RUTGERS
New Jersey Agricultural Experiment Station

Watershed Restoration and Protection Plan for the Rancocas Creek

Rutgers Cooperative Extension Water Resources Program
Christopher C. Obropta, Ph.D., P.E.
May 11, 2024

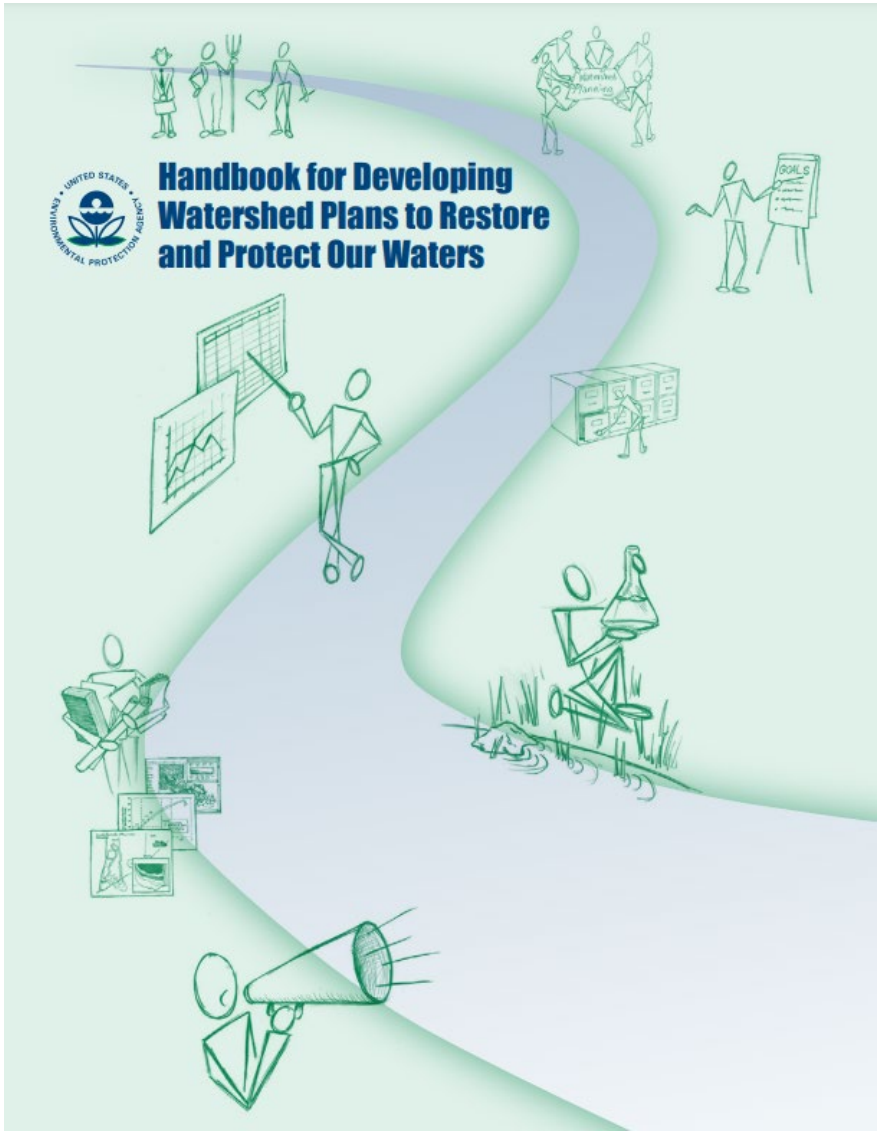
Rutgers Cooperative Extension

Rutgers Cooperative Extension (RCE) helps the diverse population of New Jersey adapt to a rapidly changing society and improves their lives through an educational process that uses science-based knowledge.

Water Resources Program

Our mission is to identify and address water resources issues by engaging and empowering communities to employ practical science-based solutions to help create a more equitable and sustainable New Jersey.

Summary of Scope of Work



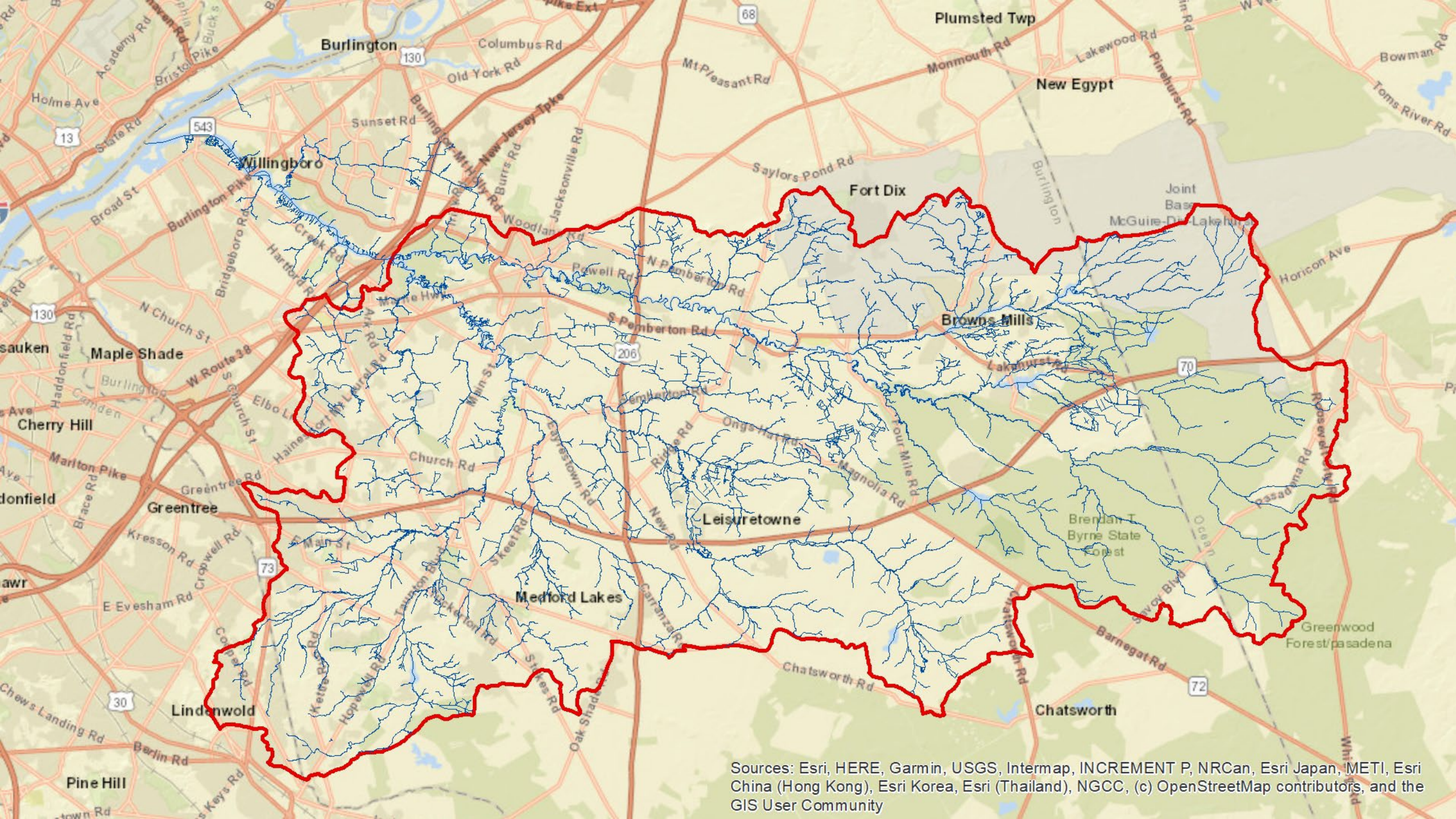
The Rutgers Cooperative Extension (RCE) Water Resources Program will work closely the municipalities and watershed groups to complete a Watershed Restoration and Protection Plan for Rancocas Creek that satisfies the EPA's nine minimum plan criteria.

Reason for the Work

Much of the Rancocas Creek and its tributaries have impaired water quality, which is caused by stormwater runoff. Additionally, many communities in the Rancocas Creek suffer from localized flooding. This project will create a plan that will be a blueprint for how to improve these conditions.

