OPEN SPACE AND RECREATION PLAN UPDATE: CONSERVATION AND STEWARDSHIP

County of Sussex

Technical Report I: Land Preservation

Water Resource Priorities

THE LAND CONSERVANCY OF NEW JERSEY

AUGUST 2016

Prepared for:
Sussex County
Board of Chosen Freeholders
Open Space Advisory Committee

Funded by a Catalyst Grant from the Open Space Institute's Delaware River Watershed Protection Fund

OPEN SPACE AND RECREATION PLAN UPDATE:
CONSERVATION AND STEWARDSHIP

for
COUNTY of SUSSEX

Technical Report I: Land Preservation

Produced by:
The Land Conservancy of New Jersey
an accredited land trust

Project Consultants:
Kathleen Caccavale
The Land Conservancy of New Jersey
Nathaniel Sajdak
Sussex County Municipal Utilities Authority – Wallkill River Watershed Management Group
Daniel J. Van Abs, Ph.D.
School of Environmental & Biological Sciences, Rutgers, The State University of New Jersey

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For further information please contact:

THE LAND CONSERVANCY OF NEW JERSEY
19 BOONTON AVENUE
BOONTON, NJ 07005
PH: (973)541-1010
FAX: (973)541-1131
TLC-NJ.ORG

County of Sussex
Sussex County Division of Planning
One Spring Street
Newton, NJ 07860
Ph: (973) 579-0500
Fax: (973) 579-0513
sussex.nj.us

WATER RESOURCE MODELING

Accompanying the *Sussex County Open Space and Recreation Plan Update* are three *Technical Reports* which include the results of the detailed ArcGIS mapping analysis run to model water resources and prioritize land for preservation and stewardship. These reports are as follows:

- ✓ Technical Report I – Land Preservation (*Maps 1-13*)
- ✓ Technical Report II – Land Stewardship (*Maps A-I*)
- ✓ Technical Report III – Analysis and Recommendations (*Maps I-IV*)

Each report contains a table detailing the metrics, data, and mapping for the water resource areas studied in Sussex County. The final report includes a table detailing the priority lands for preservation, as identified by the water resource model in Sussex County. These are identified on a parcel basis and are ranked by their proximity to already preserved lands. This table, along with the accompanying mapping, provides the tools by which the County Open Space Committee, Board of Chosen Freeholders, and local officials can target their efforts to protect lands in Sussex County – focusing on those properties that support the water resources integral to the County and expand existing public open spaces.

Technical Report I - Land Preservation

The following 13 maps illustrate characteristics used to identify targets for protection of the water resources in Sussex County. Each map targets a defining characteristic important to water quality and/or quantity. These are defined in greater detail on the accompanying table and in the Plan Update.

Maps 1-5 identify the hydrologic characteristics within the Sussex County.

Maps 6-9 and Map 3 identify characteristics protecting stream and aquifer quality.

Maps 10-13 identify the characteristics of aquatic ecosystem functions in Sussex County.

Map 1 identifies the areas of ground water recharge areas within stressed watersheds, which make up 3% of the county.

Map 2 illustrates prime recharge areas that provide flows to surface waters and wells. These account for 31.26% of the county.

Map 3 identifies forest cover (including wooded wetlands) which makes up 63.29% of the county.

Map 4 shows where Sussex County's wetlands are located and that they make up 13.6% of the total acres of the county.

Map 5 identifies flood hazards or floodprone areas, which make up 14.6% of the county.

Map 6 identifies riparian areas throughout the county which make up 25.86% of the total acreage.

Map 7 identifies soluble carbonate rocks, to illustrate areas that are at a higher risk of water contamination. These areas make up 24.03% of the county.

Map 8 shows where public community water supply wells are located, as well as time buffer zones for 2, 5, and 12 year travel to the well. These zones make up 2.95%, 3.46%, and 6.17% of Sussex County respectively, with a total of 12.57%.

Map 9 identifies source water areas targeting land where water flows into the public water supply. These areas make up 6.11% of the county's total acreage.

Map 10 identifies undeveloped riparian areas of headwater streams in Sussex County, totaling 17.84%.

Map 11 identifies the unique and unusual aquatic habitats. The different categories are; potential vernal habitat, vernal habitat, high elevation water bodies, and those high elevation water bodies with a 300 foot buffer. Each makes up 11.88%, 7.03%, 0.77%, and 2.18% of the county respectively.

Map 12 shows the aquatic habitats for threatened and endangered species, which is 1.03% of the county.

Map 13 shows wetlands habitat for threatened and endangered species, which is 12.99% of the county.

Table 1 includes the acreages for each of the water resource characteristics described and shown on *Maps 1 – 13.*

Table 1. Water Resources in Sussex County (Acreages)

Map	Acres	Percent of County
Map 1: Stressed Watersheds: Current Utilization		
Significant Recharge Areas (70% Threshold)	10,301.62	3.00%
Stressed Watershed (based on 25% of Low Flow Margin)	24,116.24	7.03%
Map 2: Prime Recharge Areas	107,236.07	31.26%
Map 3: Forest Cover (Include Wooded Wetlands)	217,112.44	63.29%
Map 4: Wetlands	46,644.01	13.60%
Map 5: Flood Hazards & Floodprone Areas	50,094.28	14.60%
Map 6: Riparian Areas	88,697.73	25.86%
Map 7: Soluble Carbonate Rocks	82,421.35	24.03%
Map 8: Public Wellhead Protection Areas		
2 Year Time of Travel	10,110.31	2.95%
5 Year Time of Travel	11,854.09	3.46%
12 Year Time of Travel	21,159.70	6.17%
Total	43,124.10	12.57%
Map 9: Source Water Areas	20,961.38	6.11%
Map 10: Headwaters and Riparian Areas		
Headwaters	61,203.65	17.84%
Riparian Areas (Total)	88,697.73	25.86%
Map 11: Unique & Unusual Aquatic Habitats		
Potential Vernal Habitat	40,763.71	11.88%
Vernal Habitat	24,128.51	7.03%
High Elevation Water Bodies	2,628.56	0.77%
High Elevation Water Bodies (include 300 feet buffer)	7,493.29	2.18%
Map 12: Aquatic Habitats for Threatened & Endangered Species	3,531.91	1.03%
Map 13: Wetland Habitat for Threatened & Endangered Species	44,555.02	12.99%

Water Priorities for Land Preservation in Sussex County

The Sussex County Open Space Plan includes a set of maps that provide information about important water-related characteristics. The following table provides the three "focus" areas, measurable characteristics, purpose, metrics and data. Each "focus" has an equal weight, and each "characteristic" within the focus area has an equal weight.

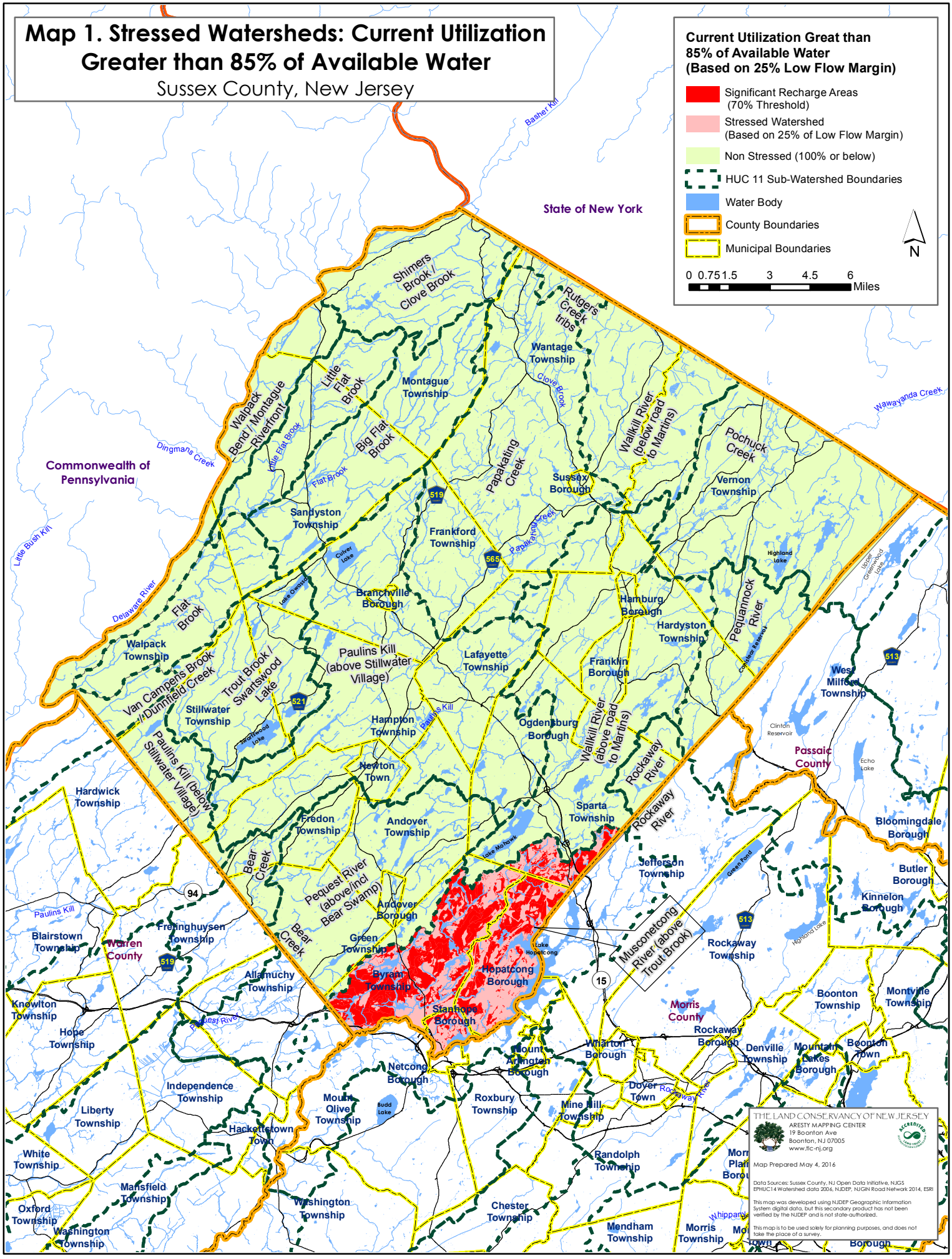
Within each Focus Area – the individual characteristics are given an equal weight. The map for each polygon reflects areas that may have a weight of 1, 2, 3, 4, or 5. The overall map may be a combination of the three focus maps, with scores of 1 to 15, or a gradation of scores to allow for more flexibility in how the information is used. The user will be able to use the maps individually, or together – depending on the purpose. The scores are based on polygons and not on individual properties. Properties can be evaluated on a weighted-average basis or other method.

