10. Watershed Conservation Prioritization

By combining data from many parts of the Aquatic Community Classification project, we are able to highlight unique riverine conditions that designate certain watersheds to be of greater conservation concern than others. Conventional conservation prioritization may point to a single occurrence of a natural feature, such as the presence of a rare fish species or a high-quality mussel assemblage. However, watersheds that hold multiple traits of conservation value should be set apart as a higher protection priority.

We combined many aspects of stream condition to determine all-inclusive conservation values for watersheds across Pennsylvania. Information was integrated from the biological community classification, fish and macroinvertebrate biological metric scores, and results from our least-disturbed stream (LDS) reach analysis (Chapter 9).

The ACC biological community information provides a qualitative way to examine watersheds based on biological assemblages and the various stream habitat types that occur within it. We performed this analysis with only communities that indicate quality habitat conditions (Table 11-1), which allowed us to select stream reaches with relatively unaltered habitat condition. See chapters 4 through 7 for more information about community groups, their respective habitat types, and the water quality conditions in which they are found.

Biological metric calculations provide a way to quantitatively rank streams and watersheds related to habitat and water quality and how closely the biotic assemblages reflect natural ecological function. Both fish and macroinvertebrate data were used for metric scores in this analysis; these calculations are discussed in detail in the *Fish and Macroinvertebrate Metric Scores* section of this chapter. These metric calculations are similar to those used in Indices of Biotic Integrity (IBI), which are commonly used to synthesize data about water quality, biological diversity, and natural ecological function (Bode et al. 1996).

The results of the LDS analysis were used here to select watersheds that contained the greatest number of relatively undisturbed stream reaches in the study area. The stratification of LDS reaches by size allows for different criteria for various stream sizes. This way, the same criteria are not applied to both headwater streams and larger rivers, which generally face different types and levels of impairment. By using the LDS results in this conservation prioritization analysis, we are able to include qualitative data based solely on abiotic conditions of stream reaches in both local and total upstream catchment areas.

First Fork Sinnemahoning Creek in Potter Co., PA, is in an exceptionally high quality watershed. It is a prime example of a 'Tier 1' priority conservation area.

Methodology

For this investigation, we used the United States Geological Survey's HUC12 small watersheds (average size ~30 mi^2) as units of land to summarize data. Watersheds at this scale are small enough to have comparable stream types and biological assemblages, yet are still an appropriate size to be used for project areas. To determine which HUC12s were of greatest conservation priority, we associated three types of data with each: high quality biological communities (Table 10-1), fish and macroinvertebrate metric data, and information from LDS analysis (Chapter 9). All data were stratified by stream size (small, <10 mi^2 watershed area; medium, 11-100mi^2; and large, >100mi^2), so that watersheds that were unique for small-stream features could be separated from those that were unique because of large-stream features.

To select the watersheds that were of greatest conservation value, each watershed was categorized as 'Tier 1', 'Tier 2', or 'non-priority' for each of the three variables. Tier 1 status for a particular variable indicates that the watershed is in the 90th percentile or greater for that particular

variable; i.e., tier 1 represents the best 10% of all stream reaches. Those in between the 80th-90th percentiles were identified as 'Tier 2'. Watersheds that fell below the 80th percentile for a variable did not receive a ranking for that particular variable.

The tier rankings for all four categories were combined to determine comprehensive tier designations for all watersheds. A watershed was designated as Tier 1 if it was represented by Tier 1 occurrences of quality communities, LDS reaches *and* fish or macroinvertebrate metric scores. Tier 2 watersheds were selected as such if they had either Tier 1 or Tier 2 occurrences of all three of these data types, but not Tier 1 occurrences in all three data types (Table 10-2, Figure 10-1). More details on tier calculations are given in the following sections.

Dataset Descriptions

High Quality Communities

A count of biological communities that indicate high-quality streams and watersheds (Table 10-1) were summarized by HUC12 watershed. The counts of communities in each HUC12 were used to designate tier rankings for each watershed. Mussel communities were only used in the large stream category, as that is where most of the mussel data were located.

Community types were assigned to the stream sizes that they commonly represent. This ensured that watersheds would be included if they exhibited quality small stream, quality medium-sized stream and/or quality large river habitats, which may not necessarily occur together (Table 10-1).

Fish and Macroinvertebrate Metric Scores

Fish and macroinvertebrate data were compiled from the ACC database and used to calculate metrics that reflect variations in biodiversity, water quality and stream function (Tables 10-3, 10-4). Fish data were only associated with streams having watersheds greater than 10 mi^2, since small streams do not usually sustain diverse fish assemblages.

The macroinvertebrate metric calculations were adapted from the New York state Index of Biological Integrity (Bode et al. 1996). An IBI is a way to score the quality of streams based on the resident biological assemblages. Generally, the index is made up of several metrics that provide information about various aspects of biological communities. At the time of completion of this report, Pennsylvania's IBI is in development by the PA Department of Environmental Protection. Bode's (et al. 1996) IBI is a widely accepted index and was used in the absence of a completed Pennsylvania version. The metrics calculated here were modified slightly, to accommodate the presence-only format of data used in this analysis (Table 10-4).

