



RUTGERS UNIVERSITY

Water Resources Program

New Jersey Agricultural Experiment Station



Watershed Restoration and Protection Plan for Rancocas Creek

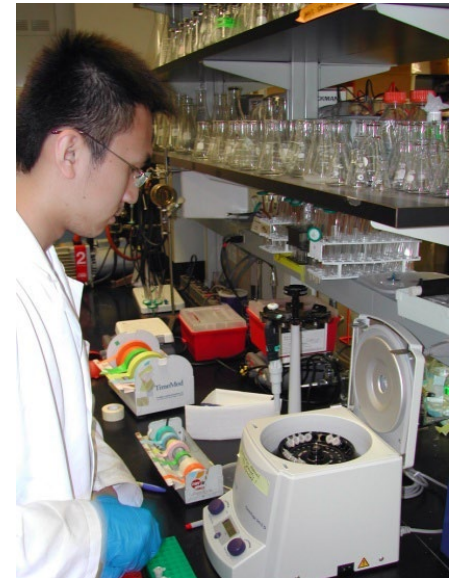
Christopher C. Obropta, Ph.D., P.E.

June 18, 2025



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.

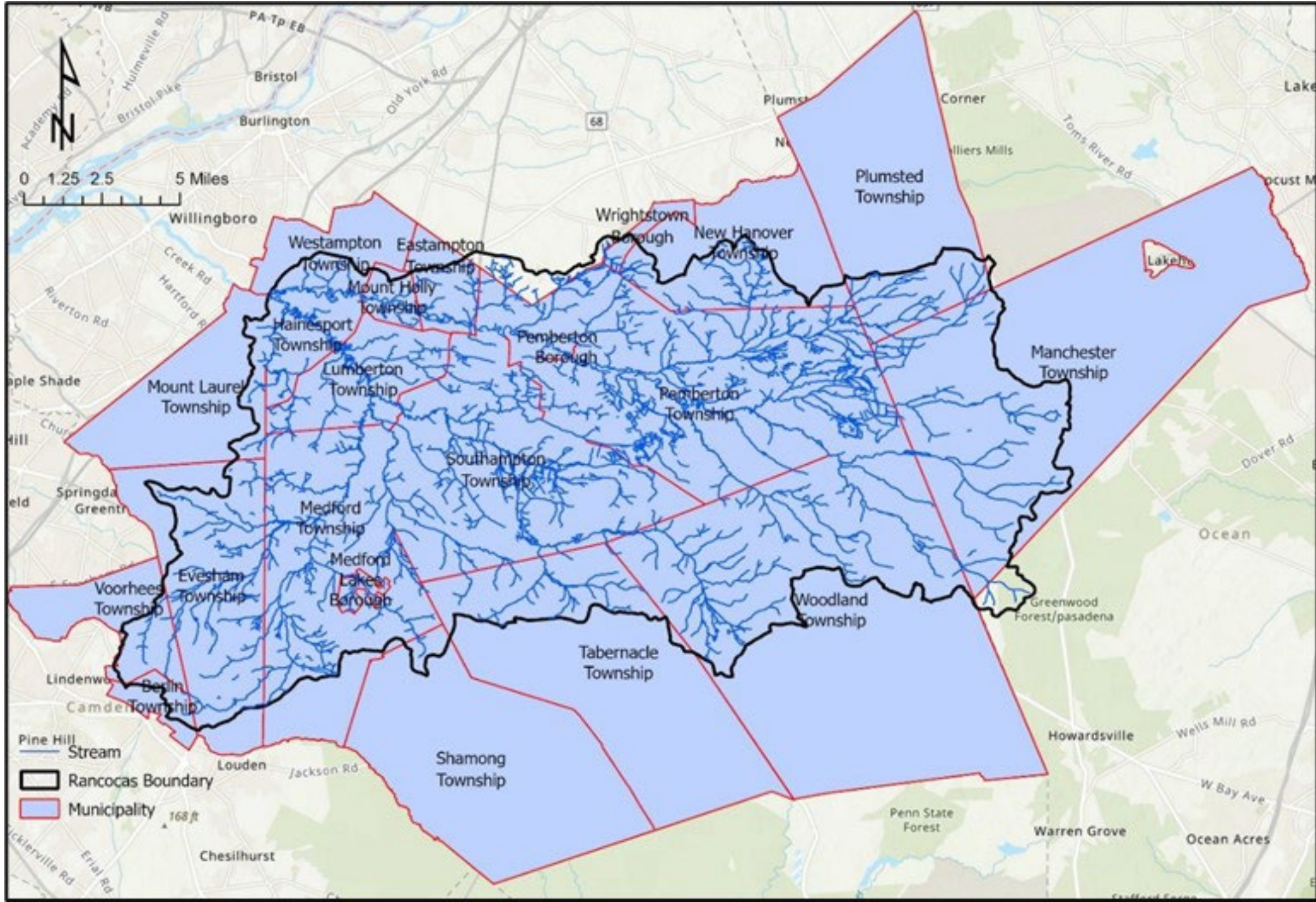
Reason for the Work

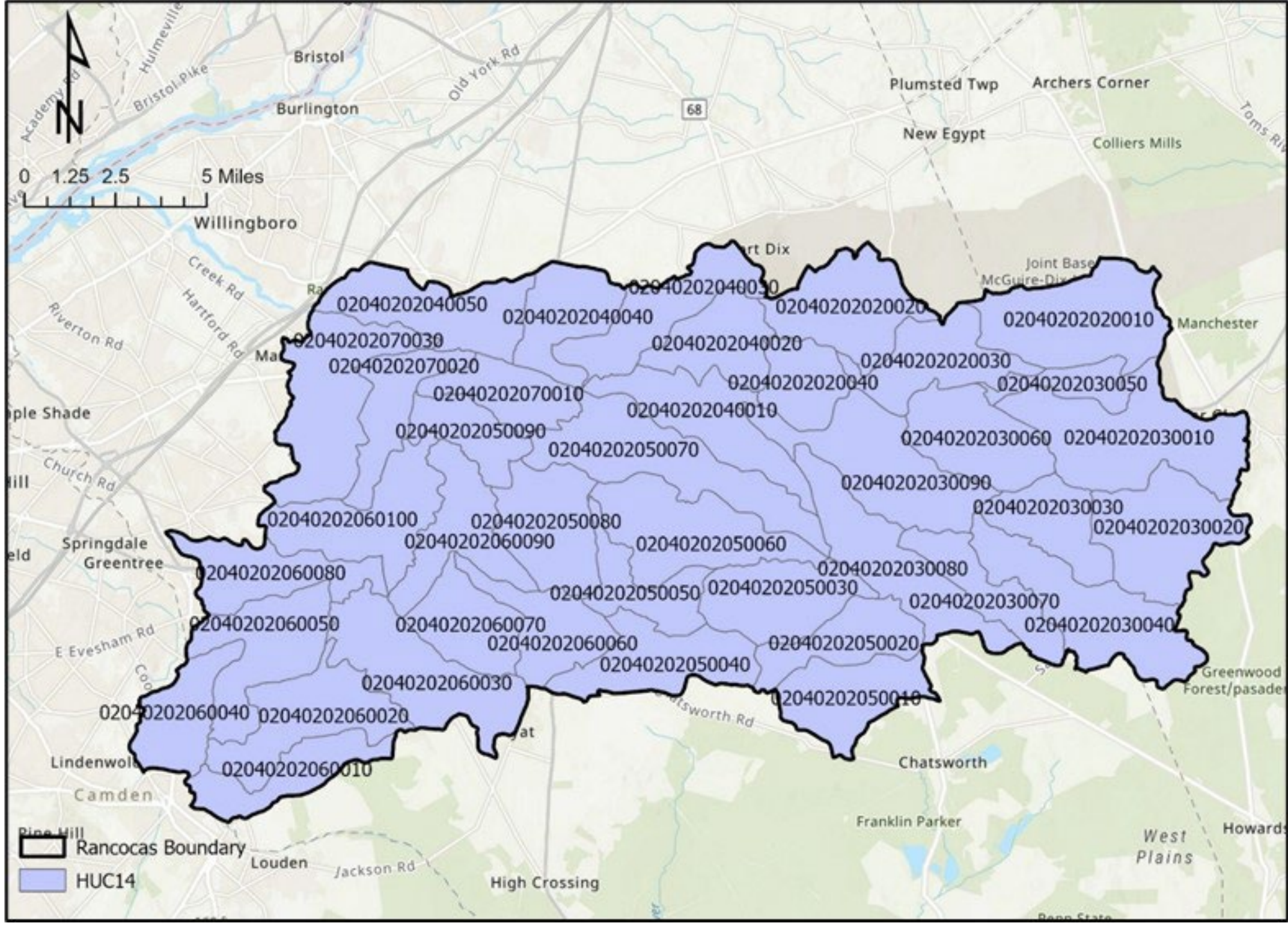
The goal is to reduce pollutants entering the Rancocas Creek, especially phosphorus and sediment. This project will create a plan that will be a blueprint for how to achieve reductions in these pollutant loads.

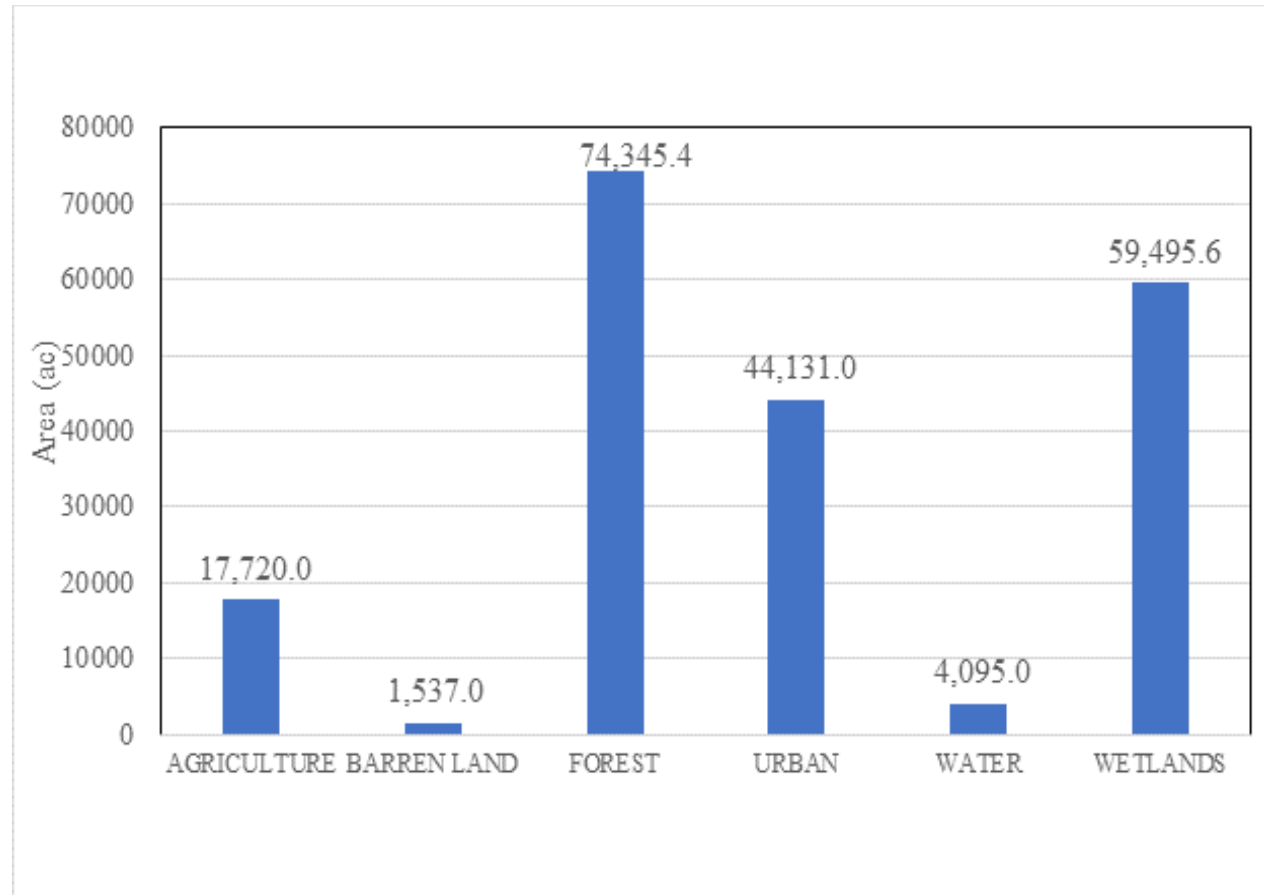
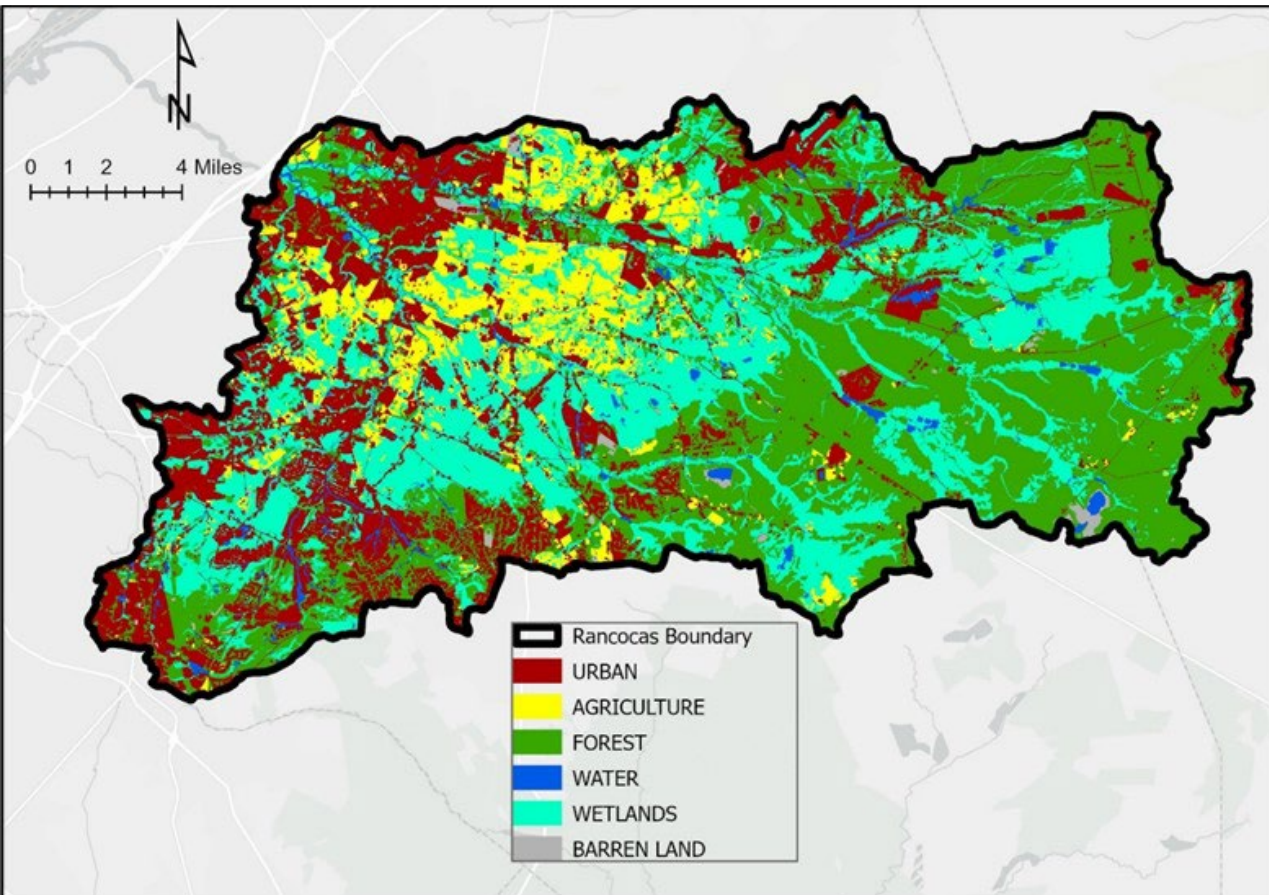


Detailed Scope of Work (List of Objectives)

