

Pennsylvania Coastal and Estuarine Land Conservation Plan

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**Prepared by the:
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I. INTRODUCTION

1.1 Background on the Program

The Coastal and Estuarine Land Conservation Program (CELCP or CELC Program) was created by an Act of Congress in 2002 to provide funding for coastal land conservation. The Department of Commerce, Justice, and State Appropriations Act of 2002 (Public Law 107-77), directed the Secretary of Commerce to establish a Coastal and Estuarine Land Conservation Program “for the purpose of protecting important coastal and estuarine areas that have significant conservation, recreation, ecological, historical, or aesthetic values, or that are threatened by conversion from their natural or recreational state to other uses,” giving priority to lands which can be effectively managed and protected and that have significant ecological value.

The Act instructed the Secretary of Commerce to issue guidelines that would establish the eligibility, procedural, and programmatic requirements for participation in CELCP. The final program guidelines (Vol. 68 *Fed. Reg.* No. 116, June 17, 2003, p.35860) detail the requirements for state participation in a competitive funding program, and outline a three-stage process for competitive funding: (1) develop a state coastal and estuarine land conservation plan; (2) create a method for identifying and ranking qualified projects within states and nominating them to a national competitive selection process annually; and (3) establish a process for conducting peer review and selection of projects at the national level.

According to the guidelines, state participation in the CELC Program is voluntary. Coastal states that choose to participate in the program, must use the program guidelines when developing state conservation plans, proposing or soliciting land acquisition projects, applying for funds, and carrying out selected projects under this program.

1.2 Pennsylvania’s Coastal and Estuarine Land Conservation Plan

In fulfillment of the requirements for participation in CELCP, the Commonwealth of Pennsylvania is preparing and submitting the following Coastal and Estuarine Land Conservation Plan (CELC Plan) for approval by the National Oceanic and Atmospheric Administration (NOAA) Office of Ocean and Coastal Resource Management (OCRM). The Pennsylvania CELC Plan shall be constructed according to the final CELC Program guidelines issued in June 2003. The plan will provide an assessment of priority land conservation needs and clear guidance for selecting land conservation projects within the State for nomination to NOAA for funding.

The Pennsylvania CELC Plan is being developed under the aegis of the Pennsylvania Coastal Zone Management (CZM) Program. The Pennsylvania Department of Environmental Protection’s Water Planning Office (DEP-WPO), which houses the Pennsylvania CZM Program, is the lead agency for implementing Pennsylvania’s Coastal Zone Management Program, as approved pursuant to the Coastal Zone Management Act of 1972, as amended (16 USC 1451 et seq.). The Pennsylvania DEP is also the state lead agency for establishing and implementing Pennsylvania’s CELC Program.

The Pennsylvania CZM Program contracted with the Delaware Valley Regional Planning Commission (DVRPC) to prepare this plan. DVRPC is the coordinating agency for the PA CZM program in the Delaware Estuary region. DVRPC is an interstate, intercounty and intercity agency that provides continuing, comprehensive and coordinated planning to shape a vision for the future growth of the Delaware Valley Region in southeastern Pennsylvania. DVRPC was chosen to prepare the CELC Plan for Pennsylvania because of its extensive experience in regional land use, environmental and open space planning, its relationships with numerous public and private stakeholders, and because of its advanced GIS mapping capabilities.

1.3 Conserving Coastal Habitat

CELCP was created in response to a pressing need for coastal land conservation to protect coastal environments and their waters. The U.S. Commission on Ocean Policy's Final Report, *An Ocean Blueprint for the 21st Century*, released in 2004, highlights the need for coastal conservation. The report emphasizes the many benefits of natural coastal habitats: buffering coastal communities against the effects of storms, filtering pollutants from runoff, and providing a basis for booming recreation and tourism industries. Coastal habitats also provide spawning grounds, nurseries, shelter, and food for marine life, including a disproportionate number of rare and endangered species. Despite their unique value, coastal habitats face acute pressures from the increasing numbers of people who come to live, work, and recreate in coastal regions. While human activities and development fuel coastal economies, they "can also degrade coastal habitats and compromise their ability to adapt to environmental changes."

As a result of development pressures, coastal areas have experienced serious habitat degradation, fragmentation and loss. Conservation—via fee simple land acquisition or the purchase of conservation easements—is a primary tool to protect coastal resources from further degradation and loss. Not only does conservation protect significant ocean and coastal habitat, "it also precludes the need to undertake costly and scientifically uncertain restoration efforts after an area has been degraded or lost." Despite the importance of conservation, the U.S. Commission on Ocean Policy concludes that, "current conservation needs... are not being met—a situation that will continue to worsen with increasing pressures on ocean and coastal environments and rising demands for coastal land."

To address this conservation shortfall, the Ocean Commission recommends additional federal funding for conserving coastal habitats. According to the Commission, over the past several decades, "only a small fraction of federal spending [has been] used to support coastal habitat conservation efforts, although habitat conservation is one of the goals of the Coastal Zone Management Act." One such resource for coastal conservation is the Coastal and Estuarine Land Conservation Program, created by Congress in 2002 to provide a dedicated funding source to support coastal conservation partnerships among willing landowners. In addition to CELCP, the Ocean Commission recommends that "a larger share of U.S. Department of Agriculture and other federal agency conservation programs should be directed to estuarine and coastal lands." The Ocean Commission

goes on to state that “to guide these programs, each state should identify priority coastal habitats and develop a plan for establishing partnerships among willing landowners for conservation purposes, with participation from federal agency, local government, non-governmental, and private-sector partners.” The creation of Pennsylvania’s CELC Plan is a critical first step in this effort.¹

1.4 CELC Plan Required Elements

In order to qualify to receive funds under CELCP, the CELCP Guidelines require states to develop and submit to NOAA for approval, a CELC plan that provides an assessment of priority conservation needs and clear guidance for nominating and selecting land conservation projects within the state. The final program guidelines state that plans are intended to be fairly simple and concise, and may make use of existing plans for the state or region, such as regional, state, or local watershed protection plans, greenway and open space plans, or land conservation plans. A state may incorporate existing plans, or portions thereof, by reference into a CELC plan. The required elements for state CELC plans include the following:

- A map or description of the geographic extent of coastal and estuarine areas within the state, as defined for the purposes of the CELCP;
- A description of the types of lands or values to be protected through the program and the need for conservation through acquisition;
- Identification of “project areas” that represent the state’s priority areas for conservation, including areas threatened by conversion, based on state and national criteria for the program;
- A description of existing plans, or elements thereof, that are incorporated into the plan;
- A list of state or local agencies, or types of agencies, that are eligible to hold title to property acquired through the CELCP;
- A description of the state’s process for reviewing and prioritizing qualified proposals for nomination to the national selection process. The vetting process should, at a minimum involve representatives from the state’s coastal zone management program, NERR(s), and any other agencies or entities that the state considers appropriate; and
- A description of public involvement and interagency coordination that occurred during the development of the plan.

State plans must also address the following national criteria for projects and project areas as they relate to the purpose of CELCP:

- Protects important coastal and estuarine areas that have significant conservation, recreation, ecological, historical, or aesthetic values, or that are threatened by conversion from their natural or recreational state to other uses;

¹ U.S. Commission on Ocean Policy, *An Ocean Blueprint for the 21st Century*, September 2004, <<http://www.oceancommission.gov/>>.

- Gives priority to lands which can be effectively managed and protected and that have significant ecological value;
- Directly advances the goals, objectives, or implementation of the state's coastal management plan or program, NERR management plans approved under the CZMA, national objectives of the CZMA, or a regional or state watershed protection plan involving coastal states with approved coastal management plans; and
- Is consistent with the state's approved coastal management program.

1.5 Coordination and Public Input in the Development of Pennsylvania's Plan

NOAA guidance stipulates that State plans will be developed and submitted by the state lead agency, in conjunction with: the state's coastal management program (if different from the lead agency); National Estuarine Research Reserves in that state; state or federal agencies involved in coastal land acquisition, conservation, or management in the state; and other interested parties. Further, NOAA requests that the plan contain a description of public involvement and interagency coordination that has taken place during the development of the plan, if applicable.

From the outset, key stakeholders were included in Pennsylvania's CELC planning process. Early in the plan formulation stage, meetings were held with the Delaware Estuary and Lake Erie Coastal Zone Steering Committee and the statewide Coastal Zone Advisory Committee. These two standing committees are key components of Pennsylvania's Coastal Zone Management program. The committees were briefed on Pennsylvania's CELC plan at regular intervals and were asked to provide guidance in the development of conservation priorities. In addition, a special meeting was convened in Erie in August 2005 with local governments, state agencies, the land trust community, and other non-profit groups to discuss, review and obtain feedback on the plan.

Following an internal review and inclusion of comments from stakeholders, a well-developed draft was distributed to the PA Department of Conservation and Natural Resources (the state's lead agency for land acquisition and management), the PA Fish and Boat Commission, the PA Game Commission, and the Governor's Policy Office for a final detailed review.

Pennsylvania's CELC Plan makes use of several state, regional, county and watershed-based plans, all of which were created with extensive public involvement and coordination among government agencies and non-profit organizations. The conservation priorities defined in this plan are in part based on these previous planning efforts. Each of the referenced plans are described in detail in Section 3.5.

The public input and interagency coordination efforts that took place during the creation of this plan are described in further detail in Section V.

II. PENNSYLVANIA’S COASTS: DEMOGRAPHICS, LAND USE AND TRENDS

2.1 Pennsylvania’s Coastal Zones

According to the definition in the federal CZMA of 1972, Pennsylvania is a “coastal state” because of two widely separated areas: the 76-mile long Lake Erie shoreline and the 112-mile segment of the tidal Delaware River in Pennsylvania. See **Map 1: Pennsylvania’s Coastal Zones** (please refer to **Appendix A** for all maps). The original Pennsylvania Coastal Zone Management Program, approved in 1980, established Pennsylvania’s coastal zones for both the Lake Erie and Delaware Estuary shorelines based on the CZMA’s definition of a coastal zone:

Coastal waters... and the adjacent shorelands... including transitional and intertidal areas, salt marshes, wetlands, and beaches. The zone extends inland from the shoreline only to the extent necessary to control shorelands the uses of which have a direct and significant impact on the coastal waters (Section 304(a)).

Using this definition and an approach that considered not only how water is effected by land use, but also how land is effected by proximity to coastal waters, Pennsylvania delineated coastal zone boundaries for the Delaware Estuary and Lake Erie coasts. The methodologies used for this purpose reflect the divergent character of the lands adjacent to Pennsylvania’s two coasts.

Lake Erie Coastal Zone

The lands immediately adjacent to Lake Erie’s coast feature a mix of agricultural, wooded and urban land uses, while the Delaware Estuary coastline, by contrast, is more heavily urbanized with widespread industrial, manufacturing, commercial, utility and transportation land uses. Accordingly, Lake Erie’s coastal zone boundary was delineated on the basis of large-scale landscape features such as coastal agricultural areas, sensitive natural resource areas, prime agricultural soils, and areas impacted by lake effect climate modification. The Lake Erie boundary also took into consideration railroad lines, major highways, and concentrated urban developments that formed logical barriers within the landscape.

The 76-mile long Lake Erie coastal zone, including Presque Isle Peninsula, forms the northern rim of Erie County. The eastern and western coastal zone boundaries are the New York and Ohio state borders, respectively. On the lake, the coastal zone reaches to the international boundary with Canada. Extending inland, to the south, the coastal boundary varies in width from 900 feet within parts of Erie City to more than three miles in Harborcreek and North East townships. A total of ten municipalities and Presque Isle State Park lie within the Lake Erie coastal zone. Together this area totals approximately 40,989 acres. The population of the coastal zone when it was established in 1975 was 23,569. See **Map 2: Lake Erie Coastal Zone** in **Appendix A**.

Delaware Estuary Coastal Zone

The process for creating the Delaware Estuary coastal zone boundary took into consideration a more complicated mix of natural and man-made landscape features including: (1) shoreline properties; (2) properties or activities that directly use or are affected by changes in the river; (3) floodplains; (4) contiguous vacant or marginally used land at or near the water's edge (5) major highways, railways, and rights-of-way near the shore; and (6) industries and businesses that serve coastal and port-related activities. See **Map 3: Delaware Estuary Coastal Zone (Appendix A)**.

The 112-mile Delaware Estuary coastal zone extends through Bucks, Philadelphia, and Delaware counties and includes all or portions of 25 municipalities and two cities. Together this area totals approximately 64,733 acres. The Delaware Estuary coastal zone has been expanded several times since it was first established, including an expansion in 1995 that more than doubled the coastal zone area in Bucks County. Eastward, the coastal zone extends to the New Jersey boundary in the middle of the Delaware River. To the south, the coastal boundary reaches to the Delaware state border. The falls at Morrisville, PA, where the tidal influence on the Delaware ends, is the northern boundary. Inland, to the west, the coastal zone border varies in width from one-eighth mile in urban areas like Philadelphia, and Chester, to almost eight miles in southern Bucks County. The coastal zone includes the entire tidal portion of the Delaware River as well as the tidal portions of the Schuylkill River and the Neshaminy, Darby, Chester, Ridley and Crum creeks. The population of the original coastal zone area in 1970 was 33,470.²

2.2 Geographic Boundary for CELCP

Pennsylvania's coastal zones, as described above, have been the focus of the Commonwealth's approved CZM program over the past 25 years. These zones were defined as they were to reflect the intent and spirit of the CZMA. However, for the purposes of CELCP, the Commonwealth will not use the coastal zone program boundaries to define the geographic extent of Pennsylvania's coastal and estuarine areas. Instead, the Commonwealth will base its CELC Plan boundary on Pennsylvania's coastal watershed boundaries and three watersheds that drain to the Chesapeake Bay. Such a delineation is consistent with the program guidelines, which define coastal and estuarine areas as either a state's federally approved coastal zone or as "...the state's coastal watershed boundary as described in NOAA's Coastal Zone Boundary Review (October 1992). The coastal watershed boundary is defined for estuarine drainage areas by the inland boundary of those 8-digit USGS hydrologic cataloguing units (HUCs) that contain the head of tide." For the Great Lakes region, the coastal boundary is defined by those 8-digit cataloguing units that drain directly to the lakes. The Delaware Estuary Coastal Watershed (DECW) contains one entire "HUC-8" watershed and portions of two other HUC-8 watersheds (the remainder of these HUC-8 watersheds are in New Jersey). The Lake Erie Coastal Watershed (LECW) consists of a single HUC-8 watershed. The

² Pennsylvania Department of Environmental Resources, *Pennsylvania Coastal Zone Management Program Technical Record*, Office of Resources Management, Harrisburg, PA, December 1978.

Chesapeake Bay drainage area consists of three HUC-8 watersheds. See **Maps 4 and 4A: Pennsylvania's Coastal Watersheds (Appendix A)**.

The Commonwealth chose to use the coastal watershed boundary and the drainage area to the Chesapeake Bay, rather than the CZM boundary, as the CELC Plan boundary for the following reasons:

- First, while the existing coastal zone boundaries are appropriate for the Commonwealth's CZM Program, they are limiting for the purpose of land conservation. The Delaware Estuary's coastal zone contains few high-value undeveloped natural areas that are not already protected. Of the remaining unprotected and undeveloped areas, many are contaminated former industrial sites. Likewise, the Lake Erie region also features a larger concentration of natural areas further inland, away from Erie City, which is adjacent to the lake. The use of the coastal watershed boundary as the CELC Plan boundary will allow for the conservation of larger, unfragmented, higher-quality natural resource areas, many of which are threatened by conversion due to suburban development.
- Second, there has been growing concern over how to manage and reduce nonpoint source pollution throughout Pennsylvania's coastal watersheds. Because land conservation is a highly effective way to control nonpoint source pollution and maintain water quality, conserving land throughout the DECW, the LECW and the Chesapeake Bay Watershed will be critical for maintaining the health of Pennsylvania's coasts.
- Third, in May 2009, President Obama issued Executive Order 13508, Protection and Restoration of the Chesapeake Bay, which resulted in the drafting of a strategy that included a component on Land Conservation and Public Access in the Chesapeake Bay Region. Inclusion of the Chesapeake Bay watersheds allows Pennsylvania to partner with federal agencies to help support land conservation efforts intended to help protect the Bay's coastal waters and Pennsylvania's tributaries.
- Finally, the use of coastal watershed boundaries for the CELC Plan will allow the Commonwealth to capitalize on numerous existing plans, studies and reports that focus on the state's coastal watersheds.

The following sections characterize Pennsylvania's coastal and estuarine areas. The current state of these areas reflects millions of years of natural history, hundreds of years of human settlement and the forces of human activity that shape the region today. While there is not enough space here to characterize the DECW, LECW and Chesapeake Bay watersheds in great detail, the following paragraphs will touch on each region's geography, physical setting, changing populations, past and present land uses, and natural features. Understanding these characteristics will be a necessary prerequisite for establishing Pennsylvania's coastal land conservation priorities.

2.3 The Delaware Estuary Coastal Watershed

Overview

The DECW is a large, complex and continually changing area that encompasses one of the nation's largest metropolitan areas, Philadelphia, as well as extensive agricultural lands and rich natural landscapes. It is difficult to take a single snapshot that portrays the richness of the watershed, but it does have some defining characteristics.

- The study area has a complicated fabric of land uses that range from the densely urbanized neighborhoods of Philadelphia to the large wooded expanses of Schuylkill County. In between are first generation suburbs, industrial and mining operations, small towns and villages, agricultural regions, forests and parks, wetlands, and rapidly growing expanses of suburban residential and commercial development.
- The watershed flows through four physiographic provinces whose different geologic and topographic settings provide the foundation for its drainage patterns and the natural characteristics of its ground and surface waters.
- Nearly 75 percent of the watershed comprises an intricate network of small headwaters streams that are particularly vulnerable to individual and cumulative land use decisions and practices.
- Approximately 62 percent of the watershed remains in agriculture and forest, 6 percent is either vacant or covered by water, and 32 percent is developed.
- While recent population increases have been moderate, suburban development is consuming disproportionate amounts of land, particularly in rapidly growing areas of Berks, Chester, and Montgomery counties. If such trends continue, they threaten to consume over 100,000 acres of land every ten years.³
- The watershed is an irreplaceable source of water for a region becoming increasingly reliant on groundwater. At the same time, impervious cover created by suburban development is reducing the replenishment of groundwater reserves.

Watershed Location

The DECW extends approximately 82 miles from the Delaware state line to the headwaters of the Schuylkill River at Tuscarora Springs in Schuylkill County. The watershed includes all of Philadelphia and Montgomery counties, large parts of Delaware, Bucks, Chester, Berks and Schuylkill counties, and smaller portions of Carbon, Lehigh, Lebanon, and Lancaster counties. The DECW drains approximately 2,591 square miles, and includes all or portions of 352 municipalities. The DECW is depicted on **Map 5 (Appendix A)**.

³ The Conservation Fund, *State of the Schuylkill River Watershed*, 2002, p. 3.

The Schuylkill River watershed is the largest HUC-8 watershed within the DECW, occupying over 1,900 square miles. The remainder of the coastal watershed is comprised of parts of two other HUC-8 watersheds: the Neshaminy-Crosswicks Creek watershed, at 290 square miles, and the Lower Delaware River watershed, at 390 square miles. The DECW also contains numerous subwatersheds (HUC-8s are divided into smaller HUC-11s, which are in turn broken down into HUC-14s and so on). The DECW contains 16 HUC-11 subwatersheds. Breaking the region down further, the DECW contains 85 HUC-14 watersheds. **Map 6** depicts the major watersheds within the DECW.

Understanding the geography of the DECW’s watersheds is important, as this plan references the Rivers Conservation Plans that have been completed for the DECW. The planning area for Rivers Conservation Plans is based on watershed boundaries. Pennsylvania’s Rivers Conservation Plans are described in more detail in *Section 3.5: Existing Plans Incorporated by Reference into the Pennsylvania CELC Plan* under subsection *Pennsylvania’s Rivers Conservation Plans* on pg. 37.

Physical Setting

The DECW falls into four natural regions or “provinces” whose histories have produced different geologic, topographic, hydrologic, soil and climatic conditions (see **Map 6A**). In turn, they have influenced land use and economic development patterns within the watershed.

- *Ridge and Valley Province*

The northern section of this province, primarily in Schuylkill County, is made up of numerous long narrow mountain ridges separated by valleys of shale and other sedimentary rocks. It provides the resources for the region’s anthracite mining. In contrast, its southern Great Valley section, south of Blue Mountain in Berks County, is a broad lowland with undulating hills and good agricultural soils.

- *New England Province*

Underlain by gneiss, quartzite and other hard rocks, this province, also known as the Reading Prong, comprises extensively forested hills and ridges and is drained by a network of steep, rocky streams.

- *Piedmont Province*

Underlain by both sedimentary and crystalline rocks, this province consists primarily of rolling hills and valleys, with extensive branching streams and prime agricultural soils. It encompasses much of the Philadelphia metropolitan area.

- *Atlantic Coastal Plain Province*

Found only in the southern reaches of the watershed, this province comprises gently sloping sands and gravel deposits. Extending into New Jersey, it contains one of the region's most important groundwater resources.

Watershed Population

As of 2000, the DECW was home to 4,022,492 residents. This was an increase of 90,722 residents, or 2.3 percent over the 1990 population of 3,922,770 (see **Map 7**).⁴ Although population projections are not available for the watershed as a whole, county-based projections suggest that Berks, Bucks, Chester and Montgomery counties will see the greatest population growth over the next 15 years. Combined, these counties may see a 15 percent increase in their population, or 350,000 new residents, between 2000 and 2020. By contrast, Delaware, Philadelphia and Schuylkill counties are likely to experience a small population loss.⁵

Land Use

The DECW's land use reflects its natural setting, its agricultural and industrial past, and successive waves of suburban development that have occurred over the past six decades. The northern half of the watershed is still mostly rural and forested, while the southern half is more intensely developed. As of 2000, nearly 33 percent of the coastal watershed remained in forest. Agricultural uses accounted for 29 percent of the watershed, and developed land uses, which include residential, commercial, industrial, transportation, utility and civic land uses, covered an additional 33 percent. The DECW's remaining land is either barren/vacant (bare rock, construction sites, defunct mining operations, abandoned industrial lands, etc.) or occupied by open water or non-forested wetlands.⁶ DECW land use is depicted on **Map 8 (Appendix A)** and summarized in **Table 1**.

⁴ Population totals for the DECW were obtained by overlaying census block groups with the DECW boundary to determine which block groups fall mostly within the boundary. Accordingly, population totals should only be considered an approximation of the number of individuals living within the DECW boundary. Data for this process was obtained from the U.S. Census Bureau <www.census.gov>.

⁵ Delaware Valley Regional Planning Commission, *Data Bulletin No. 73: Population and Employment Forecasts, 2000-2030*, March 2005, <www.dvrpc.org/data/databull.htm>.

⁶ DECW land use totals are based on information from DVRPC's Year 2000 Land Use Mapping (released in March 2004) and the Year 2000 Pennsylvania Land Cover dataset developed by Penn State University (released in May 2003). The DVRPC data was used for Bucks, Chester, Delaware, Montgomery and Philadelphia counties. Penn State data was used for the remaining counties in the DECW. The DVRPC land use dataset is based on visual interpretation of aerial orthophotography. The Pennsylvania Land Cover dataset was generated from Enhanced Thematic Mapper satellite data and other ancillary sources.

Table 1: Delaware Estuary Coastal Watershed Land Use

Type	Acres	Percent
Agriculture	481,474	29.01%
Developed	541,418	32.62%
Vacant	53,904	3.25%
Water	41,452	2.50%
Wooded	541,403	32.62%
TOTAL	1,659,651	100.00%

Sources: Year 2000 Land Use, DVRPC; Pennsylvania Land Cover 2000, Penn State University

Trends in Land Consumed for Development

While the DECW saw only a 2.3 percent population increase during the 1990s, the amount of land consumed for development rose by a much greater percentage. Although historical land use data is not available to perform calculations and comparisons for the coastal watershed area as a whole, data at the state, county and city level can illuminate trends that are occurring throughout the CELC plan study area.

- Between 1970 and 1990, developed land uses in the 5-county southeastern Pennsylvania area (Bucks, Montgomery, Chester, Philadelphia and Delaware counties) increased by 114,000 acres or 32 percent, while the population of this region *declined* by 1 percent during the same period.
- Development in the 5-county area during the 1990s (84,500 acres developed) took place at a faster rate than seen during the previous two decades, when developed acreage increased by an average of 57,000 acres per decade.
- Between 1970 and 2000, the 5-county area lost over 139,000 acres of farmland, a decline of 28 percent, and over 59,000 acres of wooded and other open space lands, a decline of 14 percent.⁷
- From 1980 to 1990, the population of the Reading metropolitan area grew by 16 percent, but the urbanized land area grew by 81 percent.⁸

The trends in land consumption in the DECW clearly show that the region is becoming less dense and is spreading outward from the center of traditional cities and towns. Even though the area has experienced little population growth over the past three decades, land

⁷ Statistics describing the 5-county southeastern Pennsylvania area are derived from DVRPC's Year 2000 Land Use dataset (Delaware Valley Regional Planning Commission, *Data Bulletin No. 78: 2000 Land Use by Minor Civil Division*, March 2004, <www.dvrpc.org/data/databull.htm>).

⁸ 10,000 Friends of Pennsylvania, p. 8.

has been consumed at a rapid rate. Known as sprawl, this development pattern has resulted in the elimination of tens of thousands of acres of agricultural, wooded and other open space lands. If these land consumption patterns continue into the future, hundreds of thousands of additional acres of natural and open space lands could be consumed for suburban residential, commercial and industrial development in the coming decades, despite relatively low population growth rates.

2.4 The Lake Erie Coastal Watershed

Overview

Like the DECW, the LECW is characterized by a central urban core, the City of Erie, surrounded by suburban, agricultural and wooded areas. Although the City of Erie is Pennsylvania's fourth largest urban center, the LECW is still predominantly rural and undeveloped in character. Almost 79 percent of the coastal watershed is occupied by forest land, agricultural land, open/vacant land, or water.

Watershed Location

The LECW extends the length of Pennsylvania's 76-mile Lake Erie coast from the Ohio border in the west to the New York border in the east. The watershed extends inland ten miles on average, with the western portion extending well into Crawford County, a distance of over 25 miles. The LECW drains approximately 507 square miles, and encompasses all or portions of two counties, 32 municipalities, and the City of Erie (see **Map 9**).

The LECW contains one HUC-8 watershed and six HUC-11 subwatersheds (see **Map 10**). A Rivers Conservation Plan was published by the Lake Erie Region Conservancy (LERC) in August 2008 for the entire Lake Erie Coastal Watershed. This plan is described in more detail in *Section 3.5: Existing Plans Incorporated by Reference into the Pennsylvania CELC Plan*.

Physical Setting

The LECW is comprised of the following two physiographic provinces (see **Map 10A**):

- *Central Lowlands Province*

The Central Lowlands are found only in the extreme northwestern corner of the state near the coast of Lake Erie. This is an area of low relief with northwest-sloping, lake-parallel, low-relief ridges. The region is underlain by shale and siltstone and has a parallel drainage pattern. Although small relative to the size of the state, most of the LECW is located within this province. The gentle topography and relatively good soils of this province make it a favorable region for agriculture.

- *Glaciated Appalachian Plateau Province*

This is a maturely dissected plateau of moderate relief, over-printed with notable moraine, drumlin, kettle, scour, and other glacial features. The province is characterized by irregular topography – broadly rolling with high hills, and deep, steep-sided linear valleys partly filled with glacial deposits. It is mostly underlain by

sandstone, siltstone and shale. Only the southern edge of the watershed lies within the Appalachian Plateau province.⁹

Watershed Population

As of 2000, the LECW was home to 239,961 residents, an increase of 2 percent over the 1990 population of 235,160.¹⁰ The population of Erie County, in which most of the LECW is located, also experienced slow population growth in recent decades. The county population increased from 279,780 to 280,843 residents between 1980 and 2000, an increase of only 0.4 percent. Erie City, located in the center of Erie County, experienced a population *decline* during the same period, from 119,123 in 1980, to 103,717 in 2000 (see **Map 11**).

Both the slow growth in the region's overall population and population declines in Erie City are the result of out-migration associated with employment losses. Population projections prepared by Erie County suggest that population growth over the next 20 years will be relatively flat. The "current trend" population projection scenario shows a small population increase of 5,201 residents between 2000 and 2020. Assuming a continuation of the same out-migration rate experienced from 1990 to 2000, projections show a slight population decline for the county of 908 residents by 2020.¹¹

Land Use

Land use in the LECW largely reflects its position along the shoreline of Lake Erie. The fertile soils of the coastal slope and the climate modification effects of the lake make the LECW a comparatively favorable location for agriculture. This is evidenced by the fact that over 41 percent of the LECW is in agricultural use. Proximity to the lake was also the impetus for the growth of the watershed's core urban settlement – Erie City. Access to shipping on the Great Lakes enabled Erie City to become both an important regional port facility and an industrial center.

