



RUTGERS UNIVERSITY

Water Resources Program

New Jersey Agricultural Experiment Station



Watershed Restoration and Protection Plan for the South Branch Raritan River

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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



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.

Project Partners



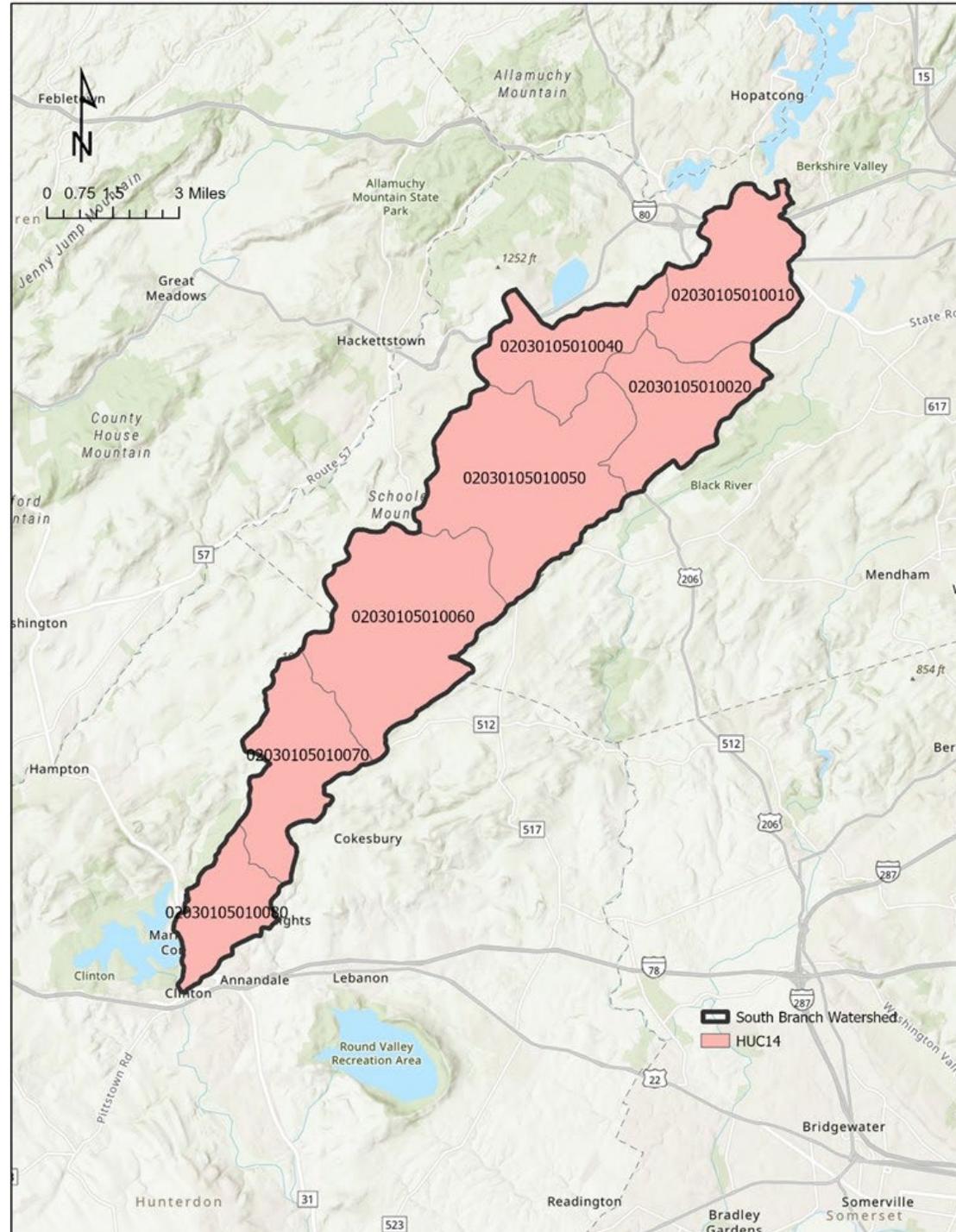
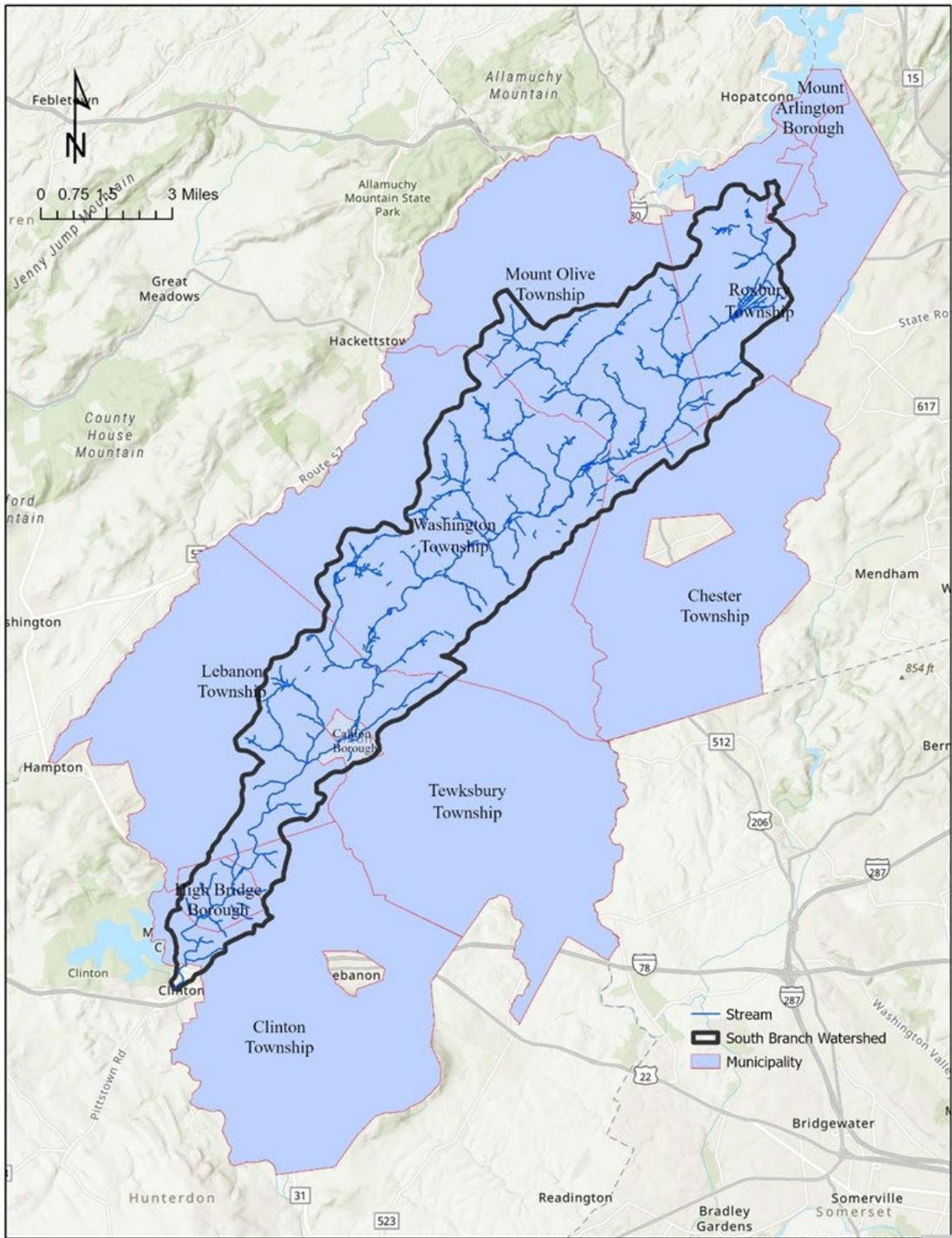
Reason for the Work

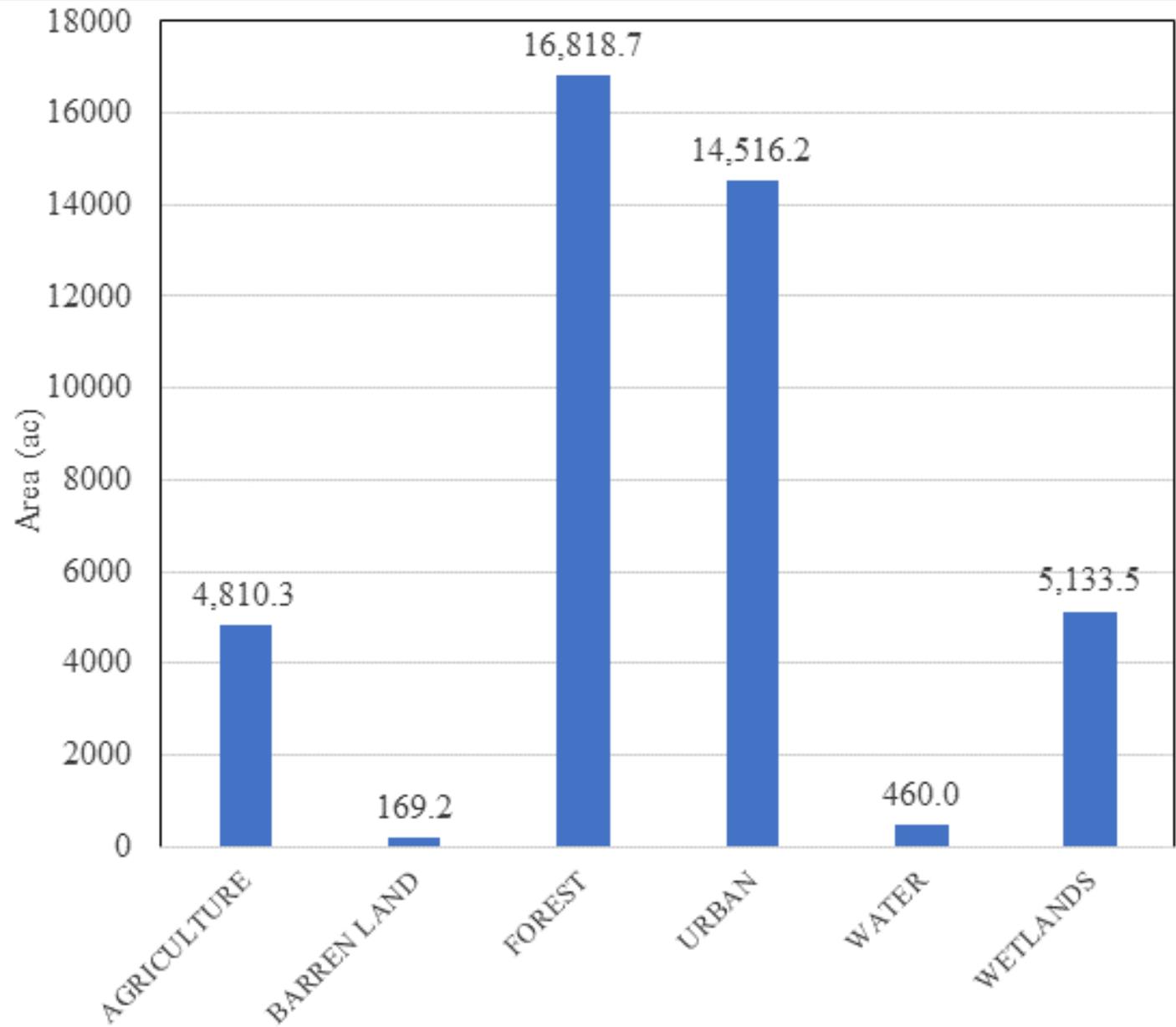
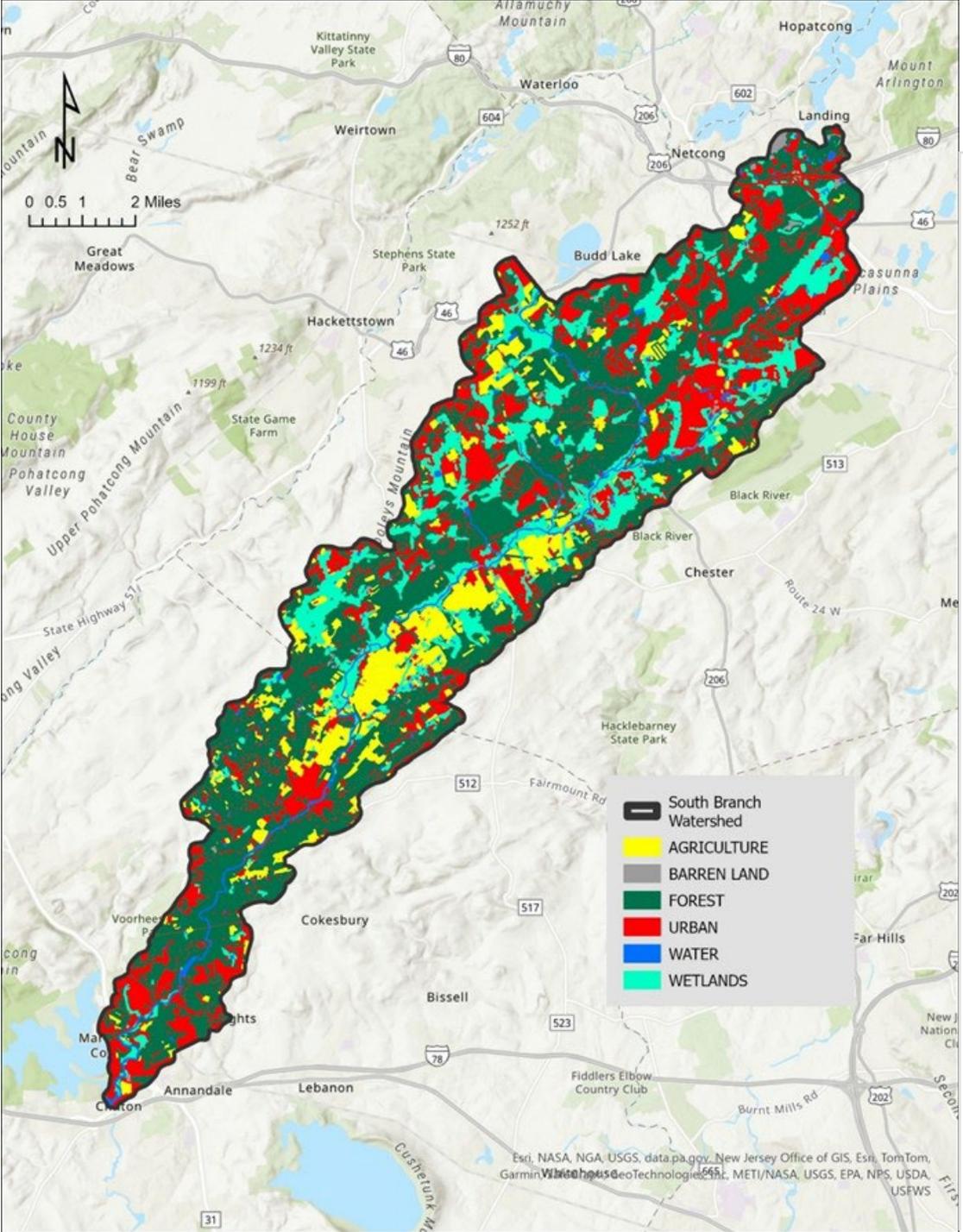
The NJDEP has prepared a TMDL for total suspended solids and total phosphorus that requires a 60% reduction in total suspended solids and a 68% to 84% reduction in total phosphorus. This project will create a plan that will be a blueprint for how to achieve these reductions.