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

	Area (acres)				Area (acres)		
Land Use	HUC14			Land Use	HUC14		
	02040202020010	02040202020020	02040202020030		02040202020040	02040202030010	02040202030020
AGRICULTURE	0.0	9.4	74.9	AGRICULTURE	87.9	15.8	114.6
BARREN LAND	2.1	29.7	9.6	BARREN LAND	36.5	23.4	0.0
FOREST	5,833.4	2,214.6	1,845.0	FOREST	1,237.4	4,489.4	5,527.4
URBAN	809.9	2,153.5	1,168.4	URBAN	529.4	893.3	189.3
WATER	70.7	158.5	202.8	WATER	34.2	100.7	71.5
WETLANDS	609.1	1,135.1	1,335.6	WETLANDS	1,124.7	3,248.2	587.2
Total:	7,325.3	5,700.9	4,636.2	Total:	3,050.1	8,770.8	6,490.1
	Area (acres)				Area (acres)		
Land Use	HUC14			Land Use	HUC14		
	02040202030030	02040202030040	02040202030050		02040202030060	02040202030070	02040202030080
AGRICULTURE	3.1	23.5	0.0	AGRICULTURE	71.8	0.0	0.0
BARREN LAND	14.1	328.7	0.0	BARREN LAND	41.6	10.7	21.5
FOREST	3,012.5	5,408.8	595.2	FOREST	1,701.4	2,290.3	3,775.5
URBAN	23.3	59.3	27.1	URBAN	709.6	0.8	410.2
WATER	42.6	215.3	118.6	WATER	268.2	80.3	155.0
WETLANDS	601.9	1,197.4	1,153.9	WETLANDS	2,315.5	1,151.2	1,694.8
Total:	3,697.6	7,233.0	1,894.8	Total:	5,108.1	3,533.4	6,057.1

	Percentage (%)				Percentage (%)		
Land Use	HUC14			Land Use	HUC14		
	02040202020010	02040202020020	02040202020030		02040202020040	02040202030010	02040202030020
AGRICULTURE	0.0%	0.2%	1.6%	AGRICULTURE	2.9%	0.2%	1.8%
BARREN LAND	0.0%	0.5%	0.2%	BARREN LAND	1.2%	0.3%	0.0%
FOREST	79.6%	38.8%	39.8%	FOREST	40.6%	51.2%	85.2%
URBAN	11.1%	37.8%	25.2%	URBAN	17.4%	10.2%	2.9%
WATER	1.0%	2.8%	4.4%	WATER	1.1%	1.1%	1.1%
WETLANDS	8.3%	19.9%	28.8%	WETLANDS	36.9%	37.0%	9.0%
Total:	100.0%	100.0%	100.0%	Total:	100.0%	100.0%	100.0%
	Percentage (%)				Percentage (%)		
Land Use	HUC14			Land Use	HUC14		
	02040202030030	02040202030040	02040202030050		02040202030060	02040202030070	02040202030080
AGRICULTURE	0.1%	0.3%	0.0%	AGRICULTURE	1.4%	0.0%	0.0%
BARREN LAND	0.4%	4.5%	0.0%	BARREN LAND	0.8%	0.3%	0.4%
FOREST	81.5%	74.8%	31.4%	FOREST	33.3%	64.8%	62.3%
URBAN	0.6%	0.8%	1.4%	URBAN	13.9%	0.0%	6.8%
WATER	1.2%	3.0%	6.3%	WATER	5.3%	2.3%	2.6%
WETLANDS	16.3%	16.6%	60.9%	WETLANDS	45.3%	32.6%	28.0%
Total:	100.0%	100.0%	100.0%	Total:	100.0%	100.0%	100.0%

General Land Use Category	Area	Total Phosphorus	Total Nitrogen	Total Suspended Solids
	(acres)	(lbs/yr)	(lbs/yr)	(lbs/yr)
Agriculture	17,720	23,036	177,201	5,316,011
Barren Land	1,537	769	7,685	92,217
Forest	74,345	7,434	223,036	2,973,822
Urban	44,131	48,979	493,594	5,718,802
Water	4,095	410	12,280	163,728
Wetlands	59,496	5,954	178,523	2,380,233
Totals =	201,324	86,582	1,092,318	16,644,813