weight	Characteristics	Purpose	Metrics and Data	Map
	Focus Area 1. Protecting the Resources – Hydrology			
1	Identify hydrologically stressed watersheds	Place higher priority on protection of recharge areas in HUC11s with highest water demands.	Stressed watersheds, using 25% of Low Flow Margin setting in DGS14-1 Computer Workbook Investigating Water Availability in New Jersey on a Watershed Management Area Basis HUC 11 (watershed) basis – based on surface water (other than reservoir-supported) and groundwater withdrawal Recharge areas only (provide 70% of the recharge) in those watersheds that are using 85% of their allocation	Map 1. Stressed Watersheds: Current Utilization Greater than 85% of Available Water
1	Preserve Prime Recharge Areas	Recharge provides flows to surface waters and to wells. Critical to flow of trout streams.	Define "prime" as the best recharge areas comprising 40% of drought flow: Baseline measurement was the 1960s drought of record Recharge Areas (NJGS Method GSR32) and DGS02-3 Ground-Water Recharge for New Jersey Using the groundwater recharge mapping and HUC 14 (subwatershed) delineations, PGWRA are the lands with the highest recharge rates that in aggregate provide 40% of the total HUC14 recharge	Map 2. Prime Recharge Areas
1	Preserve Forest Area	Forest cover results in less runoff, more even stream flows, higher water quality	Total forest cover (focus is on hydrology, core forest is less of an issue here than under ecosystem protection) – includes forested wetlands NJDEP 2012 LULC	Map 3. Forest Cover

weight	Characteristics	Purpose	Metrics and Data	Map
1	Preserve Wetlands	Removing potential for loss of hydrologic function due to nearby development; resolve land use conflicts	Presence/absence of wetlands – includes forested wetlands NJDEP 2012 LULC – Anderson Classes 2140, 2150, 6200 series	Map 4.Wetlands
1	Preserve Floodplains	Removing potential for loss of hydrologic function due to floodplain modification; resolve land use conflicts	Presence/absence of floodplains • 2011 DFIRM (Final) – FEMA 1% (100 year) flood plain • NJDEP Floodprone Mapping from 1996 LULC (USGS derivation)	Map 5. Flood Hazard and Floodprone Areas
	Focus Area 2. Protecting the Resources – Stream and Aquifer Quality			
1	Maintain Forest Area	Forest cover results in higher water quality.	Total forest cover (the focus here is on water quality, and so core forest is less of an issue here than under ecosystem protection)	Map 3. Forest Cover
1	Maintain Riparian Areas	Critical habitat types for shading of streams (important for trout production streams), filtering of sediment	Riparian Area evaluation (using a method similar to Raritan Basin Watershed Management Plan, or TNC Active River Area approach), predevelopment (approximate) and 2012: • *Water bodies (NJDEP 2012)* • *If associated with a water body:* *Floodprone Areas (NJDEP 1996) and FEMA DFIRM 1% (100 year) flood plain* *Riparian Soils (hydric or alluvial, and less than 18 inch seasonal depth to high water table – NRCS SSURGO 2014)* *Wetlands (NJDEP LULC 2012)* *Wetlands Transition Areas (Freshwater Wetlands Protection Act rules, stream classifications, T&E species)* *Stream buffers – wildlife passage corridors, 300 feet on either side of streams that are 3rd order or greater, 150 feet on either side for 1st or 2nd order streams* • *Remove isolated wetlands, floodprone areas, and water bodies (including vernal pools)* • *Remove developed lands per 2012 LULC Anderson codes*	Map 6.Riparian Areas

weight	Characteristics	Purpose	Metrics and Data	Map
1	Karst Topography	Areas with active dissolution of limestone bedrock are at higher risk of contamination	• Limestone bedrock outcrops – surficial bedrock geology for limestone and dolomite • (Note: Karst topography identification not available per NJGS)	Map 7.Soluble Carbonate Rocks
1	Preserve Wellhead Protection Areas	Wellhead protection areas provide the bulk of water to wells within a 12-year time period.	• NJDEP 2011 • Tier 1 (2-year), 2 (5-year) and 3 (12-year) time of travel • Note: Andover wells are on map, Branchville wells not completed • DGS02-2 Well Head Protection Areas for Public Community Water Supply Wells in New Jersey • DGS04-5 Well Head Protection Areas For Public Non-Community Water Supply Wells In New Jersey. Not included on the map, GIS does not exist	Map 8. Public Wellhead Protection Areas
1	Surface Water Reservoir Protection	Protecting lands that flow to the public water supply	Morris Lake (Sparta), Lake Rutherford /Colesville Reservoir (in Wantage), Pequannock River Watershed (City of Newark), Rockaway River Watershed (Jersey City), Lake Hopatcong is a major recreational area, and an emergency water supply source • *Included Lake Shawnee and Lake Winona within Lake Hopatcong watershed* • *Lake Rutherford/Colesville Reservoir: Source Water Assessment Report for Sussex Borough – Lake Rutherford is the storage location and drains into Colesville Reservoir where it is held (www.nj.gov/cgi-bin/dep/swap/swapdata2.pl?psid=1921001)* *Reservoir drainage areas (Rutgers CRSSA) data*	Map 9. Source Water Areas

weight	Characteristics	Purpose	Metrics and Data	Map
	Focus Area 3. Protecting Aquatic Ecosystem Functions.			
1.25	Protect Headwaters to Streams	First and Second Order streams. Protects downstream flows, quality, ecosystems. Highly vulnerable.	1st and 2nd Order Streams: Riparian Areas associated with 1st/2nd order streams, selecting those that are not developed • Headwaters stream identification NJDEP stream hydrography. • Headwaters riparian delineations using the method in #2. Identification of undeveloped, non-preserved headwaters riparian areas	Map 10. Headwaters and Riparian Areas
1.25	Preserve Unique and Unusual Aquatic Habitats	• Calcareous (limestone) fens (unusually high pH) • Sinkhole ponds • Mountain lakes Vernal pools	• 2003 Sussex OSRP – data cannot be confirmed, will not be mapped • 2003 Sussex OSRP – data cannot be confirmed, will not be mapped • NJDEP LULC for lakes at higher altitudes (above 1,000 feet) NJDEP vernal pool mapping (2012 Landscape Project 3.1)	Map 11. Unique and Unusual Aquatic Habitats
1.25	Maintain Riparian Areas	• Riparian areas are critical for providing food sources to aquatic habitats, quality protection and shading.	• Riparian Area evaluation as above. • Landscape Project mapping of habitat for T&E species that are closely associated with open waters (Information provided by TNC for T&E)	Map 12. Aquatic Habitats for Threatened and Endangered Species
1.25	Preserve Wetlands	• Wetlands themselves are important aquatic and transitional ecosystems, including T&E species.	• Wetlands identification as above • Landscape Project mapping of habitat for T&E species that are closely associated with wetlands and forested wetlands	Map 13. Wetlands Habitat for Threatened and Endangered Species


