RUTGERS
THE STATE UNIVERSITY
OF NEW JERSEY

Rutgers Cooperative Extension
Water Resources Program

Impervious Cover Assessments for the Brunwicks and Milltown

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www.water.rutgers.edu

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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

The Water Resources Program is one of many specialty programs under Rutgers Cooperative Extension.

Our Mission is to identify and address community water resources issues using sustainable and practical science-based solutions.

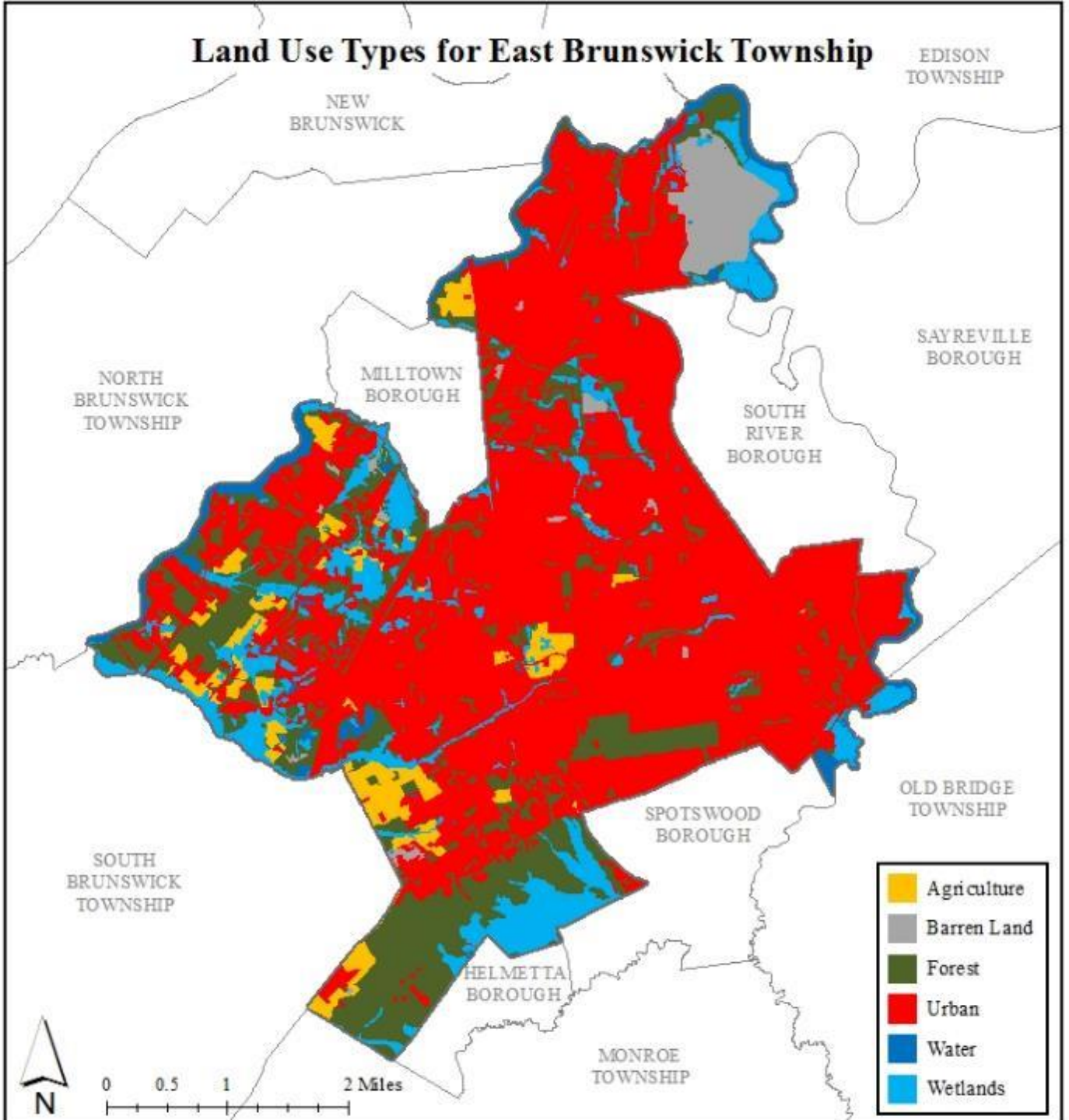
The Water Resources Program serves all of New Jersey, working closely with the County Extension Offices.

