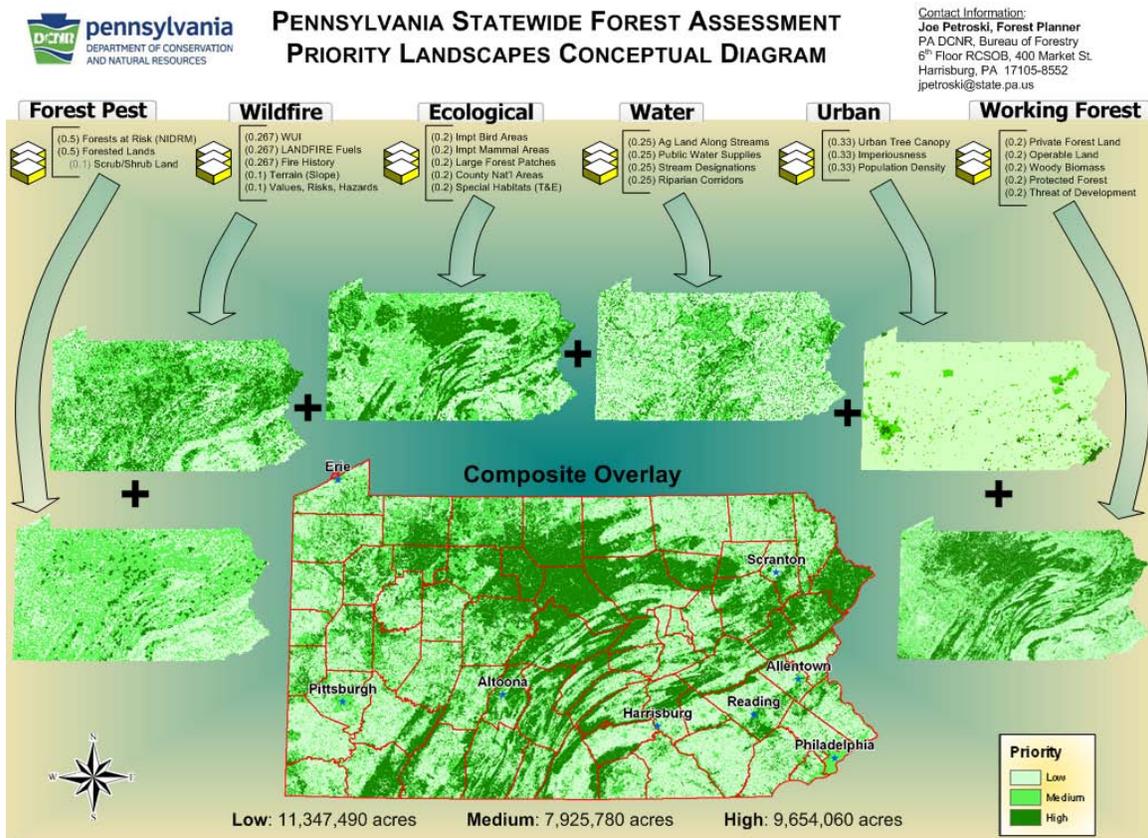


Appendix 5A

Priority Landscapes GIS Analysis Methodology

Overview

This appendix describes the methodology used for Pennsylvania’s Priority Landscapes GIS Analysis. The figure below is a conceptual diagram of Pennsylvania’s priority landscapes methodology. This methodology defines six spotlighted perspectives that depict priority landscape areas: (1) Forest Pests, (2) Wildfires, (3) Ecological, (4) Water, (5) Urban, and (6) Working Forests. For each, a priority landscapes map was produced that classifies all 28 million acres of the state into high-medium-low priority categories based on the map’s theme. The six priority landscape map results were combined into a composite overlay to show intersecting priority landscape areas.



Conceptual diagram of Pennsylvania’s priority landscapes GIS analysis methodology. Priority landscape maps were created for six spotlighted perspectives. A composite overlay shows intersecting priority areas among the six spotlighted perspectives.

