>	4			2			2	4					1
Hydrophilidae; <i>Berosus</i>													1
Psephenidae; <i>Ectopria</i>													
<i>Psephenus</i>		2				6		8		14			3
Ptilodactylidae; <i>Anchytarsus</i>	3												
Non-Insect Taxa													
Turbellaria (flat worms)													
Planariidae		1											
Oligochaeta	5	22	13	8	8	13		5	4	7			18
Nematoda				6									
Nemertea													
Hydracarina				1									
GASTROPODA													
Ancylidae						2							
<i>Ferrissia</i>													
Physidae				1									
Sphaeriidae;						3							1
<i>Sphaerium</i>	34		3	17									
<i>Pisidium</i>										1			
Unionidae		24											
AMPHIPODA													
Talitridae; <i>Hyallega</i>				1									

TAXA	STATION ¹												
	1LR Apr-03	2UNT Apr-03	3LR Apr-03	4TMC Apr-03	5FR Apr-03	6LR Apr-03	7SC Apr-03	8AC Apr-03	9BR Apr-03	10LR Apr-03	11SR Apr-03	12PC Apr-03	13LR Apr-03
ISOPODA													
Asellidae													
DECAPODA													
Cambaridae; <i>Cambarus</i>													
Number of taxa in total sample	33	19	22	28	21	32	21	30	28	28	14	25	37

¹Refer to Figure 1 for station location

TABLE 4 (continued)
BENTHIC MACROINVERTEBRATE TAXA LIST
LEHIGH RIVER
LACKAWANNA, LUZERNE, MONROE AND WAYNE COUNTIES
APRIL and MAY 2003

TAXA	STATION ¹									REFERENCE STATIONS		
	14SSC Apr-03	15BS Apr-03	16TR Apr-03	17TC Apr-03	18TC May-03	19CC May-03	20CC Apr-03	21KC Apr-03	26LR Apr-03	1KCR ² Apr-03	1SWC ³ Apr-03	1DMB ⁴ Apr-03
Ephemeroptera (mayflies)												
Ameletidae; <i>Ameletus</i>											1	
Baetidae;												
<i>Acentrella</i>					12							
<i>Acerpenna</i>				2			3					
<i>Baetis</i>	5										1	
Caenidae; <i>Caenis</i>				2								
Ephemeridae; <i>Ephemera</i>				1								
Ephemerellidae;												
<i>Attenella</i>												
<i>Drunella</i>	1				10				14	92	1	
<i>Ephemerella</i>	37			6	18				8	5	51	40
<i>Eurylophella</i>		15	4	3	1	6	4	4	8	1	1	1
<i>Serratella</i>	1				2					14	8	
<i>Timpanoga</i>												
Heptageniidae;												
<i>Epeorus</i>	14				1		1			3	2	13
<i>Cinygmula</i>										2		
<i>Heptagenia</i>												
<i>Leucrocuta</i>							1			5		1
<i>Stenacron</i>				1			2				1	
<i>Stenonema</i>					2				3	3	8	
Isonychiidae; <i>Isonychia</i>									1	1	2	
Leptophlebiidae												
<i>Choroterpes</i>												

TAXA	STATION ¹									REFERENCE STATIONS		
	14SSC Apr-03	15BS Apr-03	16TR Apr-03	17TC Apr-03	18TC May-03	19CC May-03	20CC Apr-03	21KC Apr-03	26LR Apr-03	1KCR ² Apr-03	1SWC ³ Apr-03	1DMB ⁴ Apr-03
<i>Leptophlebia</i>		1		3								
<i>Habrophlebia</i>												
<i>Habrophlebiodes</i>												
<i>Paraleptophlebia</i>							7				5	5
Plecoptera (stoneflies)												
Capniidae												
Chloroperlidae;	1											
<i>Sweltsa</i>	2				1							2
<i>Suwallia</i>												
Leuctridae; <i>Leuctra</i>	1	10	87	1	6	34	19	3				16
Nemouridae	1						3					
<i>Amphinemura</i>		61	17		1	2					2	7
<i>Nemoura</i>								2				
<i>Prostoia</i>			3							9	1	
<i>Shipsa</i>												
Perlidae;												
<i>Acroneuria</i>				1	4	1	2		1	7	3	1
<i>Agnatina</i>	3											
<i>Paragnetina</i>					1							
<i>Perlesta</i>												
Perlodidae;												
<i>Helopicus</i>										1		
<i>Isoperla</i>	1	1	4	2	1		1				2	1
<i>Isogenoides</i>												
Peltoperlidae; <i>Tallaperla</i>	1	1	6				1				1	
Pteronarcyidae; <i>Pteronarcys</i>										3		3
Taeniopterygidae; <i>Oemopteryx</i>											1	
<i>Strophopteryx</i>											1	
Trichoptera (caddisflies)												
Brachycentridae; <i>Micrasema</i>				1	1						1	