Like Philadelphia, Erie is characterized by its industrial and manufacturing past, and by its historic role as a population center in the region. Also like Philadelphia, the population of the city has declined over the past 50 years, while out-migration from the city has led to development of the surrounding countryside. Even so, as a whole, the LECW remains relatively rural. In addition to the 41 percent of the watershed in agricultural use, over 33 percent remains in forest, and an additional 4 percent is vacant or occupied by open water. Developed land uses cover the remaining 21 percent of the watershed.¹² LECW land use is depicted on **Map 12** and summarized in **Table 2**.

⁹ Pennsylvania Department of Conservation and Natural Resources, *Landforms of Pennsylvania*, Retrieved 1 Aug. 2005 <<http://www.dcnr.state.pa.us/topogeo/map13/map13.aspx>>.

¹⁰ Population totals for the LECW were obtained using the same "block group" method used to develop population totals for the DECW. Source: U.S. Census Bureau <www.census.gov>.

¹¹ Erie County Department of Planning, *Erie County Demographic Study*, 2003, pp. 50-54.

¹² LECW land use totals are based on the *Year 2000 Pennsylvania Land Cover* dataset developed by Penn State University. The land cover dataset was generated using Enhanced Thematic Mapper satellite data and was released in May 2003.

Table 2: Lake Erie Coastal Watershed Land Use

Type	Acres	Percent
Agriculture	98,403.49	41.38%
Developed	50,524.31	21.24%
Vacant	6,673.30	2.81%
Water	2,800.43	1.18%
Wooded	79,424.65	33.40%
TOTAL	237,826.17	100.00%

Source: Pennsylvania Land Cover 2000, Penn State University

Trends in Land Consumed for Development

Like the DECW, the LECW experienced only a small population increase during the 1990s, but the amount of developed land rose by a much greater percentage. Although historical data at the coastal watershed level is not available, data for Erie County readily illustrates land consumption patterns in the watershed.

- Between 1978 and 2002, developed lands increased by 18.3 percent (11,731 acres), while the total population increased by only 0.4 percent over roughly the same time period.
- The majority of the increase in developed land between 1978 and 2002 was for residential uses.
- In 1980, the residential density for Erie County was approximately 9.3 persons for every developed residential acre. In 2002, the residential density for Erie County was about 6.4 persons per every developed residential acre.
- Erie County lost approximately 7,000 acres of agricultural, wooded and other open lands between 1978 and 2002. However, in terms of percentage, this decline is only 1.7 percent.

Land in the LECW is being consumed for development at a relatively rapid rate, considering that the region experienced almost zero population growth over the past 25 years. Such development is a product of out-migration from the older, more densely developed portions of Erie City into the surrounding rural municipalities. The new development is occurring at much lower densities than the older development it is replacing. According to the Erie County Department of Planning and Economic

Development, Erie City had a net residential density of 17 persons per acre as of 2000, while new suburban developments were likely to have about 5 persons per acre. At the same time, household size is shrinking. These factors have combined to accelerate low-density suburbanization in the watershed.¹³

It is important to point out that even though Erie County is experiencing the same patterns of suburbanization as the DECW, the county still has a large proportion of undeveloped and rural land. While the percentage increase in developed land over the past 25 years has been high (over 18 percent), the small proportion of original development means that almost 85 percent of all land within Erie County is still wooded, vacant or in agricultural use. Nevertheless, low-density sprawl-style development is steadily encroaching on these valuable resources.

2.5 Chesapeake Bay Watersheds

Overview

Under the federal Clean Water Act, the Chesapeake Bay is listed as an impaired waterway. Pennsylvania and other states made a commitment under the Chesapeake 2000 Agreement to help improve water quality by reducing the level of nutrients—specifically nitrogen, phosphorus and sediments—that pollute the bay and cause “dead zones.”

Watershed Location

Pennsylvania’s portion of the Chesapeake Bay watershed includes the Susquehanna and Potomac River watersheds and contributes half of the fresh water to the Bay. For the purposes of the CELCP program, Pennsylvania has included three sub-watersheds: namely, the Lower Susquehanna Watershed (HUC 02050306), the Chester-Sassafras Watershed (HUC 02060002), and the Gunpowder-Patapsco Watershed (HUC 02060003). Although these watersheds do not drain to Pennsylvania coastal waters, it is a critical area for national coastal conservation, supports Pennsylvania’s participation in the Chesapeake Bay Program, and helps implement the recent Chesapeake Bay Executive Order (E.O. 13508 - Chesapeake Bay Protection and Restoration).

Watershed population

As of 2000, municipalities within the selected Chesapeake Bay watersheds were home to approximately 1,023,948 residents. This was an increase of 115,918 residents, or 13 percent over the 1990 population of 908,030. Chester County experienced the greatest percent population growth, followed by Berks and Adams Counties. Lancaster and York Counties, however, gained the most new residents, about 90,000. Municipality-based population projections suggest that the area will see a 25 percent increase in population, or 251,000 new residents, between 2000 and 2020. Between 2000 and 2030, a 28% increase in population is expected or 290,000 new residents. Overall, municipalities in

¹³ Erie County Department of Planning, *Erie County Land Use Plan*, December 2003, pp. 18-22.

Adams County are expected to see the greatest population growth from the years 2000 to 2030, almost doubling in size. Chester County will see about half of that growth rate, while Berks, Lancaster, Lebanon, and York Counties will grow at a rate of about 25%. Aggregated county populations are depicted on Map 12a and summarized in Table 3.¹⁴

Table 3: Chesapeake Bay Watersheds Population

County	1990 pop	2000 pop	2030 pop	1990-2000 change	1990-2000 % change	2000-2030 change	2000-2030 % change
Adams	50,467	58,533	113,722	8,066	16%	55,189	94%
Chester	42,919	53,844	78,605	10,925	25%	24,761	46%
Berks	29,002	34,112	43,444	5,110	18%	9,332	27%
Lancaster	422,822	470,658	577,243	47,836	11%	106,585	23%
Lebanon	23,704	25,989	31,979	2,285	10%	5,990	23%
York	339,116	380,812	468,920	41,696	12%	88,108	23%
Total	908,030	1,023,948	1,313,913	115,918	13%	289,965	28%

Source: Census, PADEP 2006

Land Use

The selected Chesapeake Bay watersheds encompass Pennsylvania’s most prime agricultural areas, surrounding the populous urban centers of Lancaster, York, and Hanover. As of 2006, about 55% of the Chesapeake Bay watersheds were engaged in agricultural land uses, including cultivated crops and pasture/hay. About 24% of the area is forested, with a majority classified as deciduous forest. A little over 11% of the area is developed, with most of that dedicated to low-intensity land use. About 5% of the watershed is scrub-shrub landscape. The remaining area is compassed by small amounts of open water, grassland/herbaceous areas, and wetlands. 2006 land use area is depicted on Map 12b and summarized in Table 4.¹⁵

Table 4: Chesapeake Bay Watersheds Land Use

Class	2006 Area (acres)	Percent of total
Agriculture	803444	55.1%
<i>Cultivated Crops</i>	491360	33.7%
<i>Pasture/Hay</i>	312084	21.4%
Forest	349753	24.0%
<i>Deciduous Forest</i>	310831	21.3%
<i>Mixed Forest</i>	30477	2.1%
<i>Evergreen Forest</i>	8445	0.6%

¹⁴ Population totals were obtained by overlaying municipalities within the CBW boundary to determine which municipalities fall mostly within the boundary. Accordingly, population totals should only be considered an approximation. Data for this process was obtained from the U.S. Census Bureau <www.census.gov>. Population projections were obtained from a least squares regression function derived by the PA DEP from 1980, 1990, and 2000 Census data.

¹⁵ Land use totals and trends are based on NOAA’s Coastal Change Analysis Program 1996, 2001, and 2006 raster datasets. Layers were clipped by the CBW boundary and analyzed to derive aggregated area and change. Data was obtained from NOAA <http://www.csc.noaa.gov/crs/lca/ccap.html>.

Developed	166217	11.4%
<i>Developed, Low Intensity</i>	69797	4.8%
<i>Developed, Open Space</i>	51115	3.5%
<i>Developed, Medium Intensity</i>	29242	2.0%
<i>Developed, High Intensity</i>	16063	1.1%
Scrub/Shrub	76626	5.3%
Open Water	25361	1.7%
Grassland/Herbaceous	15866	1.1%
Wetland	15791	1.1%
<i>Palustrine Forested Wetland</i>	12187	0.8%
<i>Palustrine Emergent Wetland</i>	1917	0.1%
<i>Palustrine Scrub/Shrub Wetland</i>	1621	0.1%
<i>Estuarine Emergent Wetland</i>	66	0.0%
Bare Land	4710	0.3%
Unconsolidated Shore	304	0.0%
Total	1458072	100.0%
<i>Source: NOAA 1996, 2001, 2006 CCAP</i>		

Trends in Land Consumed for Development

From 1996 to 2006, definite trends of land use change are observable in the Chesapeake Bay watersheds. Most apparent is a dramatic increase in developed land, accompanied by a decrease in forested and agricultural areas.

- Between 1996 and 2006, developed land uses increased by almost 7,000 acres, a 0.4 percent increase per year. High intensity development comprised a majority of the growth, followed by medium intensity development.
- The rate of land consumed for development was about 0.5% per year between 1996 and 2001, while the rate of population increase was much higher at 1.3% per year between 1990 and 2000. Unfortunately land use data is not available pre-1996, which would probably exhibit a higher rate of developed land growth.
- Between 1996 and 2006, almost 2,900 acres of agricultural land was lost and 2,700 acres of forest. While this was a relatively low rate of loss (about 0.1% per year), the land area converted is significant.
- Wetlands also exhibited a decline during this period, mostly from 2001-2006, with a total loss of 428 acres, totaling a 0.3 percent rate of loss per year. The majority of wetlands lost were palustrine and estuarine emergent wetlands.

Population growth has been extremely high in the Chesapeake Bay watersheds and is predicted to continue its increase, especially over the upcoming 2000 to 2020 period. A significant portion of these new residents are migrating from the south to live in southern Lancaster and York counties. Agricultural, forest, and wetlands appear to be experiencing the burden of population-driven conversion. New high intensity development is most likely accommodating many of these new residents in the form of

recently constructed large housing developments. 1996-2006 land use change is summarized in Table 5.¹⁶

Table 5: Chesapeake Bay Watersheds Land Use Change

Class	1996 Area (acres)	2006 Area (acres)	1996-2006 Change (acres)	1996-2006 % Change (acres)
Developed	159,422	166,217	6,794	4.3%
<i>Developed, High Intensity</i>	13,459	16,063	2,604	19.3%
<i>Developed, Medium Intensity</i>	27,434	29,242	1,808	6.6%
<i>Developed, Low Intensity</i>	68,131	69,797	1,666	2.4%
<i>Developed, Open Space</i>	50,398	51,115	717	1.4%
Open Water	25,161	25,361	200	0.8%
Grassland/Herbaceous	15,706	15,866	159	1.0%
Unconsolidated Shore	322	304	-18	-5.7%
Bare Land	4,734	4,710	-24	-0.5%
Wetland	16,219	15,791	-428	-2.6%
<i>Palustrine Forested Wetland</i>	12,430	12,187	-243	-2.0%
<i>Palustrine Scrub/Shrub Wetland</i>	1,650	1,621	-29	-1.7%
<i>Palustrine Emergent Wetland</i>	2,069	1,917	-152	-7.3%
<i>Estuarine Emergent Wetland</i>	71	66	-5	-7.2%
Forest	352,422	349,753	-2,668	-0.8%
<i>Deciduous Forest</i>	312,984	310,831	-2,153	-0.7%
<i>Evergreen Forest</i>	8,728	8,445	-282	-3.2%
<i>Mixed Forest</i>	30,710	30,477	-233	-0.8%
<i>Scrub/Shrub</i>	77,765	76,626	-1,139	-1.5%
Agriculture	806,318	803,444	-2,874	-0.4%
<i>Cultivated Crops</i>	493,888	491,360	-2,528	-0.5%
<i>Pasture/Hay</i>	312,430	312,084	-346	-0.1%

Source: NOAA 1996, 2001, 2006 CCAP

2.6 Impacts of Land Consumption

The loss of agricultural, wooded and other undeveloped lands has significant impacts on a region’s environment, economy, and overall quality of life. In the LECW and DECW and Chesapeake-draining watersheds, development of open lands reduces groundwater and stream flow during dry periods, increases stormwater runoff during wet periods, and generally disrupts the functioning of the hydrologic cycle. More rapid stormwater discharge intensifies flood events, releases non-point source pollutants into waterways and streams, and erodes the riparian vegetation that normally helps to filter out those pollutants. Greater impervious coverage also limits the ability of rainwater to recharge groundwater, and without groundwater recharge, stream base flow becomes more

¹⁶ NOAA 1996, 2001, 2006 CCAP

difficult to maintain during dry periods, damaging aquatic habitats and jeopardizing surface water supplies.

Consumption of natural lands destroys wildlife habitats, limits areas available for passive recreation, and diminishes the character and livability of existing towns and villages. The elimination of habitat is widely recognized as the greatest threat to existing populations of flora and fauna and the stability of ecosystems. Habitat degradation and fragmentation drive threatened and endangered species further toward extinction, while species that are now abundant may become more scarce, until they too are threatened and endangered. Conversely, habitat loss and degradation can result in the creation of “pest” species, such as deer, geese, squirrels and other animals that adapt more readily to human-influenced environments. Not surprisingly, land conservation and preservation are by far the most effective means of protecting and maintaining diverse wildlife populations and the ecological relationships upon which they depend.¹⁷

Passive recreation activities, such as walking, biking and nature watching, are some of the most popular in Pennsylvania.¹⁸ These types of activities require large and well-distributed systems of open space and natural lands. The sizable economic, quality of life, and physical health benefits afforded by natural resource-based passive recreation will be impaired unless appropriate steps are taken to acquire and preserve key open space resources in perpetuity. If fully realized, a linked system of regional protected open space will greatly expand opportunities for high-quality passive recreational experiences.

Open space and greenway buffers help to shape urban growth and create community identity. Without open space buffers, residential and commercial developments in one town begin to blend into adjacent towns, creating an undistinguishable landscape of residential subdivisions and commercial strips. Such circumstances undermine community character and make it difficult to create and maintain a “sense of place.”

These are key qualities that have allowed many traditional, compact towns to thrive, despite the trend toward low density residential development that has become the norm in Pennsylvania over the last five decades. Maintaining community character and creating a sense of place, both of which require the strategic preservation of open space, will be required if existing and *new* compact forms of development are to succeed and flourish in the future. Protected open spaces, greenways and greenbelts will be indispensable towards this effort.

Low-intensity suburban development entails numerous additional environmental, economic and quality of life impacts that need to be recognized when discussing land preservation. While the scope of this plan does not warrant a detailed investigation of all these issues, the following list highlights some of the negative consequences of the low-intensity development that now characterizes Pennsylvania’s coastal watersheds:

¹⁷ Wilson, Edward O., *The Future of Life*, 2002, pp. 65-67.

¹⁸ PA DCNR, *Pennsylvania’s Recreation Plan 2004-2008*, April 2004.

- **Growth in VMT:** Low intensity land consumption leads to disproportionate growth in vehicle miles traveled (VMT) and increases in auto emissions that are significant contributors to ground-level ozone and other air pollutants;
- **Lack of transportation alternatives:** Dispersed development patterns discourage the transit use, biking and walking, which are cost-efficient, less polluting modes of travel that don't require concomitant increases in surface parking and road mileage;
- **Congestion:** Longer commutes, more time wasted due to congestion, and increased expenditures on road construction and road maintenance to keep dispersed suburban areas accessible;
- **Higher costs for roads, schools and housing:** Three major research investigations concluded that planned growth scenarios that avoid sprawl development can lower construction costs for roads, utilities and schools up to 25 percent. A national study found that at a statewide level of analysis in Pennsylvania, sprawl would raise private housing costs between 2 and 8 percent above what they would be under a planned growth scenario.¹⁹

2.7 Coastal Watershed Land Conservation

The effects of development throughout coastal watersheds are ultimately felt along Pennsylvania's coasts. Non-point source pollution and water quality impairments resulting from activities in upstream areas will make their way downstream to coastal regions, negatively effecting the health, productivity and physical appearance of coastal areas. In the DECW, LECW and Chesapeake Bay watersheds, the ability of coastal waters to maintain healthy populations of aquatic life, and the use of coastal resources for water supplies and recreation will be impaired as more open land is consumed for suburban development. To offset these trends, each region needs to guide new development into more compact forms, reinvest in older communities, and step-up land conservation programs and strategies.

Focusing development into more compact mixed-use communities, and investing in older towns and cities, a technique commonly referred to as "smart growth", will be critical to minimizing the consumption of open lands, stimulating economic growth and improving the character and quality of Pennsylvania's communities. At the same time, conserving valuable natural resources and agricultural lands through fee simple acquisition and the purchase of conservation easements, will be key measures for protecting land, focusing development, and insuring the quality and character of existing and future communities. Unfortunately, current funding for land protection is only adequate to protect a modest fraction of the lands now threatened by sprawl. As a result, state and local governments and conservation organizations have turned to "smart conservation" as a way to complement their smart growth initiatives.

¹⁹ 10,000 Friends of Pennsylvania, p. 6.

Smart conservation refers to a tested approach that offers towns a way to step out of the “race for open space” and gain firmer control over their future. As the “green” side of smart growth, smart conservation aims to create an interconnected regional web of healthy ecosystems, wildlife habitats, water supplies, agricultural areas and places to recreate. To accomplish these goals, smart conservation prescribes a system of master planning, local regulation and strategic land conservation. By identifying the most critical pieces of open space in an area before they are subject to acute development pressures, communities can get a “bigger bang” for their conservation buck. Rather than waiting until a particular parcel is slated for development, strategic planning allows communities to identify their most valuable resources in advance and take action before competing demands cause dramatic land price escalation.

CELCP has the ability to dovetail nicely with Pennsylvania’s smart conservation efforts. In addition to providing funding for land conservation in Pennsylvania’s coastal areas, CELCP requires that states plan for strategic conservation by identifying “project areas” that represent the state’s priority areas for conservation within its coastal watersheds. Pennsylvania’s project areas, and the criteria upon which they are based, will be discussed in the following sections.

III. PRIORITIES FOR COASTAL AND ESTUARINE LAND PROTECTION

3.1 Identification of Project Areas

Pennsylvania Priorities – Project Area Goals

1. Water Quality Improvement and Protection
2. Wildlife and Habitat Preservation
3. Increased Public Access and Recreation
4. Enhancement of Coastal Resource Connections and Corridors

The primary goal of CELCP is to protect “important coastal and estuarine areas” that have significant conservation, recreation, ecological, historical, or aesthetic values – giving priority to lands which can be effectively managed and protected and that have significant ecological value. Important coastal and estuarine areas are the basis for the identification of “project areas”. The CELCP guidelines define project areas as “*discrete areas to be identified within a CELC Plan that describe the state’s priority areas for conservation based on national and state criteria, representing the values to be protected through the program and areas threatened by conversion.*” The guidelines state that project areas may consist of habitat types, priority conservation areas within other coastal, estuarine, or watershed management plans, or areas that provide linkages or corridors among conservation areas.

Biodiversity and ecologically driven elements of value are crucial factors in the CELCP project area identification process. The identification of Pennsylvania’s project areas will rely partly on existing studies that identify ecologically valuable lands, including the Natural Lands Trust’s (NLT’s) *Smart Conservation Model*, DVRPC’s *2030 Greenspace Network*, and the *Schuylkill Watershed Conservation Plan*, and on individual environmental data layers generated by regional, state, and federal sources.

All of the individual data layers displayed on the DECW and LECW maps (i.e. woodlands, wetlands, floodplains, high Smart Conservation value areas, etc.) were combined into a single layer to create a “Project Area” map for the DECW and the LECW. (see **Maps 24 and 25 in Appendix A**).²⁰ These maps allows applicants to determine if their project falls within or outside of Pennsylvania’s project areas. *Please note: these maps and all the paper maps contained in Appendix A are relatively small scale pdf maps that may be limited for precise “parcel level” investigations. If CELCP applicants are unable to determine if their parcel(s) falls within a project area, they should contact PADEP’s Office of Coastal Resource Management for additional assistance or to obtain copies of the GIS “shapefiles” used to create the PA CELC Plan maps for their own in-house use. Priorities for protection in the Chesapeake Bay-draining watersheds are not mapped in the Appendix. Please see section 3.2 for these project areas.*

²⁰ Because mapping data from the Schuylkill Watershed Conservation Plan (SWCP) was not readily available in digital form, this layer was not included in the final DECW Project Areas Map. The SWCP maps are depicted separately in Appendix D.

The delineation of project areas in the CELC plan is not a detailed spatial prioritization. The location of a project within a project area is only a threshold for nomination.

Individual projects applying for CELC funds will be ranked and prioritized at the state level on the basis of a qualitative and quantitative evaluation procedure described in *Section 3.4: Ranking and Evaluating CELCP Projects*, which begins on page 32.

3.2 Pennsylvania's Project Areas

The delineation of project areas is based primarily on the location of high-value natural resources. Generally speaking, in Pennsylvania, high-value natural resources include the following types of lands: contiguous and unfragmented wooded lands, wetlands, riparian lands, floodplains, wildlife habitat areas, and lands that create connections to and between important conservation lands. These features and land types are at the core of the *Smart Conservation Model*, the *2030 Greenspace Network*, and the *Schuylkill River Watershed Conservation Plan*. These three existing studies will be the primary source for the identification of project areas in the LECW and DECW. However, the geographic extent of these documents does not include the Lake Erie watershed nor does it include parts of the Delaware Estuary watershed. As a result, environmental data layers and additional planning studies are used to define Pennsylvania's project areas in the LECW and DECW. For Chesapeake Bay-draining areas, Chesapeake Bay maps and assessments are used to define project areas. All of these studies and environmental data layers are discussed in the following paragraphs.

Primary Studies/Plans

- **Smart Conservation Model.** NLT prepared the Smart Conservation Model for a 15-county area in southeastern Pennsylvania, including all of the DECW except Schuylkill and Carbon counties. The Smart Conservation Model used 21 individual data layers to rank the ecological value of all lands within the study area on a 1 to 10 scale. Some of the layers used for input into the model include the following: habitat value based on land use and land characteristics for over 600 indigenous vertebrate species including mammals, herbs, fish and birds; wetlands; hydric soils; floodplains; riparian buffers; impervious cover; interior forest habitat; natural vegetation blocks; steep slopes; and key locations for rare, species and threatened natural communities, as determined by the Pennsylvania Natural Areas Inventory and the Pennsylvania Natural Heritage Program. A description of the Smart Conservation Model and the methodology it employs for ranking lands can be found in **Appendix B**.

All lands ranked 6 through 10 are included as project areas in the CELC plan (see **Map 13**). (Note: the Smart Conservation Model was not developed for Erie County and was therefore not used for the delineation of project areas in the LECW).

- **2030 Greenspace Network.** The CELC plan emphasizes the protection of lands that create connections to and between other conservation lands. This connected network concept is embodied by DVRPC's long-range plan for greenspace, the 2030 Greenspace Network, a vision for a seamless and interconnected network of naturally vegetated open space. The original 2030 Greenspace Network was developed for Bucks, Chester, Delaware, Montgomery and Philadelphia counties in southeastern Pennsylvania. A copy of the original 2030 Greenspace Network Map is provided in **Appendix C**.

The 2030 Greenspace Network is included in its totality as a project area. In the coastal watershed areas not covered by the original 2030 Greenspace Network, expanded greenspace networks – one for the DECW and one for the LECW – were created based on visual interpretation of aerial photos, land use and environmental data, as well as county and regional plans. These expanded greenspace networks are shown on **Map 14** and **Map 15**.

The DECW and LECW greenspace networks are based on the location of core ecological “hubs” and “corridors”, including large protected land areas, contiguous wooded lands, steep slopes, wetlands and riparian corridors. However, unlike the Smart Conservation Model, which only identifies current high-value lands, the Greenspace Network identifies lands that could be used to bridge “gaps” in the natural land cover to create a seamless network. These lands generally include fragmented woodlands, agricultural lands, vacant lands, institutional lands, managed areas, or lands currently in some form of recreational use. While a tool such as the Smart Conservation Model may not rank these “bridge” lands highly, their potential to link existing natural lands gives them great worth.²¹

The identification of linkages between larger ecological nodes is in keeping with CELCP’s emphasis on creating an interconnected network of greenspace, and it supports the state’s over-arching goal of creating a state-wide system of greenways as outlined in *Pennsylvania Greenways: An Action Plan for Creating Connections*.

- **The Schuylkill Watershed Conservation Plan (SWCP).** The Academy of Natural Sciences, Natural Lands Trust, and The Conservation Fund completed the SWCP in May 2001. This detailed document provides a comprehensive overview of natural and ecological conditions in the entire Schuylkill River watershed, and sets the goal of creating a “sustainable landscape.” According to the plan, “the goal of promoting a sustainable landscape focuses on: creation of an integrated, connected natural lands vision for the Schuylkill River watershed, incorporating existing and proposed greenspace nodes; and, recognition that protecting a quorum of natural lands will promote landscape sustainability and help preserve water quality.” The plan also states that a sustainable landscape “is critical to ensuring human health and quality of life, through source water protection, prevention of floods, and provision of natural/recreational areas and greenspace amenities.”

To create a sustainable landscape vision, the SWCP identified high-quality natural lands and made recommendations for preserving them within a networked system. The “high-quality natural lands” identified by the SWCP are included as project

²¹ Because the Greenspace Network was drawn in a somewhat conceptual seamless fashion, it does include some fragments of developed land. Thus, it is important for CELC projects to be analyzed relative to all of the data layers used to define project areas within this plan.

areas within Pennsylvania’s CELC Plan. The data layers used to define high-quality natural areas in the SWCP included the following: Pennsylvania Natural Diversity Inventory (PNDI) sites; Pennsylvania Important Bird Areas (IBAs); primary sensitive lands, i.e. steep slopes, wetlands, and floodplains; “exceptional value watersheds”; and contiguous forested land cover. The plan also examined biodiversity potential based on first order stream frequency and percent forested land cover and ranked each of the subwatersheds within the Schuylkill River watershed accordingly.

The SWCP identifies the lands above on two maps: the Sensitive Lands Map and the Composite Proposed Greenspace Map. These maps are displayed in **Appendix D**. The location of a CELC project in an area targeted by the SWCP is both a threshold and an incentive for project nomination. It should be noted, however, that the lands identified by the SWCP closely duplicate the lands already captured by the Smart Conservation Model and/or the 2030 Greenspace Network.

- **Chesapeake Bay Health and Restoration Assessment**
- During the first quarter of each year, the Chesapeake Bay Program assembles an assessment of Chesapeake Bay health and restoration, which synthesizes the previous year’s Bay ecosystem health, restoration efforts and factors impacting Bay and watershed health. The report provides information on efforts to preserve land within the Chesapeake Bay watershed. The document can be found at <http://www.chesapeakebay.net/indicatorshome.aspx?menuitem=14871> . Chesapeake Bay program maps that delineate protection priorities can be found at <http://www.chesapeakebay.net/mapsearch.aspx?menuitem=14873> .

Supplementary Environmental Data Layers

- **Woodlands.** To delineate project areas in areas not covered by the Smart Conservation Model, the Greenspace Network, or the Schuylkill Watershed Conservation Plan (and to supplement these studies), individual environmental data layers are used. Primary among these is the location of unfragmented, contiguous woodlands, as determined by land use and land cover data developed by DVRPC and Penn State University. For the CELC plan, contiguous woodlands are defined as all woodland blocks of 50 acres or more (**see Maps 16 and 17**).

Smaller fragmented woodlands used to form corridors connecting larger greenspace “hubs” are also included as project areas when they fall within areas identified by the greenspace network, as specified above.

- **Floodplains.** All 100-year floodplains, as mapped by the Federal Emergency Management Agency (FEMA), are included as project areas (**see Maps 18 and 19**). Floodplains are identified as project areas because of the important

environmental benefits they provide. The benefits of naturally functioning floodplains include the storage and conveyance of flood waters, the recharging of groundwater, the maintenance of surface water quality, and the provision of habitats for fish and wildlife. Naturally functioning floodplains protect the aquatic communities that form the base of the food chain by maintaining water temperatures, removing and mitigating pollutants, and filtering out excessive sediments. These areas also provide diverse recreational opportunities, scenic value, and a source of community identity and pride. Development should be kept out of floodplains to both maintain these benefits and to protect individuals and society from incurring losses due to flooding.

