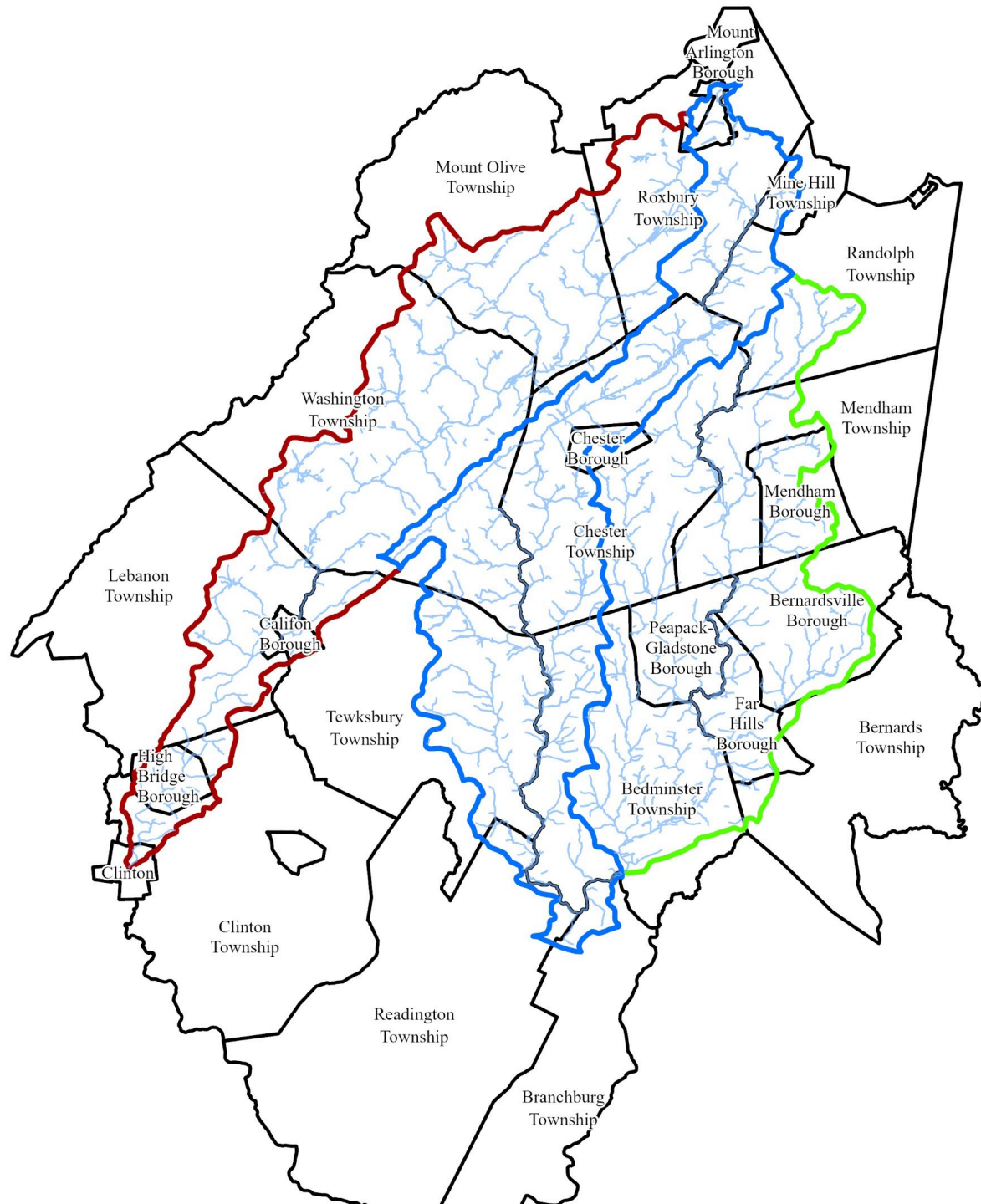


# Three Watersheds in the NJ Highlands



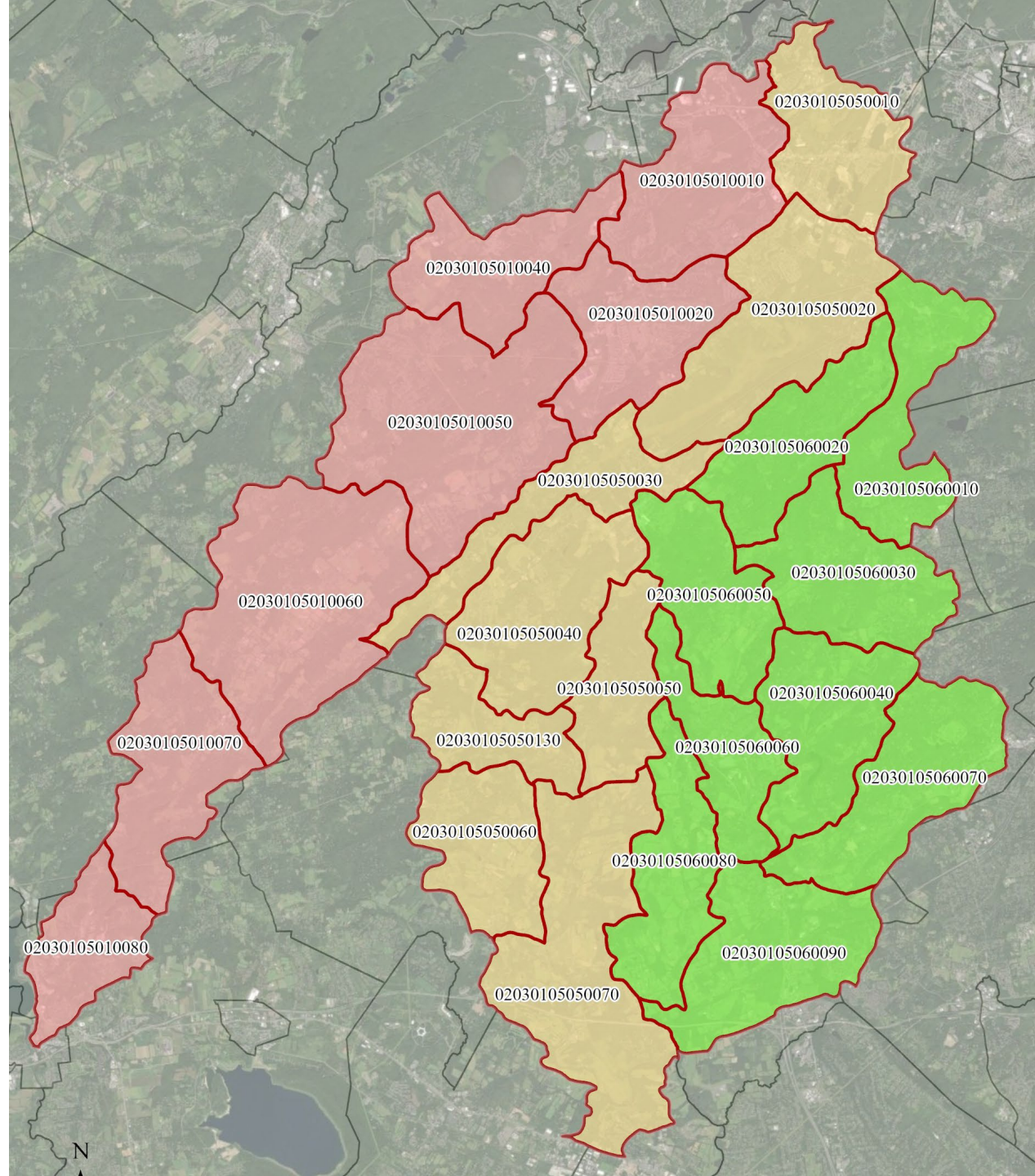
**R** | **RUTGERS UNIVERSITY**  
**Water Resources Program**  
New Jersey Agricultural Experiment Station



