VI. Rural Priority Landscape Area

Overview

The Cooperative Forestry Assistance Act (CFAA) provides the authorities for a broad range of State and Private Forestry (S&PF) programs. As amended by the 2008 Farm Bill, the CFAA requires each state forestry agency to develop a Statewide Forest Resource Assessment ("State Assessment") and Statewide Forest Resource Strategy ("Resource Strategy"), collectively referred to as a State Forest Action Plan (SFAP). Once completed, states are eligible to receive funds under the authorities of the Act. State Assessments are intended to identify key forest-related issues and priorities to support development of the long-term Resource Strategy. All states were initially required to complete a SFAP by June 2010. Additional requirements include a review at least every five years and an update at least every ten years. Most states, like Delaware, have a deadline of December 2020 to submit an updated and revised SFAP to the U.S. Forest Service (USFS) to secure S&PF funding for core forestry programs.

Once again, Geographic Information System (GIS) technology was used to complete the rural priority landscape area process. GIS allows for complex analyses of geographic data on standard desktop computers using sophisticated computer software. The Delaware Forest Service (DFS) has routinely used GIS technology for the past 20 years for a variety of purposes. All DFS foresters have been capable users since 2005. Furthermore, the Delaware Department of Agriculture (DDA) has had a full-time GIS coordinator on staff since 2015. Therefore, the DFS had been pre-positioned to carry out this complex analysis without additional software or training. The DDA GIS coordinator handled data management, processing, and analyses for this study.

The GIS analysis used for this study involved the overlay of 21 datasets. Some layers were recommended by USFS guidelines. Other layers were added by DFS staff members because they were clearly relevant in Delaware. A few additional layers were incorporated based on recommendations made by members of the Forest Stewardship Committee in 2019.

This analysis was used to identify the critical forested landscapes in rural areas—a second and separate (see Section VII) analysis identified critical urban forests. Therefore, this process only included forest and agricultural lands (as recommended by the USFS because agricultural land can be converted to forestland) and land located outside of municipal boundaries.

Once the 21 input layers were assembled, they were combined in an overlay process. A composite score was calculated for each 30-meter by 30-meter area in the state (representing about a quarter of an acre) based on the presence or absence of each of the input layers for that area. Layers were weighted according to average scoring of committee members, so that higher-scoring layers had greater impact in the composite score.

The goal with this analysis was to build on the Forest Stewardship Spatial Analysis Project (SAP) methodology developed in 2006 that relied on a weighted overlay analysis. The current analysis differed from SAP in several key areas. Unlike SAP, this analysis included public lands and incorporated nearly twice as many layers to compute priority scores. Urban areas were not included in SAP but are included in Section VII—Urban Priority Landscape Areas—though the input layers and ranking system were different.

The 21 data layers included in the State Assessment GIS analysis included the following (presented in order of their weighting):

1. Forest Fragmentation
2. Delaware Habitats of Conservation Concern
3. Riparian Areas
4. Forest Cover
5. Forest Health Risk
6. High Productivity Soils
7. Proximity to Existing Sawmills
8. Wetlands
9. Resilient Land (TNC)
10. Wildland/Urban Interface (WUI)
11. Natural Areas
12. Low Development Risk
13. Protected Lands
14. Historical/Cultural Sites
15. Conservation Easements
16. Forest Legacy Areas
17. Commercial Forest Plantation Act (CFPA) Properties
18. High-Priority Watersheds
19. Groundwater Recharge/Drinking Water
20. Wildfire Risk
21. Impaired Air Quality

Additional layers recommended by the USFS or the Stewardship Committee that were not incorporated into the analysis included the following:

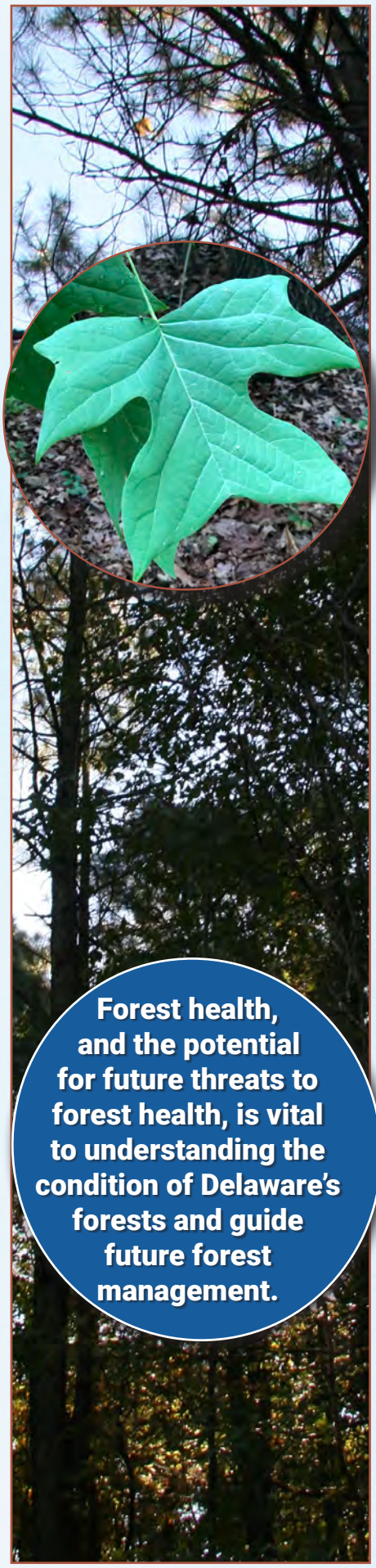
Zoning Map – Zoning data is variable by county and does not provide the information the committee desired (projection of new development). An existing dataset, wildland urban interface, tends to show developing areas and that layer was given a higher weight as a substitute.

Landowner Incentive Program – Partially redundant with conservation easements and incorporated areas, other data is confidential.

Recreation Map – Recreation areas are included in the public protected lands data.

Regional Flow – Regional flow is a component of Resilient Land data already being used (The Nature Conservancy).

Sea Level Rise – 100-year estimates are available, but far exceed the 10 year scope of this assessment.



Input Layers

A more detailed description of each of the 21 input layers used to determine the rural priority landscape area follows.

1. Forest Fragmentation

The DFS originally mapped contiguous forested areas that cover at least 250 acres for the 2010 assessment. A forest block was not considered contiguous if it was bisected by a paved road. Instead, forest areas on either side of roads were separate blocks for acreage determination. This data was updated for 2020 by examining contiguous forested areas using 2017 aerial imagery. Forestland that had been cleared for other uses (agriculture or development) was removed and block sizes were recalculated. Blocks that fell below 250 acres were then removed. While relatively small for some areas of the country, a 250-acre contiguous forested area is significant in Delaware. Large areas of contiguous forest are important for a variety of reasons, including habitat for forest-interior dwelling species. Large forested areas also present more opportunities for forest management activities.

2. Delaware Habitats of Conservation Concern

The Delaware Ecological Network (DEN) is a statewide conservation network developed from GIS and field-collected data. The DEN, based on principles of landscape ecology and conservation biology, provides a consistent framework to help identify and prioritize areas for natural resource protection. DEN incorporates Habitats of Conservation Concern for rare/threatened/endangered species along with corridors connecting core ecosystem areas.

3. Riparian Areas

Riparian forested buffers improve water quality by filtering sediments and other pollutants before they reach streams and other waterways. These forests also moderate stream water temperatures and provide travel corridors and other habitat for many wildlife species. The riparian areas layer was created using a 100 foot buffer on each side of statewide streams and water bodies, which created 200 foot wide riparian areas along all waterways.

4. Forest Cover

Forest cover is obviously an important component of a State Forest Resource Assessment. A Delaware 1-meter landcover dataset was developed by the University of Vermont Spatial Analysis Laboratory, in collaboration with the USFS, and funding by the William Penn Foundation, National Park Service, and the EPA. https://drbproject.org/products/

This landcover data is based on 2014 LIDAR, along with 2013 and 2012 aerial imagery. It included forest canopy categories which we extracted to create a forest canopy layer for this analysis. Although this analysis includes both forest and agricultural lands because croplands can be converted to forest (afforested), existing forest cover, represented by this layer, received higher weighting.

5. Forest Health Risk

Forest health, and the potential for future threats to forest health, is vital to understanding the condition of Delaware's forests and helps guide future forest management decisions. This layer, provided by the USFS, helps assess forest health. It is based on Forest Inventory and Analysis (FIA) data and predicts the amount of mortality through basal area loss (a measure of forest stocking) due to forest insects and diseases over the next ten years at a one-kilometer scale. Because most of Delaware has an estimated future loss of zero, areas with estimated loss greater than 5% were used as the forest health risk input.

6. High Productivity Soils

Soil and water are essential for forests. Therefore, an assessment of a state's soils is an important component of a forest resource assessment because one may wish to consider soil quality when focusing forest conservation efforts. For this analysis, high productivity soils were defined as:

- For Kent and Sussex Counties, soils capable of producing loblolly pine annual growth increments of 320 board-feet per acre, per year, at age 50. This includes Evesboro loamy sand (but not Evesboro sand), Fallsington, Kalmia, Matawan, Pocomoke, Sassafras, and Woodstown soils.
- For New Castle County, soils capable of producing yellow-poplar annual growth increments of at least 300 board-feet per acre, per year, at age 50. Included are Bayboro, Butlertown, Codorus, Delanco, Evesboro, Fallsington, Hatboro, Johnston, Klej, Matapeake, Mixed alluvial, Rumford, Sassafras, and Woodstown soils.

7. Proximity to Existing Sawmills

Access to stable and diverse forest markets is important to keep private forestlands as forests. Without viable markets to generate income, many forest landowners will convert their forests to other uses. Traditional forest markets, such as primary wood processors (e.g., sawmills, paper mills, plywood mills, etc.), are a major component of forest markets. The DFS staff mapped sawmills, log concentration yards, and chip mills in the area. A 10-mile buffer around mills represents the area from which logs could be delivered at a very low hauling cost. Ten miles is conservative, but larger buffers would cover the entire state and therefore have no impact on the analysis. Facilities in Maryland were included if they were within ten miles of Delaware.

8. Wetlands

This layer from the Department of Natural Resources and Environmental Control (DNREC), Division of Watershed Stewardship includes all Delaware wetlands.

9. Resilient Lands

Resilient Lands is The Nature Conservancy's project to identify land with sufficient variability and microclimate options that enable species and ecosystems to persist in the face of climate change and which will maintain this ability over time. A site's resilience score estimates its capacity to maintain species diversity and ecological function as the climate changes. The score is relative to all other sites with the same geophysical setting and is described on a relative basis as above or below average. This layer included all sites with final resilience scores classified as slightly above, above, or far above average.