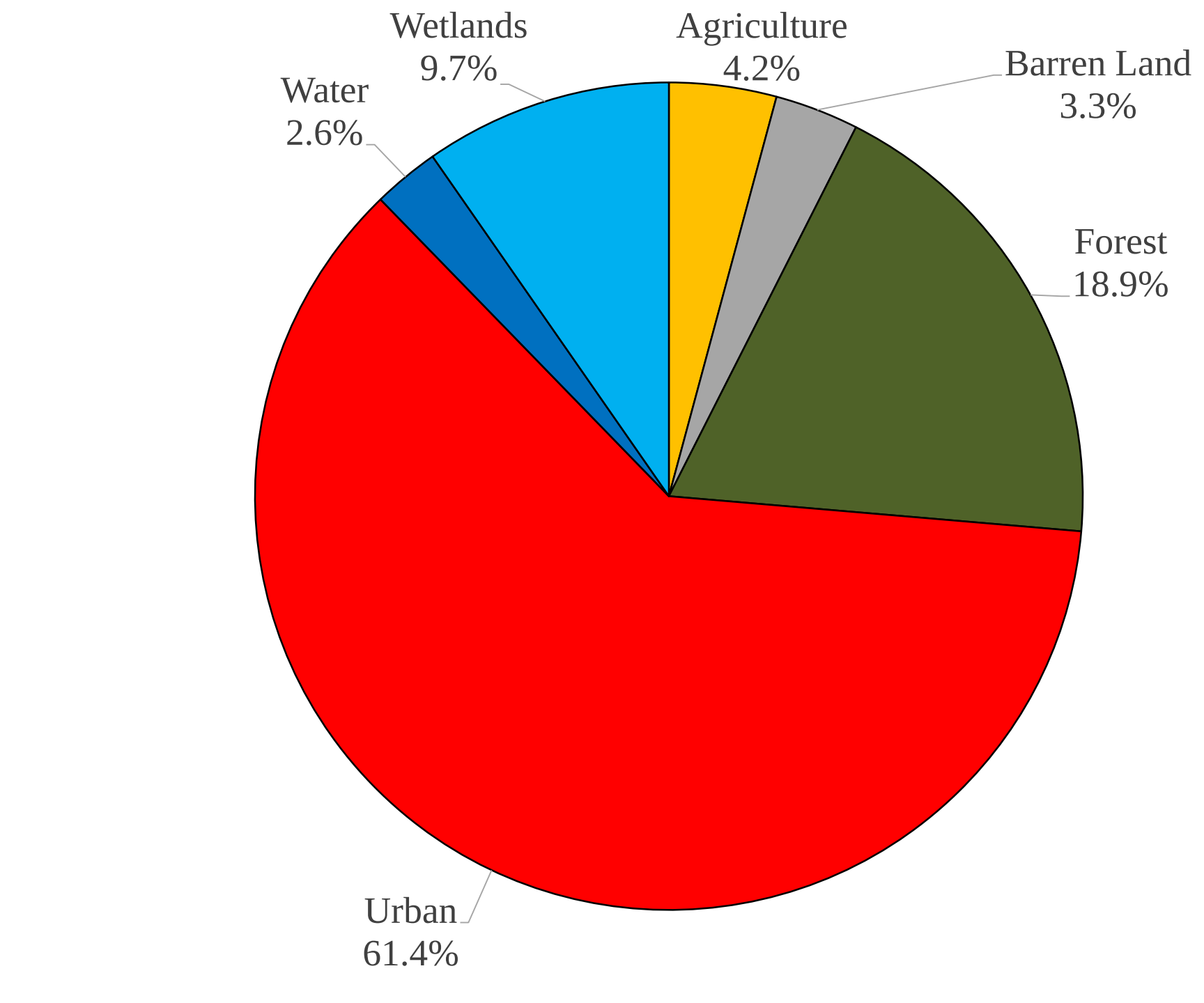
Impervious Cover Assessment

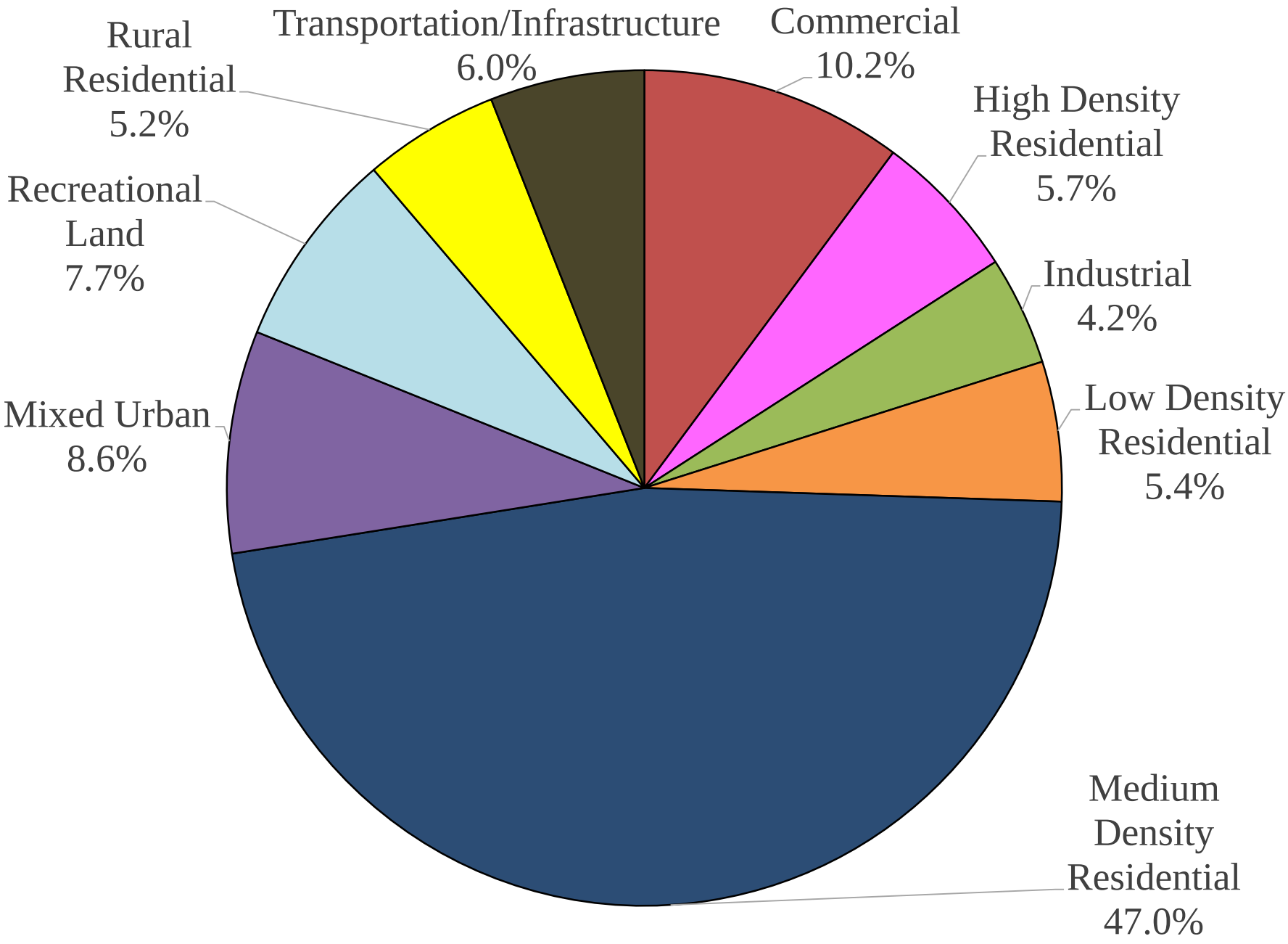
Impervious Cover Assessment

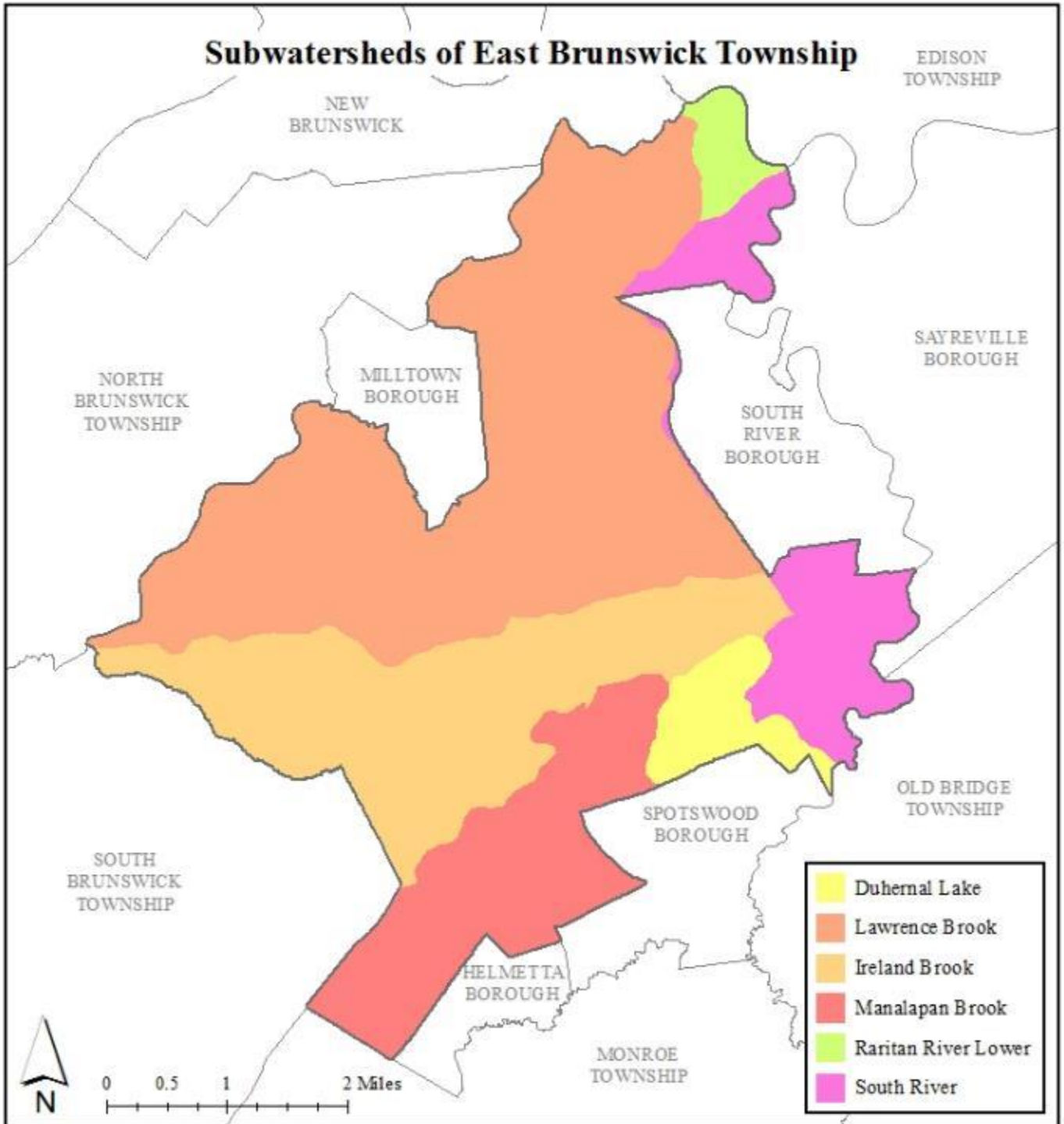
- Analysis completed by watershed and by municipality
- Use 2007 Land Use data to determine impervious cover
- Calculate runoff volumes for water quality, 2, 10 and 100 year design storm and annual rainfall
- Contain three concept designs

East Brunswick Impervious Cover Assessment


Land Use Types for East Brunswick Township
EDISON TOWNSHIP
NEW BRUNSWICK
SAYREVILLE BOROUGH
NORTH BRUNSWICK TOWNSHIP
MILLTOWN BOROUGH
SOUTH RIVER BOROUGH
OLD BRIDGE TOWNSHIP
SPOTSWOOD BOROUGH
SOUTH BRUNSWICK TOWNSHIP
HELMETTA BOROUGH
MONROE TOWNSHIP
Agriculture
Barren Land
Forest
Urban
Water
Wetlands
N
0
0.5
1
2 Miles


Wetlands
9.7%
Agriculture
4.2%
Barren Land
3.3%
Water
2.6%
Forest
18.9%
Urban
61.4%


Rural Residential 5.2%
Transportation/Infrastructure 6.0%
Commercial 10.2%
High Density Residential 5.7%
Recreational Land 7.7%
Industrial 4.2%
Mixed Urban 8.6%
Low Density Residential 5.4%
Medium Density Residential 47.0%


Subwatersheds of East Brunswick Township
EDISON TOWNSHIP
NEW BRUNSWICK
SAYREVILLE BOROUGH
NORTH BRUNSWICK TOWNSHIP
MILLTOWN BOROUGH
SOUTH RIVER BOROUGH
OLD BRIDGE TOWNSHIP
SPOTSWOOD BOROUGH
SOUTH BRUNSWICK TOWNSHIP
HELMETTA BOROUGH
MONROE TOWNSHIP
Duhernal Lake
Lawrence Brook
Ireland Brook
Manalapan Brook
Raritan River Lower
South River
N
0
0.5
1
2 Miles

Watershed	Total Area (ac)	Impervious Cover (ac)	%
Duhernal Lake	571	158	28.6%
Ireland Brook	3,374	749	22.5%
Lawrence Brook	6,567	1,834	28.8%
Manalapan Brook	2,133	222	10.4%
Lower Raritan River	291	0	0.0%
South River	1,404	342	25.5%
Total	14,340	3,304	23.0%

Subwatershed	NJ Water Quality Storm (MGal)	Annual Rainfall of 44" (MGal)	2-Year Design Storm (3.3”) (MGal)	10-Year Design Storm (5.0”) (MGal)	100-Year Design Storm (8.2”) (MGal)
Duhernal Lake	5.4	188.4	14.1	21.8	36.8
Ireland Brook	25.4	895.0	67.1	103.7	174.9
Lawrence Brook	62.2	2,190.7	164.3	253.9	428.2
Manalapan Brook	7.5	264.8	19.9	30.7	51.8
Lower Raritan River	0.0	0.0	0.0	0.0	0.0
South River	11.6	408.3	30.6	47.3	79.8
Total	112.1	3,947.2	296.0	457.5	771.5

East Brunswick Township
Impervious Cover Assessment

East Brunswick Police Department, 1 Civic Center Drive

RUTGERS

PROJECT LOCATION:

A

B

C

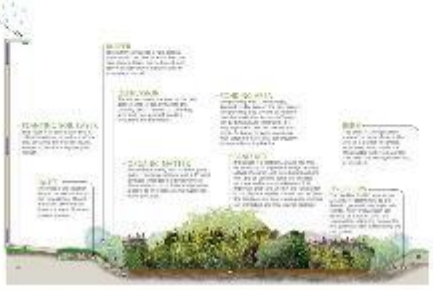
D

SITE PLAN:

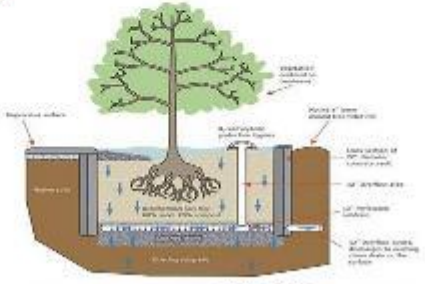
1 **BIORETENTION SYSTEMS:** Bioretention systems should be installed to intercept pathway runoff and parking lot runoff, respectively. The bioretention systems will reduce sediment and nutrient loading reaching catch basins.