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





Land Use and Nonpoint Source Loading Analysis

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

Land Use Code	Land Use Label	Land Use Type	TP	TN	TSS
1110	Residential, High Density or Multiple Dwelling	Urban	1.4	15	140
1120	Residential, Single Unit, Medium Density	Urban	1.4	15	140
1130	Residential, Single Unit, Low Density	Urban	0.6	5	100
1140	Residential, Rural, Single Unit	Urban	0.6	5	100
1150	Mixed Residential	Urban	1.4	15	140
1200	Commercial/Services	Urban	2.1	22	200
1211	Military Installations	Urban	2.1	22	200
1214	No Long Military	Urban	2.1	22	200
1300	Industrial	Urban	1.5	16	200
1400	Transportation/Communication/Utilities	Urban	1.5	16	200
1410	Major Roadway	Urban	1.5	16	200
1411	Mixed Transportation Corridor Overlap Area	Urban	1.5	16	200
1419	Bridge Over Water	Water	0.1	3	40
1420	Railroads	Urban	1.5	16	200
1440	Airport Facilities	Urban	1.5	16	200
1461	Wetland Rights-Of-Way	Wetlands	0.1	3	40
1462	Upland Rights-Of-Way Developed	Urban	1	10	120

Land Use	Area (acres)		
	HUC14		
	02030105010010	02030105010020	02030105010040
AGRICULTURE	104.3	276.3	502.3
BARREN LAND	98.6	17.9	13.7
FOREST	2,313.6	1,333.7	1,668.9
URBAN	2,455.3	2,294.2	1,356.4
WATER	51.2	49.2	41.3
WETLANDS	627.0	714.0	682.2
Total:	5,650.0	4,685.3	4,264.7

Land Use	Area (acres)		
	HUC14		
	02030105010010	02030105010020	02030105010040
AGRICULTURE	1.8%	5.9%	11.8%
BARREN LAND	1.7%	0.4%	0.3%
FOREST	40.9%	28.5%	39.1%
URBAN	43.5%	49.0%	31.8%
WATER	0.9%	1.1%	1.0%
WETLANDS	11.1%	15.2%	16.0%
Total:	100.0%	100.0%	100.0%

Land Use	Area (acres)		
	HUC14		
	02030105010050	02030105010060	02030105010070
AGRICULTURE	1,027.5	2,325.3	471.8
BARREN LAND	10.7	15.1	8.9
FOREST	3,588.5	3,759.1	2,949.9
URBAN	3,369.9	2,095.0	1,486.6
WATER	98.9	93.4	59.4
WETLANDS	1,670.7	1,242.7	73.8
Total:	9,766.1	9,530.6	5,050.4

Land Use	Area (acres)		
	HUC14		
	02030105010050	02030105010060	02030105010070
AGRICULTURE	10.5%	24.4%	9.3%
BARREN LAND	0.1%	0.2%	0.2%
FOREST	36.7%	39.4%	58.4%
URBAN	34.5%	22.0%	29.4%
WATER	1.0%	1.0%	1.2%
WETLANDS	17.1%	13.0%	1.5%
Total:	100.0%	100.0%	100.0%

Land Use	Area (acres)
	HUC14
	02030105010080
AGRICULTURE	102.8
BARREN LAND	4.4
FOREST	1,204.8
URBAN	1,459.0
WATER	66.8
WETLANDS	123.4
Total:	2,961.3

Land Use	Area (acres)
	HUC14
	02030105010080
AGRICULTURE	3.5%
BARREN LAND	0.1%
FOREST	40.7%
URBAN	49.3%
WATER	2.3%
WETLANDS	4.2%
Total:	100.0%

Table 6. Pollutant loads for HUC 02030105010010

General Land Use Category	Area (acres)	Total Phosphorus (lbs/yr)	Total Nitrogen (lbs/yr)	Total Suspended Solids (lbs/yr)
Agriculture	104.3	135.6	1,043.0	31,289.2
Barren Land	98.6	49.3	492.8	5,913.4
Forest	2,313.6	231.4	6,940.8	92,543.9
Urban	2,455.3	2,543.2	25,232.8	304,751.3
Water	51.2	5.1	153.6	2,048.4
Wetlands	627.0	61.7	1,850.5	24,674.0
Totals =	5,650.0	3,026.2	35,713.5	461,220.1

Table 7. Pollutant loads for HUC 02030105010020

General Land Use Category	Area (acres)	Total Phosphorus (lbs/yr)	Total Nitrogen (lbs/yr)	Total Suspended Solids (lbs/yr)
Agriculture	276.3	359.2	2,763.3	82,898.6
Barren Land	17.9	8.9	89.5	1,073.6
Forest	1,333.7	133.4	4,001.0	53,346.5
Urban	2,294.2	2,382.7	23,775.8	283,828.6
Water	49.2	4.9	147.6	1,968.1
Wetlands	714.0	65.6	1,969.1	26,255.0
Totals =	4,685.3	2,954.8	32,746.3	449,370.4

Table 8. Pollutant loads for HUC 02030105010040

General Land Use Category	Area (acres)	Total Phosphorus (lbs/yr)	Total Nitrogen (lbs/yr)	Total Suspended Solids (lbs/yr)
Agriculture	502.3	653.0	5,022.8	150,683.6
Barren Land	13.7	6.8	68.4	820.7
Forest	1,668.9	166.9	5,006.5	66,753.5
Urban	1,356.4	1,199.3	11,509.0	153,725.4
Water	41.3	4.1	123.8	1,650.8
Wetlands	682.2	68.1	2,010.7	26,663.4
Totals =	4,264.7	2,098.2	23,741.2	400,297.4

Table 9. Pollutant loads for HUC 02030105010050

General Land Use Category	Area (acres)	Total Phosphorus (lbs/yr)	Total Nitrogen (lbs/yr)	Total Suspended Solids (lbs/yr)
Agriculture	1,027.5	1,335.7	10,274.5	308,235.7
Barren Land	10.7	5.3	53.4	640.2
Forest	3,588.5	358.8	10,765.5	143,539.6
Urban	3,369.9	2,471.3	22,336.2	351,385.7
Water	98.9	9.9	296.7	3,955.5
Wetlands	1,670.7	163.1	4,843.1	64,340.7
Totals =	9,766.1	4,344.2	48,569.3	872,097.4

Table 10. Pollutant loads for HUC 02030105010060

General Land Use Category	Area (acres)	Total Phosphorus (lbs/yr)	Total Nitrogen (lbs/yr)	Total Suspended Solids (lbs/yr)
Agriculture	2,325.3	3,022.8	23,252.7	697,580.7
Barren Land	15.1	7.5	75.3	903.2
Forest	3,759.1	375.9	11,277.3	150,364.2
Urban	2,095.0	1,468.1	13,015.7	222,618.5
Water	93.4	9.3	280.3	3,737.7
Wetlands	1,242.7	123.9	3,718.2	49,575.9
Totals =	9,530.6	5,007.7	51,619.5	1,124,780.2

Table 11. Pollutant loads for HUC 02030105010070

General Land Use Category	Area (acres)	Total Phosphorus (lbs/yr)	Total Nitrogen (lbs/yr)	Total Suspended Solids (lbs/yr)
Agriculture	471.8	613.4	4,718.3	141,549.3
Barren Land	8.9	4.4	44.3	531.7
Forest	2,949.9	295.0	8,849.6	117,994.6
Urban	1,486.6	1,062.2	9,530.8	155,177.6
Water	59.4	5.9	178.2	2,375.8
Wetlands	73.8	7.2	216.1	2,881.0
Totals =	5,050.4	1,988.1	23,537.3	420,510.1

Table 12. Pollutant loads for HUC 02030105010080

General Land Use Category	Area (acres)	Total Phosphorus (lbs/yr)	Total Nitrogen (lbs/yr)	Total Suspended Solids (lbs/yr)
Agriculture	102.8	133.6	1,027.5	30,825.7
Barren Land	4.4	2.2	22.1	265.6
Forest	1,204.8	120.5	3,614.5	48,193.2
Urban	1,459.0	1,506.4	14,981.9	180,050.9
Water	66.8	6.7	200.4	2,672.5
Wetlands	123.4	10.8	324.1	4,321.2
Totals =	2,961.3	1,780.2	20,170.6	266,329.1

General Land Use Category	Area	Total Phosphorus	Total Nitrogen	Total Suspended Solids
	(acres)	(lbs/yr)	(lbs/yr)	(lbs/yr)
Agriculture	7,778	10,112	77,782	2,333,465
Barren Land	268	134	1,342	16,097
Forest	16,503	1,650	49,509	660,114
Urban	10,500	9,761	94,548	1,224,872
Water	628	63	1,883	25,102
Wetlands	4,016	394	11,761	156,593
Totals =	39,693	22,113	236,824	4,416,242