10. Wildland/Urban Interface (WUI)

The wildland/urban interface (WUI) demonstrates where urban areas are expanding. Therefore, it is likely that forests and other undeveloped lands in these areas will soon be impacted and/or replaced by development. Identifying these areas is important to a forest resource assessment as it can help focus where to spend limited public funds on forestry projects. USFS WUI data were used by extracting areas classified as:

- Medium Density Intermix – Housing density between 49.4 and 41.3/sq km and wildland vegetation > 50%.

- Medium Density Interface – Housing density between 49.4 and 741.3/sq km, wildland vegetation ≤50% but within 2.4 km of an area with ≥75% wildland vegetation.

https://www.fs.usda.gov/rds/archive/catalog/RDS-2015-0012-2

11. Natural Areas

Many of the most ecologically diverse habitats are found in forests. Conserving and protecting these areas is important to ensure that the plant and animal species found in these habitats continue to thrive. Delaware law (Title 7, Chapter 73) establishes a process to identify Natural Areas—those tracts that contain the best examples of diverse flora and fauna. This data layer contains Delaware's Natural Areas identified by DNREC.

12. Low Development Risk

Loss of forestland to development is unavoidable. Future investments in forest conservation and forest management are usually more worthwhile in areas not targeted for development by state and local governments because these areas will not have the infrastructure (e.g., better roads, central sewer and water, etc.) necessary to support widespread, dense development. Delaware has identified four levels for state investment—Levels 1–3 include existing urban areas and those rural-urban fringe areas targeted for development in the future. Level 4, most of the state, is comprised of rural areas where no state-supported infrastructure improvements are planned and, thus, population growth is not desired. This data layer contains the Level 4 areas within Delaware's existing 2015 State Strategies dataset.

13. Protected Lands

This input contains all properties owned in fee simple (no easements) by federal, state, county, and local governments as well as non-governmental organizations (NGOs) with natural resource protection missions. This data layer attempts to capture public and NGO lands because these properties are likely to remain undeveloped. These properties often serve as the "core" areas for forest protection efforts. Expanding these core areas with additional purchases, easements on adjoining private lands, etc., can help maintain, expand, and connect large patches of forests. Knowing the location of these parcels can help guide future forest conservation efforts and investments.

The ownerships included in this layer are:

- State Parks
- State Fish & Wildlife lands
- Federal Fish & Wildlife lands
- State Forests
- Stockley Center
- NGO lands
  - Mt. Cuba Center
  - The Nature Conservancy

- Delaware Nature Society
- Delaware Wild Lands, Inc.
- Nanticoke River Watershed Alliance

- Hoopes Reservoir parcels owned by the City of Wilmington
- National Guard properties
- County Parks
- Other County-owned lands
- DelDOT Open Space and other properties
- Community Open Space properties, where available

Buena Vista in New Castle

14. Historical/Cultural Sites

Historical and cultural sites are important to a state's history and recreational economy. Protecting these sites from land-use conversion helps ensure their preservation. DNREC Division of Historical & Cultural Affairs maintains data locating Delaware's 9,150 National Historic Landmark and National Historic Register places, along with four scenic byways, and 89 historic districts. A ½-mile radius around each site was used to represent a buffer. Forest cover around these sites can maintain and enhance their aesthetic value and provide other economic and environmental benefits (e.g., wildlife habitat, riparian buffers, etc.).

15. Conservation Easements

Conservation easements permanently protect land from development. Therefore, it is likely that forests under conservation easements will remain forested. In some circumstances, it is worthwhile to target technical and financial assistance to these areas because there is little danger of a change in land use. This input layer includes the following:

- Delaware Forest Service Easements (including Forest Legacy Easements)
- DNREC (Parks & Recreation, Fish & Wildlife) Easements
- Delaware Aglands Preservation Foundation Easements
- Delaware Forestland Preservation Program Easements
- Delaware Young Farmer Agricultural Easements
- DelDOT Corridor Capacity Program Easements
- NRCS Wetland Reserve Easements

16. Forest Legacy Areas

This layer contains Delaware's four Forest Legacy Areas that were approved by the Secretary of Agriculture in 1998 as well as all subsequent revisions approved by the USFS. These are the areas where Delaware can use federal Forest Legacy Program funds to protect working forestlands and were identified as high priority areas in Delaware's Forest Legacy Assessment of Need. Forest Legacy Areas are to be incorporated into the State Assessment as stipulated by USFS guidelines.

17. Commercial Forest Plantation Act (CFPA) Properties

This data layer, maintained by the DFS, contains forestland enrolled in Delaware's Commercial Forest Plantation Act (CFPA). This tax abatement program provides a 30-year property tax exemption for privately owned forests at least 10 acres in size and that are managed for timber production following a forest management plan approved by the DFS. These properties are also typically well-managed and are more likely to remain forested, which is important information for the State Assessment.

18. High-Priority Watersheds

Clean water is a priority for all citizens. Unfortunately, many of Delaware's waterbodies do not meet the EPA definition of swimmable and fishable. Forests and forest management can help improve water quality, such as through the establishment of riparian forested buffers. The DNREC Division of Watershed Stewardship determines priority watersheds which were used for this data layer.

19. Groundwater Recharge/Drinking Water

Groundwater is the primary source for drinking water in Delaware. Forestland is widely recognized as providing clean, abundant water. Therefore, protecting the state's highest-quality forested groundwater areas is an important long-term strategy. This dataset contains the groundwater recharge areas classified as excellent by the Delaware Division of Water.

20. Wildfire Risk

Wildfires can pose a substantial risk to forest health. Identifying areas that are most prone to high-intensity wildfires can help foresters better plan for and mitigate this threat. While Delaware does not often experience intense wildfires, there are two cover types that are susceptible to incendiary fires—young loblolly pine plantations and areas dominated by the invasive reed, *Phragmites australis* (Fuel Model 3). Areas classified as moderate, high, or very high hazard were extracted from USFS LANDFIRE program's Wildfire Hazard Potential (2018) dataset for this analysis.
https://www.landfire.gov/getdata.php

21. Impaired Air Quality

Air quality is important for all life—plant and animal. Forests improve air quality by removing particulates and other pollutants. Therefore, governments may wish to target forest conservation efforts in areas with poor air quality. DNREC's Division of Air Quality issued its Delaware Annual Air Quality Report in 2017 and reported the following:

- All three counties had exceedances of ozone standards in 2007, New Castle County had more violations than Kent and Sussex. But since then there has been a downward trend in the three-year average ozone ppm value and starting in 2013 Kent and Sussex Counties have been below the 2015 standard while New Castle County was still in non-attainment.
- New Castle County failed to meet $PM_{2.5}$ standards ($PM_{2.5}$ refers to fine inhalable particles, with diameters generally 2.5 micrometers and smaller) during every year from 2001 through 2007. Kent and Sussex Counties did not have any $PM_{2.5}$ violations during this same time period. However, since 2007, all three counties have met the annual standard.

Based on these and other historical findings by Delaware's air quality management agency, the boundary of New Castle County was used to map Delaware's poor air quality area.

Overlay Methodology

Each input layer was converted to a raster dataset (cells). A resolution of 30 meters was chosen as a compromise between limitations of existing data resolution and the desired high-resolution final product. This resolution is approximately equal to quarter-acre resolution, meaning there are about five million raster cells in the State.

All layers were “clipped” to a statewide layer consisting of forest cover and cropland, excluding all forest and cropland within municipal boundaries. This means that any land uses other than cropland or forest, and any lands of any type within municipal boundaries, were not included in the model. We included cropland because agricultural land can be converted to forest via planting or abandonment. We did not include municipal areas because a separate (and different) analysis was conducted for urban areas.

The following weighting scheme, based on the votes of Stewardship Committee members present at the June 2019 meeting, was utilized:

Input Layer	Committee Rank	GIS Weighting
Forest Fragmentation	1	2.0
Del. Habitats of Conservation Concern	2	1.9
Riparian Areas	3	1.7
Forest Cover	4	1.6
Forest Health Risk	5	1.3
High Productivity Soils	6	1.3
Proximity to Sawmills	7	1.3
Wetlands	8	1.1
Resilient Lands (TNC)	9	1.1
Wildland Urban Interface (WUI)	10	1.0
Natural Areas	11	1.0
Low Development Risk	12	1.0
Protected Lands	13	1.0
Historical/Cultural Sites	14	.9
Conservation Easements	15	.8
Forest Legacy Areas	16	.8
Commercial Forest Plantation Act (CFPA)	17	.8
High-Priority Watersheds	18	.8
Groundwater Recharge/Drinking Water	19	.7
Wildfire Risk	20	.7
Impaired Air Quality	21	.5

For each raster cell, each input layer present was included in the final score for that cell using a simple “present/not present” process. In other words, if a cell overlapped an input layer, then the cell received the weighted value for that layer and that value was included in the composite score. Consider the following example from a single cell near Georgetown in Redden State Forest:

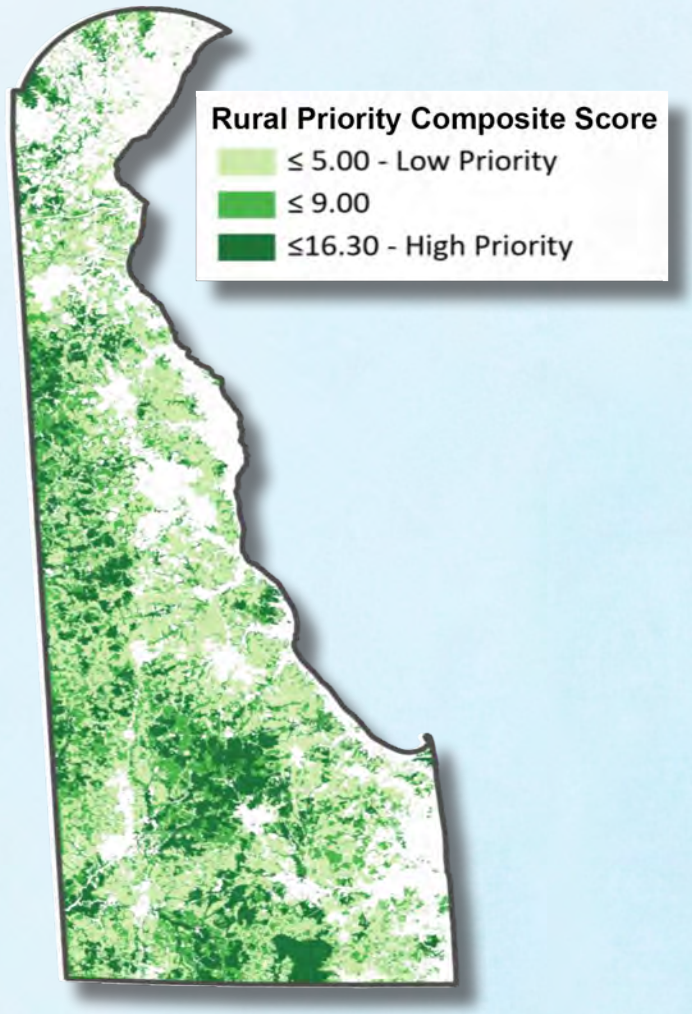
Input Layer Final Score	Present	Final Weight
Forest Fragmentation	Yes	2.0
Del. Habitats of Conservation Concern	Yes	1.9
Riparian Areas	No	0
Forest Cover	Yes	1.6
Forest Health Risk	Yes	1.3
High Productivity Soils	Yes	1.3
Proximity to Sawmills	Yes	1.3
Wetlands	No	0
Resilient Lands (TNC)	No	0
Wildland Urban Interface (WUI)	No	0
Natural Areas	Yes	1.0
Low Development Risk	Yes	1.0
Protected Lands	Yes	1.0
Historical/Cultural Sites	No	0
Conservation Easements	No	0
Forest Legacy Areas	Yes	.8
Commercial Forest Plantation Act	No	0
High-Priority Watersheds	Yes	.8
Groundwater Recharge/Drinking Water	No	0
Wildfire Risk	No	0
Impaired Air Quality	No	0
Total Composite Score		**14.0**