Detailed Scope of Work (List of Objectives)

1. Identification of the causes and sources of nutrient loading
2. Estimation of the load reductions expected for the management measures
3. Recommendation of nonpoint source (NPS) management measures to address the causes and sources
4. Estimation of the amounts of technical and financial assistance needed
5. Development and delivery of informational and education component
6. Development of a schedule for implementing NPS controls
7. Development of interim, measurable milestones
8. Development of criteria to ensure load reductions are being achieved
9. Development of a monitoring component to evaluate effectiveness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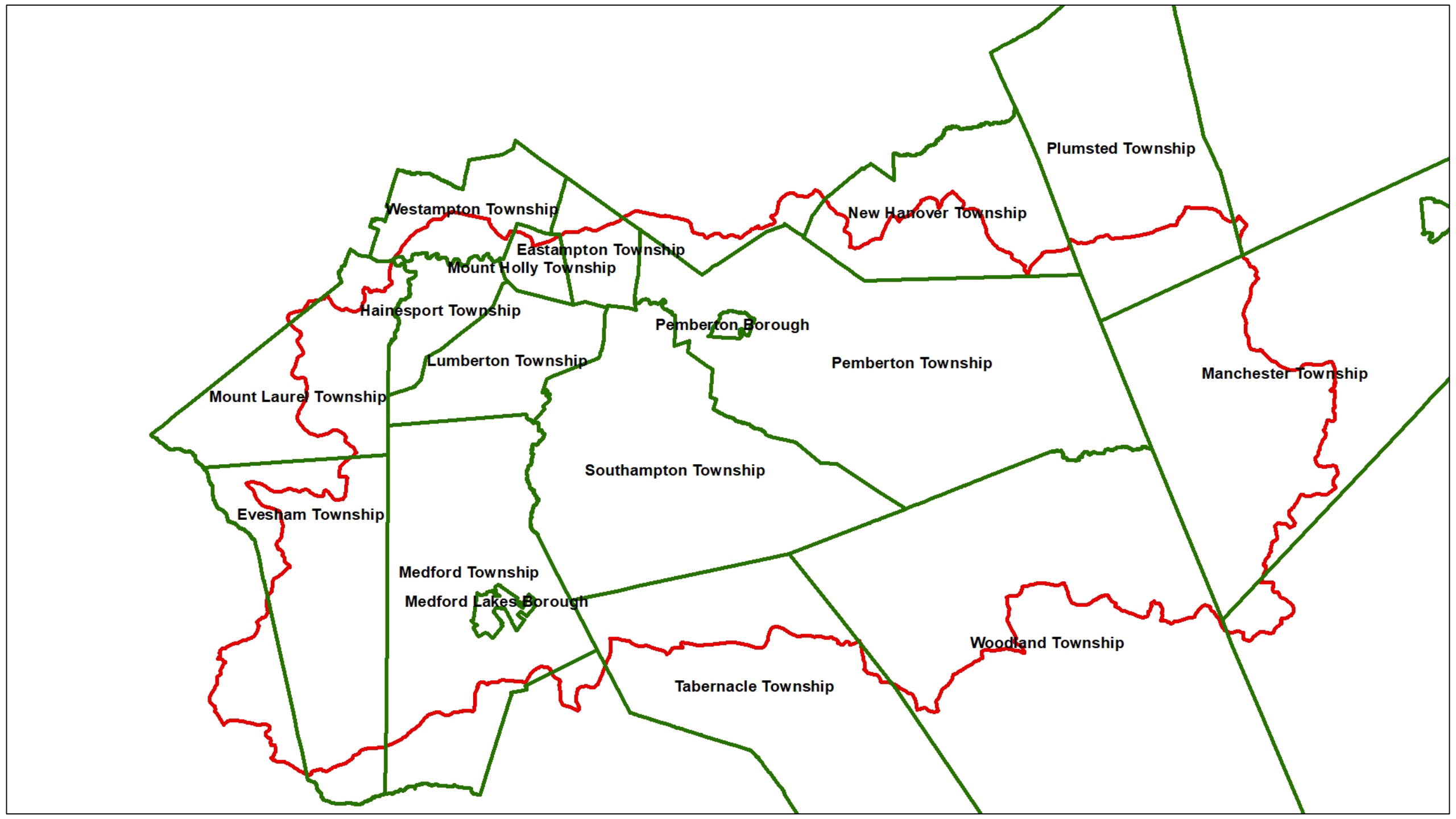
Plumsted Twp
New Egypt
Willingboro
Fort Dix
Browns Mills
Maple Shade
Cherry Hill
Greentree
Leisuretowne
Medford Lakes
Lindenwold