Impervious Cover Analysis



Impervious Cover Model

Stream Quality

Good

Fair

Poor

Sensitive

Impacted

Non-Supporting

Urban Drainage

10%

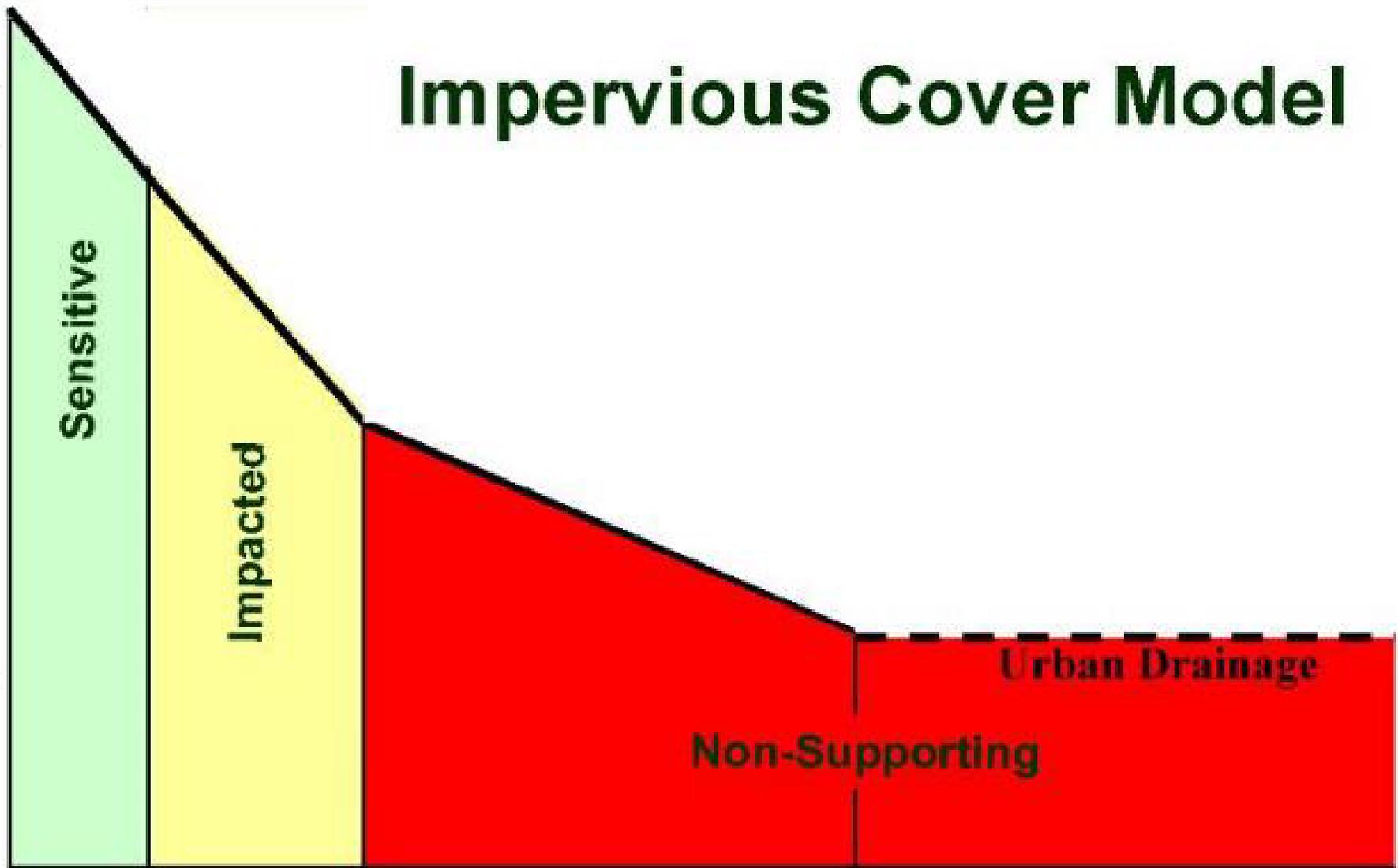
25%

40%

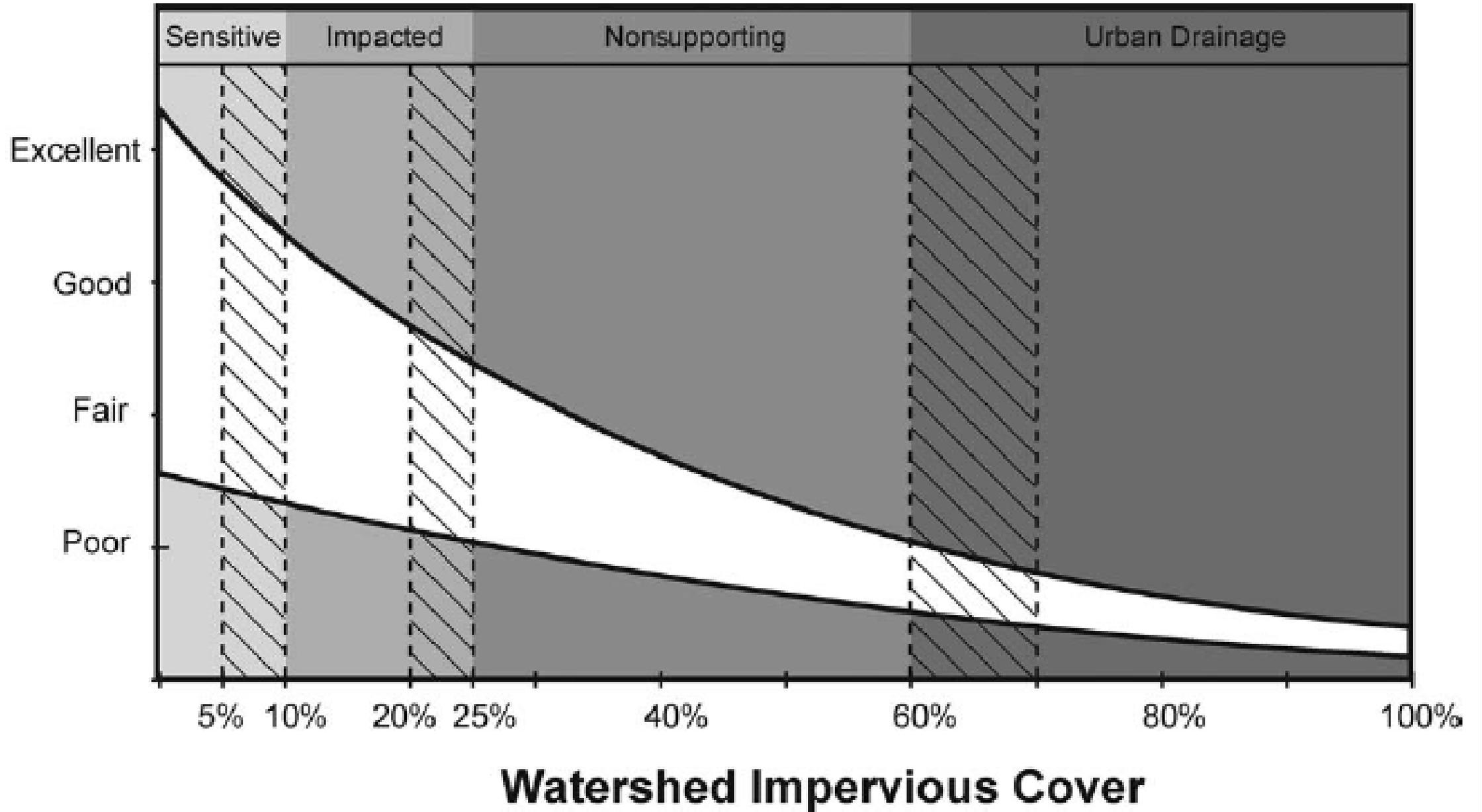
60%

100%

Watershed Impervious Cover



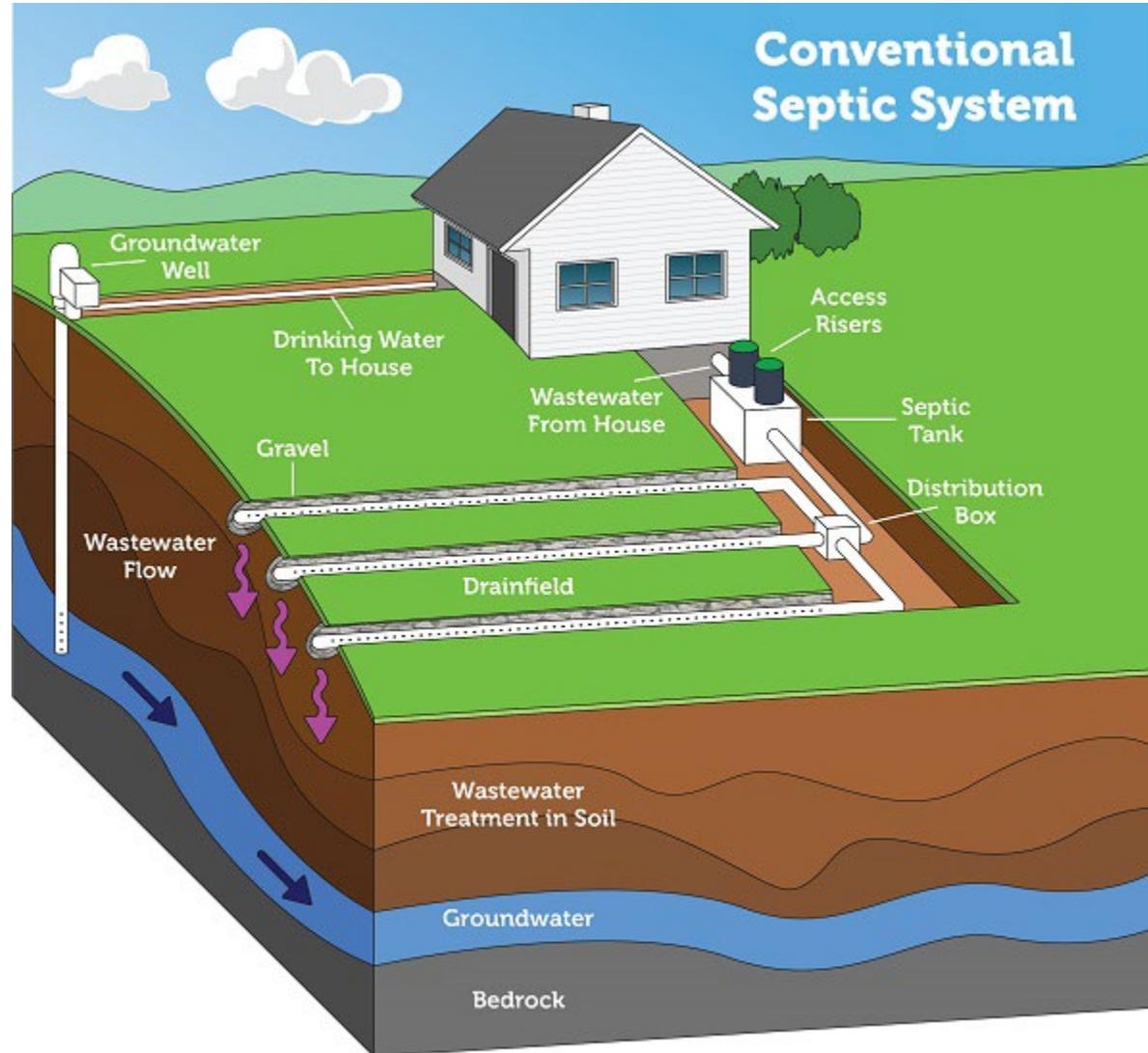
Stream Quality



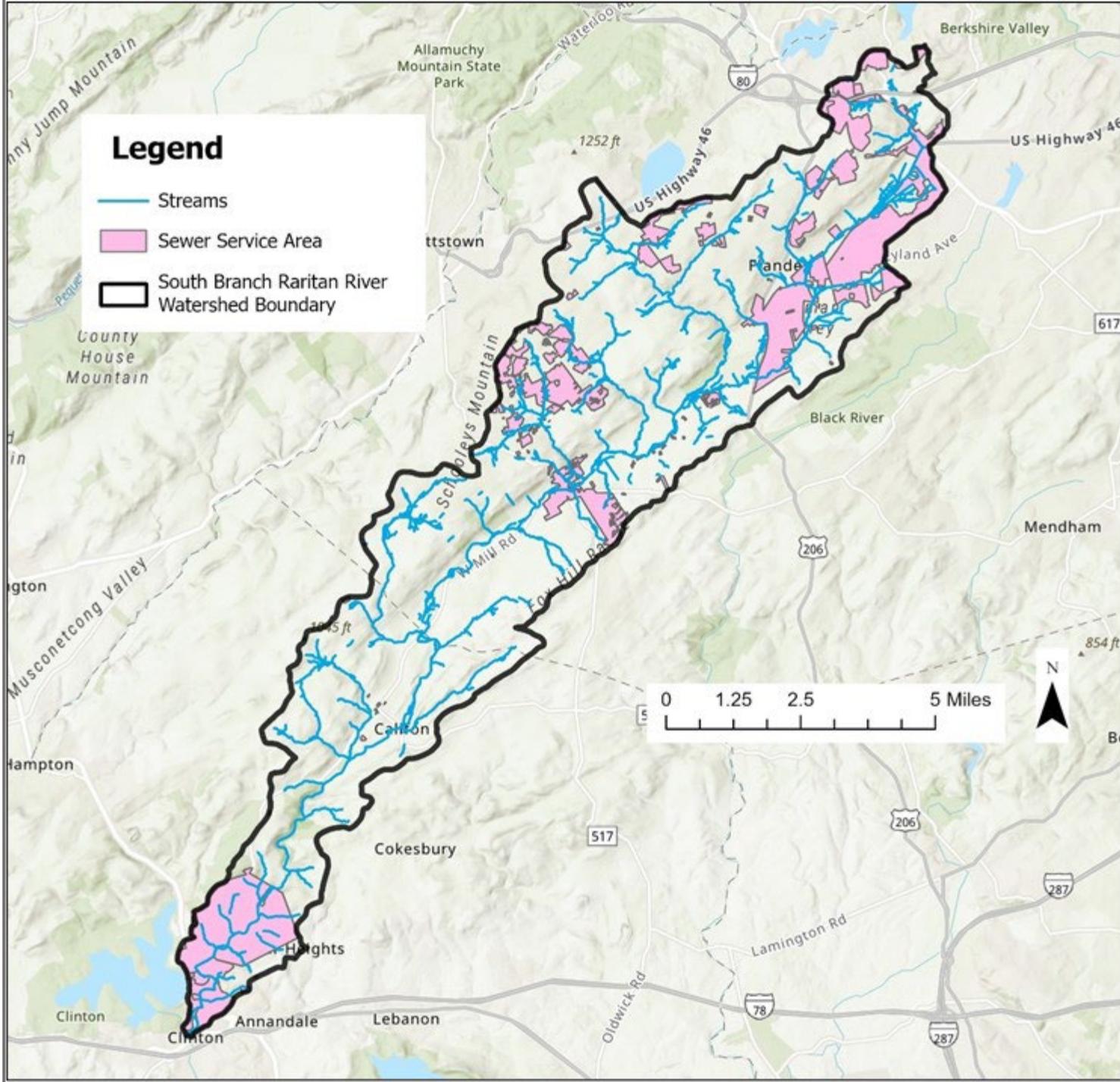
HUC14	Impervious Cover (acres)			
	Buildings	Other	Road	Total
02030105010010	214.4	463.7	347	1,025.1
02030105010020	196.1	400.5	210.6	807.2
02030105010040	94.8	229.6	136.2	460.5
02030105010050	169.3	397	301.1	867.4
02030105010060	105.19	299.3	177.4	581.9
02030105010070	68.2	175.7	140.4	384.4
02030105010080	97.6	225.3	176.6	499.5
TOTALS =	799.7	1,713.1	1,116.1	3,629

HUC14	Total Impervious Cover (ac)	Total HUC14 Area (ac)	Impervious Cover (%)
02030105010010	1,025.1	5,650.0	18.1%
02030105010020	807.2	4,685.3	17.2%
02030105010040	460.5	4,264.7	10.8%
02030105010050	867.4	9,766.1	8.9%
02030105010060	581.9	9,530.6	6.1%
02030105010070	384.4	5,050.4	7.6%
02030105010080	499.5	2,961.3	16.9%
Totals =	4,626.0	41,908.4	8.7%

Septic System Analysis



Please note: Septic systems vary. Diagram is not to scale.



HUC14	Number of Parcels that are outside Sewer Service Area and Inside the 200-meter Stream Buffer (septic systems)	Homes with Septic Systems Built Prior to 2000	TP Load from Septic Systems (lbs/yr)
02030105010010	355	316	1,983.7
02030105010020	215	190	1,192.7
02030105010040	242	195	1,224.1
02030105010050	561	503	3,157.6
02030105010060	652	600	3,766.6
02030105010070	566	523	3,283.2
02030105010080	52	51	320.2
Totals =	2,643	2,378	14,928.1

Fertilizer Ordinance

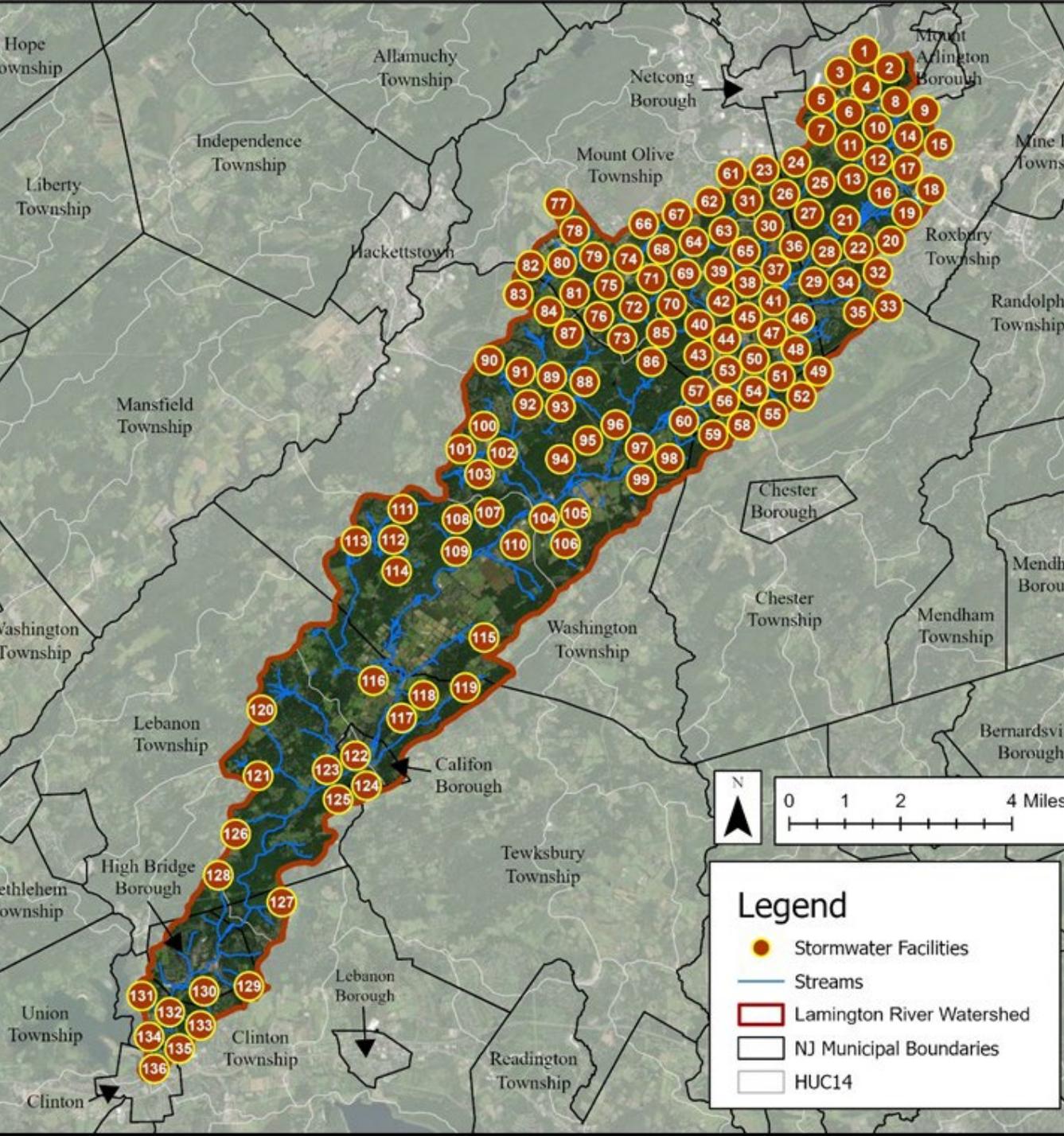


Raritan River South Branch Watershed				
Residential Area (ac)	Impervious Cover Total (ac)	Lawn (ac)	TP Fertilizer Applied (lbs/yr)	TP Fertilizer Runoff (lbs/yr)
HUC 02030105010010				
1,733.1	575.9	1,157.2	4,158.6	104.0
HUC 02030105010020				
1,394.9	450.0	944.9	3,395.7	84.9
HUC 02030105010040				
916.9	274.1	642.8	2,310.0	57.8
HUC 02030105010050				
2,673.0	610.1	2,062.9	7,413.4	185.3
HUC 02030105010060				
1,854.8	352.2	1,502.6	5,399.9	135.0
HUC 02030105010070				
1,294.5	261.3	1,033.2	3,713.0	92.8
HUC 02030105010080				
1,049.1	310.2	738.9	2,655.4	66.4
TOTALS				
10,916.3	2,833.8	8,082.5	29,046.1	726.2

Street Sweeping and Leaf Collection



Watershed-wide Practice		TP Reduction (lbs/yr)
1	Street Sweeping (twice per week throughout entire study area)	1,116
2	Street Sweeping (once a month throughout entire study area)	89.3
3	Fall Street Sweeping and Leaf Collection (only residential areas)	686.5
4	Combination of 2 and 3	775.8



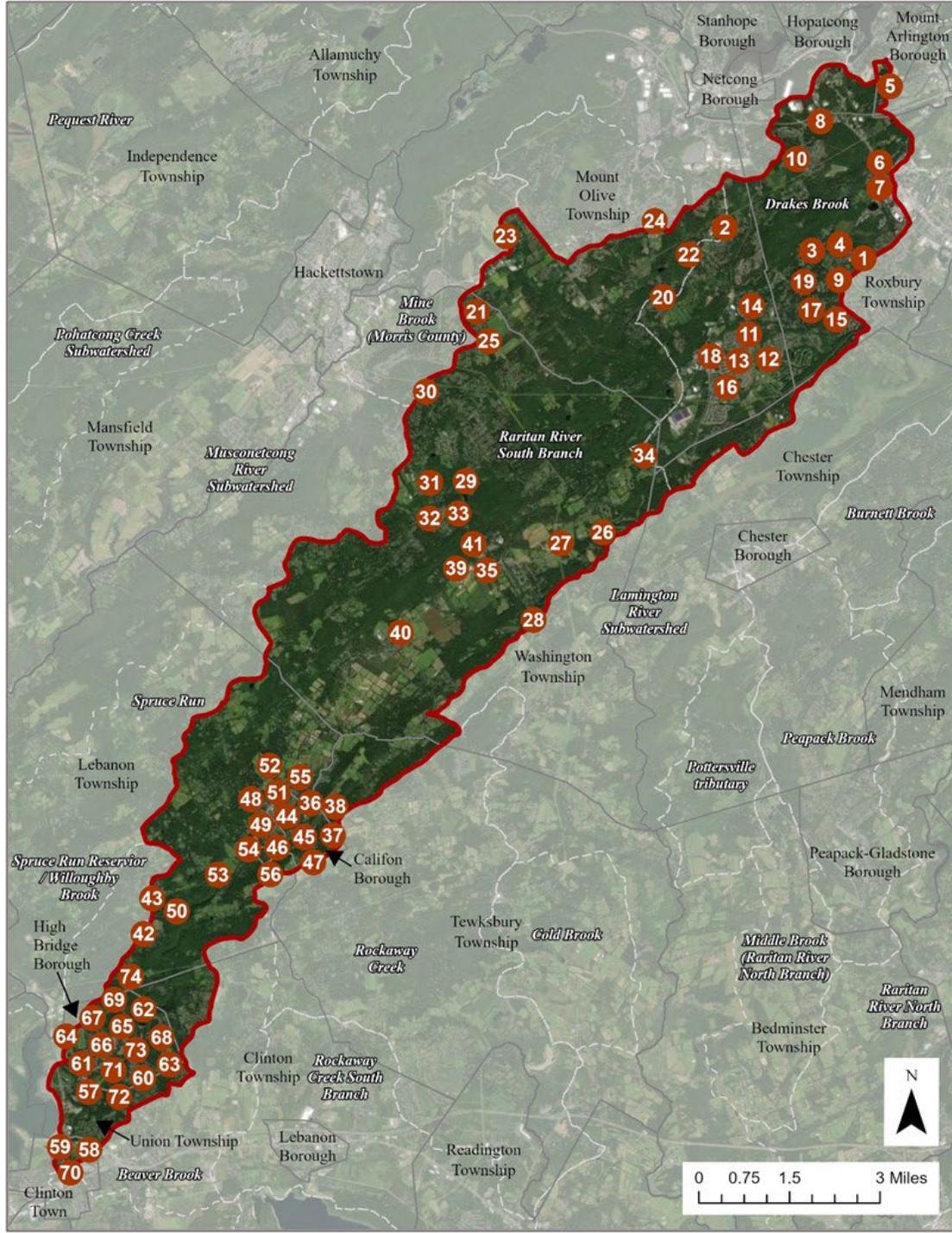
ID	Owner	Address	Type	Town
HUC 02030105010010				
1	5 Lenel Road LLC	5 Lenel Rd	N	Roxbury
2	Gulick & Sons, LLC	12 Lenel Rd	R	Roxbury
3	Unknown	1 Exceptional Way	R	Roxbury
4	Kikia Assoc LLC, Prudent Publishing	400 N Frontage Rd	N	Roxbury
5	1881 NJ LLC, Victoria Classic	1881 Route 46, Ledge	R	Roxbury
6	Township of Roxbury	2 Fox Chase Ln	N	Roxbury
7	Township of Roxbury	1830 Route 46, Ledge	R	Roxbury
8	Selby, John	101 Hillcrest Ave	I	Roxbury