This document describes the methodology used for each of the six spotlighted perspectives. A description of the map's results, data used, model components, and weights are included. The composite overlay is also described, which depicts the intersection of the six spotlighted perspectives.

ArcGIS 9.3.1 with the Spatial Analyst Extension was used to perform all analyses. A description of all datasets used in the analyses can be found in Appendix 5B. The raster grids computed (e.g., the priority landscapes for the six spotlighted perspectives and the composite overlay) have a resolution of 30 meters and cell values computed between zero and 1. Cell values near zero are low priority, and cell values near one are high priority areas.

Forest Pest Priority Landscapes

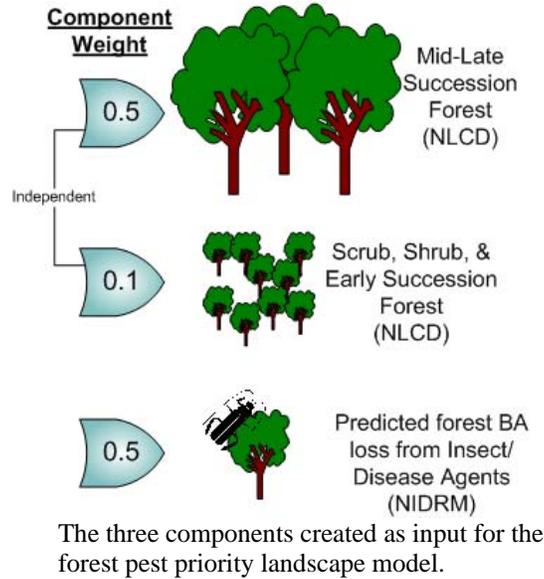
The forest pest priority landscapes analysis identifies areas that are subject to or predicted to be damaged from major insect and disease agents in the foreseeable future. Critical host tree species such as oaks, maples, hemlock, ash, American beech, and red/white pines are threatened by major damage causing agents like gypsy moth, oak wilt, oak decline, anthracnose, forest tent caterpillar, sugar maple decline, hemlock woolly adelgid, emerald ash borer, beech bark disease, Sirex wood wasp, and many other agents.

Two datasets were used as inputs:

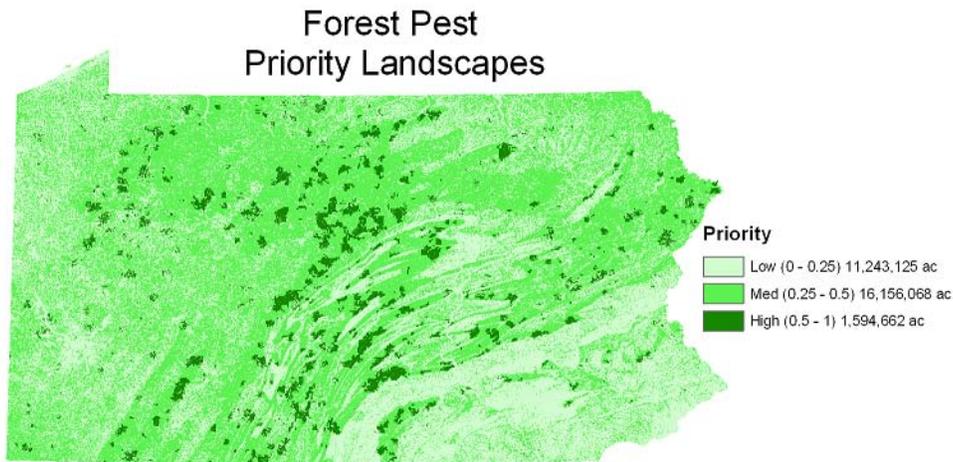
- (1) 2006 National Insect & Disease Riskmap (NIDRM)
- (2) 2001 National Land Cover Dataset (NLCD)

The NIDRM percent basal area (BA) loss predicts tree mortality over the next 15 years due to insect and disease agents. The NIDRM analysis includes many different agents nationwide, but the most significant in Pennsylvania are gypsy moth, red oak decline, and hardwood decline. The NLCD classifies the land into 16 different land cover categories such as agriculture, forests, developed areas, wetlands, and barren lands.