Map 1. Stressed Watersheds: Current Utilization Greater than 85% of Available Water
Sussex County, New Jersey
Current Utilization Great than 85% of Available Water (Based on 25% Low Flow Margin)
Significant Recharge Areas (70% Threshold)
Stressed Watershed (Based on 25% of Low Flow Margin)
Non Stressed (100% or below)
HUC 11 Sub-Watershed Boundaries
Water Body
County Boundaries
Municipal Boundaries
N
0 0.751.5 3 4.5 6 Miles
State of New York
Commonwealth of Pennsylvania
Basher Kill
Wawayanda Creek
Dingmans Creek
Little Bush Kill
Delaware River
Shimers Brook / Clove Brook
Rutgers Creek tribs
Wantage Township
Clove Brook
Montague Township
Little Flat Brook
Walpack Bend / Montague Riverfront
Kittle Flat Brook
Flat Brook
Big Flat Brook
Papakating Creek
Wallkill River (below road to Martins)
Pochuck Creek
Sussex Borough
Vernon Township
Sandyston Township
Frankford Township
Culver Lake
Lake Owassa
Branchville Borough
Hamburg Borough
Hardyston Township
Pequannock River
Highland Lake
Upper Greenwood Lake
Walpack Township
Flat Brook
Van Campens Brook / Dunnfield Creek
Trout Brook / Swartswood Lake
Stillwater Township
Paulins Kill (above Stillwater Village)
Lafayette Township
Franklin Borough
Wallkill River (above road to Martins)
Ogdensburg Borough
Hampton Township
Paulins Kill
Swartswood Lake
Paulins Kill (below Stillwater Village)
Newton Town
Rockaway River
Sparta Township
Hardwick Township
Fredon Township
Andover Township
Lake Mohawk
Bear Creek
Pequest River (above/incl Bear Swamp)
Andover Borough
Green Township
Hopatcong Borough
Byram Township
Stanhope Borough
Lake Hopatcong
Musconetcong River (above Trout Brook)
Jefferson Township
Green Pond
Rockaway Township
Highland Lake
Passaic County
Clinton Reservoir
Echo Lake
West Milford Township
Bloomingdale Borough
Butler Borough
Kinnelon Borough
Boonton Township
Montville Township
Morris County
Rockaway Borough
Denville Township
Mountain Lakes Borough
Boonton Town
Wharton Borough
Mount Arlington Borough
Netcong Borough
Roxbury Township
Mine Hill Township
Dover Town
Rockaway River
Randolph Township
Mendham Township
Morris Township
Chester Township
Washington Township
Mansfield Township
White Township
Oxford Township
Washington Township
Independence Township
Liberty Township
Hackettstown Town
Mount Olive Township
Budd Lake
Knowlton Township
Hope Township
Pequest River
Allamuchy Township
Blairstown Township
Frelinghuysen Township
Warren County
Paulins Kill
94
519
521
565
513
15
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Data Sources: Sussex County, NJ Open Data Initiative, NJGS
EPHUC14 Watershed data 2006, NJDEP, NJGIN Road Network 2014, ESRI
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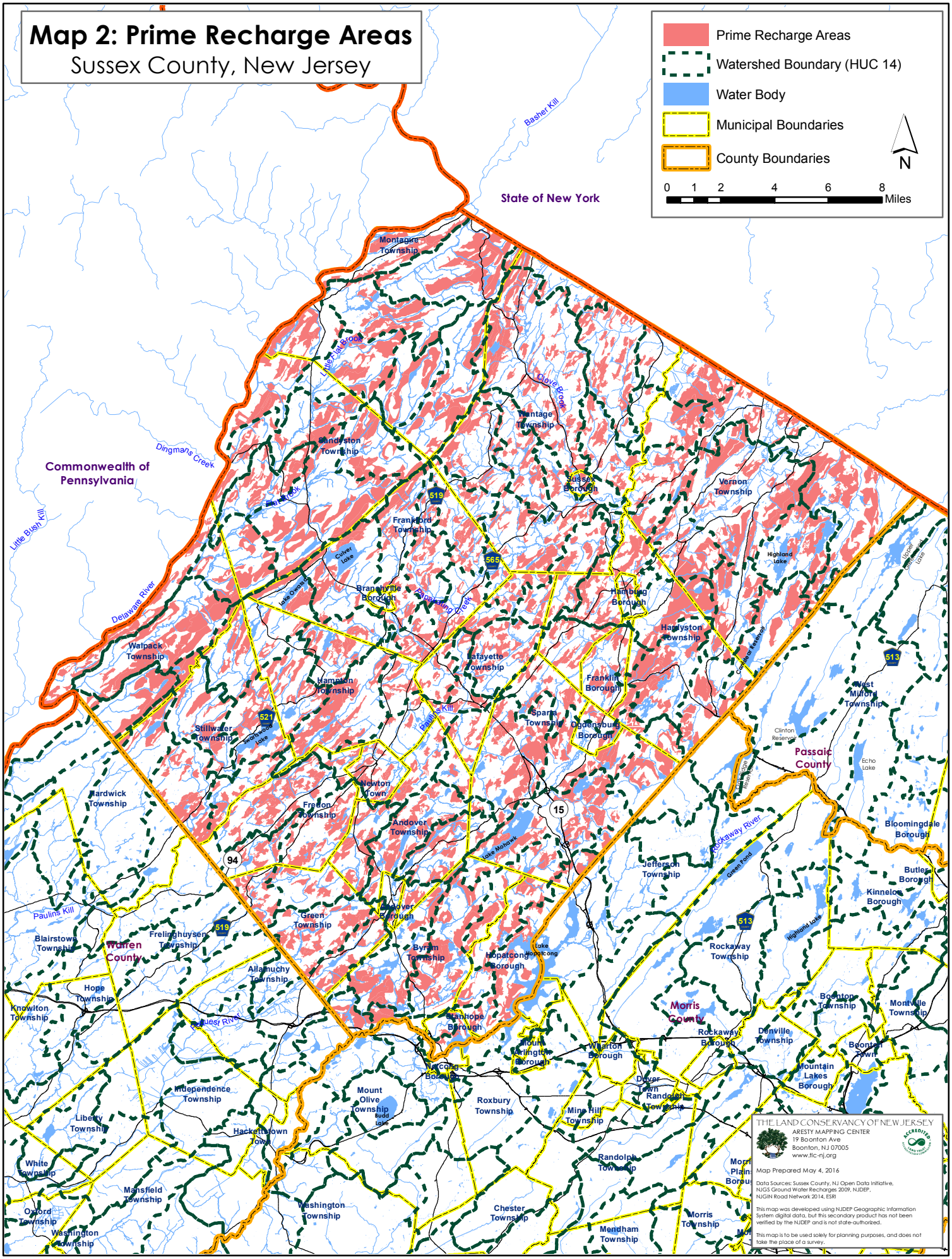
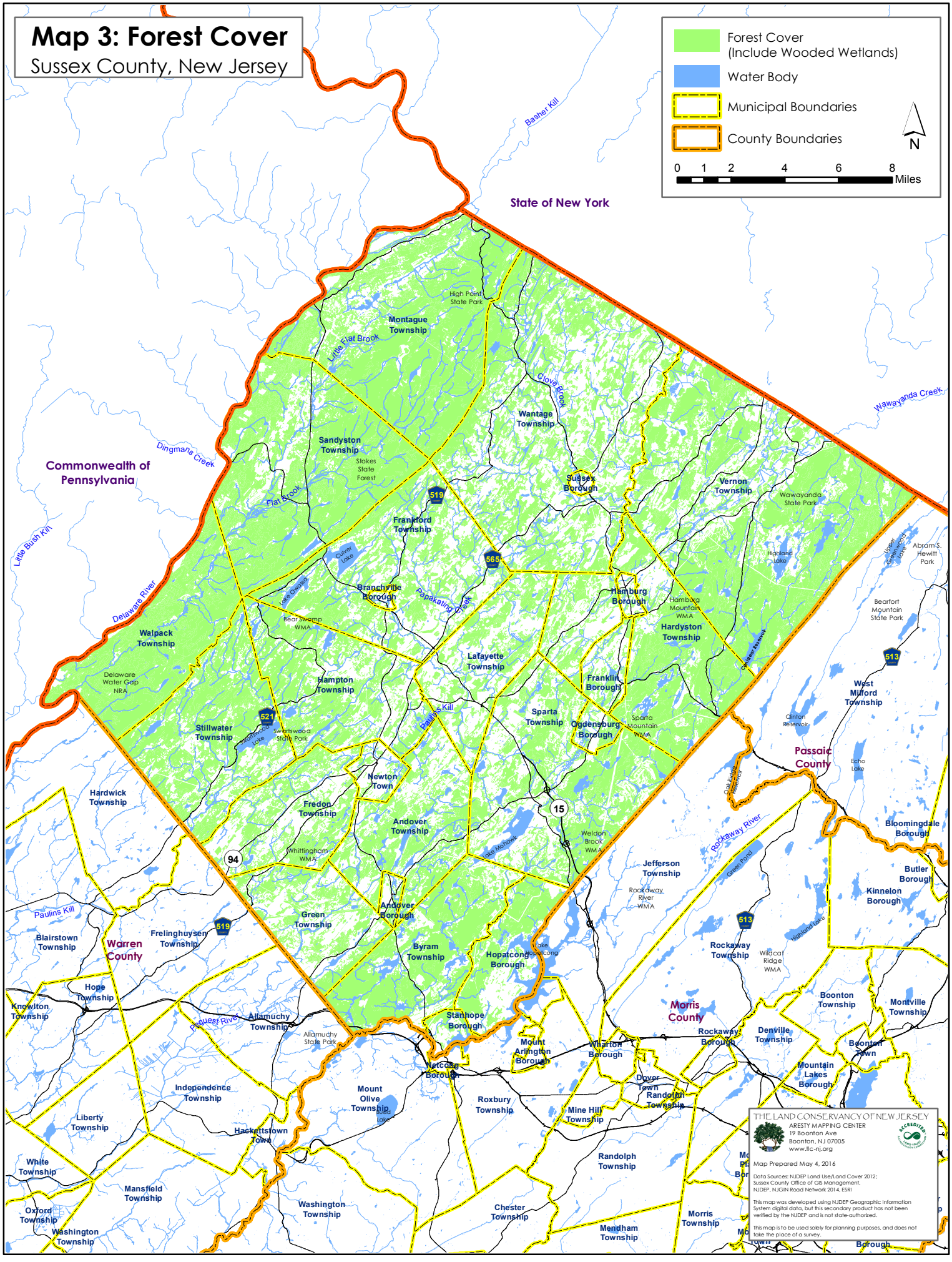
Map 2: Prime Recharge Areas

Sussex County, New Jersey





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Map Prepared May 4, 2016

Data Sources: NJDEP Land Use/Land Cover 2012; Sussex County Office of GIS Management, NJDEP, NJGIN Road Network 2014, ESRI