Impervious Cover Analysis



Impervious Cover Model

Stream Quality

Good

Fair

Poor

Sensitive

Impacted

Non-Supporting

Urban Drainage

10%

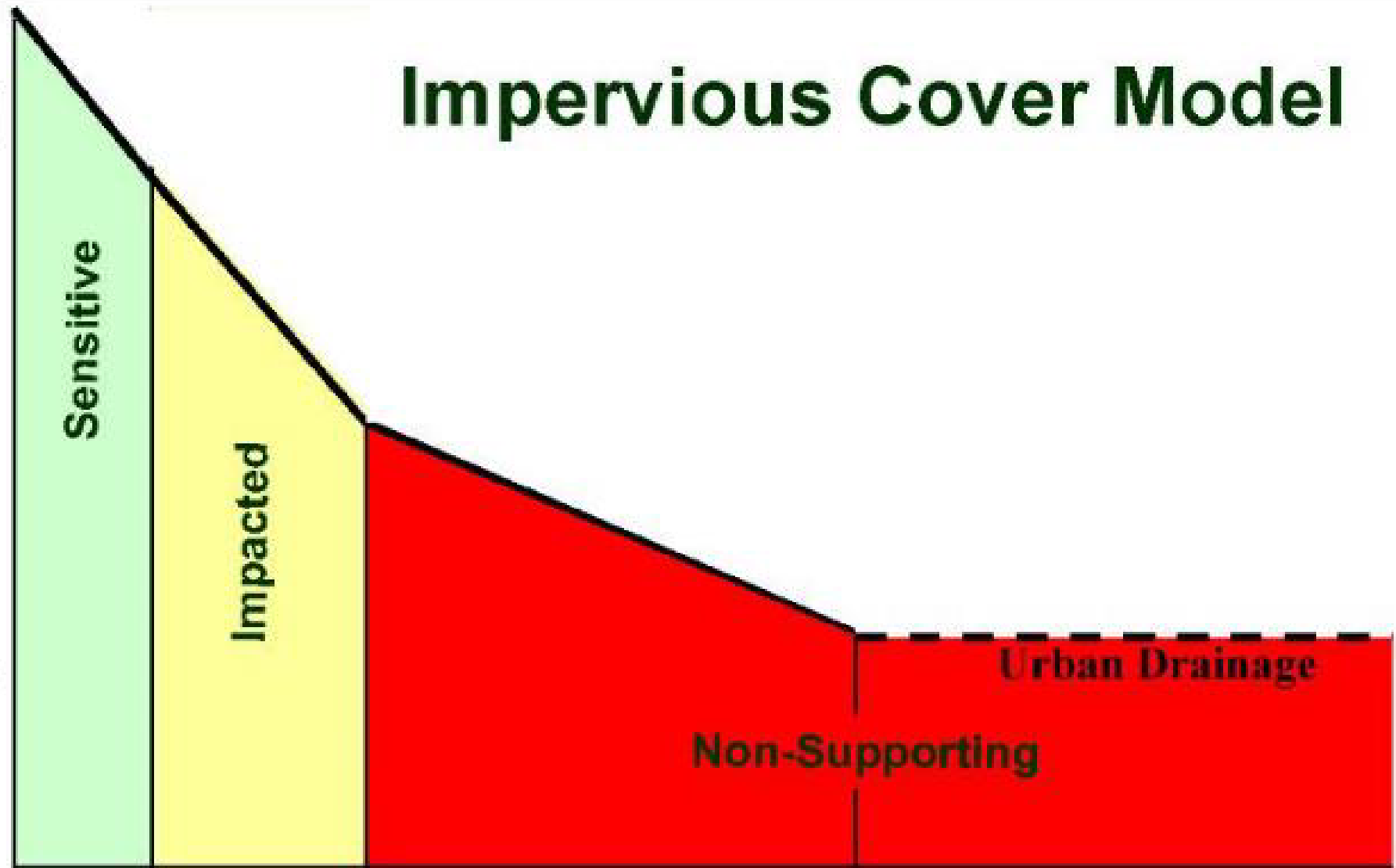
25%

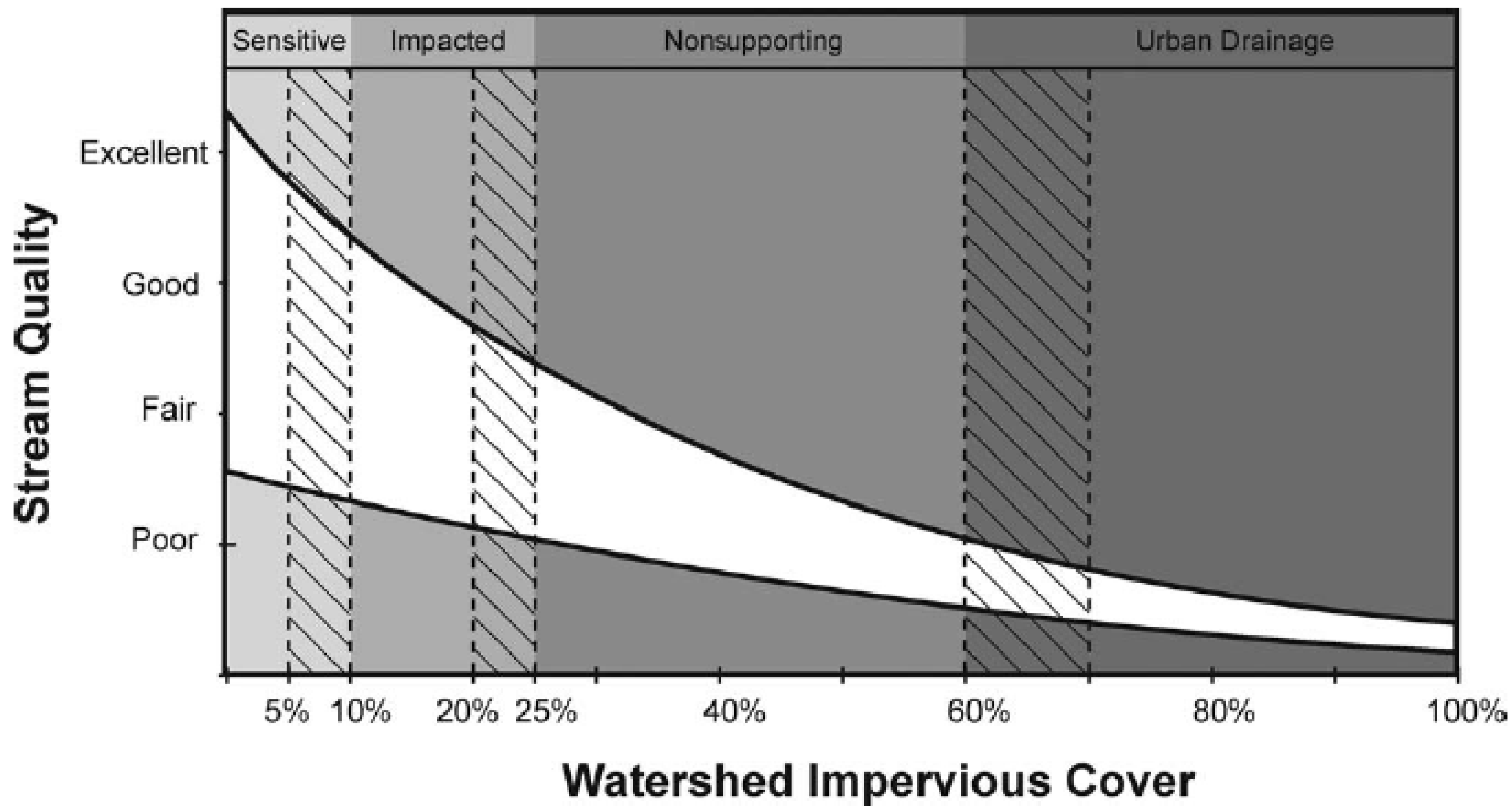
40%

60%

100%

Watershed Impervious Cover

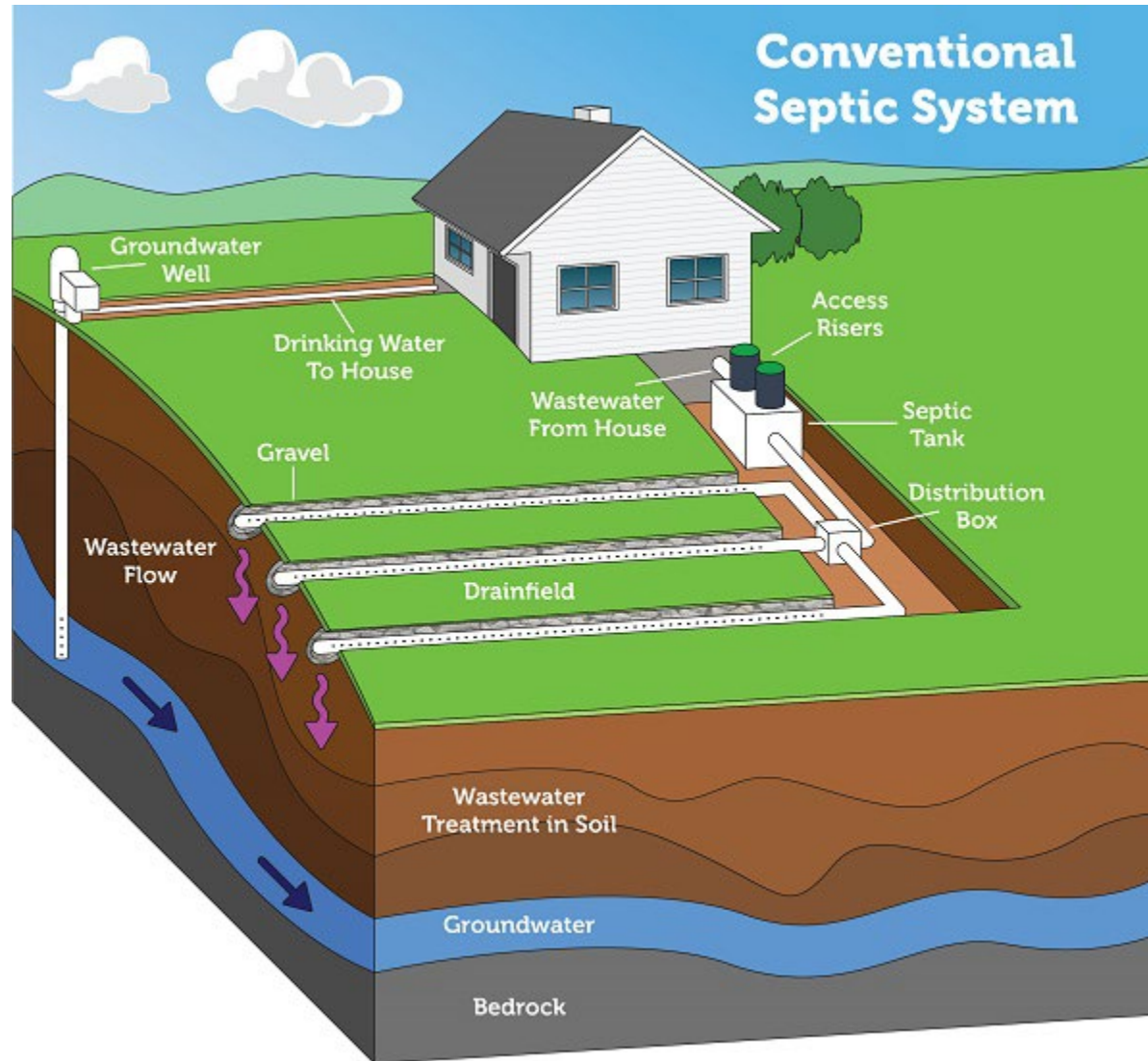




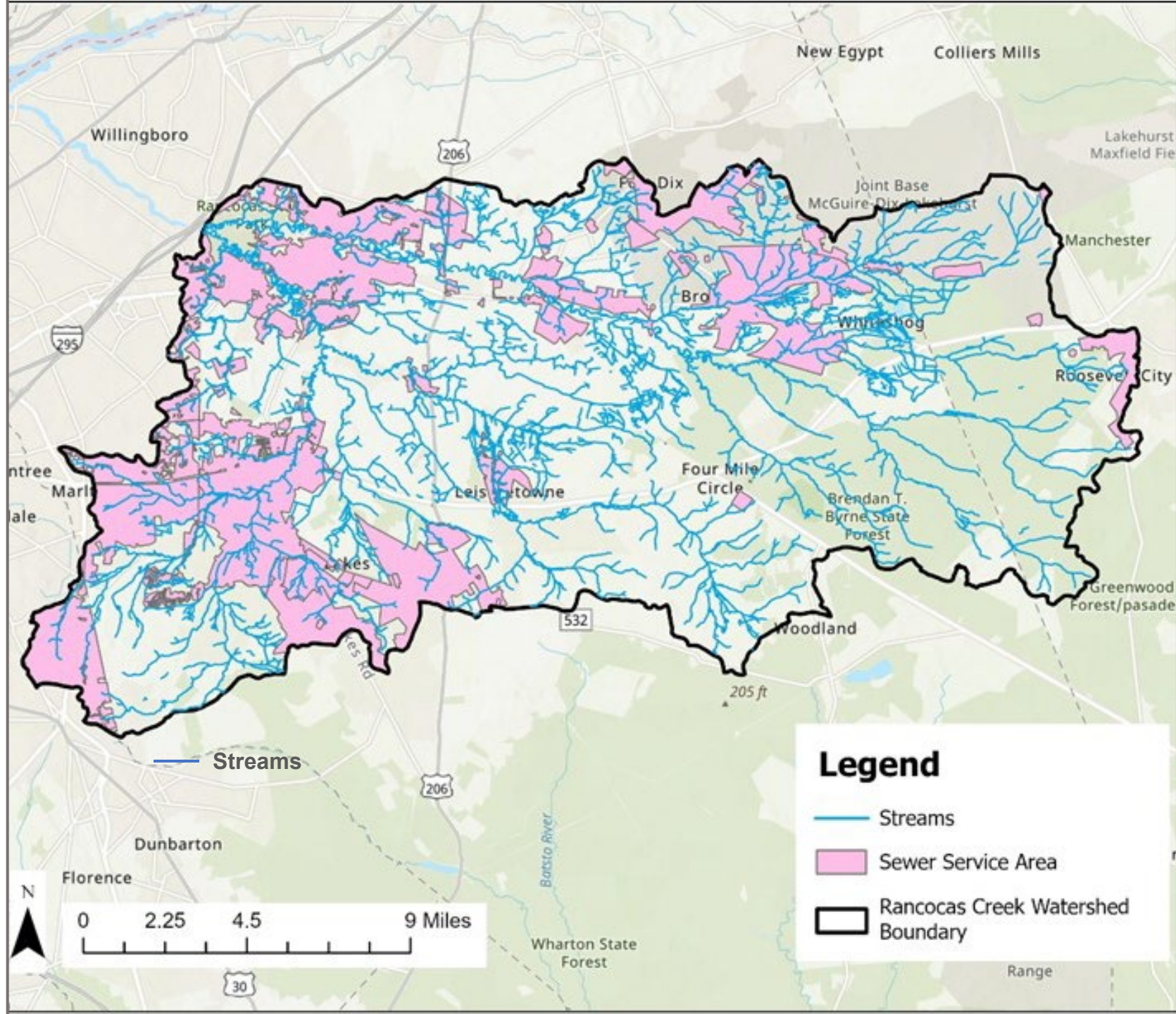
HUC14	Impervious Cover (acres)			
	Buildings	Other	Road	Total
02040202020010	5.9	180.2	44.1	230.2
02040202020020	121.0	499.9	222.4	843.3
02040202020030	71.0	171.1	157.5	399.6
02040202020040	37.4	107.2	75.6	220.2
02040202030010	77.6	224.5	150.0	452.1
02040202030020	7.6	85.8	45.0	138.4
02040202030030	0.2	25.1	9.3	34.6
02040202030040	1.1	91.4	20.5	113
02040202030050	0.2	26.1	0.9	27.2
02040202030060	58.6	199.1	142.6	400.3
02040202030070	0.01	37.7	11.1	48.81
02040202030080	26.4	111.3	100.6	238.3
02040202030090	52.5	121.3	143.9	317.7
02040202040010	81.8	212.5	172.6	466.9
02040202040020	68.6	129.5	96.8	294.9
02040202040030	49.9	153.5	112.8	316.2
02040202040040	61.7	179.3	109.4	350.4
02040202040050	298.0	652.5	440.8	1,391.3
02040202050010	4.3	26.7	20.4	51.4
02040202050020	5.0	21.2	22.2	48.4
02040202050030	22.8	115.7	89.9	228.4
02040202050040	49.2	155.2	92.3	296.7
02040202050050	94.8	152.7	139.2	386.7
02040202050060	29.6	111.7	76.8	218.1
02040202050070	31.8	104.5	102.2	238.5
02040202050080	84.6	208.8	135.7	429.1
02040202050090	40.6	92.1	68.0	200.7
02040202060010	87.4	188.4	115.0	390.8
02040202060020	148.3	265.3	208.2	621.8
02040202060030	319.6	499.4	408.0	1227
02040202060040	216.0	475.2	266.5	957.7
02040202060050	168.6	263.6	224.7	656.9
02040202060060	54.3	160.8	93.5	308.6
02040202060070	50.5	126.0	84.8	261.3
02040202060080	294.3	400.3	353.0	1,047.6
02040202060090	52.3	165.6	100.3	318.2
02040202060100	203.6	444.4	246.8	894.8
02040202070010	68.3	128.5	90.4	287.2
02040202070020	180.4	335.3	176.5	692.2
02040202070030	334.7	728.0	426.8	1,489.5
TOTALS =	3,560.51	8,377.4	5,597.1	17,535

HUC14	Total Impervious Cover (ac)	Total HUC14 Area (ac)	Impervious Cover (%)
0204020200010	230.2	7325.4	3.1%
0204020200020	843.3	5700.9	14.8%
0204020200030	399.6	4636.2	8.6%
0204020200040	220.2	3050.1	7.2%
02040202030010	452.1	8771.0	5.2%
02040202030020	138.4	6490.0	2.1%
02040202030030	34.6	3697.6	0.9%
02040202030040	113	7233.1	1.6%
02040202030050	27.2	1894.7	1.4%
02040202030060	400.3	5108.2	7.8%
02040202030070	48.81	3533.3	1.4%
02040202030080	238.3	6057.2	3.9%
02040202030090	317.7	7101.5	4.5%
02040202040010	466.9	5341.0	8.7%
02040202040020	294.9	3874.0	7.6%
02040202040030	316.2	4908.9	6.4%
02040202040040	350.4	3915.1	8.9%
02040202040050	1,391.3	5666.8	24.6%
02040202050010	51.4	4554.3	1.1%
02040202050020	48.4	3705.1	1.3%
02040202050030	228.4	5078.0	4.5%
02040202050040	296.7	5129.7	5.8%
02040202050050	386.7	3156.6	12.3%
02040202050060	218.1	6620.4	3.3%
02040202050070	238.5	7590.9	3.1%
02040202050080	429.1	5192.0	8.3%
02040202050090	200.7	2886.9	7.0%
02040202060010	390.8	3564.8	11.0%
02040202060020	621.8	5749.4	10.8%
02040202060030	1227	7026.1	17.5%
02040202060040	957.7	3700.3	25.9%
02040202060050	656.9	5697.8	11.5%
02040202060060	308.6	3881.5	8.0%
02040202060070	261.3	3912.3	6.7%
02040202060080	1,047.6	4429.5	23.7%
02040202060090	318.2	4674.2	6.8%
02040202060100	894.8	6027.3	14.8%
02040202070010	287.2	3372.0	8.5%
02040202070020	692.2	3565.7	19.4%
02040202070030	1,489.5	7504.6	19.8%
Totals =	17,535	201,324.4	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)
02040202020010	0	0	0.0
02040202020020	0	0	0.0
02040202020030	41	39	244.8
02040202020040	24	24	150.7
02040202030010	4	4	25.1
02040202030020	11	10	62.8
02040202030030	1	1	6.3
02040202030040	3	3	18.8
02040202030050	0	0	0.0
02040202030060	87	85	533.6
02040202030070	0	0	0.0
02040202030080	110	103	646.6
02040202030090	73	72	452.0
02040202040010	75	69	433.2
02040202040020	11	10	62.8
02040202040030	186	173	1,086.0
02040202040040	50	49	307.6
02040202040050	82	77	483.4
02040202050010	10	8	50.2
02040202050020	16	10	62.8
02040202050030	69	57	357.8
02040202050040	164	139	872.6
02040202050050	107	104	652.9
02040202050060	144	105	659.1
02040202050070	145	139	872.6
02040202050080	210	177	1,111.1
02040202050090	87	77	483.4
02040202060010	417	311	1,952.3
02040202060020	760	628	3,942.3
02040202060030	25	22	138.1
02040202060040	100	95	596.4
02040202060050	54	52	326.4
02040202060060	33	31	194.6
02040202060070	121	121	759.6
02040202060080	0	0	0.0
02040202060090	239	191	1,199.0
02040202060100	33	25	156.9
02040202070010	46	43	269.9
02040202070020	28	19	119.3
02040202070030	97	73	458.3
Totals =	3,663	3,146	19,749.3

Fertilizer Ordinance



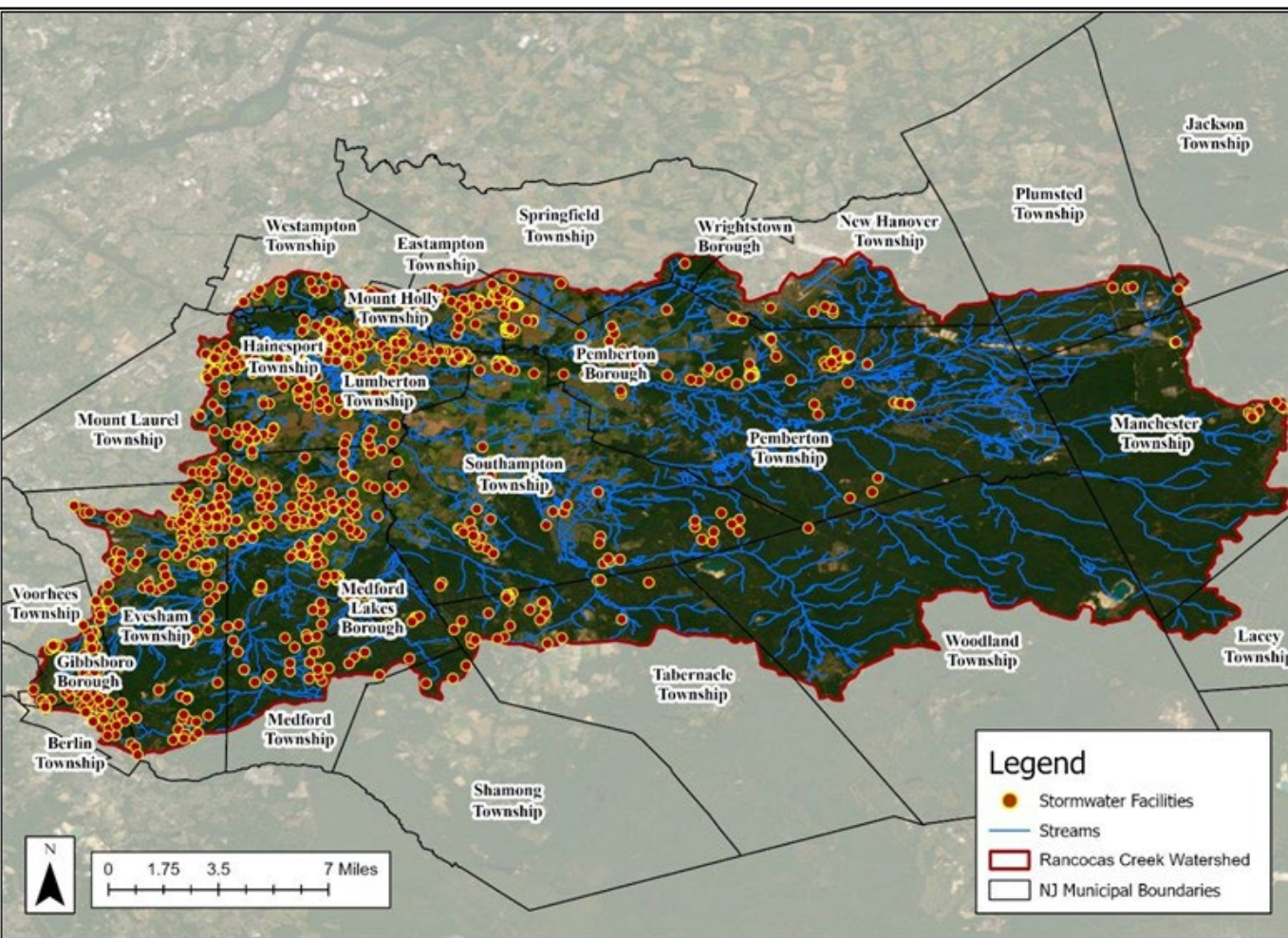
Residential Area (ac)	Impervious Cover Total (ac)	Lawn (ac)	TP Fertilizer Applied (lbs/yr)	TP Fertilizer Runoff (lbs/yr)
		HUC 02040202020010		
0	0	0	0	0
		HUC 02040202020020		
578.8	241.5	337.3	1,212.2	30.3
		HUC 02040202020030		
739.5	220.5	519	1,865.1	46.6
		HUC 02040202020040		
257.8	98.7	159.1	571.8	14.3
		HUC 02040202030010		
438.1	136.9	301.2	1,082.4	27.1
		HUC 02040202030020		
166.6	35.3	131.3	471.9	11.8
		HUC 02040202030030		
9.6	1.5	8.1	29.1	0.7
		HUC 02040202030040		
35.1	4.4	30.7	110.3	2.8
		HUC 02040202030050		
5.3	2.1	3.2	11.5	0.3
		HUC 02040202030060		
598.0	232.1	365.9	1,314.9	32.9
		HUC 02040202030070		
0.1	0.07	0.03	0.1	0.003
		HUC 02040202030080		
331.2	119.7	211.5	760.1	19.0
		HUC 02040202030090		
559.4	203.3	356.1	1,279.7	32.0
		HUC 02040202040010		
685.3	256.5	428.8	1,541.0	38.5
		HUC 02040202040020		
188.1	73.1	115.0	413.3	10.3
		HUC 02040202040030		
404.0	97.7	306.3	1,100.8	27.5
		HUC 02040202040040		
400.7	129.6	271.1	974.3	24.4
		HUC 02040202040050		
1,834.3	791.2	1043.1	3,748.6	93.7
		HUC 02040202050010		
73.7	12.6	61.1	219.6	5.5
		HUC 02040202050020		
72.0	12.5	59.5	213.8	5.3

Residential Area (ac)	Impervious Cover Total (ac)	Lawn (ac)	TP Fertilizer Applied (lbs/yr)	TP Fertilizer Runoff (lbs/yr)
		HUC 02040202050030		
218.2	43.7	174.5	627.1	15.7
		HUC 02040202050040		
820.0	175.3	644.7	2,316.9	57.9
		HUC 02040202050050		
918.4	303.8	614.6	2,208.7	55.2
		HUC 02040202050060		
382.8	96.3	286.5	1,029.6	25.7
		HUC 02040202050070		
344.9	79.3	265.6	954.5	23.9
		HUC 02040202050080		
824.0	229.0	595.0	2,138.3	53.5
		HUC 02040202050090		
550.0	141.7	408.3	1,467.3	36.7
		HUC 02040202060010		
898.7	259.3	639.4	2,297.8	57.4
		HUC 02040202060020		
1,769.5	524.7	1,244.8	4,473.4	111.8
		HUC 02040202060030		
3,105.2	957.7	2,147.5	7,717.5	192.9
		HUC 02040202060040		
1,503.5	520.8	982.7	3,531.5	88.3
		HUC 02040202060050		
1,008.2	410.9	597.3	2,146.5	53.7
		HUC 02040202060060		
873.3	198.2	675.1	2,426.1	60.7
		HUC 02040202060070		
658.4	168.2	490.2	1,761.6	44.0
		HUC 02040202060080		
1,966.9	756.0	1,210.9	4,351.6	108.8
		HUC 02040202060090		
784.1	154.8	629.3	2,261.5	56.5
		HUC 02040202060100		
1,343.9	454.2	889.7	3,197.3	79.9
		HUC 02040202070010		
465.4	167.3	298.1	1,071.3	26.8
		HUC 02040202070020		
1,141.5	408.3	733.2	2,634.9	65.9
		HUC 02040202070030		
2,392.4	810.4	1,582.0	5,685.2	142.1
		TOTALS		
29,346.9	9,529.2	19,817.7	71,219.0	1,780.5

Street Sweeping and Leaf Collection



Watershed-wide Practice		TP Reduction (lbs/yr)
1	Street Sweeping (twice per week throughout entire study area)	5,597
2	Street Sweeping (once a month throughout entire study area)	447.8
3	Fall Street Sweeping and Leaf Collection (only residential areas)	2,379.7
4	Combination of 2 and 3	2,827.5



ID	Owner	Address	Type	Town
HUC 02040202020010				
1	Joint Base McGuire-Dix-Lakehurst	Pinehurst Rd	I	Plumsted Twp
2	Joint Base McGuire-Dix-Lakehurst	Pinehurst Rd	I	Plumsted Twp
3	Joint Base McGuire-Dix-Lakehurst	Pinehurst Rd	I	Plumsted Twp
4	U.S. Government	Lakehurst Naval Air Ctr	I	Jackson Twp
5	United States Military Reservation	Hanover Furnace Manc Rd	I	Manchester Twp
6	United States Military Reservation	Pinehurst Rd	I	Manchester Twp