*Christopher C. Obropta, Ph.D., P.E.*  
*Extension Specialist in Water Resources*  
[obropta@envsci.rutgers.edu](mailto:obropta@envsci.rutgers.edu)

# HUC14 in the Study Area

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**Water Resources Program**  
New Jersey Agricultural Experiment Station



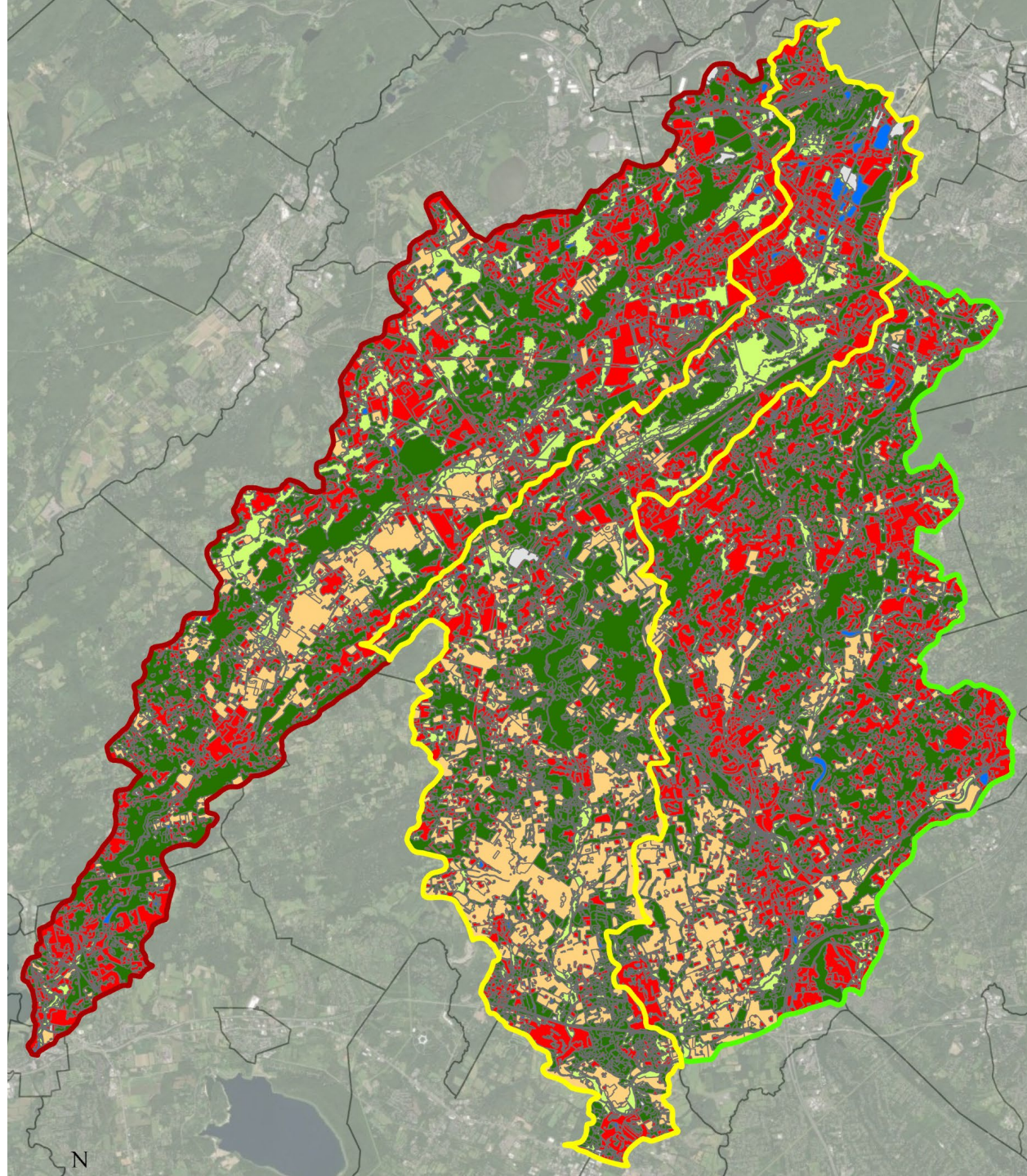


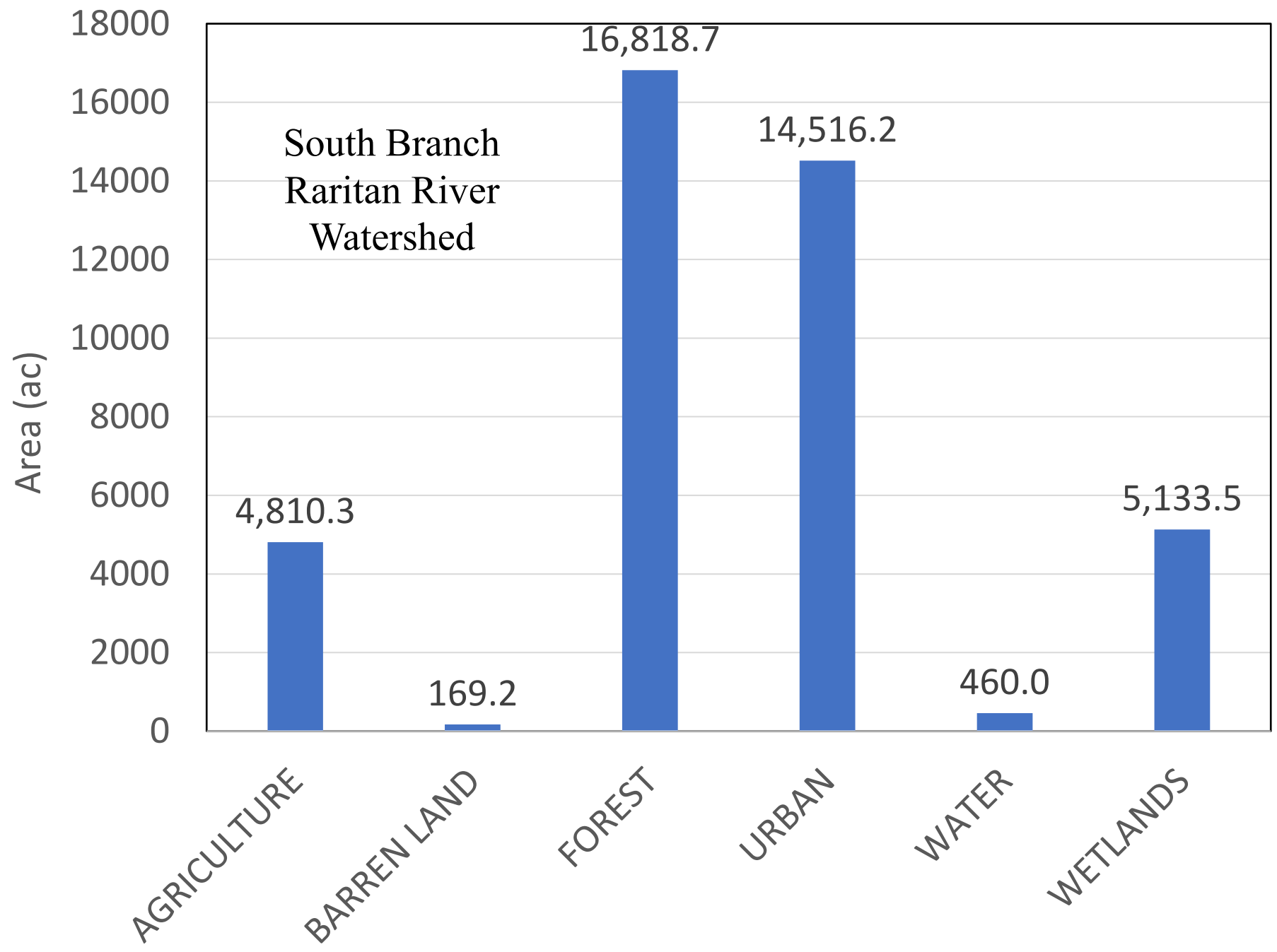
# Land Use and NPS Loading

## Legend



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Water Resources Program  
New Jersey Agricultural Experiment Station







# Land Use Analysis by HUC14

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



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





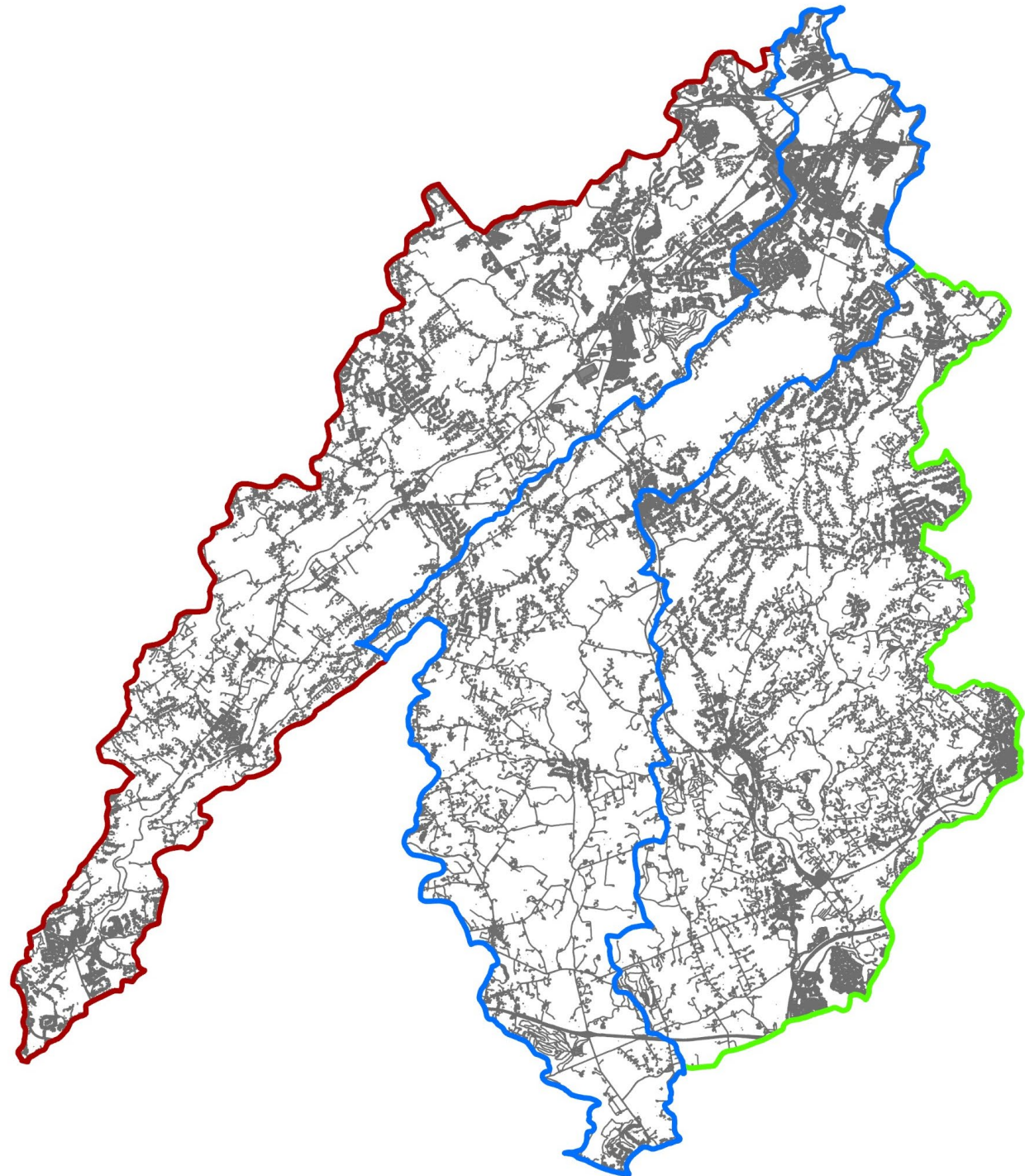
Land Use Code	Land Use Label	Land Use Type	TP	TN	TSS
1110	Residential, High Density Or Multiple Dwelling	Urban	1.4	15	140
1120	Residential, Single Unit, Medium Density	Urban	1.4	15	140
1130	Residential, Single Unit, Low Density	Urban	0.6	5	100
1140	Residential, Rural, Single Unit	Urban	0.6	5	100
1200	Commercial/Services	Urban	2.1	22	200
1300	Industrial	Urban	1.5	16	200
1400	Transportation/Communication/Utilities	Urban	1.5	16	200
1410	Major Roadway	<b>58 Unique Land Use Codes</b>			200
1419	Bridge Over Water				40
1420	Railroads	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
1463	Upland Rights-Of-Way Undeveloped	Urban	1	10	120
1499	Stormwater Basin	Urban	0.6	5	100
1600	Mixed Urban Or Built-Up Land	Urban	1	10	120
1700	Other Urban Or Built-Up Land	Urban	1	10	120
1710	Cemetery	Urban	1	10	120
1750	Managed Wetland In Maintained Lawn Greenspace	Wetlands	0.1	3	40