ID	Land Use	Drainage Area	Type	TP Load (lbs/yr)	Existing TP Load Reduction	Future TP Load Reduction
HUC 2030105010010						
1	Industrial	5.07	N	7.6	4.6	4.6
2	Commercial/Services	5.31	R	3.2	1.6	1.6
3	Industrial	66.79	R	100.2	50.1	50.1
4	Industrial	35.11	N	52.7	31.6	31.6
5	Industrial	72.31	R	108.5	54.2	54.2
6	Residential, Single Unit, Medium Density	42.89	N	60.0	36.0	36.0
7	Residential, Single Unit, Medium Density	39.47	R	55.3	27.6	27.6
8	Commercial/Services	0.32	I	0.7	0.4	0.4

Existing Pollutant Load for the Study Area

	Raritan River South Branch Watershed
Nonpoint source aerial loading based upon land use	21,199
Septic system load	14,928
Detention Basin Load Reduction	-1,021
Total Existing Load	35,106

Parcels for Retrofitting with Green Infrastructure



- 74 sites
- 1,723,533 sq.ft. = drainage area (39.6 ac)
- 57 Rain Gardens
- 46 Porous Pavement Projects
- 10 Cisterns
- 14 Planter Boxes

Site ID	Site Name and Address	Lot Area (sq.ft.)	Impervious Cover for Lot (sq.ft.)	Total Drainage Area (sq.ft.)	Size of Rain Garden Practice (sq.ft.)	Size of Porous Asphalt Practice (sq.ft.)	Size of Other Practice
HUC 02030105010010							
1	American Christian School-South Campus, 126 South Hillside Avenue, Succasunna NJ 07876	193,601	60,281	12,575	2,740	900	0
2	Fun-N-Friends Nursery School, 58 Drakesdale Road, Flanders NJ 07836	225,845	55,191	9,240	710	1,600	0
3	Holy Wisdom Byzantine Catholic Church, 197 Emmans Road, Roxbury NJ 07836	393,578	27,418	7,410	1,090	1,790	0

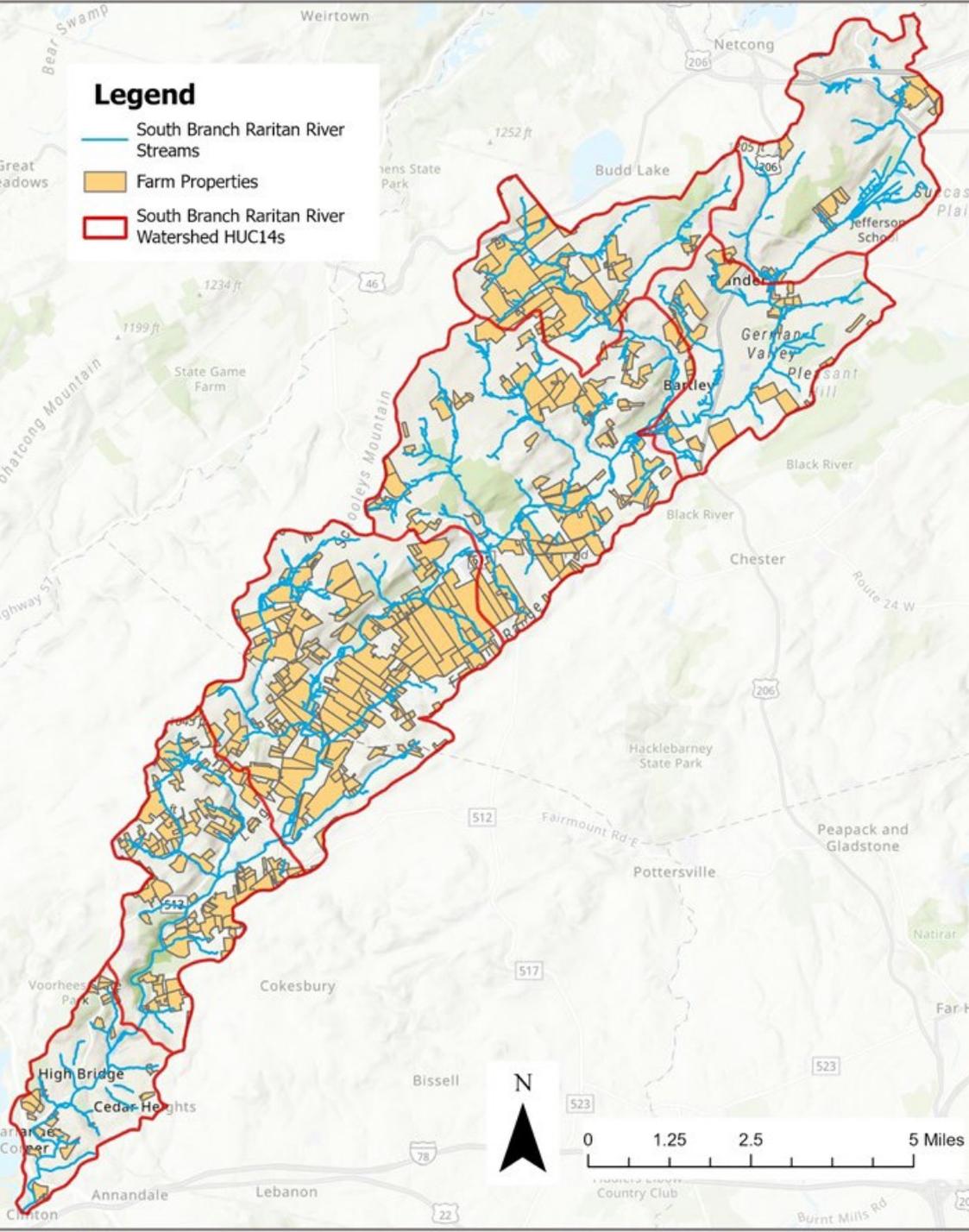
Site ID	Site Name and Address	TP Loading reduction with underdrain (lbs/yr)	TP Loading reduction w/o underdrain (lbs/yr)
HUC 02030105050010			
1	American Christian School-South Campus, 126 South Hillside Avenue, Succasunna NJ 07876	1.74	2.61
2	Fun-N-Friends Nursery School, 58 Drakesdale Road, Flanders NJ 07836	1.62	2.43
3	Holy Wisdom Byzantine Catholic Church, 197 Emmans Road, Roxbury NJ 07836	0.78	1.17
4	Jefferson Elementary School, 35 Corn Hollow Road, Succasunna NJ 07876	5.58	8.37
5	Lake Rogerene Fire Department, 173 Orben Drive, Landing NJ 07850	0.30	0.45

Rain Gardens to Manage Rooftop Runoff

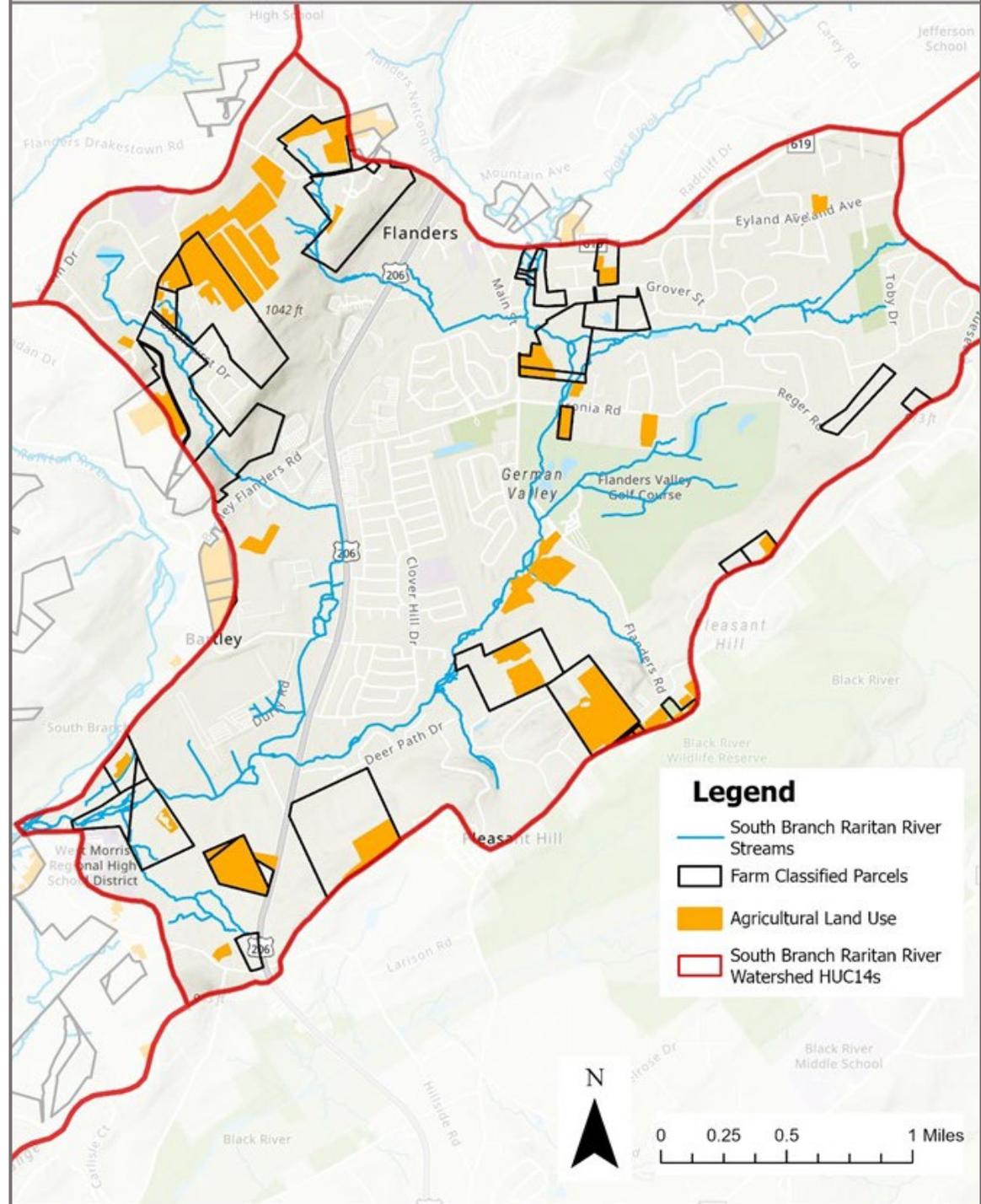
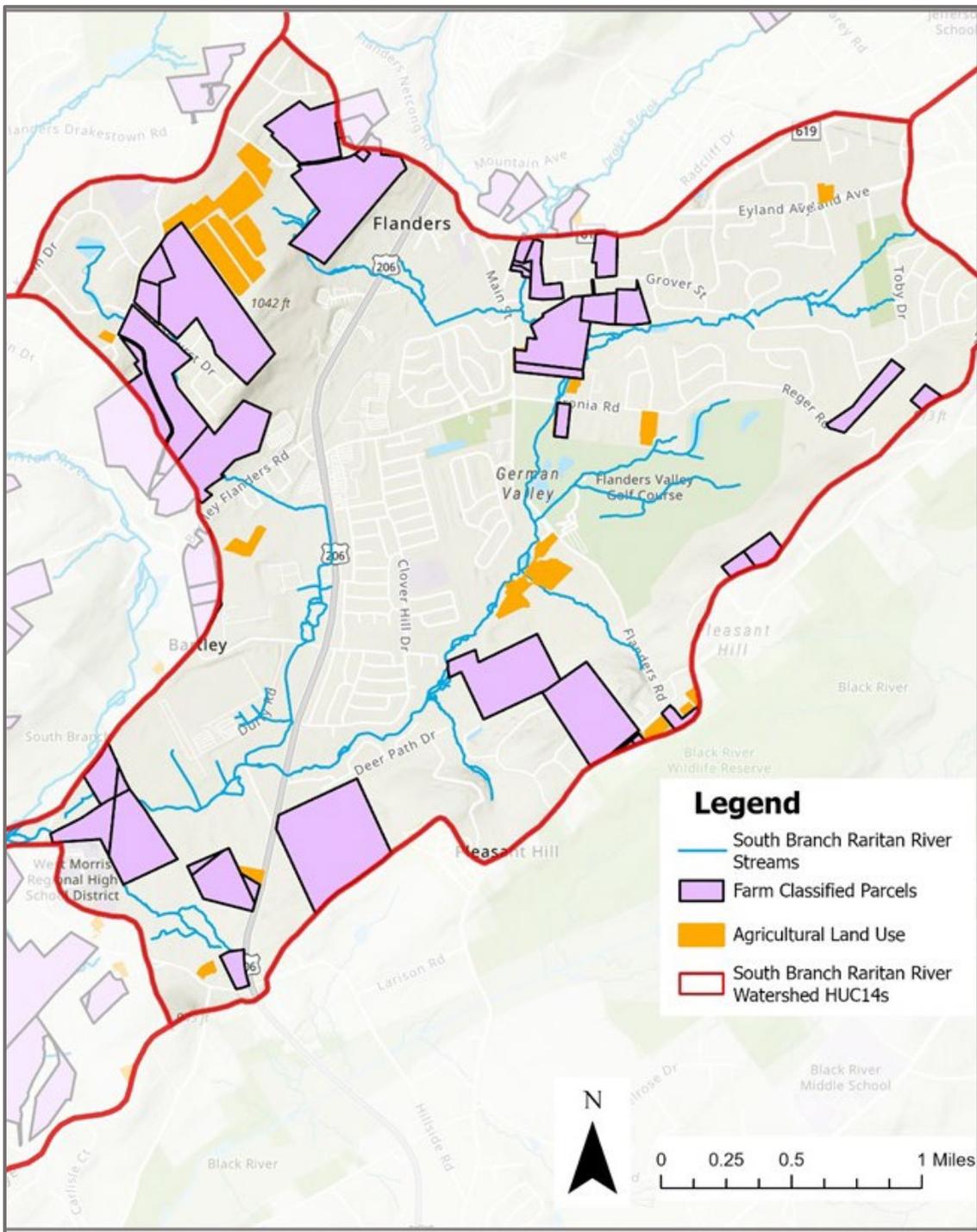
- 11,233 buildings in the study area
- 658.4 acres of rooftop
- 25% of the rooftops of 25% buildings
- TP Reduction = 81.8 lbs/yr
- TN Reduction = 856.9 lbs/yr
- TSS Reduction = 7,790 lbs/yr