Note that the highest possible score would be 23.5 if all input layers were present in a cell, though no cell in Delaware scored higher than 16.3. Weights were specifically chosen with a sum of 23.5 so that the composite scores would be comparable to 2010 assessment scores which had the same total. In addition, a 2010 input raster was used as the raster analysis environment settings to ensure that 2020 raster cells were aligned with cells from the 2010 analysis, which is necessary for comparisons.

Rural Priority Landscape Area

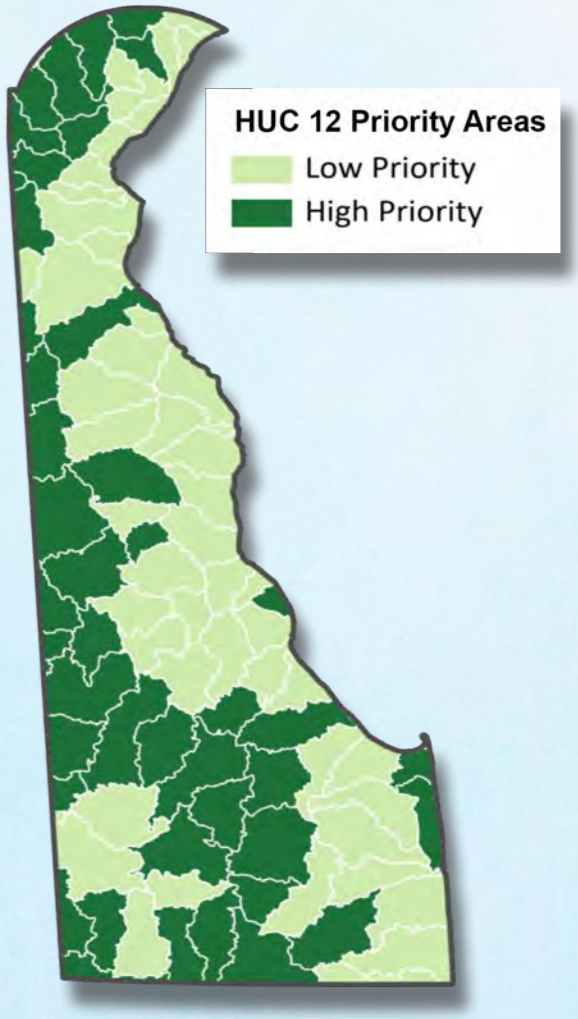
The final product from the weighted overlay of the 21 input layers had a resolution of 30 meters (Figure 45). Thus, a single acre of land could have high, medium, and low-priority cells. To match the 2010 assessment, priority values were averaged over each HUC 12 watershed (a local sub-watershed level that captures tributary systems). Delaware contains about 100 HUC 12 watersheds (or portions thereof) with an average area of about 13,000 acres.

Figure 45. Initial statewide composite map layer.



Source: Delaware Department of Agriculture

Figure 46. Draft priority area map by HUC watershed.



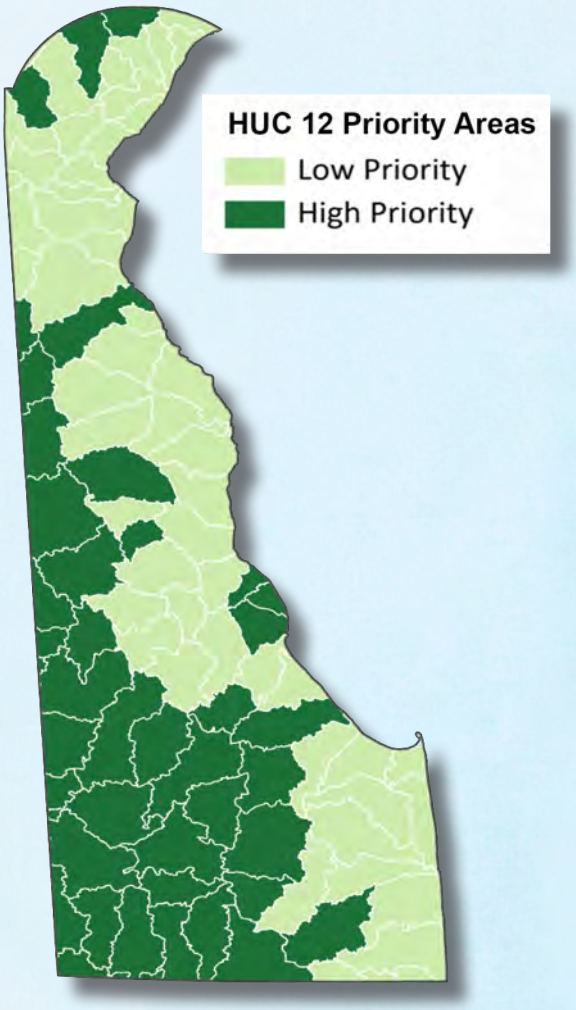
Source: Delaware Department of Agriculture

One additional analysis was used to prioritize each HUC 12 watershed as either high priority or low priority—the raster data was processed in Spatial Analyst using the Zonal Statistics tool. The composite scores for every cell within a given HUC 12 watershed were evaluated and a final mean value of those cells was assigned to that watershed. Mean composite scores for watersheds ranged from 2.9 to 10.7. A value of 5.35 was used as a cutoff for 'high priority' watersheds to be comparable with the 2010 assessment. This resulted in 43 of Delaware's 100 HUC 12 watersheds receiving high priority (Figure 46).

This map was then reviewed by the Forest Stewardship Committee. While the Committee generally agreed with the final result, members felt unanimously that some changes were needed. Specifically, several watersheds in eastern Sussex County were removed from the high priority list because of limited opportunities for forestry activities in those areas. And several watersheds in southwestern Sussex County were added to the high priority list because of the high potential for successful forestry-related efforts and their location within the Chesapeake Bay watershed.

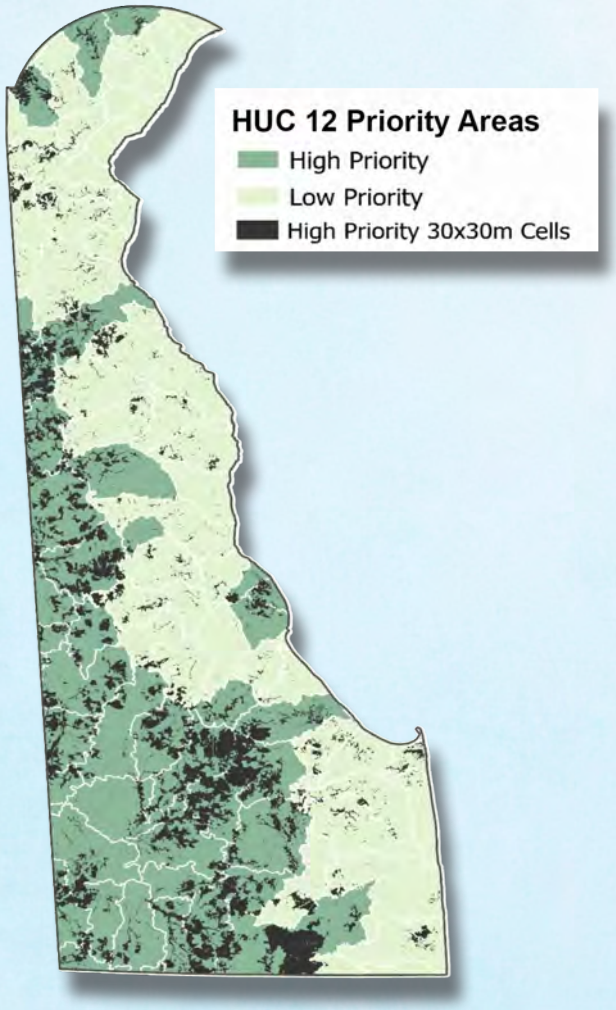
These changes were made, and a final map was produced (Figures 47 and 48). The Committee noted that this result was very similar to the natural resource prioritization efforts by other organizations including The Nature Conservancy and The Conservation Fund.

Figure 47. State Stewardship Committee priority HUC watershed map.



Source: Delaware Department of Agriculture

Figure 48. Detailed map of underlying pixel data for State Stewardship Committee priority area map.



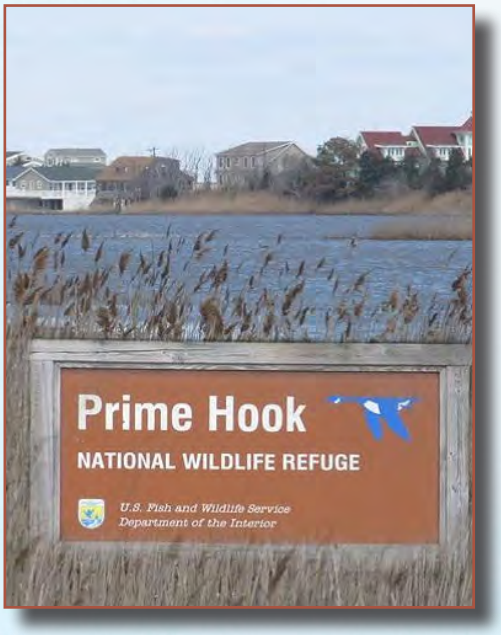
Source: Delaware Department of Agriculture

Rural Priority Landscape Area Description

The State of Delaware occupies approximately 1.25 million acres along the mid-Atlantic coast, of which 442,593 acres are identified as the Priority Landscape Area (medium and high priority). Within the medium and high priority area, 336,000 acres are forested or 93% of the state's forestland base. This area spans both physiographic provinces (Piedmont and Coastal Plain) and all three counties—New Castle, Kent, and Sussex. The Piedmont province is found in the northernmost portion of the state (New Castle County) and is characterized by low rolling hills. The Coastal Plain province (Kent and Sussex County) lies south of the Piedmont province and is characterized by little topographic relief with extensive streams and tidal estuaries. The Priority Landscape Area encompasses 44 HUC 12 watersheds and four major drainage basins—Piedmont, Delaware Estuary, Chesapeake Bay, and Inland Bays.