# Pollutant Loading Analysis by HUC14

General Land Use Category	HUC 02030105010010			
	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
<b>Totals =</b>	<b>5,650.0</b>	<b>3,026.2</b>	<b>35,713.5</b>	<b>461,220.1</b>



# Impervious Cover



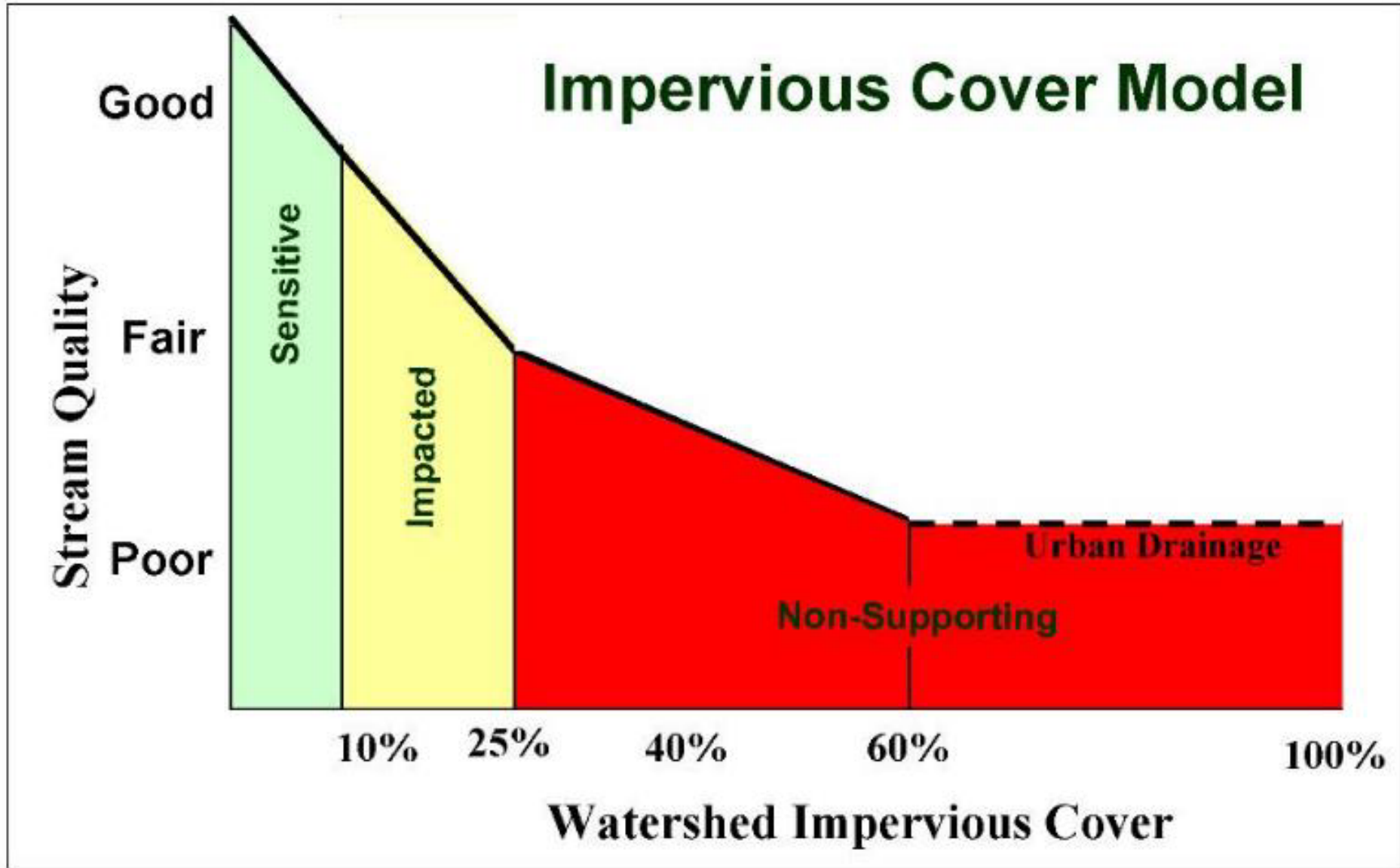
RUTGERS UNIVERSITY

Water Resources Program

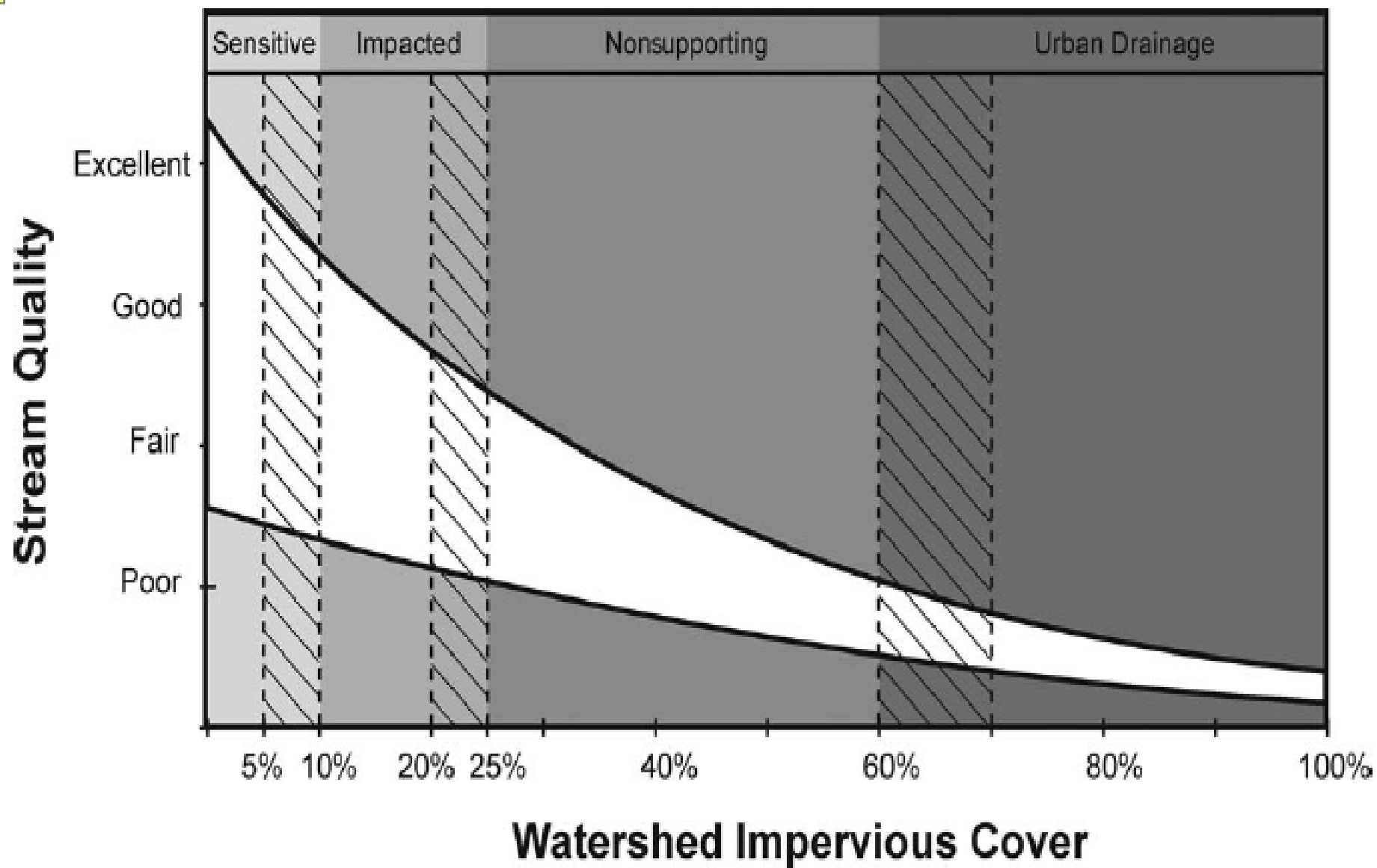
New Jersey Agricultural Experiment Station