TAXA	STATION ¹									REFERENCE STATIONS		
	14SSC Apr-03	15BS Apr-03	16TR Apr-03	17TC Apr-03	18TC May-03	19CC May-03	20CC Apr-03	21KC Apr-03	26LR Apr-03	1KCR ² Apr-03	1SWC ³ Apr-03	1DMB ⁴ Apr-03
Glossosomatidae; <i>Glossosoma</i>									1			
Helicopsychidae; <i>Helicopsyche</i>										3		
Hydropsychidae;												
<i>Cheumatopsyche</i>				3	5				5	1	1	
<i>Diplectrona</i>	1	12	11			1	7	5			1	11
<i>Hydropsyche</i>	2			3	6	1	1	1	4	1	5	
Hydroptilidae; <i>Hydroptila</i>						1	3	17	2			
<i>Palaeagapetus</i>			1									
<i>Oxyethira</i>												
<i>Stactobiella</i>												
Leptoceridae;												
<i>Ceraclea</i>												
<i>Oecetis</i>				1								
<i>Setodes</i>												
Lepidostomatidae; <i>Lepidostoma</i>		9	1				3					1
Limnephilidae;												
<i>Goera</i>												
<i>Pycnopsyche</i>			1	1					1			
Odontoceridae; <i>Psilotreta</i>				1			1					
Philopotamidae;												
<i>Chimarra</i>				7	1	7					1	
<i>Dolophilodes</i>	2										2	
Polycentropodidae; <i>Polycentropus</i>							1					2
Psychomyiidae; <i>Lype</i>												
Rhyacophilidae; <i>Rhyacophila</i>		2	7			4	2	1	2	2	5	2
Uenoidae; <i>Neophylax</i>	1				1					11		
Other Insect Taxa												
LEPIDOPTERA; <i>Langessa</i>										1		
DIPTERA (true flies)												
Athericidae; <i>Atherix</i>	1					1						
Ceratopogonidae		1										1

TAXA	STATION ¹									REFERENCE STATIONS		
	14SSC Apr-03	15BS Apr-03	16TR Apr-03	17TC Apr-03	18TC May-03	19CC May-03	20CC Apr-03	21KC Apr-03	26LR Apr-03	1KCR ² Apr-03	1SWC ³ Apr-03	1DMB ⁴ Apr-03
<i>Alluaudomyia</i>												
<i>Bezzia</i>						1						
Chironomidae	8	36	73	53	45	65	60	19	115	9	41	25
Empididae;												
<i>Chelifera</i>					1							
<i>Clinocera</i>									4	1	1	
<i>Hemerodromia</i>		1			1							
Psychodidae, <i>Psychoda</i>												
Simuliidae; <i>Cnephia</i>												
<i>Prosimulium</i>	82	21	1	77		58	51	10	18	4	24	74
<i>Simulium</i>	1	42	10	25	8	14	3	119			1	
<i>Stegopterna</i>												
Tabanidae;												
<i>Chrysops</i>		1						1				
Tipulidae; <i>Antocha</i>					1				6			
<i>Dicranota</i>						1						1
<i>Erioptera</i>												
<i>Hexatoma</i>	1											3
<i>Limnophila</i>	1											
<i>Pilaria</i>				1								
<i>Pseudolimnophila</i>				1								
<i>Tipula</i>			1	1								
MEGALOPTERA												
Corydalidae; <i>Corydalus</i>							1		1			
<i>Nigronia</i>	1	5	4	7	4	4			2	1		1
Sialidae; <i>Sialis</i>				1		1		1		1		
ODONATA (dragon-, damselflies)												
Aeshnidae; <i>Aeshna</i>												
<i>Boyeria</i>		1					1					
Calopterygidae; <i>Calopteryx</i>												
Cordulegastridae; <i>Cordulegaster</i>												