The fish and macroinvertebrate metric calculations were done separately and treated as independent measures of watershed condition. After calculation of individual metrics, the scores were normalized so that each metric would weigh equally into one composite multi-metric score for every stream reach. HUC12 watersheds containing fish or macroinvertebrate metric scores that ranked in the 90th percentile were given Tier 1 status, respectively. Watersheds in the 80th-90th percentile were given Tier 2 status in the biological metric category (Table 10-2).

Table 10-3. Metrics used in the calculations of fish data to determine the quality of habitat in HUC12 watersheds, and the response of each metric to increasing levels of disturbance (in parentheses).

Metric	Description
Total Taxa	Number of species of fish present in sample (decrease)
# Intolerant Taxa	Number of fish species generally intolerant to organic pollution (decrease)
# Tolerant Taxa	Number of fish species generally tolerant to organic pollution (increase)
Native Taxa	Number of fish species in sample that are native to the drainage (decrease)
Non-native Taxa	Number of fish species in sample that are not native to the drainage (increase)
Darter & Perch Taxa	Number of fish species in sample from the Darter and Perch group (Percidae) (decrease)
Minnow Taxa	Number of fish species in sample from the Minnow family (Cyprinidae) (decrease)
Sucker Taxa	Number of fish species in sample from the sucker family (Catostomidae) (decrease)
Sunfish Taxa	Number of fish species in sample from the sunfish family (Centrarchidae) (decrease)
% Similarity to Ref Reaches	Measure of similarity of the 9 above metrics to the mean metric scores of similar sized streams in the study area. (decrease)

Table 10-1. Biological communities used to indicate quality streams and watersheds in the conservation prioritization analysis. See the community summaries in Chapters 4-7 for more information on community types. The "Stream Size" field relates to the size of stream that each community is associated with for the conservation prioritization analysis. (HQ = high quality; MI = 'macroinvertebrate'; Stream Sizes refer to watershed size: Small, 0-10 mi^2; medium, 11-100 mi^2; large = >100 mi^2)

Community Name	Representative Taxa	Stream Size
Mussels		
Delaware Basin		
Eastern Elliptio	*Elliptio complanata*, *Villosa iris*	Large
Other	Rare mussel species	Small
Ohio – Great Lakes Basins		
Pink Heelsplitter	*Potamilus alatus*	Large
Fluted Shell	*Lasmigona costata, Ptychobranchus fasciolaris*	Large
Fatmucket	*Lampsilis siliquoidea, Pyganodon grandis*	Large
Spike	*Elliptio dilatata, Ligumia recta*	Large
Susquehanna – Potomac River Basins		
Lanceolate Elliptio	Lanceolate *Elliptio* complex	Large
Squawfoot	*Strophitus undulatus*	Large
Yellow Lampmussel	*Lampsilis cariosa*	Large
Macroinvertebrates		
Genus-level		
HQ Small Stream	*Epeorus, Oulimnius*	Medium
HQ Headwater Stream	*Amphinemura, Lepidostoma*	Small
HQ Large Stream	*Drunella, Acentrella*	Medium
Forested Headwater Stream	*Alloperla, Tipula*	Small
Family-level		
Mid-Sized HQ Stream	Isonychiidae, Philopotamidae	Medium
HQ Headwater Stream	Leuctridae, Baetidae	Medium
Common Large Stream	Nemouridae, Ameletidae	Medium
HQ Mid-Reach Stream	Chloroperlidae, Pteronarcyidae	Medium
Fish		
Atlantic Basin		
Warmwater Community 1	central stoneroller, northern hogsucker	Large
Warmwater Community2	redbreast sunfish, rock bass	Large
Coldwater Community	brook trout, brown trout	Small
Lower Del. River Community	white perch, channel catfish	Large
Ohio – Great Lakes Basin		
Large River Community	channel catfish, sauger	Large
Warmwater Community 1	greenside darter, northern hogsucker	Large
Coldwater Community	brook trout, mottled sculpin	Small

Table 10-2. Criteria used in ranking small watersheds and large river reaches for Tier 1 or Tier 2 conservation status. Fields containing "--" indicate that data were not calculated for that category; in French Creek, there were not enough LDS reaches to validate using them in the analysis, and there were no Tier 2 criteria calculated for the large river analysis. Tiers across all categories were developed so that each tier would represent the top 10% (90^{th} – 100^{th} percentile, Tier 1) and 80^{th}-90^{th} percentiles (Tier 2), respectively, for each category.