Three components were created as input for the forest pest priority landscapes model. These components were derived from the datasets listed above. Early succession forest habitat was extracted as a separate component because it is less susceptible to mortality from insect and disease agents than older forest. Therefore, early succession forest receives a lower weight than older forest. Any forest area in the state is classified by the NLCD as either early succession or mid-late succession forest (not both). As such, these components are independent, and a given area cannot receive the weight of both components.



The output for the forest pest priority landscapes model is shown below. Most high priority areas are found in relatively small-to-medium sized forest patches within the Ridge and Valley Region, the Laurel Highlands, the Poconos, South Mountain, and in the northcentral region of the state. Medium priority areas represent other forest areas that have lower tree mortality risk due to insect and disease agents. The southeastern region contains the largest amount of low priority area due to increased amounts of agriculture and other non-forest land uses in this region.



Forest pest priority landscapes output results.

Wildfire Priority Landscapes

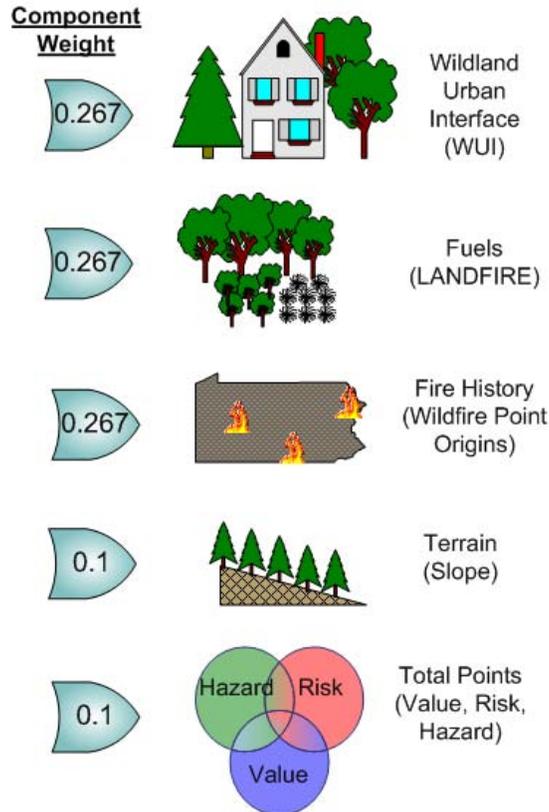
The wildfire priority landscapes analysis identifies areas where wildland fires are predicted to occur and become problematic, especially areas prone to extreme fire behavior, have potential to cause extensive property damage, or could threaten the safety of the Commonwealth’s citizens.

Five datasets were used as inputs:

- (1) 2002 Wildland Urban Interface (WUI)
- (2) 2006 LANDFIRE
- (3) 2002 – 2008 Pennsylvania Wildfire Point Origin Occurrences
- (4) Percent Slope
- (5) 2009 Local Assessment of Values, Risks, Hazards

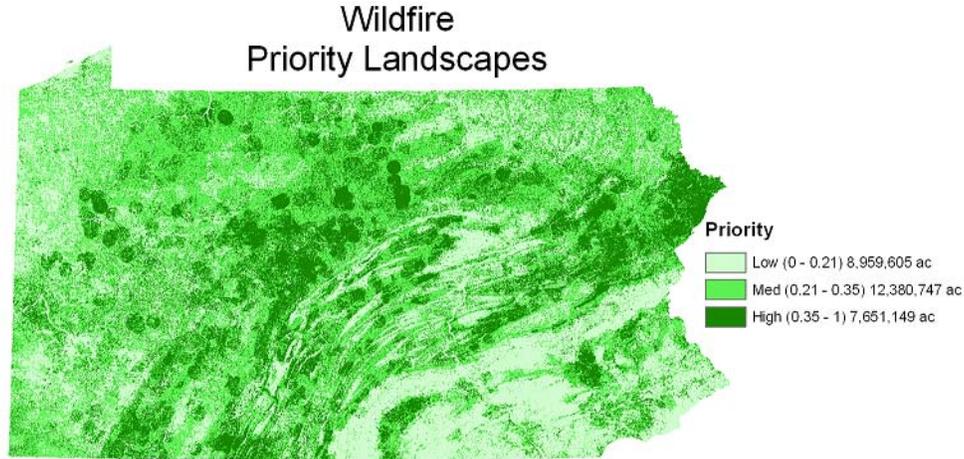
The WUI classifies areas where homes and other human development meet or intermingle with undeveloped land. LANDFIRE characterizes the land's vegetation into fuel models that predict different fire behavior intensities. The PA wildland point origin occurrences are records of wildland fire origins that have been reported. Percent slope aids in determining fire behavior from the terrain. The local assessment of values, risks, & hazards is a municipality-based rating system – this assessment has been made by local wildland fire managers.