TAXA	STATION ¹									REFERENCE STATIONS		
	14SSC Apr-03	15BS Apr-03	16TR Apr-03	17TC Apr-03	18TC May-03	19CC May-03	20CC Apr-03	21KC Apr-03	26LR Apr-03	1KCR ² Apr-03	1SWC ³ Apr-03	1DMB ⁴ Apr-03
Coenagrionidae; <i>Argia</i>									1			
Gomphidae;												
<i>Arigomphus</i>												
<i>Gomphus</i>				1					3			
<i>Lanthus</i>										1		
<i>Ophiogomphus</i>					2				1	1	1	
<i>Stylogomphus</i>				1	5						4	
COLEOPTERA (aquatic beetles)												
Elmidae; <i>Dubiraphia</i>				1								
<i>Macronychus</i>					2							
<i>Optioservus</i>	1						5	1		3		
<i>Ordobrevia</i>												
<i>Oulimnius</i>	2				1	10	2		4		4	1
<i>Promoresia</i>	18			16	1	2	1	9	4		14	2
<i>Stenelmis</i>				1	2				10			
Hydrophilidae; <i>Berosus</i>												
Psephenidae; <i>Ectopria</i>					1						1	
<i>Psephenus</i>					3				2	8	2	2
Ptilodactylidae; <i>Anchytarsus</i>												
Non-Insect Taxa												
Turbellaria (flat worms)												
Planariidae												
Oligochaeta				3	2	1	1		14	1		
Nematoda												
Nemertea									2			
Hydracarina												
GASTROPODA												
Ancyliidae;												
<i>Ferrissia</i>					3					1		
Physidae												
Sphaeriidae;					60				5		2	1

TAXA	STATION ¹									REFERENCE STATIONS		
	14SSC Apr-03	15BS Apr-03	16TR Apr-03	17TC Apr-03	18TC May-03	19CC May-03	20CC Apr-03	21KC Apr-03	26LR Apr-03	1KCR ² Apr-03	1SWC ³ Apr-03	1DMB ⁴ Apr-03
<i>Sphaerium</i>												
<i>Pisidium</i>												
Unionidae												
AMPHIPODA												
Talitridae; <i>Hyalleana</i>												
ISOPODA												
Asellidae								1				
DECAPODA												
Cambaridae;							1					
<i>Cambarus</i>										1		
Number of taxa in total sample	26	17	16	31	35	20	28	15	27	31	36	25

¹Refer to Figure 1 for station location

²Kettle Creek, Clinton County

³Saw Kill Creek, Pike County

⁴Dimmick Meadow Brook, Pike County

**TABLE 5
FISHES
LEHIGH RIVER
LACKAWANNA, LUZERNE, MONROE AND WAYNE COUNTIES**

SPECIES NAME	STATION ¹											
	Ash Creek RMI 1.10									Lehigh River		
	Aug 1976	June 1983	July 1985	Oct 1991	June 1992	July 1998	July 1999	June 2000	June 2001	RMI 87.81 July 1997	RMI 89.48 July 1997	RMI 92.82 July 1997
Brown Trout, <i>Salmo trutta</i>	X	X	X	X	X	X	X	X	X	X	X	X
Brook Trout, <i>Salvelinus fontinalis</i>	X	X	X	X	X	X	X	X	X		X	X
Rainbow Trout, <i>Oncorhynchus mykiss</i>												X
White Sucker, <i>Catostomus commersoni</i>						X				X	X	X
Cutlips Minnow, <i>Exoglossum maxillingua</i>						X				X	X	X
Common Shiner, <i>Luxilus cornutus</i>										X	X	X
Golden Shiner, <i>Notemigonus crysoleucas</i>	X											
Blacknose Dace, <i>Rhinichthys atratulus</i>		X	X			X	X			X	X	X
Longnose Dace, <i>R. cataractae</i>		X	X			X				X	X	X
Margined Madtom, <i>Noturus insignis</i>										X	X	X
Largemouth Bass, <i>Micropterus salmoides</i>												X
Pumpkinseed, <i>Lepomis gibbosus</i>											X	X
Bluegill, <i>L. macrochirus</i>											X	
Tessellated Darter, <i>Etheostoma olmstedii</i>						X				X	X	X
TOTAL TAXA	3	4	4	2	2	7	3	2	2	8	11	12