Conservation Target	Quality Community Tier Criteria		Fish & Macroinvertebrate Metric Tier Criteria		LDS Tier Criteria		Overall Criteria for Tier 1 Watershed/River Reach	Overall Criteria for Tier 2 Watershed/River Reach
	Tier 1	Tier 2	Tier 1	Tier 2	Tier 1	Tier 2	Tier 1	Tier 2
Region-Wide Watersheds	Multiple stream reaches with quality community occurrences in watershed	At least one stream reach with quality community occurrences in watershed	At least one stream reach with either fish or MI metric score above 90th percentile in watershed	At least one stream reach with either fish or MI metric score in the 80th-90th percentile in watershed	Multiple LDS stream reaches of any size in watershed	At least one LDS reach of any size in watershed	Watershed has Tier 1 LDS, Tier 1 Metric and Tier 1 Community rankings	Watershed has Tier 1 or 2 LDS, Tier 1 or 2 Metric and Tier 1 or 2 Community rankings - no overlap w/ Tier 1 watersheds
French Creek	Multiple stream reaches with quality community occurrences in watershed	At least one stream reach with quality community occurrences in watershed	same as above	same as above	--	--	Watershed with 5 or more quality mussel communities and multiple Tier 1 fish or macroinvertebrate metrics; best professional judgment of French Creek ecologists	Watershed with quality mussel communities and at least one Tier 1 fish or macroinvertebrate metrics occurrence; best professional judgment of French Creek ecologists
Calcareous Geology	10 or more community occurrences per watershed	1-9 community occurrences per watershed	same as above	same as above	Multiple calcareous geology LDS stream reaches of any size in watershed	At least one calcareous geology LDS reach of any size in watershed	Watersheds with any Calcareous Geology LDS reaches of any size, at least one quality community occurrence of any taxa type and at least one Tier 1 biological metric score; or, watersheds with any region-wide LDS reaches	Watersheds with any two of the following three criteria: any calcareous geology LDS reaches, any Tier 1 biological metric reaches or any quality community occurrences
Piedmont Physiographic Region	Any occurrences of quality community types	--	same as above	same as above	Multiple LDS stream reaches of any size in watershed	At least one LDS reach of any size in watershed	Watersheds with region-wide LDS reaches of any size, Piedmont Community Tier 1 ranking and Peidmont Biological Metric Tier 1 Ranking; Or, and watersheds with size 3 or 4 Piedmont LDS reaches	Watersheds with either LDS reaches or with Tier 1 ranked Community occurrences and metric scores
Waynesburg Hills Physiographic Region	Multiple stream reaches with quality community occurrences in watershed	At least one stream reach with quality community occurrences in watershed	same as above	same as above	Greater than 7 Waynesburg Hills LDS reaches	Greater than 2 Waynesburg Hills LDS reaches	Watershed with more than one quality community occurrence, more than one Tier 1 biological metric stream reach and 7 or more Waynesburg Hills LDS reaches	Watershed with at least one quality community occurrence, at least one Tier 1 biological metric stream reach and 2 or more Waynesburg Hills LDS reaches
Large Rivers	All 3 community taxa types are present in river reach	--	Either fish or MI metric scores above 90th percentile for large river metric scores	--	--	--	Either Large River Tier 1 for both metric scores & community criteria or best professional judgement/ expert opinion	--

Table 10-4. Metrics used in the calculations of macroinvertebrate data to determine the quality of habitat in HUC12 watersheds, and the response of each metric to increasing levels of disturbance (in parentheses). Adapted from Bode et al. (1996.)

Bode (1996)	ACC (2007)	Description of ACC calc.
Species Richness, Species Diversity	Taxa Richness	# of different genera present. (decrease)
EPT Richness	EPT Richness	# of different EPT genera present. EPT stands for Ephemeroptera (mayflies), Plecoptera (stoneflies) and Trichoptera (caddisflies). Individuals from these three insect classes are generally most sensitive to water pollution and habitat alteration. (decrease)
NCO Richness (number of Chironomidae and Oligochaeta taxa)	Proportion of class Insecta taxa	Relative proportion of organisms in class Insecta (alternative to a non-insect taxa metric). These taxa are generally less sensitive to water pollution and habitat alteration than many other groups of macroinvertebrates. (increase)
HBI	Modified HBI	The Hillsenhoff Biotic Index (Hillsenhoff, 1987) assigns a score to streams based on the tolerance of resident macroinvertebrates to organic pollution. The modified HBI here was calculated using presence data - each taxon present receiving a "1" for abundance. (increase)
PMA (% model affinity)	% Similarity to Reference stream scores	This metric was calculated by comparing the values of the above four metrics to the mean values of these metrics that are found in LDS reaches of the same size: small (0-10 mi^2 watershed area), medium (11-100 mi^2) or large (>100 mi^2). This is calculated with the assumption that biotic assemblages from LDS streams represent assemblages functioning as naturally as possible in the study area. (decrease)

Least Disturbed Streams (LDS)

LDS reaches were divided into the original four size classes (Chapter 9), plus an additional "large river" category that includes all stream segments with watersheds greater than 2000 mi^2. This was done to select relatively intact sections of large rivers, which were not well represented in the original size four LDS category. A separate set of LDS criteria were developed for the large river category (Table 10-5). Only 22 HUC12s had large river LDS segments in them; these watersheds all received a 'Tier 1' ranking in this category since a relatively undisturbed large river signifies a unique resource for this region.

Table 10-5. Least-Disturbed Stream (LDS) criteria for large rivers (watersheds greater than 2000 mi^2). See LDS Chapter (9) for more information about LDS analysis.