2 **TREE FILTER BOXES:** Tree boxes can be installed in the parking strips to catch the first flush of stormwater and treat it prior to discharge to the storm sewer system.

1 BIORETENTION SYSTEM



2 TREE FILTER BOX



East Brunswick Township
Impervious Cover Assessment
Old Bridge Volunteer Fire Company & Board of Fire Commissioners, 680 Old Bridge Turnpike

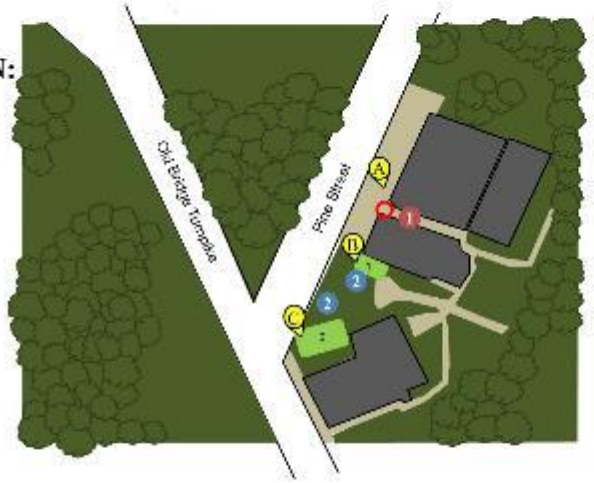
RUTGERS


A


B

PROJECT LOCATION:

SITE PLAN:



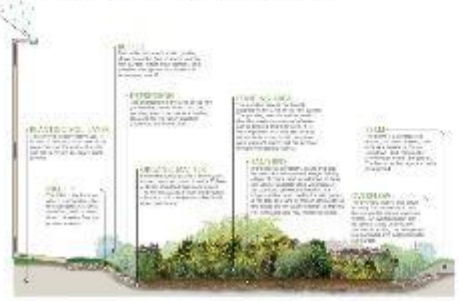
C

1. **RAINWATER HARVESTING SYSTEM:** Rainwater will be harvested from the roof of the building and stored in cisterns. The water will be used to wash the fire trucks.

2. **BIORETENTION SYSTEMS:** Bioretention systems should be installed to intercept pathway runoff and parking lot runoff, respectively. The bioretention systems will reduce sediment and nutrient loading reaching catch basins.

1 RAINWATER HARVESTING SYSTEM

2 BIORETENTION SYSTEM



East Brunswick Township
Impervious Cover Assessment
Elks Lodge, 21B Oakmont Avenue

RUTGERS

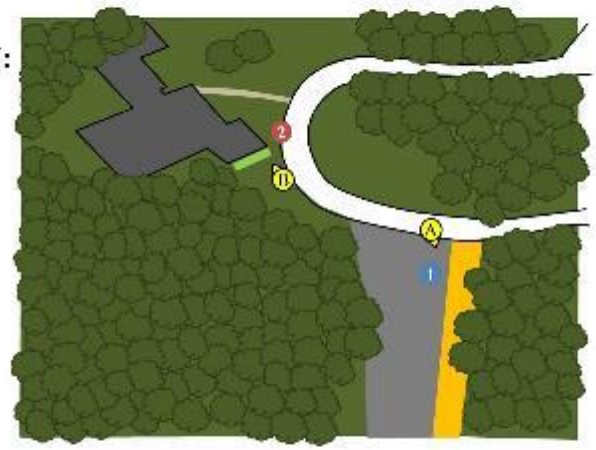

A


B

PROJECT LOCATION:

SITE PLAN:

N



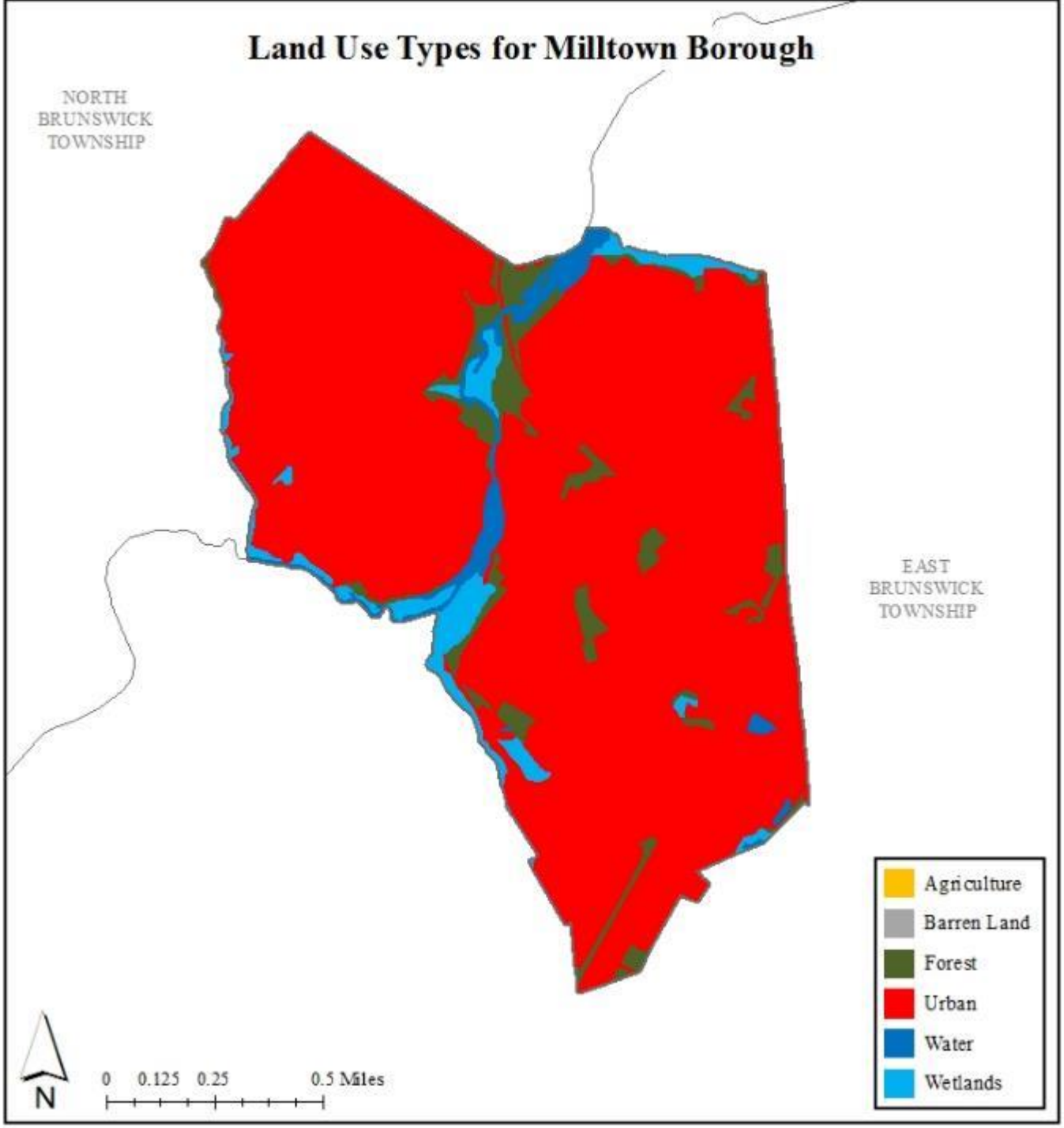
1 **POROUS ASPHALT:** Porous asphalt should be installed to capture runoff from the parking lot and driveway.