- **Wetlands.** National Wetlands Inventory data was used to identify wetlands. All wetlands are included as project areas. (see **Maps 20 and 21**). Wetlands are a key ecological resource that support both terrestrial and aquatic animals and boast biological productivities far greater than those found in most other ecosystems. They have a remarkable knack for capturing and storing sunlight and efficiently recycling materials. They also have an extraordinary ability to shelter fish and wildlife, cleanse polluted and silt-laden water, and protect against floods. Because of their ability to maintain ground and surface water quality, provide valuable habitat, and control and store floodwaters, the conservation of wetlands is a top priority for the Commonwealth of Pennsylvania. Wetlands do receive significant regulatory protection from local, state and federal programs, but conservation through acquisition affords maximum protection of these critical areas.
- **Riparian Lands.** In Pennsylvania, riparian lands often form the spine of greenways that connect larger greenspace “hubs”. Many of the linear corridors in the Greenspace Network, for example, are riparian corridors. An inter-connected network of forested and vegetated riparian lands is essential for a healthy and thriving stream ecosystem. Vegetated riparian lands are ecologically valuable because they protect stream waters from direct sunlight, help maintain cooler water temperatures, provide detritus in the stream that serves as food and shelter for aquatic species, filter excess nutrients and pollutants, reduce sediment loads, and control erosion by stabilizing stream banks and limiting high velocity flood flows. Not surprisingly, riparian lands often overlap with floodplains and are likely to contain wetland areas. To identify riparian areas not captured in other data layers, a fixed buffer of 300 feet was applied to all streams and rivers in the DECW and LECW (see **Maps 22 and 23**). While these buffered areas encompass a variety of land uses, their overall importance for the health of coastal watersheds warrants their inclusion as project areas.

Supplementary Studies/Plans

- Pennsylvania Rivers Conservation Plans

Rivers Conservation Plans (RCPs) have been completed for subwatersheds within the DECW. The Schuylkill Watershed Conservation Plan, described above, is an RCP that covers approximately three-quarters of the area of the DECW. Other RCPs have been done for southeastern Pennsylvania covering smaller subwatersheds within the Schuylkill River basin as well as for watersheds that fall within the DECW but outside of the Schuylkill River watershed. An RCP for the entire Lake Erie coastal watershed, entitled *Pennsylvania Lake Erie Watershed Conservation Plan*, was published by the Lake Erie Region Conservancy (LERC) in August 2008. These plans are described in more detail in *Section 3.5: Existing Plans Incorporated by Reference into the Pennsylvania CELC Plan*.

Discrete geographic areas targeted for conservation within RCPs are defined as project areas by this plan. However, the majority of lands targeted for conservation in RCPs are already encompassed by the project areas identified above. To review areas targeted for conservation by RCPs, CELCP applicants must refer to the RCP documents themselves. Most Rivers Conservation Plans are available online by accessing the Pennsylvania Department of Conservation and Natural Resource's Rivers Registry at:

<http://www.dcnr.state.pa.us/brc/rivers/riversconservation/registry/>

A list of RCPs completed as of December 2007 within the DECW (the Lake Erie Watershed Plan Conservation Plan is the only RCP for that region) is also included in this document on page 41.

3.3 Additional Lands and Values to be Protected through CELCP

Many lands have the *potential* to have a high ecological function, even though their *current* ecologic function may not be optimal. For example, the region's agricultural lands, former resource extraction lands, abandoned industrial lands, and vacant urban lands offer unique opportunities for the restoration of ecological function. Accordingly, these areas can be included as CELC projects if they fall within and contribute to the project areas identified above. However, applicants will need to demonstrate financial support and clear plans for restoration in their proposals for these types of projects.

Agricultural Lands

In studies that prioritize the ecological value of land, agricultural areas do not rate highly because they are stripped of natural vegetation, graded, fertilized and used for monoculture cropping. However, when agricultural areas remain fallow, they are reclaimed by successional natural communities. With these communities come natural forms of vegetation, a wider diversity of plant and animal life and a higher level of ecological function. Additionally, agricultural lands tend to have good, nutrient-rich soils, high-quality drainage, and the ability to support large amounts of biomass and healthy forest communities. Furthermore, the conversion of agricultural lands to natural

communities begins almost as soon as these areas cease to be farmed, and this transition occurs at little or no cost.

Because of their potential ecological value, agricultural lands should not be excluded from consideration for future conservation. Furthermore, the economics of farming in some parts of Pennsylvania have created disincentives for keeping land in agricultural use. It should be noted, however, that the CELC plan *does not define all* agricultural lands as project areas for the following reasons: (1) opportunities for conversion of agricultural lands to natural lands may be limited; (2) the Commonwealth and local governments are currently working to preserve agricultural lands and maintain the economic viability of farming; and (3) the present-day ecological value of farmlands is not as high as other naturally-vegetated land. Agricultural lands *can be considered for submission as CELC projects* when they fall within an existing project area, as defined above. Agricultural lands protected with CELC funds must be allowed to revert to a natural state.

Abandoned Industrial Lands, Vacant Urban Lands and Strip Mining Areas

Abandoned industrial areas, known as brownfields, former strip mining areas, and vacant urban lands, offer exciting opportunities for ecological restoration, especially when these sites are located in urban settings that have lost most of their natural features and green spaces. These are vacant and barren lands that have restoration potential and are located within or adjacent to the CELC project areas that contain the states' priorities for protection. Accordingly, these areas can be considered high-priority CELC projects when they fall within and contribute to the project areas identified in this plan. While not all of these sites have been comprehensively mapped, they are mostly captured by the vacant/barren land use category and are shown on **Map 26** and **Map 27**.

In Pennsylvania, where sizable stretches of the state's waterfronts are occupied by abandoned, marginal or faltering industrial, manufacturing and commercial sites, the opportunities for ecological restoration are significant. In addition, such restoration can offer important recreational and quality of life benefits to large populations currently deprived of access to high-quality open space and/or waterfronts. Any project that includes lands in this category will be carefully examined with regard to restoration feasibility, ecological value, and long-term management plans. Pennsylvania will ensure that all proposed CELC projects will complement working waterfront needs, consistent with the new CELC authorization.

3.4 Evaluating and Ranking CELCP Projects

To be eligible for consideration by Pennsylvania's CELC program, a project must embody one or more of the types of lands and values identified in the previous sections and be included within Pennsylvania's project areas. A large number of potential CELC projects could meet these criteria. How then will the state evaluate and prioritize projects among one another?

While a purely quantitative evaluation system would seem most fair, there is no clear formulaic basis by which projects can be compared. Indeed, some of the state’s priorities are contradictory, making a straight “apples to apples” comparison of projects difficult. For example, one priority of the Commonwealth is to promote projects with a low per-acre cost, while another is to protect lands facing a threat of conversion, even though lands in the latter category will likely have a much higher per-acre cost. Likewise, lands proximate to developed communities lacking in open space resources are likely to be more costly than lands in rural areas, but the passive recreation and quality-of-life benefits of protecting the former are arguably greater because of the larger populations they serve. Similarly, conserving lands close to Pennsylvania’s coastal waters is desirable because of public access opportunities and direct benefits to coastal environments. However, coastal land prices tend to be high in Pennsylvania due to both relatively denser development along parts of the coast and the potential desirability of waterfront property for future residential growth and tourism.

Given such competing goals, a large degree of subjective and qualitative analysis will be involved in evaluating and ranking projects submitted to the state for CELCP funding. However, it is possible to lay out criteria that will help to distinguish high-quality projects from those of a lesser caliber. To do this, the Commonwealth will use a three-step process that determines (1) if a project is eligible for CELCP funding; (2) how well it corresponds with Pennsylvania’s CELCP goals; and (3) how well a project meets the goals of the national program as defined by NOAA, and addresses a variety of additional subjective factors. The better a project corresponds with Pennsylvania’s and NOAA’s CELCP goals, the more likely it will be forwarded on to NOAA for consideration at the national level. The following describes the steps that will be used to evaluate the eligibility and quality of CELCP projects within Pennsylvania. Applicants are encouraged to address these criteria in their project proposals.

STEP 1

To be eligible for CELCP funds, a project must:

- Meet the national criteria as listed in *Section 1.4: CELC Plan Required Elements* beginning on page 5;
- Be located within Pennsylvania’s coastal and estuarine areas and also within a project area as defined in this plan (please also see maps 4, 4A, 24 and 25).
- Match federal CELCP funds with *non-federal funds* at a ratio of at least 1:1 (in addition to *non-federal funds*, in-kind donations of land are also eligible match);
- Be held in public ownership (fee simple or conservation easements) and provide conservation in perpetuity;
- Provide for access to the general public or other public benefit, as appropriate and consistent with resource protection;

STEP 2

Projects most likely to be nominated to the national selection process are those that attain or exceed the following goals (The goals are listed in two tiers. A greater weight is placed on the goals in Tier 1.):

Tier 1

- Contain lands receiving high Smart Conservation Model scores (e.g. 8, 9 or 10);
- Protect unfragmented woodlands, wetlands, floodplains, and riparian corridors as defined by this plan;
- Conserve all or portions of larger unfragmented (i.e., approx. 500+ acres), natural landscapes;
- Protect rare species, natural features and communities identified by the Pennsylvania Natural Areas Inventory and the Pennsylvania Natural Heritage Program²²;
- Protect lands that link existing conservation areas and contribute to the completion of the greenway corridors outlined in this plan;

Tier 2

- Provide increased opportunities for passive recreation and improve public access to waterfronts, especially on the Schuylkill and Delaware rivers, and the Lake Erie waterfront;
- Provide aesthetic enhancements and/or contribute to the preservation of historic landscapes or structures, in a manner that does not devalue or threaten the ecological values of the property;
- Conserve lands in Pennsylvania's federally-designated coastal zones (**see Maps 2 and 3**);
- Conserve ecologically valuable areas that are threatened by conversion (**see Maps 28 and 29**). Lands threatened by conversion are determined by an analysis of population projections and forecasted residential densities for growth (based on conventional growth scenarios) at the municipal level through 2030. The level of threat is divided into four categories. Categories are based on the likelihood that existing undeveloped land will be developed by 2030. The following percentages

²² In the areas of southeastern Pennsylvania covered by the Smart Conservation Model, this criteria is duplicative as the Pennsylvania Natural Areas Inventory and the Pennsylvania Natural Heritage Program database were used as inputs into the model.

define the categories: a 40 percent chance of development by 2030 or greater; a 20 to 40 percent chance of development; a 10 to 20 percent chance of development; and less than a 10 percent chance of development.

These four categories are meant only to provide a broad basis for comparison. Local and site specific conditions play a large role in determining development threat. For example, while the threat of development for a municipality as a whole may be small, development for a particular portion of a municipality may be much higher. Likewise, development pressure on a given site or parcel may be intense, despite the fact that the overall development threat for the municipality is small. Applicants should document any local or site specific knowledge of a development threat in their applications. Projects aimed at preserving high-value ecological lands that face a relatively higher threat of development (as determined by Maps 28 and 29 or by documenting local conditions) will receive additional emphasis in the project selection process.

- Maximize acres preserved per dollar; and
- Reclaim and protect vacant industrial, brownfield, former strip mining or other abandoned lands for the purpose of ecological restoration, long-term conservation, greenway completion, passive recreation and waterfront access.

STEP 3

The criteria in Step 3 incorporate a number of additional factors, including the relationship of the project to other plans. In this step, less quantifiable issues, including those pertaining to a property’s management and integrity, will also be considered. Please also see Sections 3.2 and 3.5 for a list of plans incorporated by reference. Project applicants should address the following in their submissions:

- How does the proposed acquisition address the ranking priorities listed in NOAA’s Federal Funding Opportunity Notice?;
- How will the proposed acquisition further existing conservation goals and objectives contained in the plans referenced by this CELC plan?;
- Is the site highly vulnerable to uncontrollable external impacts?;
- What restoration is needed and what are the challenges to effective restoration? Is the property too small and/or too degraded to maintain or reestablish normal ecosystem processes? Are special programs such as exotic plant removal or hydrological restoration required?;
- Can the applicant demonstrate financial support and a clear plan for restoration in their proposal?;

- Can the property be effectively managed and maintained? Does the holder of management responsibility have adequate capacity for effective long-term management of the property?;
- How does the property compare in terms of benefits/costs to other properties? What are potential obstacles to transferring the property? How quickly can the transfer be made?

The above criteria are not listed in order of importance. However, ecological value, as embodied by the five bullet items in Tier 1 of Step 2 above, carry the greatest weight. Such a policy is in keeping with the CELCP guidelines. Projects will be evaluated based on both the degree to which they achieve the goals above and the number of goals they help to accomplish. Please also see Section 4.3 for more information on the state project selection/nomination process.

3.5 Existing Plans Incorporated by Reference into the PA CELC Plan

NOAA guidelines encourage States to make use of work that has already been accomplished that relates to land conservation or restoration at the state or local level. Numerous plans and studies have been completed that address land conservation priorities and ecological needs in Pennsylvania's coastal watersheds. The conservation priorities and evaluation criteria highlighted throughout this CELC Plan are informed by these documents. Several of these documents were used explicitly to identify project areas. These documents are listed immediately below. Following this list is a list of documents that were used to help define overall conservation priorities, but were not used as project area source documents. Both this second set of documents and the documents used to identify project areas will be used by the Commonwealth to evaluate and rank CELCP applications.

Plans and Reports Used to Identify Project Areas

- *Regional Greenspace Priorities of Southeastern Pennsylvania*
<http://www.regionalgreenplan.org/intro.htm>

The original "Regional Open Space Priorities Report" (ROSPR) was completed by the GreenSpace Alliance of Southeastern Pennsylvania in Winter 2004. In 2006, the report was revised and released with a new title: *Regional Greenspace Priorities of Southeastern Pennsylvania*. The report identifies, prioritizes, and recommends protection strategies for high-value natural resource, agricultural, and recreational lands in the five-county southeastern Pennsylvania area. Of particular interest is the report section that prioritizes land for natural resource protection using the Natural Lands Trust's Smart Conservation Model. The Smart Conservation Model is used to identify project areas within this document, and, as noted earlier, will be an important tool in evaluating and ranking CELCP projects submitted to the Commonwealth for competition at the national level.

- *Destination 2030: Delaware Valley Regional Planning Commission's Long-Range Plan*
<http://www.dvrpc.org/LongRange.htm>

Destination 2030 is DVRPC's long range plan for the five counties of southeastern Pennsylvania. The plan, completed during Summer 2005, features a vision for a completely interconnected system of open space: the 2030 Greenspace Network. The Network was developed in conjunction with the region's member governments, PA DCNR, and representatives of the non-profit community, and was reviewed at a series of public meetings held during May and June of 2005. An updated version of the long-range plan, *Connections 2035*, was adopted by the Board in July 2009.

The Greenspace Network is an unbroken system of primarily naturally-vegetated lands that includes both linear corridors and larger nodes of open space, and it

encompasses almost all of the region's existing federal, state and county parks. Making the Greenspace Network a reality will require preserving or acquiring thousands of additional acres of currently unprotected open space. The Commonwealth will prioritize CELC projects that help to achieve this goal. The entire Network is identified as a Project Area. A copy of the original 2030 Greenspace Network map can be found in **Appendix C**.

- *Schuylkill Watershed Conservation Plan (SWCP)*
<http://www.schuylkillplan.org/>

The Conservation Fund, Natural Lands Trust and the Patrick Center for Environmental Research prepared the SWCP in 2001 under a contract with the Pennsylvania Department of Conservation and Natural Resources (DCNR). The plan was officially adopted by PA DCNR as a River Conservation Plan. Spatially, the plan covers the entire Schuylkill River Watershed, all of which falls within, and covers over 75 percent of the DECW.

One of the primary focus areas for this plan was an analysis of watershed lands required for ecosystem sustainability. The goal of the analysis was to identify landscapes that will help to sustain the watershed ecosystem, by defining a pattern of greenspace and protected natural areas that can function as an interconnected network to protect the ecological and hydrological processes of the watershed.

The final analysis identified over 200,000 acres of the Schuylkill River watershed as priority lands for conservation or restoration. The identification of these lands was based on the location of biodiversity hotspots, floodplains, steep slopes, wetlands, forested lands and greenspace corridors. The analysis also determined the potential development threat to watershed resources by mapping population projections. The plan recommends that conservation of natural resources be implemented in order of priority and threat.

Both the focus and the geographic scope of the SWCP are closely aligned with the CELC plan. All the lands shown on the Sensitive Lands Map and the Composite Proposed Greenspace Map are defined as project areas within this plan. A summary of the Landscape Sustainability section of the plan and the Composite Proposed Greenspace Map and Sensitive Lands Map are included in **Appendix D**.

- *Pennsylvania Rivers Conservation Plans*
<http://www.dcnr.state.pa.us/brc/rivers/riversconservation/registry/>

Additional Rivers Conservation Plans (RCPs) have been completed for much of the DECW. The Schuylkill Watershed Conservation Plan, described above, is an RCP covering approximately three-quarters of the area of the DECW. (See below for a description of the Lake Erie Watershed Conservation Plan, the only RCP completed for the LECW.) Other RCPs have been done for southeastern Pennsylvania covering areas not addressed by the Schuylkill Watershed

Conservation Plan or focusing in more detail on subwatersheds within the Schuylkill River watershed.

The Rivers Conservation Program was developed to conserve and enhance river resources through the preparation of locally initiated watershed-based plans. A Rivers Conservation Plan performs the following: 1) identifies significant natural, recreational and cultural resources; 2) determines threats to river resources and values as part of a locally-driven planning process; and 3) recommends methods to conserve, enhance and restore a watershed's rivers and streams.

River Conservation Plans have been prepared for nearly all of southeastern Pennsylvania's coastal watersheds and sub-watersheds. The following is a list of RCPs in southeastern Pennsylvania completed and approved by the Department of Conservation and Natural Resources (DCNR) as of March 2009.

- Chester Creek
- Chester County (countywide)
- Crum Creek
- Darby Creek
- French Creek
- Hay Creek
- Lower Delaware River
- Lower Neshaminy Creek
- Maiden Creek
- Paunacussing Creek
- Pennypack Creek
- Ridley Creek
- Schuylkill River
- Tacony-Frankford Creek
- Tookany Creek
- Tulpehocken Creek
- Upper and Middle Neshaminy Creek
- Upper Perkiomen Creek
- Wissahickon Creek

Most River Conservation Plans are available on-line through DCNR at <http://www.dcnr.state.pa.us/brc/rivers/riversconservation/registry/>.

All completed and approved RCPs as of December 2008 are referenced by Pennsylvania's CELC plan. Projects that fall within priority conservation areas identified in RCPs will receive additional consideration in the Commonwealth's ranking and evaluation process.

Plans and Reports Used to Inform Pennsylvania's Conservation Priorities

- *Pennsylvania Coastal Resources Management Program Technical Guidance Document*
<http://www.elibrary.dep.state.pa.us/dsweb/Get/Document-68114/394-0300-001.pdf>

The *Technical Guidance Document*, originally prepared in 1998, is the current active program document for the Pennsylvania Coastal Resources Management Program (The document is periodically updated to incorporate “Routine Program Changes”). The *Guidance Document* enumerates the Pennsylvania Coastal Resource Management Program’s policies, objectives, regulatory authorities and processes for implementation of program goals. The entire document is included by reference within the PA CELC Plan.

The *Guidance Document’s* policy framework is directly supported by the acquisition of coastal lands for conservation and public use. The *Guidance Document* lists the following objectives of the Coastal Resource program: preserving and enhancing wetlands, expanding public access to coastal areas for recreation, managing floodplains and coastal hazard areas, improving water quality and coastal fisheries, and preserving historic and cultural resources. All of these objectives can be supported through CELCP-supported acquisitions (Note: The *Guidance Document* includes other policies, such as those regarding “energy facility siting” that do not specifically relate to the acquisition of lands for conservation and recreation).

The coastal zone is composed of numerous unique natural areas and areas of significant historic and cultural value. Protecting these areas is a key goal of the Pennsylvania Coastal Zone Management Program. According to the *Guidance Document*, “the wildlife and vegetation communities existing in the [coastal zone] constitute a significant natural resource, which in many instances provide a greater than local benefit. The major goals of the management program are the protection and enhancement of these areas and the encouragement of only those uses which will not interfere with the area’s natural functions.” High priority activities in these areas include protection as open space and wildlife preserves; passive recreation; and the restoration of natural plant communities.

As one of the first areas to be heavily settled by European colonists, the Delaware Estuary portion of Pennsylvania’s coastal zones contains an abundance of historic and cultural treasures. The Lake Erie coastal zone, while not settled as early as the southeastern portion of the state, also possesses many historic and cultural assets dating back to pre-Revolutionary War days. These resources have significant social value to citizens for recreational and cultural activities. According to the *Guidance Document*, “the goal of the coastal program should be to protect, maintain, or restore these areas.”

CELCP projects that conserve and protect natural areas or that protect and enhance historic and cultural resources are encouraged by the Pennsylvania Coastal Resources Management Program.

- *Pennsylvania Wildlife Action Plan*
<http://www.pgc.state.pa.us/pgc/cwp/view.asp?a=496&q=162067>

The Pennsylvania Wildlife Action Plan, prepared by the Pennsylvania Game Commission and the Pennsylvania Fish & Boat Commission, was first published in September 2005 and revised in May 2008. The Wildlife Action Plan examines the health of the Commonwealth's wildlife and prescribes actions to conserve wildlife and vital habitat before they become more rare and more costly to protect. Some of the biggest challenges facing Pennsylvania's wildlife include habitat loss, fragmentation and degradation. CELCP projects should seek to support the conservation of important coastal species and habitat identified in the Plan. CELCP applicants are encouraged to review the Wildlife Action Plan and demonstrate how their project supports the Plan's goals.

- *Pennsylvania Lake Erie Watershed Conservation Plan*
(Plan is not available online as of December 2009, but a copy can be obtained from PADEP's Coastal Resources Management Office.)

The Lake Erie Watershed Conservation Plan was published by the Lake Erie Region Conservancy in August 2008. As of December 2009, the plan had not yet been officially approved by DCNR. Because the plan was published well after the original drafts of the PA CELC Plan were compiled, the Lake Erie plan was not used explicitly to identify CELC project areas. However, priority land types and values targeted for conservation by the Lake Erie plan are included by reference in the PA CELC Plan. Almost all of these "priority land types" are already identified as Project Areas within the PA plan.

The Lake Erie plan outlines a detailed blueprint for implementing conservation activities across the watershed. The plan's unifying theme is the protection and restoration of water quality. To accomplish these goals, the plan places a strong emphasis on preserving core forests, restoring and re-establishing riparian buffers, and protecting and restoring headwater streams. Increasing public access to aquatic and natural resources for recreational and educational purposes is also primary objective of the plan.

The plan recommends using GIS to prioritize areas for protection and gives examples of how this can be done, but does not perform this analysis on a watershed-wide basis.²³ According to the plan, prioritization should be based on where desirable natural resources (i.e., forests, wetlands, riparian areas and natural floodplains) already exist or may be lacking. The geographic analysis and

²³ Some natural resource mapping is included in the plan, such as the location of Natural Areas Inventory sites, but a comprehensive inventory of lands targeted for preservation is not included.

mapping performed in the PA CELC Plan partially fulfills this missing function. Accordingly, Project Areas as defined by the PA CELC Plan, as well as procedures for prioritizing within Project Areas, are synergistic with the watershed conservation objectives of the Lake Erie plan.

CELCP applicants targeting properties within the Lake Erie watershed are encouraged to communicate with the Lake Erie Region Conservancy to coordinate activities and leverage funding opportunities.

- *The Tidal Schuylkill River Master Plan*
<http://www.schuylkillbanks.org/home.aspx?topicID=25>

The Schuylkill River Development Corporation engaged EDAW, Inc. in 2001 to prepare a long-term plan for the tidal Schuylkill River. The report was completed in March 2003. The study area for the plan encompasses a relatively small geographic area on either side of the tidal Schuylkill River. The area extends eight miles from the Fairmount Water Works dam to the Delaware River and covers an area of less than seven square miles.

The purpose of the plan is to create a sustainable strategy for the long-term physical, social and economic development of the most urbanized segment of the Schuylkill River. The plan is significant because it focuses on a small and urbanized portion of the DECW that has unique ecological, social, and recreational needs. Conservation in this physical setting and at this scale is very different than conservation at the DECW-wide scale, and the Tidal Schuylkill River Master Plan lays out a framework for effective and strategic conservation and restoration in this setting. Although large acreages are not available for preservation in the tidal Schuylkill region, the benefits of quality public access and strategic ecological restoration in an urban setting can be immense in both natural and human terms.

Key components of the plan focusing on conservation, public access and ecological restoration include the following:

- Protect and improve existing wetlands and the 100-year floodplain;
- Look for opportunities to create additional wetlands and to use wetlands for urban stormwater treatment;
- Preserve existing woodlands and revegetate areas with native species to be used for open space and recreation;
- Maintain a 100-foot buffer along the river for habitat and improved water quality;
- Look for opportunities to restore riparian buffers;
- Use bioengineering approaches to streambank stabilization as an alternative to bulkheads and riprap;
- Protect and enhance habitat areas.

The plan also calls for the creation of a continuous greenway/trail along the entire length of the river to become part of the East Coast Greenway, and the creation of several new open space nodes. The Tidal Schuylkill River Master Plan is a detailed and well-developed vision for using ecological restoration and conservation as catalysts for the redevelopment and rejuvenation a densely urbanized area. Accordingly, CELC projects that support the ecological and natural resource goals of this plan should be given favorable consideration.

- *North Delaware Riverfront Greenway Master Plan & Cost Benefit Analysis*
<http://www.drcc-phila.org/plans.htm>

The North Delaware Riverfront Greenway Master Plan focuses on a area of Northeast Philadelphia between the Delaware River and Interstate 95, and from the Betsy Ross Bridge in the south to the Bucks County line in the north. The plan was prepared by Greenways Incorporated, Econsult Corporation, and Schelter and Associates at the behest of the Pennsylvania Environmental Council, the Northeast Riverfront Task Force, and the City of Philadelphia.

The plan recommends the creation of a continuous public greenway along an eight mile stretch of the Delaware Riverfront. According to the plan, “a properly developed continuous greenway and trail system can provide a significant public recreation, open space and economic development asset for new and existing riverfront neighborhoods, the City, region, and State of Pennsylvania.” The plan details how the City will receive a significant return on its investment in a fully-developed greenway.

A highlight of the greenway plan is a continuous riverfront trail system. This trail system would provide public access, an alternative mode of transportation, and recreation opportunities along the riverfront. The trail would become part of the East Coast Greenway and would connect to existing and future trails along the Pennypack, Poquessing and Frankford creeks.

The Master Plan sets forth key recommendations to accomplish implementation and operation of the greenway in regard to the follow strategic areas:

- Land acquisition and resource protection;
- Phasing of projects: 2009, 2014, 2019;
- Funding and financing;
- Management strategies;
- Organization strategy;
- Operational policies; and
- Next steps

As is the case with the Tidal Schuylkill River Master Plan, the North Delaware Riverfront Greenway Master Plan is a detailed and well-developed vision for using greenway creation, ecological restoration, and continuous public access to

riverfronts as catalysts for the redevelopment and rejuvenation of a largely blighted and underutilized urban area. Accordingly, CELC projects that support the land acquisition and natural resource goals of the North Delaware Riverfront Greenway Master Plan should be given favorable consideration.

- *Pennsylvania Greenways: An Action Plan for Creating Connections*
<http://www.pagreenways.org/>

This plan, released in the summer of 2001, was prepared by the Pennsylvania Department of Conservation and Natural Resources (DCNR), the Department of Environmental Protection (DEP), and the Department of Transportation (PennDOT), in conjunction with the Pennsylvania Greenways Partnership Commission. The *Action Plan* was designed to provide a coordinated and strategic approach to creating connections through the establishment of greenways in Pennsylvania. According to the plan, greenways are critical because they:

- Enhance the “sense of place” in a community or region;
- Accentuate the scenic beauty and majesty of the state;
- Protect the state’s water resources by buffering non-point sources of pollution;
- Provide opportunities to protect and manage wildlife, forests and ecological systems;
- Provide recreation opportunities for families and individuals of all ages and abilities;
- Provide alternatives to automotive transportation;
- Add positively to the economic climate; and
- Are a core component of strategies to foster health and wellness—especially as the population ages.

The strategies, goals, and implementation techniques laid out by the *Action Plan* were developed in conjunction with a stakeholder group consisting of representatives from over 200 private and non-profit organizations. Extensive field interviews were also conducted with members of the public to gauge public perceptions on greenways. CELC projects that help to achieve the goals outlined in the *Action Plan* will be a priority for the Commonwealth

- *Pennsylvania Natural Areas Inventory (PNAI)*
http://www.naturalheritage.state.pa.us/CNAI_Download.aspx

A Natural Areas Inventory provides information about the location of rare, threatened and endangered species as well as about high-quality natural areas. NAIs are prepared on a countywide or multi-county basis, include public involvement, and are undertaken in cooperation with private non-profit conservation organizations and county planning offices. NAIs include a county overview, a description of the Pennsylvania Natural Diversity Inventory system,

natural areas inventory methods, results of the inventory, a summary and recommendations, and related appendices. Tasks involved in conducting an inventory include air photo interpretation and surveys of secondary sources, aerial and ground surveys, data analysis and technical report preparation, public meetings, and municipal handbook publication and distribution.