Land ownership within the priority area includes many significant private and public land holdings. The Department of Agriculture's Forest Service manages over 21,100 acres, encompassing three State Forests—Blackbird (New Castle), Taber (Kent), and Redden (Sussex). The Delaware Division of Fish & Wildlife manages more than 57,000 acres of public land and the Division of Parks & Recreation manages just over 26,000 acres.

Prime Hook National Wildlife Refuge, located approximately ten miles north of Lewes, contains over 10,000 acres devoted to habitat protection for waterfowl, migratory birds, and other threatened and endangered species.

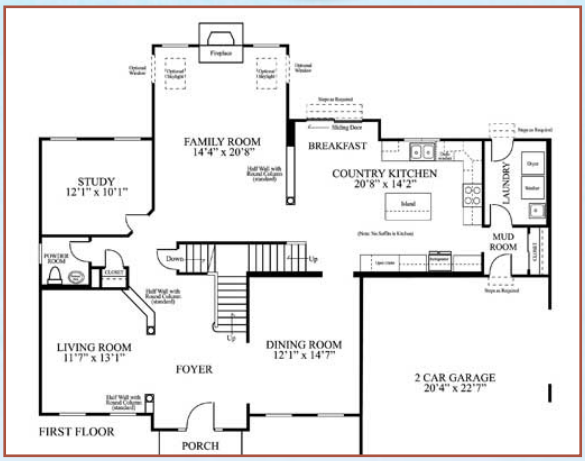


Private land within the rural priority area is protected by several non-profit conservation entities such as Delaware Wild Lands, Inc. (>19,000 acres), The Nature Conservancy (>5,000 acres), Delaware Nature Society (nearly 2,000 acres), and the Nanticoke River Watershed Conservancy (>500 acres). Private property owners also have the option of retaining the title to their land and placing it under a legally binding easement that prohibits or severely restricts future development. The Department of Natural Resources and Environmental Control (DNREC) maintains these types of easements on over 2,400 acres of land with various landowners. In addition, the Delaware Agricultural Land Preservation Foundation holds easements on approximately 139,000 acres of land, of which 27% is forested. The Delaware Forest Service (DFS) also holds easements on approximately 6,870 acres of working forests.

Though comparatively small, Delaware is rich in natural resources—from beaches to uplands, brackish and freshwater wetlands, and an abundance of flora and fauna—all defining Delaware's natural heritage. The landscape has changed considerably since early European settlers arrived. Great majestic forests once dominated the landscape. However, many of these forests have been logged or converted to farmland. Today, land is transforming faster than ever before with much of the state becoming enveloped with development. This new growth has left habitats encroached, fragmented, water quality impaired, and has displaced many plant and animal species.

Land-use Planning

State, county, and local governments regulate land-use planning. Development projects within municipalities are subject to land-use reviews through local governments. However, most non-incorporated areas of the state are subject to reviews under the corresponding county office—New Castle County Department of Land Use, Kent County Department of Planning Services, and Sussex County Planning and Zoning Department. Overall planning guidance is coordinated through the Office of State Planning Coordination (OSPC), which reports to the Governor's Office and directs state, county, and local planning efforts. Prior to submission to local governments, all major land-use changes are subject to review by state agencies (Chapter 92, Title 29 of Delaware Code). The DFS provides developers and local governments with alternatives to minimize development impacts, including recommendations for construction practices and subdivision layouts to preserve trees whenever and wherever practical.



Five Divisions of the Rural Priority Landscape Area

Delaware's rural priority landscape area spans four major drainage basins and one unique watershed. While all are similar in many respects, each is uniquely important. The watersheds found in Delaware are vital to Delaware's environment and economy because they provide homes for many plant and animal species, drinking water for residents, agricultural irrigation, and water to many industries. Below is a summary of each unique landscape division.

1. Delaware Estuary

The Delaware Estuary (520,960 acres) spans 16 watersheds and stretches north to the upper reaches of the Chesapeake and Delaware (C&D) Canal and south to the Broadkill River. This area includes 40,040 acres of rural forests on the Atlantic Coastal Plain, of which 25% is permanently protected through public land holdings and conservation easements. Of the high priority rural forest, 37% is publicly owned—the majority of which is managed by the Division of Fish & Wildlife (2,524 acres). The northernmost rural forests include areas along the western portions of Glasgow north of the C&D Canal. These forests, many of which are enrolled in the Commercial Forest Plantation Act, have been actively managed through private ownership. The southernmost forests serve as critical riparian buffers to impaired riverine systems such as Broadkill, Saint Jones, Murderkill, and Mispillion. Of the forests located in this basin, 30% serve as excellent ground water recharge areas.

The Delaware Bay's wetlands and tidal flats provide homes for many birds, mammals, fish, reptiles, amphibians, and invertebrates. This includes some endangered species like Atlantic sturgeon (*Acipenser brevirostrum*) and black skimmer (*Rynchops niger*). The wetlands found here are extremely important as they are designated as a Ramsar site, largely due to the association with migratory birds and the critical foraging/nesting grounds they provide. A Ramsar site is a wetland of international significance, based on representativeness, uniqueness or of biodiversity values designated by the National Ramsar Committee—a body of scientific and technical experts also called the National Wetland Committee. This area is also part of the Atlantic Flyway and is crucial to migrating waterfowl of concern, such as Canada geese (*Branta canadensis*) and black ducks (*Anas rubripes*). Likewise, millions of shorebirds use this area as a stop to feed upon invertebrates and horseshoe crab eggs before migrating to Arctic nesting grounds. In the southern portion of the Delaware Estuary, south to Prime Hook National Wildlife Refuge, habitat restoration programs are centered on stabilizing population numbers of the formerly federally endangered Delmarva fox squirrel (*Sciurus niger cinereus*), which was delisted in 2015. Many of the state's occurrences of the Delmarva Atlantic white-cedar (*Chamaecyparis thyoides*) swamp community are found along ponds and dams in the eastern portion of the basin, particularly along the Broadkill. Atlantic white-cedar swamps are habitats with unique soil characteristics and are home to many rare plant species including: grass-pink orchid (*Calopogon tuberosus*), coast sedge (*Carex exilis*), roundleaf sundew (*Drosera rotundifolia*), purple pitcher-plant (*Sarracenia purpurea*), curly-grass fern (*Schizaea pusilla*), and bog fern (*Parathelypteris simulate*). Stresses to the Delaware Estuary include incompatible development, unsustainable agriculture, climate change, altered hydrological regime, clearing of forests, and invasive species.

2. Blackbird Creek

The Blackbird Creek is a subset of the Delaware Estuary—it is of utmost ecological importance and therefore warrants a separate description within the high priority area. This designation is largely based on its tidal wetlands and forests as important features representing unique and high-quality areas of natural diversity. The Blackbird Creek spans approximately 19,000 acres and is nearly 34% (6,500 acres) forested in the most urbanized county of the state. 21% of the forests in Blackbird Creek are permanently protected including a portion of Blackbird State Forest (1,706 acres). Tidal wetlands dominate the far eastern portion and a high density of small, isolated wetlands occurs throughout the western portion of the area. This area is home to the largest concentration of Coastal Plain seasonal ponds in Delaware. Coastal Plain ponds, also called Delmarva Bays, are unique, isolated, irregularly inundated freshwater depressional wetlands that offer habitat for many rare species. Rare plant species associated with the ponds include: rose coreopsis (*Coreopsis rosea*), Hirst Brother's panic grass (*Dichanthelium hirstii*), teal love-grass (*Eragrostis hypnoides*), Carolina redroot (*Lachnanthes caroliniana*), creeping St. John's-wort (*Hypericum adpressum*), and awned meadow beauty (*Rhexia aristosa*). Reptiles and amphibians include: tiger salamander (*Ambystoma tigrinum*), Cope's gray tree frog (*Hyla chrysoscelis*), barking tree frog (*Hyla gratiosa*), rough green snake (*Opheodrys aestivus*), brown creeper (*Certhia americana*), and four-toed salamander (*Hemidactylium scutatum*).

Additionally, Blackbird Creek lies within the Blackbird-Millington Corridor. This corridor is recognized as one of Delaware's most important areas of "Green Infrastructure"—a network of farms, forests, and other natural areas that supports native species, maintains ecological processes, sustains air and water resources, and contributes to the health and quality of life for communities and people. Natural resource use continues to play an important but changing role in the area over time. From 1937 to 1997, cultivated land in the Blackbird Creek watershed decreased by 16% and estuarine water and tidal mud-flats in the eastern part of the area increased. The decline of agriculture on the Delmarva Peninsula, and its likely replacement with development, is a major concern. Blackbird Creek represents a tremendous water pollution control opportunity as 25% of the forests lie in excellent recharge areas.

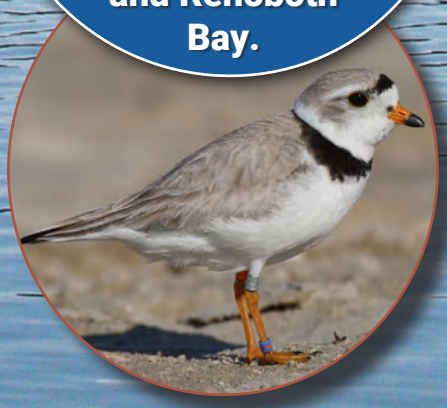
3. Inland Bays

Delaware's Inland Bays, totaling over 103,000 acres, consist of three interconnected bodies of water—Indian River Bay, Little Assawoman Bay, and Rehoboth Bay—located in the southeastern part of Delaware in Sussex County. There are 44,000 acres of forests within the Inland Bay portion of the priority forest area and of that approximately 11,370 acres (25%) are permanently protected. 79% of the protected land is owned by non-governmental organizations.

The Inland Bays historically have provided nursery areas and habitats for a variety of shellfish, finfish, and other wildlife. Over the past century, many of these desirable species have declined in numbers due to the loss of suitable habitat and the unavailability of appropriate food. The loss of valuable habitat is an important symptom of the stressed conditions of the Inland Bays. Developed lands now comprise more than one-fourth of the total Inland Bays area. This ever-increasing growth stresses the area and creates new management challenges such as nutrient overloads, harmful algal blooms, and red/brown tides. Federally threatened species such as the piping plover (*Charadrius melodus*) and swamp pink (*Helonias bullata*) plant have suffered due to habitat loss, encroachment, and destruction.