Variable	Criteria
% Catchment Urbanization	<1.5%
% Catchment Forest	>75%
% Catchment Agriculture (Non-row Crop)	<17%
% Catchment Agriculture (Row Crop)	<3.5%
# Catchment Point Sources	<200
# Catchment Road Crossings	<11,500
# Catchment Dams	<160

Alternative Conservation Prioritization Analyses

Some areas were not well represented in the results of the analysis described above. Separate investigations were done to capture these areas, which may be of unconventional conservation concern. These areas include the biologically significant French Creek watershed, which is known around the region as a resource of remarkable biological diversity. Areas that might face uncommon kinds or levels of disturbance were included as well: calcareous geology dominated stream systems, the Piedmont and Waynesburg Hills physiographic regions, and large river systems.

Large River Conservation

Large rivers are often used for cargo transport, drinking water supplies and recreation. They frequently receive sewage treatment plant effluent near cities and larger towns. Larger rivers are also the recipients of various insults to water quality that occur in their tributaries. For these reasons, an abiological approach to finding the best conditions becomes difficult. For example, the Ohio River below Pittsburgh, PA has roughly 7,000 point-source discharges and 37,000 road crossings in the entire catchment. However, despite having inflated abiotic disturbance values, large rivers can still sustain functioning biological communities that have adapted to adverse conditions such as these. This

biological large river analysis provides different information than the abiotically driven LDS large river analysis described above (Table 10-5). This large-river biological analysis indicates where biological assemblages are functioning in a relatively natural way, regardless of abiotic stresses or water quality condition.

In order to select the best large river habitat remaining in the region, we used only biological data and excluded the abiotic data that was used for other streams in the LDS analysis. We divided large rivers (stream reaches with >2000 mi^2 watershed area) into segments defined by HUC12 watershed boundaries (232 segments in the study area). Biological community and metric data were joined with each river segment using GIS.

Large river reaches were selected as a conservation priority if they had 1) occurrences of quality community types from all three groups – mussels, macroinvertebrates and fish, and 2) fish or macroinvertebrate metric scores above the 90^{th} percentile for all large river reaches (Table 10-2). Alternatively, some reaches of large rivers were selected as a conservation priority as a result of the recommendations from regional experts that were familiar with individual river systems.

Nearly 40 river reaches were selected, totaling approximately 300 miles of high quality riverine habitat. The Allegheny River appears to hold the best large-river habitat in the region. This river has the greatest number of, and most continuous, high-quality large-river reaches (Figure 10-1).

French Creek

French Creek (Ohio River basin) is perhaps the most ecologically significant waterway in the region, containing the most diverse fish and mussel assemblages of any stream in the northeast United States. The watershed is known to harbor over 80 species of fish and 27 native species of freshwater mussels, in addition to numerous species of native plants and wildlife (WPC 2003).

Despite these facts, no parts of the French Creek mainstem or watershed were selected in our conservation prioritization analysis. This may be due to elevated levels of agriculture in northwest Pennsylvania. High amounts of agricultural land likely excluded these streams from the LDS criteria, as they are based on land cover statistics. Additionally, the entire French Creek watershed is roughly 1200 mi^2, which excluded this stream from the large river analysis.

We feel that there is ample evidence to justify the inclusion of French Creek as a conservation priority. The biological resources in the mainstem and several tributaries are far too exceptional to go unprotected. By conducting a separate analysis of the French Creek watershed, we hope to facilitate both ongoing and future conservation work in this immeasurably valuable river basin.

French Creek is one of the most biologically diverse aquatic systems in the region.

In order to select the most biologically important areas of the French Creek watershed, mussel community, fish metric and macroinvertebrate metric data were used (see *Fish and Macroinvertebrate Metric Scores* section in this chapter for description of metric calculations). HUC12 watersheds that had quality mussel community locations (Table 10-1), top 10% fish metric (Table 10-3) stream reaches *and* top 10% macroinvertebrate metric stream reaches (Table 10-4) were defined as Tier 1 (Table 10-2). Watersheds were designated as Tier 2 if they possessed two of those three attributes (Figure 10-2). Comments from PNHP aquatic ecologists familiar with the French Creek ecosystem were incorporated into this analysis as well.

The results of this analysis highlight nearly the entire mainstem of French Creek for protection. They also highlight some of the tributaries that are also important for their biological diversity. Muddy, LeBouf and Coneauttee Creeks, and French Creek – South Branch all appear to be tributaries that particularly contribute to the biodiversity and overall uniqueness of this system.

Calcareous Geology Streams

Calcareous geology (limestone and dolomite) is common in the valleys across southern Pennsylvania. In the ACC study area, it is also found in sections of the upper Susquehanna River drainage in New York (Figure 8-1). Calcareous geology generally leaves unique chemical signatures in stream water that flows through it, altering water chemistry and resident biological assemblages. Streams affected by calcareous geology generally show high alkalinity and conductivity values. However, since calcareous geology generally provides land well suited for agriculture, these values can be inflated due to advanced agricultural and urban development pressure in the watershed.

Because calcareous streams represent a unique condition of habitat almost always altered by human disturbance, we have separated them out for analysis to select watersheds holding the best calcareous-stream habitat that is left in the region. The same high quality community, biological metric, and LDS data were used in this analysis, but the rankings were modified to reflect the distinct conditions present in these watersheds. LDS reaches from the region-wide analysis were combined with the specialized calcareous geology LDS reaches (Chapter 9).