NAIs have been completed for the following communities within Pennsylvania's coastal watersheds: Erie, Berks, Bucks, Chester, Delaware, Lancaster, Lebanon, Lehigh, Montgomery, Philadelphia and Schuylkill counties. In addition, Carbon and Crawford counties are currently preparing NAIs. NAIs will be used to evaluate CELC project submissions. Any project containing lands within an important natural area will be prioritized according to its relative NAI priority level. Four priority levels are identified within the NAI program.

- *County Open Space and Land Use Plans*

The following county open space plans are included by reference in Pennsylvania's CELC Plan. Not all counties within the CELC plan study area are included because some do not have open space plans or their plans are not up-to-date (i.e., less than 15 years old).²⁴ In addition to the plans listed below, Philadelphia is currently working on an open space plan. This plan will be referenced once it is completed. The following plans provide detailed frameworks for open space protection in their respective counties. The focus of each plan is to preserve important ecological features including woodlands, wetlands, floodplains, steep slopes, riparian corridors and areas rich in biodiversity, and link them together into an integrated network of greenspace.

- o *Schuylkill County Open Space & Greenway Plan*, Schuylkill County Planning & Zoning Commission, 2006.
http://www.pagreenways.org/toolbox/Schuylkill_2005.pdf
- o *Open Space, Natural Features, and Cultural Resources Plan: Shaping Our Future*, Montgomery County Planning Commission, Fall 2004.
<http://planning.montcopa.org/planning/cwp/view,a,3,q,1982.asp>
- o *Erie County Land Use Plan*, Erie County Department of Planning, December 2003.
<http://www.eriecountyplanning.org/index.php?page=comprehensive-plan-2>
- o *Linking Landscapes: A Plan for the Protected Open Space Network in Chester County Pennsylvania*, Chester County Planning Commission, September 2002.
<http://dsf.chesco.org/planning/cwp/view.asp?a=3&Q=608142&planningNav=>

²⁴ Carbon, Lancaster, Lebanon, and Lehigh counties were excluded because of the small area of each county falling within the DECW.

- o *Berks County Greenway, Park and Recreation Plan.* Berks County Planning Commission, December 2007.
<http://www.co.berks.pa.us/planning/cwp/view.asp?a=1635&q=489919>
- *Chesapeake Bay Program Documents*

The Chesapeake Bay Program assembles an assessment of Chesapeake Bay health and restoration, which synthesizes the previous year's Bay ecosystem health, restoration efforts and factors impacting Bay and watershed health. The report provides information on efforts to preserve land within the Chesapeake Bay watershed. The document can be found at <http://www.chesapeakebay.net/indicatorshome.aspx?menuitem=14871> . Chesapeake Bay program maps that delineate protection priorities can be found at <http://www.chesapeakebay.net/mapsearch.aspx?menuitem=14873> .

IV. STATE PROCESS FOR IMPLEMENTING CELCP

4.1 State Lead Agency

The state lead agency for implementing Pennsylvania's CELC Program is the Pennsylvania Department of Environmental Protection Water Planning Office (DEP-WPO). The Water Planning Office is responsible for implementing Pennsylvania's Coastal Zone Management Program, as approved pursuant to the Coastal Zone Management Act. DEP-WPO will work in close coordination with the Pennsylvania Department of Conservation and Natural Resources (PA DCNR), the state agency charged with holding title to and managing state-owned conservation lands. DCNR, along with the Pennsylvania Fish & Boat Commission and the Pennsylvania Game Commission, are responsible for public land planning and conservation programs such as Growing Greener II, Keystone '93, the Rivers Conservation Program, the Recreational Trail Program, and the Land Trust Program. These programs assist local governments in planning, land management, and acquisition for the purposes of conservation and recreation.

4.2 Entities Eligible to hold title to property acquired through CELC Program

According to NOAA's CELC Program guidelines, states must provide a list of state or local agencies or types of agencies, that are eligible to hold title to property acquired through the CELC Program. The title of property or interests in property must be held in perpetuity by the grant recipient or other appropriate public entity designated by the recipient, and such recipient will provide assurances, pursuant to the program guidelines, that the property will be held for conservation in perpetuity. In addition, NOAA specifies that a long-term stewardship or management strategy be developed that describes how grant recipients will address long-term operations, maintenance, and safety needs related to the property; as well as existing and proposed activities/uses envisioned. An important aspect of the stewardship strategy is to provide for appropriate public access, or other public benefit, that is consistent with the particular resource protection needs of the site.

Under the CELC program NOAA will make grant awards either to Pennsylvania DEP's Water Planning Office (WPO) or directly to sub-recipients, with concurrence by the WPO. In cases where grant funds are awarded to the state, WPO will allocate grants or make sub-awards to other state agencies, local governments as defined at 15 CFR 24.3, or entities eligible for assistance under section 306A(e) of the CZMA (16 USC 1455a(e)) to carry out approved projects. The Pennsylvania Department of Conservation and Natural Resources, Pennsylvania Game Commission, Pennsylvania Fish & Boat Commission, and any incorporated municipal jurisdiction or county government within Pennsylvania's coastal watershed boundary are eligible to hold title to property acquired through the CELC Program.

Funds awarded under this program must be matched on a 1 to 1 ratio. The match can be made from state, local, non-governmental or private sources in the form of cash or the value of nonmonetary or in-kind contributions, such as the value of donated lands or

services. In-kind match properties may be held by state or local public agencies or by a non-governmental organization whose primary mission is to acquire and manage land for the purpose of long-term conservation. Applicants should refer to the OCRM website at <http://www.coastalmanagement.noaa.gov/land/welcome.html> to obtain the CELCP guidelines to ensure all federal requirements are met.

4.3 State Solicitation and Nomination Process

Project Solicitation

Based on notification from NOAA of the availability of funding to implement CELCP in any given year, DEP-WPO will notify and solicit project applications from qualified entities. This will be done through procedures used to make potential applicants aware of other Coastal Resources Management grants availability, including the Pennsylvania Bulletin, the Department's applicable electronic communication media (website, etc) and direct mailings. By the deadline specified in the project solicitation, applicants will be required to submit a complete package of information on proposed projects pursuant to the CELCP guidelines and whatever additional information may be requested in the published notice.

If justified by Congressional appropriations, DEP-WPO may also solicit expressions of interest (i.e. pre-proposals) from potential applicants at any time. All that will be required at this stage in the process will be a brief description of the property, its location, limitations on use of the property, how its acquisition may further the objectives of the CELC Program or other conservation plans, estimated cost of the property, holder of title, and who would be responsible for managing the property, along with any other request for information contained in the solicitation. Submissions of expressions of interest may be held for consideration in future CELC funding cycles or forwarded to other conservation programs for consideration. Applicants that do not qualify for CELC funding or are deemed to have a low potential for funding will be notified early in the review process.

Each year, Pennsylvania may elect to focus the annual project solicitation toward specific priorities or areas identified in the approved CELC plan. A project proposal that includes several separate and distinct phases may be submitted in phases, but any succeeding phases must compete against other proposals in the year submitted, (i.e. previous funding approval does not guarantee subsequent funding).

State Review and Prioritization

DEP-WPO determines whether a proposal should be accepted for consideration on the basis that it is complete and eligible under the criteria identified within this plan. If the application is incomplete, DEP-WPO may provide an opportunity for the applicant to submit any missing information. DEP-WPO will then rank projects based on consistency with Pennsylvania's CELC Plan. Ranking will take place in accordance with the guidelines specified in Section 3.4 (see page 32). Final comments will be solicited from

the program's Coastal Zone Advisory Committee (CZAC), composed of representatives from networked state agencies. Candidate projects will then be submitted to OCRM NOAA for consideration at the national level.

Review and ranking of conservation proposals will be completed in a stepped process. As specified in Section 3.4, **Step 1** will determine whether or not properties proposed for nomination are eligible for CELCP funding. Properties will then be ranked according to how well they meet the criteria listed under **Step 2**. The highest weight will be placed on ecological function. The first criteria for evaluating ecological function in the DECW will be the numerical scores produced by NLT's Smart Conservation Model. The Smart Conservation Model was used to assign an ecological value to areas within the DECW with the exception of Carbon and Schuylkill counties. The model cannot be used to evaluate areas it does not cover. Projects will then be evaluated on the basis of the remaining criteria specified in **Step 2**. **Step 3** is the final evaluative step where a variety of additional factors will be considered. First among these is how well a project addresses the NOAA CELCP ranking priorities published in the Federal Funding Opportunity Notice. The remaining evaluation factors in **Step 3** are listed in Section 3.4

Projects identified by the review team as priorities will be nominated to OCRM NOAA for grant awards. The State may choose to nominate more than one project for CELC funding with each project standing as a separate nomination.

For those properties awarded NOAA CELCP funds and which are to be acquired by the State or in which the State will retain a long-term interest, the acquisition must be approved by the appropriate state agency prior to the transfer of the property.

V. COORDINATION AND PUBLIC INVOLVEMENT

The Commonwealth's Coastal Resources Program is a networked program. One of the most useful tools for coordination among the networked state and local agencies is the Department's Coastal Zone Advisory Committee (CZAC). This committee is authorized under the Federal Coastal Zone Management Act of 1972, as amended, and Executive Order 1980-20, issued by Governor Dick Thornburgh on September 22, 1980. There are nine state agencies with voting privileges, as well as two non-voting regional agencies (Delaware Valley Regional Planning Commission and the Erie County Department of Planning). CZAC meetings are public meetings that are noticed in accordance with the Pennsylvania Sunshine Act. Draft versions of the CELC plan were discussed at several CZAC meetings. Comments were reviewed and incorporated, as applicable.

In addition to CZAC, meetings were held with the Delaware Estuary Coastal Zone and Lake Erie Coastal Zone steering committees. These two standing committees are designed to provide strategic local input into Pennsylvania's Coastal Zone Management program. These committees were briefed on the Pennsylvania's CELC plan at regular intervals and provided guidance in the development of conservation priorities. Organizations and agencies represented by CZAC and the local steering committees include the following:

Pennsylvania Department of Conservation and Natural Resources, Department of Community and Economic Development, Department of Transportation, Governor's Policy Office, Pennsylvania Fish & Boat Commission, Pennsylvania Game Commission, Pennsylvania Historic and Museum Commission, Pennsylvania Utilities Commission, Erie County Department of Planning, Bucks County Planning Commission, Philadelphia County Planning Commission, Delaware County Department of Planning, Philadelphia Water Department, Fairmount Parks Commission, Philadelphia Office of Commerce, Philadelphia Managing Directors Office, Lake Erie Region Conservancy, Sons of Lake Erie, and representatives of several municipal governments.

Numerous other non-profit and governmental organizations, such as the Natural Lands Trust, Conservation Fund, Brandywine Conservancy, Heritage Conservancy, Highlands Coalition, Pennsylvania Environmental Council, Montgomery County Lands Trust, Greenspace Alliance, and the Chester and Montgomery county planning commissions, were briefed at various points throughout the planning process, supplied data, or were asked to provide input into the creation of the plan.

Following an internal review and inclusion of comments from stakeholders, a well-developed draft was distributed to the PA Department of Conservation and Natural Resources (the state's lead agency for land acquisition and management), the PA Fish and Boat Commission, the PA Game Commission, and the Governor's Policy Office for a final detailed review.

In addition to interagency coordination, public input was sought in several venues. An informal focus group, comprised of members from both of Pennsylvania's Coastal Zones,

was formed by the Delaware Valley Regional Planning Commission (DVRPC). Input from that group helped inform the initial draft versions that were presented to CZAC. Formal public input was gathered by publishing the draft CELC plan in the Pennsylvania Bulletin. Comments were reviewed and incorporated, as applicable.

The draft CELC Plan was published to the Pennsylvania Bulletin on April 28, 2007 for a thirty-day public comment period, which concluded May 29, 2007. No comments were received during that time.

VI. CERTIFICATION AND APPROVAL

This plan is consistent with the Commonwealth's Coastal Resource Management program, as approved by NOAA. The plan has been approved by the Department of Environmental Protection.

Signature of Approval

Coastal Resource Manager

APPENDIX A: MAPS

map 1: Pennsylvania's Coastal Zones



map 2: Lake Erie Coastal Zone Management Area



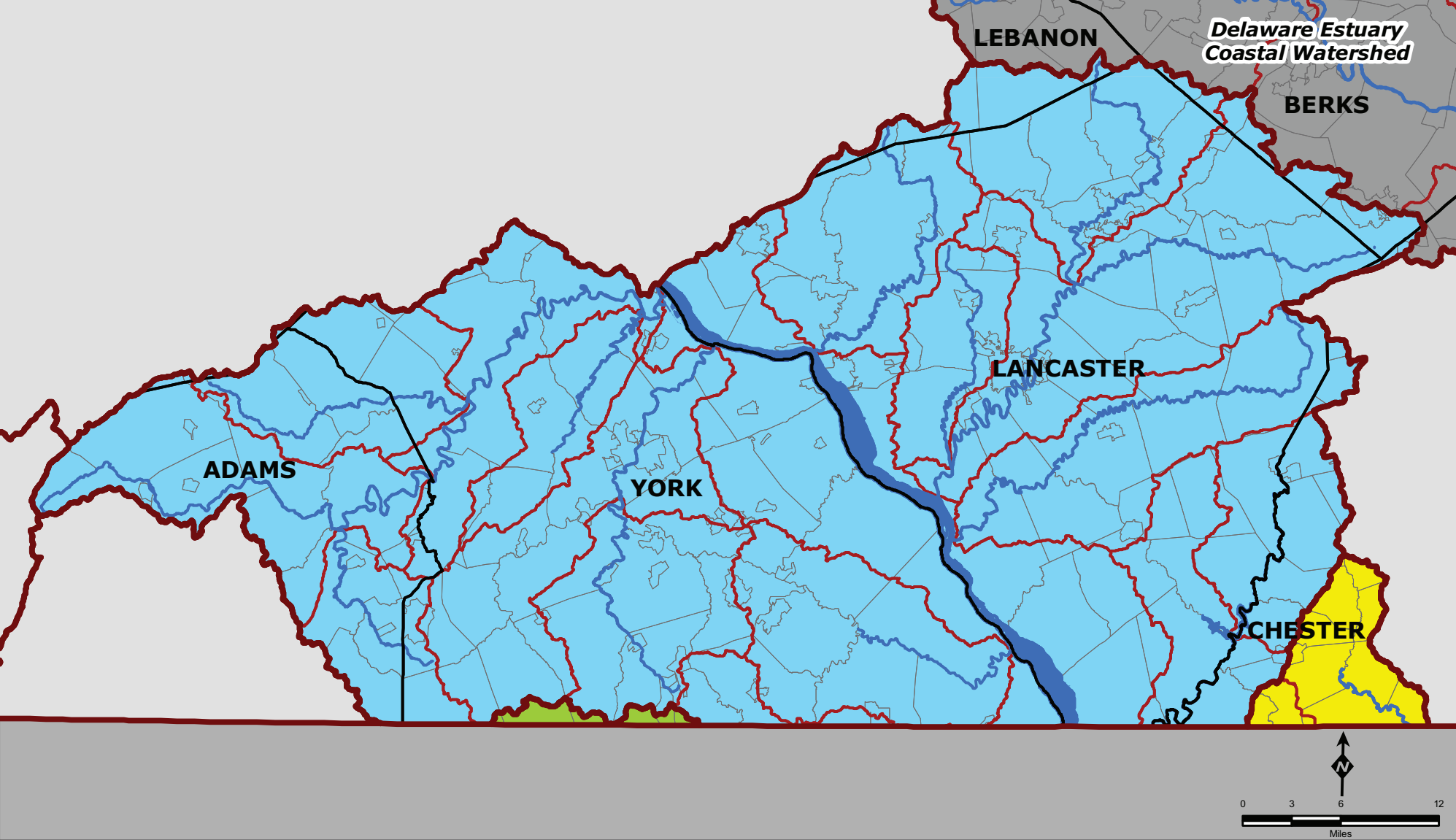
map 3: Delaware Estuary Coastal Zone Management Area



map 4: Pennsylvania's Coastal Watersheds



map 4A: Chesapeake Bay Watersheds



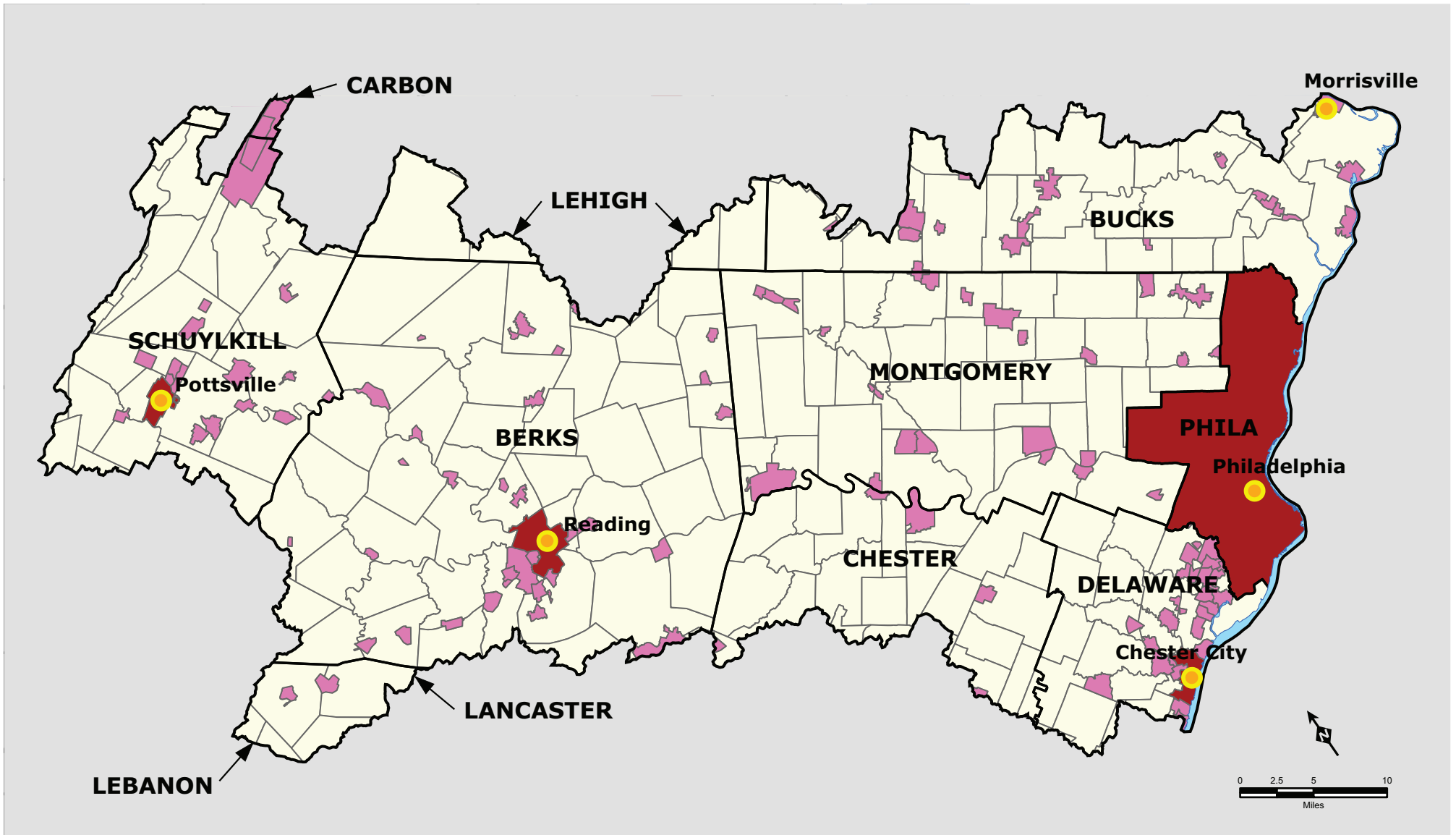
Source: PADEP

HUC 8 Watersheds

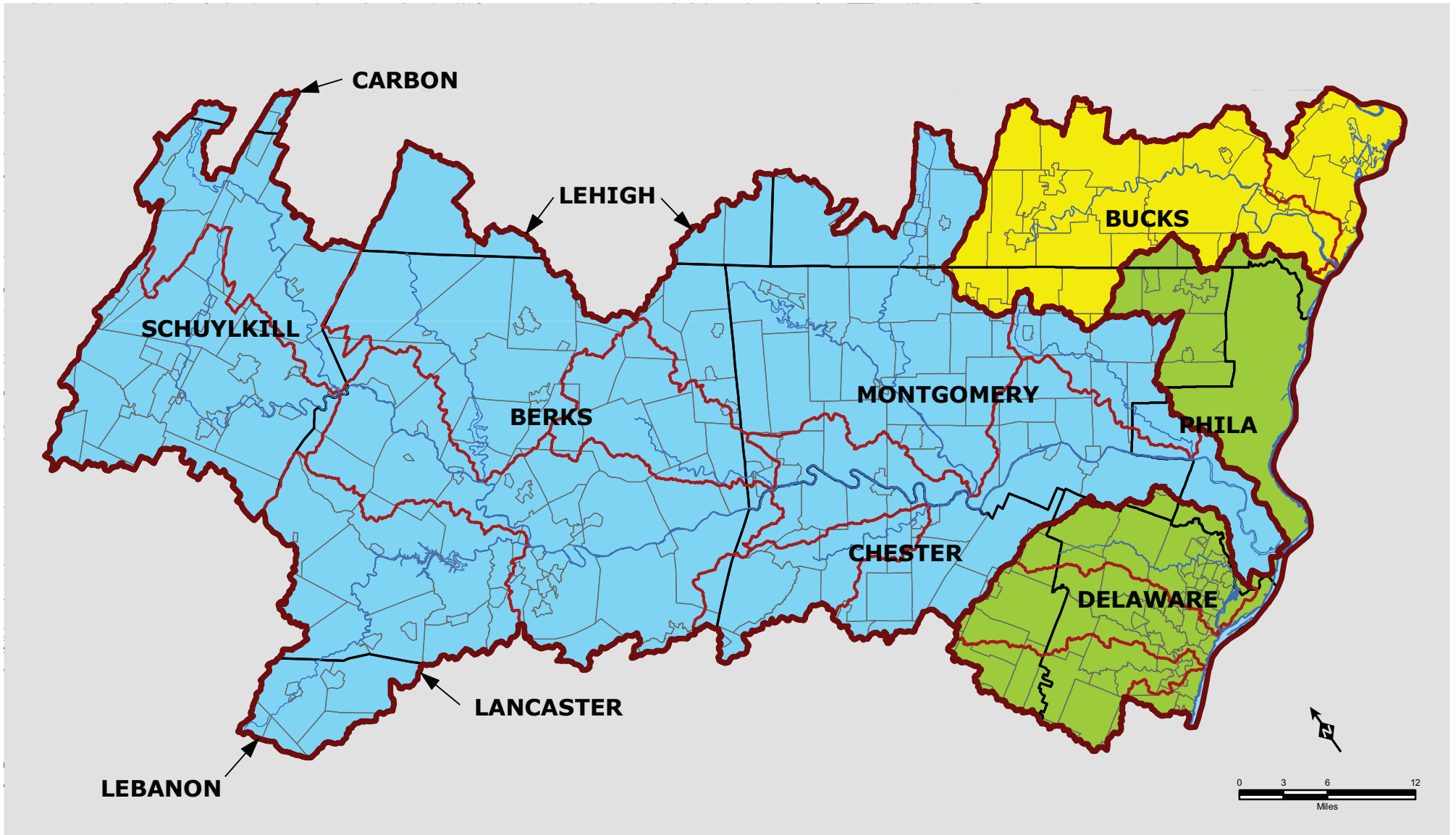
- Lower Susquehanna
- Chester-Sassafras
- Gunpowder-Patapsco

HUC 10 Watersheds




map 5: Delaware Estuary Coastal Watershed



map 6: DECW Watersheds

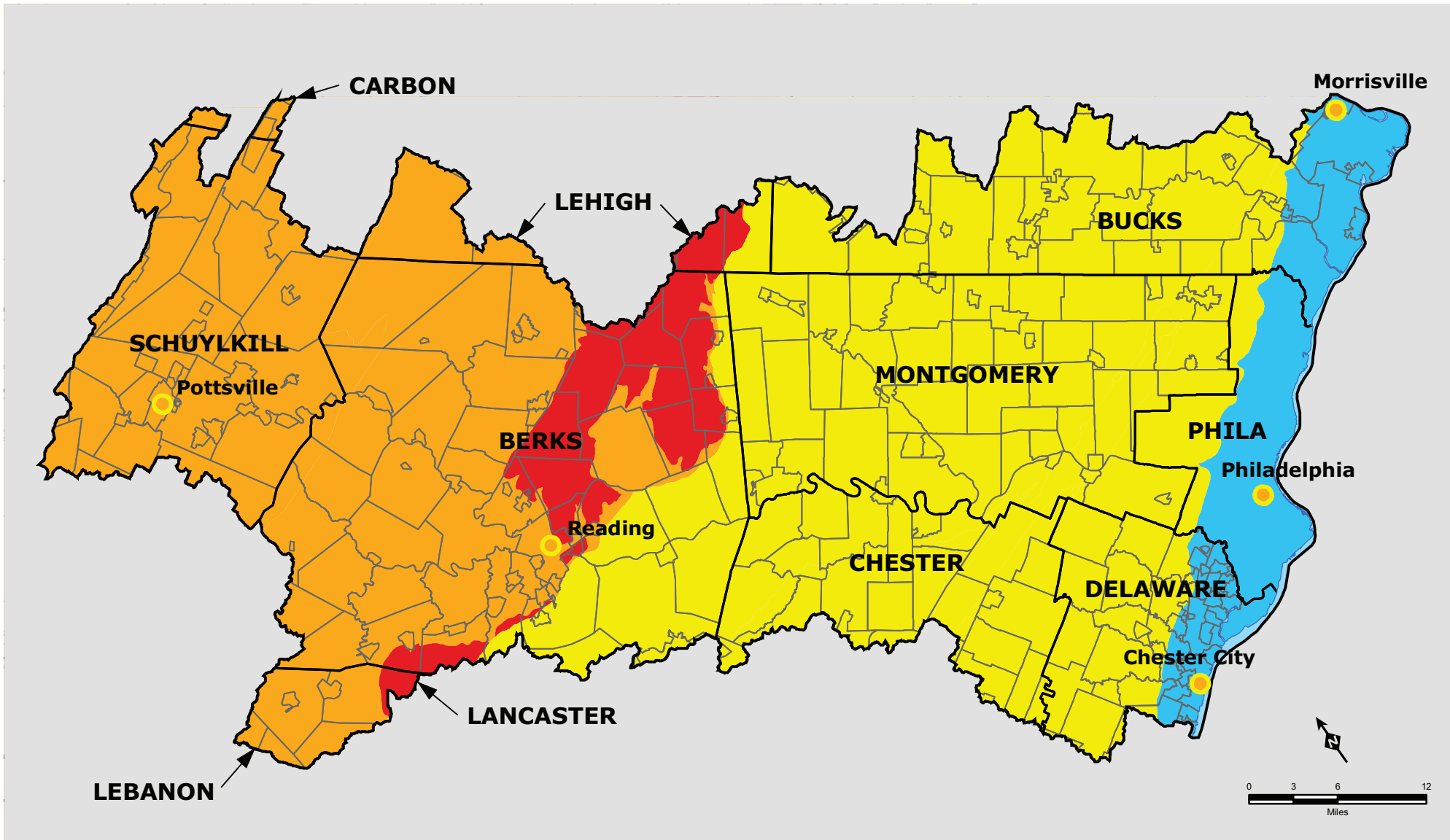


HUC 8 Watersheds

-  Neshaminy-Crosswicks Creek Watershed
-  Lower Delaware River Watershed
-  Schuylkill River Watershed