Blackbird Creek spans approximately 19,000 acres and is nearly 34% forested (6,500 acres) in the most urbanized county of the state.

The Inland Bays total over 103,000 acres and consist of three interconnected bodies of water—Indian River Bay, Little Assawoman Bay, and Rehoboth Bay.



The Inland Bays are degraded waters of Exceptional Recreational and Ecological Significance (ERES) with a commitment of restoration to a healthy condition by government and stakeholder groups. The Inland Bays are degraded waters of exceptional recreational or ecological significance (7 Del. C. § 7401; Surface Water Quality Standards) and there exists a commitment of restoration to a healthy condition by government and stakeholder groups. Delaware's Center for the Inland Bays is seeking to improve Sussex County's ordinance governing buffers between new development and wetlands and waterways. This is an important action item in the Inland Bays Comprehensive Conservation and Management Plan (CCMP). The CCMP is the blueprint for the restoration of the estuary and is currently under revision with completion scheduled for 2021.

4. Piedmont Basin

The Piedmont Basin includes the northernmost portions of the state. This area comprises approximately 32,000 acres, of which 10,000 acres lie within the priority forest area of the Piedmont Physiographic province. These forests are the most extensive mature piedmont forests. Almost 50% of the forests here are permanently protected through public lands or conservation easements. The Brandywine Creek State Park and White Clay Creek State Park comprise the majority of the land, which is managed by the Division of Parks & Recreation. Delaware Nature Society (>1,200 acres), Brandywine Conservancy (483 acres), and DNREC (236 acres) hold the majority of the conservation easements.

Two unique communities found in the Piedmont province of Delaware are Piedmont Streamside Seepage Wetlands and Piedmont Tuliptree Rich Woods. Piedmont Streamside Seepage Wetlands are freshwater wetlands that occur at the base of steep slopes and are fed by groundwater year-round. These wetlands are typically dominated by spotted jewel-weed (*Impatiens capensis*), sensitive fern (*Onoclea sensibilis*), and tussock sedge (*Carex stricta*)—an important plant associated with the federally listed endangered bog turtle (*Glyptemys muhlenbergii*). Piedmont Tuliptree Rich Woods are dominated by tulip-poplar (*Liriodendron tulipifera*), northern red oak (*Quercus rubra*), and a diverse herbaceous layer that includes species like mayapple (*Podophyllum peltatum*) and Christmas fern (*Polystichum arcostichoides*). Rare species associated with this community include American ginseng (*Panax quinquefolius*), golden-seal (*Hydrastis canadensis*), green violet (*Hybanthus concolor*), and white baneberry (*Actaea pachypoda*).

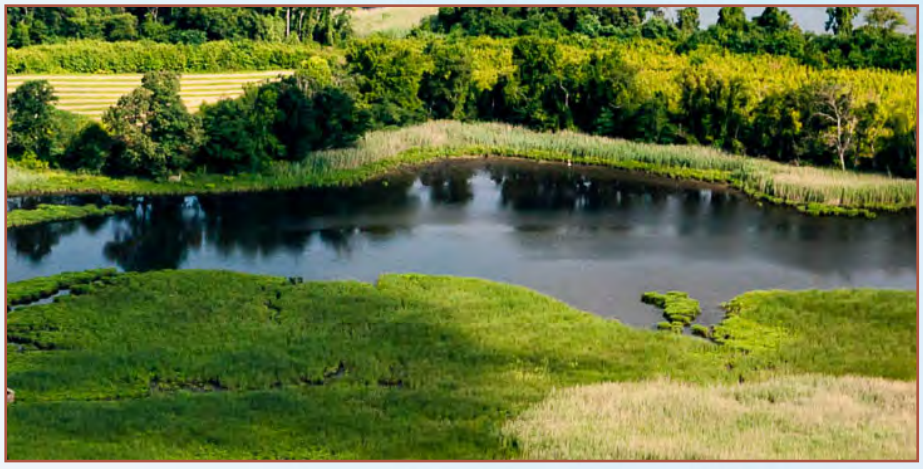
The Piedmont Basin encompasses six watersheds: Naamans Creek, Shellpot Creek, Brandywine Creek, Red Clay Creek, White Clay Creek, and the Christiana River. More than half of the stream segments found in these watersheds are identified as impaired from nonpoint source pollution. In addition, habitat loss, the proliferation of invasive species, and ecosystem degradation are widely recognized as major factors in the decline of native plant and animal populations. Today, most of the forests in this area are less than 50 acres in size with little to no forest interior, 75–100 years old, and heavily infested with literally dozens of aggressive, non-native plant species.

5. Chesapeake Basin

The Chesapeake Basin, at over 451,000 acres, includes 15 watersheds and approximately 160,000 acres defined as priority forest area. The basin extends northward from the State's southern border, encompassing nearly half of Sussex County, crossing through the western third of Kent County, and extending into New Castle County west of Middletown. Of the 160,000 acres of this critical forested area, 46% or 74,677 acres are permanently protected. Public land accounts for 33,275 acres. These lands are managed by the DFS and DNREC's Divisions of Fish & Wildlife and Parks & Recreation. Additionally, non-governmental organizations own 567 acres within the watershed. Conservation easements are held through the Department of Agriculture (34,386 acres) and DNREC (332 acres). Forestland ownership is still primarily non-industrial, however, DFS holds easements on some industrial forest tracts, including lands owned by the Glatfelter Pulp Wood Company. These lands account for 5,894 acres of the forests in the Chesapeake Basin.

Many habitats, identified in the Delaware Wildlife Action Plan, are found in this basin such as coastal marine waters, marshes, freshwater streams, wetlands, upland forests, and meadows. Many of these habitats are crucial for rare, threatened, or endangered species. Critical habitats consisting of forested blocks of 250 acres or more are vital for those species of greatest conservation need. The basin also features unique communities such as the northernmost natural stand of baldcypress (*Taxodium distichum*) found in Trap Pond State Park. Agriculture still remains a vital part of the economy, although its role is diminishing. Soils are favorable for agricultural production and are illustrated by the large number of farms under conservation easements (395 parcels totaling 35,000 acres).

Population growth rates in Sussex County are the fastest in the state, leading to new development and urban sprawl. This has created a new set of water quality stressors in the Basin. Unfortunately, most development (to accommodate this influx of new residents) is served by septic systems as feasibility studies have found that public sewer is not practical in most rural areas. DNREC water quality analyses of the Chesapeake Basin have shown that the waters are impaired by high levels of bacteria and designated water body uses are not fully supported due to pollution levels. DNREC has set Total Maximum Daily Loads (TMDL) in response to the listing of water bodies in the 303(d) report of the Federal Clean Water Act (CWA). To combat water quality issues surrounding the Chesapeake Drainage Area and Chesapeake Bay, former President Barack Obama signed an Executive Order that recognizes the Chesapeake Bay as a national treasure and called on the federal government to lead a renewed effort to restore and protect the nation's largest estuary and its watershed.



Summary

All four drainage basins, including the Blackbird Creek watershed, share similar challenges that are identified within the State Assessment such as fragmentation, parcelization, and impaired water quality. This common set of challenges led to the creation of a single rural forest priority area for Delaware. Each watershed also has one or two challenges that are most critical and warrant attention.

- The Delaware Estuary possesses riverine and coastal marshes that are part of the Atlantic Flyway and are critical to many wildlife species. Protecting these areas and improving water quality is essential. This area also contains some of Delaware's most extensive Atlantic white-cedar forests. Prime Hook and Bombay Hook National Wildlife Refuges are also located within this area and it is essential that conservation efforts are coordinated with these federal refuges.
- Blackbird Creek is the most rural watershed within Delaware's most urbanized county (New Castle). Preserving the rural character of the watershed is a high priority, as well as coordinating land-protection efforts in the Blackbird-Millington Corridor. Furthermore, protecting, buffering, and restoring Coastal Plain seasonal ponds is an additional priority.
- The forests within the Inland Bays region of the priority area are primarily headwater forests. This area is rapidly developing due to its proximity to the coast and water quality degradation is a significant concern. Important issues within this watershed are forested buffers and minimizing the additional loss of forested blocks from further development.
- The Piedmont Basin has Delaware's only mature Piedmont forests and thus deserves special attention. The area contains relatively few large forested blocks and most of them are already permanently protected, so most efforts will focus on connecting these blocks and attempting to control the high occurrence of invasive species, primarily plants that are found within this highly urbanized and fragmented area.
- The Chesapeake Basin is the most rural region within the priority area. It contains Delaware's highest concentration of working forests and it is vital to Delaware's economy that these working forests are maintained and protected. This region is also home to most of Delaware's baldcypress forests and to a population of the Delmarva fox squirrel. Efforts to protect and restore these species are very important, as is the need to improve water quality to the Chesapeake Bay. Additionally, coordination among federal, state, and local partners will be critical in a collaborative effort to improve water quality.

VII. Urban Priority Landscape Areas

Overview

Urban and community forests are the collection of trees growing within a city, town, or community. The care and management of these trees is the priority of the Urban and Community Forestry (U&CF) program. Urban and community areas in Delaware have grown significantly in the past decade, with steady population growth in all three counties of the state. Additionally, trees in urban areas of the State of Delaware have many or even more of the challenges that are found in rural forests. Public awareness of the need for tree care, increasing tree canopy, and protecting trees from pest and disease risks are a few of the obstacles to managing urban forests. The goal of this assessment is to identify priority areas of focus for assistance as well as priority issues statewide to focus efforts for the next ten years.