Chatsworth
Pine Hill
Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community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Westampton Township
Eastampton Township
Mount Holly Township
Hainesport Township
Pemberton Borough
Lumberton Township
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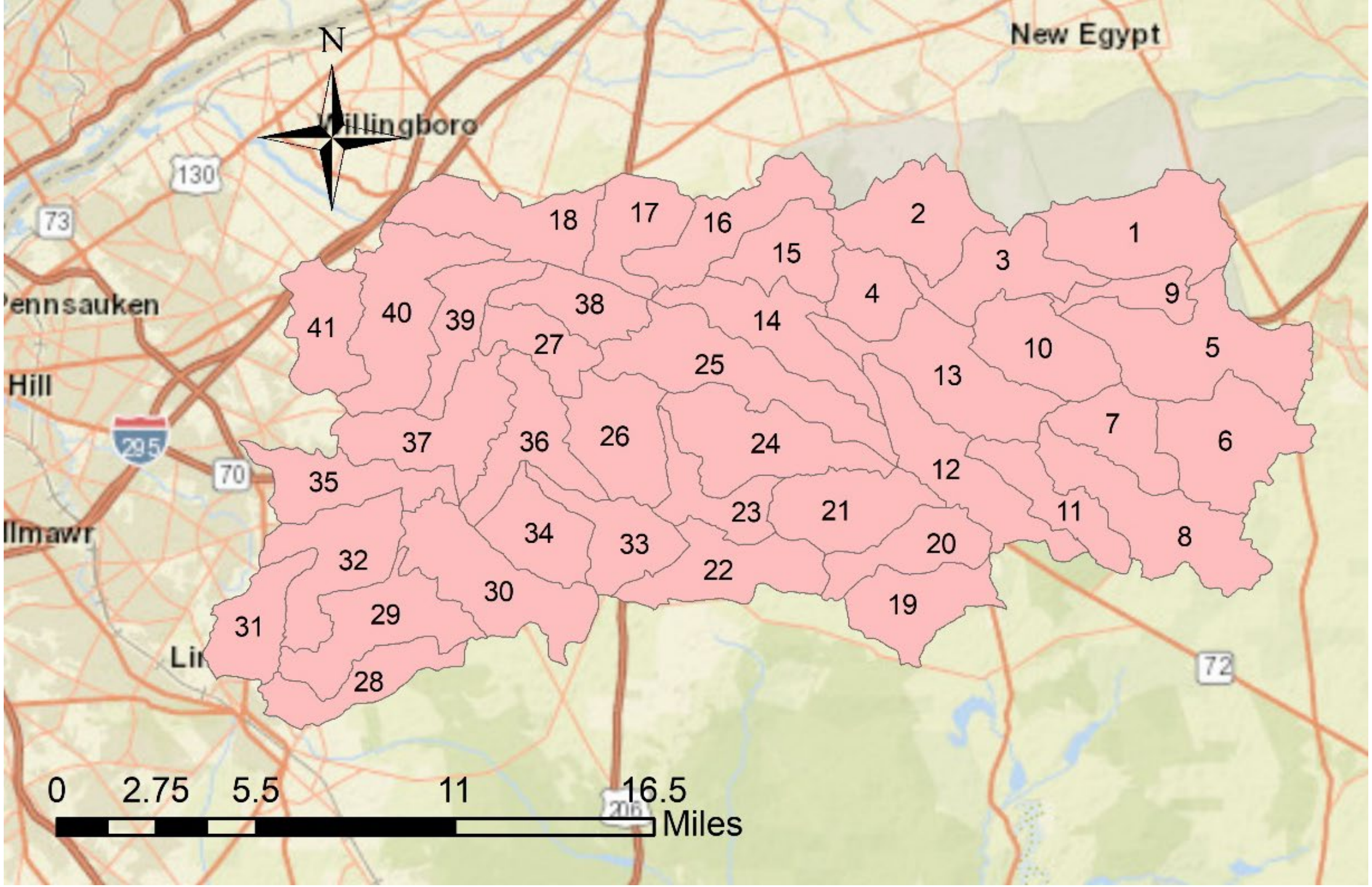
Manchester Township
Mount Laurel Township
Southampton Township
Evesham Township
Medford Township
Medford Lakes Borough
Woodland Township
Tabernacle Township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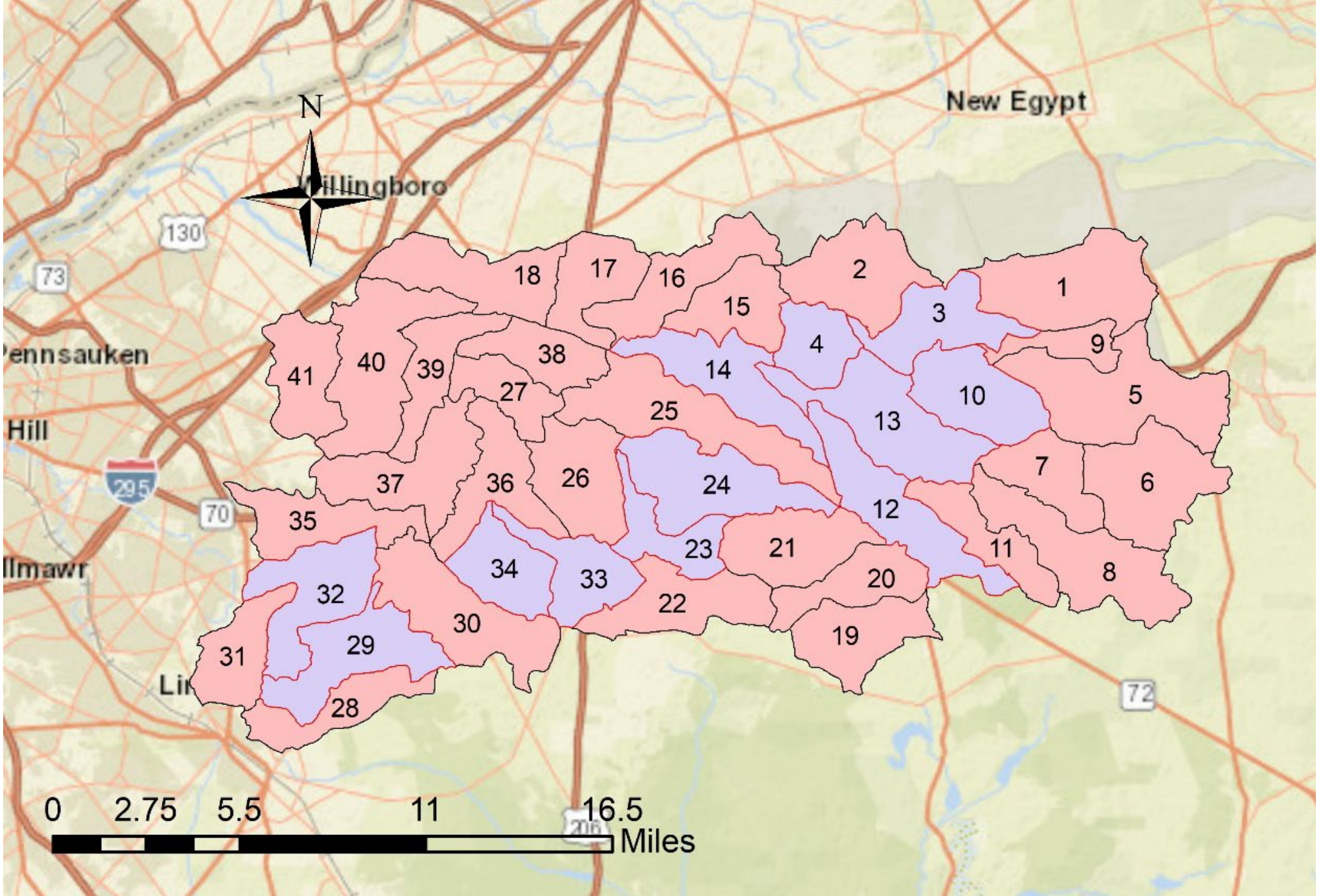
Miles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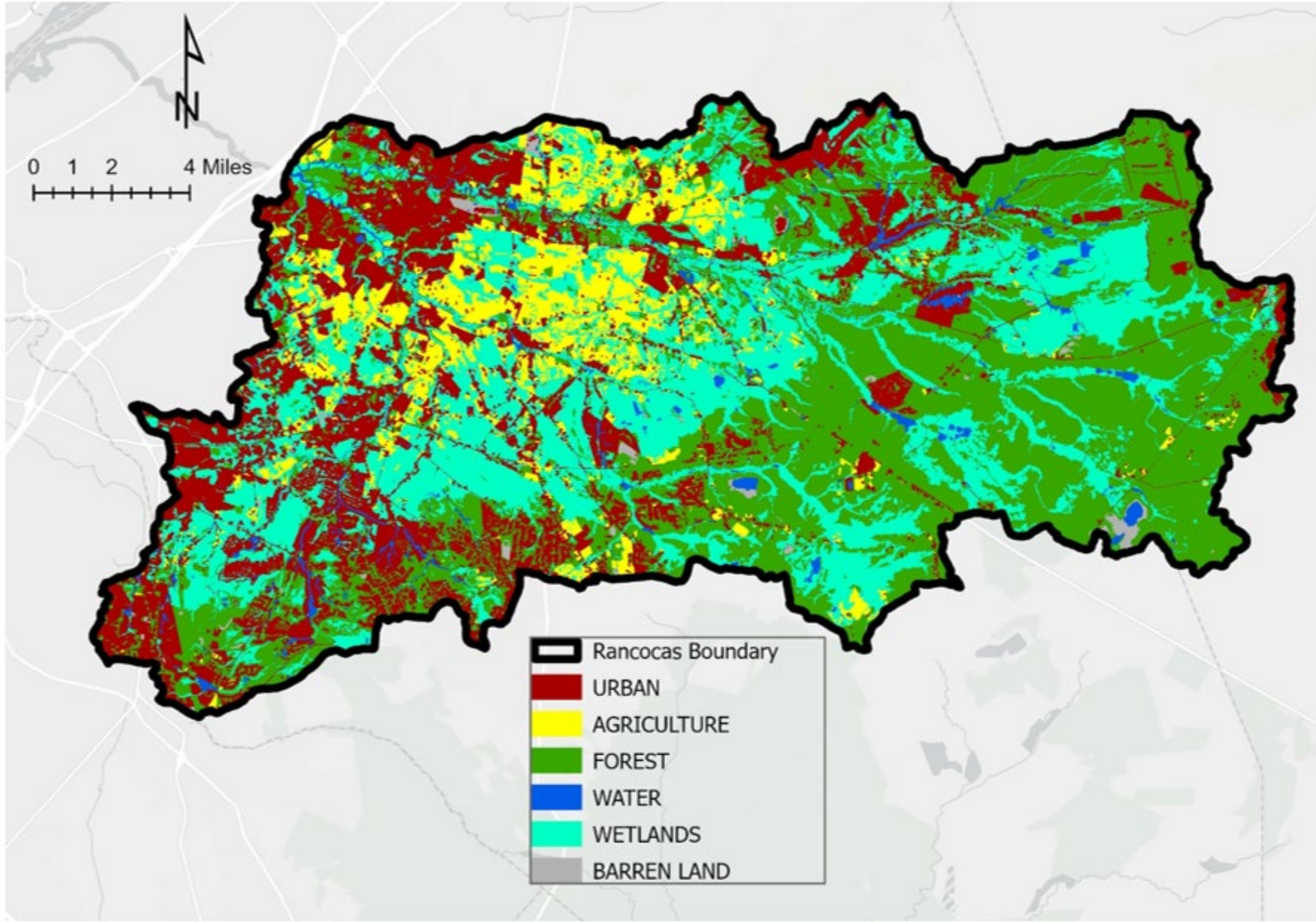
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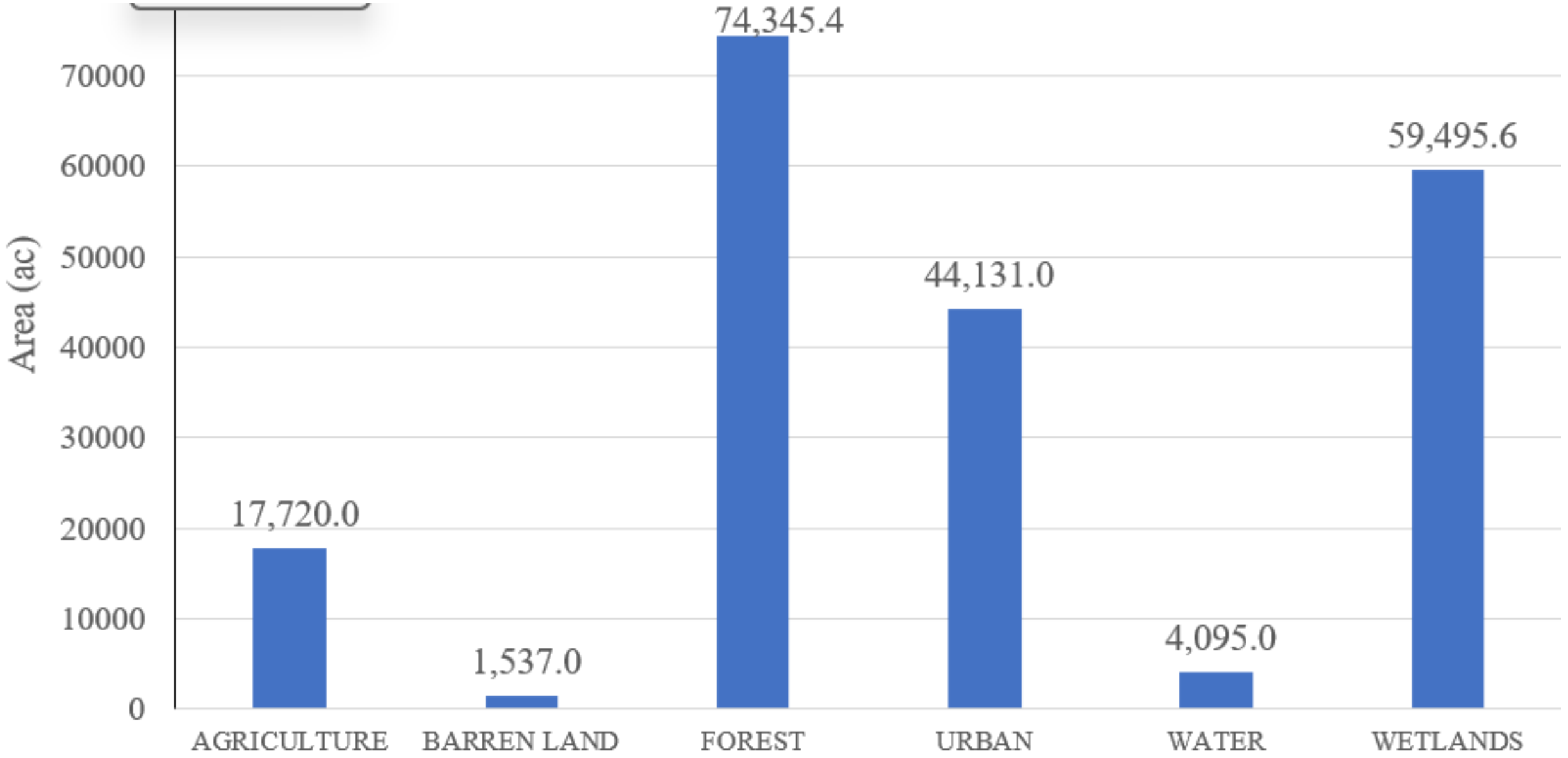
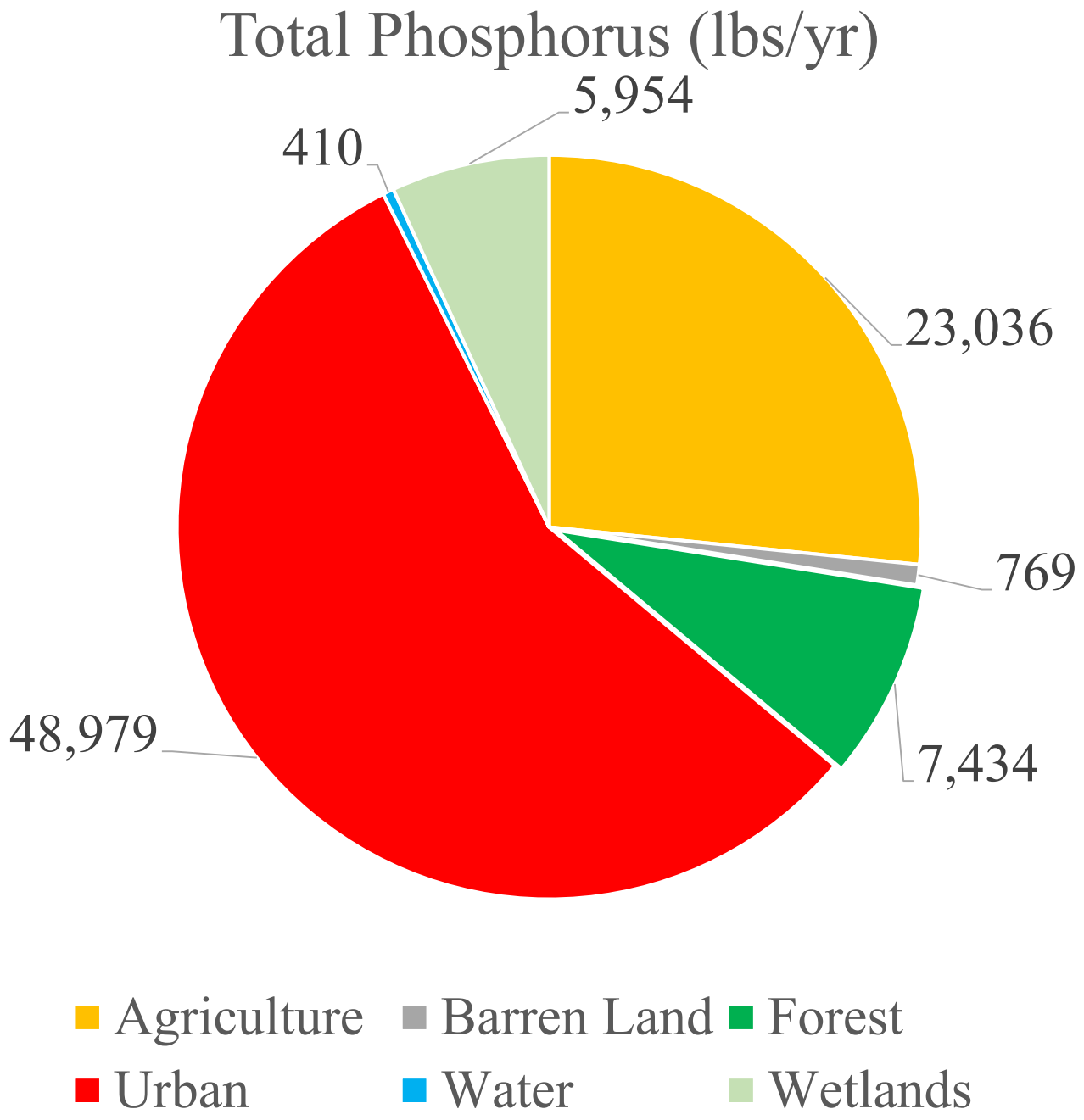
Rancocas Boundary
URBAN
AGRICULTURE
FOREST
WATER
WETLANDS
BARREN LAND