HUC 11 Watersheds

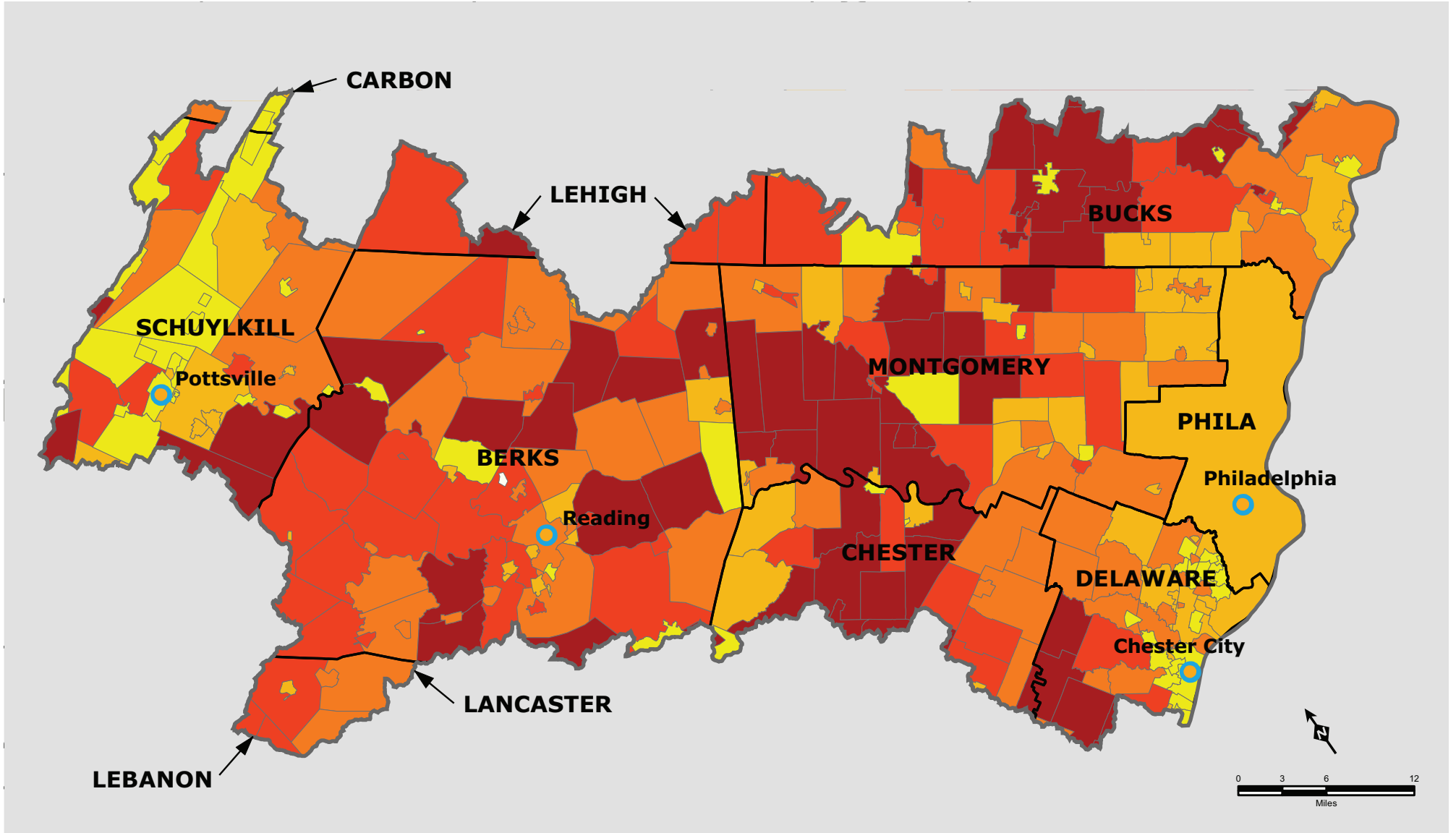
map 6A: DECW Physiographic Provinces



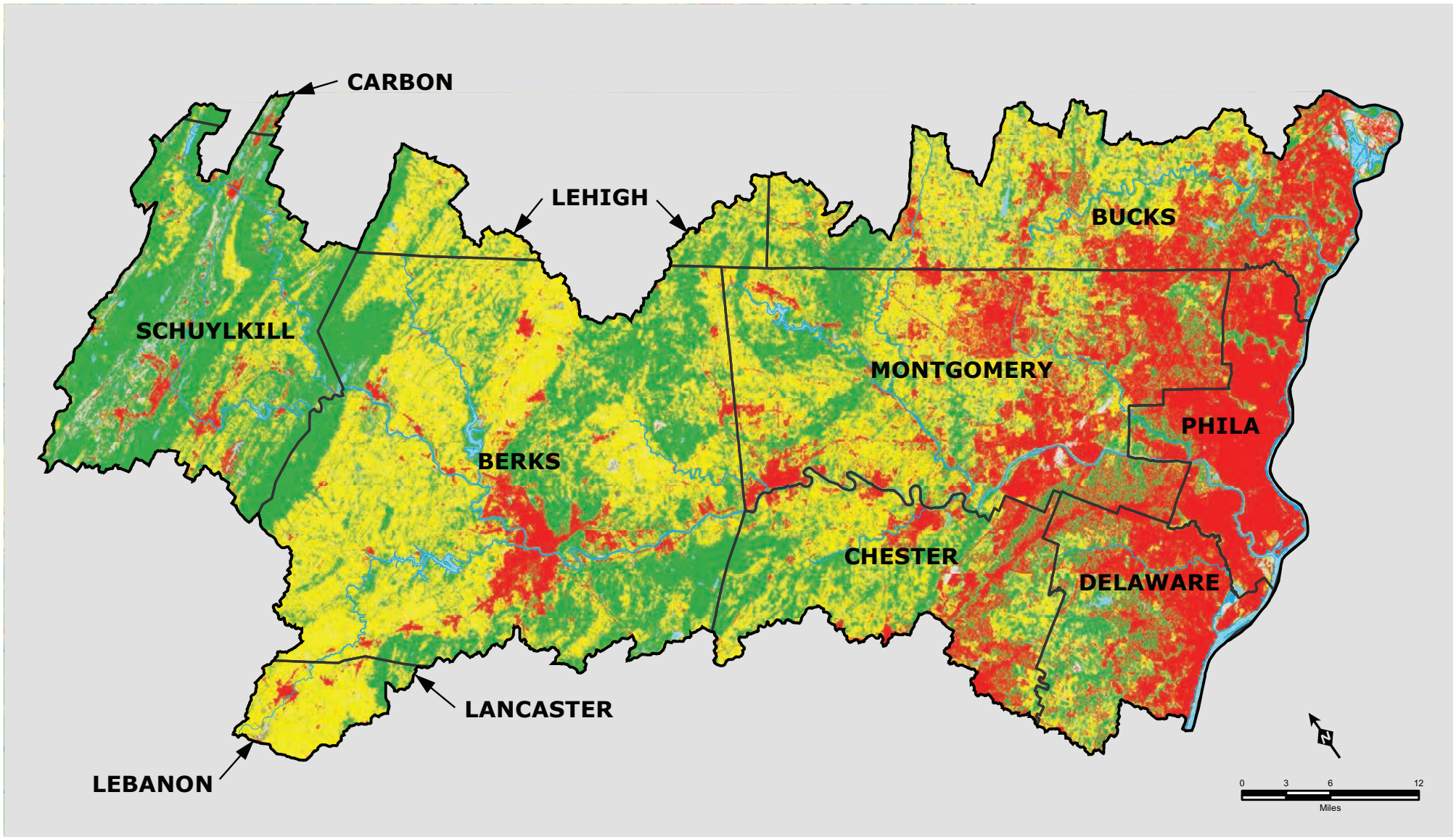
Physiographic Provinces

- Atlantic Coastal Plain Province
- Piedmont Province
- New England Province
- Ridge and Valley Province

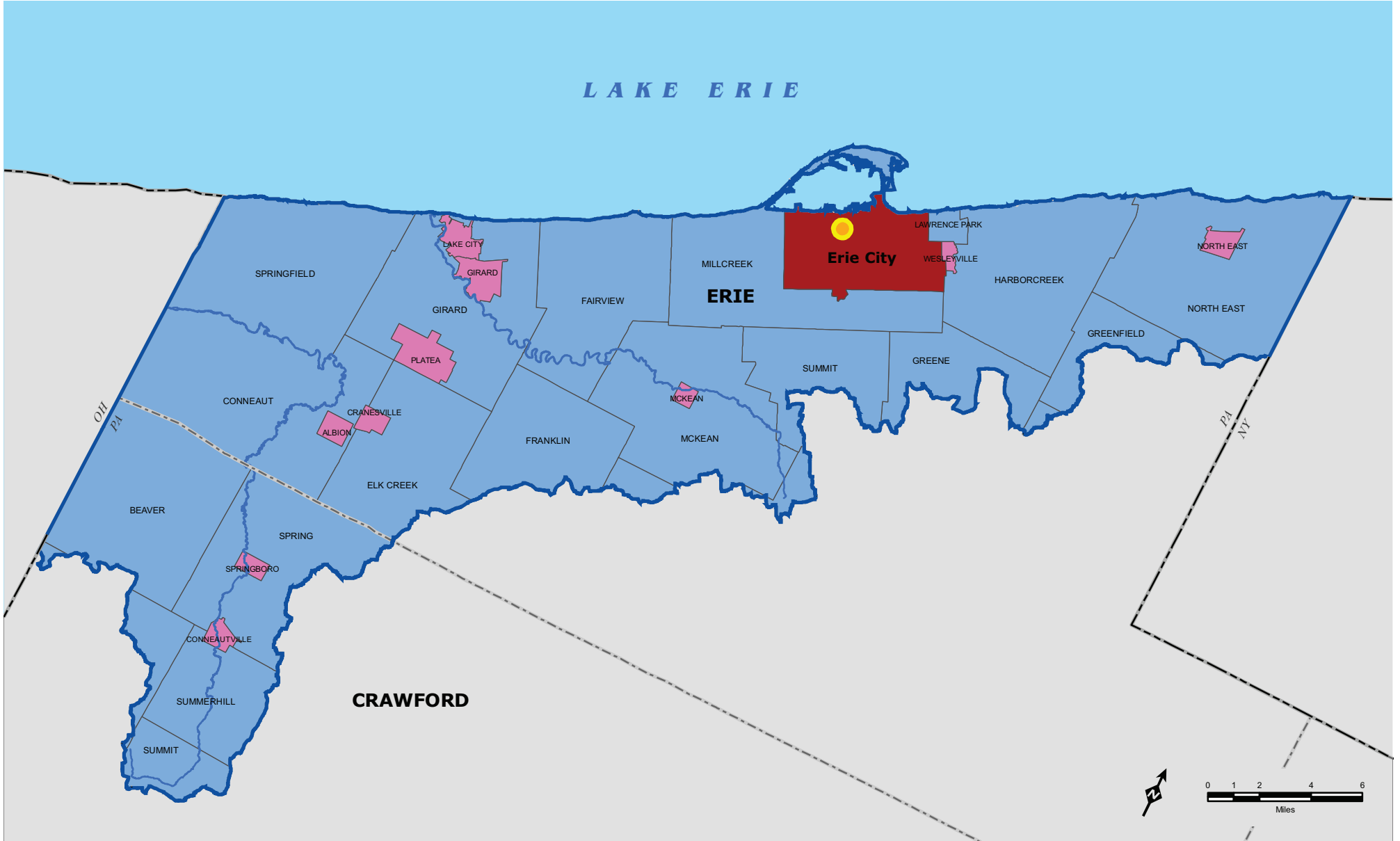
map 7: DECW Percent Population Change (1990 - 2000)



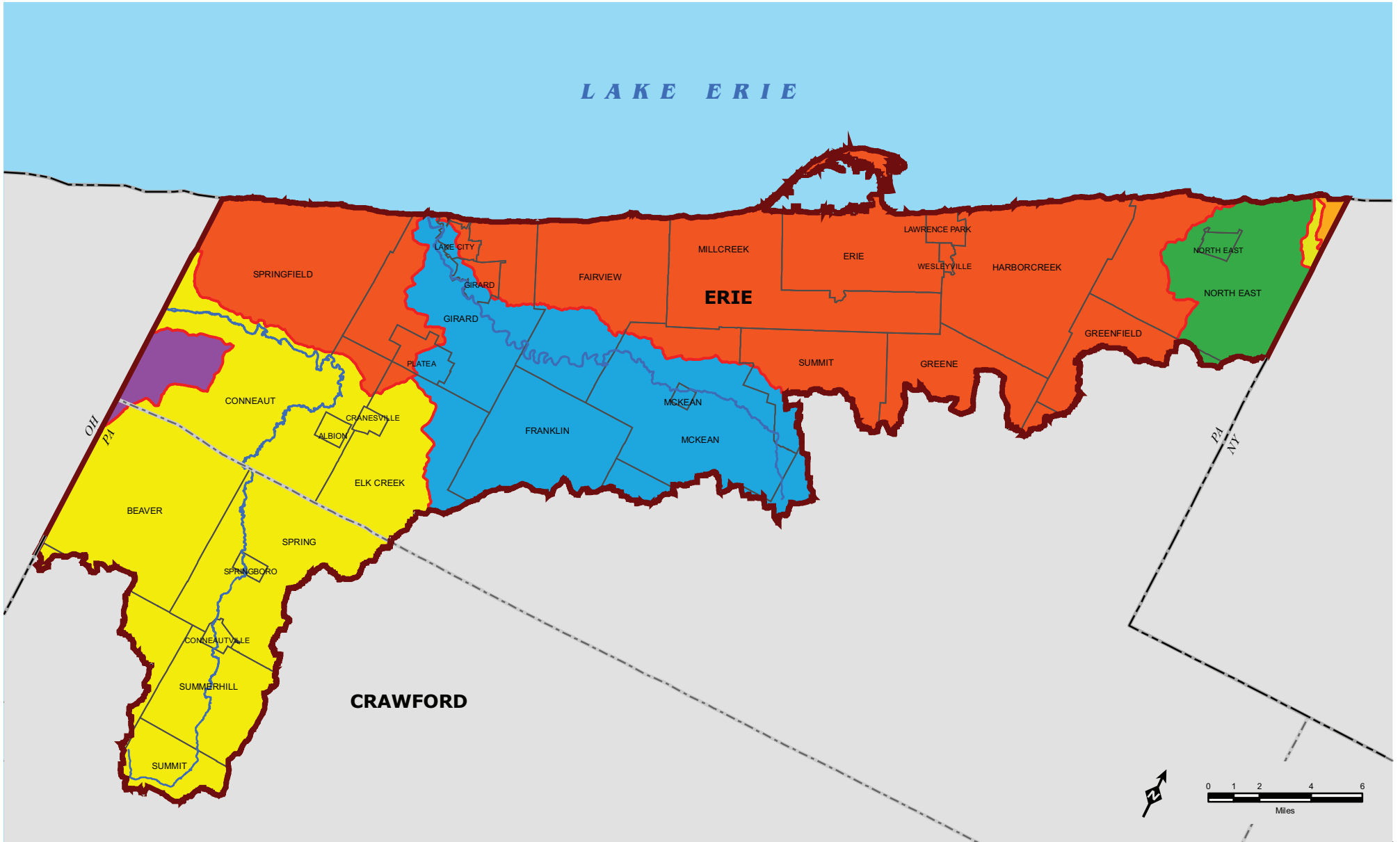
map 8: DECW Land Cover



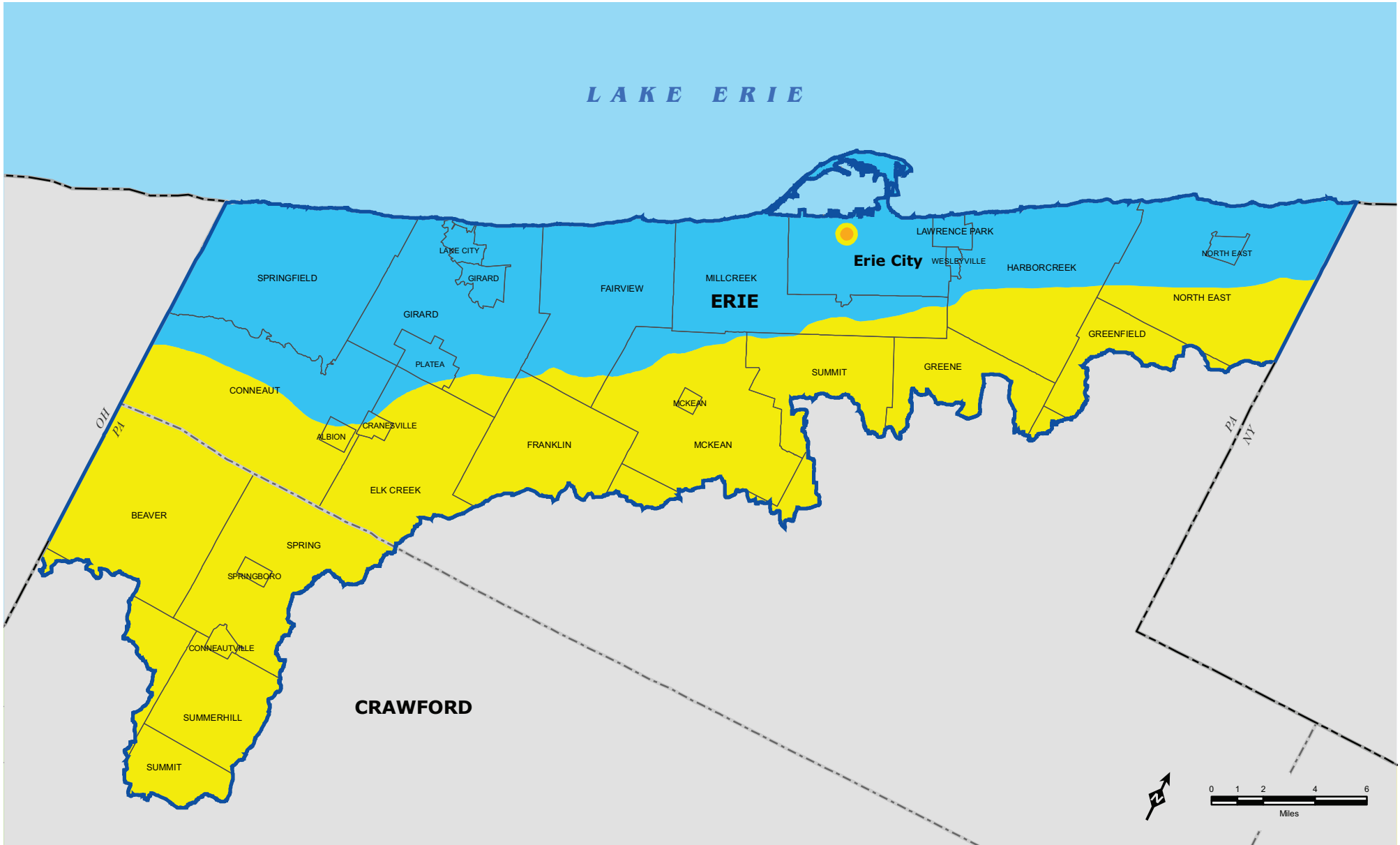
map 09: Lake Erie Coastal Watershed



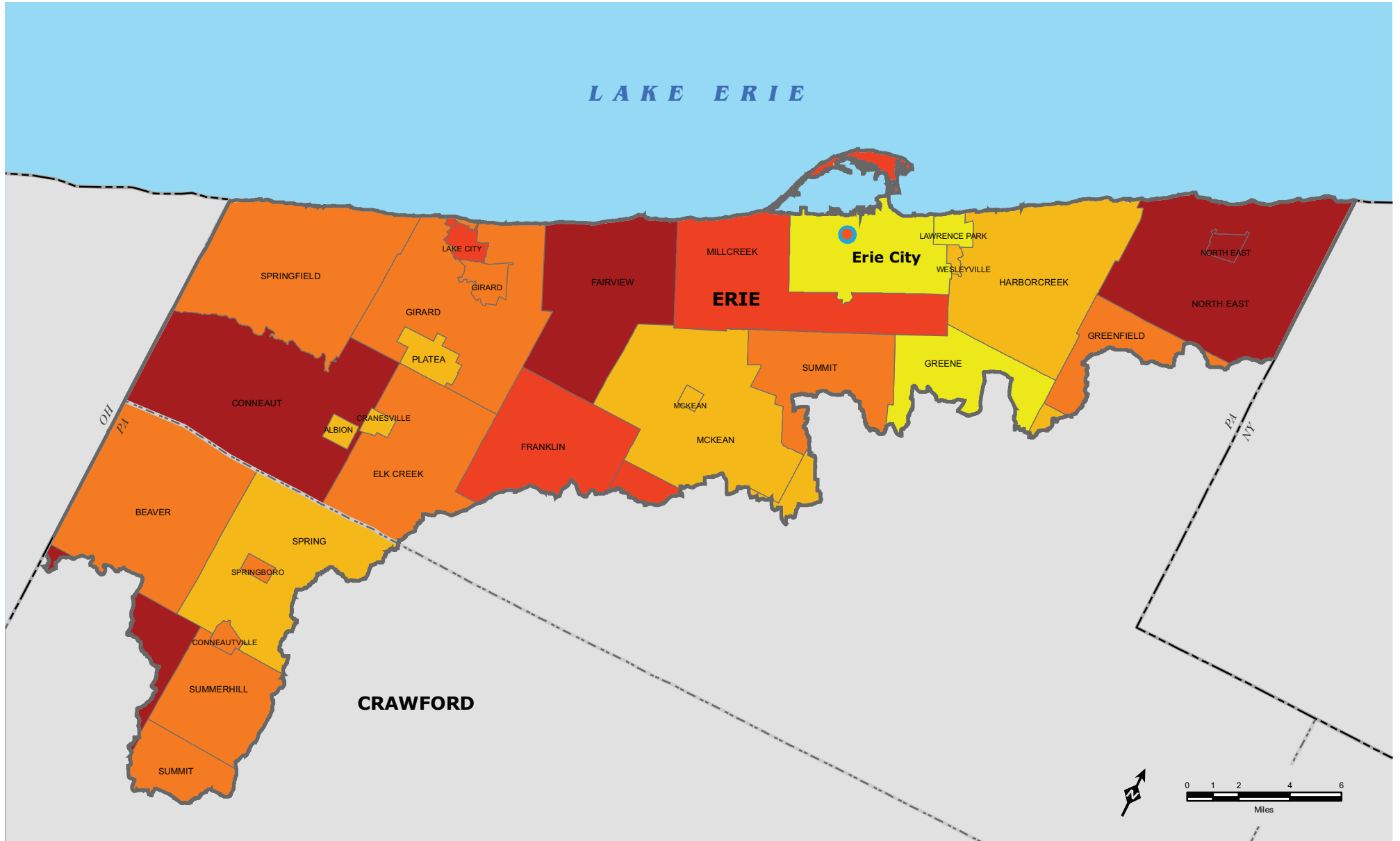
map 10: LECW Watersheds



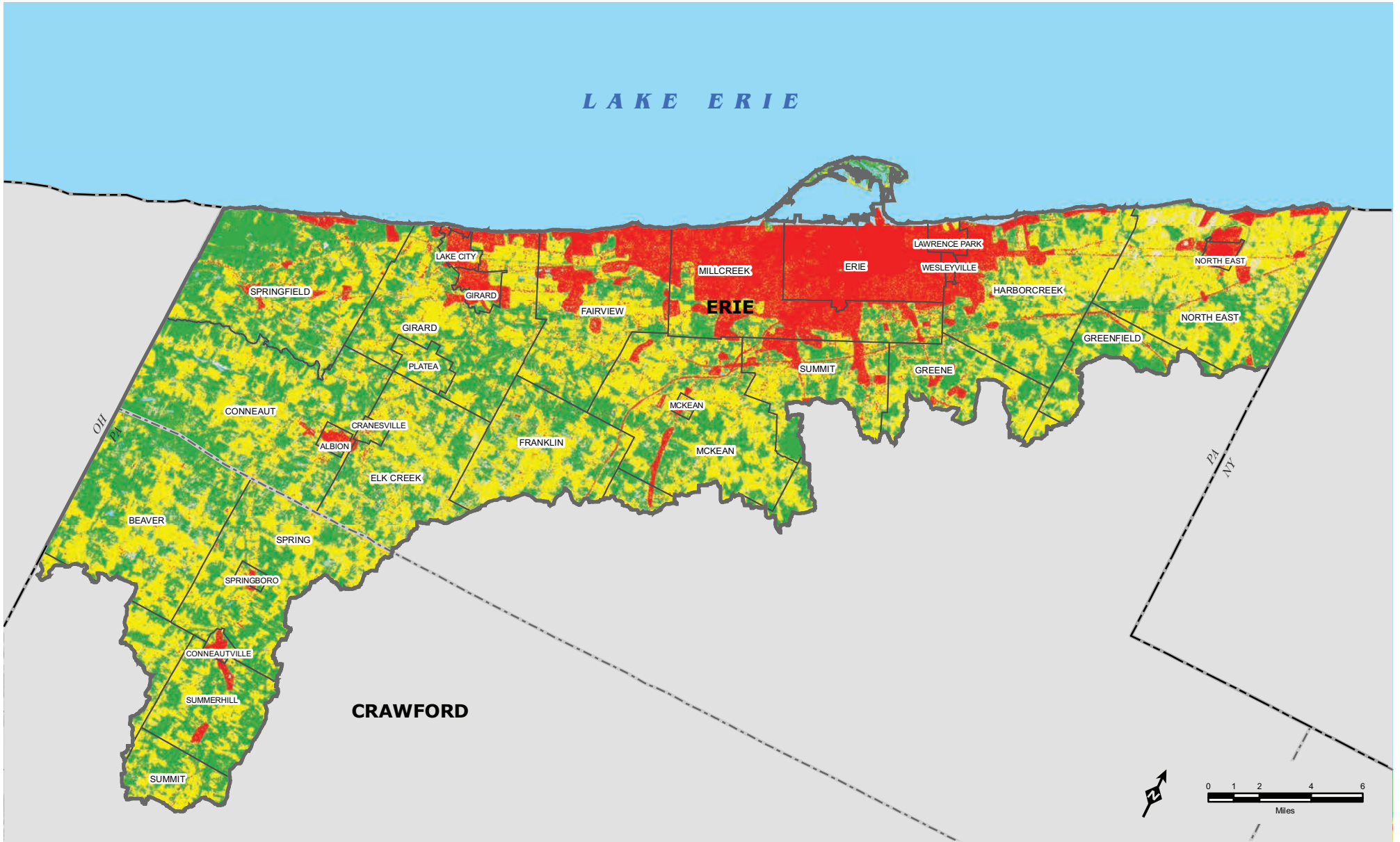
map 10A: LECW Physiographic Provinces



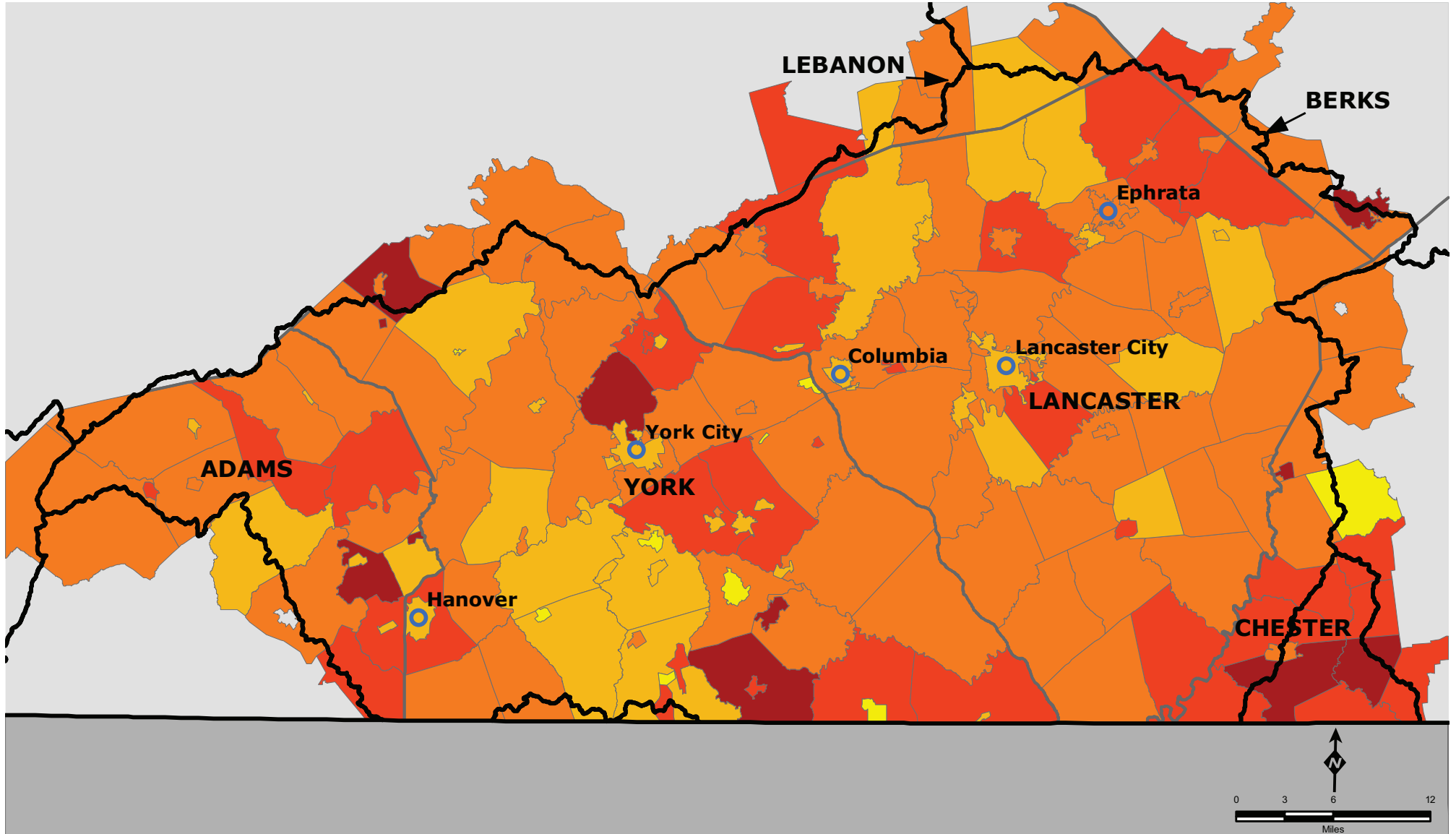
map 11: LECW Percent Population Change (1990-2000)