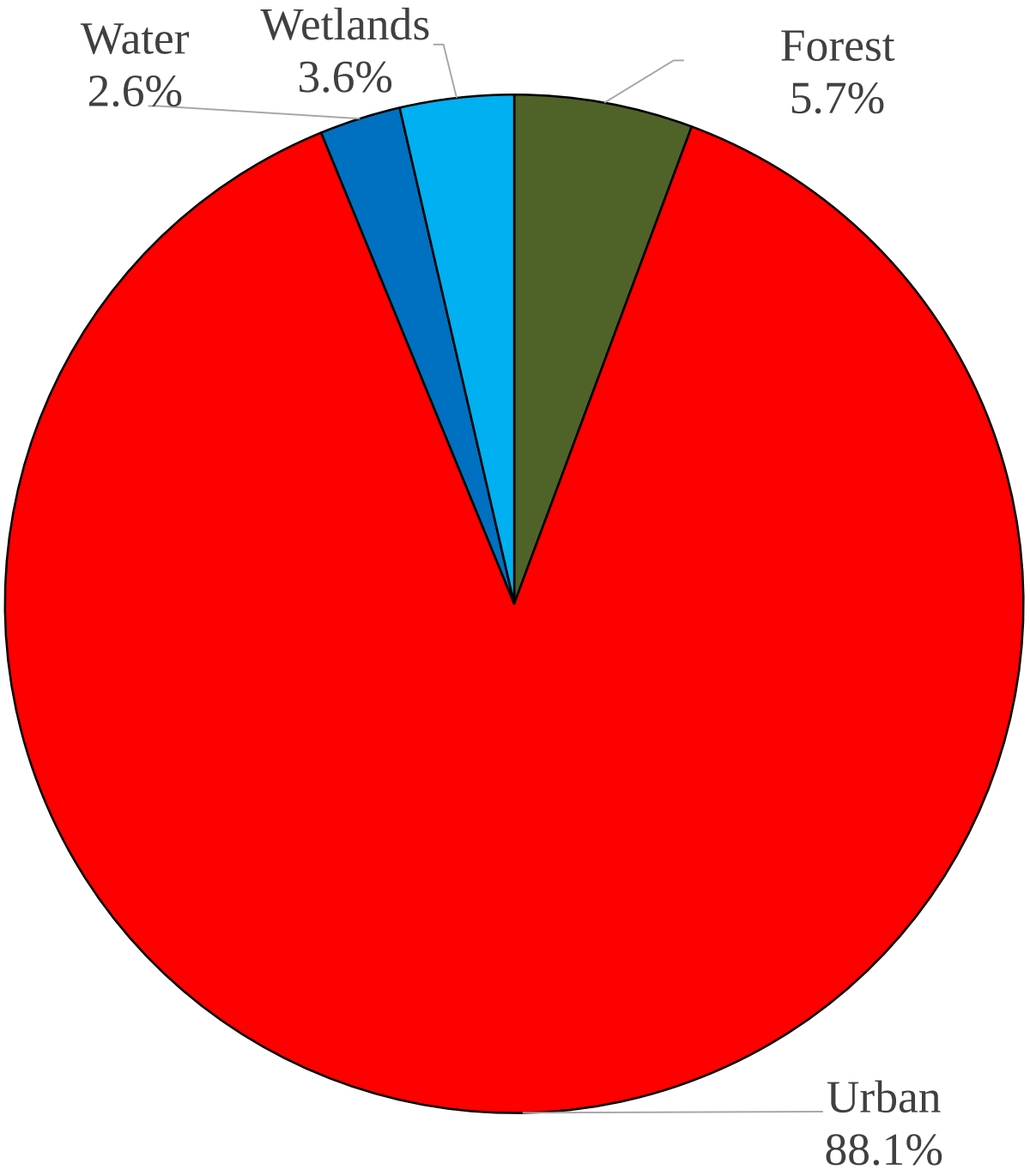
2 **BIORETENTION SYSTEM:** Downspouts should be re-directed to a bioretention system along the side of the Elks lodge to capture rooftop runoff. A bioretention system will reduce runoff and allow stormwater infiltration, decreasing the amount of contaminants that reach catch basins.

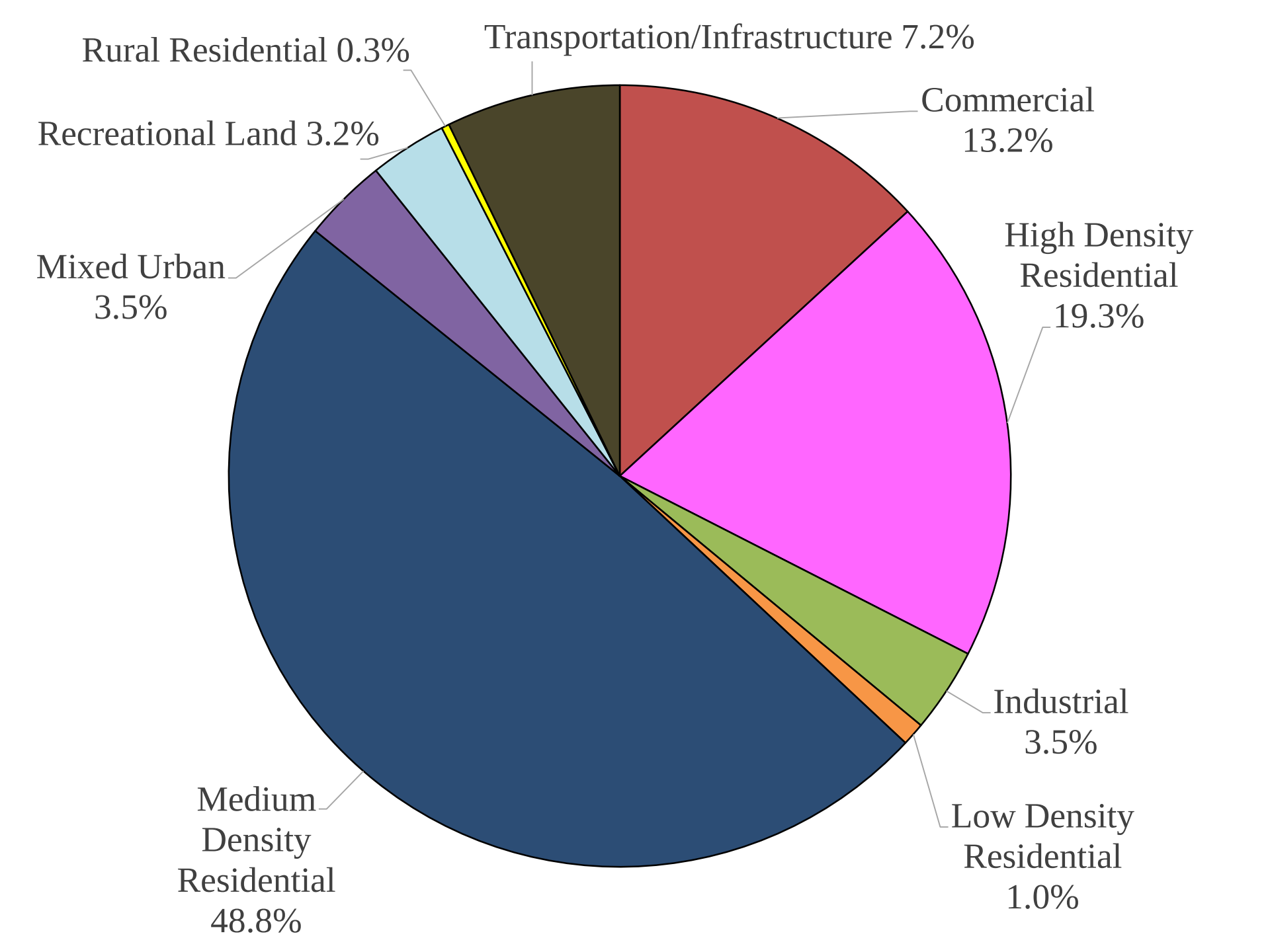
1 POROUS ASPHALT

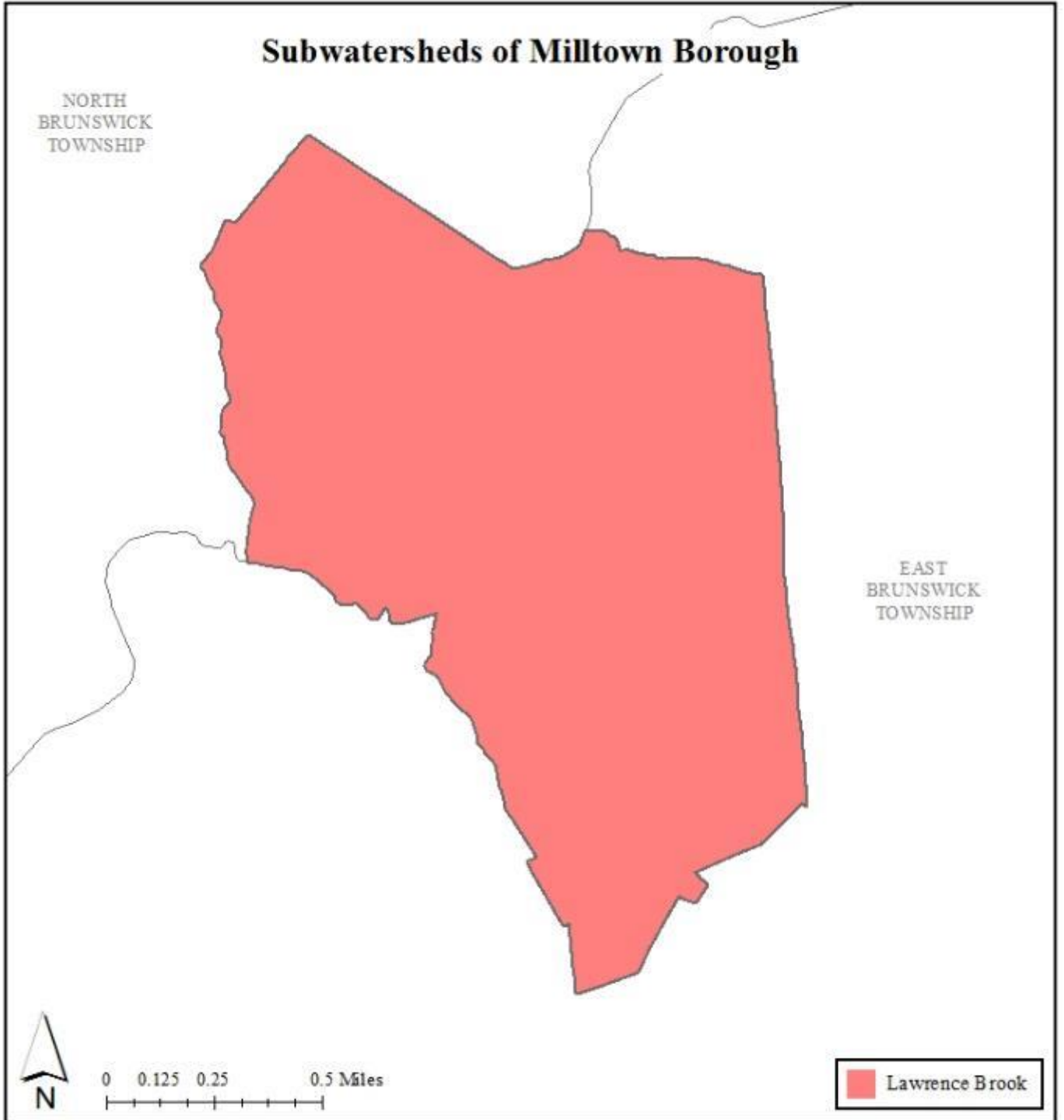
2 BIORETENTION SYSTEM

Milltown Borough Impervious Cover Assessment


Land Use Types for Milltown Borough
NORTH BRUNSWICK TOWNSHIP
EAST BRUNSWICK TOWNSHIP
Agriculture
Barren Land
Forest
Urban
Water
Wetlands
N
0 0.125 0.25 0.5 Miles