The incorporated 57 municipalities were evaluated using a Geographic Information System (GIS). The model for the analysis was a formula that weighted each community according to the following criteria:

1. Percentage of urban tree canopy (UTC) (25%)
   - Total tree canopy (50% of UTC)
   - Roadside tree canopy (50% of UTC)
2. Impervious surface index (IMP) (25%)
3. Population index (20%)
   - Population density per square mile index (PD) (75% of PD)
   - Presence in census urban area (CUA) (25% of PD)
4. Opportunity zone presence (OPZ) (10%)
5. Pest risk index (PR) (10%)
6. Community investment score (CI) (10%)
   - Four factors (see text) each worth 25% of the total CI score

For "index" criteria, the actual value was converted to a 0–1 index using the following formula to normalize values. Value$_{city}$ is the actual measured value for a municipality, Value$_{min}$ and Value$_{max}$ are the minimum and maximum observed values for all municipalities in Delaware. Other values were calculated as shown below.

$$\mathrm{UCF}_{index} = 25\left(1 - \frac{UTC_{city} + UTC_{road}}{2}\right) + 25\left(IMP_{city}\right) + 15\left(\frac{PD_{city} - PD_{min}}{PD_{max} - PD_{min}}\right) + 5\left(CUA_{true}\begin{cases}x = 1\\x = 0\end{cases}\right) + 10\left(OPZ_{true}\begin{cases}x = 1\\x = 0\end{cases}\right) + 10\left(\frac{PR_{city} - PR_{min}}{PR_{max} - PR_{min}}\right) + 10\left(\sum_{i=1}^{4} CI_{i=true}\begin{cases}x = 0.25\\x = 0\end{cases}\right)$$

Input Layers

The data for the urban analysis is described further below:

1. Urban Tree Canopy (UTC)

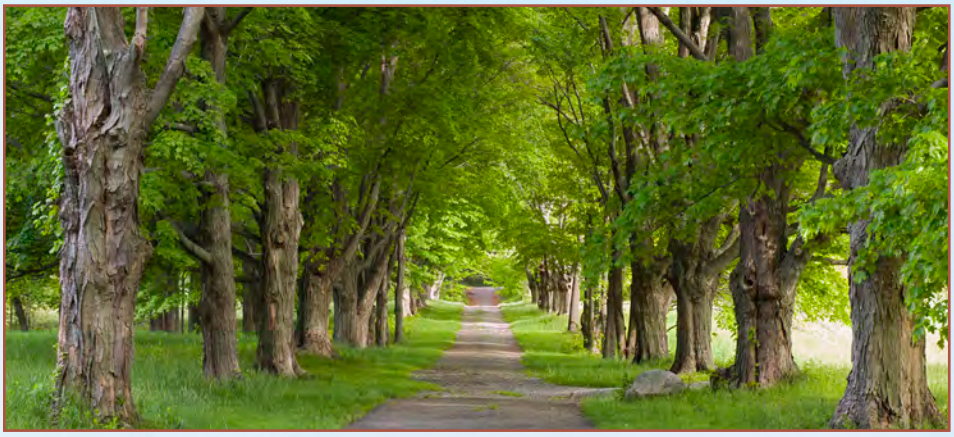
Urban tree canopy is obviously an important component of an urban forest resource assessment. The goal is to prioritize work and expenditures in municipalities with low tree canopy—where there is the most room for improvement—so the inverse of the calculated tree canopy index is used.

Using a 2014 statewide tree canopy dataset (described in the rural priority section), two measures of urban tree canopy were calculated. The average of these two measures was used for this component.

- Total tree canopy is the area of a town covered by tree canopy divided by the total area.
- Roadside tree canopy is a subset of overall canopy that calculates canopy cover within 10 feet of the roads within each town. The 10-foot buffer is not meant to capture the entire canopy (a single tree's canopy spread is often much wider) but serves as a sample area for calculating a roadside canopy cover. The goal is to estimate street tree canopy for each town, because:
    - Street trees have a high visual impact for residents evaluating the quality of their urban forest,
    - Street tree plantings are often targeted by urban tree projects, both for the visual impact and because street trees are often the only opportunity for municipal governments to improve urban forest on privately-owned land, and
    - In some towns and communities where street/residential canopy is largely absent, the overall UTC is higher because of large woodlots within their boundary limits. Often, these areas are annexed rural lands awaiting development. Roadside tree canopy inclusion serves to moderate that effect.

2. Impervious Surface Index

Impervious cover was derived from the same landcover data used to create the canopy cover data (described in the rural assessment under forest cover). Impervious classes were extracted, and percent impervious cover was calculated as the area with impervious cover divided by total area.



3. Population Index

Population density was used to measure the pressure a town's population places on its forest resources. The population index contains two weighted components—population density (75%) and presence in a U.S. Census urban area (25%). The urban area component was added because raw population density can be deceiving in cases where a small population lives in a very small area. For instance, in the 2010 assessment one small, rural town had higher population density than Dover, the state capital, in spite of the fact that its total population was only 78.

- Actual population density was calculated as the population of each community (2010 Census) divided by the size of each community in square miles.
- Presence in a U.S. Census Urban Cluster was determined by comparing municipal boundaries with Urban Cluster data published by the U.S. Census. The score is a simple presence/absence where a municipality that overlaps an urban cluster receives full points for this component, otherwise it receives a zero.

4. Opportunity Zones

Opportunity zones are an economic development tool designed as revitalization programs in economically-distressed communities in Delaware. Delaware's opportunity zones were selected by Governor Carney in 2018 and then are designated by the U.S. Department of the Treasury. There are 25 opportunity zones in Delaware that cover both rural and metropolitan areas. By incorporating this factor, it will help support urban forestry programs in areas of economic need. Municipalities received full points if they overlapped an opportunity zone, zero if they did not.

5. Pest Risk Index

Potential for future threats to forest health is critical to understanding the condition of urban forests. This layer, provided by the U.S. Forest Service, is based on Forest Inventory and Analysis (FIA) data and predicts the amount of mortality through basal area loss due to forest insects and diseases over the next ten years at a one-kilometer scale. This component was calculated as the percent of the municipal area with an estimated loss greater than 5%.

6. Community Investment Score

The community investment score measures how prepared communities are to implement a Delaware Forest Service (DFS)-supported urban forestry project. Each of these factors is worth 25% of the community investment score.

- A city manager (or equivalent) who can apply for and serve as point of contact for DFS urban forestry projects.
- Community-owned parks or community control of street trees. Communities with neither of these usually have trouble finding land for urban forestry projects.
- A municipal tree ordinance shows prior commitment to urban trees and can facilitate other factors in an urban forestry project.
- A municipal tree budget shows commitment to urban trees and increases a town's ability to provide match for grant programs.

An important note is that these factors are under the control of each individual community, relative to other assessment factors. For instance, a community could pass a tree ordinance and add tree care to their budget, and this would increase their priority score in a future update of this assessment. This gives communities the capacity to improve their own score.

Table 24. Urban priority rankings.

Community	Score
Wilmington	70.9
Georgetown	61.4
Newark	59.7
Newport	59.0
Smyrna	56.1
Seaford	55.7
Dover	55.4
New Castle	55.1
Elsmere	54.2
Milford	54.1
Bellefonte	52.2
Laurel	49.2
Dewey Beach	48.2
Clayton	47.3
Middletown	47.2
Fenwick Island	46.9
Wyoming	46.5
Townsend	46.0
Bethany Beach	43.2
Rehoboth Beach	43.0
Harrington	43.0
Felton	42.7
South Bethany	42.0
Camden	41.4
Frankford	41.1
Blades	41.0
Dagsboro	40.5
Milton	40.4
Lewes	40.0
Cheswold	39.7
Little Creek	39.7
Millsboro	39.6
Delmar	38.0
Ocean View	36.7
Odessa	36.4
Greenwood	35.0
Hartly	34.9
Bowers Beach	34.2
Millville	34.2
Delaware City	33.3
Kenton	33.1
Houston	32.4
Frederica	32.2
Bridgeville	31.9
Magnolia	31.5
Viola	31.3
Woodside	31.1
Farmington	30.7
Selbyville	29.1
Ellendale	28.9
Leipsic	26.3
Bethel	25.6
Henlopen Acres	25.5
Ardentown	24.9
Slaughter Beach	24.1
Arden	22.2
Ardencroft	21.5

Table 25. Urban priority communities.

Community	Total Acres	2010 Population	Pop Dens/ Sq Mi	Canopy Acres	Roadside Canopy Acres	Total Canopy Percent	City Manager	Priority Score
Wilmington	6,739	70,851	6,729	1,464	177	24.3	Yes	70.9
Georgetown	3,193	6,422	1,287	993	20	31.7	Yes	61.4
Newark	5,989	31,454	3,361	2,273	102	39.7	Yes	59.7
Newport	314	1,055	2,148	63	3	21.1	Yes	59.0
Smyrna	3,755	10,023	1,708	560	22	15.5	Yes	56.1
Seaford	3,212	6,928	1,381	789	32	25.6	Yes	55.7
Dover	14,938	36,047	1,544	3,845	132	26.6	Yes	55.4
New Castle	1,821	5,285	1,857	493	17	28.0	Yes	55.1
Elsmere	636	6,131	6,167	203	15	34.2	Yes	54.2
Milford	6,207	9,559	986	1,284	31	21.2	Yes	54.1
Bellefonte	113	1,193	6,781	38	5	38.7	No	52.2
Laurel	1,725	3,708	1,376	448	13	26.7	Yes	49.2
Dewey Beach	198	341	1,103	44	6	25.5	Yes	48.2
Clayton	1,200	2,918	1,556	217	5	18.5	No	47.3
Middletown	7,467	18,871	1,618	934	17	12.7	Yes	47.2

Urban Priority Landscape Areas

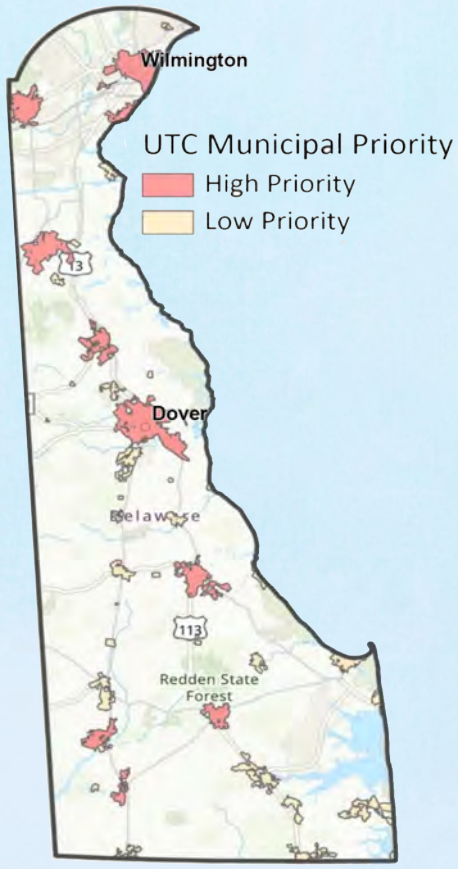
The result of the analysis yielded an indexed list of all 57 communities in Delaware ranging from zero to one-hundred. Higher ranking indicates higher priority for U&CF program delivery. However, lower ranked communities will benefit with targeted U&CF resources. The scores based on the weighted equation ranged from 70.9 to 21.5 (Table 24). The DFS decided that the first 15 communities would be a reasonable threshold for the high priority urban forestry areas. The cutoff for the priority areas was 47.2 This was based on previous experience working throughout the state in these areas and the need and potential for urban forestry resources (Table 25 and Figure 49).

Of these 15 high priority areas determined by the DFS, four of the municipalities are within the Chesapeake Bay watershed. These areas are also experiencing growth and expansion. As these communities grow it is important to consider water quality issues and working with municipal governments to increase tree canopy and decrease impervious surfaces, which often result from widespread development.