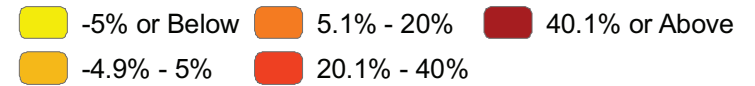
map 12: LECW Land Cover



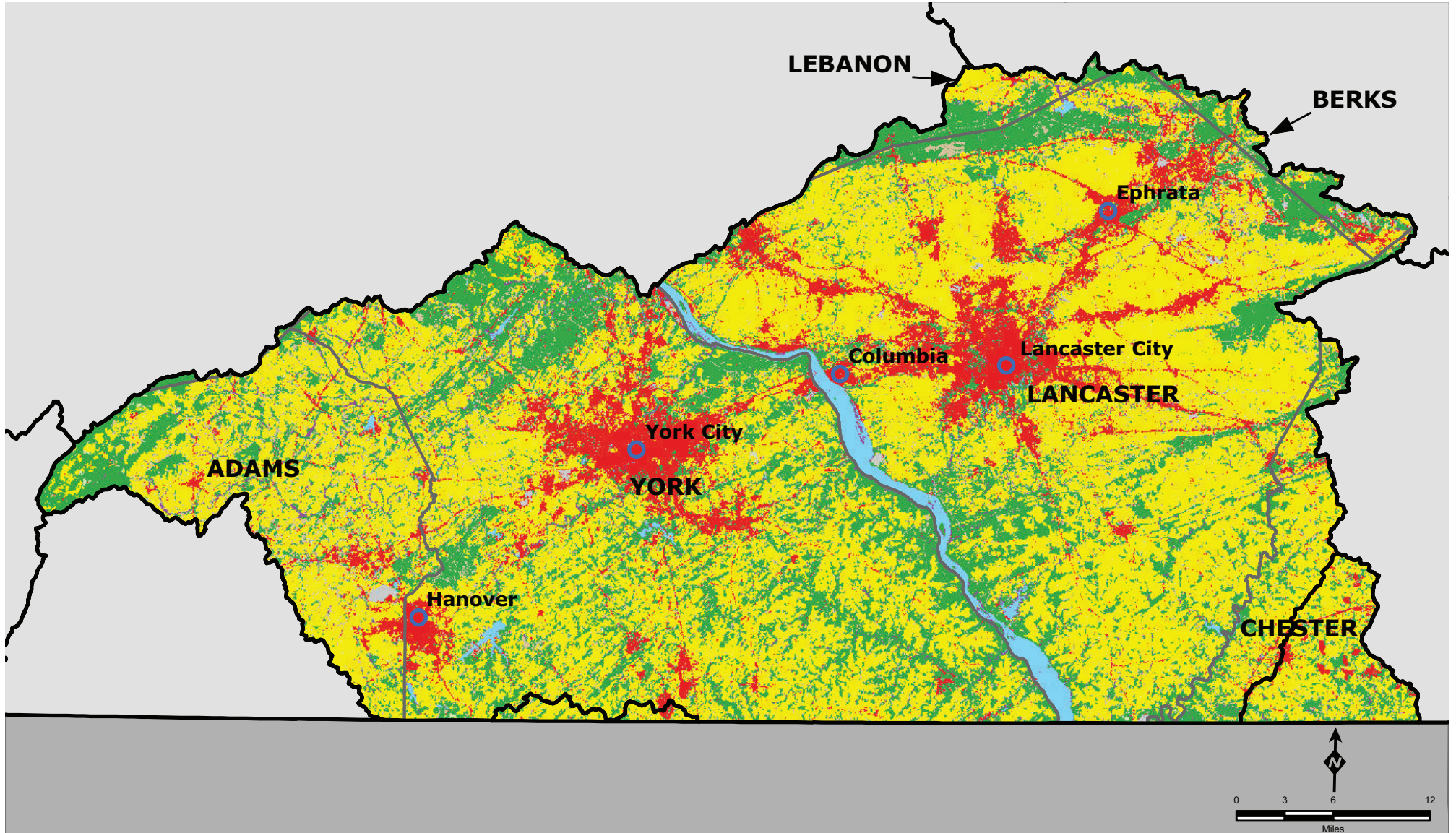
map 12A: Chesapeake Bay Watersheds Population Change (1990-2000)



Source: US Census Bureau



map 12B: Chesapeake Bay Watersheds Land Cover

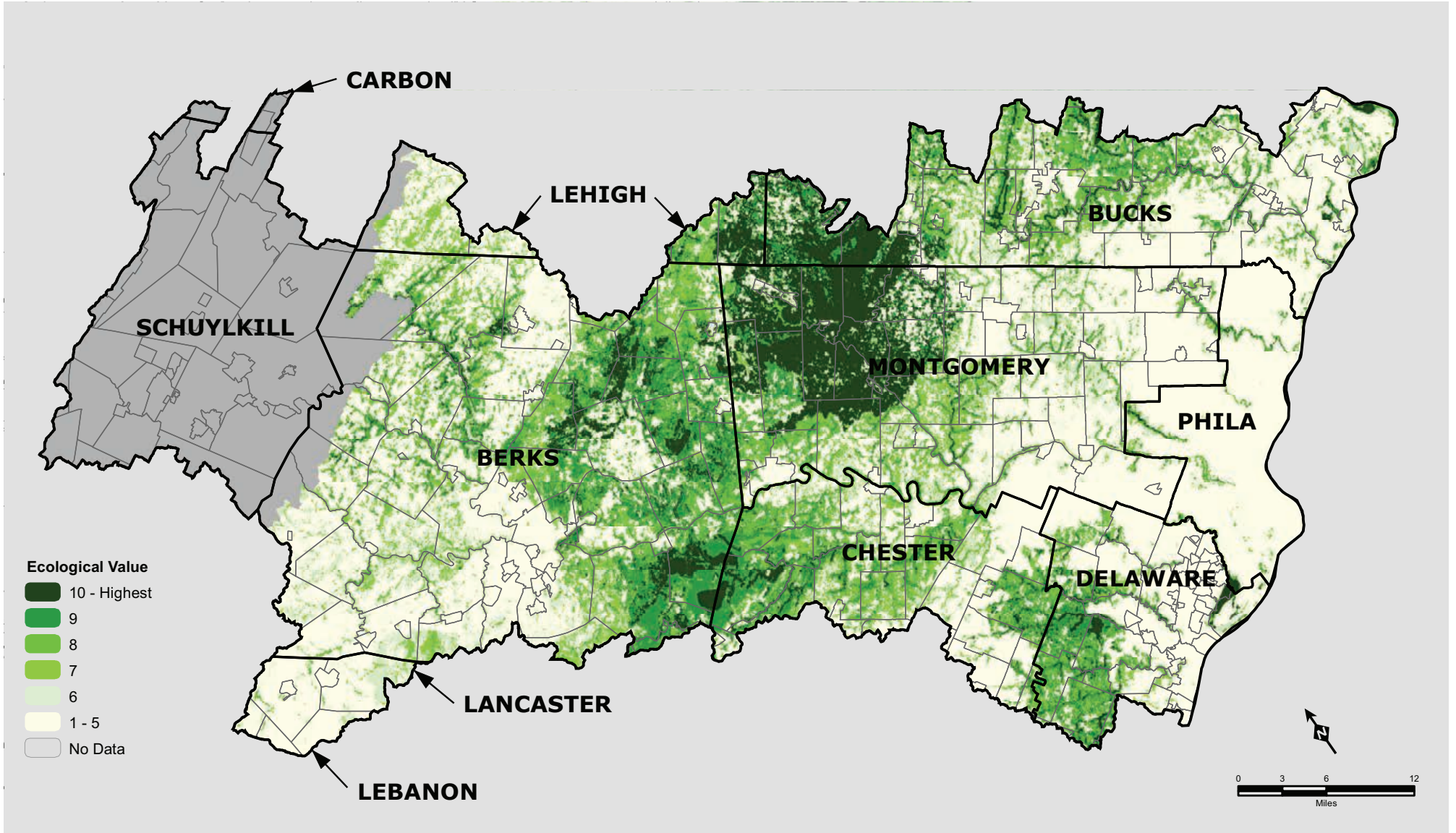


Source: NOAA

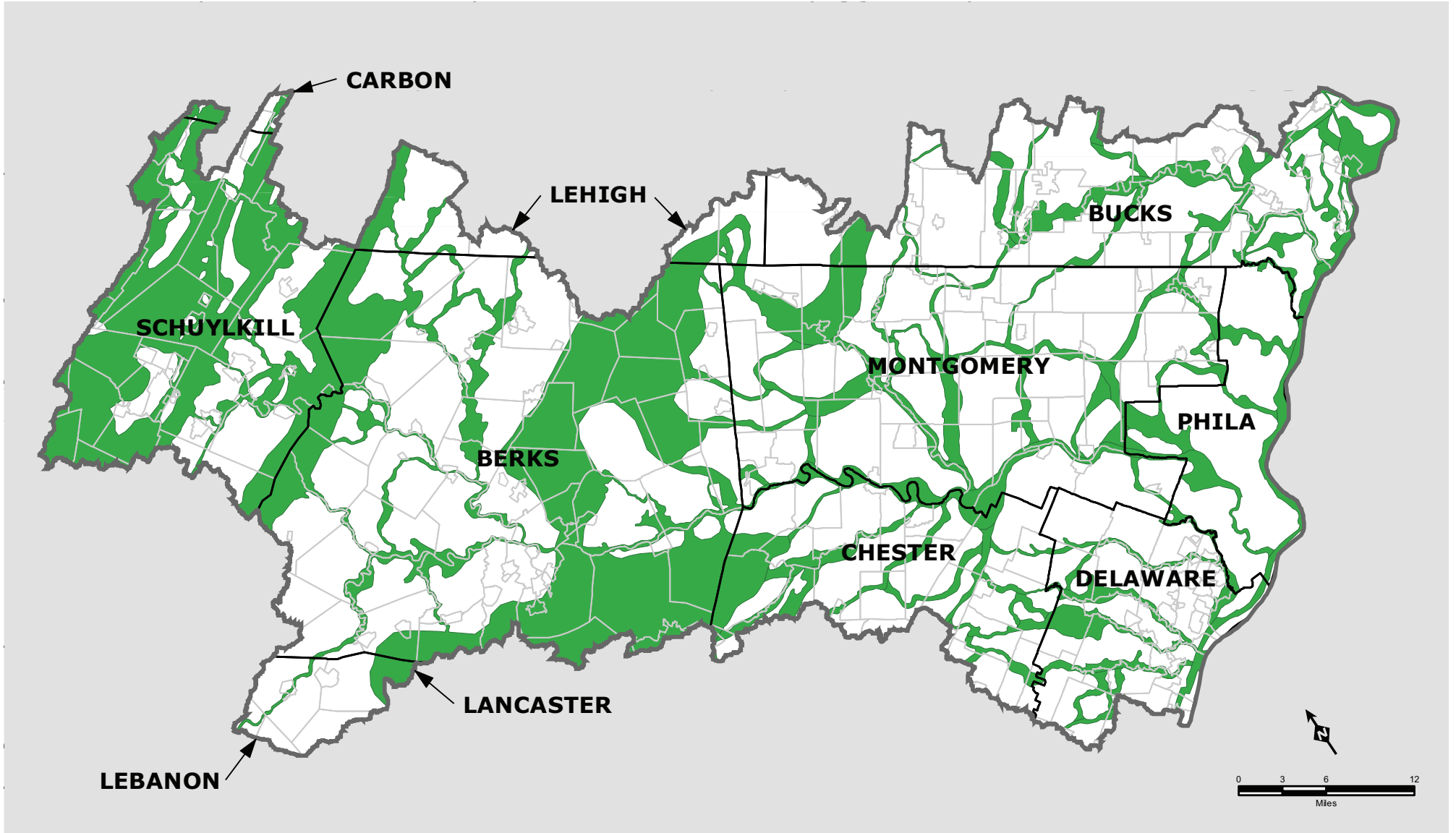
Type of Land Cover

- | | | | |
|-------------|------------|----------------------|-------------|
| Agriculture | Open Water | Grassland/Herbaceous | Scrub/Shrub |
| Developed | Forest | Wetland | Bare Land |