¹ X = Present but abundance not recorded

TABLE 6
RBP METRIC COMPARISON
LEHIGH RIVER
LACKAWANNA, LUZERNE, MONROE AND WAYNE COUNTIES
APRIL and MAY 2003

METRIC	STATION												
	1LR Apr-03	2UNT Apr-03	3LR Apr-03	4TMC Apr-03	5FR Apr-03	6LR Apr-03	7SC Apr-03	8AC Apr-03	9BR Apr-03	10LR Apr-03	11SR Apr-03	12PC Apr-03	13LR Apr-03
1. TAXA RICHNESS	33	19	22	28	21	32	21	30	28	28	14	25	37
Cand/Ref (%)	132.0	76.0	88.0	112.0	84.0	88.9	84.0	120.0	100.0	77.8	56.0	100.0	119.4
Biol. Cond. Score	8	6	8	8	8	8	8	8	8	7	0	8	8
2. MOD. EPT INDEX	12	3	8	7	9	17	10	11	13	16	7	14	17
Cand/Ref (%)	85.71	21.43	57.14	50.0	64.29	77.27	71.43	78.75	92.86	72.73	50.0	100.0	106.25
Biol. Cond. Score	8	0	2	1	4	7	6	7	8	6	1	8	8
3. MOD. HBI	5.075	4.358	3.82	5.685	2.843	3.977	3.712	4.108	3.846	3.582	3.029	3.828	4.278
Cand-Ref	3.103	2.386	1.848	3.713	0.871	1.135	1.74	2.136	1.874	0.74	1.057	1.856	2.364
Biol. Cond. Score	0	0	0	0	6	3	0	0	0	7	3	0	0
4. % DOMINANT TAXA	22.17	33.83	47.93	43.15	39.27	29.44	42.39	38.75	36.25	25	54.41	39.71	25.36
Cand-Ref	-11.93	-0.27	13.83	9.05	5.17	4.32	8.29	4.65	2.15	-0.12	20.31	5.61	-21.34
Biol. Cond. Score	8	8	6	8	8	8	8	8	8	8	2	8	8
5. % MOD. MAYFLIES	10.38	3.483	5.53	4.569	0	9	19.02	30.83	3.75	27.59	4.902	14.22	24.88
Cand-Ref	17.27	24.17	22.12	23.08	27.65	30.41	8.63	-3.18	23.9	11.82	22.75	13.43	39.08
Biol. Cond. Score	6	4	5	5	4	3	8	8	4	8	5	7	0
TOTAL BIOLOGICAL CONDITION SCORE	30	18	21	22	30	29	30	31	28	36	11	31	24
% COMPARABILITY TO REFERENCE	75	45	52.5	55	75	72.5	75	77.5	70	90	27.5	77.5	60

TABLE 6 (continued)
RBP METRIC COMPARISON
LEHIGH RIVER
LACKAWANNA, LUZERNE, MONROE AND WAYNE COUNTIES
APRIL 14, 15, and MAY 5, 2003

METRIC	STATION									REFERENCE STATIONS		
	14SSC Apr-03	15BS Apr-03	16TR Apr-03	17TC Apr-03	18TC May-03	19CC May-03	20CC Apr-03	21KC Apr-03	22LR Apr-03	1KCR ¹ Apr-03	1SWC ² Apr-03	1DMB ³ Apr-03
1. TAXA RICHNESS Cand/Ref (%) Biol. Cond. Score	26 104.0 8	17 68.0 3	16 64.0 2	31 124.0 8	35 97.2 8	20 80.0 7	28 112.0 8	15 60.0 1	27 87.1 8	31 8	36 8	25 8
2. MOD. EPT INDEX Cand/Ref (%) Biol. Cond. Score	14 100.0 8	9 64.3 4	11 78.6 7	12 85.7 8	16 72.7 6	7 50.0 1	14 100.0 8	5 35.71 0	9 56.25 2	16 8	22 8	14 8
3. MOD. HBI Cand-Ref Biol. Cond. Score	1.947 -0.025 8	3.641 1.669 0	2.623 0.651 8	3.846 1.874 0	5.032 2.19 0	3.498 1.526 0	3.33 1.358 0	5.242 3.27 0	4.992 3.078 0	1.914 8	2.842 8	1.972 8
4. % DOMINANT TAXA Cand-Ref Biol. Cond. Score	43.16 9.06 8	27.73 -6.37 8	37.66 3.56 8	33.77 -0.33 8	27.78 2.66 8	30.23 -3.87 8	31.91 -2.19 8	61.34 27.24 0	47.92 1.22 8	46.7 8	25.12 8	34.1 8
5. % MOD. MAYFLIES Cand-Ref Biol. Cond. Score	27.89 -0.24 8	7.273 20.38 5	1.732 25.92 4	6.14 21.51 5	21.3 18.11 6	2.791 24.86 4	7.979 19.67 6	2.062 25.59 4	14.17 49.79 0	63.96 8	39.41 8	27.65 8
TOTAL BIOLOGICAL CONDITION SCORE	40	20	29	29	28	20	30	5	18	40	40	40
% COMPARABILITY TO REFERENCE	100	50	72.5	72.5	70	50	75	12.5	45			

¹ Kettle Creek, Clinton County

² Saw Kill Creek, Pike County

³ Dimmick Meadow Brook