Water
2.6%
Wetlands
3.6%
Forest
5.7%
Urban
88.1%


Rural Residential 0.3%
Transportation/Infrastructure 7.2%
Commercial 13.2%
Recreational Land 3.2%
High Density Residential 19.3%
Mixed Urban 3.5%
Industrial 3.5%
Low Density Residential 1.0%
Medium Density Residential 48.8%


Subwatersheds of Milltown Borough
NORTH BRUNSWICK TOWNSHIP
EAST BRUNSWICK TOWNSHIP
N
0 0.125 0.25 0.5 Miles
Lawrence Brook

Watershed	Total Area (ac)	Impervious Cover (ac)	%
Lawrence Brook	1021.2	406.6	40.9%
Total	1021.2	406.6	40.9%

Subwatershed	NJ Water Quality Storm (MGal)	Annual Rainfall of 44" (MGal)	2-Year Design Storm (3.3”) (MGal)	10-Year Design Storm (5.0”) (MGal)	100-Year Design Storm (8.2”) (MGal)
Lawrence Brook	13.8	485.8	36.4	56.3	94.9
Total	13.8	485.8	36.4	56.3	94.9

Milltown Borough
Impervious Cover Assessment
Milltown Public Library, 20 West Church Street

PROJECT LOCATION:

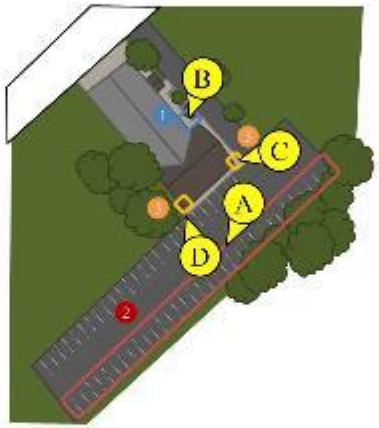
A

B

C

SITE PLAN:

N



D

1 **RAIN BARREL:** Rain barrels will help capture the stormwater that runs off of the building's rooftop. Connecting the library's downspouts to rain barrels will allow the stormwater to be slowed, collected, and used for gardening.

2 **POROUS ASPHALT:** Porous pavement promotes groundwater recharge and filters stormwater.

3 **DISCONNECTED DOWNSPOUTS:** Disconnecting downspouts from draining directly into storm sewer drains will allow pollutants to settle out and groundwater to be recharged.

1 RAIN BARREL

2 POROUS ASPHALT

PERMEABLE PAVEMENT DIAGRAM

3 DISCONNECTED DOWNSPOUTS

Milltown Borough
Impervious Cover Assessment
Parkview Elementary School, 80 Violet Terrace

RUTGERS

PROJECT LOCATION:

SITE PLAN:

1. **BIORETENTION SYSTEMS:** These rain gardens will capture, treat, and infiltrate runoff from the grass and paved areas around the school. The existing catch basins will handle any overflow from the gardens. The rain gardens will reduce sediment and nutrient loading to the local waterway while providing beautiful landscaping to the school grounds. The gardens will also provide habitat for birds, butterflies, and pollinators. They also can be incorporated into the elementary school science curriculum.

1a. **TRENCH DRAIN:** A trench drain will carry stormwater from Violet Terrace into bioretention system 2 & 5 for treatment.

2. **POROUS ASPHALT:** Porous pavement promotes groundwater recharge and filters stormwater and will help capture runoff from the parking lot and surrounding walkways.

3. **EDUCATIONAL OPPORTUNITY:** The RCE Water Resources Program, *Stormwater Management in Your Schoolyard*, can be delivered at Parkview Elementary School to educate the students about stormwater management.

1 BIORETENTION SYSTEM

1a TRENCH DRAIN

2 POROUS ASPHALT

3 EDUCATIONAL PROGRAM

Milltown Borough
Impervious Cover Assessment
Joyce Kilmer School, 21 W Church Street

RUTGERS

PROJECT LOCATION:

A

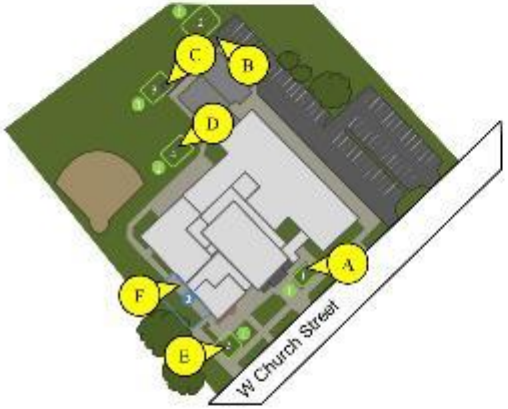
B

C

D

SITE PLAN:

N



E

1. **BIORETENTION SYSTEMS:** On this property rain gardens will be used to reduce sediment and nutrient loading to the local watershed and increase groundwater recharge. There are five areas which may be able to accommodate these systems, treating the building's runoff.
2. **RAIN BARRELS:** A rain barrel can be used to collect rain water from a downspout. This water can then be used to water plants and gardens.
3. **EDUCATIONAL OPPORTUNITY:** The RCE Water Resources Program's *Stormwater Management in Your Schoolyard* can be delivered at Parkview Elementary School to educate the students about stormwater management.