map 13: DECW Smart Conservation Model



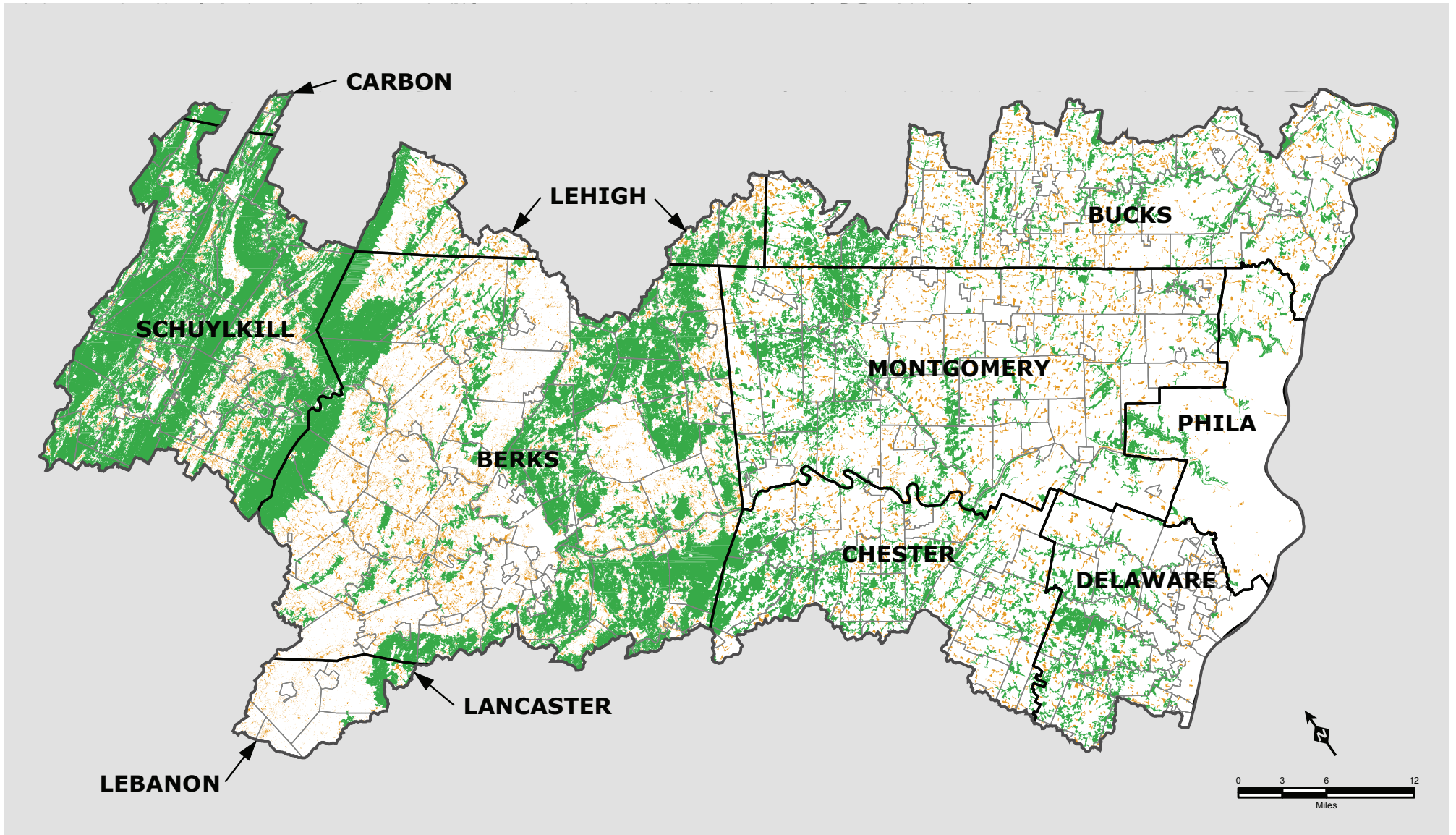
map 14: DECW Greenspace Network



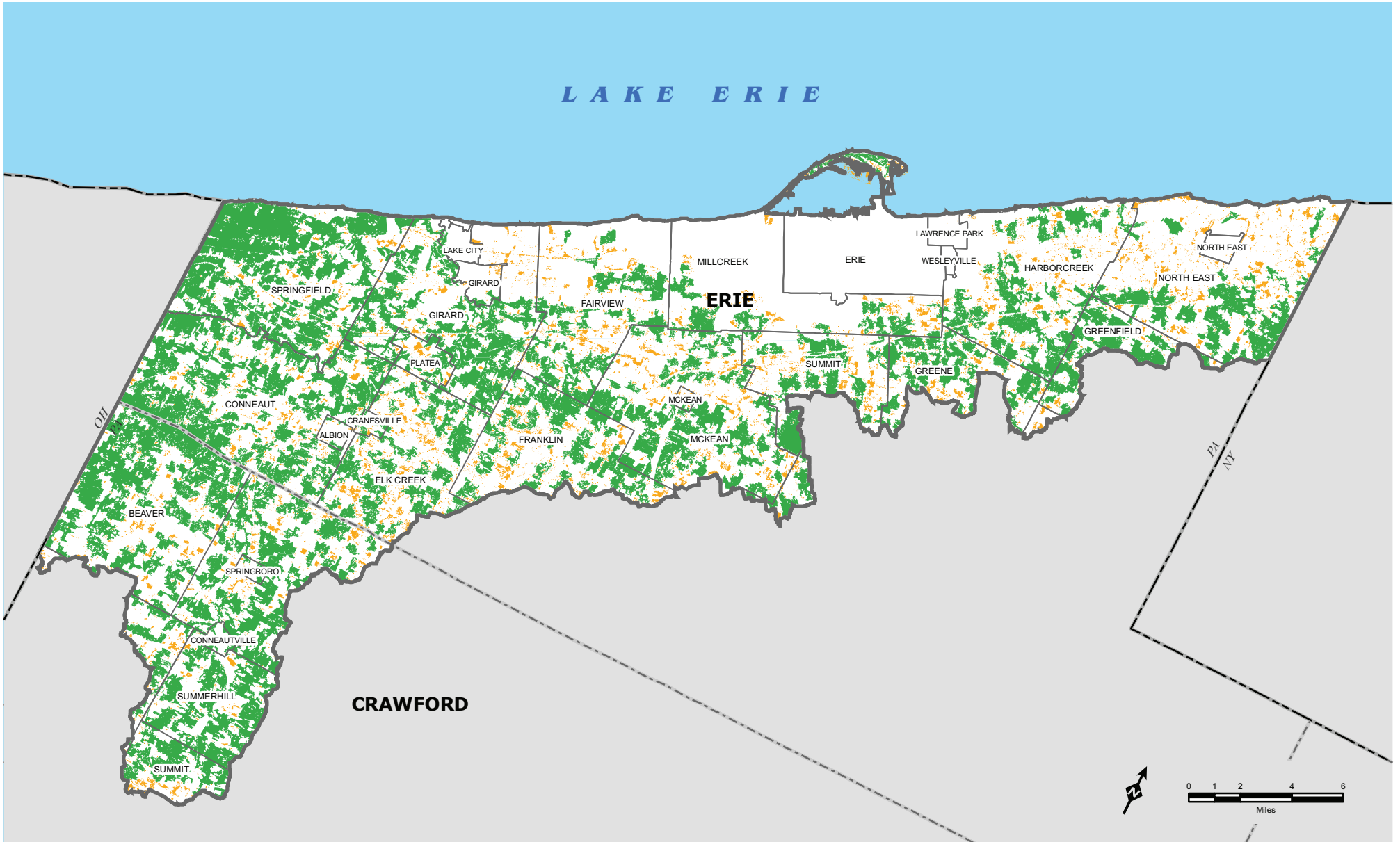
map 15: LECW Greenspace Network



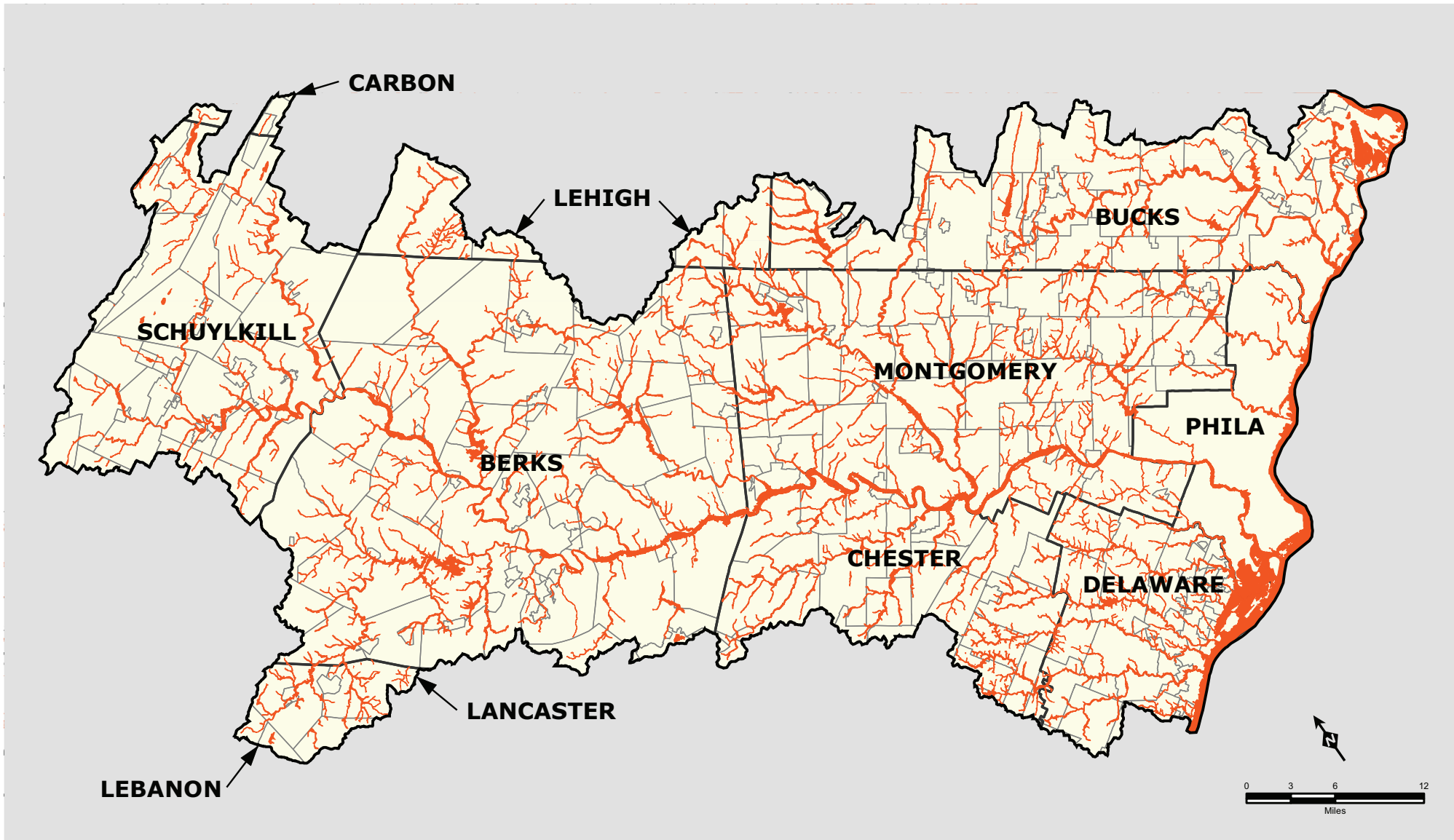
map 16: DECW Wooded Land



map 17: LECW Wooded Land



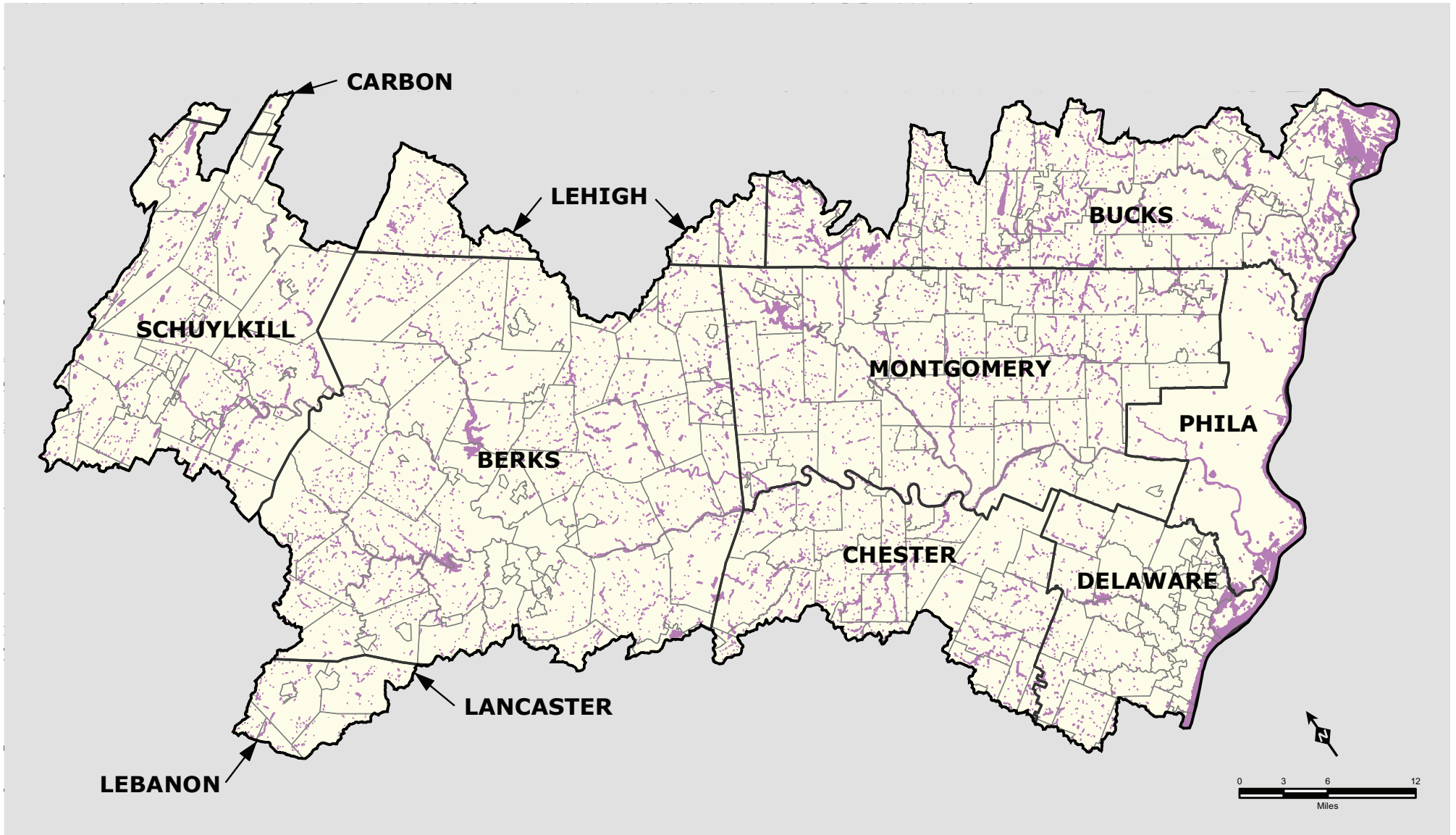
map 18: DECW Floodplains



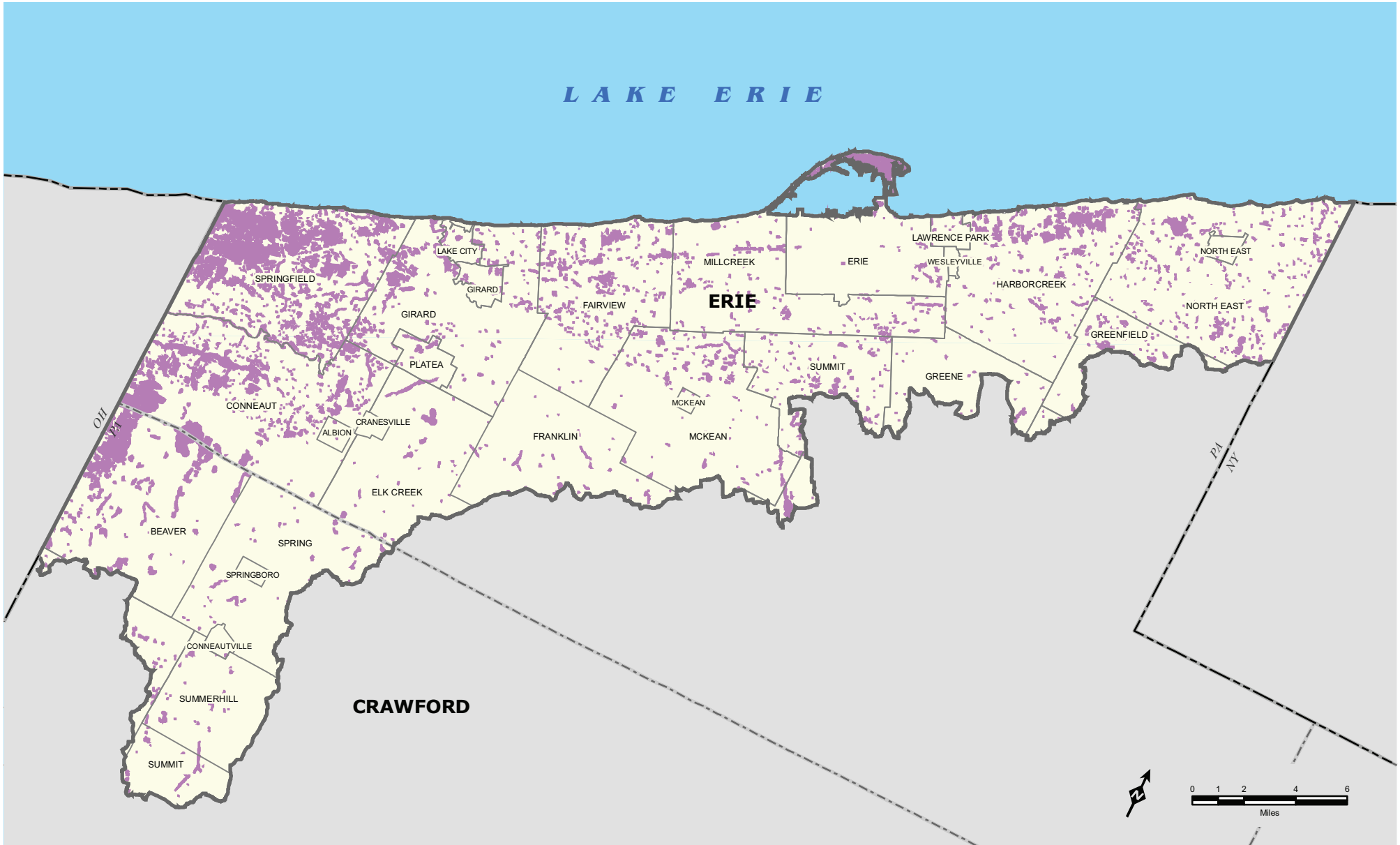
map 19: LECW Floodplains



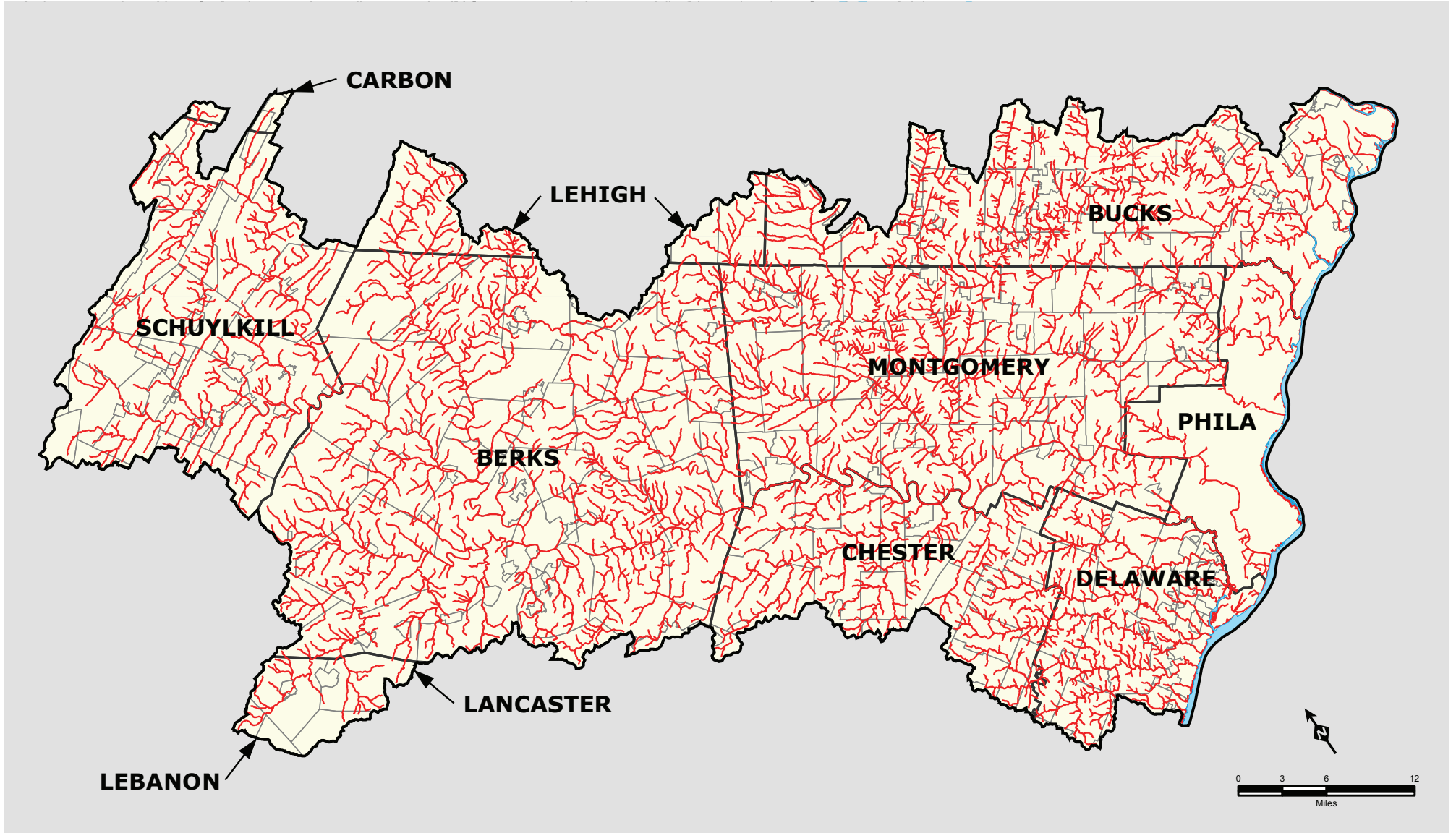
map 20: DECW Wetlands



map 21: LECW Wetlands



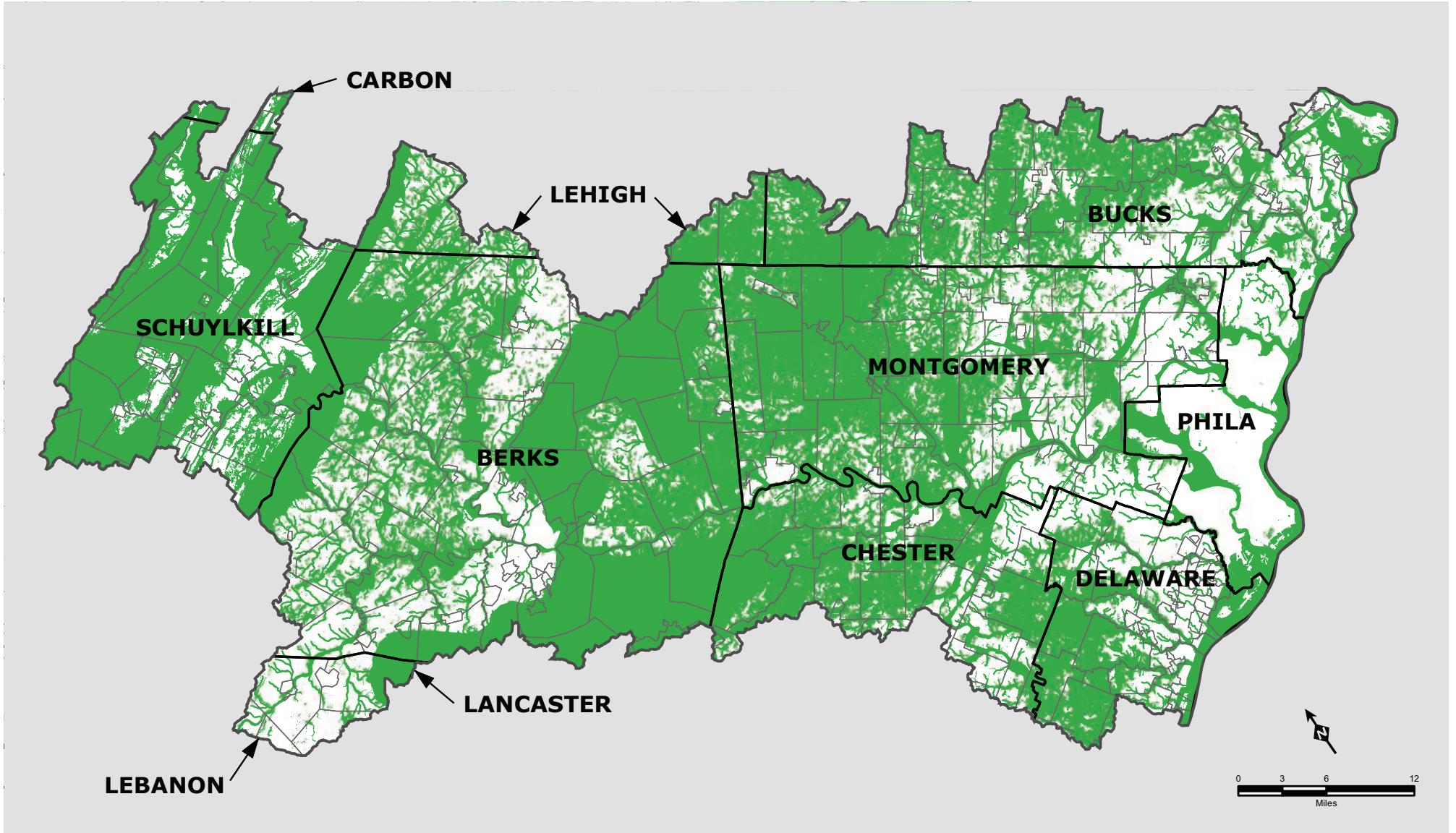
map 22: DECW Riparian Lands



map 23: LECW Riparian Lands



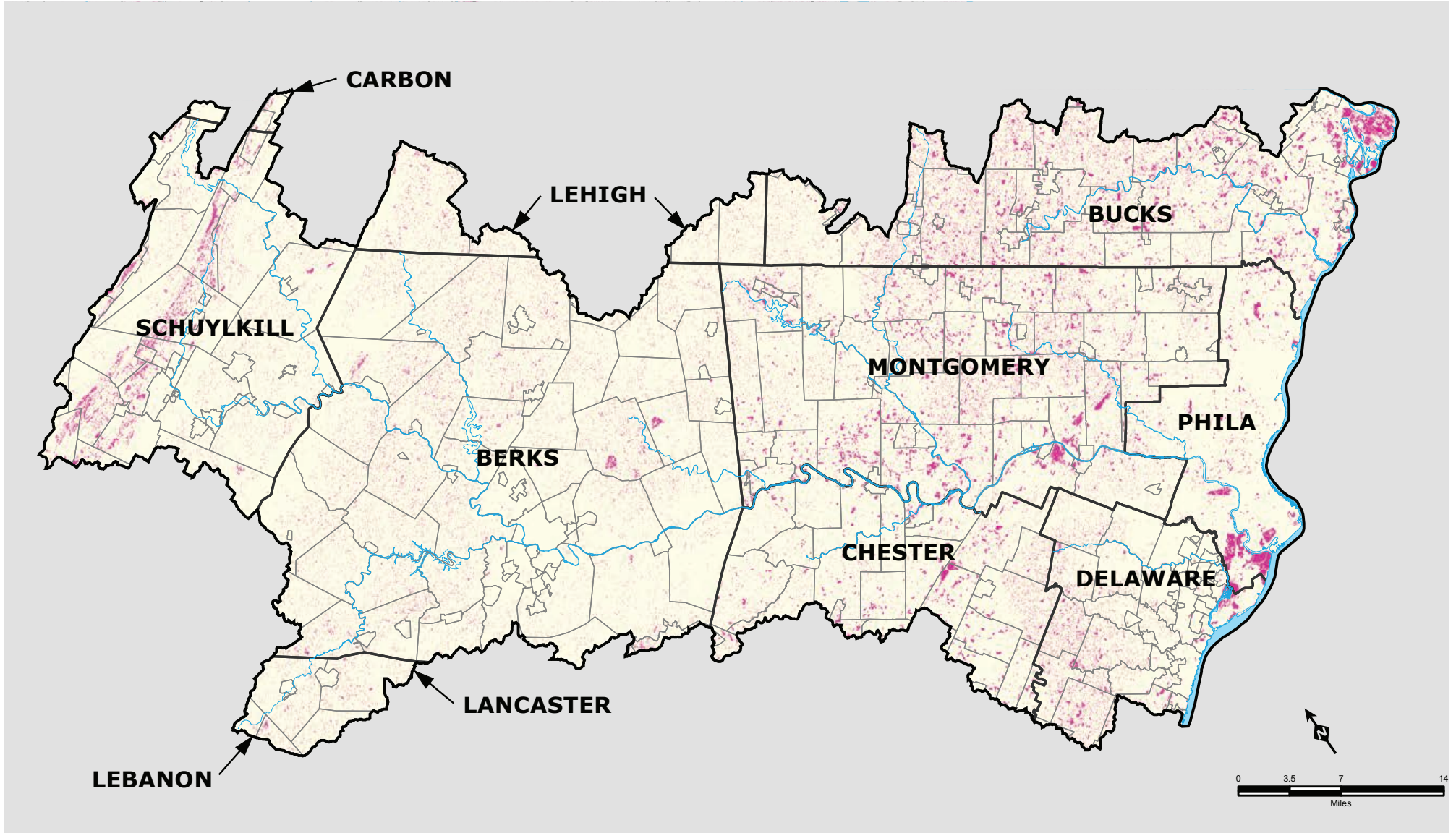
map 24: DECW Project Areas



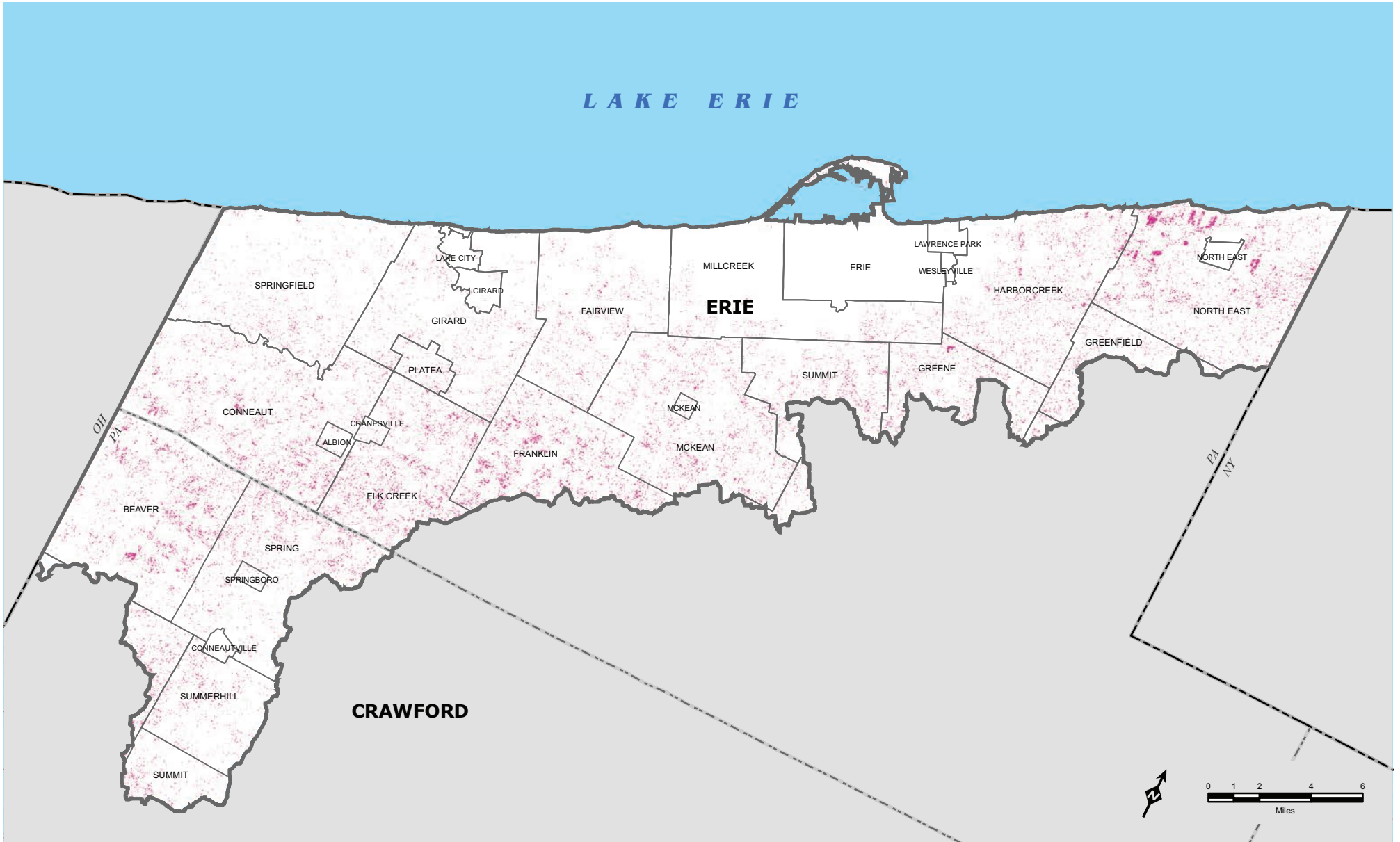
map 25: LECW Project Areas



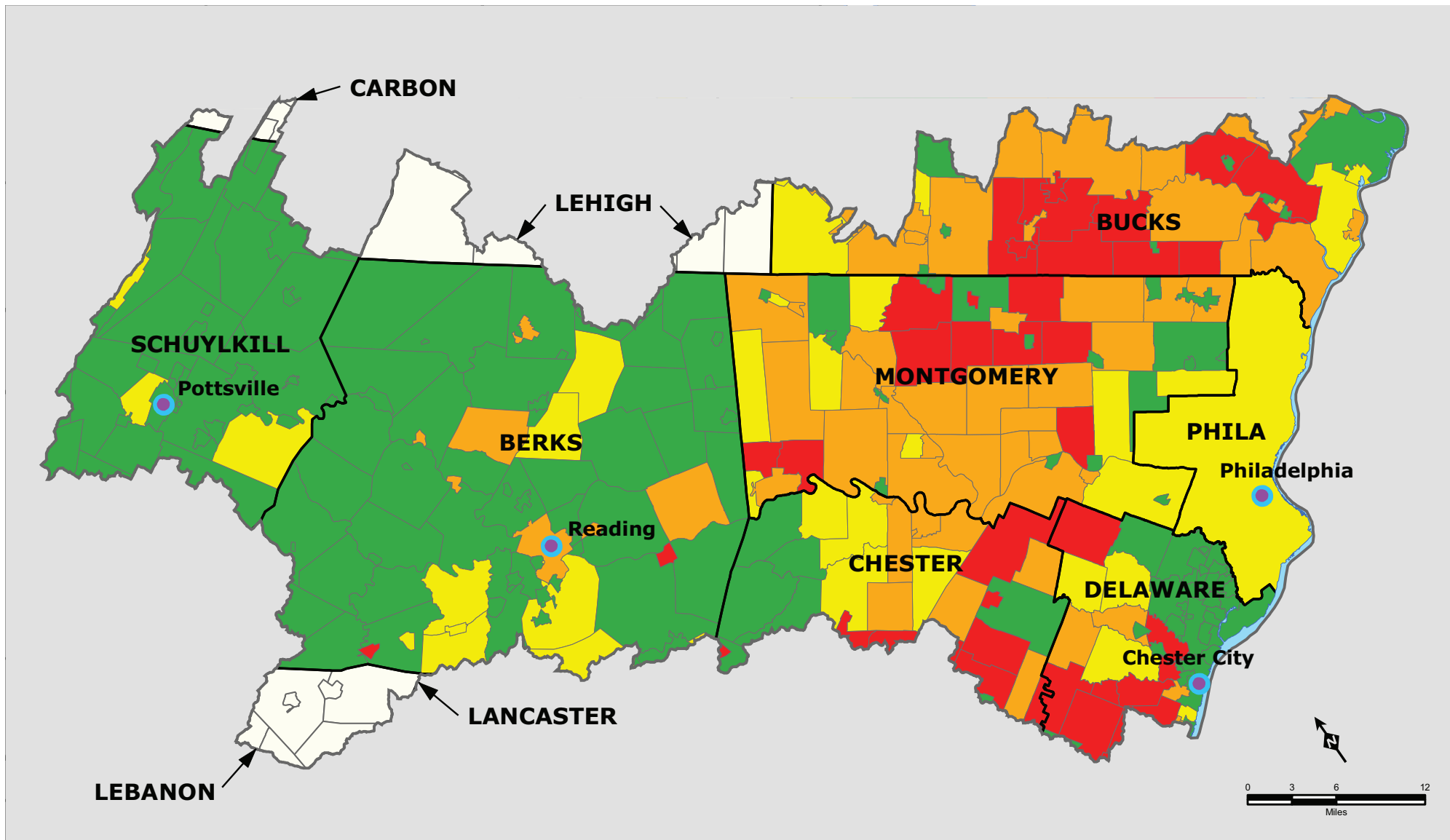
map 26: DECW Vacant Lands



map 27: LECW Vacant Lands



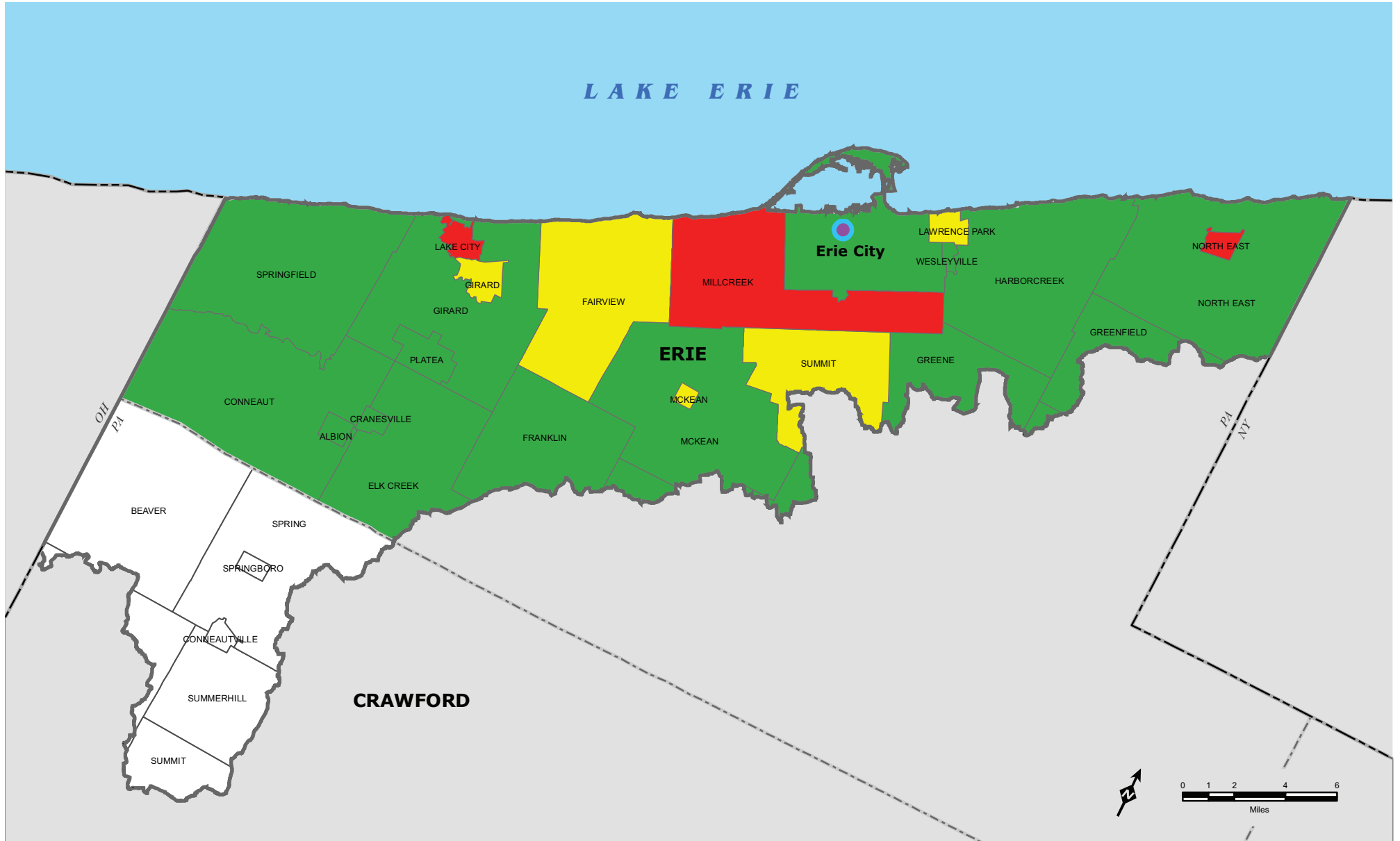
map 28: DECW Development Threat



Percent chance undeveloped land will be consumed for development by 2030 (by municipality)



map 29: LECW Development Threat



Percent chance undeveloped land will be consumed for development by 2030 (by municipality)



APPENDIX B: SMART CONSERVATION MODEL

Smart Conservation Model

Ecological Resource Mapping Assessment

Introduction

The following describes the data layers used to create the Natural Lands Trust's (NLT's) Smart Conservation Model. The process used to create the layer and its relative weight in the overall ranking process is described in detail. A table summarizing all the layers and their relative weights is included at the conclusion of this discussion.

The Smart Conservation model was created using a process that involved a broad range of scientists and practicing conservationists organized into workgroups, guiding criteria development according to taxonomic groups: 1) plants, 2) mammals, 3) birds, 4) herps (reptiles and amphibians), and 5) aquatics (water quality and aquatic organisms). The Smart Conservation model was initially developed for an 11-county area of southeastern Pennsylvania. To adapt it for use in this project, the final results were clipped to the boundary of the Delaware Estuary Coastal Watershed.

Data Layers Used in the Smart Conservation Ecological Values Mapping Assessment

To prioritize land in the region for its ecological resource value, a modeling technique similar to that for agriculture was used. NLT's first version of the Smart Conservation model used 15 data layers to prioritize the ecological resource value of the region's lands. The updated model utilizes 21 data layers, which include the following:

A. Vertebrate Habitat Subcomponent

- Mammals
- Fish
- Herps
- Birds
- Important bird areas (IBAs)
- Important mammal areas (IMAs)

B. Aquatic Resources Subcomponent

- National Wetlands Inventory (NWI)
- Hydric soils
- Floodplains
- Forested water quality
- Riparian buffer quality
- Water quality (2002) 303[d] list
- Headwaters protection
- Impervious cover, 2000
- Impervious cover change, 1985 to 2000

C. Terrestrial Resources Subcomponent

- Interior forest habitat
- Natural vegetation habitat blocks
- Contiguous grassland habitat blocks
- Contiguous barrens- or scrub/shrub-type habitat blocks

- Steep slopes

D. Rarity Subcomponent

- County Natural Areas Inventory and PA Natural Heritage Program

Detailed Layer Descriptions

A. Vertebrate Habitat Subcomponent

Mammals, Fish, Birds, Herps:

These data layers originated from the Penn State University (PSU)/Environmental Resources Research Institute (ERRI)/Pennsylvania Gap project. In 2000, PSU/ERRI released their habitat modeling layers to predict where vertebrate species are most likely to be found in Pennsylvania according to land cover, species range, and other habitat determinants, such as elevation, topography, or other such physical, map-able determinants (such as stream corridors for Louisiana water thrush).