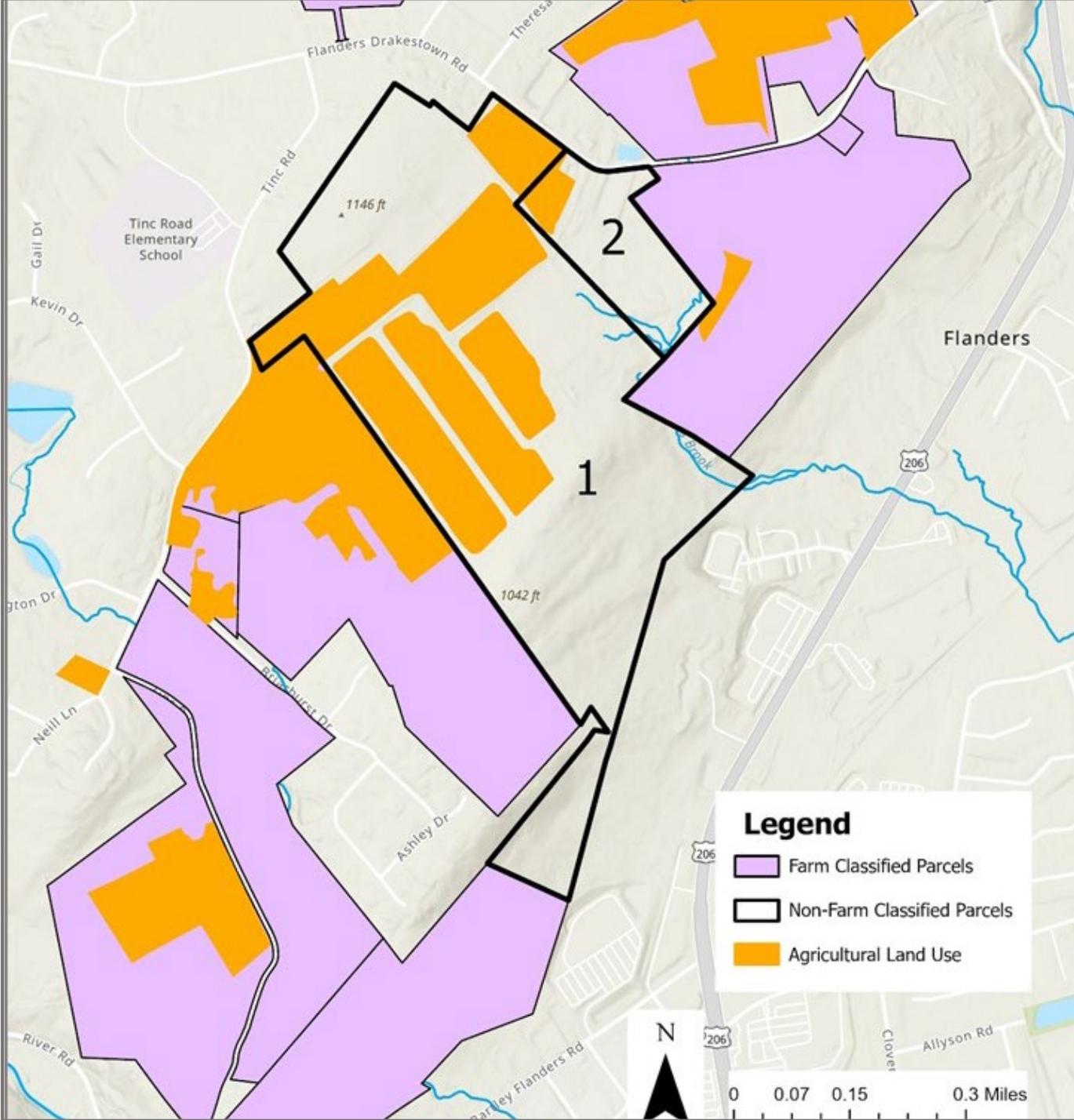


Analysis of Farm Parcels

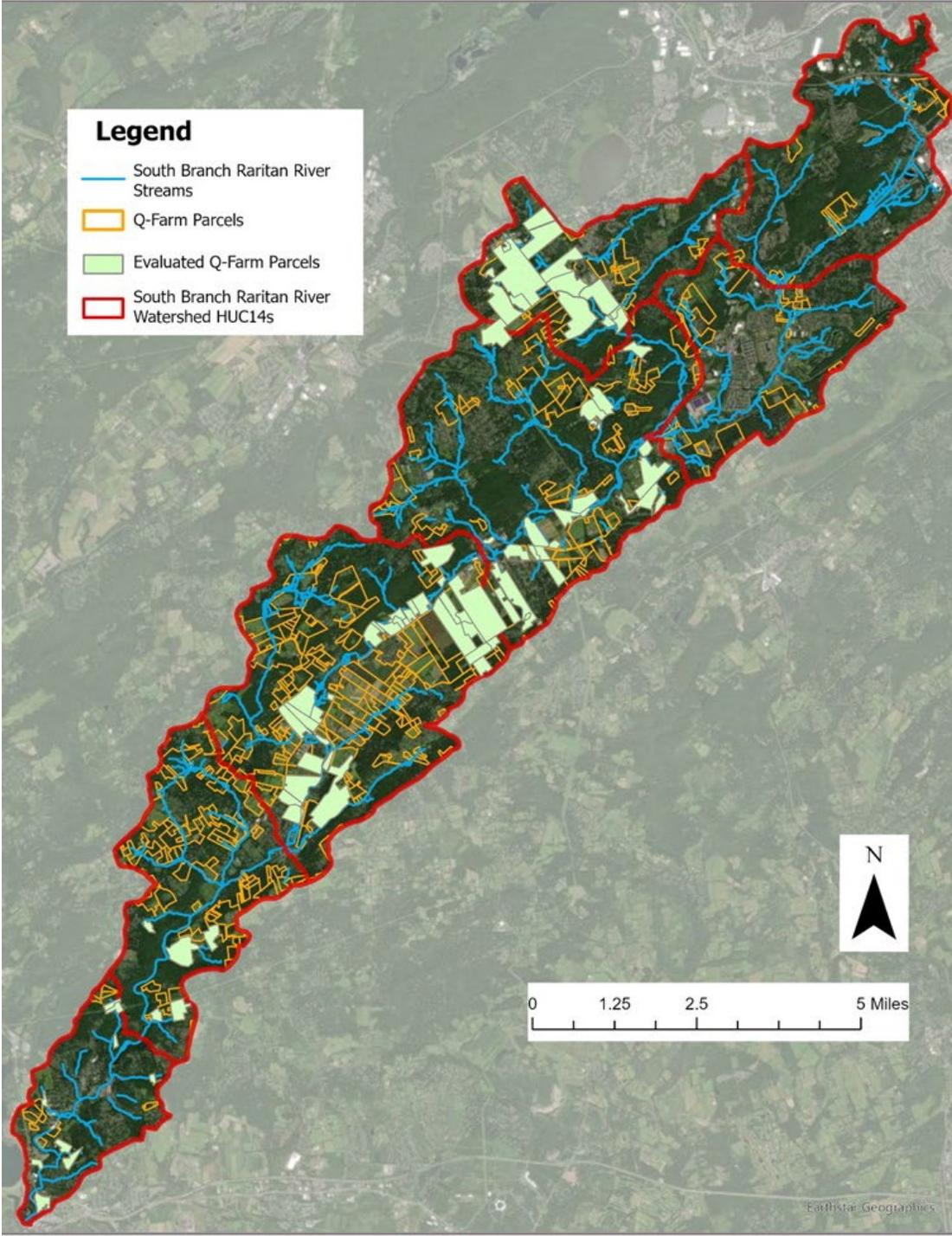


- Urban Lands = 590 lb TP / year
- Ag Lands = 5,078 lb TP / year
- 524 Farm Parcels = 11,194 acres
- Ag land use in these parcels = 3,096 acres = 6,253 lb TP / year





	Ag LU	TP Load	No. of
Description	(acres)	(lbs/yr)	Parcels
Total for Farm Property (3A, 3B, and/or Q-Farm)	3,906	5,078	524
Total for entire study area (all four HUC14s)	4,810	6,253	15,820*
Remaining	904	1,175	15,296



- 524 Farm Parcels
- 206 Farm Parcels intersect with river or tributaries
- 91 Farm Parcels were visited
- Farms Classified as:
 - Row Crops
 - Livestock/Horses
 - Hay/Grass
 - Wooded
 - Nursery

Block	Lot	Q-Farm Code	Municipality	Cover Crop	Enhanced Stream Buffer	Impervious Cover Mgt.	Rainwater Harvesting	Livestock Exclusion	Manure Mgt.
12	3	Q0015	Lebanon Twp				X		X
12	5	Q0017	Lebanon Twp				X		
16	20	Q0024	Lebanon Twp			X	X		
18	49.03	Q0035	Lebanon Twp						X
41	11.01	Q0097	Lebanon Twp	X		X	X		
41	10	Q0113	Lebanon Twp				X		X
41	11	Q0115	Lebanon Twp	X	X				
41	13	Q0116	Lebanon Twp	X					

Existing load from 16 Q-Farms recommended for cover crop

Area (ac)	TP Load (lbs/yr)	TN Load (lbs/yr)	TSS Load (lbs/yr)
671.2	873	6,712	201,370

Load reduction for cover crop on recommended 16 Q-Farms

Area (ac)	TP Load (lbs/yr)	TN Load (lbs/yr)	TSS Load (lbs/yr)
671.2	524	2,014	161,096

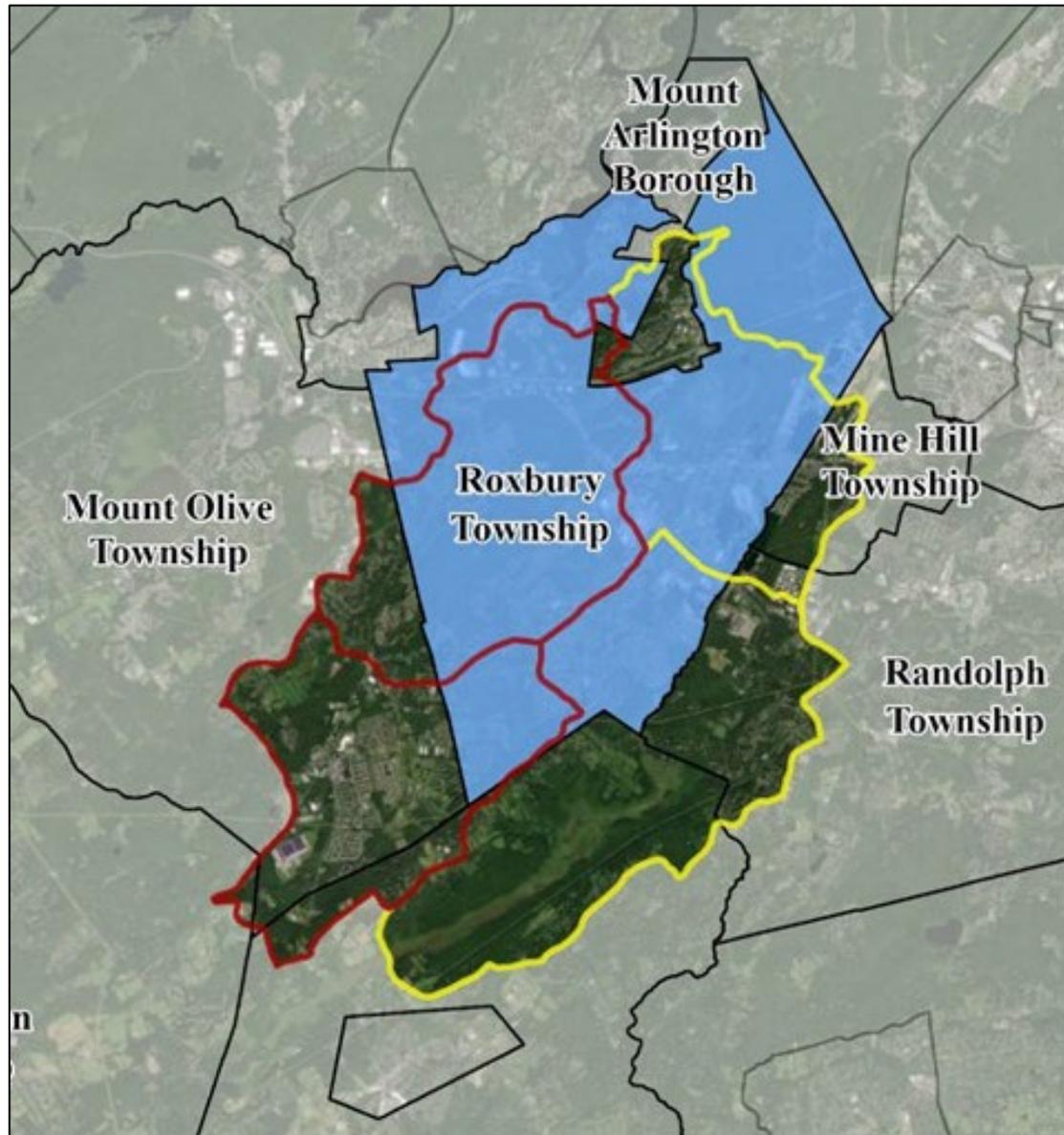
Load reductions for proposed management strategies

Management Strategy	TP Reduction (lb/yr)
Leaf collection and additional street sweeping (Option #4 – Table 27)	775.8
Green infrastructure for proposed retrofit sites	375.9
Rain gardens for ¼ rooftops for ¼ of buildings	99.8
Converting existing detention basins to bioretention basins	415.2
Agricultural management practices on specific farms	524.0
Septic system replacement	6,566.3
TOTAL =	8,757.0

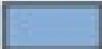
Existing loads and proposed load reduction

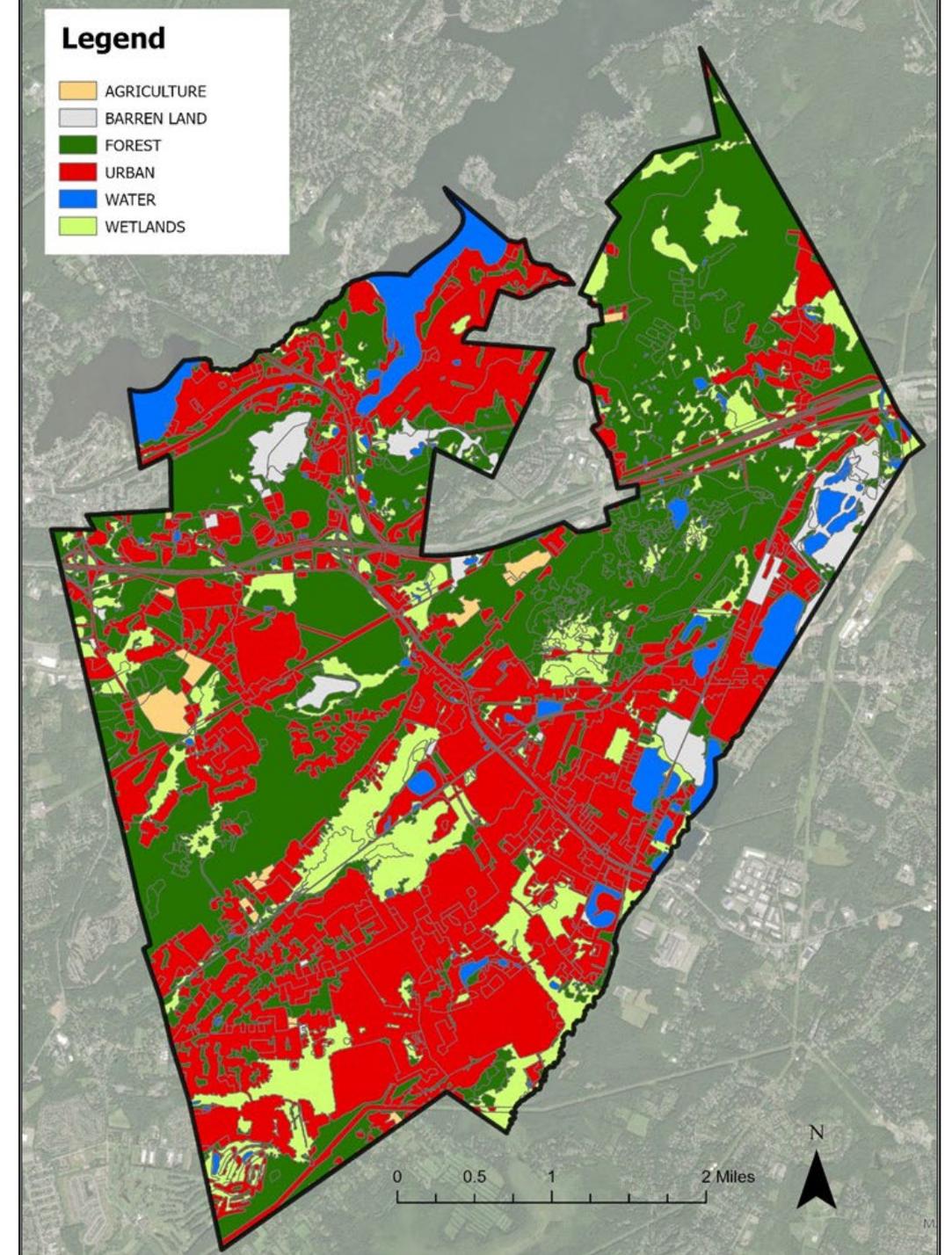
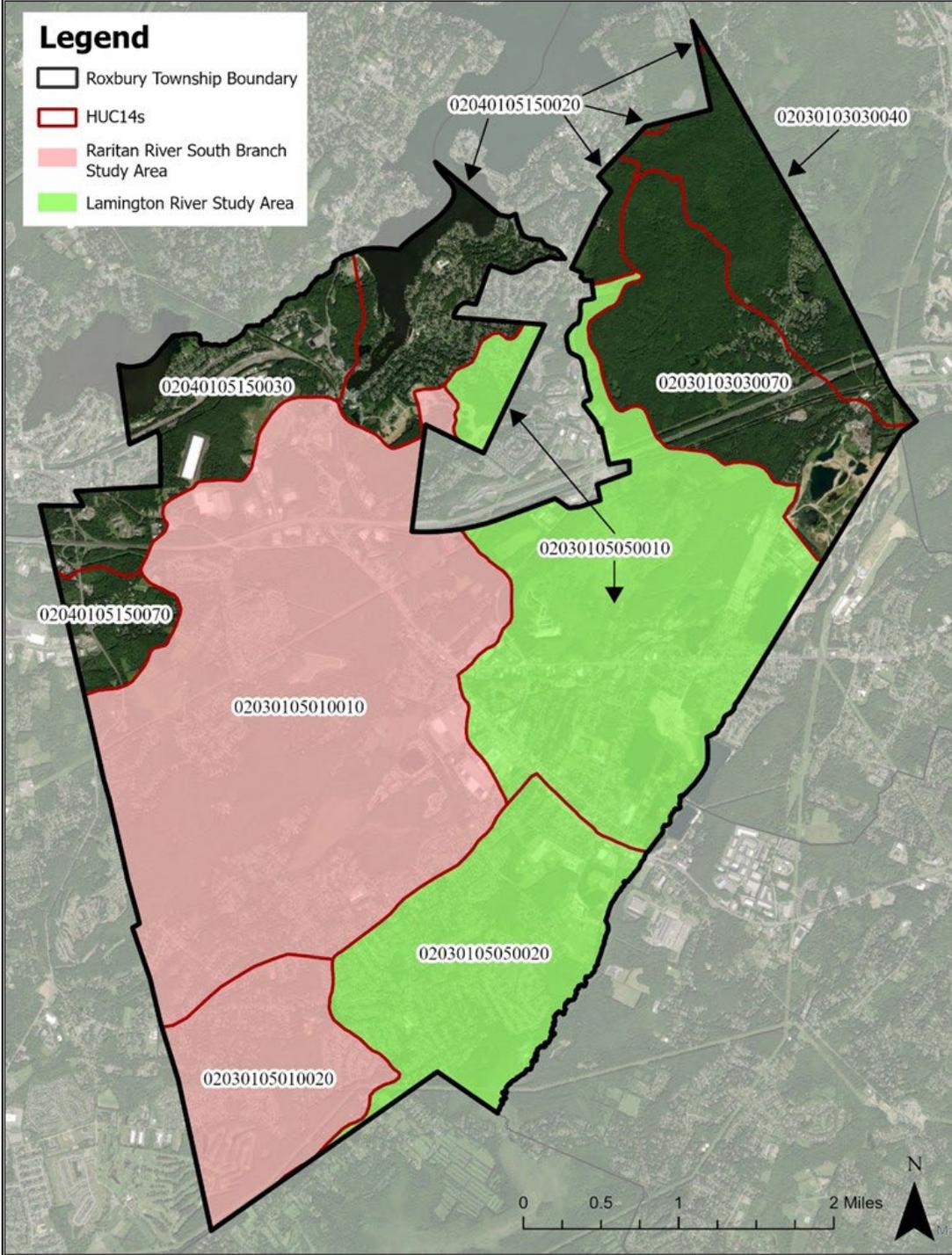
	TP (lbs/yr)
Existing Load	35,106
Load Reduction	8,757
% Load Reduction	24.9%