Five components were created as input for the wildfire priority landscapes model. These components were derived from the datasets listed above. Developed areas with intermixed vegetation received increased weights. Shrub-type vegetation (fuel models 4-7) received greatest weights; the timber (fuel models 8-10) received moderate weights; and grasses (fuel models 1-3) received lowest weights in the model. A spatial clustering of wildfire “hotspots” was computed using the fire point origins to identify where large fires have been occurring and where numerous occurrences of smaller fires have been reported. Steeper slopes were given higher weights than flat areas because the risk of extreme fire behavior increases in steep terrain. Municipalities with higher total points (e.g., the sum of value, risk and hazard ratings) were given higher weights in the model than those with lower total points.



The five components created as input for the wildland fire priority landscapes model.

The output for the wildfire priority landscapes model is shown below. Most high priority areas are found in the Poconos, South Mountain, and in the center of the state (Clearfield, Center, & Clinton counties). These regions have favorable fuels, intermixed areas of vegetation and development, and are “hotspots” of past wildland fire occurrences. Most medium priority areas exhibit favorable fuels, but do not have a history of wildland fire occurrence or do not have intermixed areas of vegetation and development. The southeastern region contains the largest amount of low priority area due to unfavorable fuels and a lack of wildland fire occurrence – a significant amount of agriculture and other non-forest land uses are found within this region.



Wildland fire priority landscapes output results.

Ecological Priority Landscapes

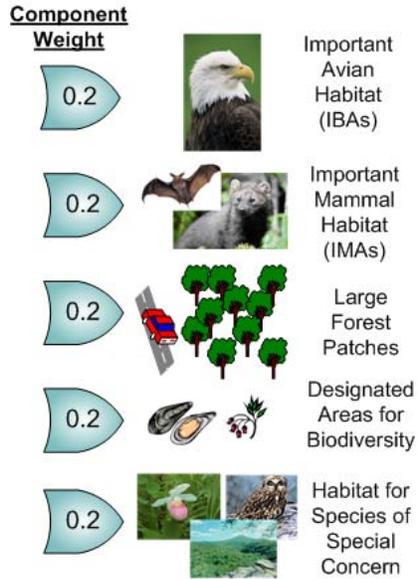
The ecological priority landscapes analysis identifies areas that contain critical biodiversity areas, specially designated habitat for birds and mammals, large / contiguous forest patches, and habitat for species of special concern.

Six datasets were used as inputs:

- (1) Pennsylvania County Natural Areas Inventories (CNAI)
- (2) Pennsylvania Environmental Review (ER) Layer
- (3) Important Bird Areas (IBAs)
- (4) Important Mammal Areas (IMAs)
- (5) Major Pennsylvania Roads
- (6) 2001 National Land Cover Dataset (NLCD)