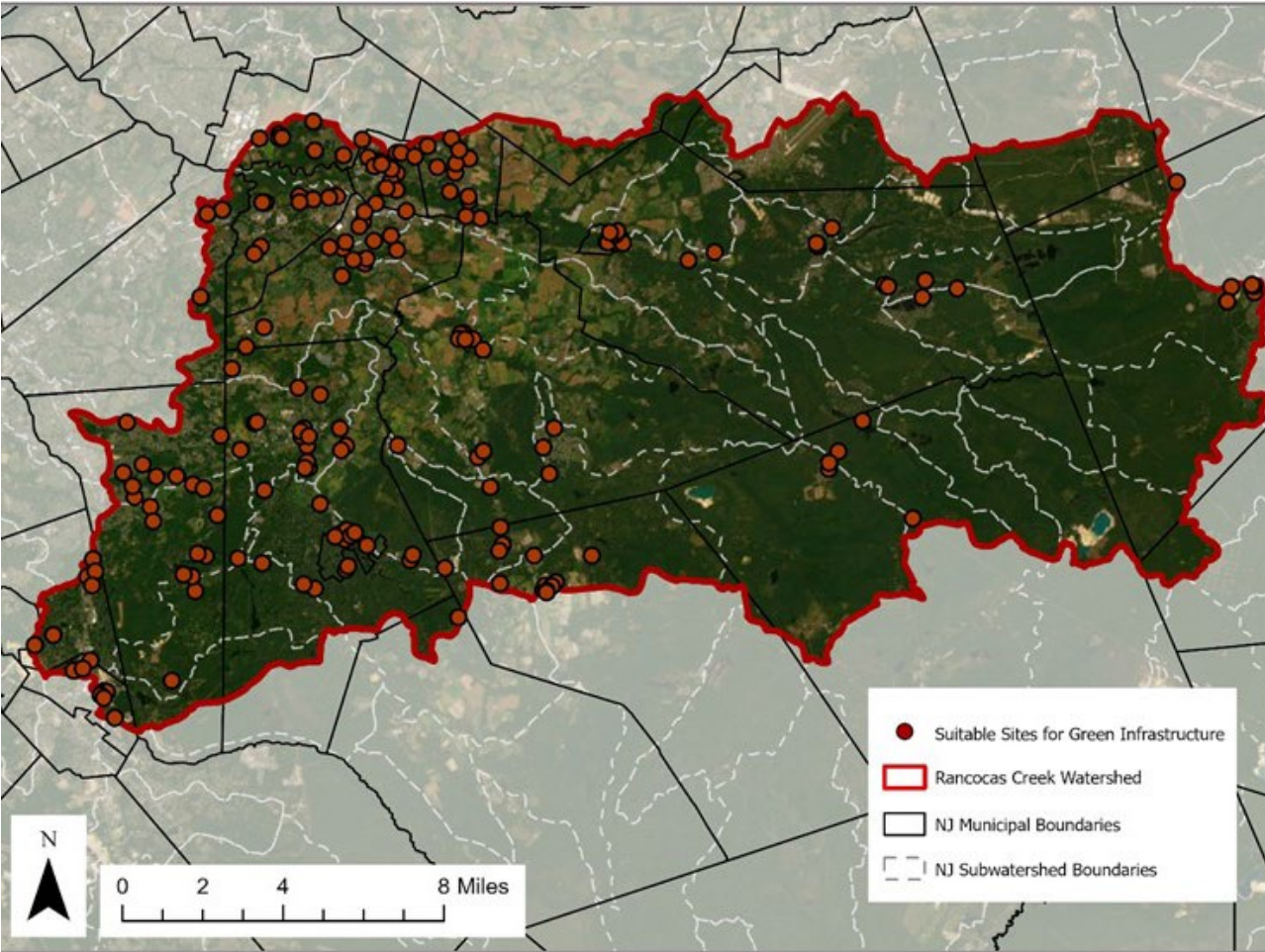
ID	Land Use	Drainage Area	Type	TP Load (lbs/yr)	Existing TP Load Reduction	Future TP Load Reduction
HUC 02040202020010						
1	Military Installations	4.22	I	8.9	5.3	5.3
2	Military Installations	3.96	I	8.3	5.0	5.0
3	Military Installations	2.53	I	5.3	3.2	3.2
4	Military Installations	77.77	I	163.3	98.0	98.0
5	Military Installations	0.23	I	0.5	0.3	0.3
6	Military Installations	0.69	I	1.4	0.9	0.9
7	Residential, Rural, Single Unit	12.90	I	7.7	4.6	4.6

Existing Pollutant Load for the Study Area

	Rancocas Creek Study Area
Nonpoint source aerial loading based upon land use	86,582
Septic system load	19,749
Detention Basin Load Reduction	-8,338
Total Existing Load	97,993

Parcels for Retrofitting with Green Infrastructure

- 189 sites
- 3,299,854 sq.ft. = drainage area (75.8 ac)
- 164 Rain Gardens
- 102 Porous Pavement Projects
- 34 Cisterns
- 10 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 02040202020010							
1	Cousins Paintball New Jersey, 750 Whiting-New Egypt Road, Manchester Township, NJ 08759	1,776,788	34,401	450	115	0	0
HUC 02040202020030							
2	Korean Baptist Church, 535 Lakehurst Road, Browns Mills, NJ 08015	241,196	69,665	14,600	0	3,560	0
3	Pemberton Community Library, 16 Broadway Street, Browns Mills, NJ 08015	184,259	54,858	18,010	1,875	1,080	0

Site ID	Site Name and Address	TP Loading reduction with underdrain (lbs/yr)	TP Loading reduction w/o underdrain (lbs/yr)
HUC 020402020010			
1	Cousins Paintball New Jersey, 750 Whiting-New Egypt Road, Manchester Township, NJ 08759	1.02	1.53
HUC 020402020030			
2	Korean Baptist Church, 535 Lakehurst Road, Browns Mills, NJ 08015	2.04	3.06
3	Pemberton Community Library, 16 Broadway Street, Browns Mills, NJ 08015	1.56	2.34

Rain Gardens to Manage Rooftop Runoff

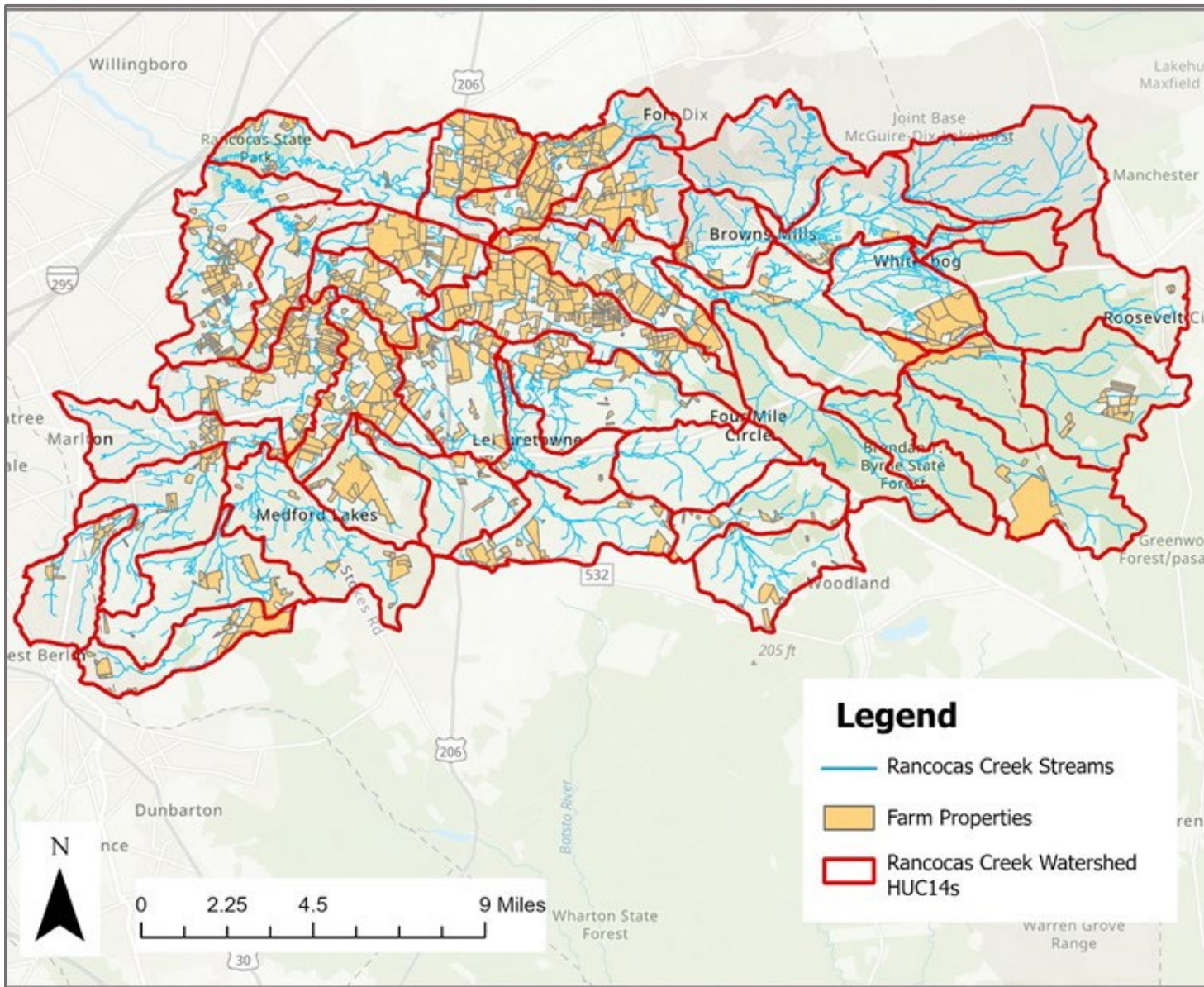


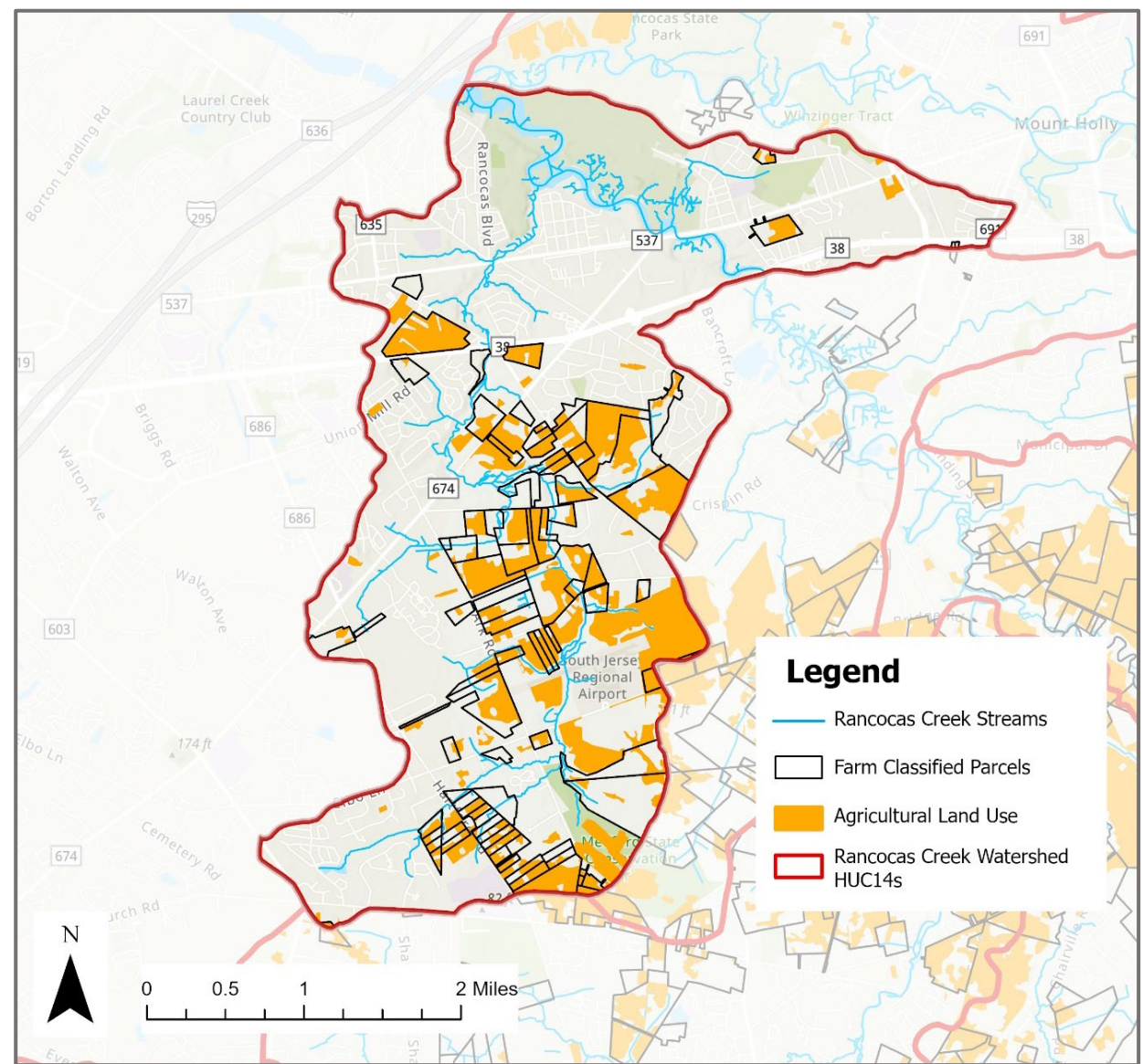
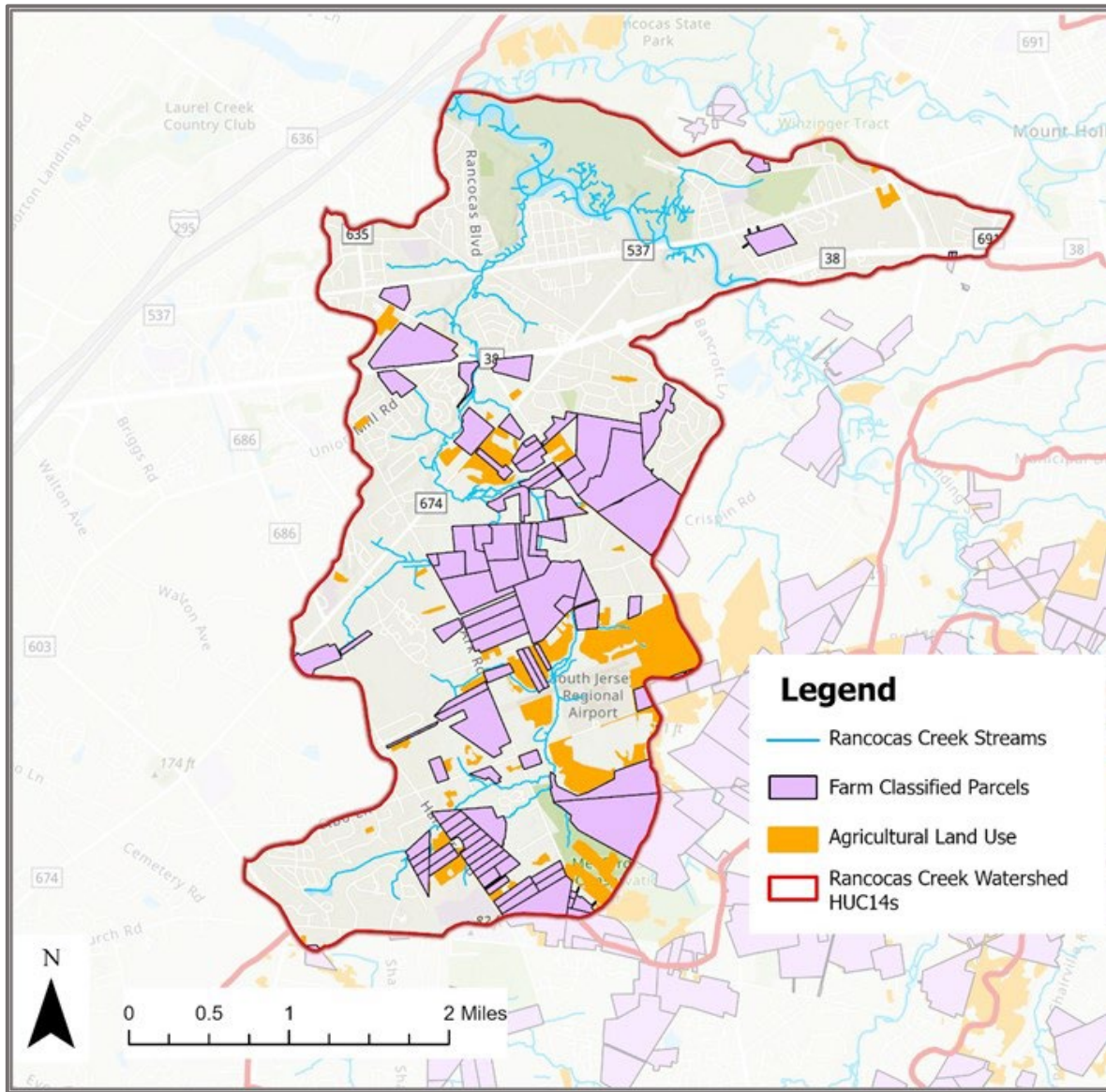
- 65,078 buildings in the study area
- 3,561 acres of rooftop
- 25% of the rooftops of 25% buildings
- TP Reduction = 444.9 lbs/yr
- TN Reduction = 4,660.7 lbs/yr
- TSS Reduction = 42,370 lbs/yr