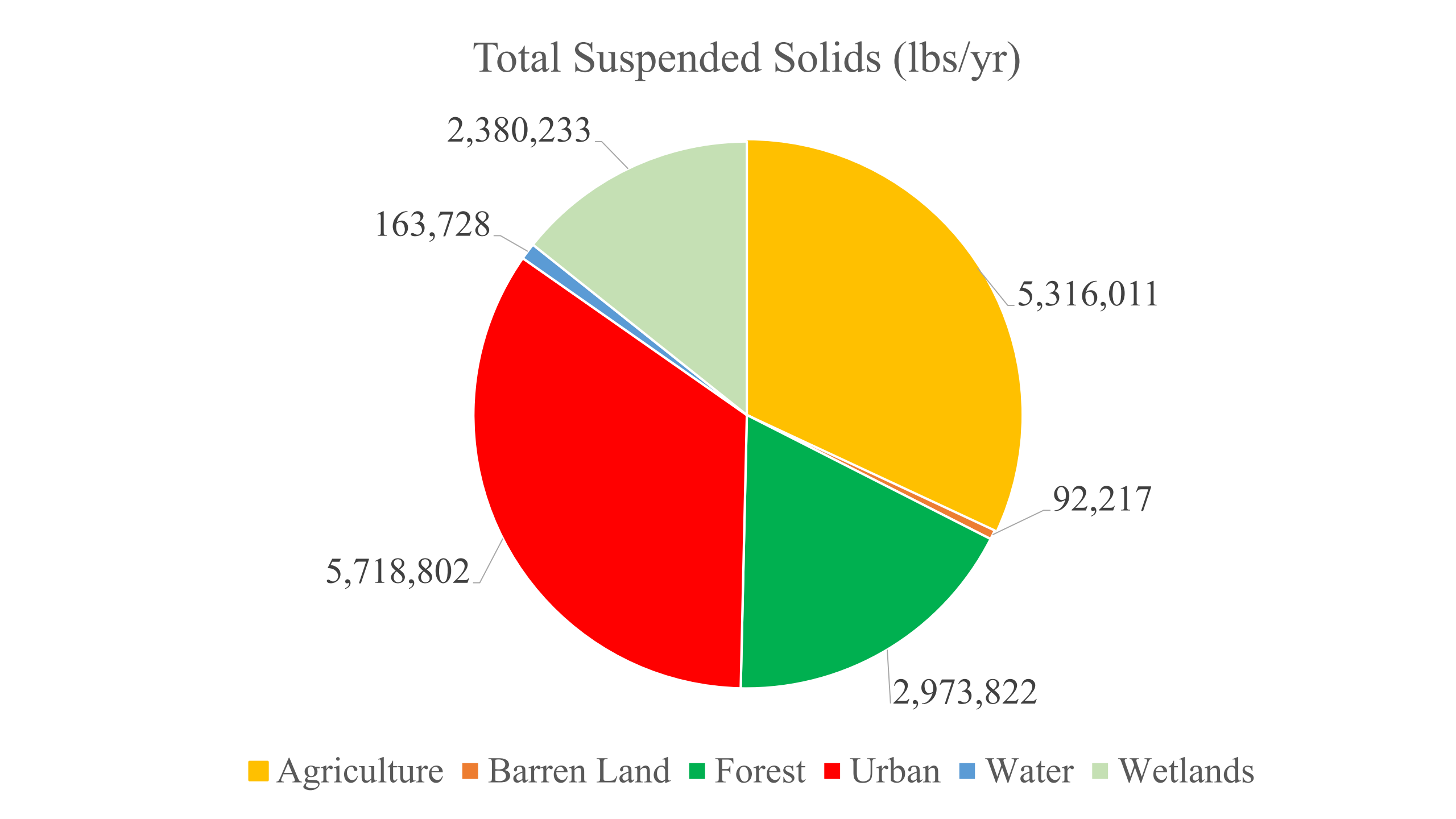

Area (ac)
70000
60000
50000
40000
30000
20000
10000
0
17,720.0
1,537.0
74,345.4
44,131.0
4,095.0
59,495.6
AGRICULTURE
BARREN LAND
FOREST
URBAN
WATER
WETLANDS