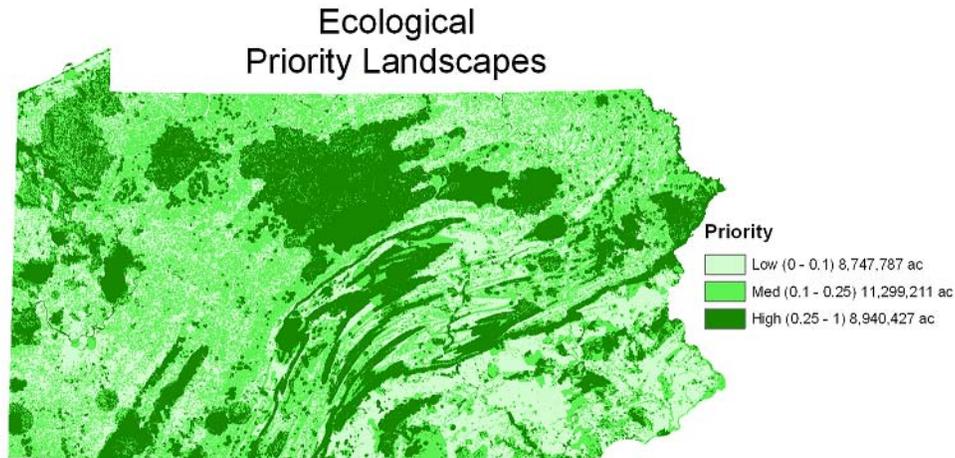
The CNAIs are areas with special biodiversity importance. The ER layer contains known locations of species of special concern. IBAs and IMAs are specially designated areas for birds and mammals. Major roads include interstates and other major roadways that fragment forested areas (rural and woods roads are not included). The NLCD classifies the land into 16 different land cover categories such as agriculture, forests, developed areas, wetlands, and barren lands.

Five components were created as input for the ecological priority landscapes model. These components were derived from the datasets listed above. Areas designated as IBAs, IMAs, or designated biodiversity areas (CNAIs) were given higher weights than those areas not designated. Large forest patches (greater than 100 acres) unfragmented by major roads were given higher weights than fragmented forest patches. Higher weights were also given to areas that have known populations of species of special concern.



The five components created as input for the ecological priority landscapes model.

The output for the ecological priority landscapes model is shown below. Most high priority areas occur in South Mountain, the Laurel Highlands, the mountains of the Ridge and Valley Region, the Kittatinny Ridge, and the northwest region of the state. The largest forest patches in the state are found in the northcentral and contribute to the high priority classification of this area. Other high priority areas are those specially designated for some type of important area. Many specially designated areas also contain known populations of species of special concern. Medium priority areas may be forest patches that meet the 100 acre large forest patch size requirement, but may not be a specially designated area or do not contain known populations of species of special concern. Low priority areas in the result are small forest patches not specially designated as important and do not contain species of special concern. The southeast region contains the largest portion of low priority.



Ecological priority landscapes output results.

Water Priority Landscapes

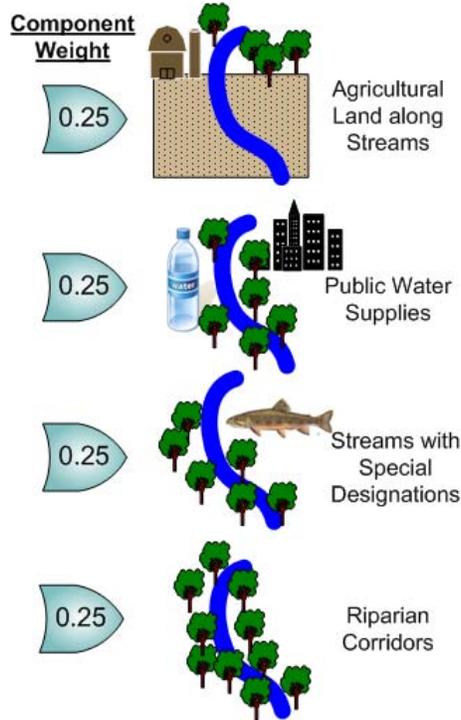
The water priority landscapes analysis identifies important areas for maintaining or improving water quality.