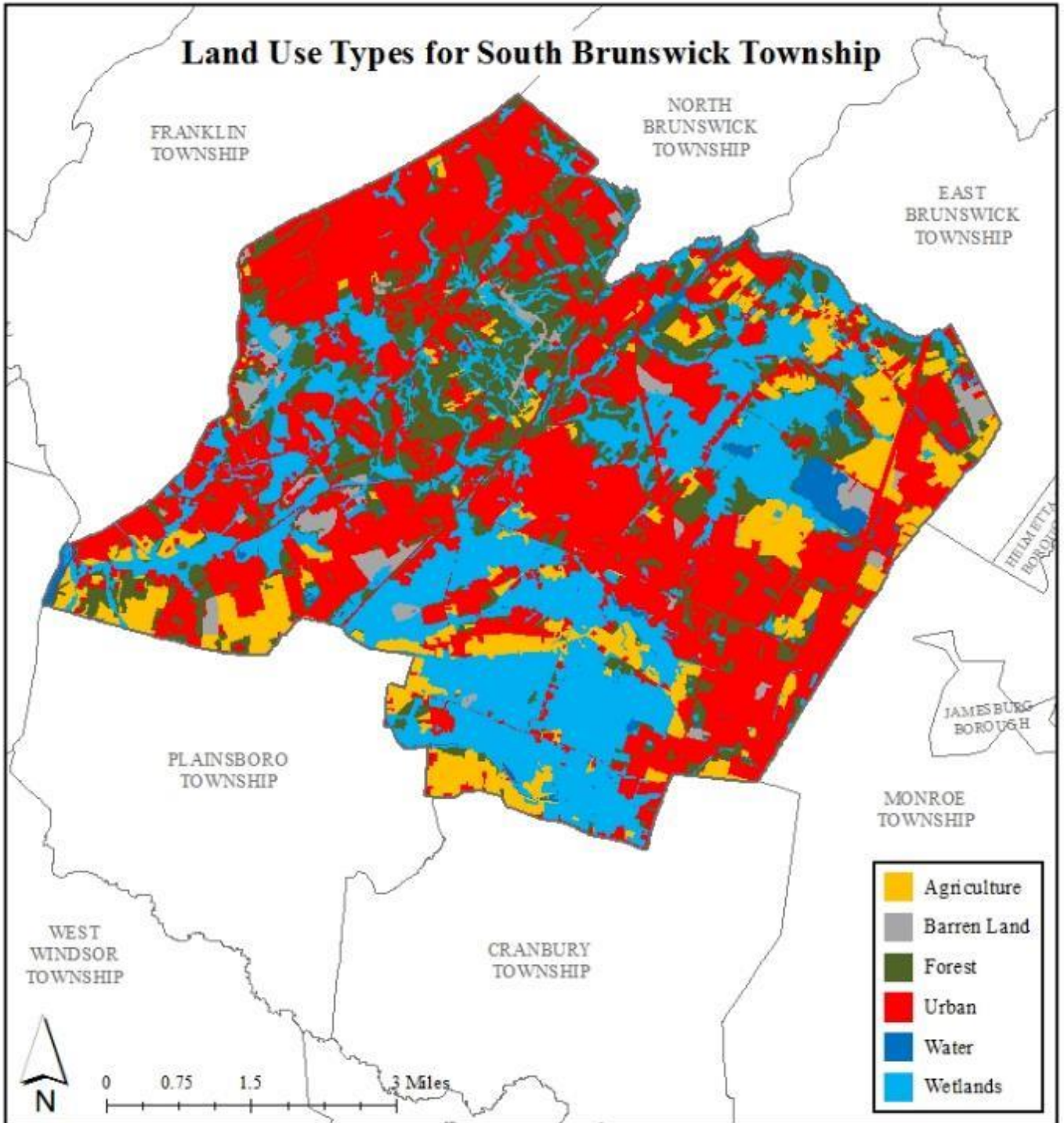
1 BIORETENTION SYSTEM

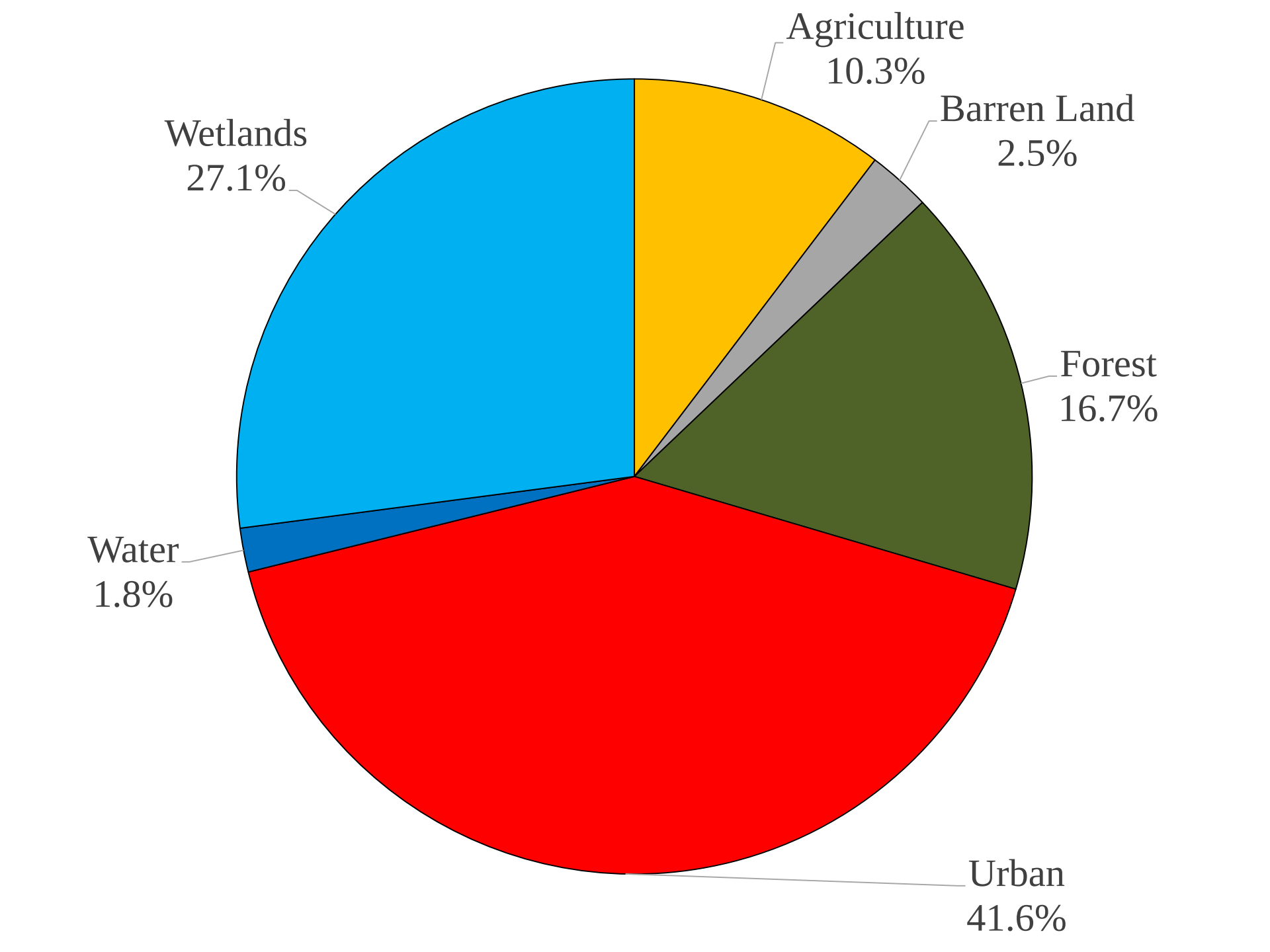
2 RAIN BARRELS

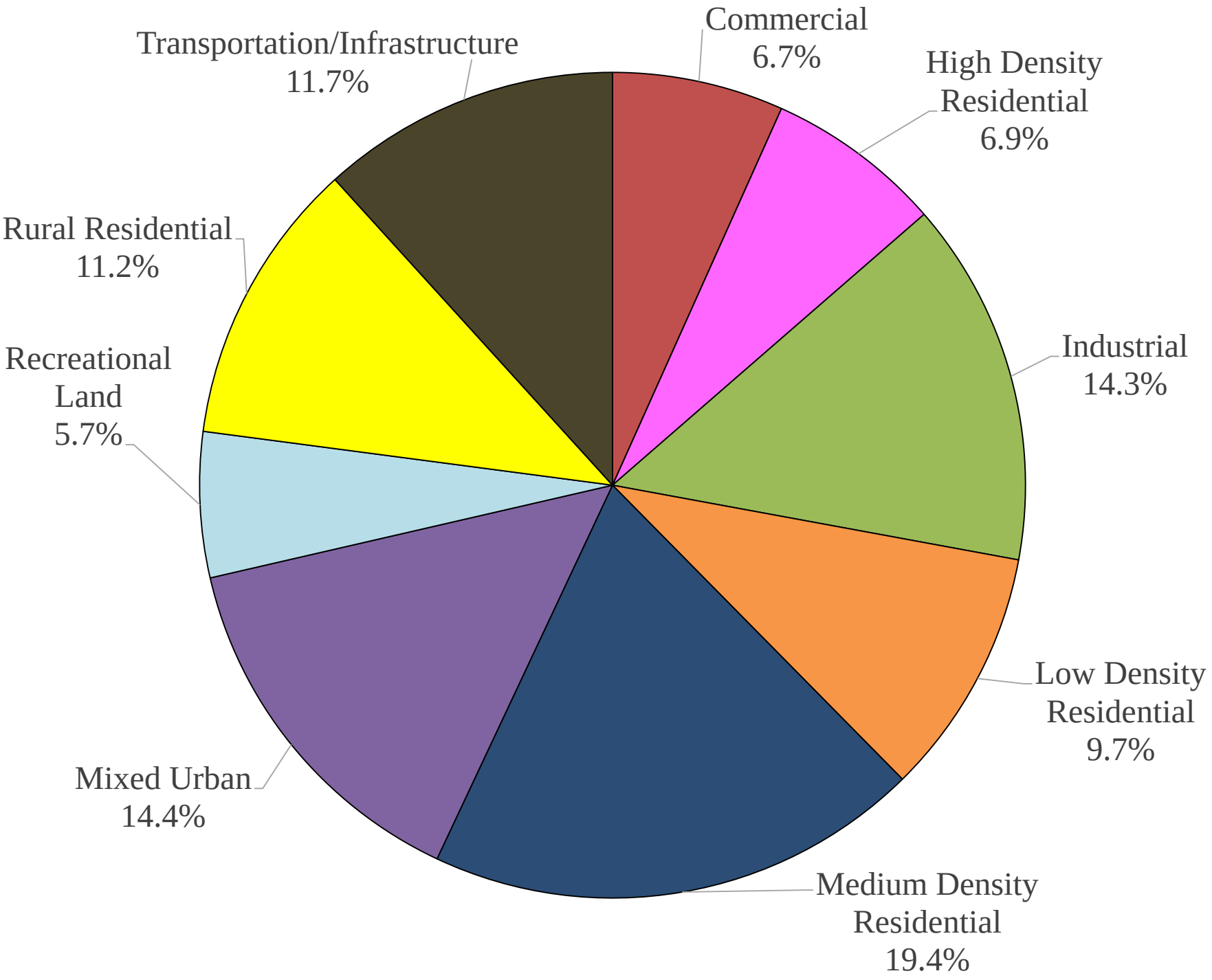
3 EDUCATIONAL PROGRAM

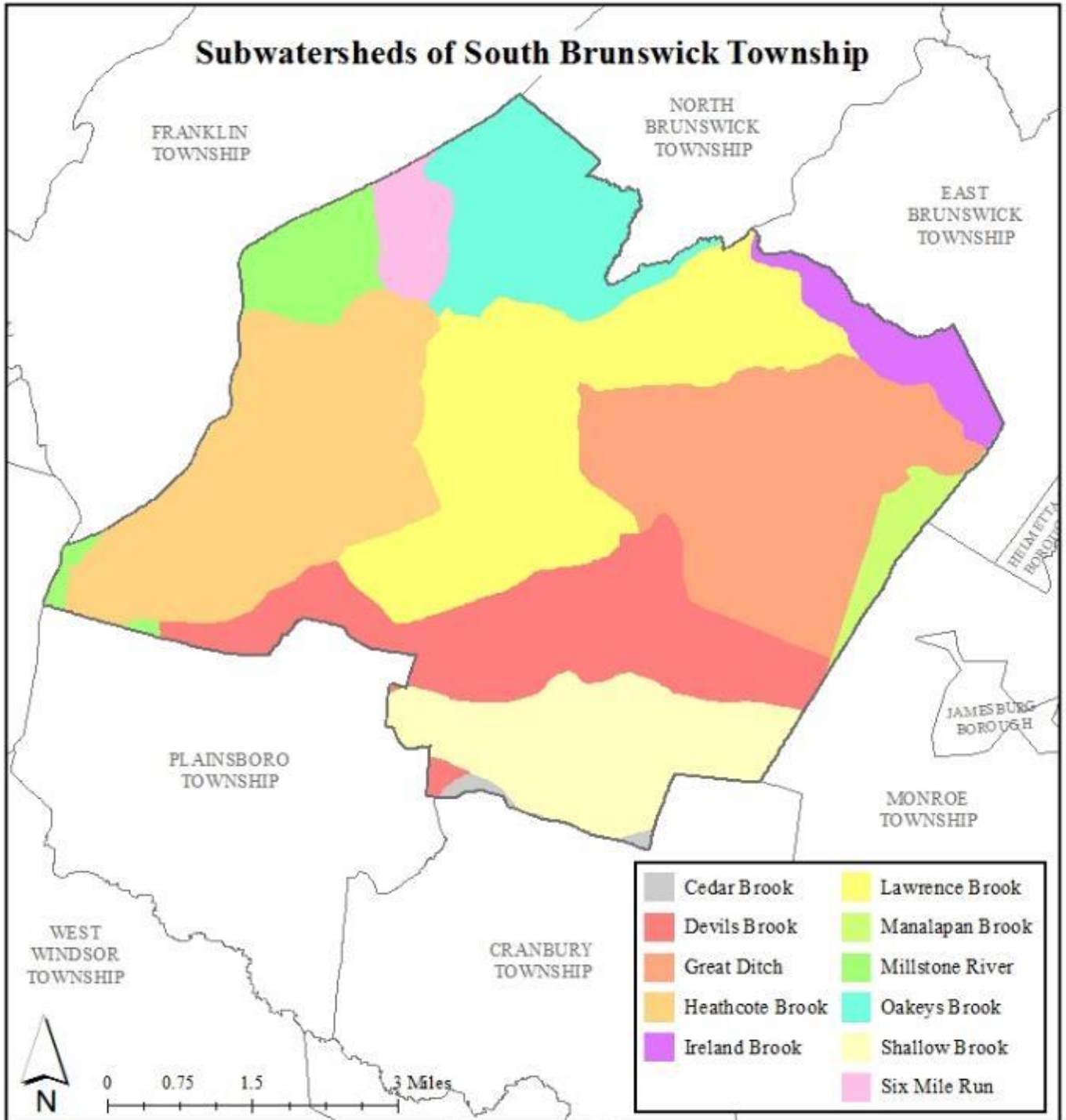
F

South Brunswick Impervious Cover Assessment


Land Use Types for South Brunswick Township
FRANKLIN TOWNSHIP
NORTH BRUNSWICK TOWNSHIP
EAST BRUNSWICK TOWNSHIP
HILLSBOROUGH
JAMESBURG BOROUGH
PLAINSBORO TOWNSHIP
MONROE TOWNSHIP
WEST WINDSOR TOWNSHIP
CRANBURY TOWNSHIP
Agriculture
Barren Land
Forest
Urban
Water
Wetlands
N
0
0.75
1.5
3 Miles


Agriculture
10.3%
Barren Land
2.5%
Forest
16.7%
Urban
41.6%
Water
1.8%
Wetlands
27.1%


Commercial
6.7%
High Density
Residential
6.9%
Industrial
14.3%
Low Density
Residential
9.7%
Medium Density
Residential
19.4%
Mixed Urban
14.4%
Recreational
Land
5.7%
Rural Residential
11.2%
Transportation/Infrastructure
11.7%


Subwatersheds of South Brunswick Township
FRANKLIN TOWNSHIP
NORTH BRUNSWICK TOWNSHIP
EAST BRUNSWICK TOWNSHIP
HELMETTA BOROUGH
JAMESBURG BOROUGH
PLAINSBORO TOWNSHIP
MONROE TOWNSHIP
WEST WINDSOR TOWNSHIP
CRANBURY TOWNSHIP
Cedar Brook
Devils Brook
Great Ditch
Heathcote Brook
Ireland Brook
Lawrence Brook
Manalapan Brook
Millstone River
Oakeys Brook
Shallow Brook
Six Mile Run
N
0
0.75
1.5
3 Miles

Watershed	Total Area (ac)	Impervious Cover (ac)	%
Cedar Brook	80.4	4.8	5.9%
Devils Brook	3,635.0	499.8	13.9%
Great Ditch	4,696.7	839.4	18.9%
Heathcote Brook	4,764.9	730.6	15.4%
Ireland Brook	802.8	69.3	8.7%
Lawrence Brook	5,293.0	666.9	12.8%
Manalapan Brook	435.0	98.4	23.1%
Millstone River	1,009.8	258.2	26.3%
Oakeys Brook	2,261.6	482.0	21.4%
Shallow Brook	2,667.0	369.9	14.1%
Six Mile Run	596.9	137.7	23.1%
Total	26,243.0	4,156.9	16.1%

Subwatershed	NJ Water Quality Storm (MGal)	Annual Rainfall of 44" (MGal)	2-Year Design Storm (3.3”) (MGal)	10-Year Design Storm (5.0”) (MGal)	100-Year Design Storm (8.2”) (MGal)
Cedar Brook	0.2	5.7	0.4	0.7	1.1
Devils Brook	17.0	597.1	44.8	69.2	116.7
Great Ditch	28.5	1,002.8	75.2	116.2	196.0