Analysis by Municipality



Legend

-  Roxbury Township
-  HUC14s in Raritan River South Branch Study Area
-  HUC14s in Lamington River Study Area
-  Municipalities in Study Area

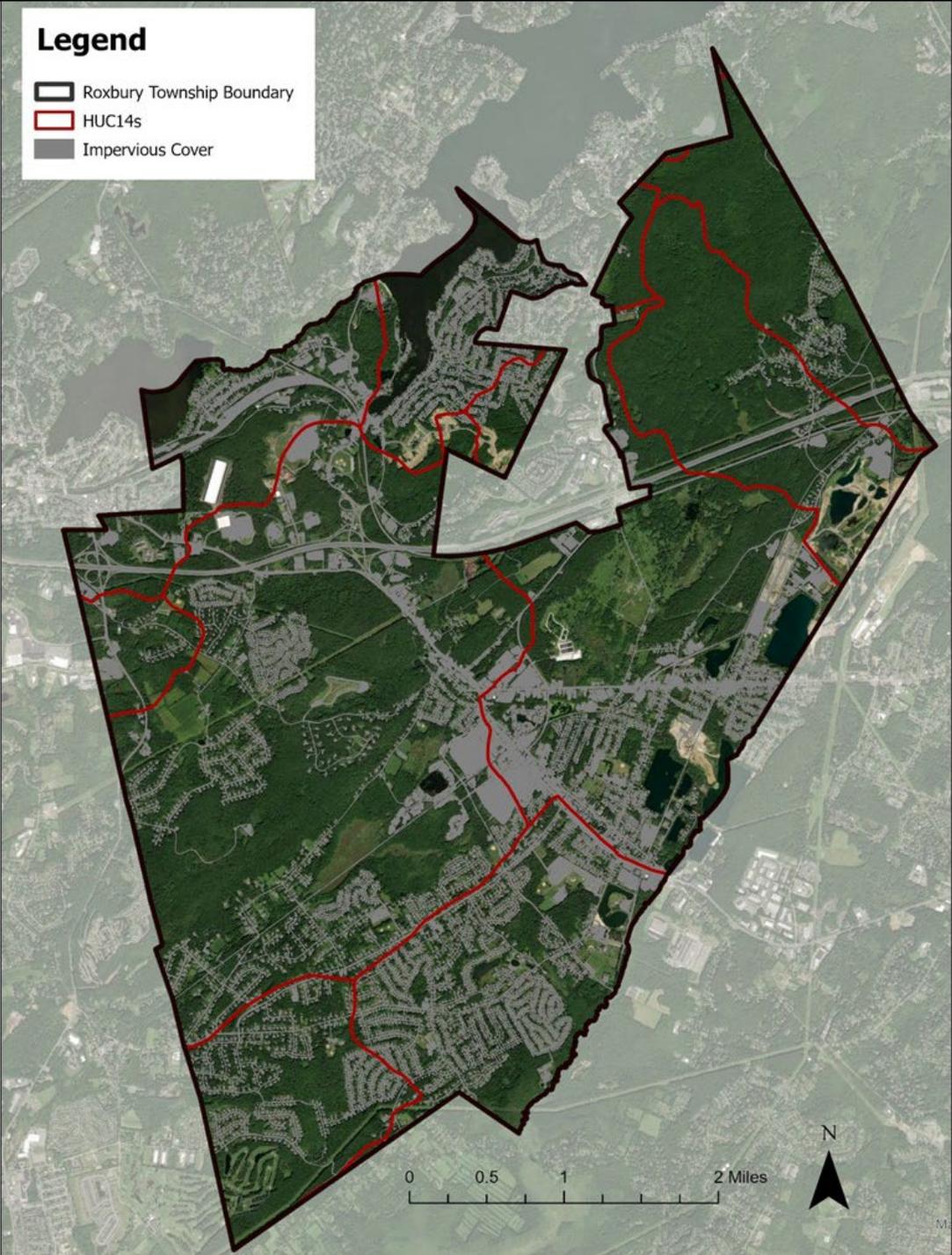


Land Use	Area (acres)	TP Load (lbs/yr)	TN Load (lbs/yr)	TSS Load (lbs/yr)
02030103030040				
Agriculture	1.0	1.3	9.6	289.4
Barren Land	0.1	0.0	0.4	4.6
Forest	537.3	53.7	1,611.9	21,491.4
Urban	152.1	212.9	2,281.1	21,290.6
Water	11.1	1.1	33.4	444.9
Wetlands	118.3	11.8	354.9	4,732.1
TOTAL =	819.8	280.9	4,291.3	48,252.9
02030103030070				
Agriculture	0.0	0.0	0.0	0.0
Barren Land	129.5	64.8	647.6	7,771.8
Forest	817.2	81.7	2,451.7	32,689.8
Urban	168.4	235.8	2,526.1	23,577.0
Water	63.3	6.3	189.8	2,531.3
Wetlands	146.8	14.7	440.3	5,870.5
TOTAL =	1,325.2	403.3	6,255.6	72,440.3

Land Use	Area (acres)	TP Load (lbs/yr)	TN Load (lbs/yr)	TSS Load (lbs/yr)
All HUC14s				
Agriculture	129.5	168.4	1,295.1	38,853.4
Barren Land	405.1	202.5	2,025.5	24,305.5
Forest	5,451.5	545.1	16,354.5	218,059.5
Urban	5,780.0	8,092.0	86,700.2	809,201.5
Water	637.6	63.8	1,912.8	25,504.3
Wetlands	1,636.1	163.6	4,908.3	65,443.4
TOTAL =	14,039.8	9,235.4	113,196.3	1,181,367.7

Legend

-  Roxbury Township Boundary
-  HUC14s
-  Impervious Cover

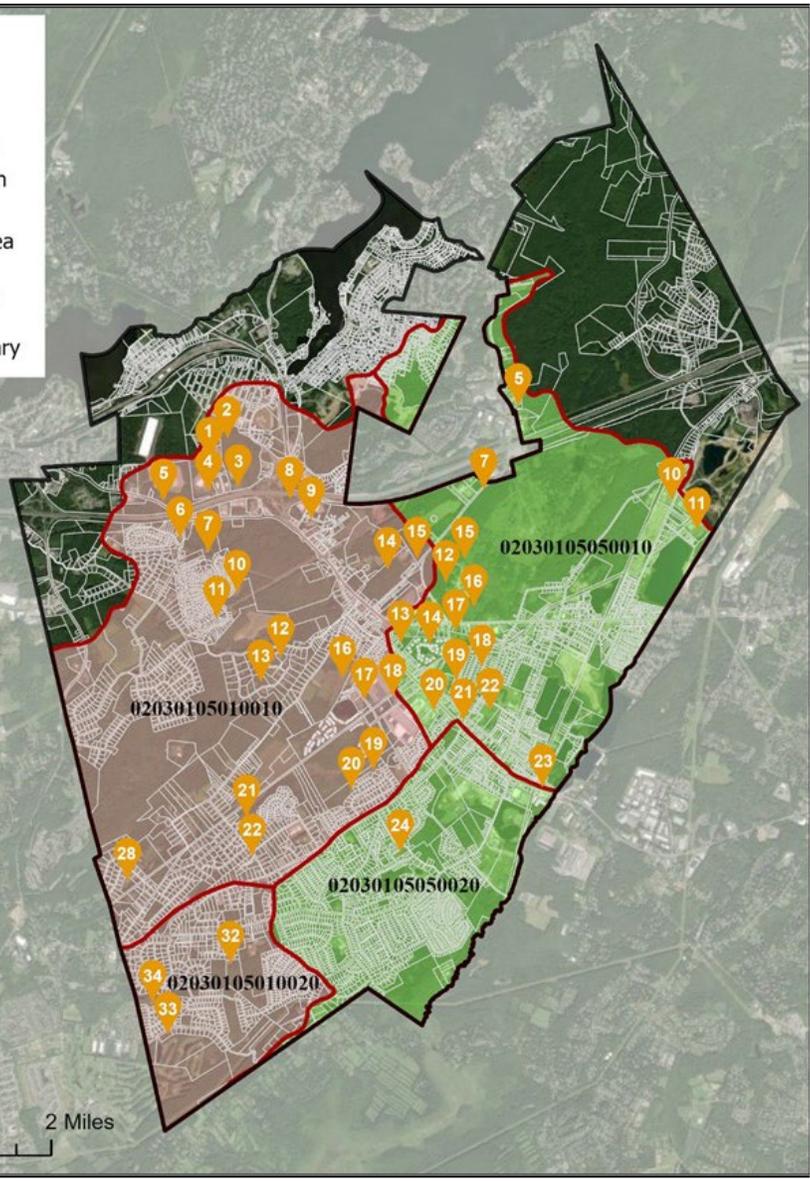


Class	Area (acres)	HUC Impervious Cover (%)
02030103030040		
Building	7.83	
Other	25.46	
Road	22.73	
TOTAL =	56.0	6.8%
02030103030070		
Building	5.74	
Other	66.24	
Road	32.42	
TOTAL =	104.4	7.9%
02030105010010		
Building	167.69	
Other	375.83	
Road	267.92	
TOTAL =	811.4	17.8%
02030105010020		
Building	34.59	
Other	65.75	
Road	50.96	
TOTAL =	151.3	15.7%

Class	Area (acres)	HUC Impervious Cover (%)
02030105050010		
Building	108.73	
Other	345.38	
Road	153.89	
TOTAL =	608.0	22.0%
02030105050020		
Building	99.40	
Other	198.04	
Road	133.45	
TOTAL =	430.9	28.5%
02040105150020		
Building	41.41	
Other	90.82	
Road	63.44	
TOTAL =	195.7	23.6%
All HUCs		
Building	493.12	
Other	1,312.70	
Road	805.82	
TOTAL =	2,611.6	18.6%

Legend

-  Stormwater Facilities
-  HUC14s in the Study Area
-  Raritan River South Branch Study Area
-  Lamington River Study Area
-  Roxbury Township Parcels
-  Roxbury Township Boundary

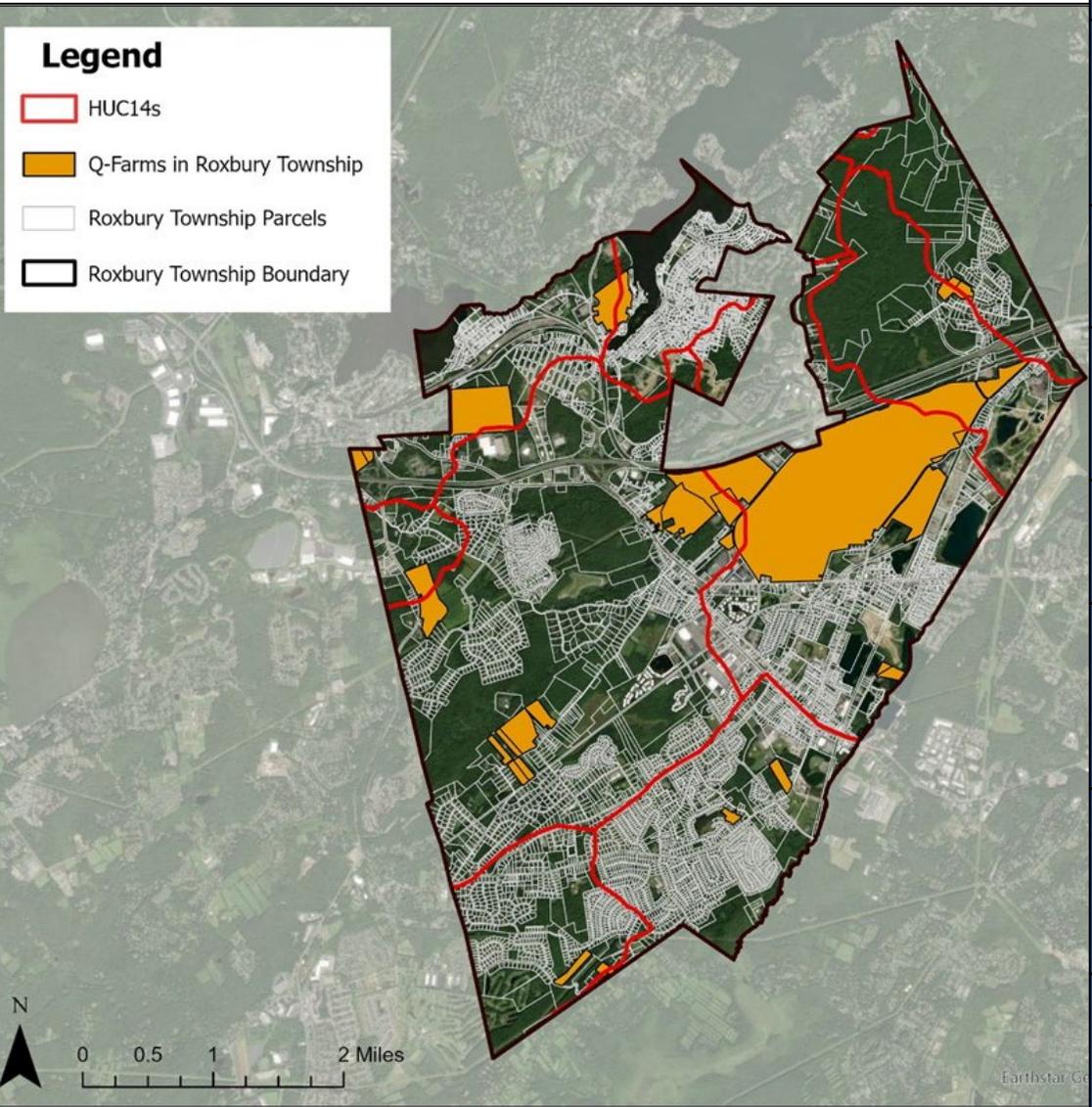


Lamington River Study Area

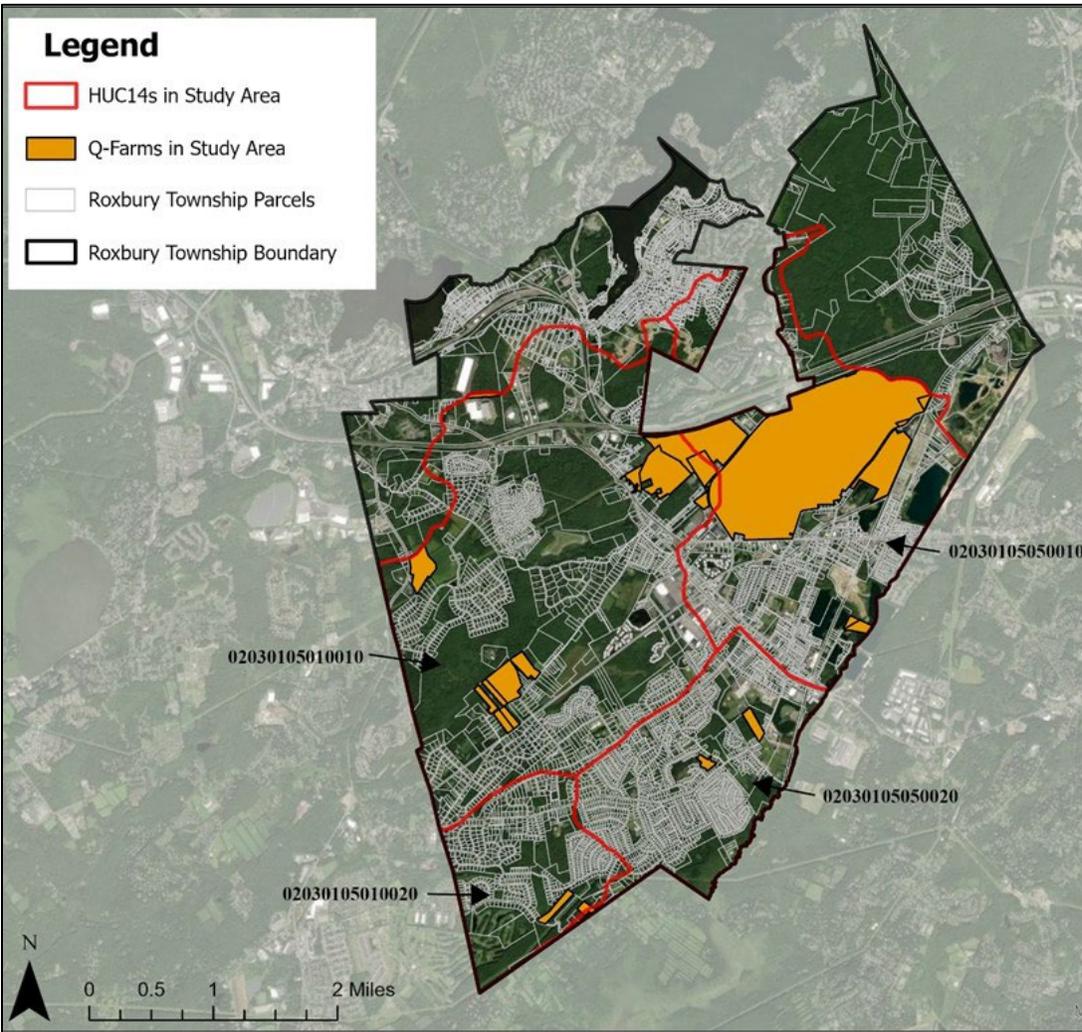
<u>ID</u>	<u>Owner</u>	<u>Address</u>	<u>Type</u>
1	Kara At Mt Arlington and A&R Management	125 Howard Blvd	N
2	Kara At Mt Arlington and A&R Management	125 Howard Blvd	N
3	SNH Ns Properties Trust C/O PTC	2 Hillside Dr	D
4	Unknown	181 Howard Blvd	N
5	Unknown	172-176-180 Howard Blvd	N