Out of 419 HUC12 watersheds that have greater than 25% calcareous geology, 30 were determined to be Tier 1, and 24 were selected as Tier 2 (Figure 10-3). Tier 1 watersheds have quality community occurrences, high-scoring fish or macroinvertebrate metric streams, and LDS stream reaches (either region-wide or calcareous geology LDS reaches). Tier 2 watersheds have streams that qualify in any two of these categories (Table 10-2).

Piedmont Streams

The Piedmont physiographic region (Figure 9-2) is located in the southeast corner of Pennsylvania. It is an area that has a long history of human habitation and, consequently, alteration of the landscape and watersheds. Streams in this region have undergone a widespread removal of native streamside vegetation. This has occurred either directly via timber harvest or land development, or indirectly through events related to human habitation such as the introduction of invasive species or disease-driven changes like American Chestnut Blight or American Elm Disease (Sweeny 1992). Agricultural practices are also prominent in the Piedmont region. Agricultural lands that are poorly buffered can add excess nutrients and sediments to streams, which can further degrade water quality and habitat condition for stream organisms.

The increased levels of land development in the Piedmont region, coupled with some unique geology types located there (namely crystalline silicic and crystalline mafic geology types), led us to a separate analysis to determine which streams and watersheds are the closest to naturally-functioning for this region.

HUC12 watersheds in the Piedmont region were designated as a Tier 1 conservation priority if they had Least-Disturbed Stream (LDS) reaches, high-scoring fish or macroinvertebrate biological metric stream reaches, and quality aquatic community occurrences within them. Tier 2 watersheds are represented by variables from two of these three categories. Watersheds were also included in the Tier 1 category if they held Size Large or Medium Piedmont-specific LDS reaches, since they are a rarity in the region (Figure 10-4). These cut-off values were selected so that quality aquatic habitats in the Piedmont region above the 90^{th} percentile would be Tier 1 priority, and those values in the 80^{th}-90^{th} percentiles would be Tier 2 (Table 10-2).

Waynesburg Hills Streams

The Waynesburg Hills Physiographic section is located in southwest Pennsylvania (Figure 10-2). This area (namely Greene and Washington Counties and part of Fayette County) has a long history of coal mining and agriculture that has left streams in this region in a unique state of degradation. Washington County, for example, leads Pennsylvania in sheep and goat farming (WPC 2005). In addition to other alterations to the landscape, calcareous geology is also prominent in this area. This type of geology leads to a host of other water quality and condition issues, as discussed above.

Despite the prevalence of agriculture, coal mining may be the activity that best defines the Waynesburg Hills Physiographic region. Greene and Washington Counties are the first and second leading coal-producing counties in the state, respectively (WPC 2005; Greene County website 2007). The portion of Fayette County in the Waynesburg Hills section has a long history

of coal production, as it was part of the "Connellsville Coke Region," which fueled the steel mills of Pittsburgh for roughly 100 years, ending in 1970 (www.coalandcokepsu.org).

Abandoned coal mines and other mining activities can cause acidic and/or metal-laden discharges (abandoned mine drainage, or AMD) to flow into streams. AMD streams are characterized by a reddish-orange appearance. This can often create toxic waters and pH values outside the range acceptable for most aquatic animals. Although some recovery is possible, AMD remediation in streams can be a very costly process.

Toby Creek in Clarion Co., PA, is an example of a stream that is affected by Abandoned Mine Drainage (AMD).

In order to find the best remaining quality streams and watersheds in the Waynesburg Hills Physiographic province, quality community locations were combined with high-scoring fish and macroinvertebrate metric stream reaches and the Waynesburg Hills LDS reaches. HUC12 watersheds were selected to be of Tier 1 conservation priority if they contained multiple stream reaches with a quality community, multiple reaches with high-scoring biological metric scores and seven or more Waynesburg Hills LDS reaches. A watershed was Tier 2 if it held at least one stream reach with a quality community, at least one reach with a quality biological metric score and two or more Waynesburg Hill LDS reaches. These cut-off values were chosen in order to determine the watersheds that held the top 10% quality aquatic habitat in the area (Tier 1) as well as those in the 80^{th}-90^{th} percentile (Tier 2) (Table 10-2, Figure 10-4).

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Related Shapefiles:

Conservation_HUC12s.shp
ACC_LDS_reaches.shp
Large_River_Conservation_reaches.shp
French_Creek_Conservation_HUC12s.shp
Piedmont_Conservation_HUC12s
Piedmont_LDS_reaches.shp
WaynesburgHills_Conservation_HUC12s
WaynesburgHills _LDS_reaches.shp
CalcareousGeol_Conservation_HUC12s
CalcareousGeol _LDS_reaches.shp
All biological community shapefiles