Heathcote Br.	24.8	872.9	65.5	101.2	170.6
Ireland Brook	2.4	82.8	6.2	9.6	16.2
Lawrence Br.	22.6	796.8	59.8	92.4	155.7
Manalapan Br.	3.3	117.6	8.8	13.6	23.0
Millstone Rv.	8.8	308.5	23.1	35.8	60.3
Oakeys Brook	16.4	575.8	43.2	66.7	112.5
Shallow Brook	12.6	441.9	33.1	51.2	86.4
Six Mile Run	4.7	164.5	12.3	19.1	32.1
Total	141.1	4,966.2	372.5	575.6	970.7

South Brunswick Township
Impervious Cover Assessment
St. Barnabas Episcopal Church, 142 Sandhill Road

RUTGERS

PROJECT LOCATION:

SITE PLAN:

N

A

B

C

D

1. **BIOSWALE:** A bioswale will be installed to treat runoff from the upper parking lot. A bioswale is a vegetated system that will lower the levels of sediment and nutrient loading to the local watershed.
2. **BIORETENTION SYSTEMS:** Bioretention systems on this property will reduce the sediment and nutrient loading to the local watershed and will increase groundwater recharge. There are two areas which may be able to accommodate this system and will treat the building's runoff.
3. **POROUS ASPHALT:** Porous asphalt promotes groundwater recharge and filters stormwater.

1 BIOSWALE

2 BIORETENTION SYSTEM

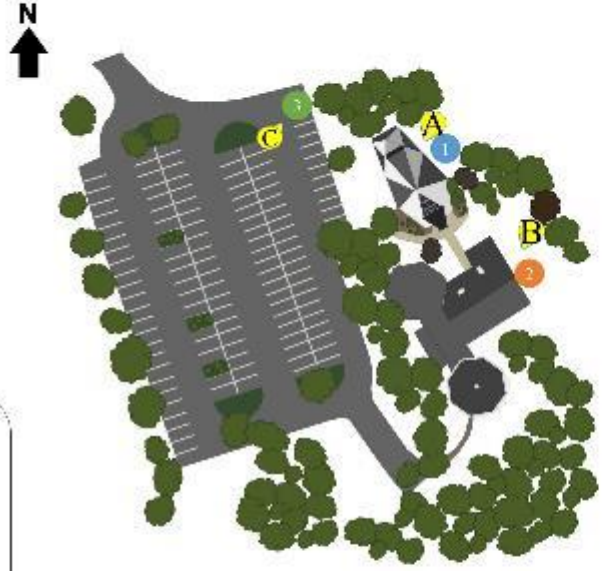
3 POROUS ASPHALT

South Brunswick Township
Impervious Cover Assessment
Community Presbyterian Church, 57 Sand Hill Road

RUTGERS

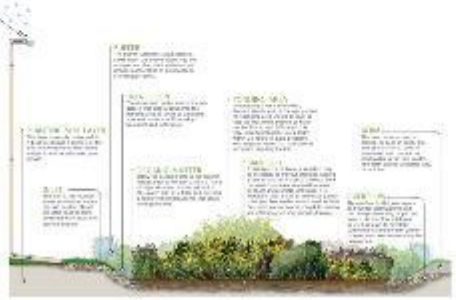
PROJECT LOCATION:

SITE PLAN:



1. **BIORETENTION SYSTEM:** A bioretention system should be installed near the northeast side of the parking lot and along the side of the building where an inlet exists and can act as an overflow. A bioretention system will reduce runoff and allow stormwater infiltration, decreasing the amount of contaminants that reach catch basins.
2. **CISTERN:** A cistern will decrease the volume of stormwater runoff reaching catch basins by capturing and storing stormwater runoff for use in watering the existing vegetable garden.
3. **POROUS ASPHALT:** Porous asphalt promotes groundwater recharge and filters stormwater.