Raritan River South Branch Study Area

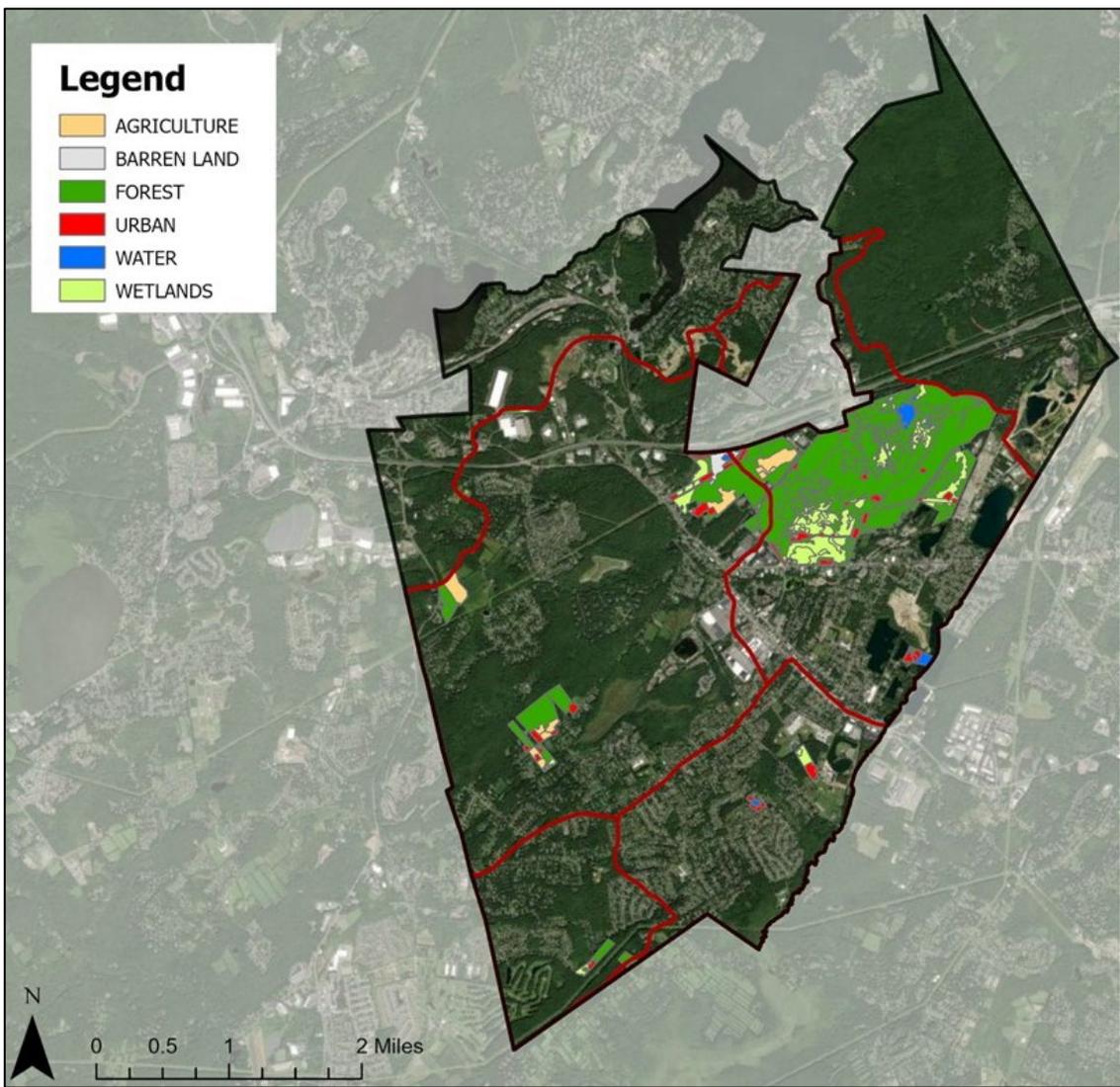
<u>ID</u>	<u>Owner</u>	<u>Address</u>	<u>Type</u>
5	1881 NJ LLC, Victoria Classic	1881 Route 46, Ledge	RB
7	Township of Roxbury	1830 Route 46, Ledge	RB
10	Township of Roxbury	138 Mountain Rd	N
11	Township of Roxbury	138 Mountain Rd	N



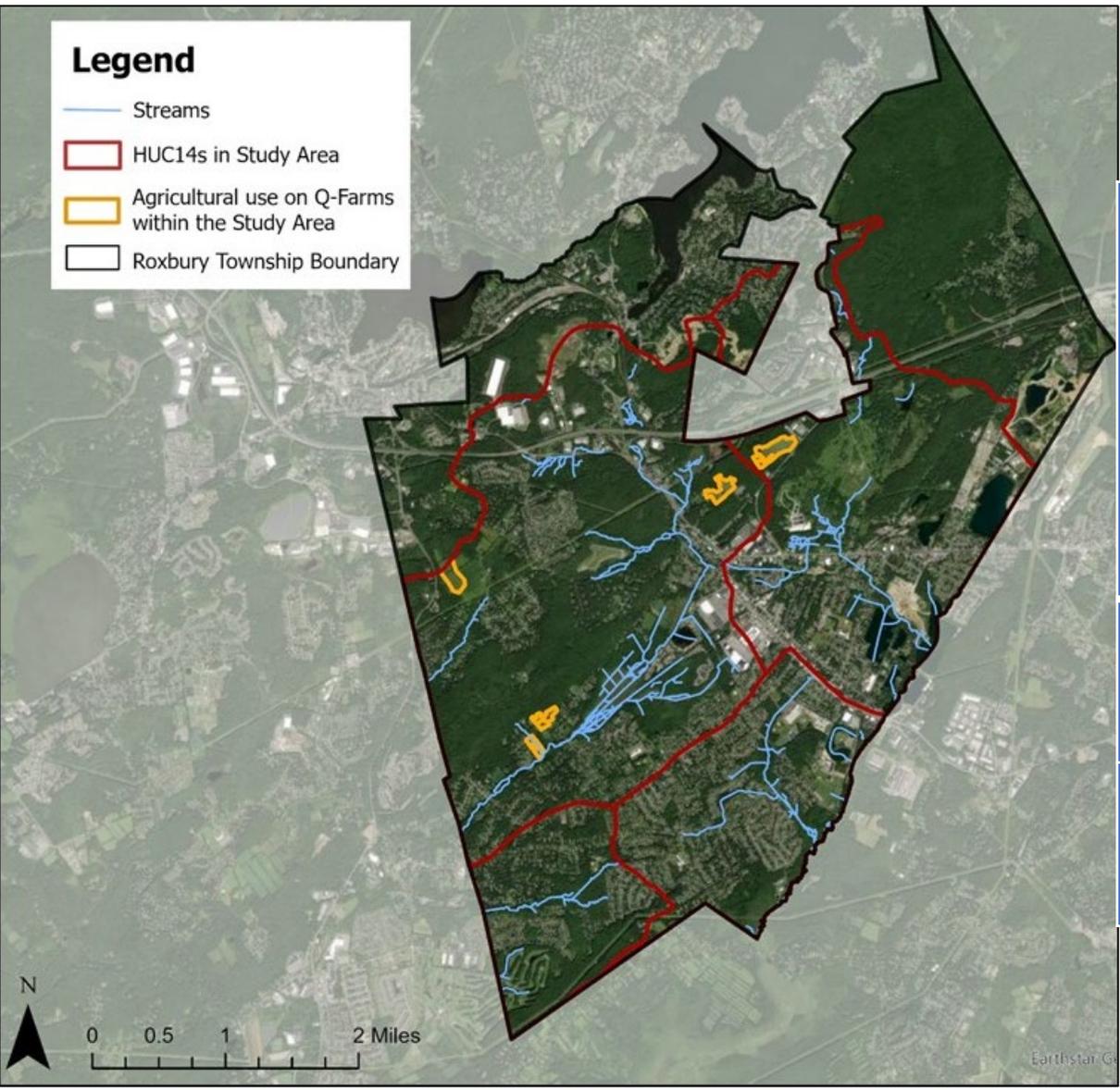
Blk	Lot	Location	Owner	Owner Address
51.01	7.02	316 Pleasant Hill Rd	Brooks, Gregory/Izabella	316 Pleasant Hill Rd
102	54	160 Pleasant Hill Rd	Chester Twp Assessed In	319 Pleasant Hill Rd
102	48	12 Reger Rd	Benkendorf, Wm/Gudrun%Garden Center	1 Vanderbilt Ave, 48Th Fl
1801	13	Eyland Ave	Board of Education of Roxbury	Unknown
2202	5	30 Green Ln	Penzenik, Stephen D/Patricia A	30 Green Ln
2202	4	32 Green Ln	Penzenik, Stephen D/Patricia A	32 Green Ln
3301	12.01	40A Condit St	Guerrero, Mark E	38 Condit St
5503	10	208A Emmans Rd	Millan, Anselmo/Laureano, Ana Cris	208A Emmans Rd



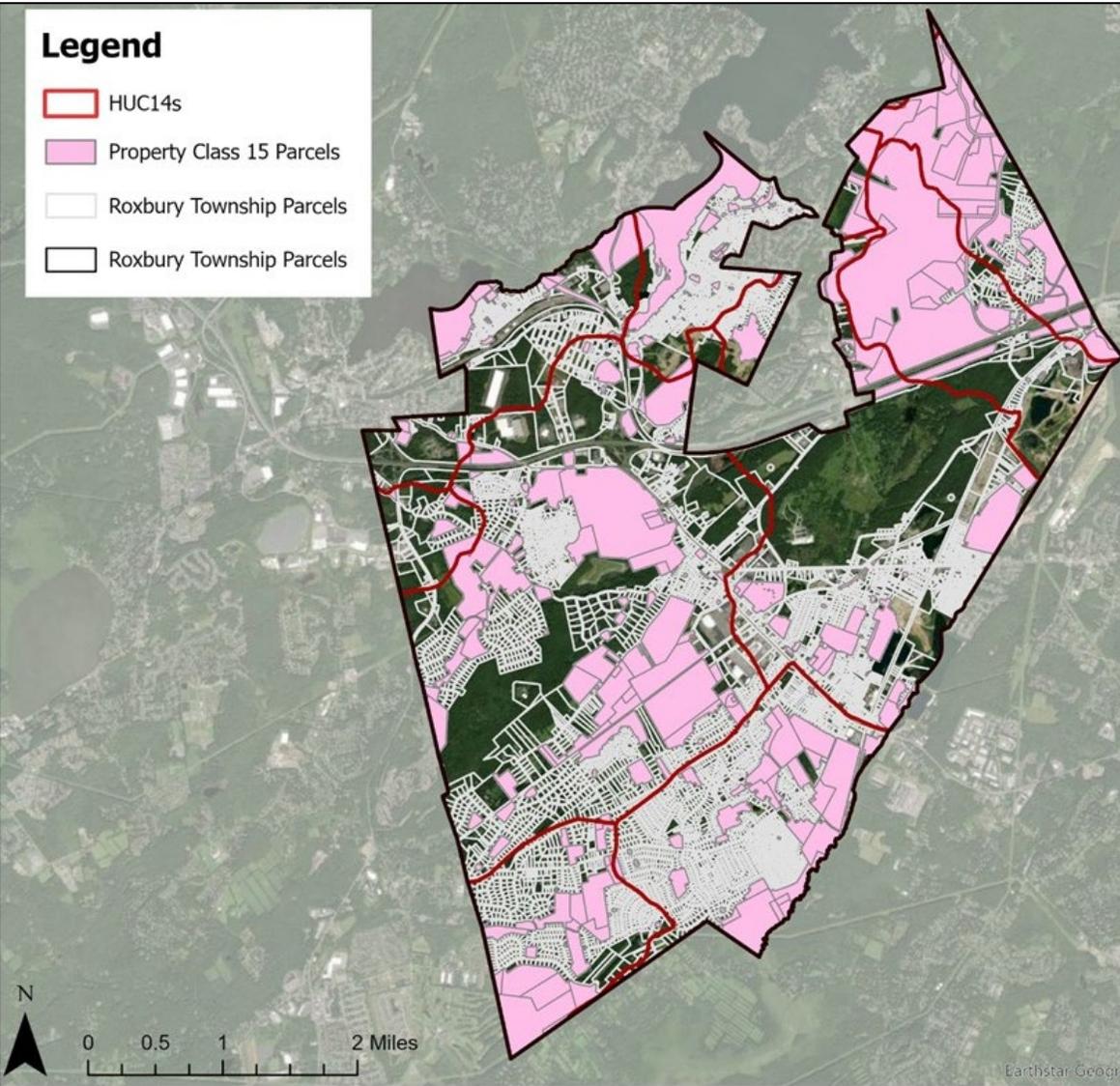
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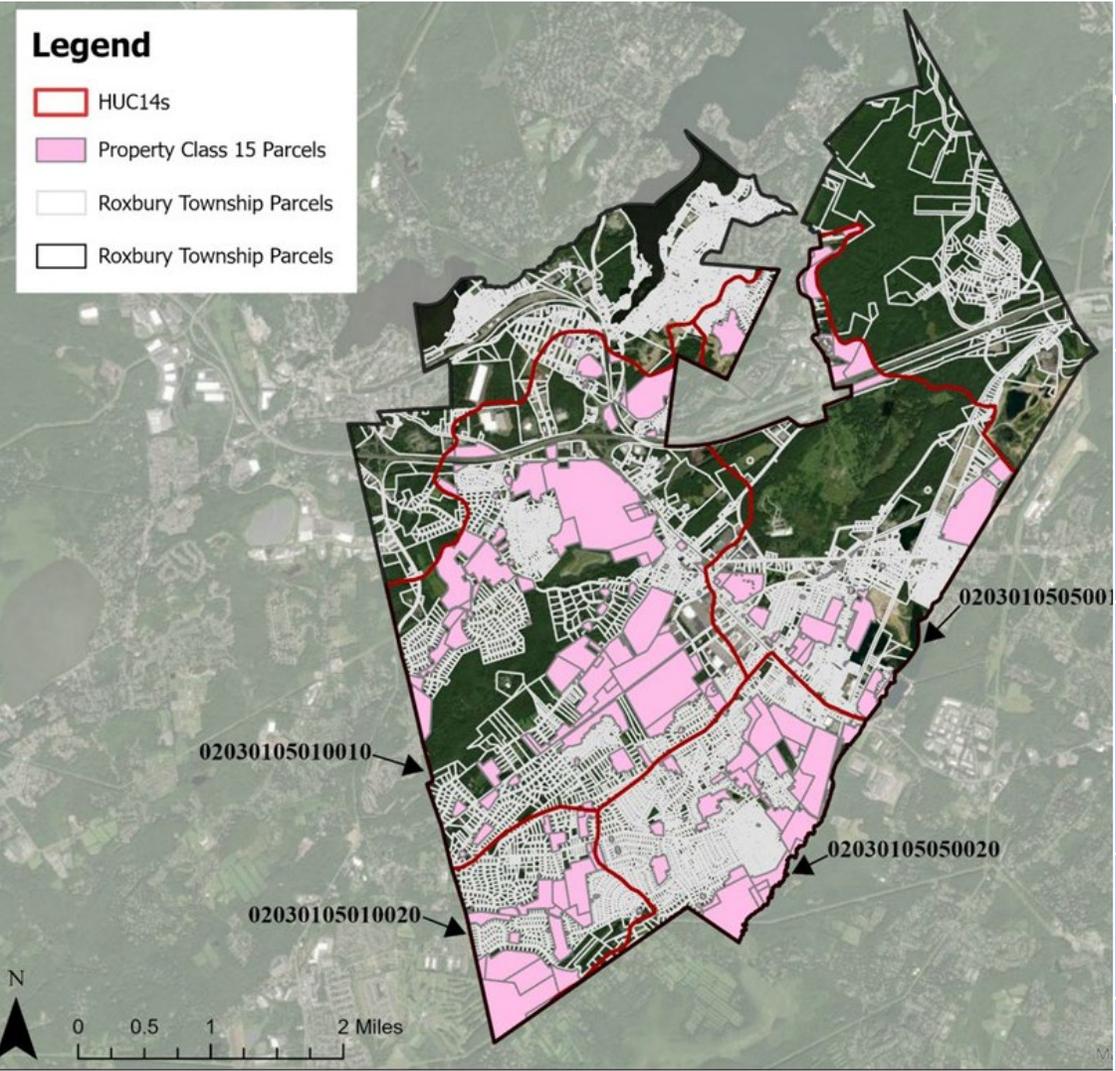
Land Use	Area (acres)
Agriculture	63.0
Barren Land	13.4
Forest	923.2
Urban	74.9
Water	23.6
Wetlands	184.6
Total:	1,282.7