# What does the science say about impervious surfaces?







Schuler, T.R., L. Fraley-McNeal, and K. Cappiella. 2009. Is Impervious Cover Still Important? Review of Recent Research. *Journal of Hydrologic Engineering* 14 (4): 309-315.




# Impervious Cover Analysis by HUC14

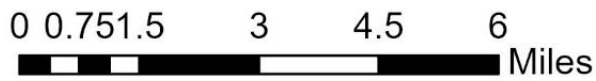
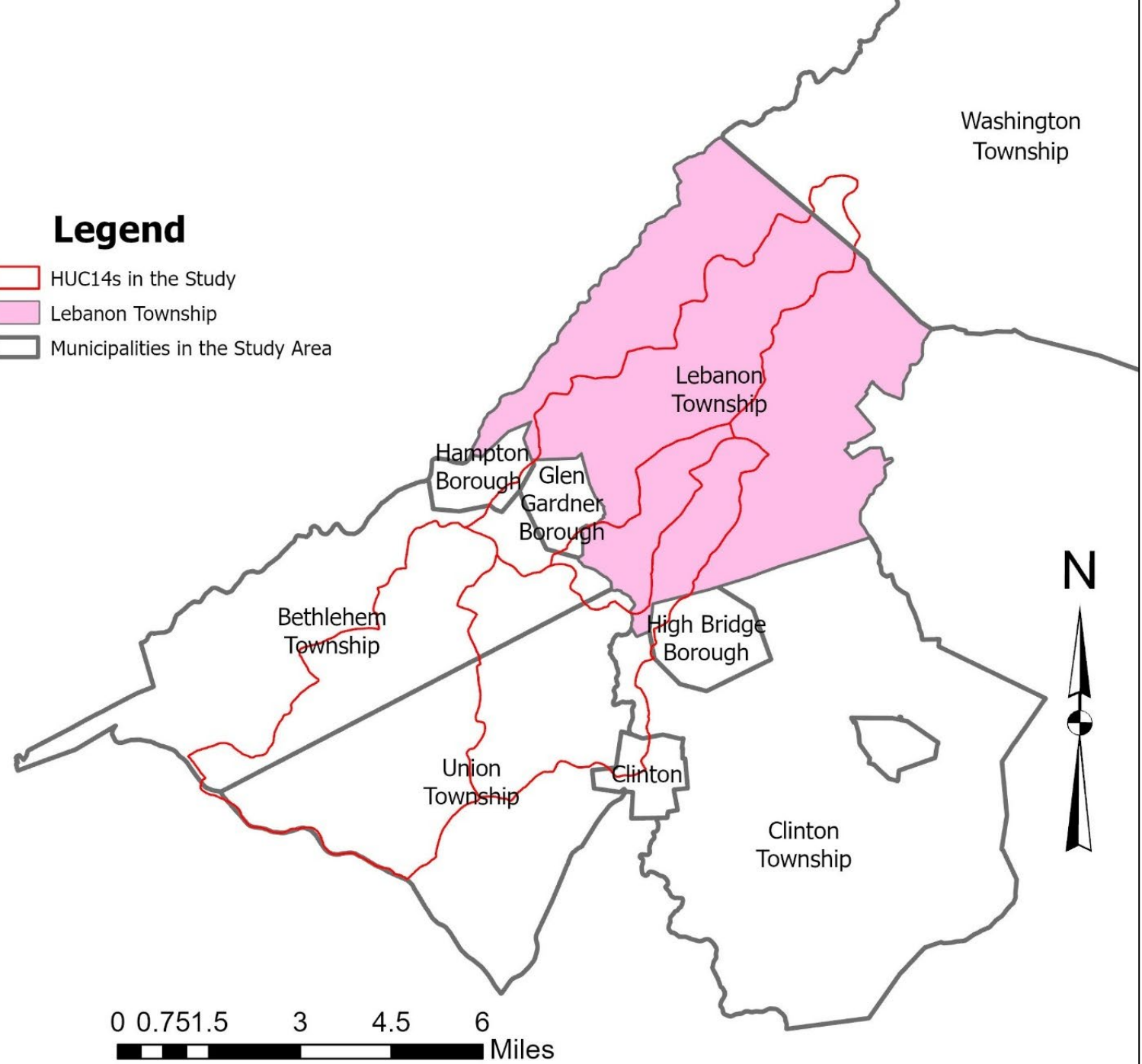
Impervious Cover Class (2015)	Impervious Cover (acres)		
	02030105010010	02030105010020	02030105010040
Building	214.4	196.1	94.8
Other	463.7	400.5	229.6
Road	347.0	210.6	136.2
<b>TOTAL =</b>	1025.1	807.2	460.5
<b>% Impervious Cover =</b>	18.1%	17.2%	10.8%