A majority of the 57 communities (nearly three-quarters), fall within Delaware opportunity zones and including opportunity zones into the equation has allowed the DFS to better identify areas of resource need. For example, 20 of 25 Delaware opportunity zones are within brownfield redevelopment sites. This may provide the opportunity to incorporate urban forestry during mitigation planning to encourage green infrastructure.

Though the high priority communities lie within the top 15 of the priority indices, there are other municipalities throughout the state that should fall under priority communities deserving assistance. These communities may have all the parameters of the feasibility score but need assistance from the U&CF program. The converse will also be considered when identifying areas in Delaware with low feasibility scores but may have opportunity to grow the urban forestry management component in the community.

Figure 49. Urban priority areas based on composite scores (high cutoff = 47.2).



Source: Delaware Department of Agriculture.

Wildland Fire Preparedness Priority

Wildfires pose a substantial risk to some communities. While Delaware does not often experience intense wildfires, there are two cover types that are susceptible to incendiary fires, including one that is found within/adjacent to many communities—areas dominated by the invasive reed, *Phragmites australis* (Fuel Model 3). Identifying these areas allows the DFS to help those communities prepare for this risk. Wildland fire risk is estimated as the percentage of municipal land covered by each of the following datasets. The DFS examined these results to determine the high-priority communities for wildland fire preparedness (Table 26).

1. USFS LANDFIRE Wildfire Hazard Potential
   Areas classified as moderate, high, or very high hazard were extracted from the 2018 Wildfire Hazard Potential dataset for this analysis.
   https://www.landfire.gov/getdata.php

2. USFS Wildland Urban Interface
   USFS Wildland Urban Interface data were used by extracting areas classified as:

   - Medium Density Intermix: housing density between 49.4–741.3/sq km and wildland vegetation >50%.
   - Medium Density Interface: housing density between 49.4–741.3/ sq km, wildland vegetation ≤ 50% but within 2.4 km of an area with ≥75% wildland vegetation.
     https://www.fs.usda.gov/rds/archive/catalog/RDS-2015-0012-2

Several other factors were taken into consideration for ranking communities besides the DFS data layers and Landfire GIS analysis. These included the following:

- Potential for fire spread to nearby structures,
- Access to evacuation routes,
- Fires over 10 acres in the last five years, and
- Fuels located just outside of municipal boundaries.

Table 26. Wildland Urban Interface (WUI) priority communities.

Community	Total Acres	2010 Population	Pop Dens/ Sq Mi	Wildfire Hazard Acres	Wildfire Hazard %	WUI Acres	WUI %
Frederica	827	774	599	199	24	0	0
Lewes	2,199	2,747	800	166	8	25	1
Slaughter Beach	235	207	565	102	44	39	17
New Castle	1,821	5,285	1,857	44	2	168	9
Leipsic	101	183	1,157	35	34	0	0
Delaware City	1,164	1,695	932	34	3	21	2
Bowers Beach	109	335	1,971	29	27	53	49
Odessa	299	364	779	25	8	2	1
Bethany Beach	695	1,060	976	17	2	0	0
Rehoboth Beach	543	1,327	1,564	7	1	27	5
South Bethany	263	449	1,092	2	1	1	0
Henlopen Acres	149	122	523	0	0	70	47
Little Creek	60	224	2,397	0	0	51	85
Fenwick Island	189	379	1,283	0	0	0	0
Dewey Beach	198	341	1,103	0	0	0	0

VIII. Multi-State Regional Priority Landscape Areas

The Delaware Forest Service (DFS), working with the U.S. Forest Service, the Northeast-Midwest State Foresters Alliance (NMSFA), and the Delaware Forest Stewardship Committee identified the following multi-state regional priority areas:

- Chesapeake Bay Watershed
- Delmarva Peninsula and Mid-Atlantic Coastal Plain
- Interstate 95 Corridor
- Delaware River Watershed
- Blackbird-Millington Corridor

All of these areas, except for the Blackbird-Millington Corridor, are listed in the 2016 U.S. Forest Service, Eastern Region State and Private Forestry publication NA-FR-02-16 entitled *Multi-State Priority Areas in the Northeast and Midwest* (Philip A. DeSenze, Compiler, 75 pp.).

Chesapeake Bay Watershed

Roughly 30% of Delaware—along the western section of the state including all three counties—drains into the Chesapeake Bay watershed. Delaware's portion of the total watershed is about 1%. Delaware is classified as a headwaters state for the bay—it is within the watershed but not adjacent to the Chesapeake Bay. Nearly all of the Chesapeake Bay watershed within Delaware was identified as part of the rural forest priority area, which further demonstrates the importance of the Chesapeake Bay watershed to our state. While many regions of the watershed are heavily urbanized, Delaware's portion of the Chesapeake Bay watershed is still quite rural with only a handful of small towns. The DFS will continue to work with its partners, both within and outside Delaware, to maintain and restore forests in this watershed, particularly focusing on opportunities to preserve and restore riparian and headwater forests and large forested blocks. Below is a description of the Chesapeake Bay watershed developed by the U.S. Forest Service including priorities and partnerships germane to Delaware.

Several natural resource and conservation efforts have taken place over the past decade to clean up and restore the Chesapeake Bay. This is recognized as a high national priority, involving federal agencies, including the Environmental Protection Agency, Department of Agriculture, and Department of the Interior, as well as state agencies and other partners. States are involved in various efforts to reforest Chesapeake Bay tributaries, reduce sediment loads into those streams, minimize urban impacts, and restore the bay to its former condition. Since 2008 these efforts have protected over 150,000 acres of high-value private working forests from development. Additionally, the Eastern Region State and Private Forestry and Chesapeake Bay Program completed and jointly released an updated *"Chesapeake Forest Restoration Strategy"* in 2020. This document outlines forest restoration in urban and community, agricultural, and natural landscapes. All of the states listed below also signed on to an agreement of shared stewardship with the U.S. Forest Service in 2020.

States:

Delaware, Maryland, New York, Pennsylvania, Virginia, West Virginia, District of Columbia

Landscapes of National Significance

- *Captain John Smith Chesapeake National Historic Trail* – District of Columbia, Delaware, Maryland, Virginia

Rivers and Water Trails

- *Nanticoke River – Captain John Smith Chesapeake Connecting Trail* – Delaware

Existing Partnerships

- Atlantic Coastal Fish Habitat Partnership
- Atlantic Coast Migratory Bird Habitat Joint Venture
- Chesapeake Bay Commission
- Chesapeake Bay Program
- Chesapeake Bay Watershed Initiative
- Mid-Atlantic Climate Change Response Framework
- Mid-Atlantic Panel on Aquatic Invasive Species
- North Atlantic Landscape Conservation Cooperative
- Working Lands for Wildlife (bog turtle and golden winged warbler)

Opportunities for Partnership, Cooperation, and Projects

- Support ecosystem markets and land registries to generate additional incentives for continued forest conservation and restoration.
- Work closely with the USDA Natural Resources Conservation Service to prioritize forestry projects under the Chesapeake Bay Watershed Initiative.
- Develop sustainable forestry incentives and policies to stimulate improved forest conservation through:
    1. Tax incentives: income tax credit for developing a forest stewardship plan; expanded property tax rebate for forest stewardship plans.
    2. Effective and equitable regulations, particularly related to harvesting.
    3. Forest enterprise zones to support healthy forest product markets and technical innovation for new markets.
    4. Forest health reserve fund to improve response to forest health threats.
    5. Family forest revolving loan fund to support intact intergenerational transfer of forest land.
- Link forests, storm water, and water supply through Comprehensive Plan elements like Sensitive Areas, Water Resources, and Land Protection Plans, and through new requirements for prioritized environmental site design for storm water.
- Support dedicated land conservation funding through state and local ballot measures.
- Adopt a transferable or refundable tax credit program, or both, for donated conservation easements.

- Support effective Transferable and Purchase of Development Rights programs in local jurisdictions.
- Work with federal, state, and local organizations to improve technical assistance to forest landowners.
- Invest in ongoing conservation education, outreach, and technical assistance to local jurisdiction planners and landowners to improve forest conservation and management, and to schools.

Reference:

Eastern Region State and Private Forestry; Chesapeake Bay Program. 2012. Chesapeake forest restoration strategy. Newtown Square, PA: U.S. Department of Agriculture, Forest Service. 35 p. http://executiveorder.chesapeakebay.net/chesapeakeforestrestorationstrategy.pdf. (18 February 2016).

Delmarva Peninsula and Mid-Atlantic Coastal Plain

The Mid-Atlantic Coastal Plain, including the Delmarva Peninsula, was also identified as a multi-state priority area. Nearly all of Delaware is found within the Delmarva Peninsula. Several issues are important across the peninsula including:

- Forest Threats – Development and fragmentation, common invasive species, southern pine beetle, climate change impacts, and in certain areas—wildland fire.
- Forest Types and Wetlands – The area contains unique wetlands such as Delmarva Coastal Plain Ponds, unique forested types, including Atlantic white-cedar bogs and baldcypress, as well as significant areas of working forests, including loblolly pine.
- Forest Markets – The Delmarva Peninsula is basically one forest market. Any efforts to maintain and enhance traditional forest markets as well as develop new markets, including bioenergy, must be coordinated across this region since these markets would utilize wood from throughout the region.

Below is a description of the Delmarva Peninsula and Mid-Atlantic Coastal Plain developed by the U.S. Forest Service including priorities and partnerships relevant to Delaware.

Several issues important across this peninsula include forest threats such as development and fragmentation, the southern pine beetle and other invasive pest and plant species, maintaining unique forest types and wetlands such as the Atlantic white-cedar bogs, and supporting forest markets to utilize wood from throughout the region.

States:

Delaware, Maryland, New Jersey, Virginia

Landscapes of National Significance

- *Captain John Smith Chesapeake National Historic Trail* – Delaware, Maryland, Virginia
- *Delaware National Bayshore* – Delaware

Rivers and Water Trails

- *Nanticoke River – Captain John Smith Chesapeake Connecting Trail* – Delaware

Existing Partnerships

- Atlantic Coastal Fish Habitat Partnership
- Atlantic Coast Migratory Bird Habitat Joint Venture
- Chesapeake Bay Commission
- Chesapeake Bay Program
- Chesapeake Bay Watershed Initiative
- Mid-Atlantic Climate Change Response Framework
- Mid-Atlantic Panel on Aquatic Invasive Species
- National Water Quality Initiative
  Delaware – *Clear Brook-Nanticoke River*
- North Atlantic Landscape Conservation Cooperative
- Working Lands for Wildlife (bog turtle)

Opportunities for Partnership, Cooperation, and Projects

- Land Conversion – The fast pace of land consumption in the region, especially along the I-95 Corridor between Philadelphia, PA, and Newark, NJ, endangers habitat and natural systems while consuming open space. Patterns of growth, along with common threats, like the high cost of housing, rising income inequalities, and climate change, affect the health and future prosperity of the region. Urban forestry and improved land-use planning can mitigate some of these impacts.
- Fragmentation – Fragmentation exacerbates the main problems of habitat loss and the need for fire suppression. Much work remains to be done in planning and creating migration corridors along the coast. Road and highway corridors have accelerated fragmentation and remain a threat to much of the region.
- Southern Pine Beetle – Southern pine beetle is one of the most destructive insects in the southern United States. Beetle outbreaks in the area have increased in recent years, and significant outbreaks are expected in the next few years as drought and other environmental stressors continue to weaken host species such as shortleaf, loblolly, Virginia, and pitch pines. Meanwhile, increasing average temperatures and longer growing seasons have extended the northern range of this pest.