Blk	Lot	Munic.	Cover Crop	Enhanced Stream Buffer	Rainwater Harvesting
2202	4	QFARM			X
2202	5	QFARM			X

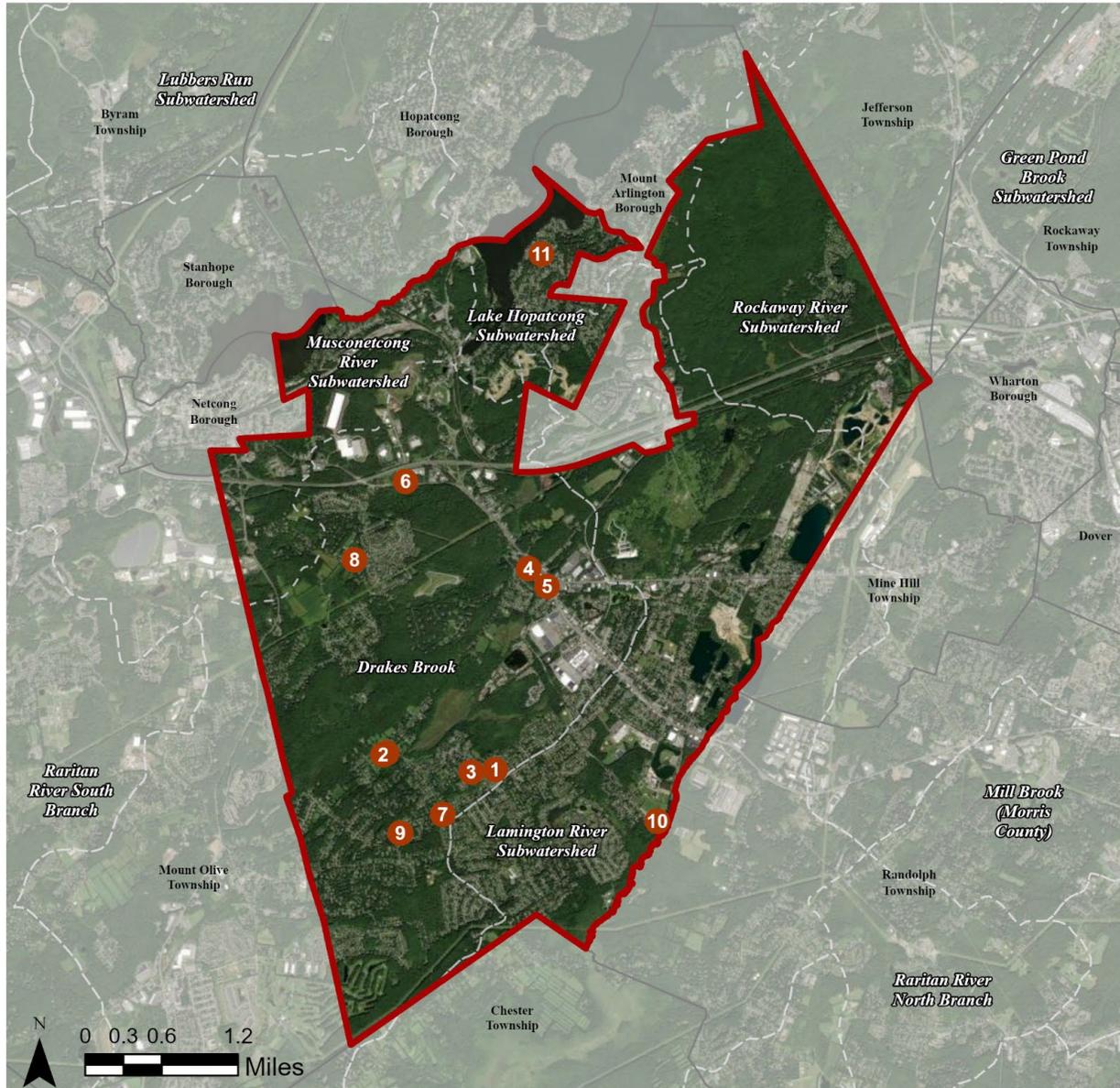


Blk	Lot	Prop Class	Location	Owner	Facility Type
1201	19	15A	20 Pleasant Hill Rd	Lichtenberg, Allen/Laura R	School
1801	4	15A	Eyland Ave, Rear	Sandstrom, John G	Schools
1801	2	15A	1 Bryant Dr	Board of Education of Roxbury	School
1801	3	15A	Eyland Ave	Board of Education of Roxbury	Schools
3801	16	15A	25 Meeker St	Presbyterian Church	School
3901	2	15A	N Hillside Ave	Hernandez, Jonathan O/Kristin R	School
3901	31	15A	Meeker St	Snyder, Eileen Marie	Park
4501	10	15A	19 Corn Hollow Rd	Hatzimihalis, Minas M	School



Blk	Lot	Prop Class	Location	Owner	Facility Type
*1201	19	15A	20 Pleasant Hill Rd	Lichtenberg, Allen/Laura R	School
1801	4	15A	Eyland Ave, Rear	Sandstrom, John G	Schools
*1801	2	15A	1 Bryant Dr	Board of Education of Roxbury	School
*1801	3	15A	Eyland Ave	Board of Education of Roxbury	Schools
3801	16	15A	25 Meeker St	Presbyterian Church	School
*3901	2	15A	N Hillside Ave	Hernandez, Jonathan O/Kristin R	School

ROXBURY TOWNSHIP: GREEN INFRASTRUCTURE SITES



SITES WITHIN THE DRAKES BROOK SUBWATERSHED

1. American Christian School- South Campus
2. Holy Wisdom Byzantine Catholic Church
3. Jefferson Elementary School
4. Ledgewood Baptist Church
5. Ledgewood Historic Park
6. Roxbury Township Court Clerk & Police Department
7. St. Dunstan's Episcopal Church
8. The Church of Jesus Christ of Latter-Day Saints
9. Temple Shalom

SITES WITHIN THE LAMINGTON RIVER SUBWATERSHED

10. Roxbury Township Daycare Center

SITES WITHIN THE LAKE HOPATCONG SUBWATERSHED

11. Nixon Elementary School

AMERICAN CHRISTIAN SCHOOL- SOUTH CAMPUS

Subwatershed: Drakes Brook

HUC14 ID: 02030105010010

Site Area: 193,601 sq. ft.

Address: 126 South Hillside Avenue
Succasunna, NJ 07876

Block and Lot: Block 4601, Lot 13

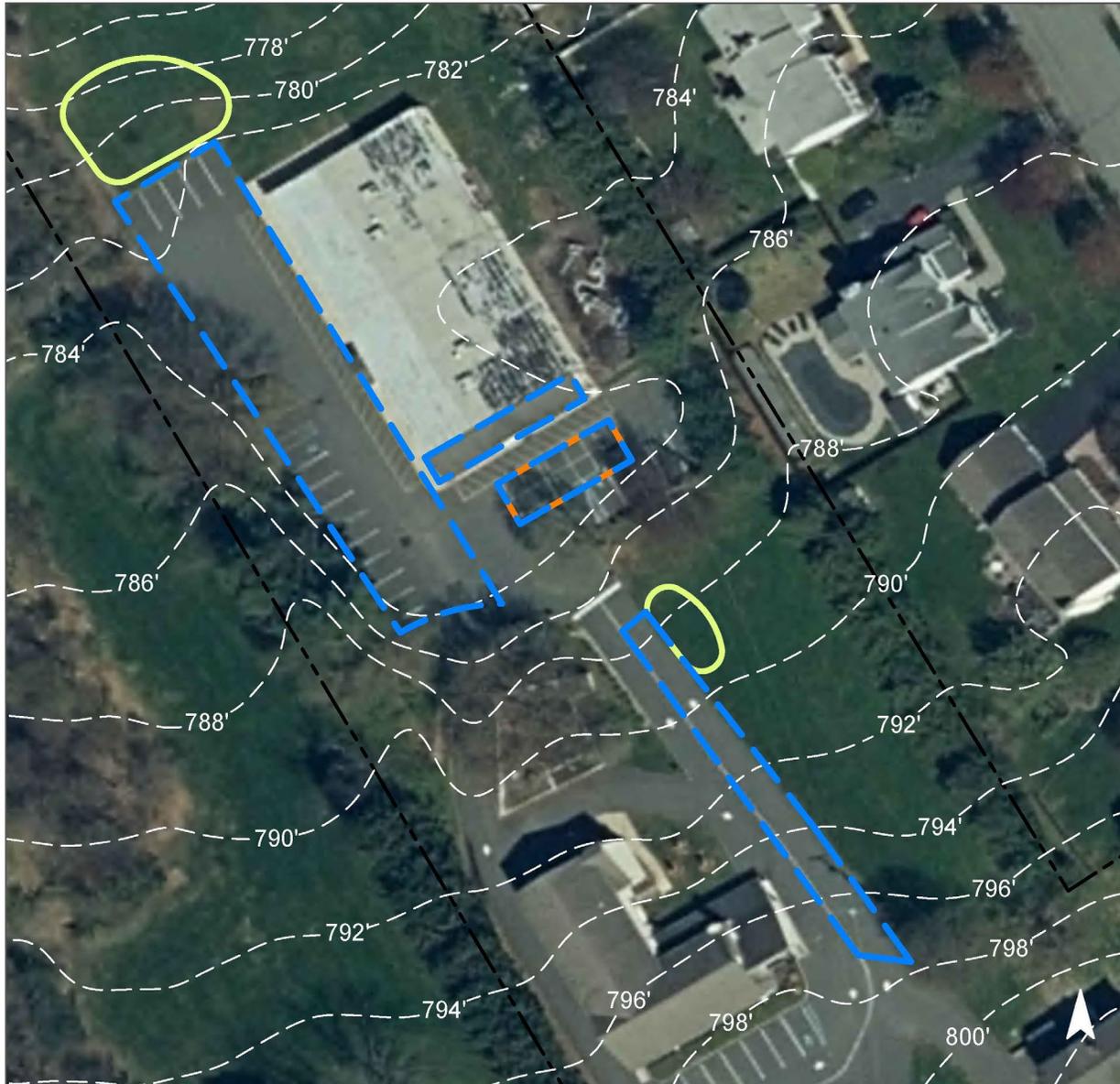


The pavement in the front of the building can be converted to porous pavement to capture and infiltrate stormwater runoff from the roof via already disconnected downspouts; the western downspout may require redirection towards the porous pavement. A rain garden with a curb cut can be installed in the grass area near the northwest corner of the building and a rain garden with a trench drain can be installed south of the building to capture, treat, and infiltrate stormwater runoff from the pavement. 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 50"
31	60,281	2.9	30.4	276.8	0.047	1.88

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	10,960	0.325	48	22,860	0.86	2,740	\$27,400
Pervious pavement	1,615	0.048	8	3,370	0.13	900	\$22,500

GREEN INFRASTRUCTURE RECOMMENDATIONS



American Christian School - South Campus

-  bioretention system
-  pervious pavement
-  captured drainage area
-  property line
-  2020 Aerial: NJOIT, OGIS



Next Steps

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

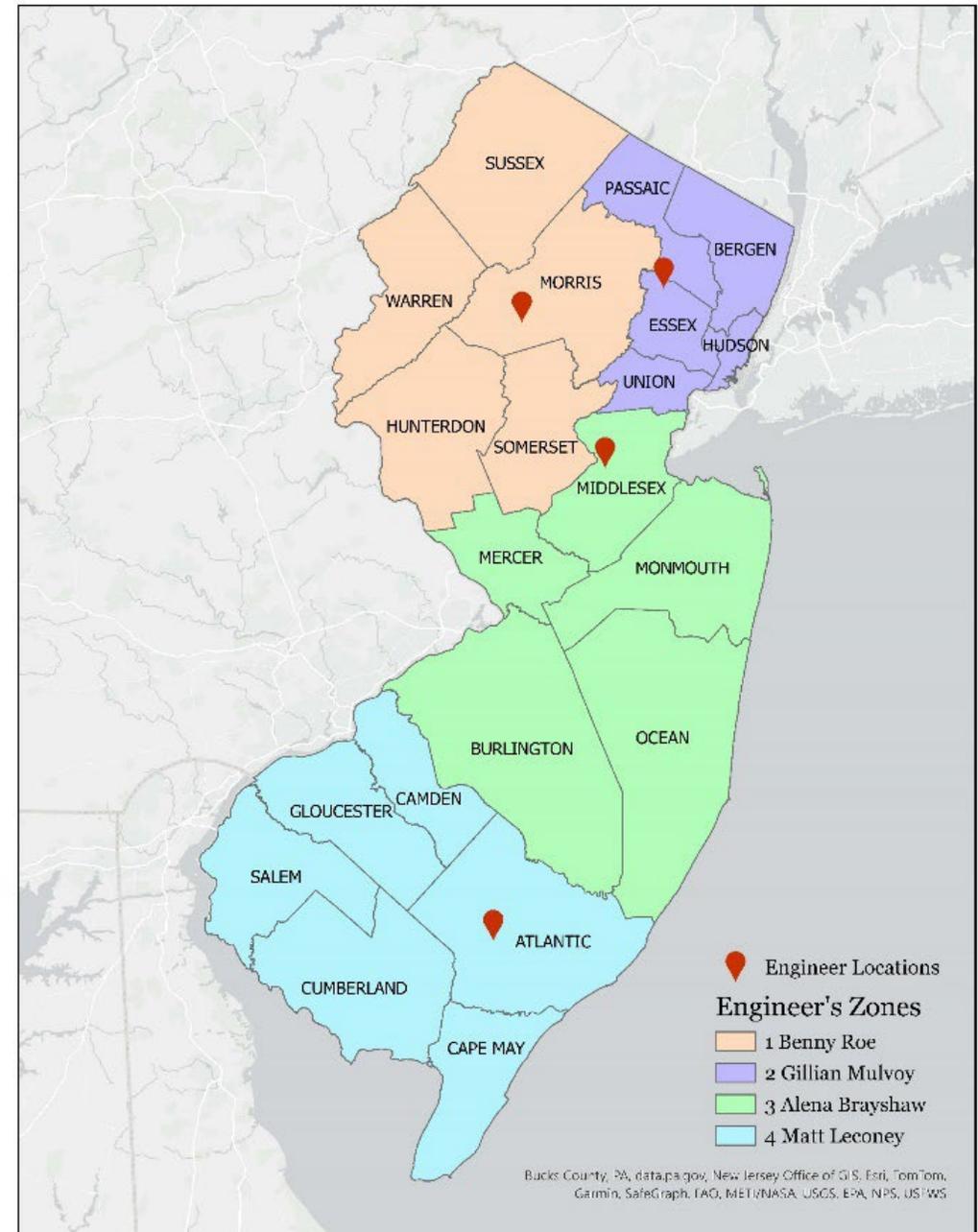
How can municipalities use these data?

- 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

Municipal Stormwater Management Technical Assistance Program

- Three-year agreement w/ NJDEP to support MS4 communities statewide
- Four Regional Engineers
- Provide technical support to all municipalities
 - Focus on former Tier B municipalities

MS4 Engineer's Zones



QUESTIONS?