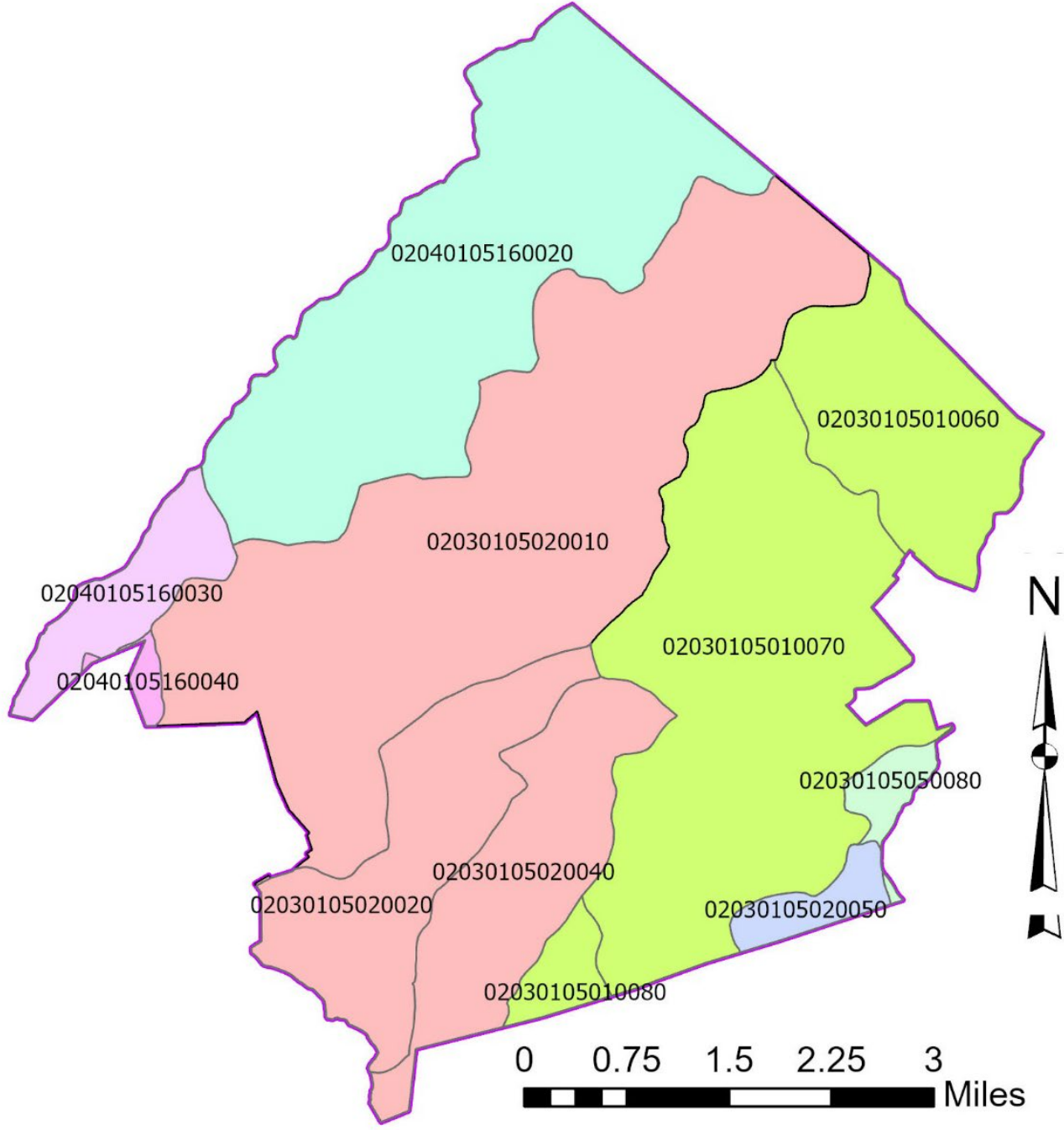




# Legend

-  HUC14s in the Study
-  Lebanon Township
-  Municipalities in the Study Area

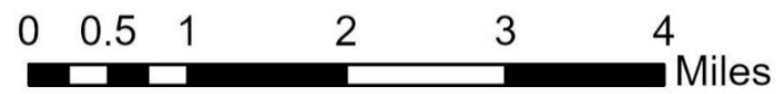
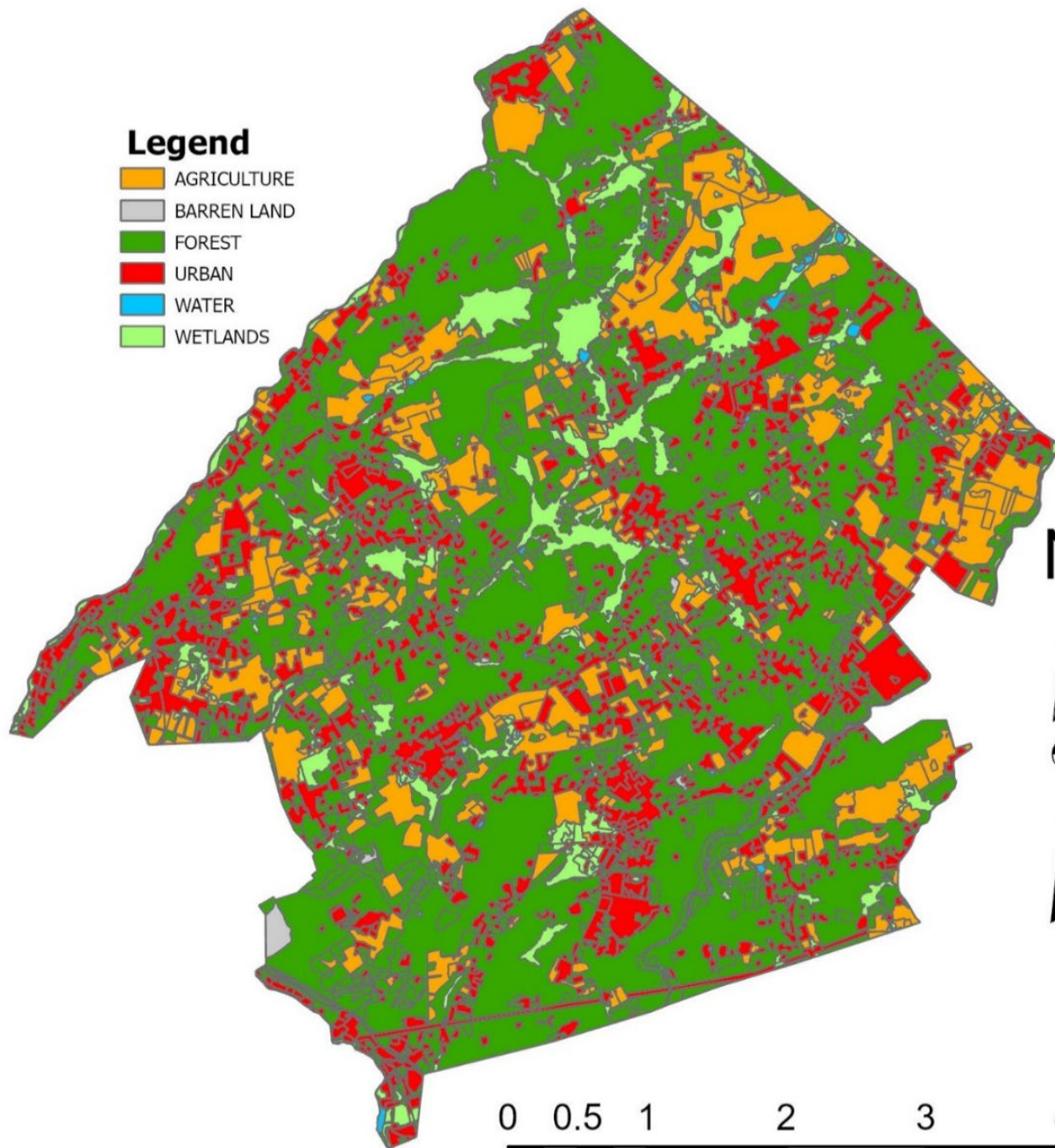