1 BIORETENTION SYSTEM



2 CISTERN

3 POROUS ASPHALT

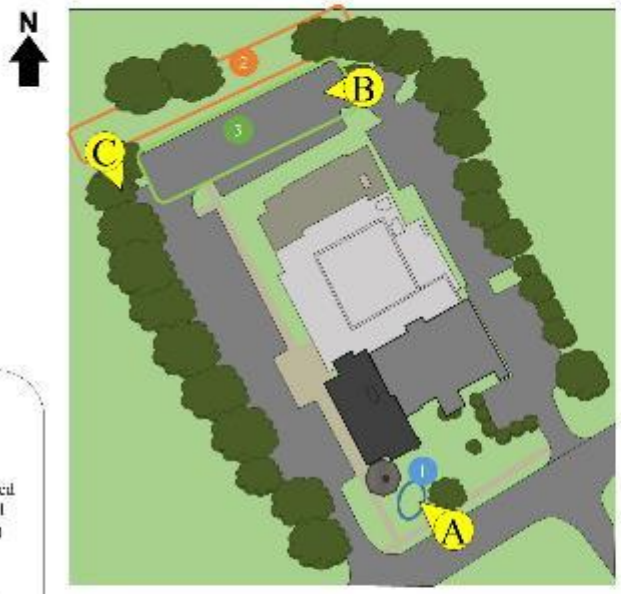
PERMEABLE PAVEMENT DIAGRAM

South Brunswick Township
Impervious Cover Assessment
South Brunswick Public Library, 110 Kingston Lane

RUTGERS

PROJECT LOCATION:

SITE PLAN:



1. **BIORETENTION SYSTEM:** A bioretention system will reduce runoff and allow stormwater infiltration, decreasing the amount of water and contaminants transported in the storm sewer to local waterways. A bioretention system can be installed at this site, treating runoff from a portion of the roof.

2. **BIOSWALE:** The bioswale will capture, treat, and infiltrate runoff from the parking lot. Water will be conveyed to the swale through a series of curb cuts. The swale will help reduce sediment and nutrient loading to the local waterway while providing beautiful landscaping and habitat for birds, butterflies, and pollinators. (OPTION 1)

3. **POROUS ASPHALT:** Porous asphalt promotes groundwater recharge and filters stormwater. A section of porous asphalt along the northern end of the parking lot will greatly reduce the amount of water reaching the sewer system. (OPTION 2)

1 BIORETENTION SYSTEM

2 BIOSWALE

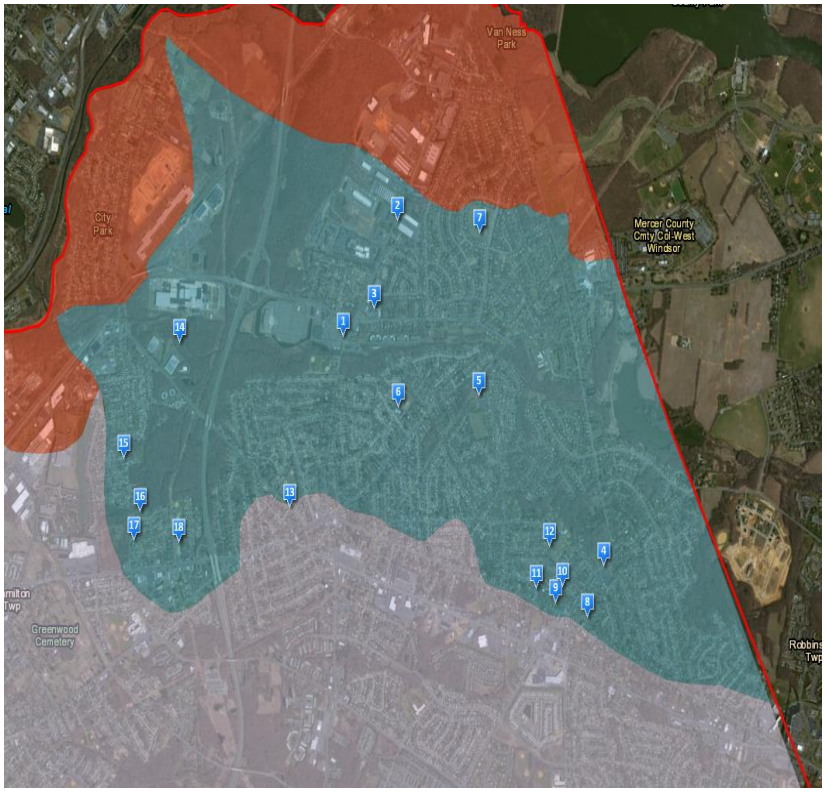
3 POROUS ASPHALT

Impervious Cover Reduction Action Plan

Miry Run Watershed Location Map

Project Sites

1. Clover Square
2. Ibis Plaza Office Suites
3. University Plaza
4. Nottingham Volunteer Fire Company
5. St. Mark United Methodist Church
6. Morgan Elementary School
7. University Heights/H.D. Morrison Elementary School
8. Hamilton Square Baptist Church
9. Greater Victory Ministries
10. Hamilton Township School District
11. First Presbyterian Church
12. Baseball Fields
13. Our Lady of Sorrows School
14. Merlin Industries Inc.
15. Enterprise Volunteer Fire Co.
16. Christ Presbyterian Church



Nottingham Volunteer Company

At this site, there is a potential to replace parking lot islands with tree filter systems and install cistern to harvest rainwater from the rooftop to wash the fire trucks. According to the NRCS soil survey, the soils are suitable for infiltration at this site.

Address	Latitude	Longitude
200 Mercer Street	40.233412	-74.65753

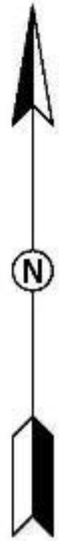
			Existing Loads (lbs/year)		
Area (sq.ft.)	**Lot**	**Block**	**TP**	**TN**	**TSS**
153,281	24.01	1839	5.3	56.3	703.8

Nottingham Volunteer Company (cont'd)

Impervious Cover		Runoff Volume (Mgal)	
%	Square feet	For the 1.25" Water Quality Storm	For an Annual Rainfall of 44"
72	110,362	0.23	3.03

Recommended BMP	Recharge Potential (Mgal/yr)	Total Suspended Solids Removal Potential (lbs/yr)	Maximum Volume Reduction Potential (gal/storm)	Peak Discharge Reduction Potential (cu.ft./second)
Tree Filter Systems	0.146	24	1,541	0.40
Cistern	0.055	18	461	0.32

Estimate cost is $16,675 for 667 square feet of tree filter systems with two feet of porous media. Estimate cost is $10,000 for 5,000 gallon cistern.



Nottingham Volunteer Company
Lot 24.01 Block 1839

LEGEND

Drainage Area

Tree Filters Infiltration Systems

5,000 Gallon Cistern

0 100' 200'

St. Mark United Methodist Church

For this site, a large portion of the parking lot can be captured in a bioretention system. According to the NRCS soil survey, the soils are suitable for infiltration at this site.

Address	Latitude	Longitude
465 Paxson Avenue	40.24428	-74.671402

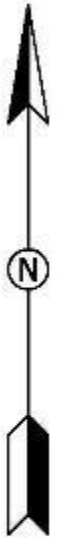
			Existing Loads (lbs/year)		
Area (sq.ft.)	**Lot**	**Block**	**TP**	**TN**	**TSS**
284,082	8	1622	9.8	104.3	1304.3

St. Mark United Methodist Church (cont'd)

Impervious Cover		Runoff Volume (Mgal)	
%	Square feet	For the 1.25" Water Quality Storm	For an Annual Rainfall of 44"
40	113,633	0.23	3.12

Recommended BMP	Recharge Potential (Mgal/yr)	Total Suspended Solids Removal Potential (lbs/yr)	Maximum Volume Reduction Potential (gal/storm)	Peak Discharge Reduction Potential (cu.ft./second)
Bioretention System	0.785	131	8,289	2.17

Estimate cost is $37,675 for 7,535 square feet of bioretention system.



LEGEND

Drainage Area

Bioretention Systems

0 100' 200'

St. Mark United Methodist Church
Lot 8 Block 1622

Summary of Projects in the Stormwater Mitigation Plan

Watersheds	Number of Projects	Total Area of Project Sites (ac)	Impervious Cover (ac)	Potential Management Area (ac)
Assunpink Creek	4	61.62	37.73	9.48
Back Creek	8	88.18	44.95	12.13
Crosswicks Creek	8	145.08	94.30	3.50
Doctors Creek	2	14.71	3.64	0.47
Miry Run	16	122.73	57.21	7.52
Pond Run	16	214.82	79.88	7.79
Shady Brook	15	98.13	65.17	4.17
TOTALS	69	745.28	382.88	45.06

Summary of Projects in the Stormwater Mitigation Plan

Watersheds	Recharge Potential (Mgal/yr)	TSS Removal Potential (lbs/yr)	Max Volume Reduction Potential (gal/storm)	Peak Discharge Reduction Potential (cfs)
Assunpink Creek	10.760	1,801	113,570	29.67
Back Creek	13.763	2,304	145,258	37.97
Crosswicks Creek	3.967	664	41,870	10.94
Doctors Creek	0.536	90	5661	1.48
Miry Run	7.280	1,428	76,724	23.56
Pond Run	8.755	1,479	92,233	26.40
Shady Brook	4.694	792	49,474	13.05
TOTALS	49.756	8,558	524,790	143.07

Summary of Projects in the Stormwater Mitigation Plan

Watersheds	Total Cost ($)	Impervious Cover Treated %
Assunpink Creek	$963,199	25.1%
Back Creek	$701,594	27.0%
Crosswicks Creek	$492,689	3.7%
Doctors Creek	$25,731	13.0%
Miry Run	955,314	13.2%
Pond Run	$975,080	9.8%
Shady Brook	$550,861	6.4%
TOTALS	$4,664,468	11.8%

Next Steps

- Municipalities review their Impervious Cover Assessments
- Provide additional sites that should be included in Impervious Cover Reduction Action Plan
- Discuss implementation of recommended actions – Funding is available

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Questions?

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