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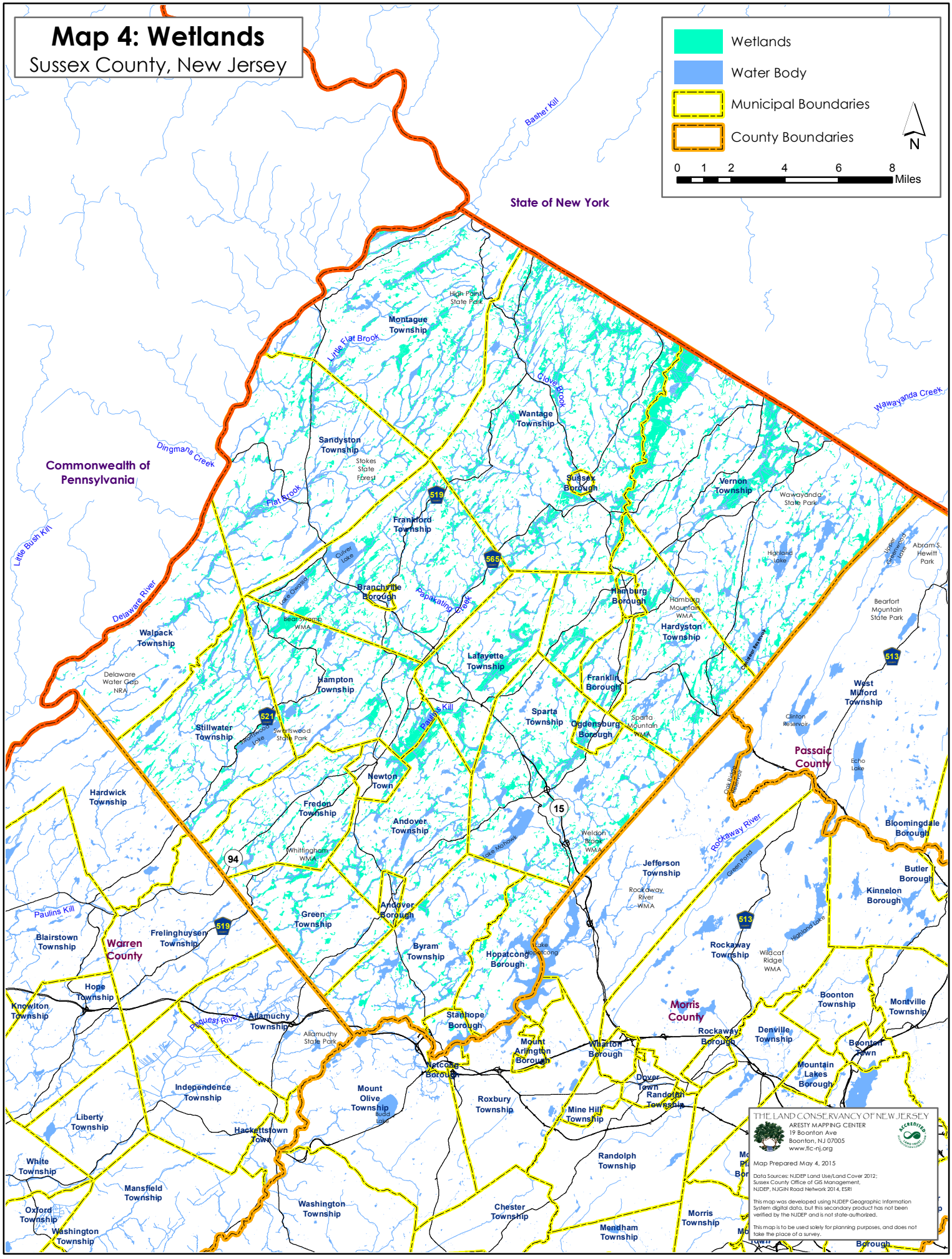
Map 4: Wetlands
Sussex County, New Jersey
Wetlands
Water Body
Municipal Boundaries
County Boundaries
N
0 1 2 4 6 8
Miles
State of New York
Commonwealth of Pennsylvania
Basher Kill
Wawayanda Creek
Dingmans Creek
Little Flat Brook
Clove Brook
Flat Brook
Little Bush Kill
Delaware River
Papakating Creek
Paulins Kill
Pequest River
Rockaway River
Green Pond
Lake Mohawk
Lake Hopatcong
Weldon Brook WMA
Whittingham WMA
Bear Swamp WMA
Hamburg Mountain WMA
Sparta Mountain WMA
Rockaway River WMA
Wildcat Ridge WMA
Wawayanda State Park
Stokes State Forest
High Point State Park
Swartswood State Park
Allamuchy State Park
Delaware Water Gap NRA
Bearfort Mountain State Park
Abram S. Hewitt Park
Clinton Reservoir
Oak Ridge Reservoir
Echo Lake
Highland Lake
Green Pond
Budd Lake
Clover Lake
Lake Owassa
Highland Lake
Upper Greenwood Lake
Sandyston Township
Montague Township
Wantage Township
Sussex Borough
Vernon Township
Frankford Township
Branchville Borough
Walpack Township
Hampton Township
Lafayette Township
Hamburg Borough
Hardyston Township
Franklin Borough
Ogdensburg Borough
Sparta Township
Stillwater Township
Newton Town
Andover Township
Andover Borough
Hardwick Township
Frelinghuysen Township
Green Township
Byram Township
Hopatcong Borough
Jefferson Township
Rockaway Township
Blairstown Township
Warren County
Hope Township
Knowlton Township
Allamuchy Township
Stanhope Borough
Netcong Borough
Mount Arlington Borough
Roxbury Township
Mount Olive Township
Independence Township
Liberty Township
Hackettstown Town
White Township
Mansfield Township
Oxford Township
Washington Township
Washington Township
Chester Township
Mine Hill Township
Dover Town
Randolph Township
Randolph Township
Mendham Township
Morris Township
Rockaway Borough
Denville Township
Boonton Town
Boonton Township
Montville Township
Mountain Lakes Borough
Morris County
Passaic County
West Milford Township
Bloomingdale Borough
Butler Borough
Kinnelon Borough
Village of Wharton
Borough
513
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15
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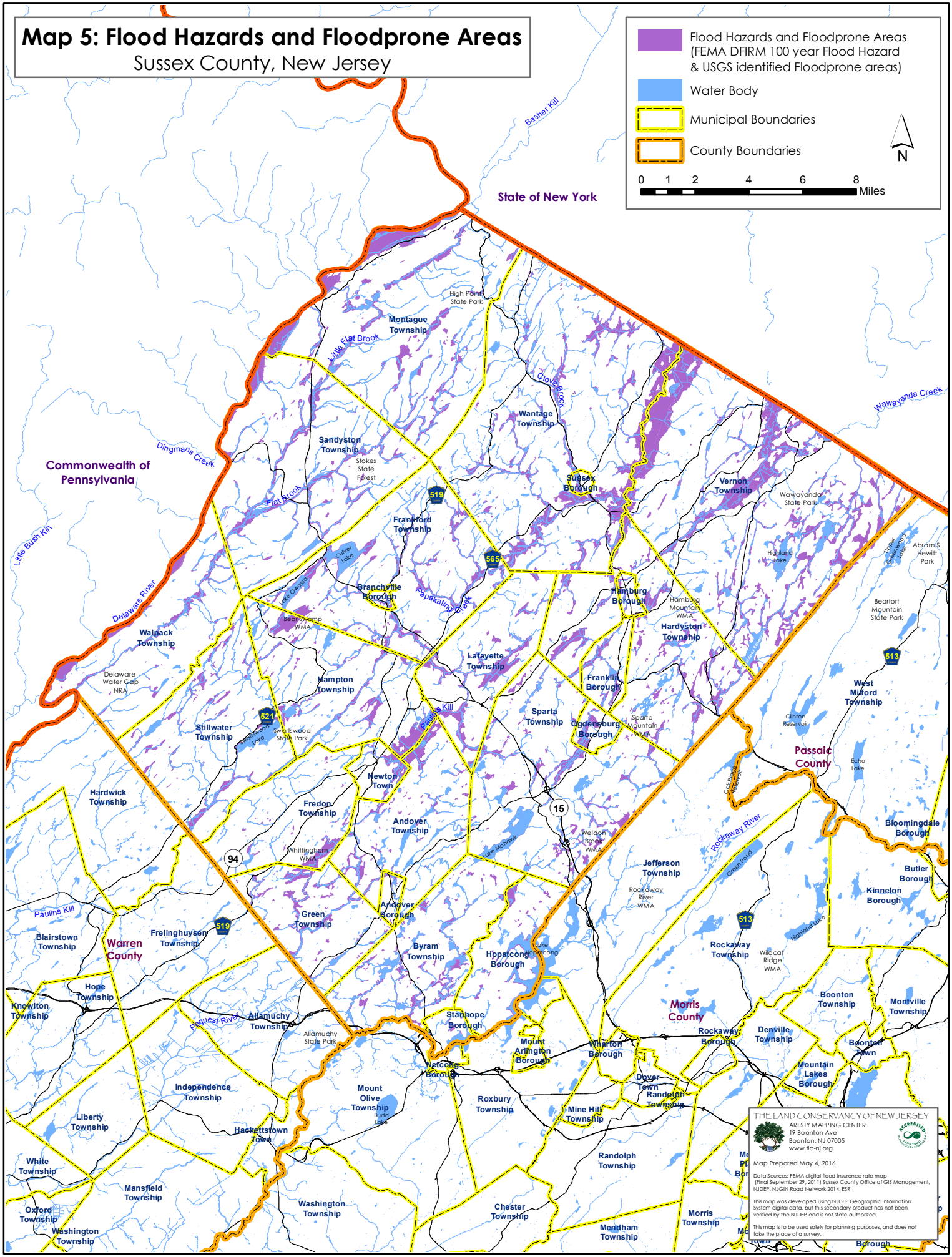
Map 5: Flood Hazards and Floodprone Areas

Sussex County, New Jersey



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Data Sources: FEMA digital flood insurance rate map (Final September 29, 2011) Sussex County Office of GIS Management, NJDEP, NJGIN Road Network 2014, ESRI