Land Cover	Total Phosphorus (TP) Load (lbs/acre/yr)	Total Nitrogen (TN) Load (lbs/acre/yr)	Total Suspended Solids (TSS) Load (lbs/acre/yr)
High, Medium Density Residential	1.4	15	140
Low Density, Rural Residential	0.6	5	100
Commercial	2.1	22	200
Industrial	1.5	16	200
Urban, Mixed Urban, Other Urban	1.0	10	120
Agriculture	1.3	10	300
Forest, Water, Wetlands	0.1	3	40
Barrenland/ Transitional Area	0.5	5	60

Pollutant Loads from Land Use

General Land Use Category	TP (lbs/yr)	TN (lbs/yr)	TSS (lbs/yr)
Agriculture	23,036	177,201	5,316,011
Barren Land	769	7,685	92,217
Forest	7,434	223,036	2,973,822
Urban	48,979	493,594	5,718,802
Water	410	12,280	163,728
Wetlands	5,954	178,523	2,380,233
Totals =	86,582	1,092,318	16,644,813


Total Phosphorus (lbs/yr)
5,954
410
23,036
769
48,979
7,434
Agriculture
Barren Land
Forest
Urban
Water
Wetlands


Total Suspended Solids (lbs/yr)
2,380,233
163,728
5,316,011
92,217
5,718,802
2,973,822
Agriculture
Barren Land
Forest
Urban
Water
Wetlands

Next Steps

- Conduct land use and nonpoint source loading calculations by HUC14 and by municipality
- Calculate impervious cover by HUC14 and by municipality
- Calculate stormwater runoff volumes for water quality storm, 2-, 10-, and 100-year storms by HUC14 and municipality (2020 and 2100 rainfall totals)
- Identify existing stormwater management practices for urban land uses
- Identify opportunities to reduce loading
  - Urban land uses
  - Agricultural land uses
  - Site specific
  - Watershed-wide

Green Infrastructure Practices

Bioretention Systems

- Rain Gardens
- Bioswales
- Stormwater Planters
- Curb Extensions
- Tree Filter Boxes