### Legend

- AGRICULTURE
- BARREN LAND
- FOREST
- URBAN
- WATER
- WETLANDS






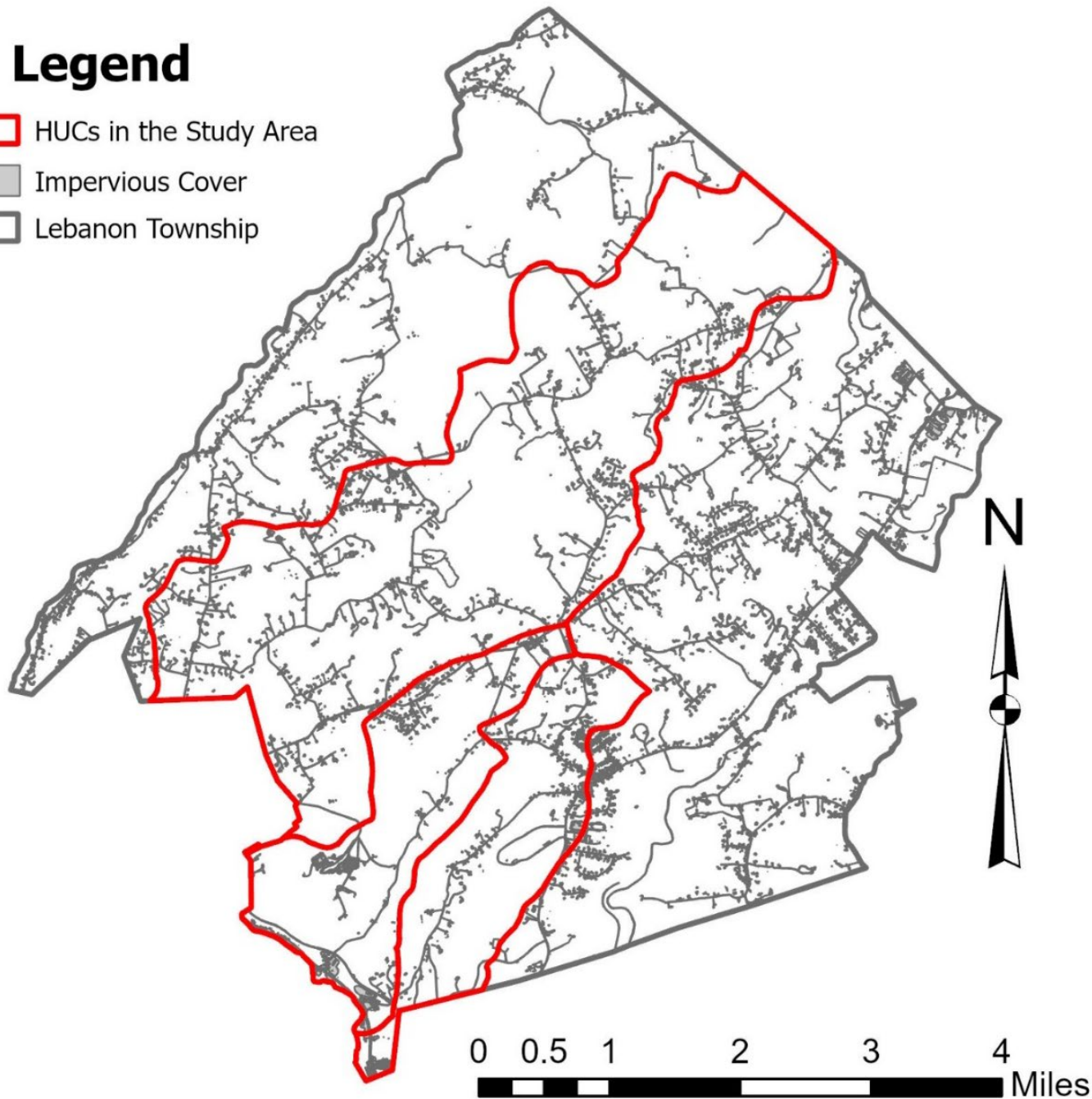




Land Use Type	Area (acres)	Total Phosphorus Load (lbs/yr)	Total Nitrogen Load (lbs/yr)	Total Suspended Solids Load (lbs/yr)
<b>02030105010060</b>				
Agriculture	473.5	615.5	4,734.7	142,041.6
Barren Land	0.0	0.0	0.0	0.0
Forest	685.4	68.5	2,056.2	27,416.2
Urban	291.0	240.2	2,228.4	33,741.3
Water	21.7	2.2	65.0	867.0
Wetlands	70.2	7.0	210.5	2,806.1
<b>TOTAL =</b>	<b>1,541.7</b>	<b>933.4</b>	<b>9,294.8</b>	<b>206,872.2</b>
<b>02030105010070</b>				
Agriculture	445.9	579.7	4,459.1	133,773.3
Barren Land	8.9	4.4	44.3	531.2
Forest	2,601.4	260.1	7,804.2	104,056.0
Urban	1,134.4	806.8	7,161.9	121,189.1
Water	44.9	4.5	134.7	1,795.6
Wetlands	55.0	5.5	165.0	2,199.3
<b>TOTAL =</b>	<b>4,290.4</b>	<b>1,661.0</b>	<b>19,769.1</b>	<b>363,544.4</b>