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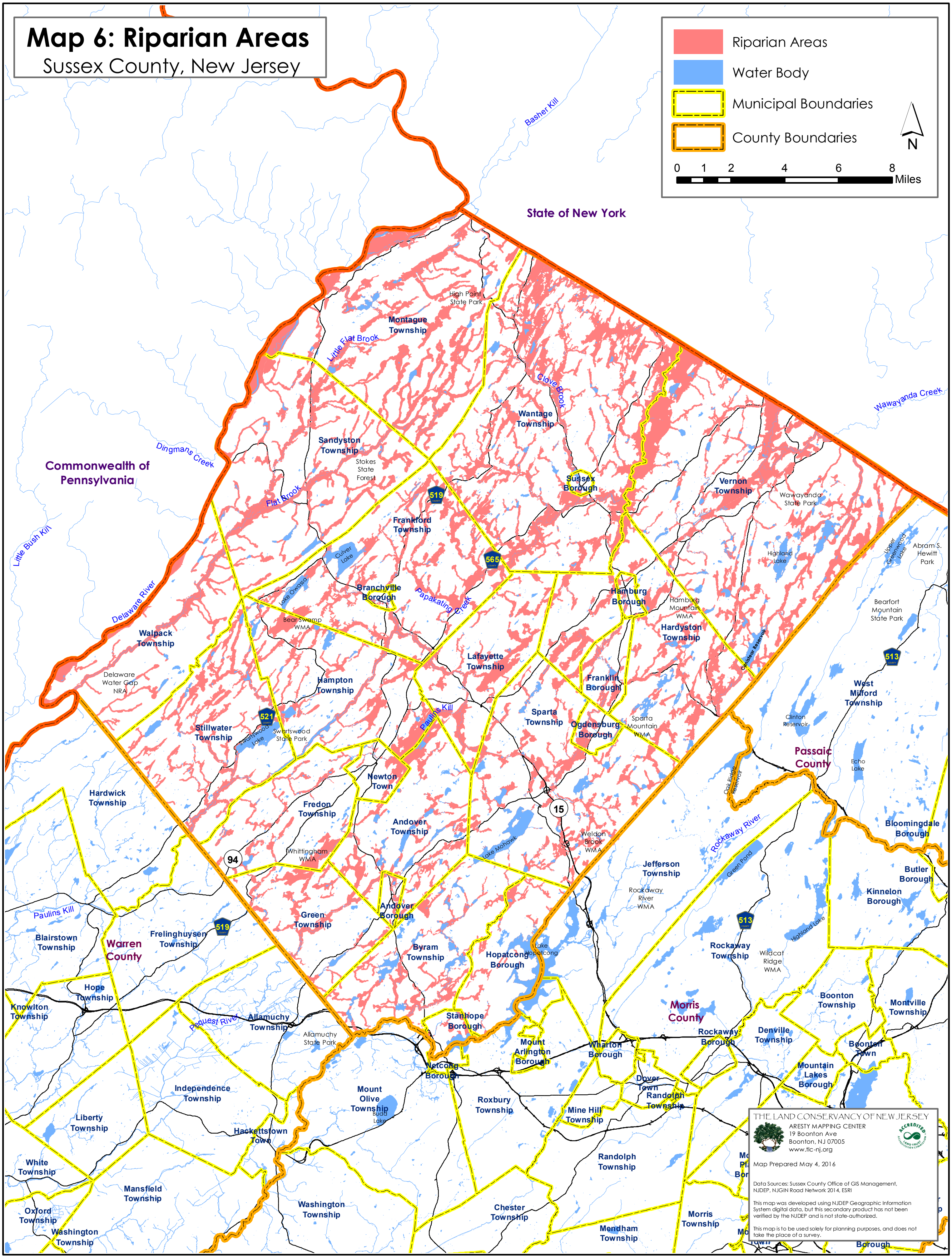
Map 6: Riparian Areas
Sussex County, New Jersey
Riparian Areas
Water Body
Municipal Boundaries
County Boundaries
N
0 1 2 4 6 8
Miles
State of New York
Commonwealth of Pennsylvania
Basher Kill
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Dingmans Creek
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Delaware River
Flat Brook
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Clove Brook
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Pequest River
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Wantage Township
Sussex Borough
Vernon Township
Wawayanda State Park
Frankford Township
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565
Culver Lake
Highland Lake
Upper Greenwood Lake
Abram S. Hewitt Park
Branchville Borough
Lake Owassa
Bear Swamp WMA
Hamburg Borough
Hamburg Mountain WMA
Bearfort Mountain State Park
Walpack Township
Hardyston Township
Lafayette Township
Delaware Water Gap NRA
Hampton Township
Franklin Borough
513
West Milford Township
521
Stillwater Township
Swartswood Lake
Swartswood State Park
Sparta Township
Ogdensburg Borough
Sparta Mountain WMA
Clinton Reservoir
Passaic County
Newton Town
Oak Ridge Reservoir
Echo Lake
Hardwick Township
Fredon Township
Andover Township
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Whittingham WMA
Lake Mohawk
Weldon Brook WMA
Bloomingdale Borough
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Kinnelon Borough
Rockaway River WMA
Paulins Kill
Green Township
Andover Borough
Blairstown Township
Warren County
Frelinghuysen Township
Byram Township
Hopatcong Borough
Lake Hopatcong
Rockaway Township
Wildcat Ridge WMA
Highland Lake
Hope Township
Knowlton Township
Allamuchy Township
Allamuchy State Park
Stanhope Borough
Morris County
Boonton Township
Montville Township
Mount Arlington Borough
Wharton Borough
Rockaway Borough
Denville Township
Boonton Town
Netcong Borough
Mountain Lakes Borough
Independence Township
Mount Olive Township
Budd Lake
Roxbury Township
Dover Town
Randolph Township
Mine Hill Township
Liberty Township
Hackettstown Town
White Township
Mansfield Township
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Mendham Township
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Borough
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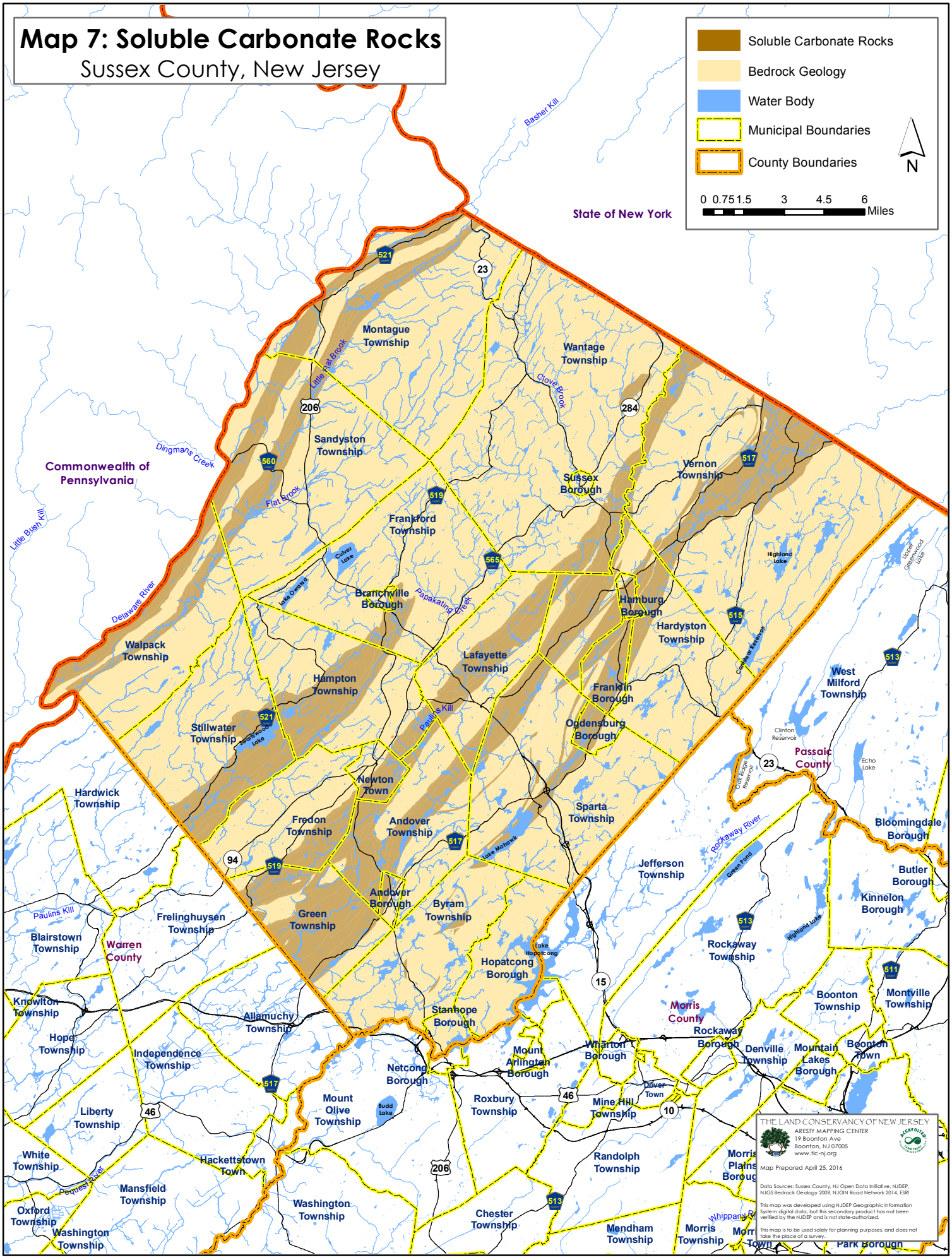
Map 7: Soluble Carbonate Rocks

Sussex County, New Jersey



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Data Sources: Sussex County, NJ Open Data Initiative, NJDEP, NJGS Bedrock Geology 2009, NJGIN Road Network 2014, ESRI