Permeable Pavements

Rainwater Harvesting

- Rain barrels
- Cisterns

Dry Wells

Rooftop Systems

- Green Roofs
- Blue Roofs

Infiltration Basins

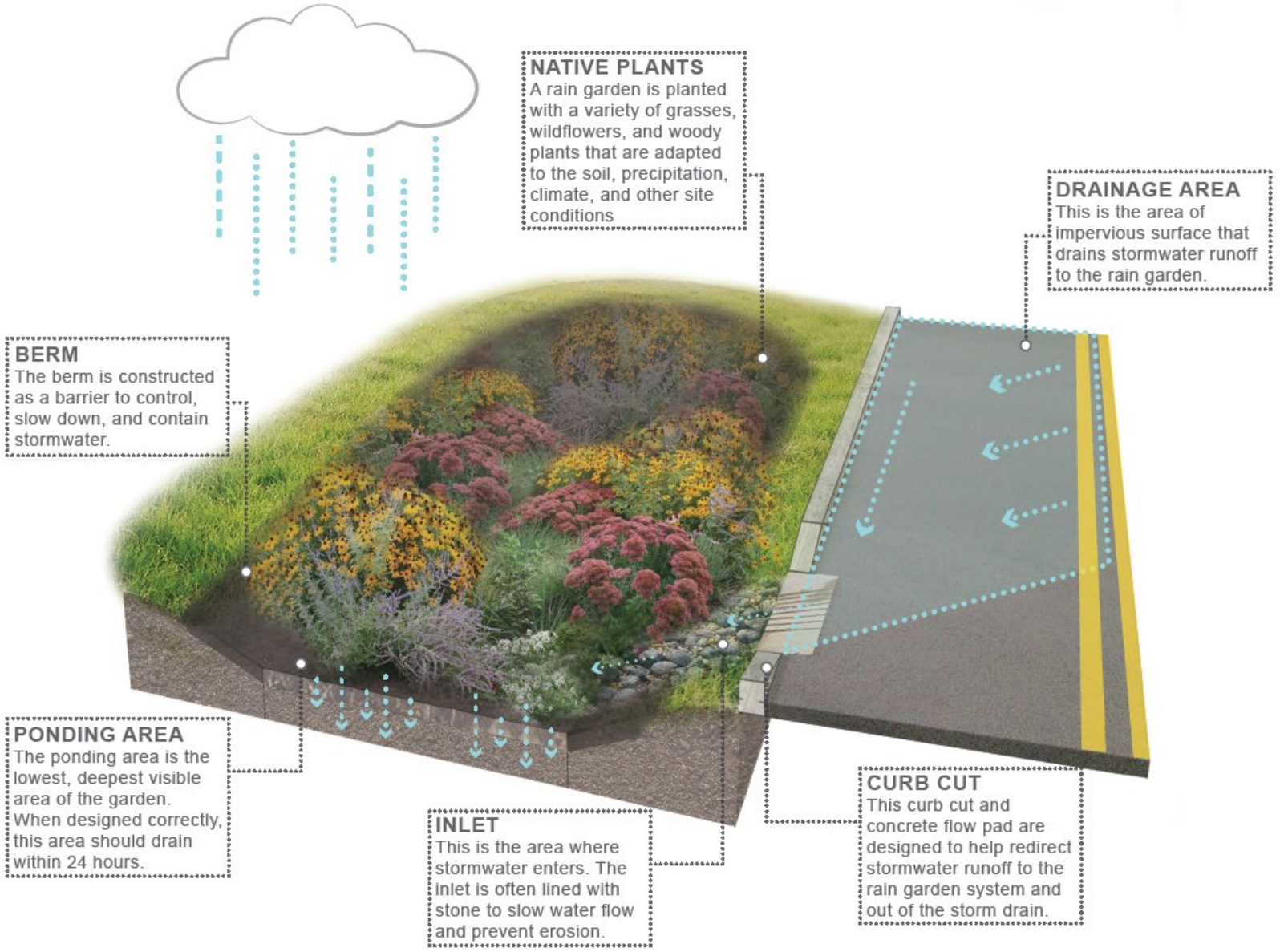
Sand Filters



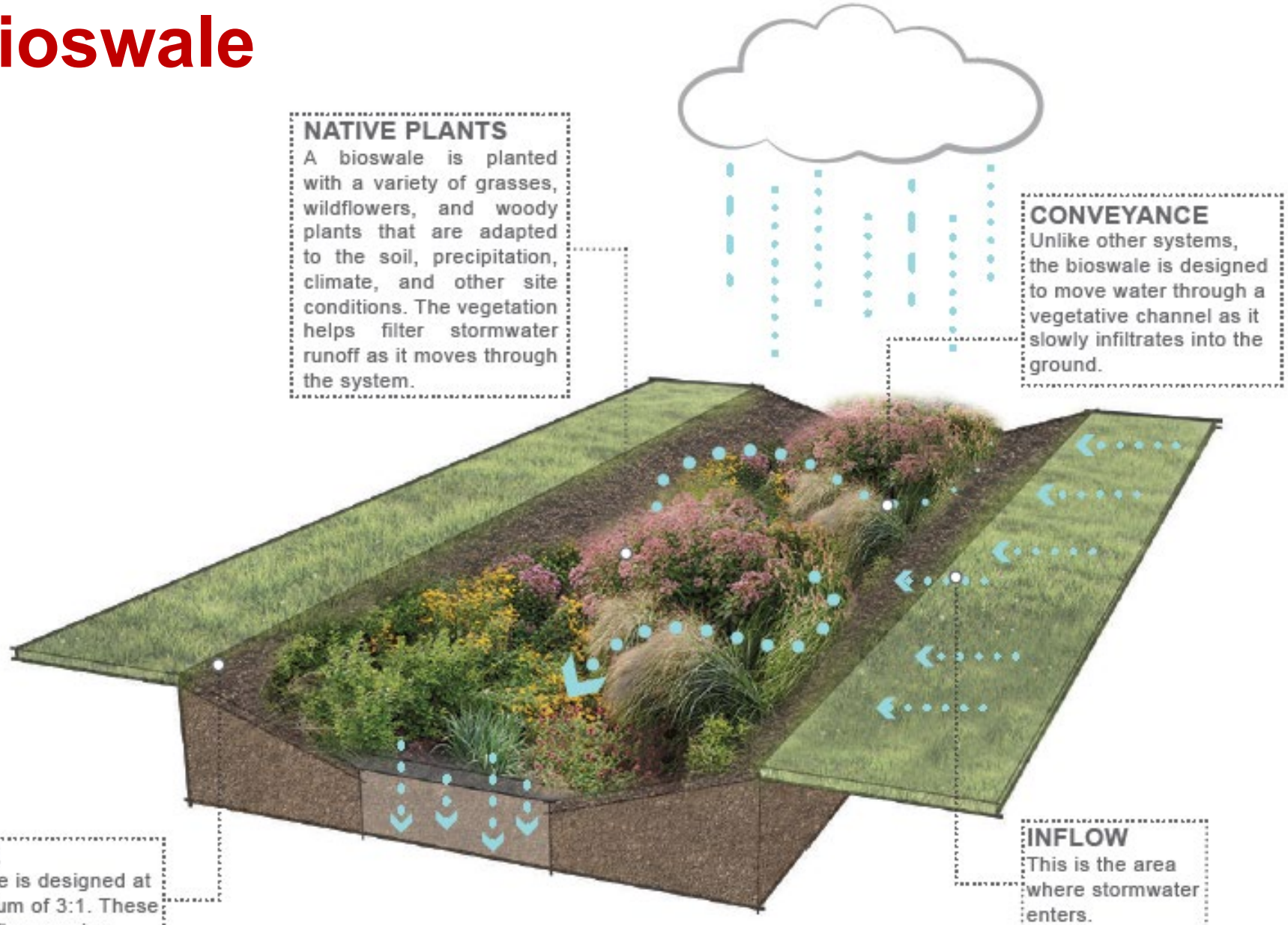





Rain Gardens



Bioswale



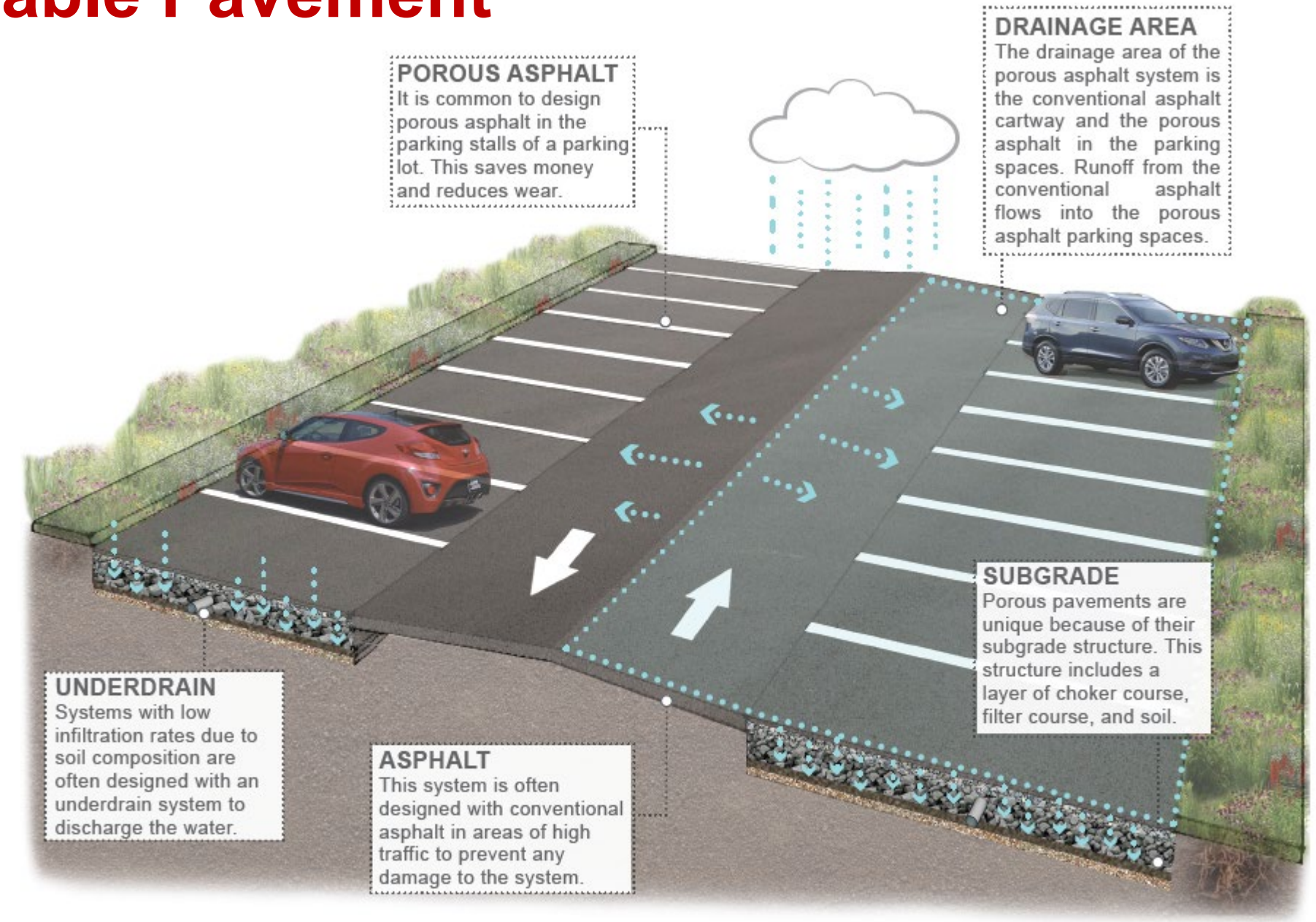
NATIVE PLANTS
A bioswale is planted with a variety of grasses, wildflowers, and woody plants that are adapted to the soil, precipitation, climate, and other site conditions. The vegetation helps filter stormwater runoff as it moves through the system.

CONVEYANCE
Unlike other systems, the bioswale is designed to move water through a vegetative channel as it slowly infiltrates into the ground.

SLOPE
The slope is designed at a maximum of 3:1. These slopes often require erosion control materials for stabilization.

INFLOW
This is the area where stormwater enters.