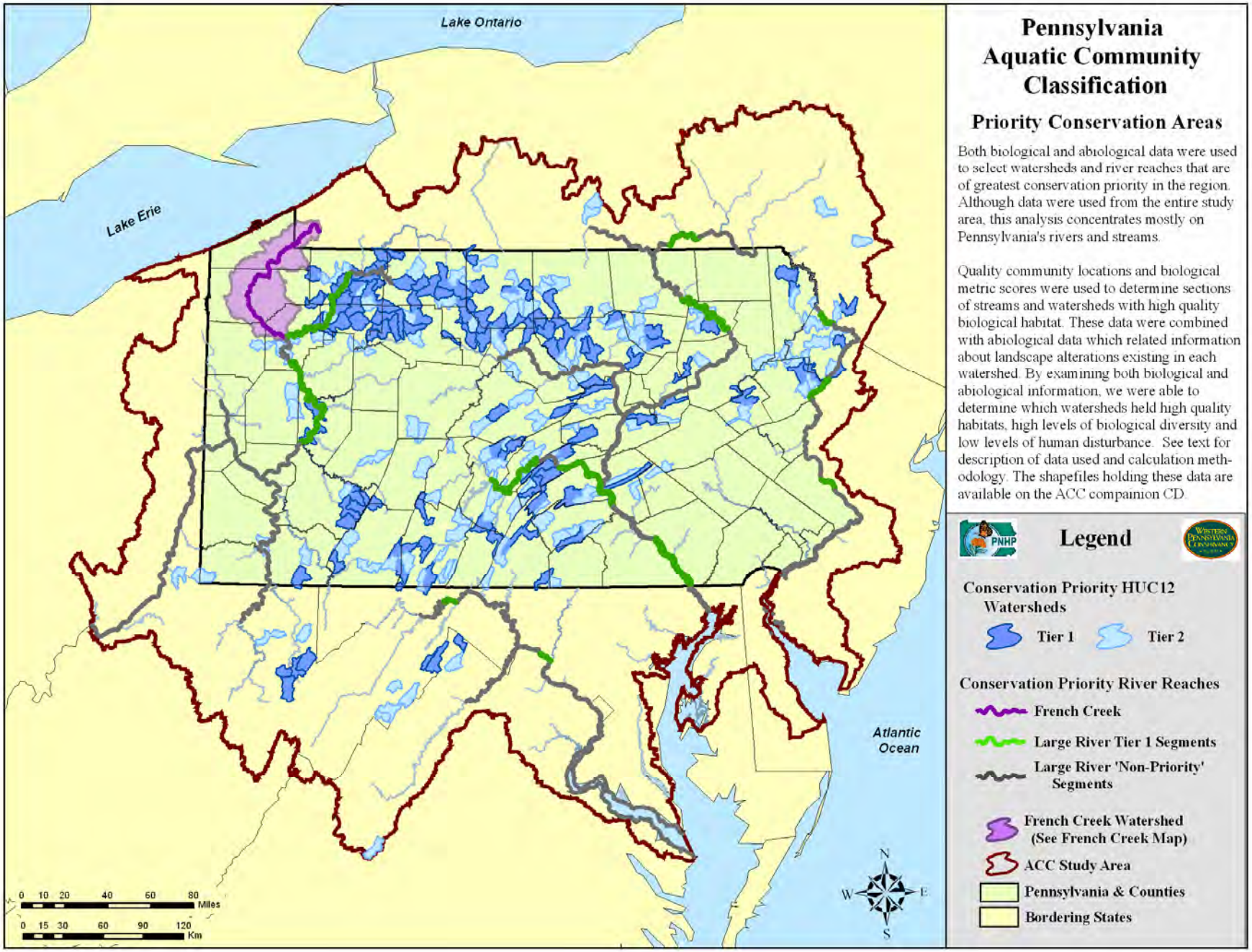

Figure 10-1. Conservation priority areas for Pennsylvania and surrounding watersheds. See text for description of analyses used to select priority HUC12s, large river segments, and the French Creek watershed.