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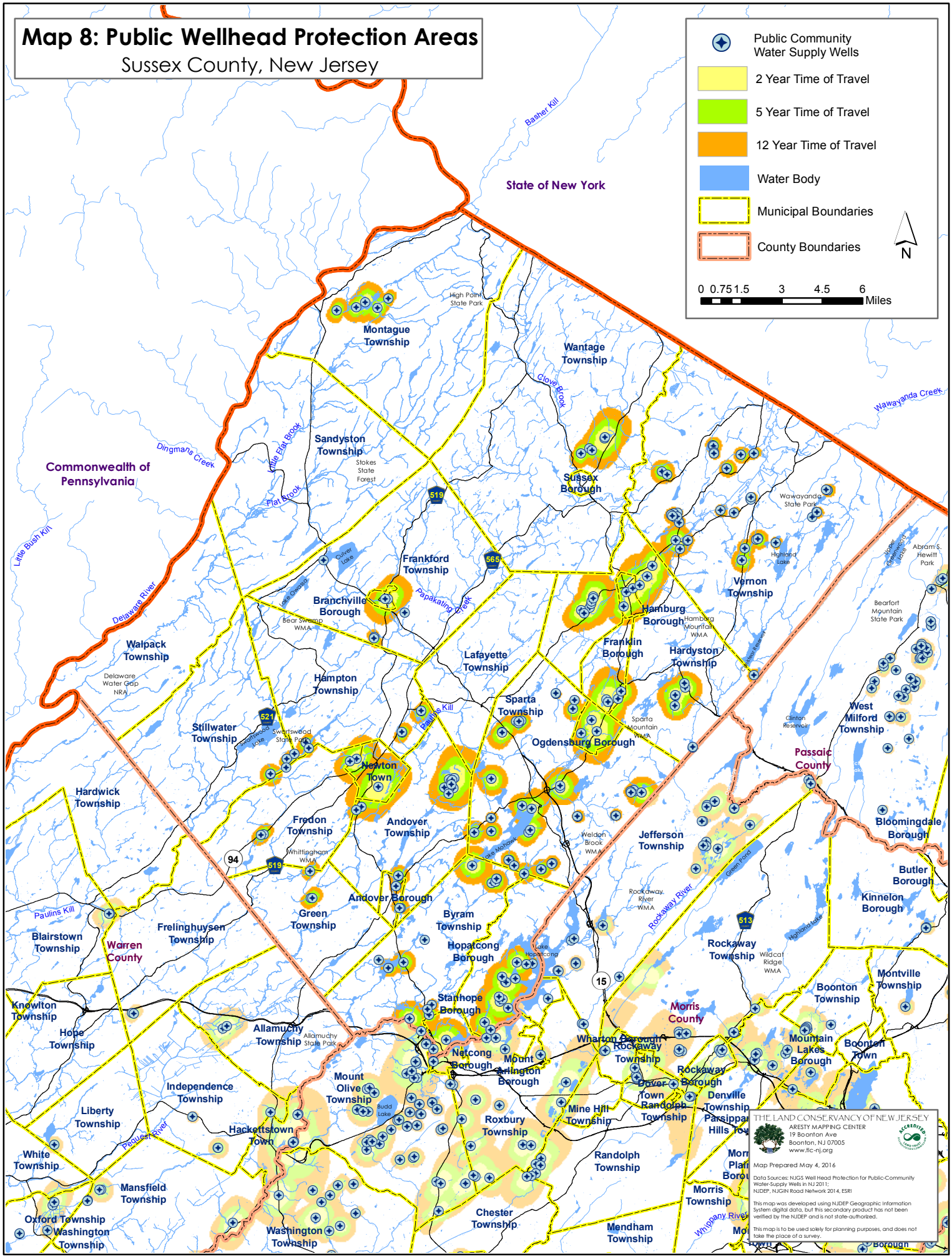
Map 8: Public Wellhead Protection Areas
Sussex County, New Jersey
Public Community Water Supply Wells
2 Year Time of Travel
5 Year Time of Travel
12 Year Time of Travel
Water Body
Municipal Boundaries
County Boundaries
N
0 0.751.5 3 4.5 6
Miles
State of New York
Commonwealth of Pennsylvania
Basher Kill
Wawayanda Creek
Clove Brook
Dingmans Creek
Little Flat Brook
Flat Brook
Little Bush Kill
Delaware River
Papakating Creek
Pellet Kill
Paulins Kill
Rockaway River
Green Pond
Whippany River
Montague Township
Wantage Township
Sandyston Township
Stokes State Forest
Sussex Borough
Wawayanda State Park
Frankford Township
Branchville Borough
Silver Lake
Lake Owassa
Bear Swamp WMA
Vernon Township
Highland Lake
Hamburg Borough
Hamburg Mountain WMA
Franklin Borough
Hardyston Township
Bearfort Mountain State Park
Walpack Township
Delaware Water Gap NRA
Lafayette Township
Hampton Township
Sparta Township
Sparta Mountain WMA
Ogdensburg Borough
Stillwater Township
Swartswood Lake
Swartswood State Park
Newton Town
West Milford Township
Clinton Reservoir
Passaic County
Hardwick Township
Fredon Township
Whittingham WMA
Andover Township
Andover Borough
Lake Mohawk
Weldon Brook WMA
Jefferson Township
Bloomingdale Borough
Butler Borough
Kinnelon Borough
Green Township
Byram Township
Hopatcong Borough
Lake Hopatcong
Rockaway River WMA
Rockaway Township
Wildcat Ridge WMA
Highland Lake
Blairstown Township
Frelinghuysen Township
Warren County
Knowlton Township
Hope Township
Stanhope Borough
Allamuchy Township
Allamuchy State Park
Netcong Borough
Mount Arlington Borough
Wharton Borough
Rockaway Township
Morris County
Boonton Township
Montville Township
Mountain Lakes Borough
Boonton Town
Rockaway Borough
Dover Town
Randolph Township
Denville Township
Parsippany Hills Township
Mine Hill Township
Roxbury Township
Mount Olive Township
Budd Lake
Independence Township
Liberty Township
Hackettstown Town
Pequest River
White Township
Mansfield Township
Oxford Township
Washington Township
Chester Township
Randolph Township
Morris Township
Mendham Township
Mor Plains Boro
Mo Town
Borough
THE LAND CONSERVANCY OF NEW JERSEY
ARESTY MAPPING CENTER
19 Boonton Ave
Boonton, NJ 07005
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Map Prepared May 4, 2016