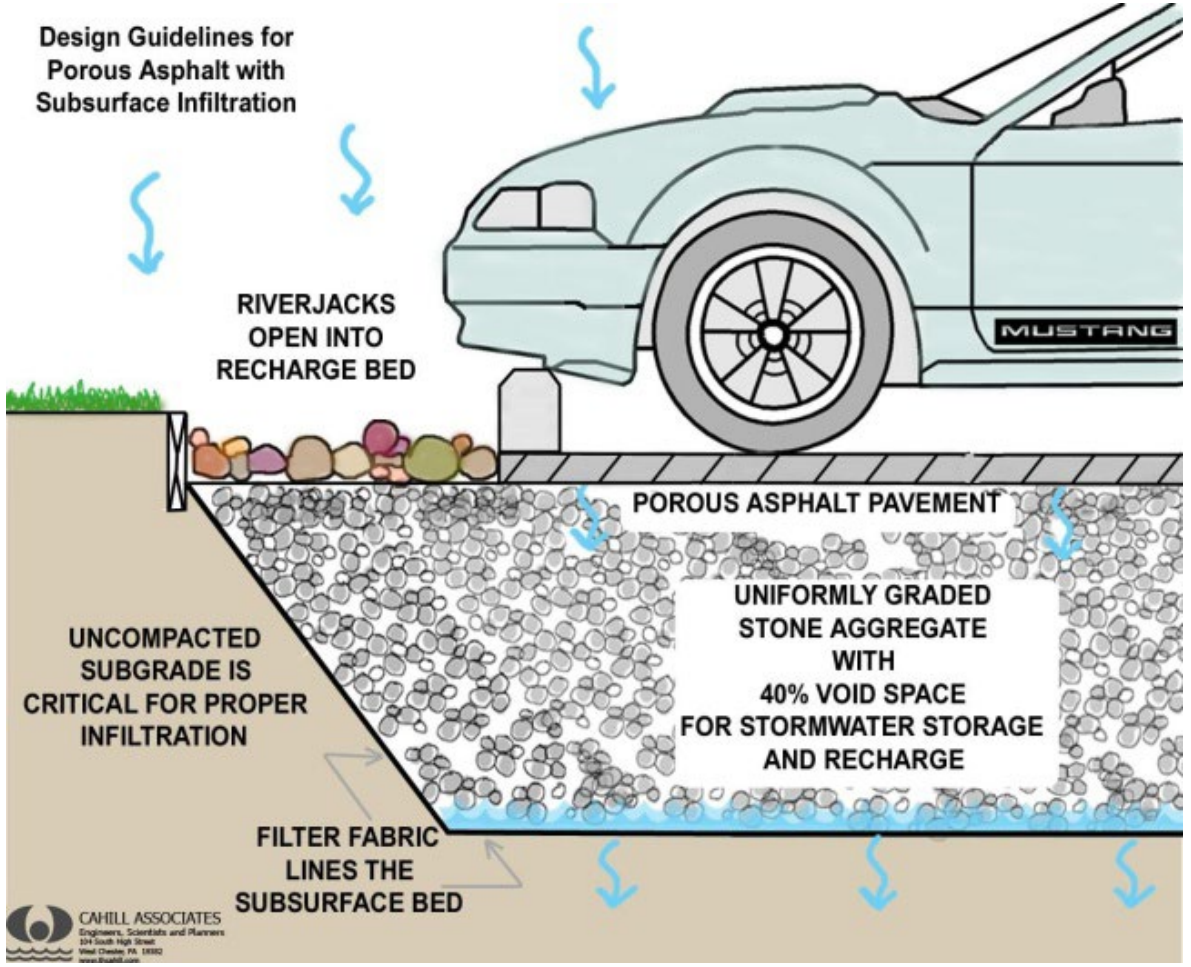
Permeable Pavement



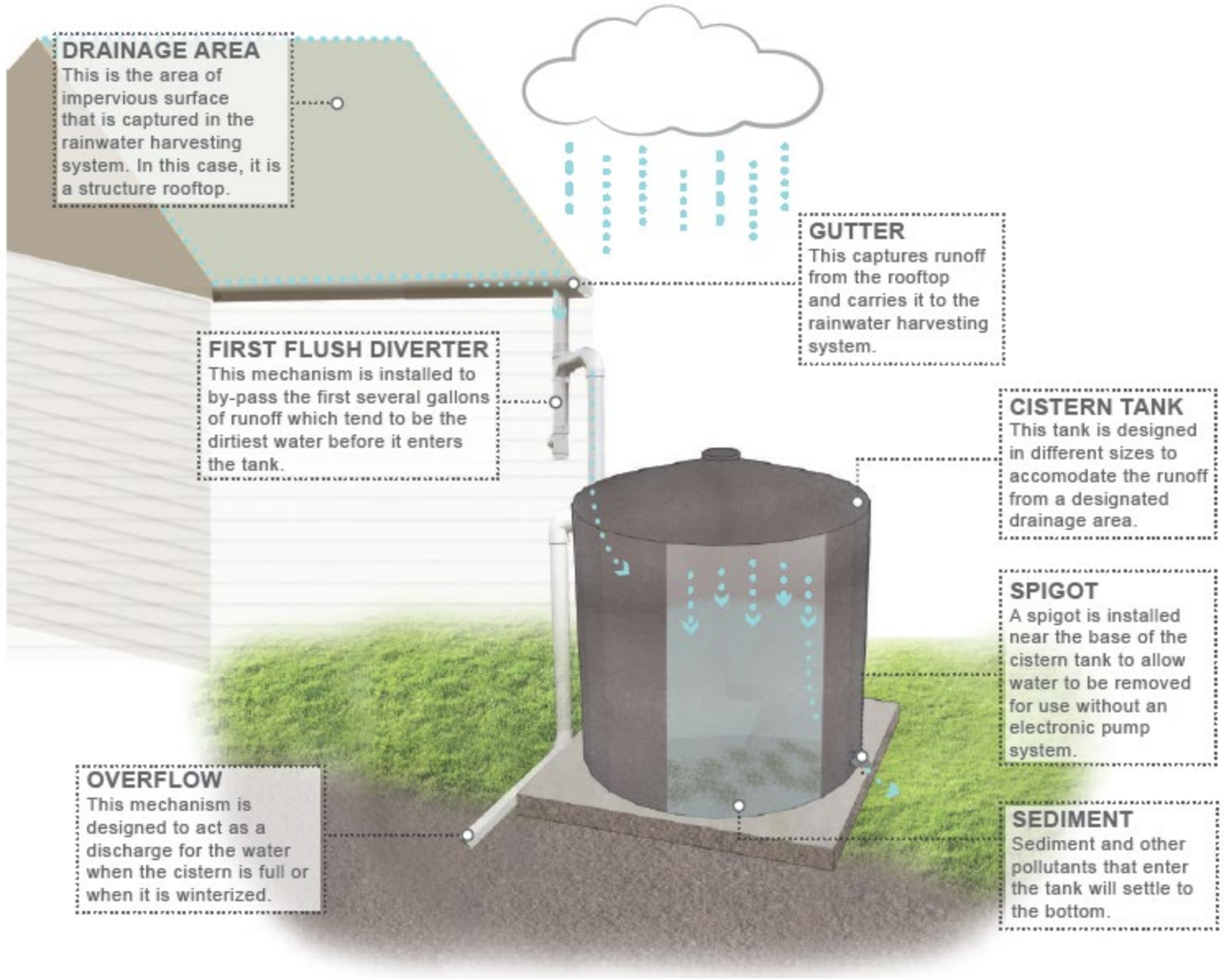
ADVANTAGES

- Manage stormwater runoff
- Minimize site disturbance
- Promote groundwater recharge
- Low life cycle costs, alternative to costly traditional stormwater management methods
- Mitigation of urban heat island effect
- Contaminant removal as water moves through layers of system