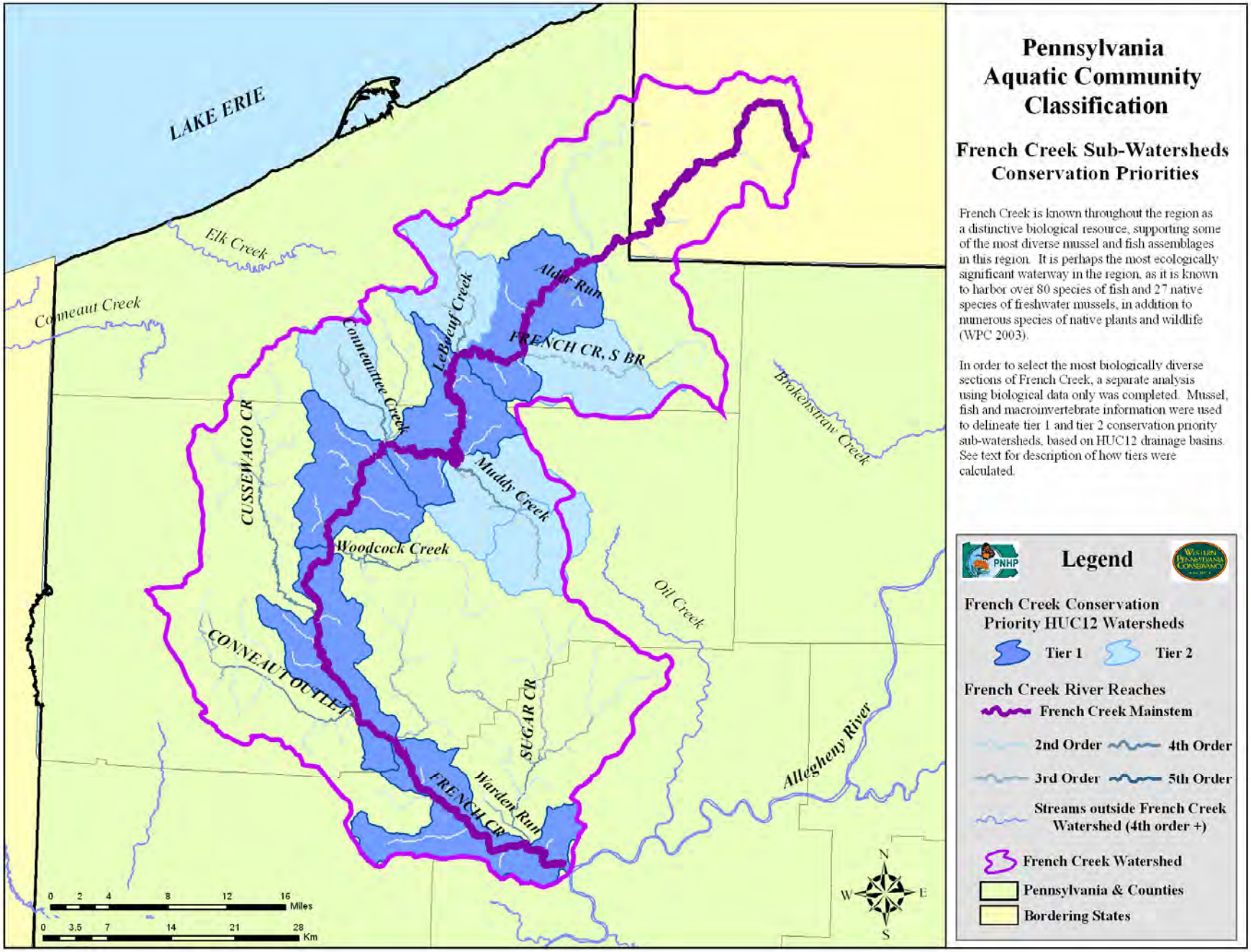

Figure 10-2. Conservation priority areas for the French Creek watershed. See text for description of separate analyses used to select priority HUC12s within this watershed.