Data Sources: NJGS Well Head Protection for Public-Community Water-Supply Wells in NJ 2011; NJDEP, NJGIN Road Network 2014, ESRI
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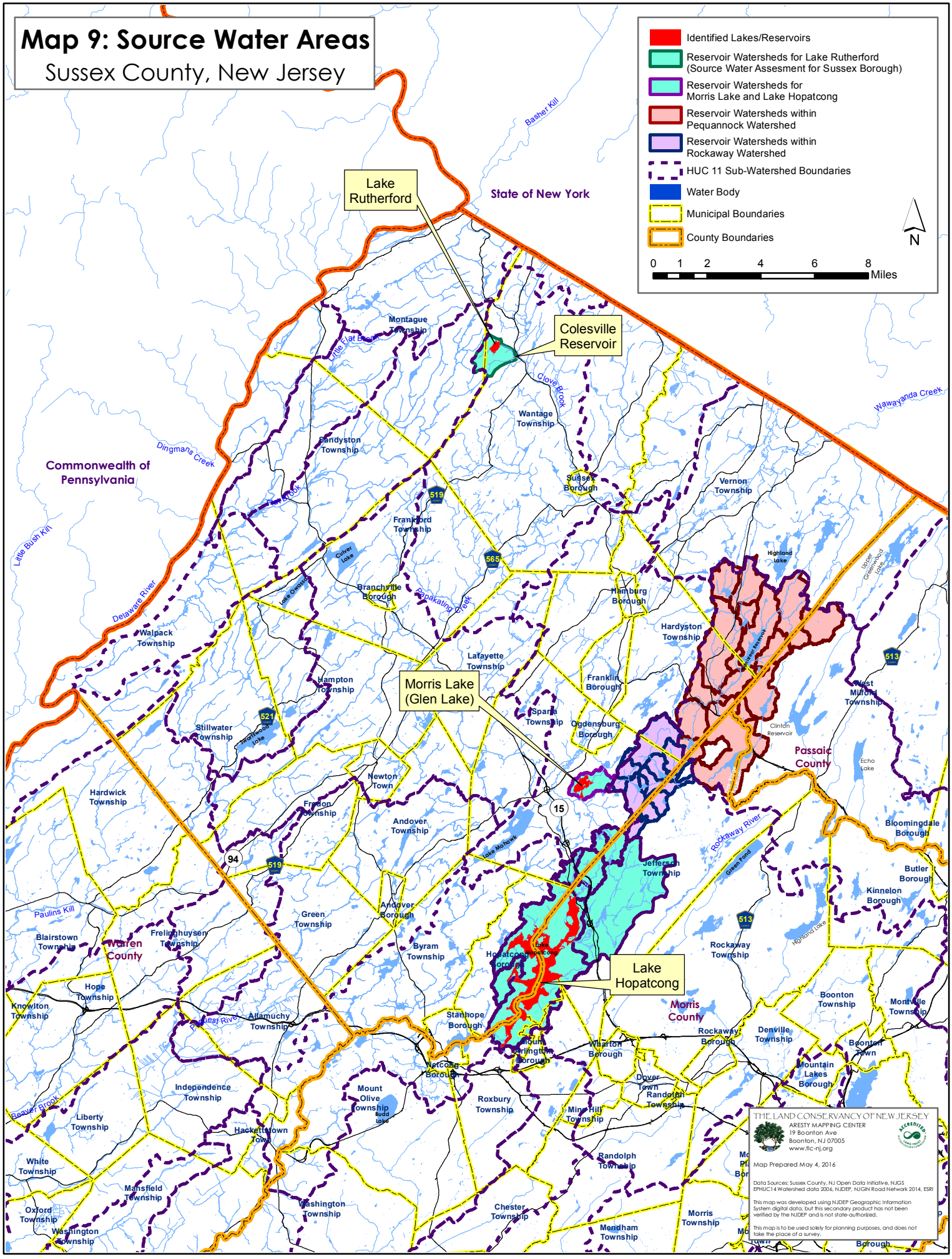
Map 9: Source Water Areas
Sussex County, New Jersey
Identified Lakes/Reservoirs
Reservoir Watersheds for Lake Rutherford (Source Water Assesment for Sussex Borough)
Reservoir Watersheds for Morris Lake and Lake Hopatcong
Reservoir Watersheds within Pequannock Watershed
Reservoir Watersheds within Rockaway Watershed
HUC 11 Sub-Watershed Boundaries
Water Body
Municipal Boundaries
County Boundaries
N
0 1 2 4 6 8 Miles
Lake Rutherford
Colesville Reservoir
Morris Lake (Glen Lake)
Lake Hopatcong
State of New York
Commonwealth of Pennsylvania
Basher Kill
Wawayanda Creek
Dingmans Creek
Little Bush Kill
Delaware River
Paulins Kill
Beaver Brook
Rockaway River
Montague Township
Sandyston Township
Wantage Township
Sussex Borough
Vernon Township
Frankford Township
Branchville Borough
Walpack Township
Hampton Township
Lafayette Township
Hamburg Borough
Hardyston Township
Franklin Borough
Sparta Township
Ogdensburg Borough
West Milford Township
Passaic County
Stillwater Township
Newton Town
Hardwick Township
Andover Township
Andover Borough
Green Township
Byram Township
Jefferson Township
Rockaway Township
Bloomingdale Borough
Butler Borough
Kinnelon Borough
Warren County
Blairstown Township
Frelinghuysen Township
Hope Township
Knowlton Township
Allamuchy Township
Stanhope Borough
Hopatcong Borough
Roxbury Township
Mount Arlington Borough
Netcong Borough
Wharton Borough
Morris County
Rockaway Borough
Denville Township
Boonton Township
Boonton Town
Montville Township
Mountain Lakes Borough
Dover Town
Randolph Township
Mine Hill Township
Liberty Township
Independence Township
Mount Olive Township
Hackettstown Town
White Township
Mansfield Township
Oxford Township
Washington Township
Chester Township
Mendham Township
Morris Township
Randolph Township
Lake Owassa
Culver Lake
Swartswood Lake
Budd Lake
Clinton Reservoir
Echo Lake
Highland Lake
Upper Greenwood Lake
Green Pond
Lake Mohawk
Lake Hopatcong
94
15
519
565
521
513
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EPHUC14 Watershed data 2006, NJDEP, NJGIN Road Network 2014, ESRI
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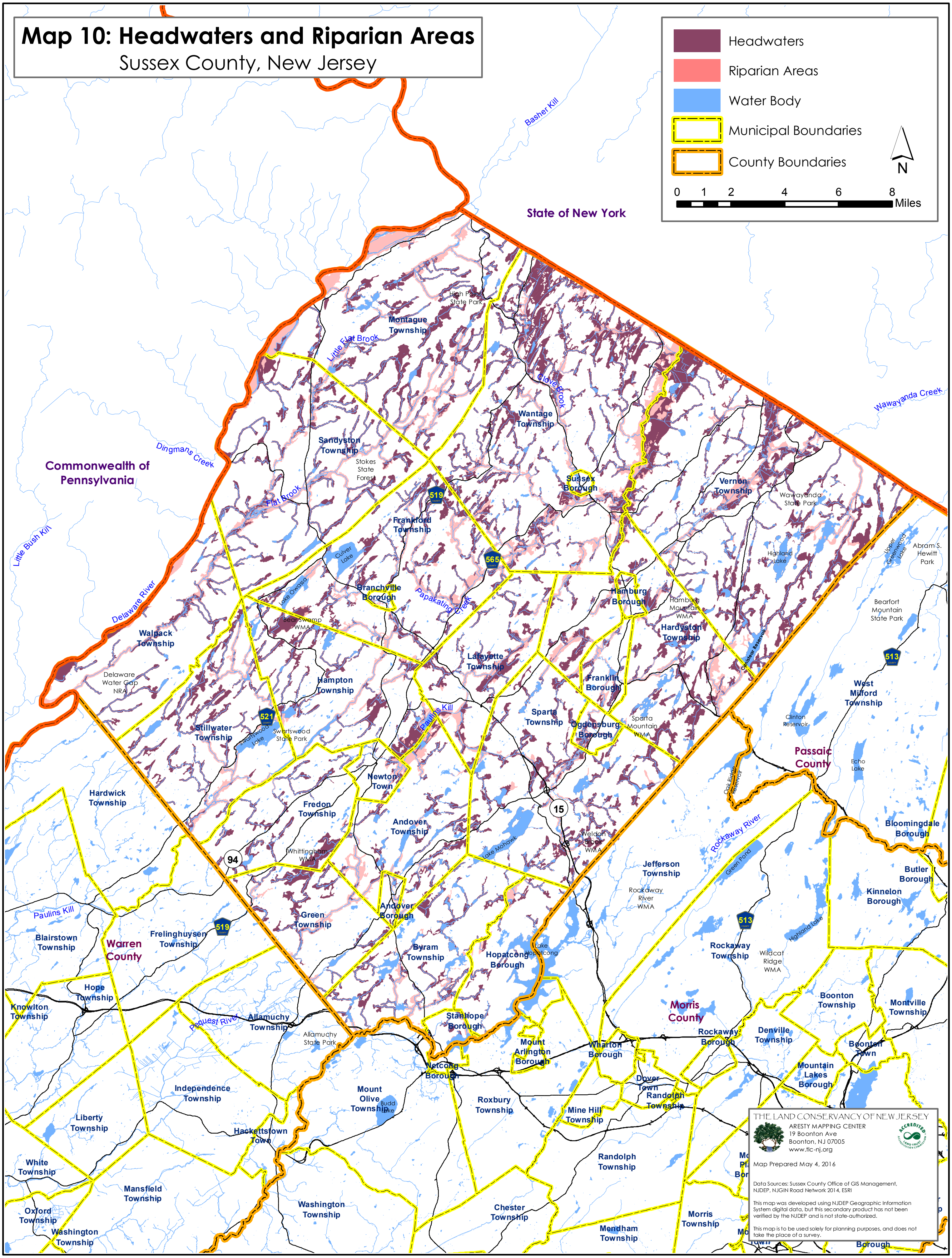
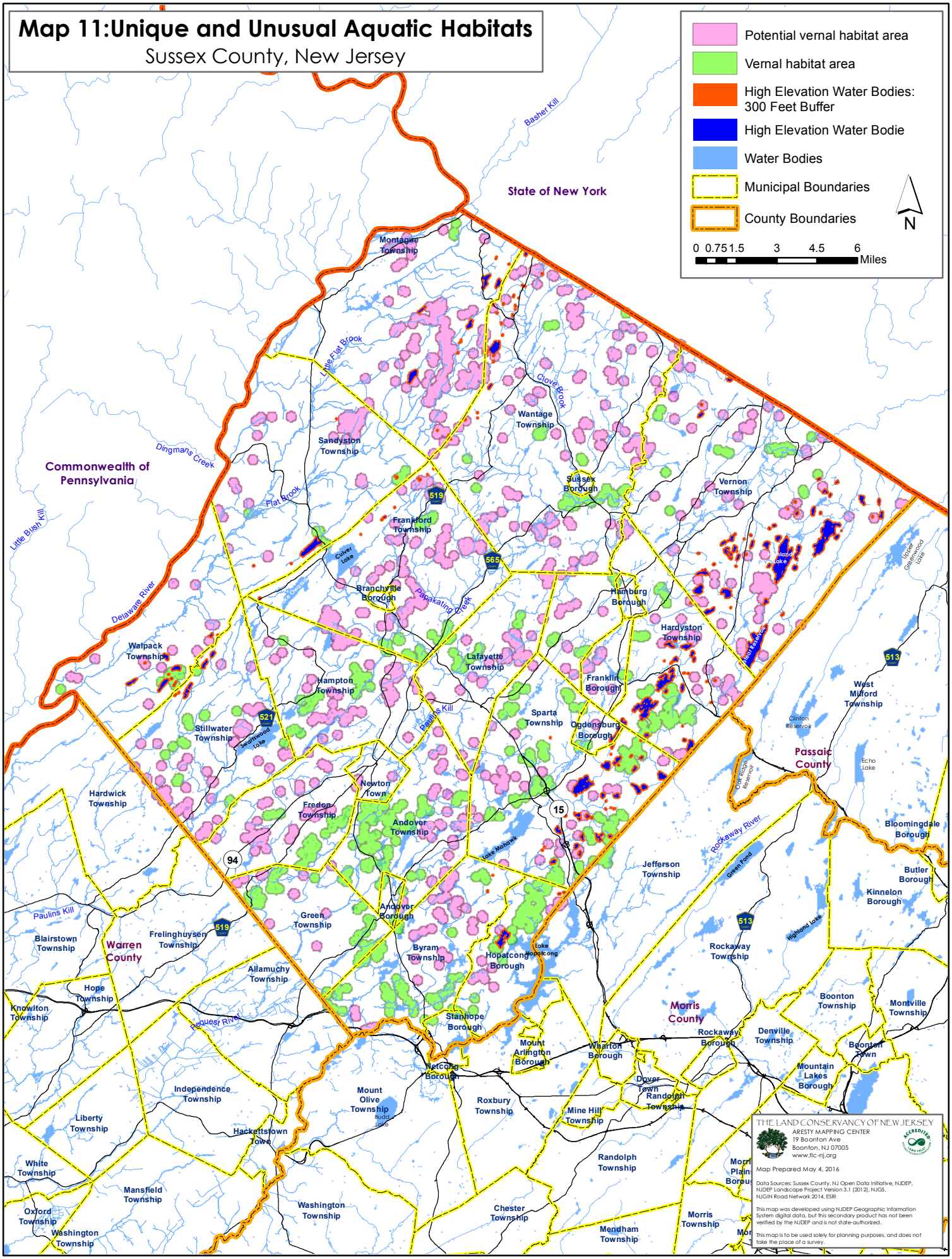
Map 10: Headwaters and Riparian Areas