Five datasets were used as inputs:

- (1) Pennsylvania Streams
- (2) Small Watersheds
- (3) 2006 Public Ground Water Supply Points
- (4) 2006 Public Surface Water Supply Points
- (5) 2001 National Land Cover Dataset (NLCD)

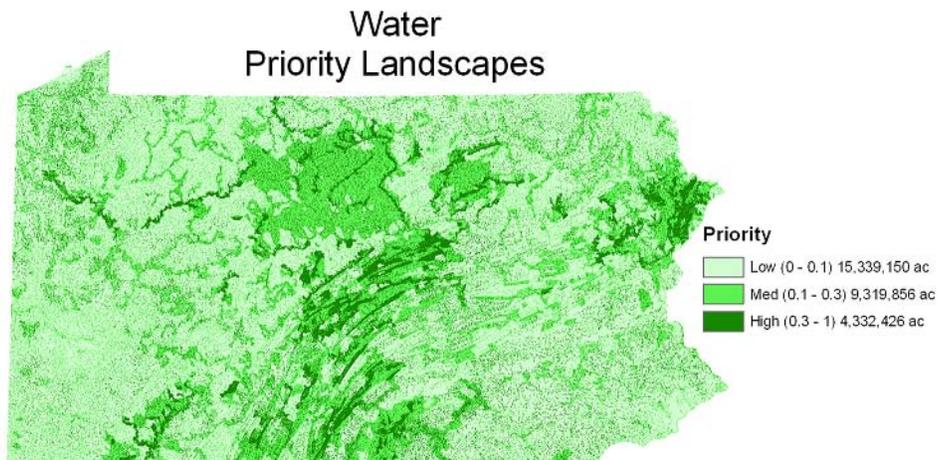
Some stream watercourses have special designations (exceptional value, high quality, wilderness trout, etc) that are given higher weight in the analysis. The geographic land areas that drain water into different watercourses are defined by the small watersheds dataset. Public drinking water supply sources (surface and ground) are integrated in the water model as these are especially critical places to maintain clean water. The NLCD classifies the land into 16 different land cover categories such as agriculture, forests, developed areas, wetlands, and barren lands.

Four components were created as input for the water priority landscapes model. These components were derived from the datasets listed above. Agricultural lands along streams with no buffer or filter strip has the potential to contaminate water through fertilizing, tilling, spraying pesticides, and other farming practices. As such, agricultural lands within 300 feet of a watercourse were included as places to promote reforestation and were given higher weight in the model. Forestland in watersheds containing public water supply sources were given higher weight in the model as these areas are important to keep forested. Higher weight was also given to watersheds containing a stream with special designation. All riparian corridors (300 feet around streams) were given higher weight than other areas in the model.



The four components created as input for the water priority landscapes model.

The output for the water priority landscapes model is shown below. Most high and medium priority areas are found along waterways in the Poconos Region, the Laurel Highlands, and in the central portion of the state. This is where many of the streams with special designations are found to overlap forests that protect public water supplies. Many medium priority areas are also found in smaller patches along riparian stream corridors across the state. Low priority areas are lands outside of riparian corridors and not in critical watershed areas.



Water priority landscapes output results.

Urban Priority Landscapes

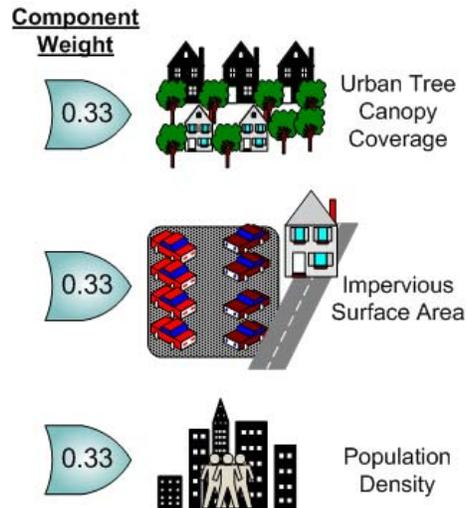
The urban priority landscapes analysis identifies important urban areas to advocate the role of trees as a critical part of the urban infrastructure.