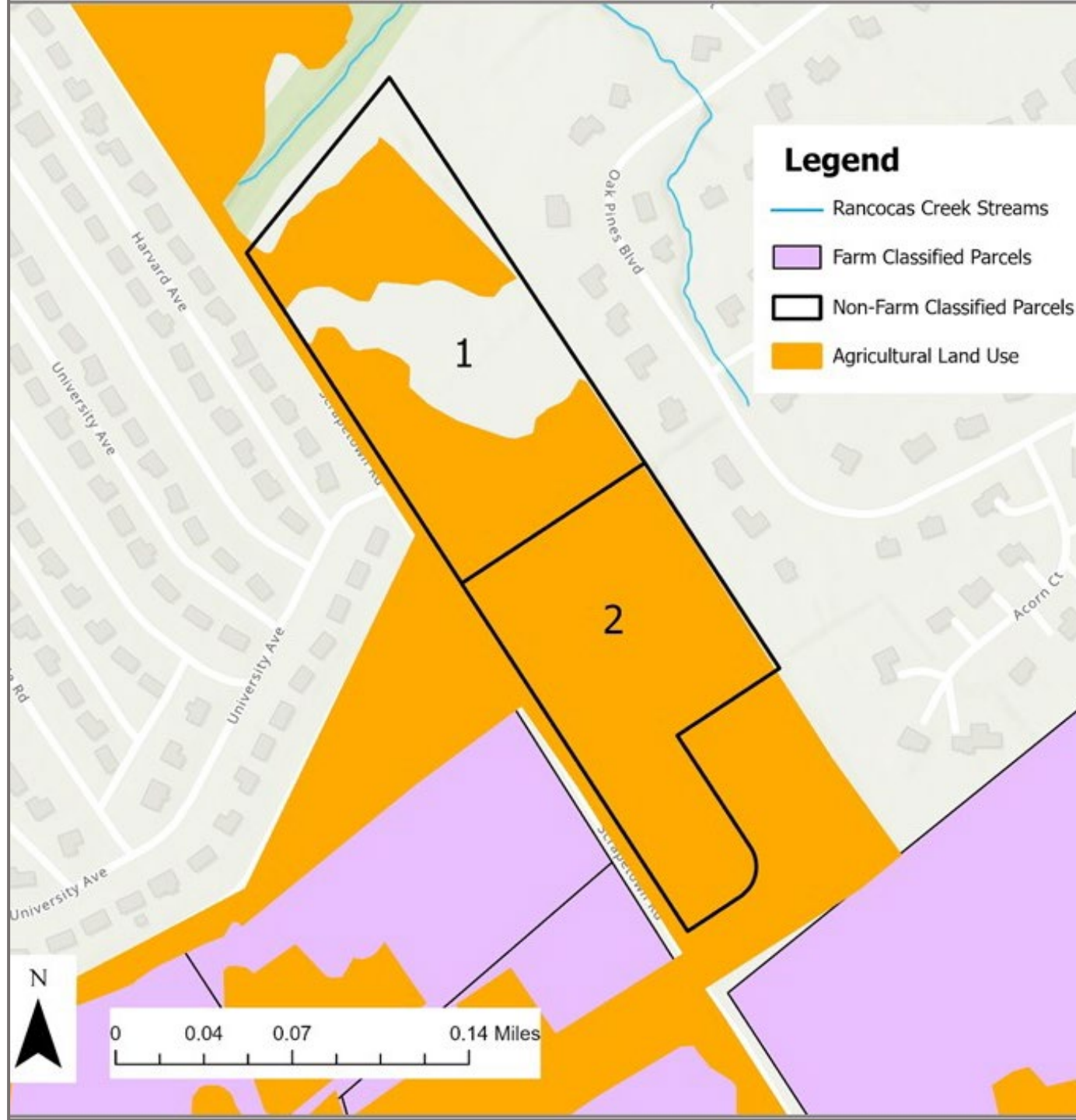


Analysis of Farm Parcels

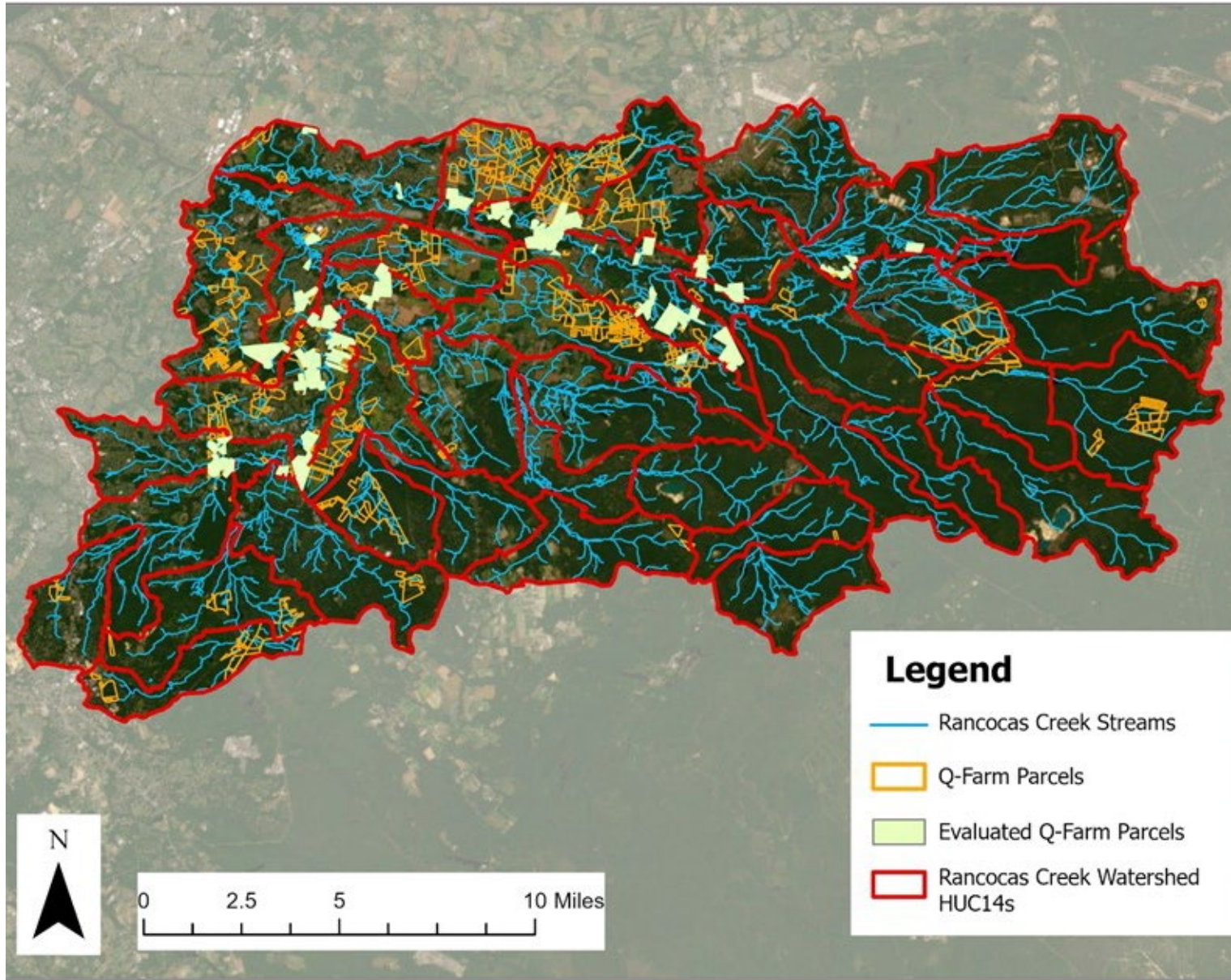
- Urban Lands = 48,979 lb TP / year
- Ag Lands = 23,036 lb TP / year
- 1,013 Farm Parcels = 31,625 acres
- Ag land use in these parcels = 11,196 acres = 14,555 lb TP / year







	Ag LU	TP Load	No. of
Description	(acres)	(lbs/yr)	Parcels
Total for Farm Property (3A, 3B, and/or Q-Farm)	11,196	14,555	1,013
Total for entire study area (all HUC14s)	17,720	23,036	89,516*
Remaining	6,524	8,481	88,503



- 577 Q-Farm Parcels
- 295 Q-Farm Parcels intersect with river or tributaries
- Farms Classified as:
 - Row Crops
 - Livestock/Horses
 - Hay/Grass
 - Wooded

Block	Lot	Q-Farm Code	Municipality	Cover Crop	Enhanced Stream Buffer	Impervious Cover Mgt.	Rainwater Harvesting	Livestock Exclusion	Manure Mgt.
1500	1	QFARM	Eastampton Twp	X	X				
33	12	QFARM	Lumberton Twp	X					
33	14.01	QFARM	Lumberton Twp	X					
41	4.01	QFARM	Lumberton Twp						X
41	4.02	QFARM	Lumberton Twp	X					
41	4.03	QFARM	Lumberton Twp	X	X				
46	13	QFARM	Lumberton Twp	X					
46.01	1.01	QFARM	Lumberton Twp	X					
51	1	QFARM	Lumberton Twp	X					
51	3	QFARM	Lumberton Twp	X	X				
51	5	QFARM	Lumberton Twp	X	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)
1,166.8	1,517	11,668	350,029

Load reduction for cover crop on recommended 16 Q-Farms

Area (ac)	TP Load (lbs/yr)	TN Load (lbs/yr)	TSS Load (lbs/yr)
1,166.8	910	3,500	280,023

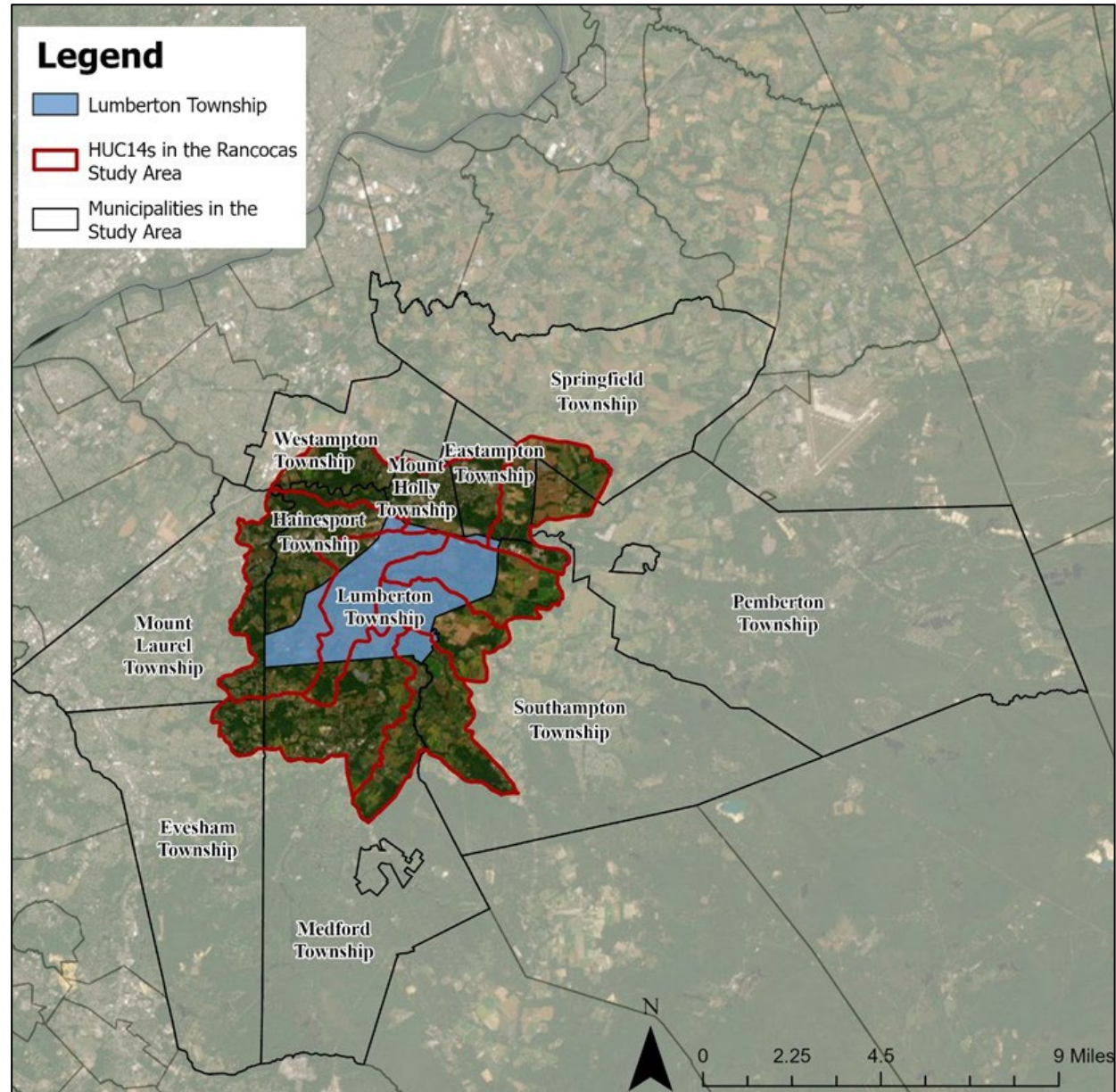
Load reductions for proposed management strategies