NLT took these statewide species layers and, working with the Expert Taxa Advisory Groups, which were convened to inform the SmartConservation™ project, removed any non-native species and species that are not endemic to the Pennsylvania Piedmont ecoregion. Once the species lists had been compiled and finalized, each species was ranked by the Expert Advisory Groups according to conservation value (CV). Conservation value was derived by considering various aspects of a species' role in the ecosystem, such as whether it was a keystone species or whether it was sensitive to disturbance or fragmentation. General population trends were also considered, (to the extent they were known), while rarity (primarily with relation to population trends) was also taken into account. CV values ranged from 0 to 10, with primarily 0, 2, 5, and 10 being used to represent “no,” “little,” “medium,” and “high,” respectively. Upon finalization of the CV assignments, NLT added each species, using its CV weight, according to the taxa group to which it belonged. The results were normalized to a 1-10 scoring scale using a 10% quantile classification system.

Important Bird Areas (IBAs):

IBAs have been defined as core and buffer polygons across areas of SEPA by the Pennsylvania Audubon Society. Where these areas exist, the researchers boosted the value of these cells to supplement the data for bird habitats. Core areas were assigned an additional score of 3, and buffers, a score of 1 (or essentially 33% of the full 10-point “mammals, fish, birds, and herps” score).

Important Mammal Areas (IMAs):

IMAs have been defined a polygons across areas of SEPA by the IMA Committee. These areas supplement the other GAP and IBA data in this subgroup. Core areas were assigned ascore of 3 (or essentially 33% of the full 10-point “mammals, fish, birds, and herps score).

B. Aquatic Resources Subcomponent

National Wetland Inventory (NWI):

Wetlands were assigned scores by type as follows:

- 1 point: Substrate-only type wetlands (e.g., no vegetation, just rock, sand, or mud types)
- 2 points: Open water and aquatic bed wetlands
- 4 points: Unconsolidated emergent or forested wetlands
- 10 points: Emergent, scrub-shrub, and forested wetland types and combinations

Hydric Soils:

Data on soil survey digital mapping for counties throughout the Piedmont were compiled from the Soil Survey Geographic Database (SSURGO). Hydric soils were mosaiced into a single coverage, clipped for the NLT expanded Piedmont ecoregion, and these cells were given a score of 3.

Flood Plains:

Data were gathered from PASDA, mosaiced into a single coverage for the Piedmont area, clipped for the NLT expanded Piedmont ecoregion, and given a score of 5.¹

Forested Water Quality:

The percent of first- and second-order streams was expressed per Pennsylvania Small Watershed and the results reclassified according to a 10-quantile distribution. Forested landcover was selected from the regional land cover data set and expressed as a percent of forested landcover for each Pennsylvania Small Watershed, also on a 10% (10-quantile) classification system. The two data sets were then added together and divided by 2 and then normalized once again on a 10% quantile basis. A Pennsylvania Small Watershed given a score of 1 represents a watershed that is in the lowest 10% for a combination of forested land cover and percent length of first- and second-order streams, while a score of 10 for a PA Small Watershed indicates it is in the top 10% of watersheds for forested land cover and percent length of first- and second-order streams.

Riparian Buffer Quality:

Riparian buffers of approximately 100 feet were created in the maps on either side of all streams or water bodies in the region. The regional landcover was then ranked for quality in support of aquatic habitat conditions by the Aquatics Expert Advisory Committee, such that the 15 landcover classes were assigned one of four habitat quality weightings as follows:

- 0 points: Commercial, urban, suburban, quarries, bare transitional
- 2 points: Row crops, recreational grass
- 5 points: Hay/pasture
- 10 points: All forest, water, and wetland types and bare rock (natural)

A Focal Variety algorithm was run on the clipped riparian buffer landcover quality weightings to indicate where aggregations versus fragmentation of land cover types existed. A 0, 2, 5, or 10 score was assigned where there were 4, 3, 2, or 1 landcover types within the focal variety zone of analysis (which used a 3-cell-by-3-cell analysis area).

The Focal Variety results were then multiplied by the weighted aquatics land cover habitat results and divided by 10.

The streams and water bodies results layer was then split from the original coverage into separate data layers as follows:

¹ The PASDA data used for this layer is based on the Federal Emergency Management Agency's (FEMA's) Flood Insurance Rate Maps. These maps were digitized by Pennsylvania DEP and assembled into a statewide coverage in 1996. FEMA's floodplain maps are currently in the process of being updated. New floodplain maps reflect increases in stormwater runoff from development that has occurred since the FEMA maps were first prepared in the 1960s, 70s and 80s, as well as more detailed elevation data. For example, a Temple University study to remap the floodplains of the Pennypack Watershed (September, 2006) shows a 24 percent increase in floodplain area over existing FEMA maps.

- All first- and second-order streams: 10 (or 0.625)
- All third- to fifth-order streams: 5 (or 0.3125)
- All streams of sixth order and higher and isolated water bodies: 1 (or 0.0625)

These three separate data sets were then mosaiced back together again using the weights noted above (as suggested and approved by the Aquatics Expert Advisory Committee).

The resulting data layers represent riparian buffer quality in very small linear spatial arrangements. Because such small areas will essentially get “buried” when compiled with broader spatial surfaces, it was felt it would be more meaningful to represent the final results by Pennsylvania Small Watershed. Therefore, the final step in the analysis was to convert the linear riparian quality values into averages per Pennsylvania Small Watershed, classified by 10% quantiles.

Water Quality (2002) 303[d] List:

Stream segments from the 303[d] GIS data set were clipped to the PA small watershed boundaries and an average score obtained based on the quality ranking system provided above. The resultant map was then recalibrated to show results on a 10-quantile basis.

Since this data set was still incomplete across the entire ecoregion as of 2005, NLT used an interim 10-point ranking system that averages water quality results per PA small watershed throughout the Extended Piedmont ecoregion, as follows:

- Attaining = 10 points
- Unattaining = 0 points
- Unassigned = 5 points

Headwaters Protection:

The Aquatics Expert Advisory Committee desired to highlight the critical importance of headwater features, such as seeps, springs, and ephemeral streams, as well as the importance of first- and second-order streams in maintaining water quality in general. It was also noted by the group that headwater areas are more defensible from upstream pollution threats. As such, they tasked NLT with formulating a way to generate a measure that indicated “location in watershed,” such that lands lower in a watershed were less valuable than lands higher in a watershed. NLT eventually decided that the best way to represent these values was through use of a flow accumulation grid. This grid was created from the Piedmont regional Digital Elevation Model (DEM), and the classification scheme used the following classes:

Number of Cells Running into the Cell in Question	Cell Score	Approximate Equivalence
0-2	10	½ acre—watershed ridge location
2-4	9	½ acre—pre-channel flow; e.g., seeps, springs, ephemeral streams
4-22	7	1 st order streams
22-112	5	1 st & 2 nd order streams
112-1414	3	2 nd & 3 rd order streams
1414-2828	2	3 rd & 4 th order streams
2828-5656	1	4 th order streams and above
5656+	0	More than 4 th order streams

Values were expressed as averages per Pennsylvania Small Watershed, with final results displayed as 10% quantiles.

Impervious Cover, 2000:

The Aquatics Advisory Committee helped NLT assign values to this data set, which became available from PSU via PASDA in early winter 2003. Impervious cover averages were generated per Pennsylvania Small Watershed. An “impact” of impervious cover ranking system was used to classify the results, centered around critical threshold impact values provided by Woods Hole Research Station (WHRS) and the Center for Sustainable Watersheds (CSW) of 6%, 10% and 20% respectively, where WHRS has research that implies water quality is largely unimpacted below 6% impervious cover watershed wide; and the CSW proposes that water quality is less impacted where impervious cover is 10% or less watershed wide and greatly impacted where impervious cover is 20% or greater watershed wide. Using these cornerstones for the ranking system provides us with the following value system:

>20% impervious cover	0 points
18-20%	1 point
16-18%	2 points
14-16%	3 points
12-14%	4 points
10-12%	5 points
9-10%	6 points
8-9%	7 points
7-8%	8 points
6-7%	9 points
<=6%	10 points

Impervious Cover Change, 1985 to 2000:

Using the impervious cover data from PSU from 1985 and 2000, and averaging it per Pennsylvania Small Watershed as described above, the 2000 condition was compared to the 1985 condition and the difference mapped in a new data set. Resulting values were classified using a 10-quantile classification system. Thus, a 10-score represents the watersheds which show the greatest amount of increase in impervious cover, while a 1-score represents the smallest percentage increase in impervious cover across a small watershed. In this manner, a high priority is placed on preserving lands in those watershed that are rapidly changing from a rural to an urbanized or suburbanized state.

C. Terrestrial Resources Subcomponent

Steep Slopes:

Historically, steep slopes have deterred development to such an extent that they are somewhat of a predictor of intact forest conditions. If the slope is steep enough, there is a good chance that extensive timbering and thus high grading and soil compaction have been avoided in these areas. In addition, these slopes should be protected to reduce the threat of erosion. The location of slopes was calculated for the region using the DEM and assigned scores as follows:

- 0%–15%: 0
- 15%–25%: 2
- 25%+: 4

Interior Forest Habitat:

NLT obtained an Interior Forest Habitat GIS layer from PSU/ERRI, which selected forest types from the landcover data set and applied a 300-foot buffer to clip away external “edge.” The remaining forests were considered Interior Forest Habitat and were ranked according to size (in acres), as suggested by the Birds Expert Advisory Committee. The rankings have been calibrated specifically for conditions across the Pennsylvania Piedmont region:

0–25 acres	0
25–50 acres	1
50–100 acres	2
100–150 acres	3
150–225 acres	4
225–300 acres	5
300–400 acres	6
400–500 acres	7
500–750 acres	8
750–1000 acres	9
1000+ acres	10

Natural Vegetation Habitat Blocks:

All natural vegetation and land cover classes were split out from the regional landcover data layer. The regional road data layer was compiled to show regional landscape fragmentation and size of remaining landscape blocks. Block size values were assigned based on input primarily from the Mammals Expert Advisory Committee, with regional adjustments based on conditions across the Pennsylvania Piedmont, as follows:

0–35 acres	0
35–70 acres	1
70–100 acres	2
100–150 acres	3
150–250 acres	4
250–500 acres	5
500–875 acres	6
875–1375 acres	7
1375–2025 acres	8
2025–3000 acres	9
3000+ acres	10

Contiguous Grassland Habitat Blocks:

All hay/pasture land cover types were clipped from the regional land cover data set (92-94) for the Expanded Piedmont ecoregion. The layer was then intersected with the regional landscape blocks, as used in the Interior Forest and Natural Vegetation descriptions. Each contiguous Hay/Pasture polygon within a landscape block was then ranked according to size, using a scoring system as follows:

0-25 acres	1
25-160 acres	2
160-250 acres	3
250-400 acres	4
>400 acres	5

Contiguous Barrens or Scrub/Shrub Habitat Blocks:

All Bare/Transitional land cover types were clipped from the regional land cover data set for the Expanded Piedmont ecoregion. The layer was then intersected with the regional landscape blocks, as used in the Interior Forest and Natural Vegetation descriptions. Each contiguous Bare/Transitional polygon within a landscape block was then ranked according to size, using the following scoring system:

<5 acres	0
5-25 acres	1
>25 acres	4

D. Rarity Subcomponent

County Natural Areas Inventory & Pennsylvania Natural Heritage Program

This subcomponent evaluates potential habitat areas for rare, threatened and endangered species. Data from the County Natural Areas Inventory and the Pennsylvania Natural Heritage Program were used to assign value to habitat areas.

NLT used The Nature Conservancy (TNC)'s explicit procedures for ranking and maintaining data on rare species and natural communities as the basis for this subcomponent. NLT used three measures to arrive at a composite rarity ranking: 1) the rarest element; 2) the number of rare elements; and 3) a weighted average element-occurrence score. Once each habitat was ranked, cells were reclassified using the quantile method.

Data used for this subcomponent is as of the most recent update of the CNAI publication within each county (up until March 2002); with the exception of rare plants which were updated by PA DCNR through March 2002 for each county in the Expanded Piedmont ecoregion.

Subcomponent Compilation and Final Ecological Resource Results

To generate the final ecological resource value scores, each layer was added with the others in its subcomponent. The following table summarizes the scoring values for each of the subcomponents and their respective layers.

Ecological Value Scoring Summary Table			
Subcomponent	Layer	Possible Points	
Vertebrate Habitat	Mammals Habitat	1 - 10 (quantiles)	
	Fish Habitat	1 - 10 (quantiles)	
	Birds Habitat	1 - 10 (quantiles)	
	Herps Habitat	1 - 10 (quantiles)	
	Important Bird Areas	0, 1, or 3	
	Important Mammal Areas	0 or 3	
	<i>Final Subcomponent weight - 23.44 percent</i>		
Aquatic Resources	Wetlands	0, 1, 2, 4, or 10	
		Substrate	1
		Open water and aquatic bed	2
		Unconsolidated emergent or forested	4
		Emergent, scrub-shrub, and forested	10
		Hydric Soils	3
	Floodplains	5	
	Forested Water Quality	1 - 10 (quantiles)	
	Riparian Buffer Quality	1 - 10 (quantiles)	
	Water Quality	0, 5, or 10	
	Headwaters Protection	0, 1, 2, 3, 5, 7, 9, or 10	
	Impervious Cover	0 - 10	
	Impervious Cover Change	1 - 10	
	<i>Final Subcomponent weight - 39.75 percent</i>		
Terrestrial Resources	Steep Slopes	0, 2, or 4	
	Interior Forest Habitat	0 - 10	
	Natural Vegetation Habitat Blocks	0 - 10	
	Contiguous Grassland Habitat Blocks	1 - 5	
	Contiguous Scrub/Shrub Habitat Blocks	0, 1, or 4	
	<i>Final Subcomponent weight - 16.82 percent</i>		
Rarity Assessment	Rare Species Habitat	1 - 10 (quantiles)	
	<i>Final Subcomponent weight - 20.00 percent</i>		

The cumulative scores from each of the four subcomponents were normalized back to a 1 to 10 (10%) quantile classification system. While reclassing the data back to a 10% quantile system has the benefit of allowing easy data compilation and comparison as part of a relative ranking system, it also has the disadvantage of changing the proportional weight of each subcomponent from its original value to a uniform 25% for each subcomponent (since there are 4 subcomponents). In order to recalibrate the scoring to achieve the original subcomponent values, an adjustment factor was required. The adjustment factors used to accomplish this goal are shown in the table below.

Subcomponent	Normalized Weight	Adjustment Factor	Final Weight
Vertebrate Habitat	25%	.9376	23.44
Aquatic Habitat	25%	1.59	39.75
Terrestrial Habitat	25%	.6728	16.82
CNAI (Rarity)	25%	.8	20
	100%		100.00

Following the combination of the four subcomponents, the results of the ecological resource assessment for the Expanded Piedmont region were clipped to the Delaware Estuary Coastal Watershed.

APPENDIX C: 2030 GREENSPACE NETWORK

2030 Greenspace Network

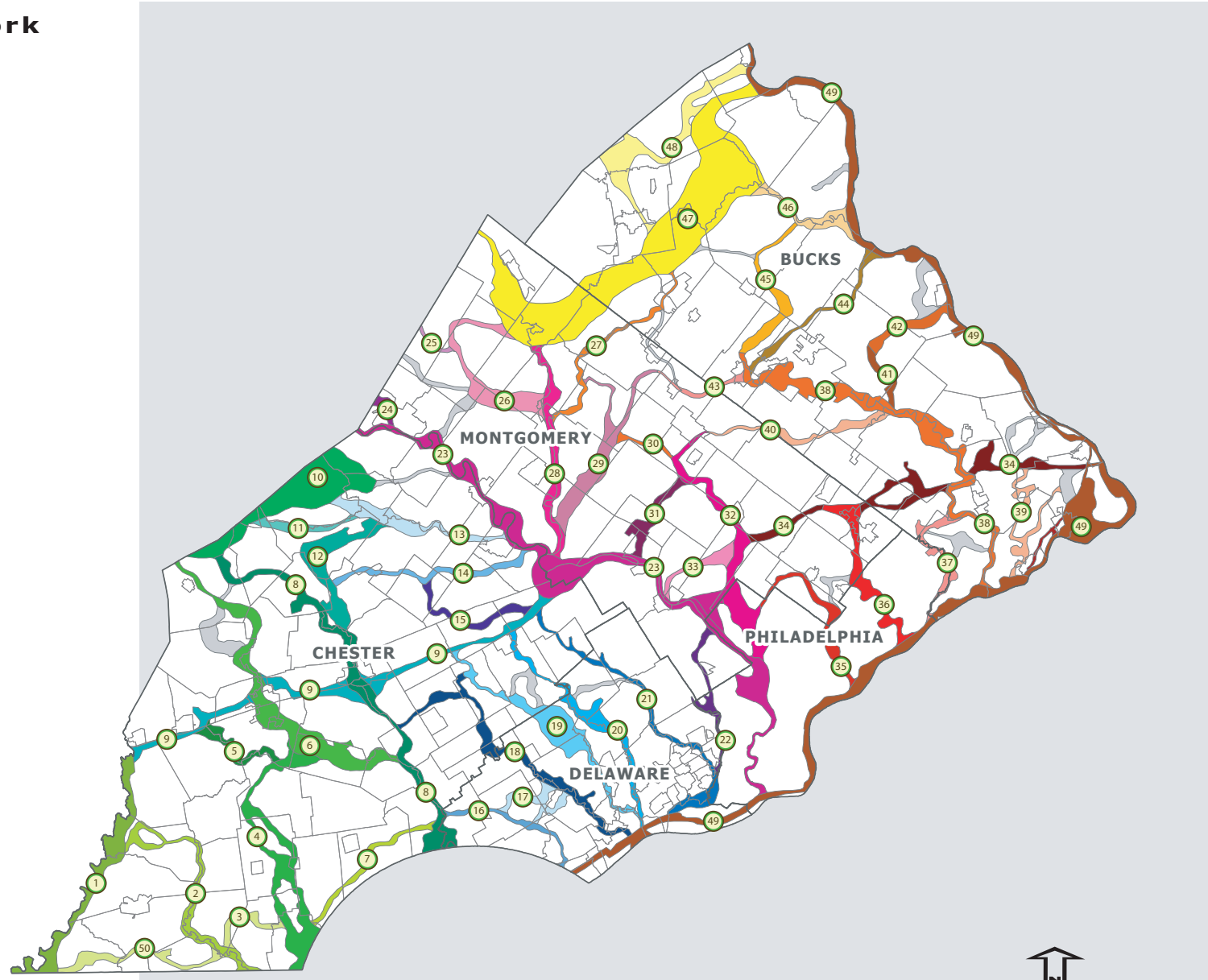
Southeastern Pennsylvania

Legend

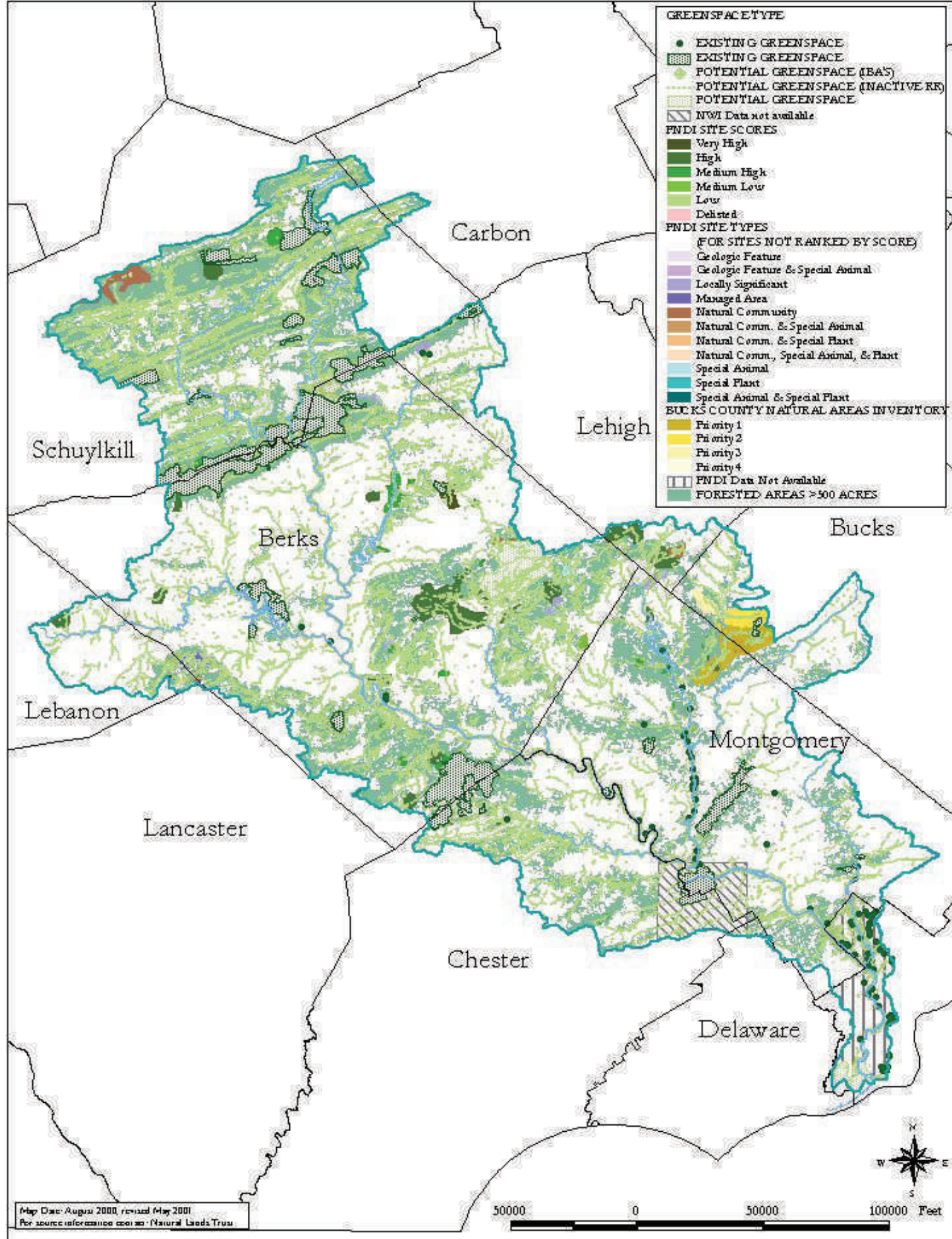
- | | |
|--------------------------------|------------------------------|
| 1. Octoraro Creek | 29. Skippack Creek-Evansburg |
| 2. Big Elk Creek | 30. Towamencin Creek |
| 3. White Clay-Ways Run | 31. Stony Creek |
| 4. White Clay-Doe Run | 32. Wissahickon Creek |
| 5. Buck Run | 33. Plymouth Creek |
| 6. West Branch Brandywine Ck. | 34. Cross County Corridor |
| 7. Delaware Arc | 35. Tacony-Cresheim Creek |
| 8. Brandywine Creek | 36. Pennypack Creek |
| 9. Great Valley Ridgelines | 37. Poquessing Creek |
| 10. Big Woods Corridor | 38. Neshaminy Creek |
| 11. Warwick-Elverson Corridor | 39. Mill-Queen Anne Creek |
| 12. Marsh Creek-Beaver Run | 40. Little Neshaminy Creek |
| 13. French Creek | 41. Mill Creek |
| 14. Pickering Creek | 42. New Hope-Ivyland |
| 15. Valley Creek-Pigeon Run | 43. W. Branch Neshaminy Ck. |
| 16. Naamans Creek-Harvey Run | 44. Paunacussing-Pine Run |
| 17. West Branch Chester Creek | 45. Peace Valley-Deep Run |
| 18. Chester Creek | 46. Tohickon Creek |
| 19. Ridley Creek | 47. North Woods (Highlands) |
| 20. Crum Creek | 48. Quakertown-Cooks Creek |
| 21. Darby Creek | 49. Delaware River |
| 22. Cobbs-Mill Creek | 50. Serpentine Barrens |
| 23. Schuylkill River | |
| 24. Manatawny Creek | |
| 25. Middle Creek | |
| 26. Swamp-Deep Creek | |
| 27. East Brach Perkiomen Creek | |
| 28. Perkiomen Creek | |

Minor Connecting Greenways









Note: Greenway colors are only meant to show where individual greenways start and stop

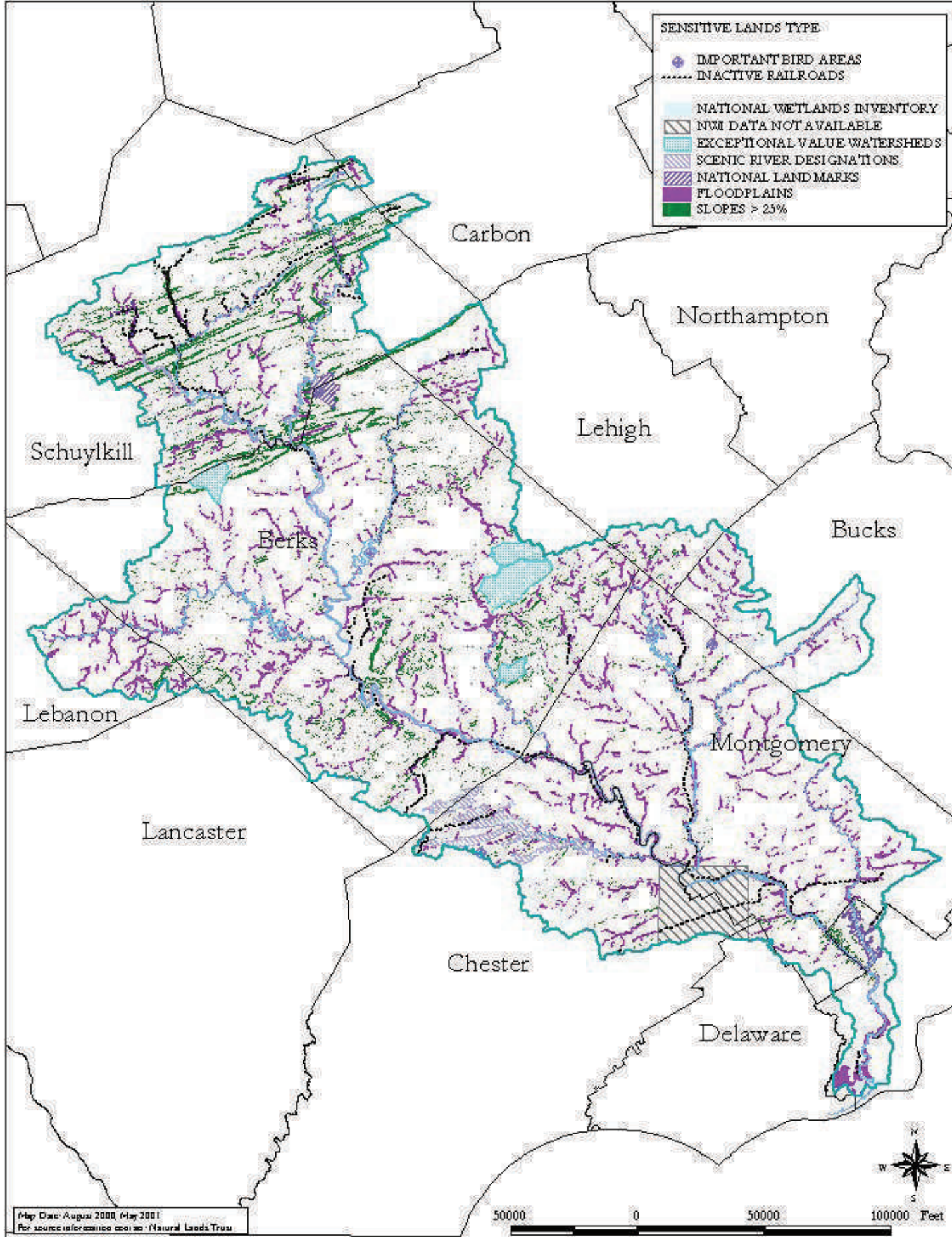


**APPENDIX D:
SCHUYLKILL WATERSHED CONSERVATION PLAN,
LANDSCAPE SUSTAINABILITY**



SENSITIVE LANDS TYPE

-  IMPORTANT BIRD AREAS
-  INACTIVE RAILROADS
-  NATIONAL WETLANDS INVENTORY
-  NWI DATA NOT AVAILABLE
-  EXCEPTIONAL VALUE WATERSHEDS
-  SCENIC RIVER DESIGNATIONS
-  NATIONAL LAND MARKS
-  FLOODPLAINS
-  SLOPES > 25%



Map Date: August 2000, May 2001
For source information contact: Natural Lands Trust