One datasets was used as input:

Pennsylvania Urban Places (Maryland Method)

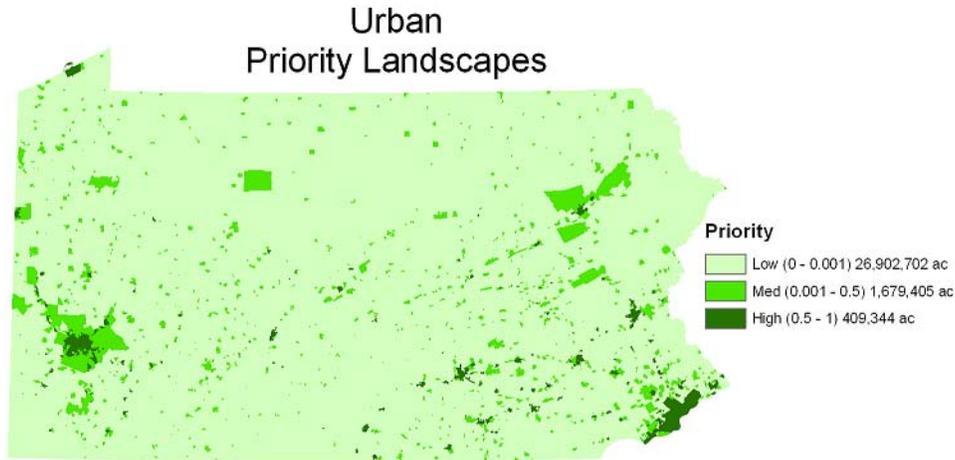
The Maryland method urban places dataset describes urban areas by percent urban tree canopy, percent impervious surface, and population density. Each was broken out as a separate component in the analysis.

The three Maryland Method components (urban tree canopy, impervious surface, and population density) were extracted as input for the for the urban priority landscapes model. Urban areas that need the role of trees advocated as a critical part of the urban infrastructure are those with a low percentage of urban tree canopy coverage, high population densities, and a high percentage of impervious surface area.



The three components created for the urban priority landscapes model.

The output for the urban priority landscapes model is shown below. Philadelphia, Pittsburg, Harrisburg, Allentown, Erie, and Reading are a few of the larger urban areas that stand out as high priority. Medium priority areas are urban areas having higher existing tree cover percentages, lower population densities, or lower percentages of impervious surfaces (rooftops, sidewalks, parking lots, etc.). Most of the state is classified as low priority because it is not in an urban environment.



Urban priority landscapes output results.

Working Forest Priority Landscapes

The working forest priority landscapes analysis identifies areas to maintain in “working” forest conditions for the purpose of providing community and economic values. Such values include supply of wood products, carbon sequestration, recreation, an aesthetic landscape, and many other services that forests can provide.

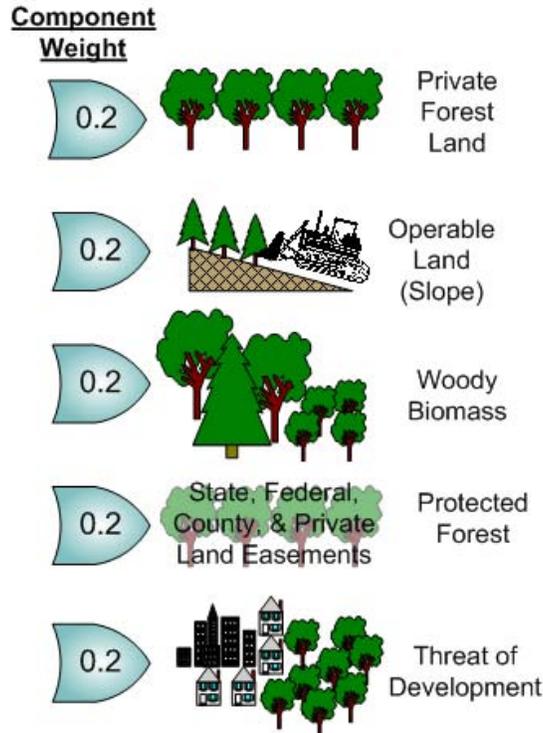
Nine datasets were used as inputs:

- (1) Percent Slope
- (2) Development Risk
- (3) Woody Biomass
- (4) Private Ownership
- (5) 2001 National Land Cover Dataset (NLCD)
- (6) State-Owned Protected Land
- (7) Federally-Owned Protected Land
- (8) County-Owned Protected Land
- (9) Privately-Owned Protected Land