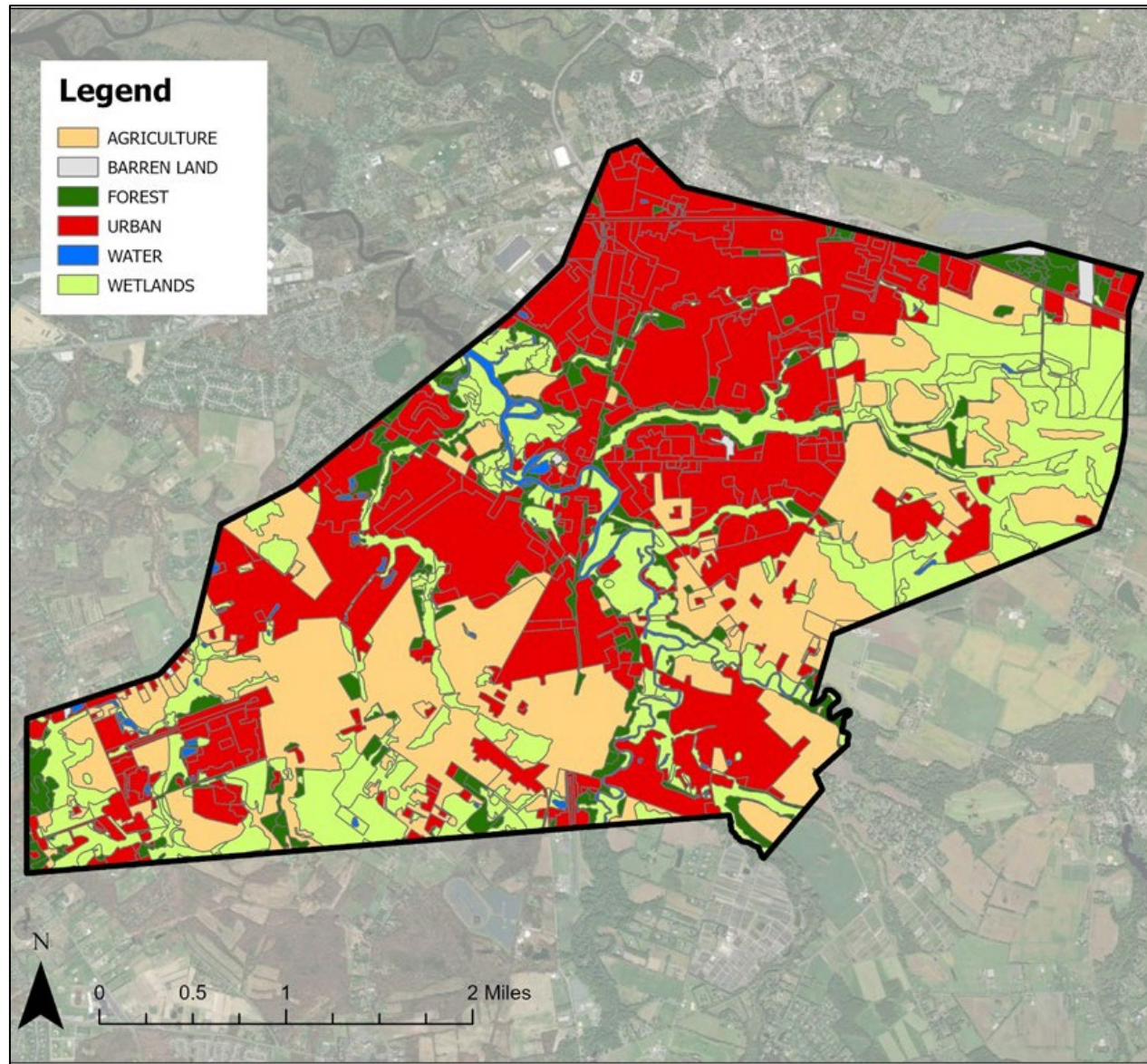
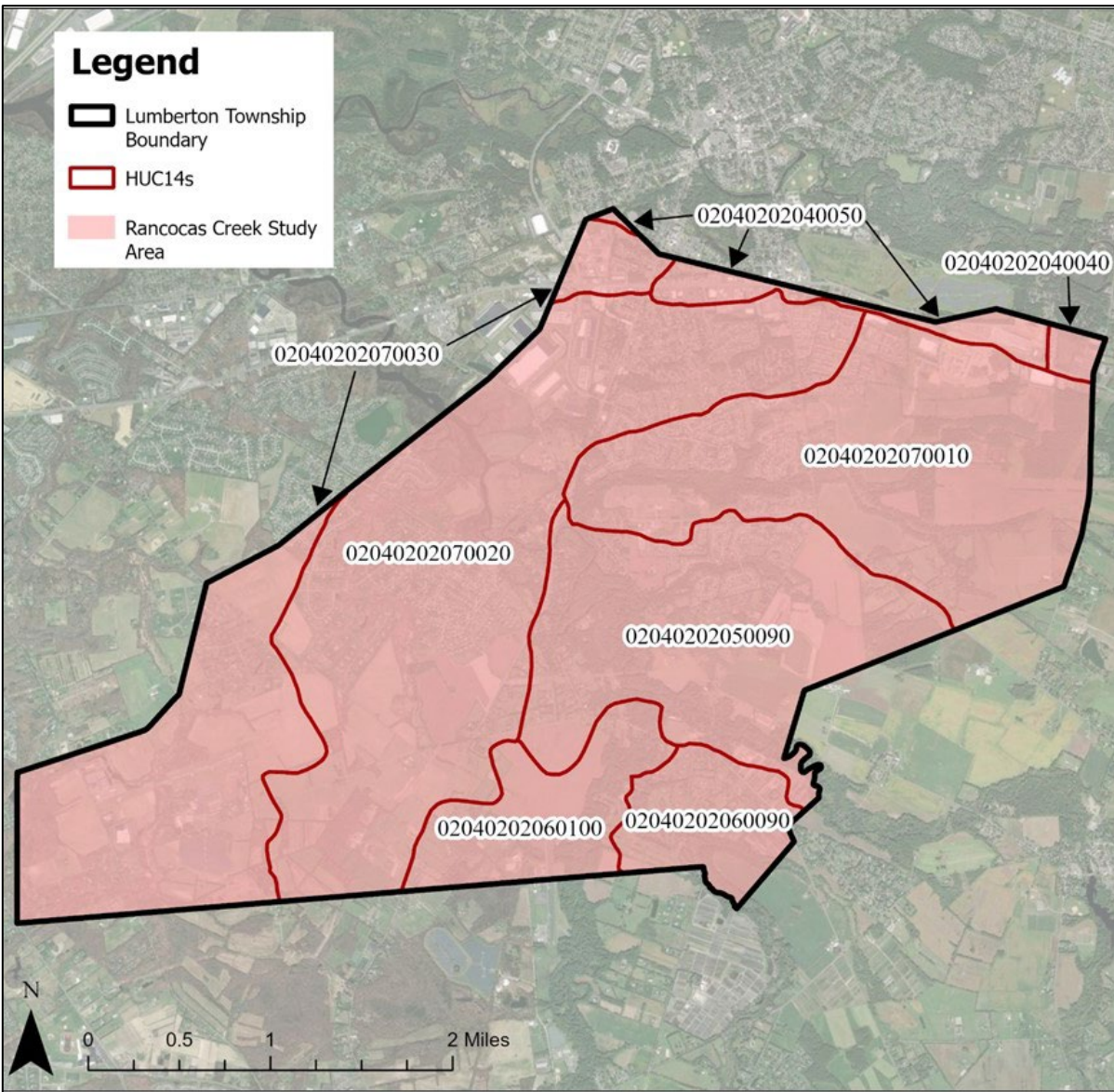
Management Strategy	TP Reduction (lb/yr)
Leaf collection and additional street sweeping (Option #4 – Table 27)	2,827.5
Green infrastructure for proposed retrofit sites	1,360.99
Rain gardens for ¼ rooftops for ¼ of buildings	444.9
Converting existing detention basins to bioretention basins	1,099.9
Agricultural management practices on specific farms	910.0
Septic system replacement	8,689.7
TOTAL =	15,333.0

Existing loads and proposed load reduction

	TP (lbs/yr)
Existing Load	97,993.0
Load Reduction	15,333.0
% Load Reduction	15.6%

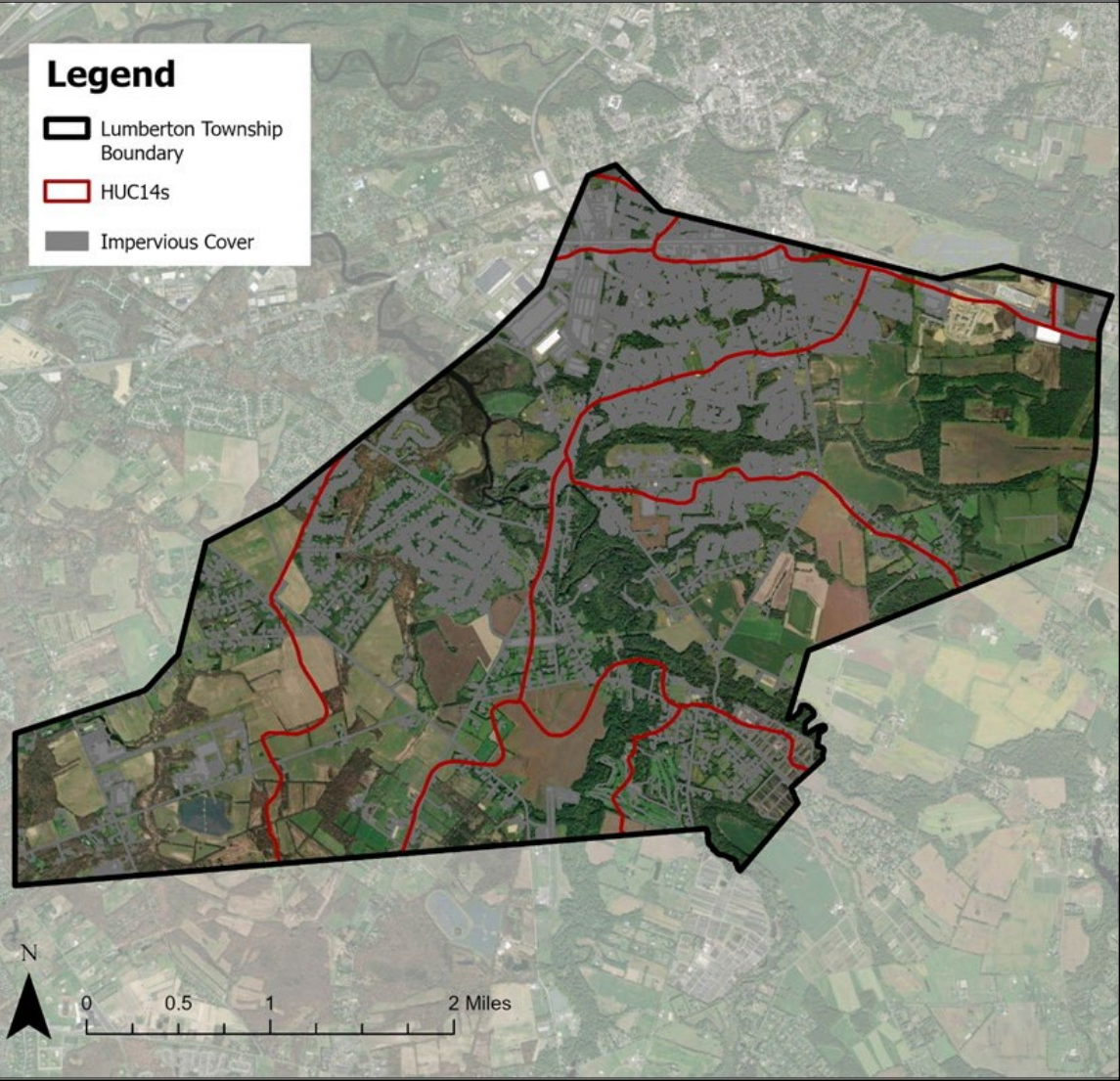
Analysis by Municipality





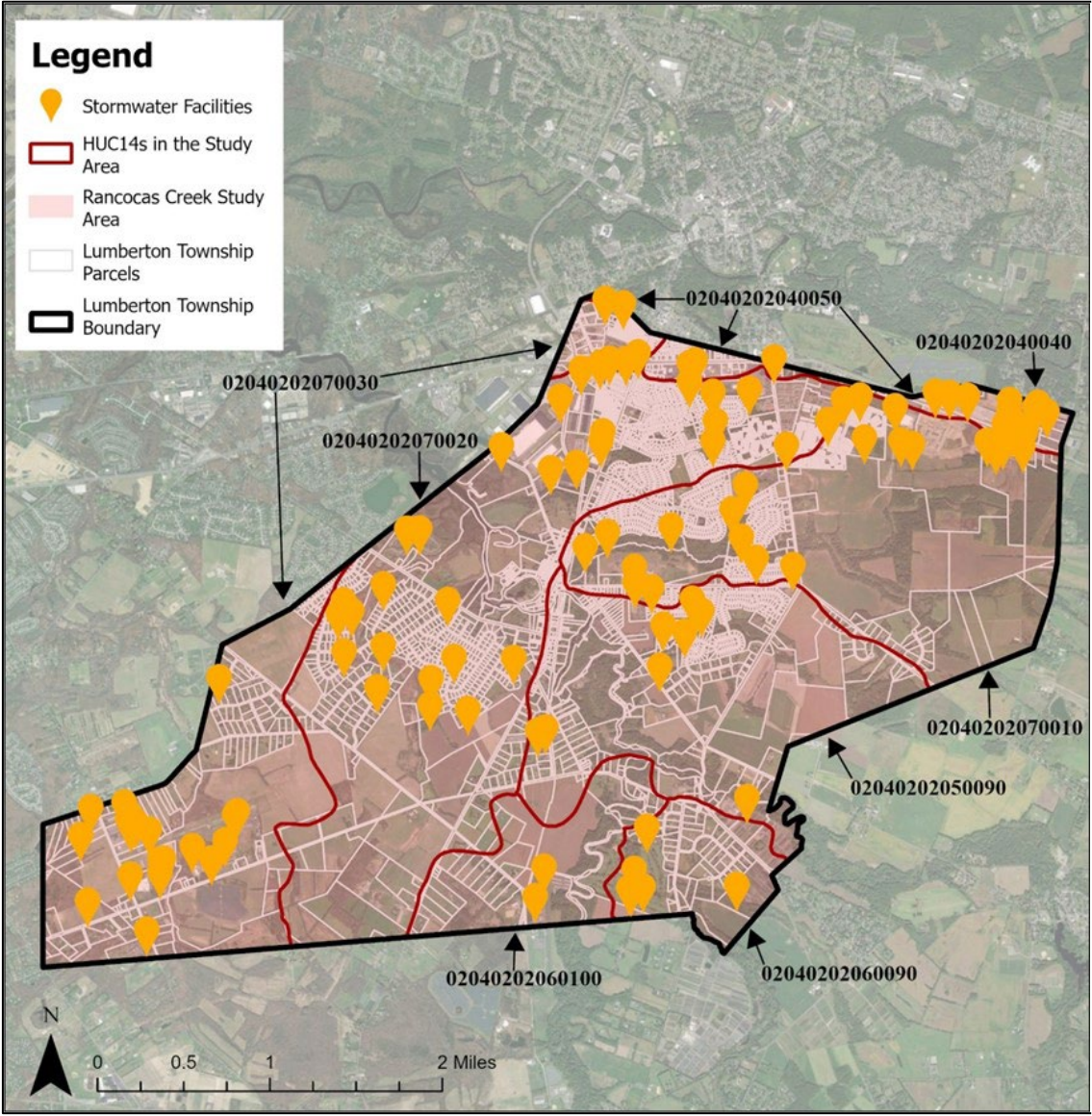
Land Use	Area (acres)	TP Load (lbs/yr)	TN Load (lbs/yr)	TSS Load (lbs/yr)
HUC14 02040202040040				
Agriculture	0.7	0.9	6.7	200.5
Barren Land	8.8	4.4	44.2	530.6
Forest	10.5	1.0	31.4	418.8
Urban	25.8	36.1	387.2	3,614.0
Water	0.0	0.0	0.0	0.0
Wetlands	1.2	0.1	3.5	47.1
TOTAL =	47.0	42.6	473.1	4,811.0
HUC14 02040202040050				
Agriculture	6.3	8.2	63.2	1,895.8
Barren Land	9.8	4.9	49.2	590.0
Forest	51.5	5.2	154.6	2,061.2
Urban	115.9	162.3	1,739.0	16,230.2
Water	0.0	0.0	0.0	0.0
Wetlands	0.1	0.0	0.4	5.1
TOTAL =	183.7	180.6	2,006.3	20,782.2

Land Use	Area (acres)	TP Load (lbs/yr)	TN Load (lbs/yr)	TSS Load (lbs/yr)
All HUC14s				
Agriculture	2,177.6	2,830.9	21,775.9	653,277.4
Barren Land	26.6	13.3	133.1	1,597.7
Forest	579.7	58.0	1,739.1	23,187.5
Urban	3,389.5	4,745.3	50,842.2	474,527.4
Water	116.0	11.6	347.9	4,639.2
Wetlands	2,037.5	203.7	6,112.4	81,498.8
TOTAL =	8,326.8	7,862.8	80,950.7	1,238,728.1

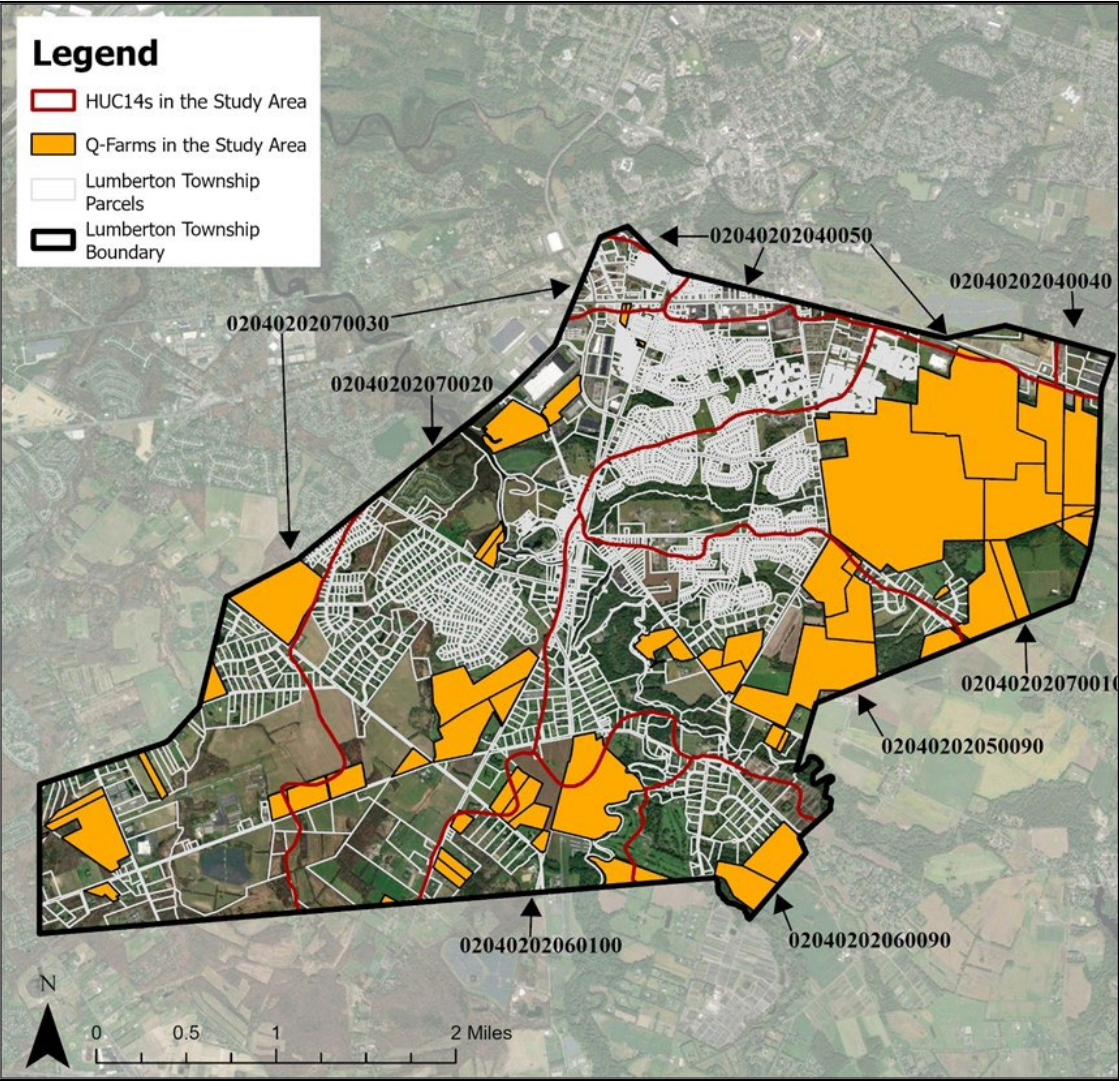


Class	Area (acres)	HUC Impervious Cover (%)
HUC14 02040202040040		
Building	4.26	
Other	12.87	
Road	3.80	
TOTAL =	20.9	44.5%
HUC14 02040202040050		
Building	11.88	
Other	50.03	
Road	22.37	
TOTAL =	84.3	45.9%
HUC14 02040202050090		
Building	31.95	
Other	71.97	
Road	51.37	
TOTAL =	155.3	10.9%
HUC14 02040202060090		
Building	4.65	
Other	18.47	
Road	9.46	
TOTAL =	32.6	8.7%