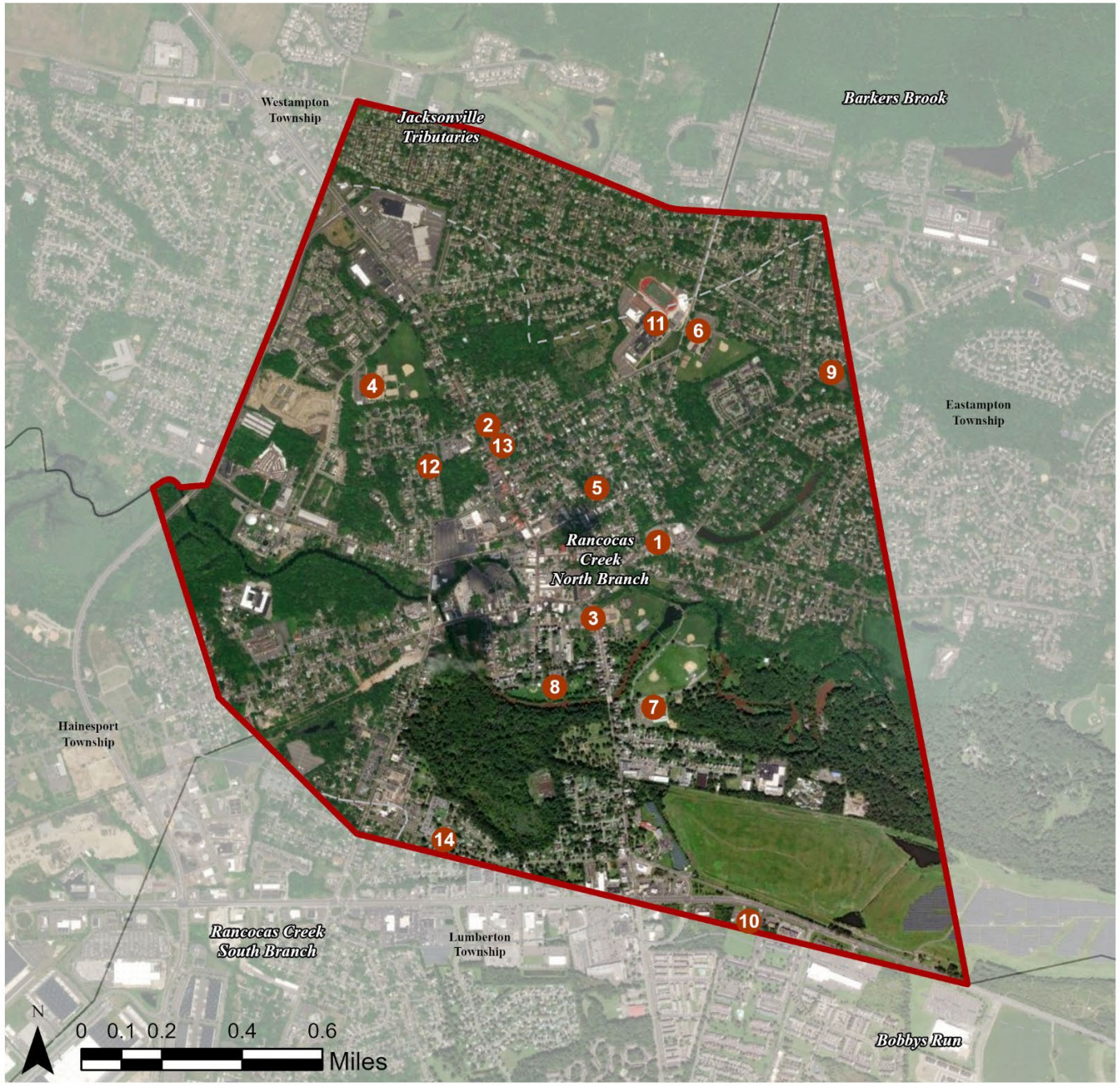
COMPONENTS



Rainwater Harvesting Systems



MOUNT HOLLY TOWNSHIP: GREEN INFRASTRUCTURE SITES



Rancocas Creek North Branch

1. America Emergency Squad
2. Burlington County Lyceum of History and Natural Science
3. Church and Pine Street Open Space
4. F.W. Holbein School
5. First Presbyterian Church
6. Gertrude C. Folwell School
7. John Brainerd Elementary School
8. Monroe Street Park
9. Mount Holly English SDA Church
10. New Jersey National Guard Armory
11. Rancocas Valley Regional High School
12. Samuel Miller Senior Housing
13. Temple Har Zion
14. Veterans of Foreign Wars

JOHN BRAINERD ELEMENTARY SCHOOL

HUC14: 02040202040050

Subwatershed: Rancocas Creek North Branch

Site Area: 456,949 sq. ft.

Address: 100 Wollner Drive
Mount Holly, NJ 08060

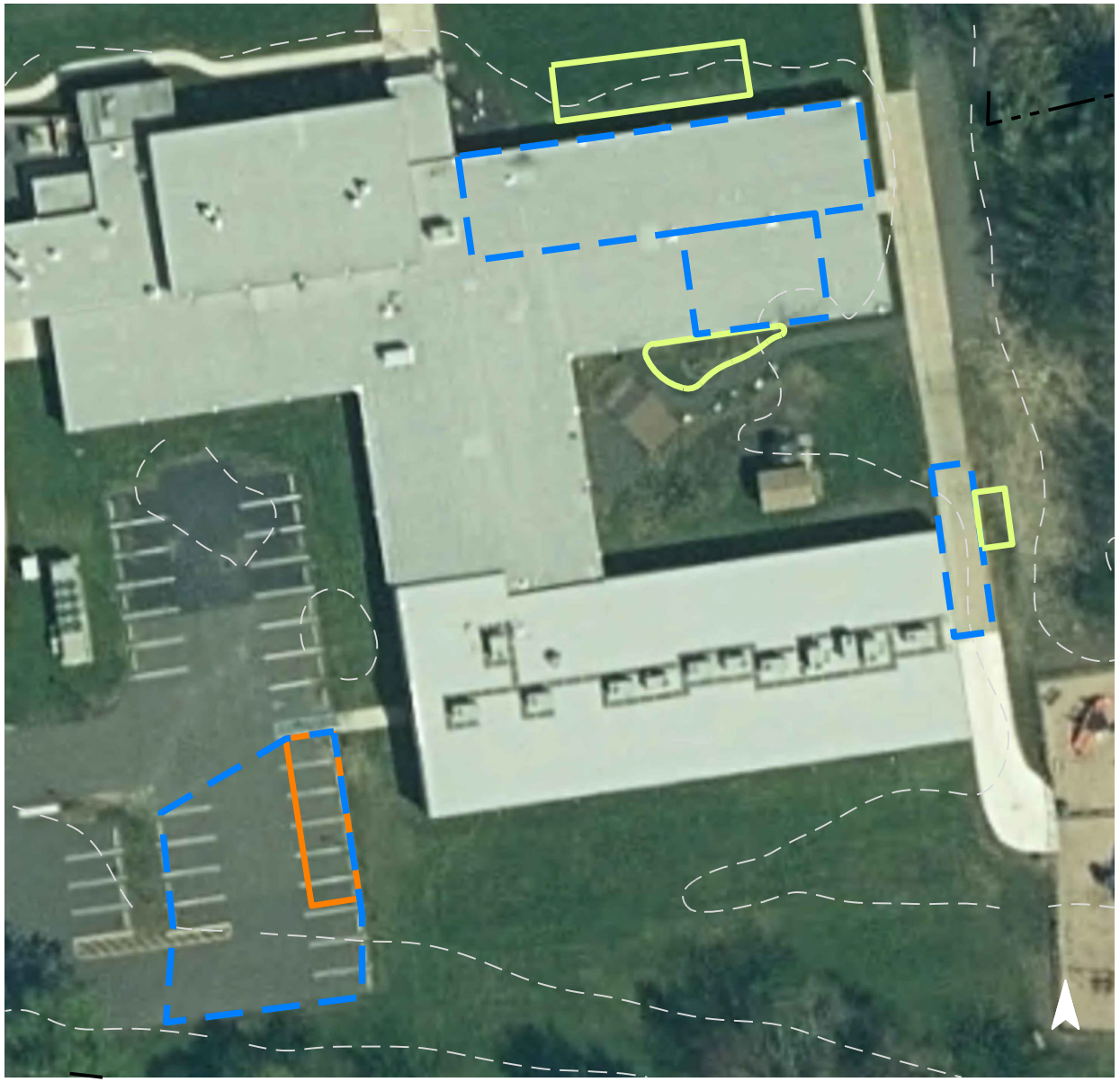
Block and Lot: Block 115 & Lot 100

Parking spaces in the parking lot to the southwest of the building can be converted to porous pavement to capture and infiltrate stormwater runoff from the parking lot. A rain garden can be installed in the grass area near the northeast wing of the building to capture, treat, and infiltrate stormwater runoff from the roof. Two rain garden can be installed in the grass area to the east of building and within the courtyard to capture, treat, and infiltrate stormwater runoff from the sidewalk. A preliminary soil assessment suggests that more soil testing would be required before determining the soil's suitability for green infrastructure.

Impervious Cover		Existing Loads from Impervious Cover (lbs/yr)			Runoff Volume from Impervious Cover (Mgal)	
%	sq. ft.	TP	TN	TSS	For the 1.25" Water Quality Storm	For an Annual Rainfall of 47.6"
25	114,428	5.5	57.8	525.4	0.089	3.35

Recommended Green Infrastructure Practices	Drainage Area (sq. ft)	Recharge Potential (Mgal/yr)	TSS Removal Potential (lbs/yr)	Maximum Volume Reduction Potential (gal/storm)	Peak Discharge Reduction Potential (cu. ft./second)	Estimated Size (sq. ft.)	Estimated Cost
Bioretention system	6,820	0.178	30	13,160	0.49	1,790	$17,900
Pervious pavement	4,980	0.130	22	9,610	0.36	890	$22,250

GREEN INFRASTRUCTURE RECOMMENDATIONS



John Brainerd Elementary School

- bioretention system
- pervious pavement
- drainage area
- property line

How can municipalities use these data?

- MS4 Permit Requirement to Develop a Watershed Improvement Plan
- Mapping is due December 31, 2025
  - Impervious areas will be mapped for the Watershed Restoration and Protection Plan
  - TMDL watershed will be identified and drainage areas to these waters
- Watershed Assessment Report is due December 31, 2026
  - Identification of potential water quality improvement projects
  - Estimate load reduction for each of these projects
- Watershed Improvement Plan Report is due December 31, 2027
  - Summary of potential projects
  - Implementation schedule
  - Project costs

Other ways municipalities can use these data?

MS4 requires municipalities to implement public education and outreach program (12 points are required from 3 of 5 categories)

1. General education of the public on stormwater issues
2. Targeted audiences outreach
3. School/Youth Education and Activities
4. Watershed/Regional Collaboration
5. Community Involvement Activities

How can you help?

- Let us know where we might be able to implement stormwater practices to reduce runoff flows to these waterbodies.
- Are there any areas of severe erosion that need to be mitigated?
- What else can you tell us about Rancocas Creek and the land that drains to it?

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www.water.rutgers.edu

COUNTY	MUNICIPALITY	COUNTY	MUNICIPALITY
Burlington	Eastampton Township	Burlington	Shamong Township
Burlington	Evesham Township	Burlington	Southampton Township
Burlington	Hainesport Township	Burlington	Tabernacle Township
Burlington	Lumberton Township	Burlington	Westampton Township
Burlington	Medford Lakes Borough	Burlington	Woodland Township
Burlington	Medford Township	Burlington	Wrightstown Borough
Burlington	Mount Holly Township	Camden	Berlin Township
Burlington	Mount Laurel Township	Camden	Voorhees Township
Burlington	New Hanover Township	Ocean	Manchester Township
Burlington	Pemberton Borough	Ocean	Plumsted Township
Burlington	Pemberton Township		