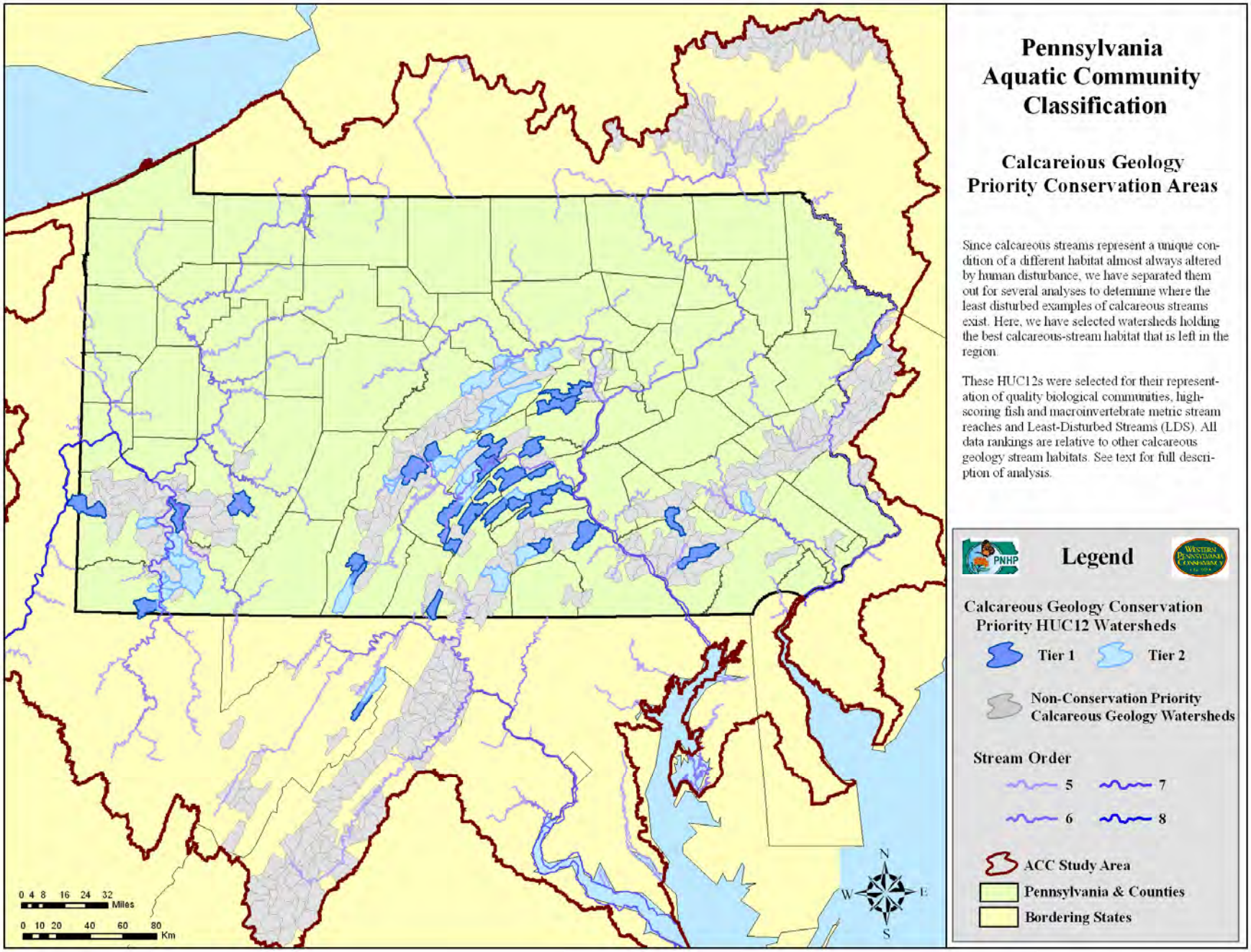

Figure 10-3. Conservation priority areas for calcareous geology watersheds. See text for description of separate analyses used to select priority HUC12s within this watershed.

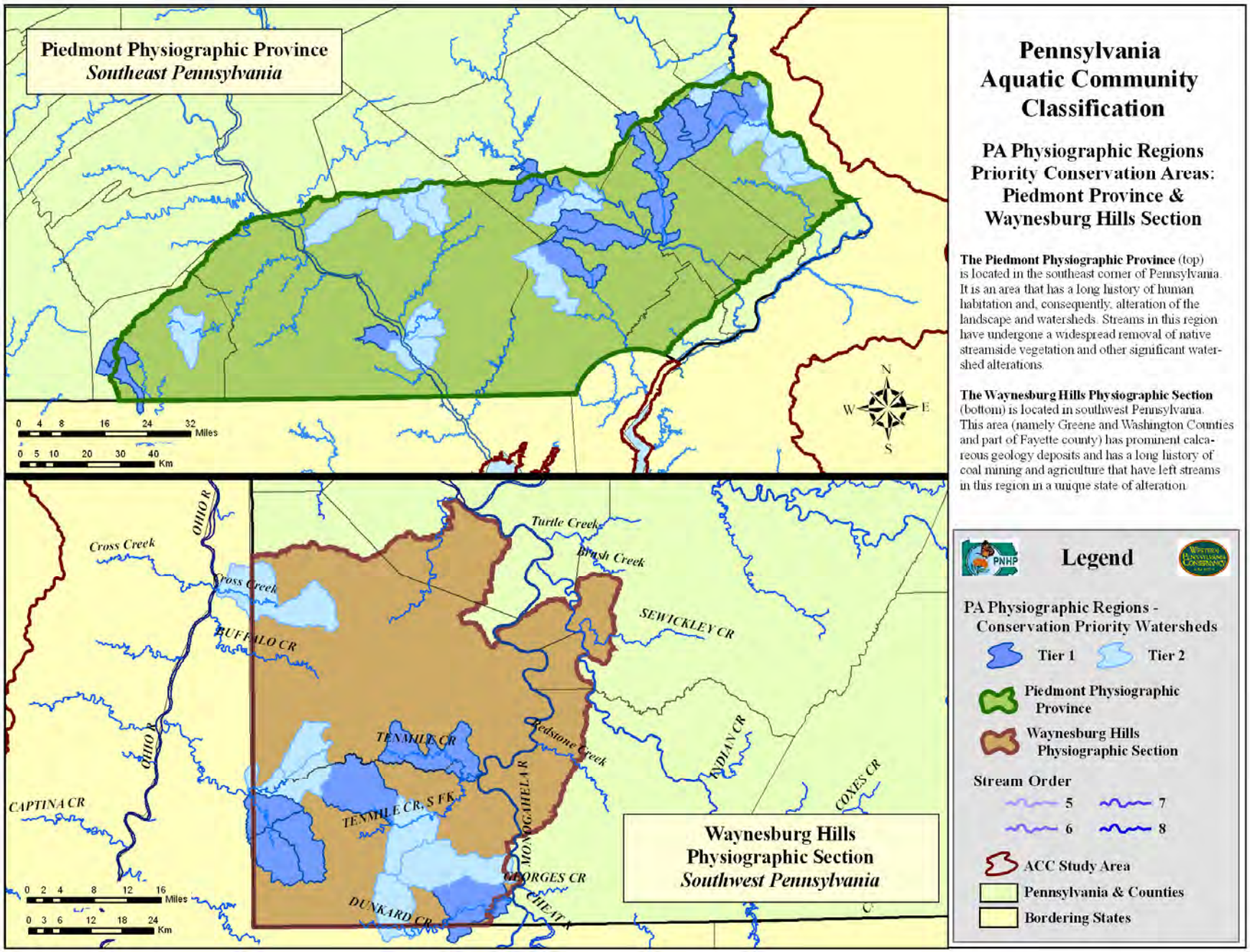

Figure 10-4. Conservation priority watersheds in the Piedmont and Waynesburg Hills Physiographic regions. See text for description of separate analyses used to select priority HUC12s within this watershed.