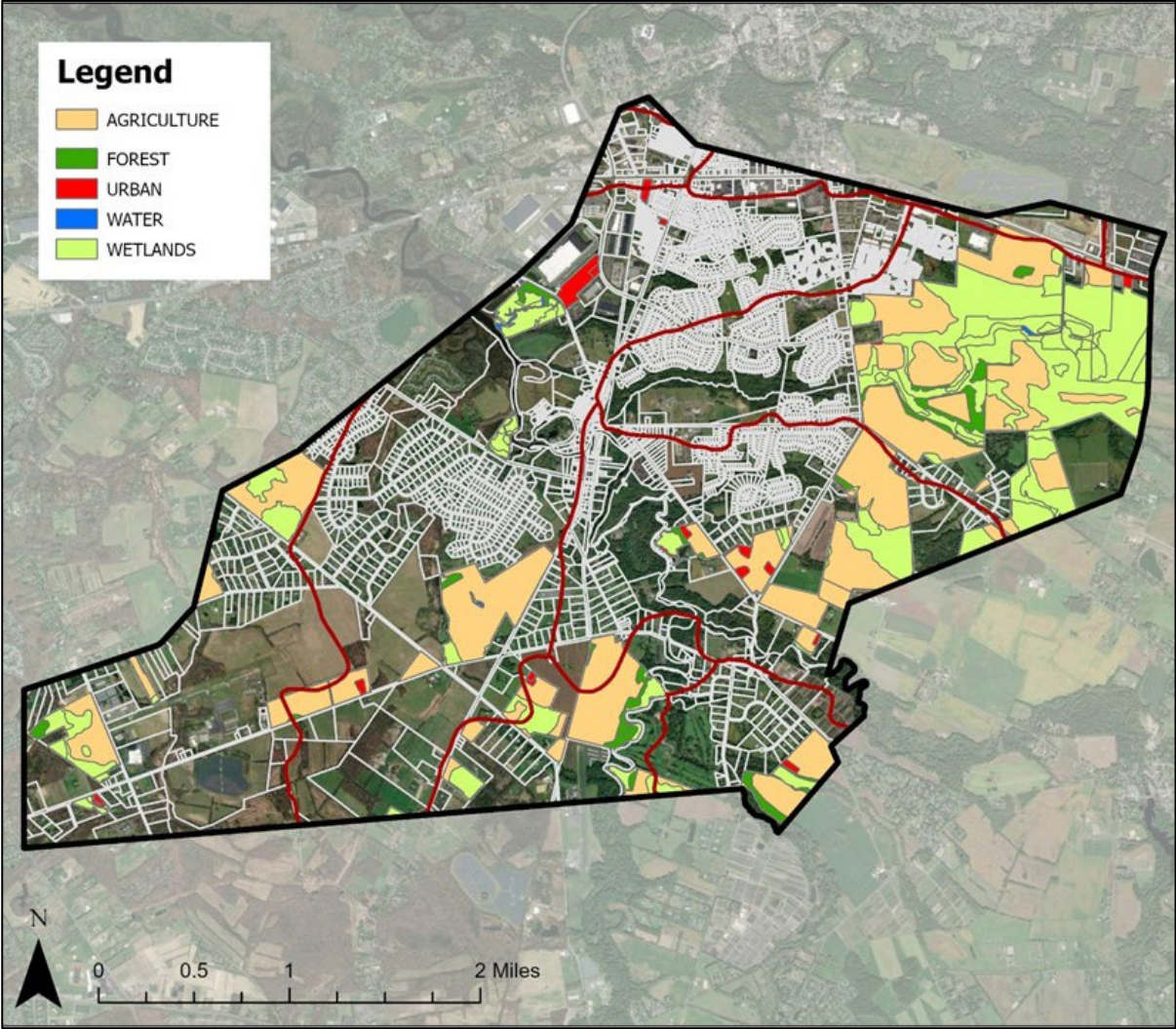
Class	Area (acres)	HUC Impervious Cover (%)
HUC14 02040202060100		
Building	5.62	
Other	18.48	
Road	6.05	
TOTAL =	30.2	5.9%
HUC14 02040202070010		
Building	60.04	
Other	102.76	
Road	62.89	
TOTAL =	225.7	12.7%
HUC14 02040202070020		
Building	149.91	
Other	264.68	
Road	147.41	
TOTAL =	562.0	21.2%
HUC14 02040202070030		
Building	34.81	
Other	120.86	
Road	41.44	
TOTAL =	197.1	14.4%
All HUCs		
Building	303.12	
Other	660.12	
Road	344.80	
TOTAL =	1,308.0	15.7%



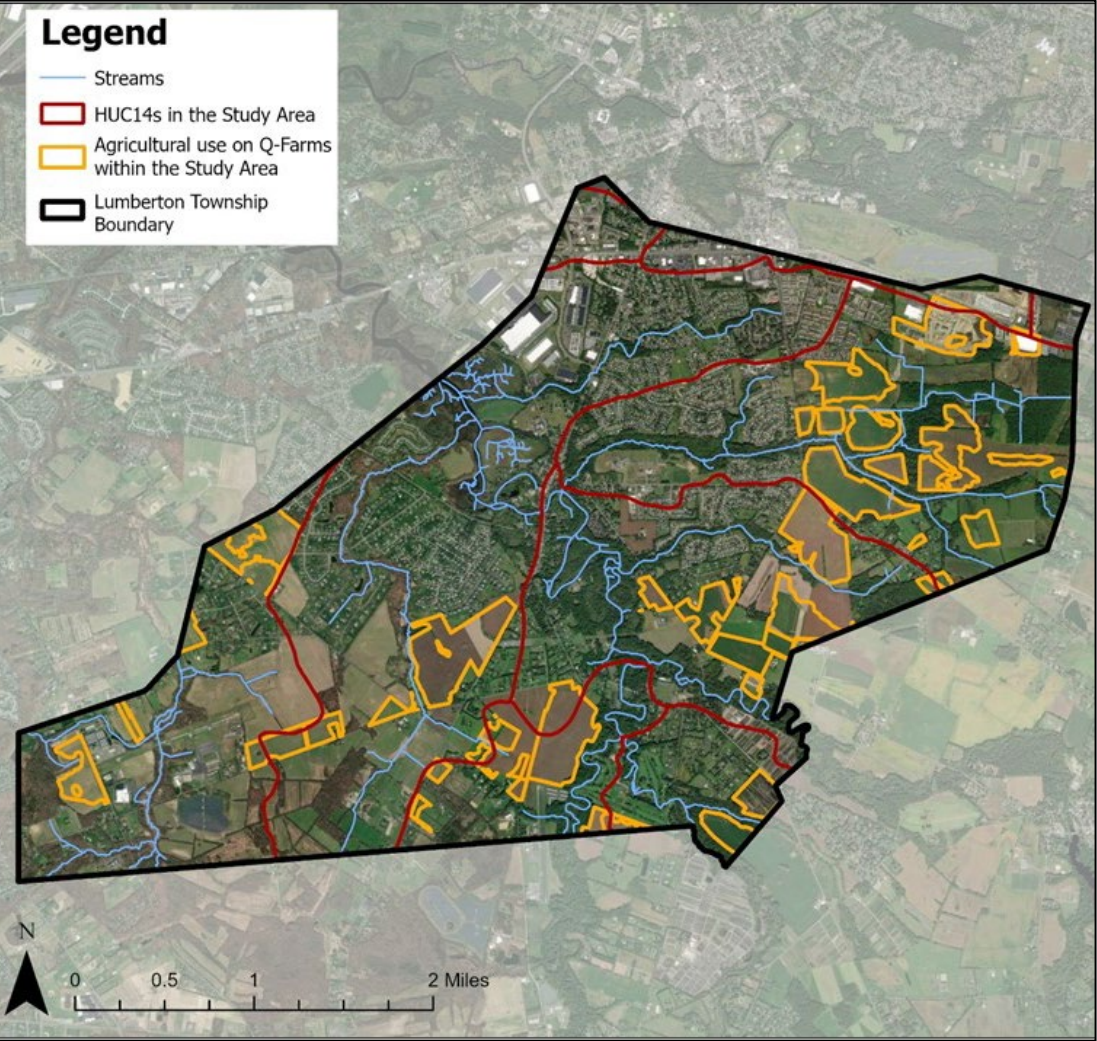
Raccoon Creek Study Area			
ID	Owner	Address	Type
144	Haddad Apparel Group Ltd	705 Smithville Rd	R
145	Unknown	State Rte 38	I
146	Haddad Apparel Group Ltd	705 Smithville Rd	R
147	Hlm Enterprises, Inc	1807 Route 38	I
148	Holmes, Barbara J	1811 Route 38	I
184	Burlington Geriatric Centers Inc	62 Richmond Avenue	UI
191	Unknown	Maple Grove Boulevard	I
192	Burl Co Community Action Program	100 Maple Grove Blvd	N
198	Heritage Bk Gen Ser %Natl Tx Search	778 Eayrestown Road	D
209	Waste Managements of NJ, Inc	State Rte 38	R



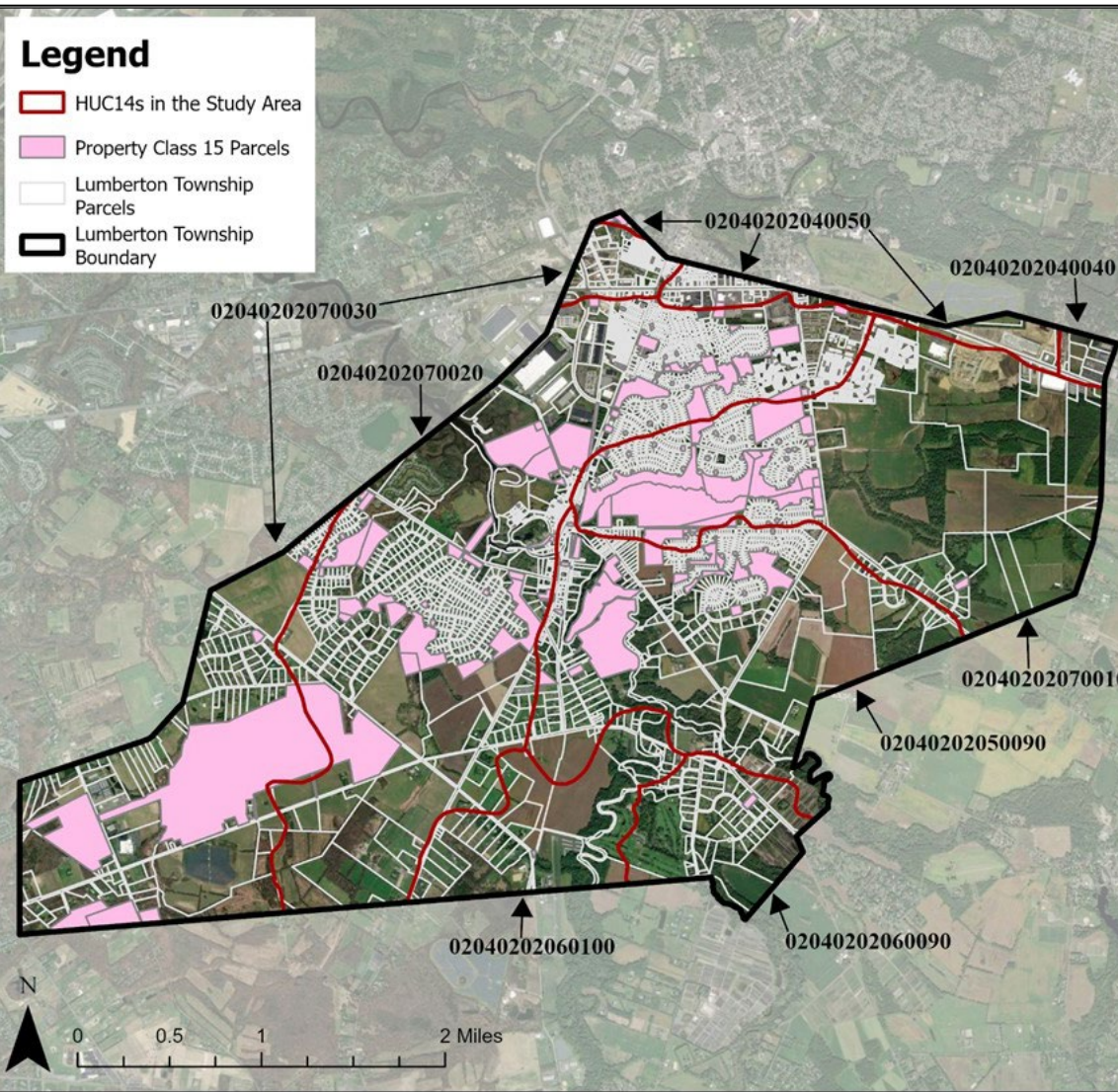
Blk	Lot	Location	Owner	Owner Address
5	3	Main St & Wilson Ave	Unknown	Unknown
5	4	Main St & Wilson Ave	Unknown	Unknown
5	5	Wilson Ave	Wills Realty Prtship %Averill Wills	Unknown
6	1	State Rte 38	Frank D Smith, III	Unknown
6	2	State Rte 38	Ambrose, Michael D	Unknown
15.04	2.01	Berry Dr & Breezy Ridge Ln	M Shen Assoc LLC	Unknown
20.17	26.01	370 Landing St	Shirk, Scott & Toomey, Michele	370 Landing St