Percent slope characterizes steepness and operability of the land. Development risk predicts areas subject to urban development pressure in the near future. Woody biomass estimates the amount of woody biomass on the land. Private ownership identifies lands owned by non-governmental entities. The NLCD classifies the land into 16 different land cover categories such as agriculture, forests, developed areas, wetlands, and barren lands. State, federal, and county –owned protected lands are held and managed by the described ownership and primarily managed as forestland. Privately-owned protected lands include forestland owned by private individuals where the property has an easement associated with it.

Five components were created as input for the working forest priority landscapes model. These components were derived from the datasets listed above. Private forest land itself was separated from other public forest land and given additional weight. Nearly seventy-five percent of Pennsylvania’s forests are privately owned by over a half-million

landowners, and maintaining the full suite of the state’s forest resource values is largely dependent on work done in private forest sector. Steep slopes (greater than 30%) were given less weight in the model than land that is more suitable (operable) for management activities. Areas with higher amounts of woody biomass were given greater weight in the model than areas with low or no woody biomass. Protected lands (those under state, federal, or county ownership, or private lands under an easement agreement) were given additional weight in the model as these forests are nearly guaranteed to be forested in the future. Higher weights were also given to lands threatened by development.



The five components created as input for the working forest priority landscapes model.

The output for the working forest priority landscapes model is shown below. Most high priority areas are found in forested areas across the northern region of the state, in the Ridge and Valley Region, South Mountain, and in the Laurel Highlands. Many of the state and federal protected lands are found in this region. Low priority areas are non-forest areas or areas with very low model component values.

Working Forest Priority Landscape



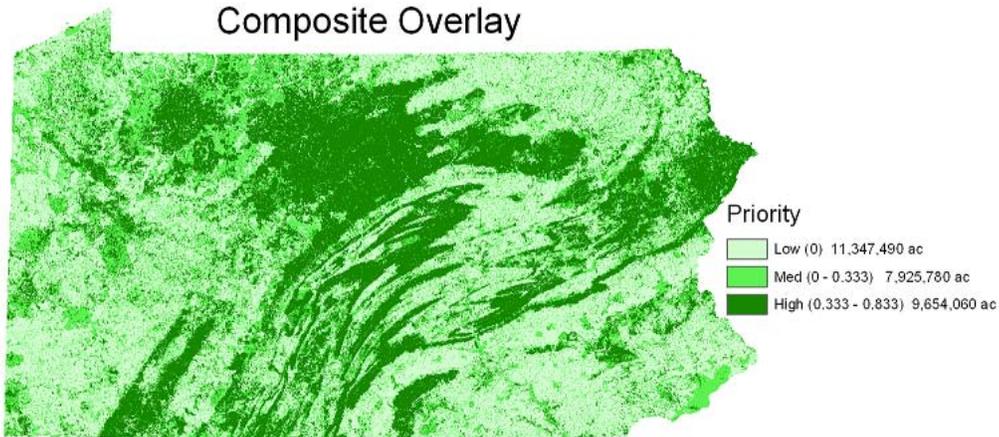
Working forest priority landscapes output results.

Composite Overlay

The composite overlay combines the six spotlighted perspectives, equally weighted, into a single map that depicts the intersection of priority landscape areas.

The output results of the composite overlay are shown below. Some of the highest ranking landscape areas coincide with landscapes identified as [Conservation Landscape Initiatives](#) (CLIs). These include the [PA Wilds](#) (northcentral), the [Pocono Forests and Water](#) (northeast), the [Laurel Highlands](#) (southwest), [South Mountain](#) (southcentral), and forestland within the [Lehigh Valley Greenways / Schuylkill Highlands](#) (southeast). The composite overlay also highlights other important landscape areas across the state such as the Kittatinny ridge (southeast), the mountains of the Ridge and Valley (southcentral), and some other high priority lands in the northwest region.

Composite Overlay



Output results of the composite overlay depicting intersecting priority areas among the six highlighted perspectives.