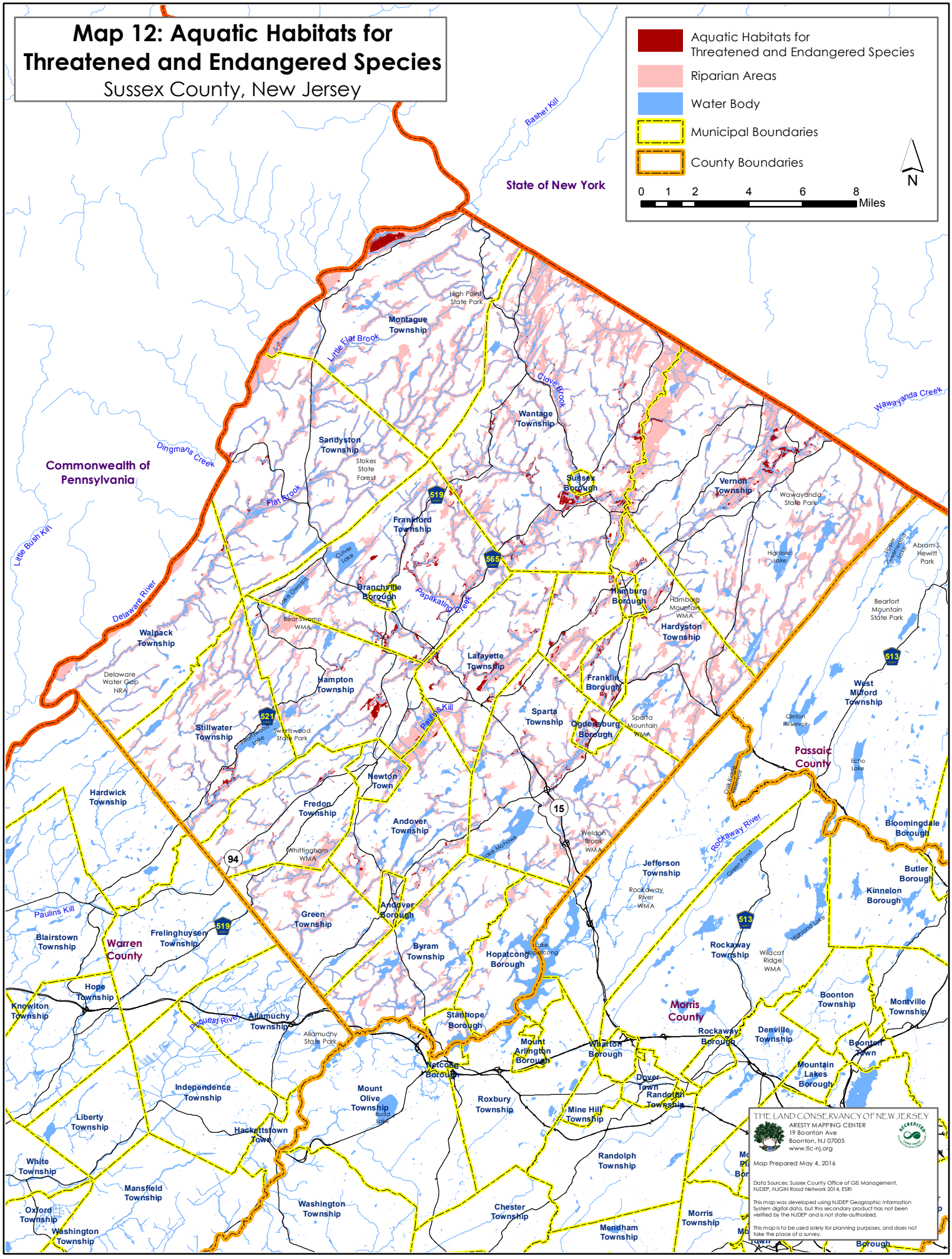
Sussex County, New Jersey



Map 11:Unique and Unusual Aquatic Habitats

Sussex County, New Jersey




Map 12: Aquatic Habitats for Threatened and Endangered Species
Sussex County, New Jersey
Aquatic Habitats for Threatened and Endangered Species
Riparian Areas
Water Body
Municipal Boundaries
County Boundaries
0 1 2 4 6 8 Miles
N
State of New York
Commonwealth of Pennsylvania
Basher Kill
Wawayanda Creek
Dingmans Creek
Little Flat Brook
Clove Brook
Flat Brook
Little Bush Kill
Delaware River
Papakating Creek
Paulins Kill
Pequest River
Rockaway River
Montague Township
Sandyston Township
Wantage Township
Sussex Borough
Vernon Township
Frankford Township
Branchville Borough
Hamburg Borough
Hardyston Township
Walpack Township
Lafayette Township
Hampton Township
Franklin Borough
Sparta Township
Ogdensburg Borough
Stillwater Township
Newton Town
Fredon Township
Andover Township
Andover Borough
Hardwick Township
Green Township
Blairstown Township
Frelinghuysen Township
Warren County
Byram Township
Hopatcong Borough
Jefferson Township
Rockaway Township
Passaic County
West Milford Township
Bloomingdale Borough
Butler Borough
Kinnelon Borough
Hope Township
Knowlton Township
Allamuchy Township
Stanhope Borough
Netcong Borough
Mount Arlington Borough
Roxbury Township
Mine Hill Township
Dover Town
Randolph Township
Rockaway Borough
Denville Township
Boonton Township
Montville Township
Mountain Lakes Borough
Morris County
Independence Township
Liberty Township
Hackettstown Town
Mount Olive Township
White Township
Mansfield Township
Oxford Township
Washington Township
Chester Township
Mendham Township
Morris Township
Randolph Township
Lake Mohawk
Lake Hopatcong
Swartswood Lake
Lake Owassa
Culver Lake
Highland Lake
Green Pond
Clinton Reservoir
Oak Ridge Reservoir
Echo Lake
Wawayanda State Park
Bearfort Mountain State Park
Abram S. Hewitt Park
Stokes State Forest
High Point State Park
Swartswood State Park
Allamuchy State Park
Delaware Water Gap NRA
Bear Swamp WMA
Whittingham WMA
Weldon Brook WMA
Rockaway River WMA
Hamburg Mountain WMA
Sparta Mountain WMA
Wildcat Ridge WMA
Budd Lake
519
565
513
521
94
15
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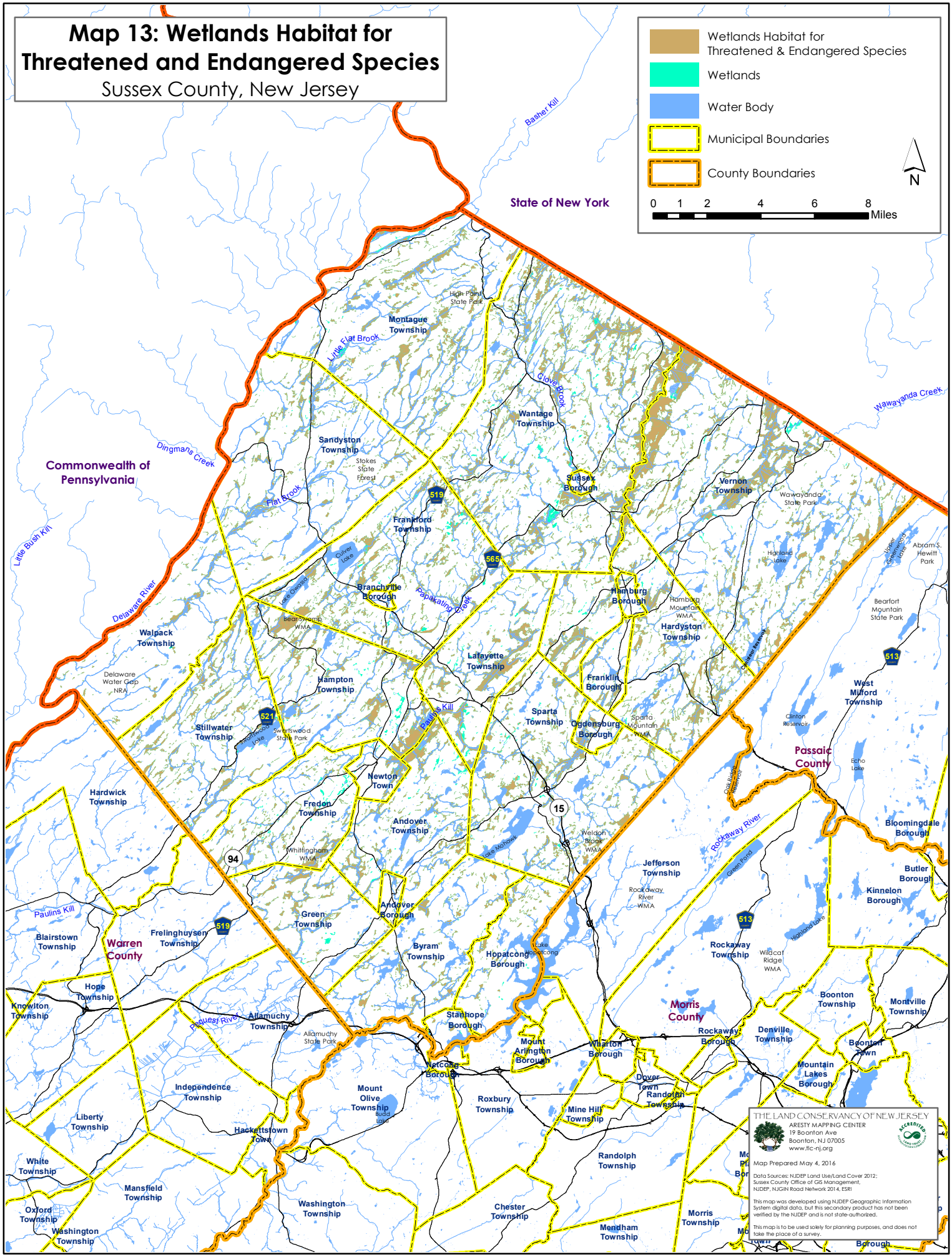
Map 13: Wetlands Habitat for Threatened and Endangered Species

Sussex County, New Jersey



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Map Prepared May 4, 2016

Data Sources: NJDEP Land Use/Land Cover 2012; Sussex County Office of GIS Management, NJDEP, NJGIN Road Network 2014, ESRI

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