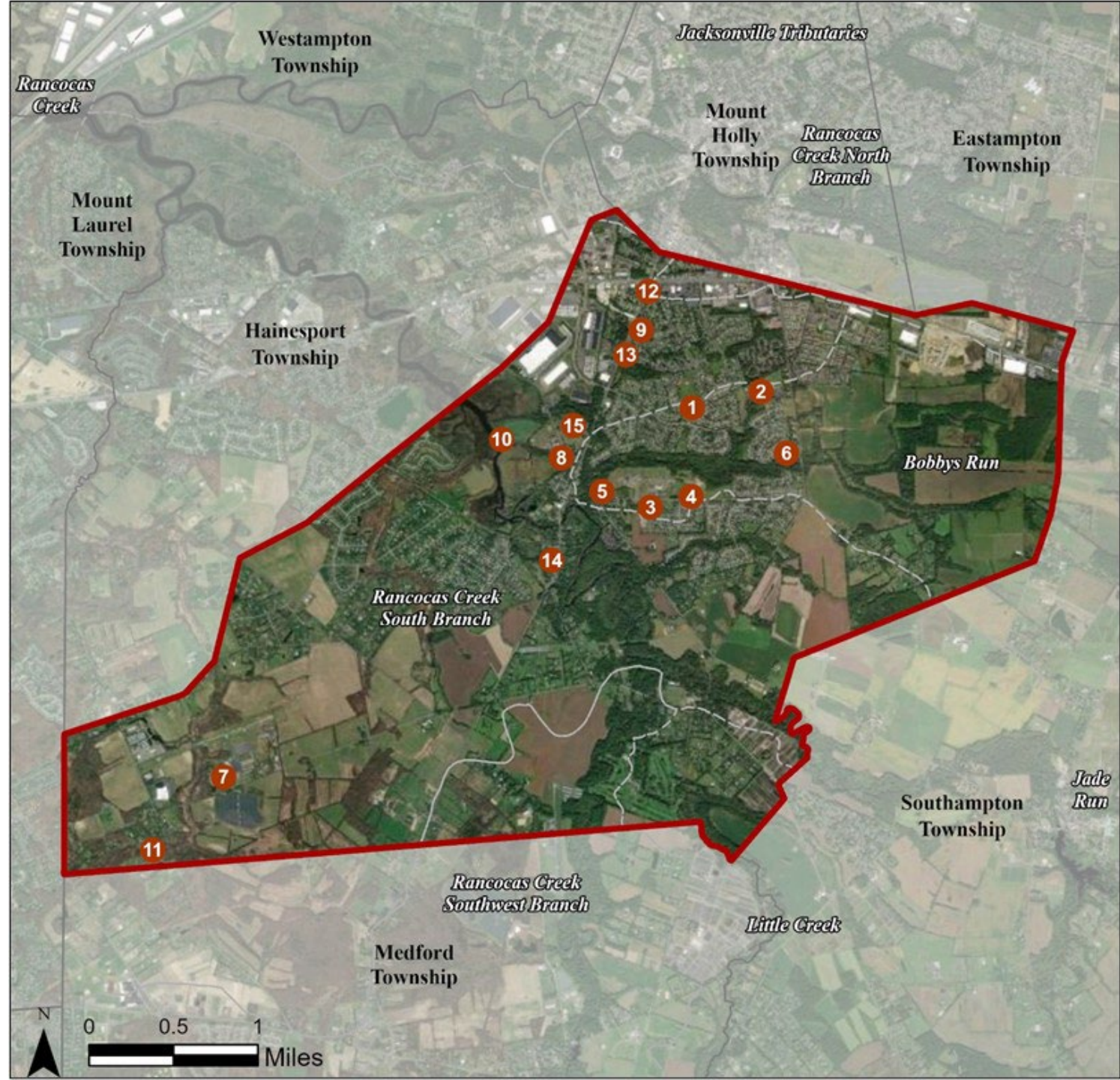
Land Use	Area (acres)
Agriculture	1,022.0
Barren Land	0.0
Forest	84.5
Urban	46.8
Water	6.5
Wetlands	790.7
Total:	1,950.4



Blk	Lot	Munic.	Cover Crop	Enhanced Stream Buffer	Manure Mgt.
33	12	Lumberton Twp	X		
33	14.01	Lumberton Twp	X		
41	4.01	Lumberton Twp			X
41	4.02	Lumberton Twp	X		
41	4.03	Lumberton Twp	X	X	
46	13	Lumberton Twp	X		



Blk	Lot	Prop Class	Location	Owner	Facility Type
*4.01 ¹	9	15A	56 Chestnut Street	Board of Education	Schools
*19.56	3	15A	30 Dimsdale Drive	Wilson, Thomas M & Robyn F	Schools
26	3.03	15A	Chestnut St	Lumberton Township	Schools
*26 ¹	4	15A	72 Chestnut Street	Board of Education	Recreation Fields
2.01	4.02	15C	11 Queen Street	Robbins, Everett D & Williams S	Tax Lien Foreclosure
3.01	1	15C	Chestnut Street	Rockhill, Robert & Linda	Vacant Land
3.02	5	15C	9 Spruce Street	Lumberton Township	Vacant Land
7	2	15C	Main Street	Somerset Tire Service	Highways



BRYAN FREEMAN PARK

RAP ID:

1

Subwatershed:

Bobbys Run

Site Area:

721,035 sq. ft.

Address:

5 Westminster Drive
Lumberton, NJ 08048

Block and Lot:

Block 19.52, Lot 25

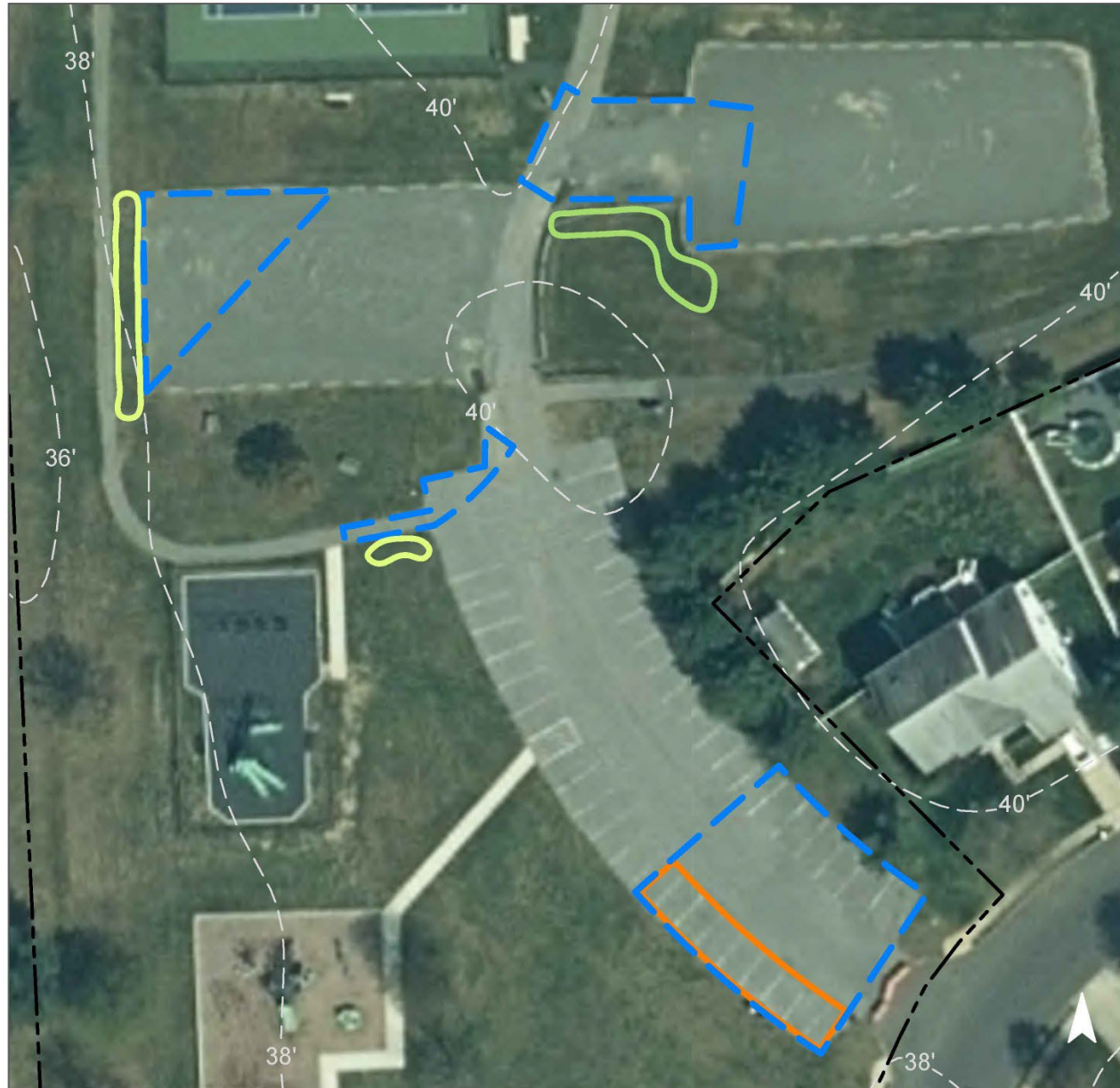


Parking spaces in the south parking lot can be converted to porous pavement to capture and infiltrate stormwater runoff from the parking lot. Rain gardens can be installed alongside the pavement to capture, treat, and infiltrate the stormwater runoff from the parking. A bioswale can be installed alongside the eastern parking lot to help move the stormwater off the parking area. A preliminary soil assessment suggests that the soils have suitable drainage characteristics 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 44"
25	106410	5.1	53.7	488.6	0.083	2.92

Recommended Green Infrastructure Practices	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 systems	0.063	11	4700	0.18	605	\$3,025
Bioswale	0.074	9	2,060	0.01	550	\$2,750
Pervious pavement	0.116	19	8,620	0.32	1,245	\$31,125

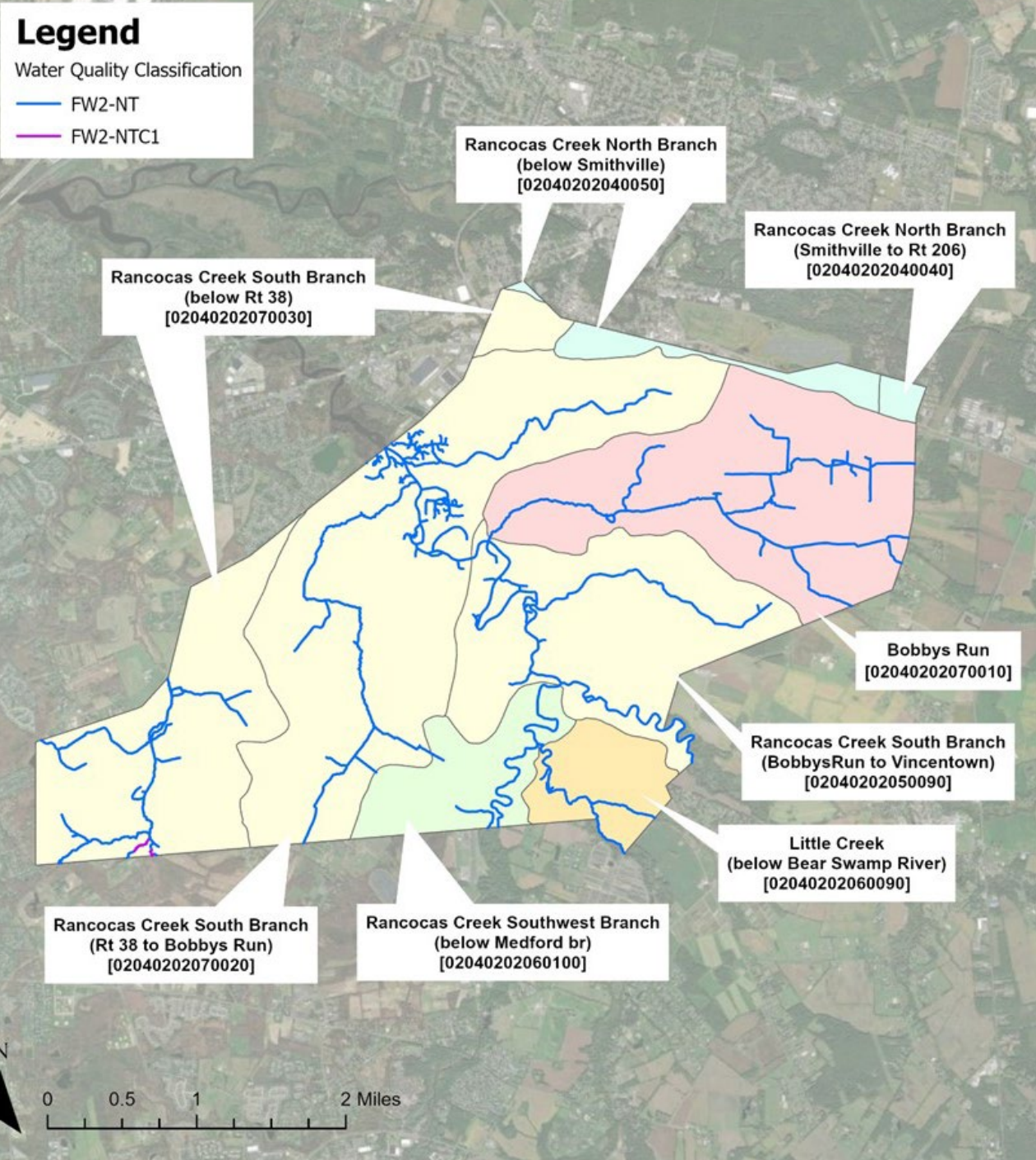
GREEN INFRASTRUCTURE RECOMMENDATIONS



Bryan Freeman Park

-  bioretention system
-  bioswale
-  pervious pavement
-  drainage area
-  property line
-  2015 Aerial: NJOIT, OGIS





Surface Water Quality Classification	Surface Water Quality Code	Miles	Percent of Municipal Streams
Freshwater 2, non-trout	FW2-NT	39.1	99.5%
Freshwater 2, non-trout, Category 1	FW2-NTC1	0.2	0.5%

Next Steps

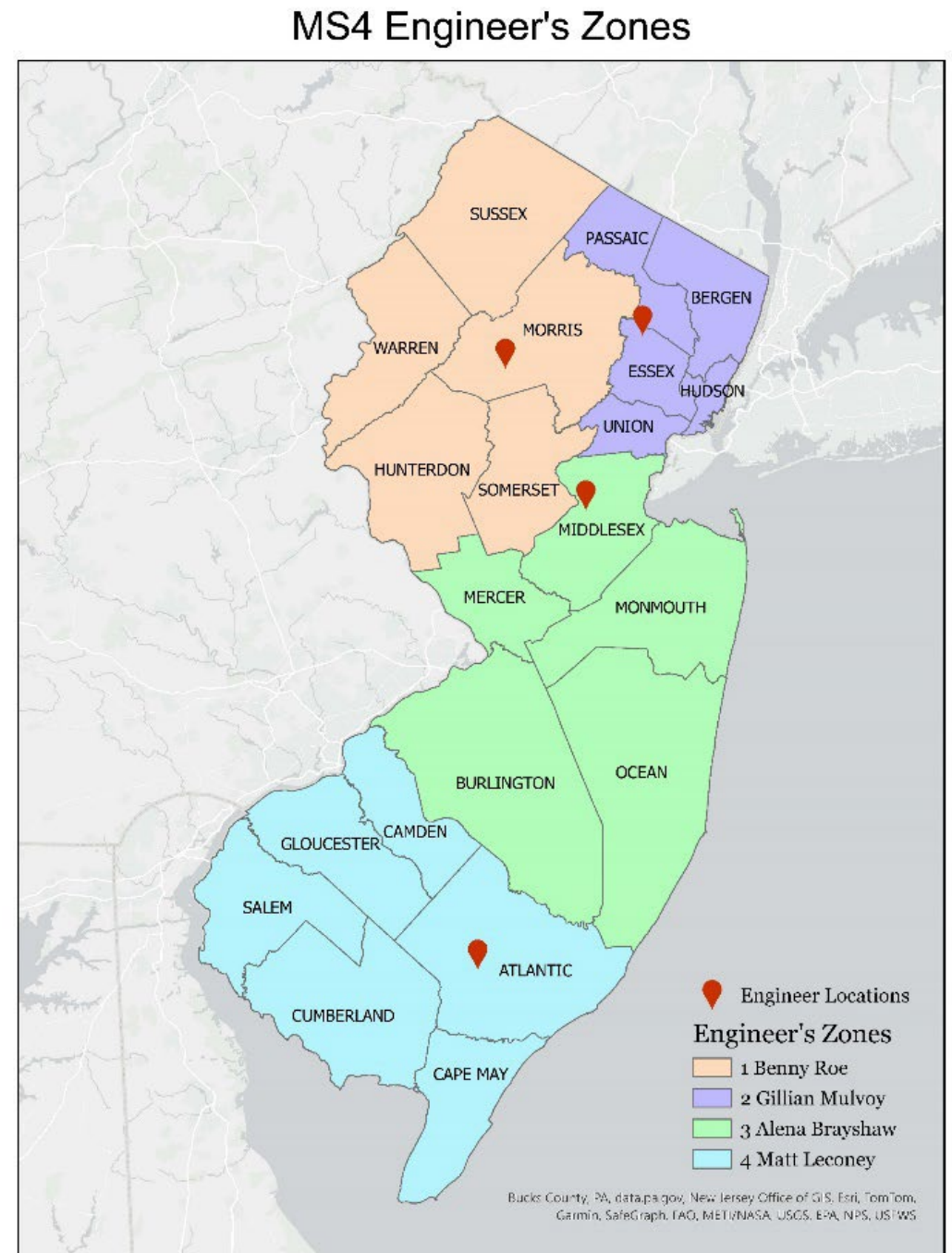
4. Estimation of the amounts of technical and financial assistance needed
5. Development and delivery of informational and education component
6. Development of a schedule for implementing NPS controls
7. Development of interim, measurable milestones
8. Development of criteria to ensure load reductions 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



QUESTIONS?