Land consumption in the region, especially along the I-95 Corridor, endangers habitat and natural systems while consuming open space.

Interstate 95 Corridor

The Interstate 95 (I-95) Corridor includes the very northern portion of Delaware and is the most urbanized portion of the state. Delaware's largest city (Wilmington) is located within the corridor. In addition to urban forestry issues, there are challenges with invasive species, particularly plants, and water quality. Delaware's two municipal water reservoirs are located within the corridor. Additionally, because this is Delaware's most urbanized area, there are opportunities to better educate students and adults to address one of Delaware's issues—*Public Awareness and Appreciation of Forests*. Delaware's urban forest priority area includes the major cities within the corridor—Wilmington and Newark. The rural priority forest area contains three small rural watersheds located just north of the interstate, which contain the best examples of Piedmont forests within the state.

Below is a description of the I-95 Corridor developed by the U.S. Forest Service including priorities and partnerships applicable to Delaware.

Forested watersheds along the I-95 Corridor face threats from expanding development, heavy use, and poor urban planning. Degradation of watersheds, forest fragmentation, and a reduction of forested land along the corridor pose severe risks to water quality, forest diversity, and watershed health. Heavy use of the corridor also increases the potential spread of invasive plants and insects.

States:

Connecticut, Delaware, District of Columbia, Maine, Maryland, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, Virginia

Landscapes of National Significance

- *Captain John Smith Chesapeake National Historic Trail* – Delaware, Maryland, Virginia
- *Delaware National Bayshore* – Delaware

Existing Partnerships

- Atlantic Coastal Fish Habitat Partnership
- Atlantic Coast Migratory Bird Habitat Joint Venture
- Chesapeake Bay Commission
- Chesapeake Bay Program
- Chesapeake Bay Watershed Initiative
- Mid-Atlantic Climate Change Response Framework
- Mid-Atlantic Panel on Aquatic Invasive Species
- North Atlantic Landscape Conservation Cooperative
- Working Lands for Wildlife (bog turtle)

Opportunities for Partnership, Cooperation, and Projects

- Link local open space and resource management efforts to broader megaregional conservation goals with meetings and research materials designed to build an understanding of larger issues and trends.
- Link the conservation of critical landscapes and forests to broader public policy goals including reducing greenhouse gas emissions, protecting drinking water, and improving water quality in the Northeast.
- Enhance best practices and coordination across jurisdictional boundaries by convening and promoting partnerships between local, state, and federal government agencies, and other land-use decisionmakers and natural resource managers.
- Expand conservation education programs across the region commensurate with the magnitude of benefits, issues, and tradeoffs related to forest conservation.
- Cooperate across agencies (federal and state) in partnership with land trusts, private landowners, and communities, to identify important landscapes to protect and manage.
- Educate community officials on forest conservation and ensure they have good planning tools, so they can decide zoning ordinances and practices that benefit forests and watersheds.

- Work with urban communities to promote healthy trees and urban forests, which contribute to improved air and water quality, watershed function, energy conservation, and social well-being.

Delaware River Watershed

The Delaware River (and Bay) comprises much of Delaware's eastern boundary and its estuaries within the state contain some of the most critical lands for migratory birds. Atlantic white-cedar swamps can be found in this watershed and water quality is a top priority. All of these issues were identified within Delaware's State Assessment and are important items to address. Below is a description of the Delaware River Watershed developed by the U.S. Forest Service including priorities and partnerships pertinent to Delaware.

This watershed's estuaries contain some of the most important lands for migratory birds within the Atlantic Flyway. In addition, several Atlantic white-cedar swamps are located within estuaries that feed the Delaware River and Bay. This watershed provides drinking water for 17 million people in four states, and water quality is an issue within Delaware's portion of the watershed. However, a collaborative effort titled the Common Waters Partnership, which is led by the Pinchot Institute, has worked closely with federal, state, and local partners, including the Delaware River Basin Commission, to improve water quality in recent years. In fact, these efforts have been so successful that the partnership has shifted its focus to planning for the impacts of a changing climate to enhance the resilience of this important watershed and landscape in the face of future uncertainty. Additionally, the area of the watershed in and around Philadelphia is now a part of the Urban Waters Federal Partnership, a national multiagency program that helps communities reconnect with and improve their urban waters.

States:

Delaware, New Jersey, New York, Pennsylvania

Landscapes of National Significance

- *Delaware National Bayshore* – Delaware

Existing Partnerships

- Atlantic Coastal Fish Habitat Partnership
- Atlantic Coast Migratory Bird Habitat Joint Venture
- Delaware River Basin Commission
- Mid-Atlantic Climate Change Response Framework
- Mid-Atlantic Panel on Aquatic Invasive Species
- North Atlantic Landscape Conservation Cooperative
- Working Lands for Wildlife (bog turtle and golden winged warbler)

Opportunities for Partnership, Cooperation, and Projects

- Coordinate within the "rivershed," similar to collaborative processes in place for the Chesapeake Bay and Great Lakes.
- Participate in climate-related work of the Common Waters Initiative.

Blackbird-Millington Corridor

The DFS believes that the Blackbird-Millington Corridor is very important to the Delmarva Peninsula, specifically the states of Delaware and Maryland. This corridor is located in the rapidly-growing area of southern New Castle County and encompasses all of the 5,929-acre Blackbird State Forest. On both sides of the state line can be found numerous Coastal Plain ponds including suitable habitat for the state-endangered tiger salamander. In 2004, The Nature Conservancy (TNC) and the Delaware Department of Natural Resources and Environmental Control (DNREC), Division of Fish & Wildlife entered into a partnership in an effort to preserve and enhance the corridor's important natural resources and habitats. This area, stretching from the Cypress Branch and Millington area in Maryland to the Delaware Bay at the mouth of Blackbird Creek is recognized by TNC and other organizations as a regional conservation priority based on three factors:

- A concentration of important ecological features and natural communities – Though it is relatively small and located within 150 miles of three major metropolitan areas, the Blackbird-Millington Corridor contains an abundance of critical plant and wildlife habitat. Large patches of hardwood forests serve as vital habitat for migratory songbirds—they buffer streams, Coastal Plain ponds, and tidal wetlands from pollution and provide waterside nesting and hunting places for raptors.
- Private landowners have a history of balanced stewardship in the corridor – People throughout history have relied on the Blackbird-Millington Corridor's rich landscape of forests, fields, and waterways for food, forest products, transportation, recreation, and inspiration. While this area today is home to a wonderful diversity of plants, animals, and ecological systems, it is also home to people living in rural agricultural communities. With so much of the land to the north and south of the corridor threatened with rapid development, the corridor has retained much of its natural heritage and unique physical features through careful stewardship by farming families and woodlot owners and far-sighted public investment.
- There exists a solid foundation for conservation – The Blackbird-Millington Corridor has a strong history of conservation. Approximately 12,000 acres in the corridor are owned and managed by public agencies for a variety of conservation purposes. Another 10,000 acres are owned and managed privately for conservation or agricultural preservation purposes. Anchoring the corridor are Blackbird State Forest (Delaware) and the Millington Wildlife Management Area (Maryland) providing nearly 10,000 acres of forests, wetlands, and fields which are open to the public for hunting and other outdoor recreational activities.

Source:
Executive Report, Blackbird-Millington Corridor Conservation Area Plan

Because of the location of Blackbird State Forest, the DFS is in an excellent position to enhance the Blackbird-Millington Corridor's ecological value by providing forest stewardship assistance to neighboring forest landowners. Also, any future land acquisitions further add to the amount of protected and connected forestlands in the corridor.

IX. Forest Resource Assessment Summary

Delaware forests play a key role in protecting and enhancing the natural environment that is all around us. One could argue that forests are, in fact, a critical part of the state's infrastructure and as such should be treated with care and managed sustainably. The sheer number of natural benefits forests provide cannot be duplicated by any other ecosystem type. Therefore, it is in everyone's interest to optimize those benefits and protect as much forestland as possible from conversion to non-forest uses. Intact, healthy forests and healthy Delaware communities go hand-in-hand.

This updated *Forest Resource Assessment* presents a comprehensive review of the status of Delaware's forests over the last ten years—rural and urban, public and private. Although Delaware has more forestland today that it did a century ago, remaining forests and their owners face an ever-growing number of threats and challenges. A constant increase in population due to Delaware's relatively mild climate and low tax rates will only add more pressure on developable forestland as time goes by.

For the changes in forest conditions and trends, the *Forest Resource Assessment* was guided by a set of Montréal Process criteria that includes indicators and metrics developed for use at the state level. The Montréal Process Working Group was formed in 1994 as a bold, intergovernmental response to the pressing need for sustainable forest management. The developed criteria have been modified and updated since 1994 but are still as relevant and critical to forest health and functionality today as they were 25 years ago.

The Delaware Forest Service (DFS), working with the Forest Stewardship Committee and many other concerned partners, identified four major issues facing Delaware's forests and forest landowners: *Forest Health and Functionality*, *Forest Markets*, *Sustainable Forest Management*, and *Public Awareness and Appreciation of Forests*. During this process, threats were also identified that if left unchecked would negatively impact Delaware forests. Each of the identified threats, however, also presents multiple opportunities for action by the DFS and its many partners that all have a keen interest in perpetuating the wide array of benefits that come directly from Delaware's healthy forests.

Through a sophisticated GIS analysis, rural and urban priority areas throughout the state were identified using specific ranking criteria. This enables the DFS and its partners to target high-value forested areas of the state for protection and enhancement especially in times of scarce funding. While not all future efforts will be focused in the highest priority areas, they will be favored due to their elevated ecological and economic values.

The updated information contained within this *Forest Resource Assessment* can now act as a solid foundation from which to develop and implement a set of strategies for the specific purpose of protecting Delaware forest ecosystems. The DFS will work with its many partners—both public and private—during the strategy development portion of the *2020 Delaware Forest Action Plan*. Once completed, this plan will set the stage for the future conservation of forestlands in Delaware in the hopes of preserving the many natural benefits healthy forests provide for all Delawareans.