# Legend

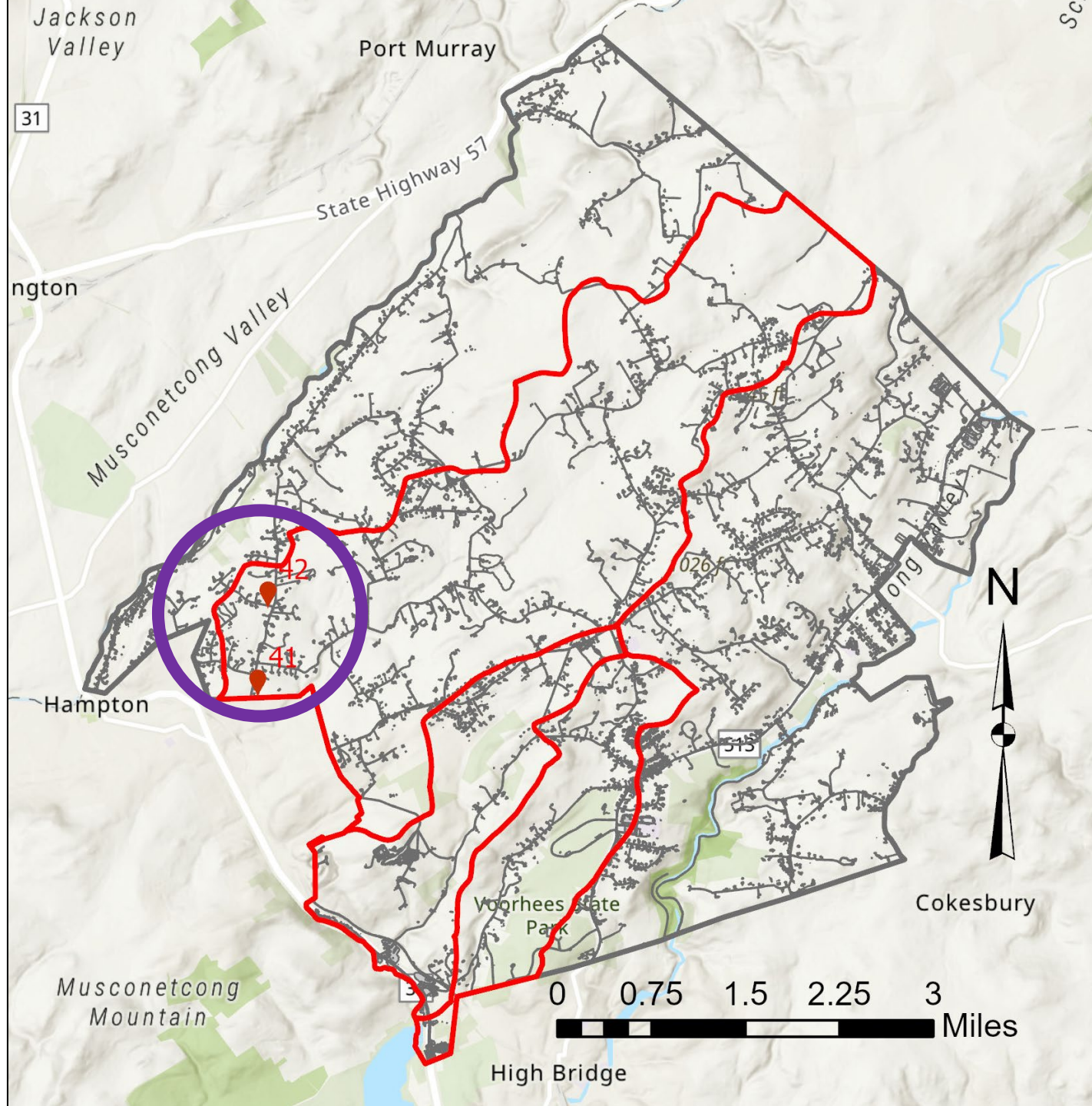
-  HUCs in the Study Area
-  Impervious Cover
-  Lebanon Township





<b>Class</b>	<b>Area (acres)</b>	<b>HUC Impervious Cover (%)</b>
<b>02030105010060</b>		
<b>Building</b>	14.7	
<b>Other</b>	52.2	
<b>Road</b>	35.5	
<b>TOTAL =</b>	102.5	6.6%
<b>02030105010070</b>		
<b>Building</b>	50.0	
<b>Other</b>	133.8	
<b>Road</b>	102.4	
<b>TOTAL =</b>	286.1	6.7%










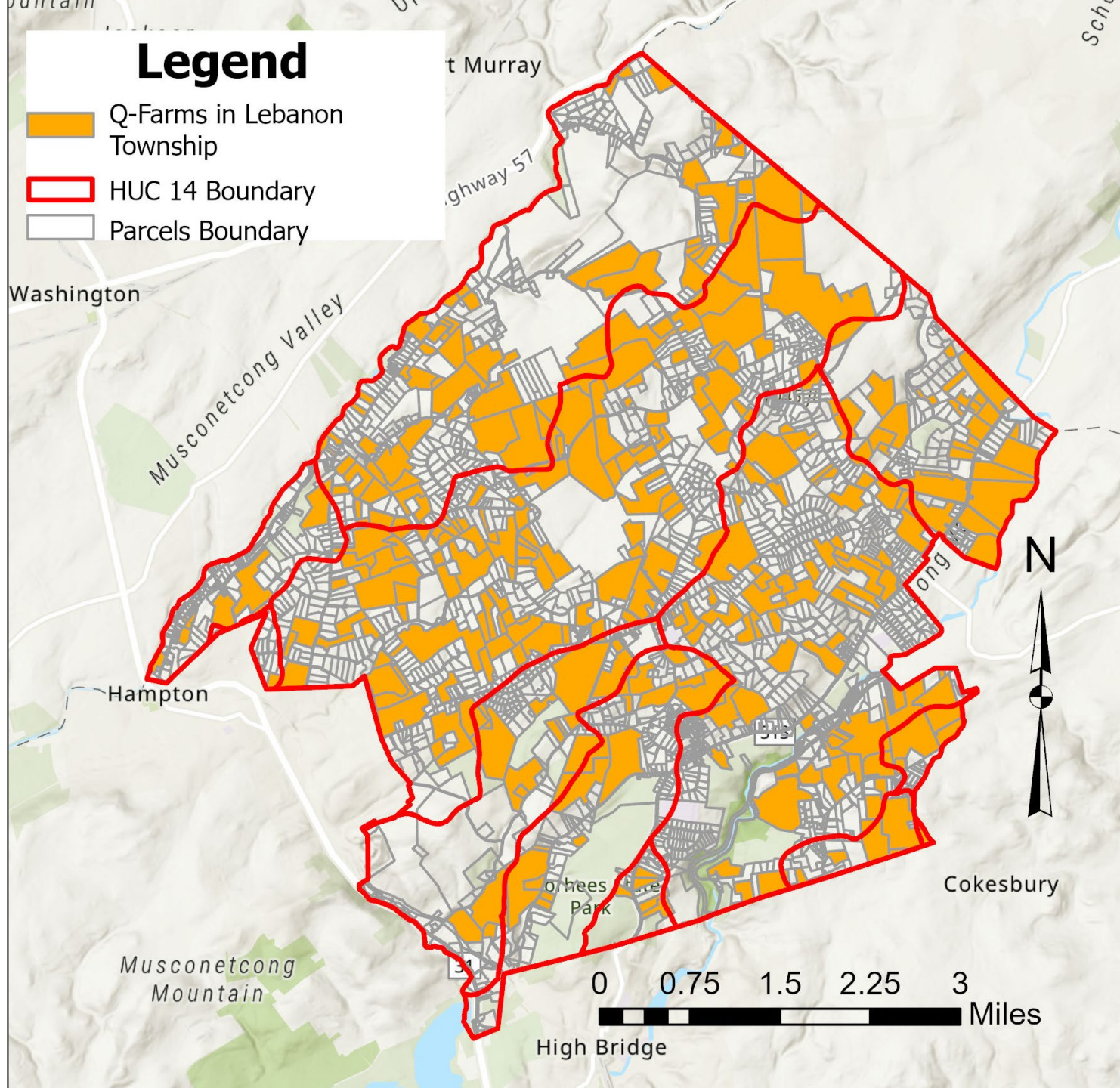
ID	Owner	Address	Type	Town
41	K. Bass	31 Forge Mill Rd	N	Lebanon
42	F. Angivoli	2 General Morgan Ln	N	Lebanon

“D” = Detention, “R” = Retention, “N” = Naturalized



# Legend

-  Q-Farms in Lebanon Township
-  HUC 14 Boundary
-  Parcels Boundary






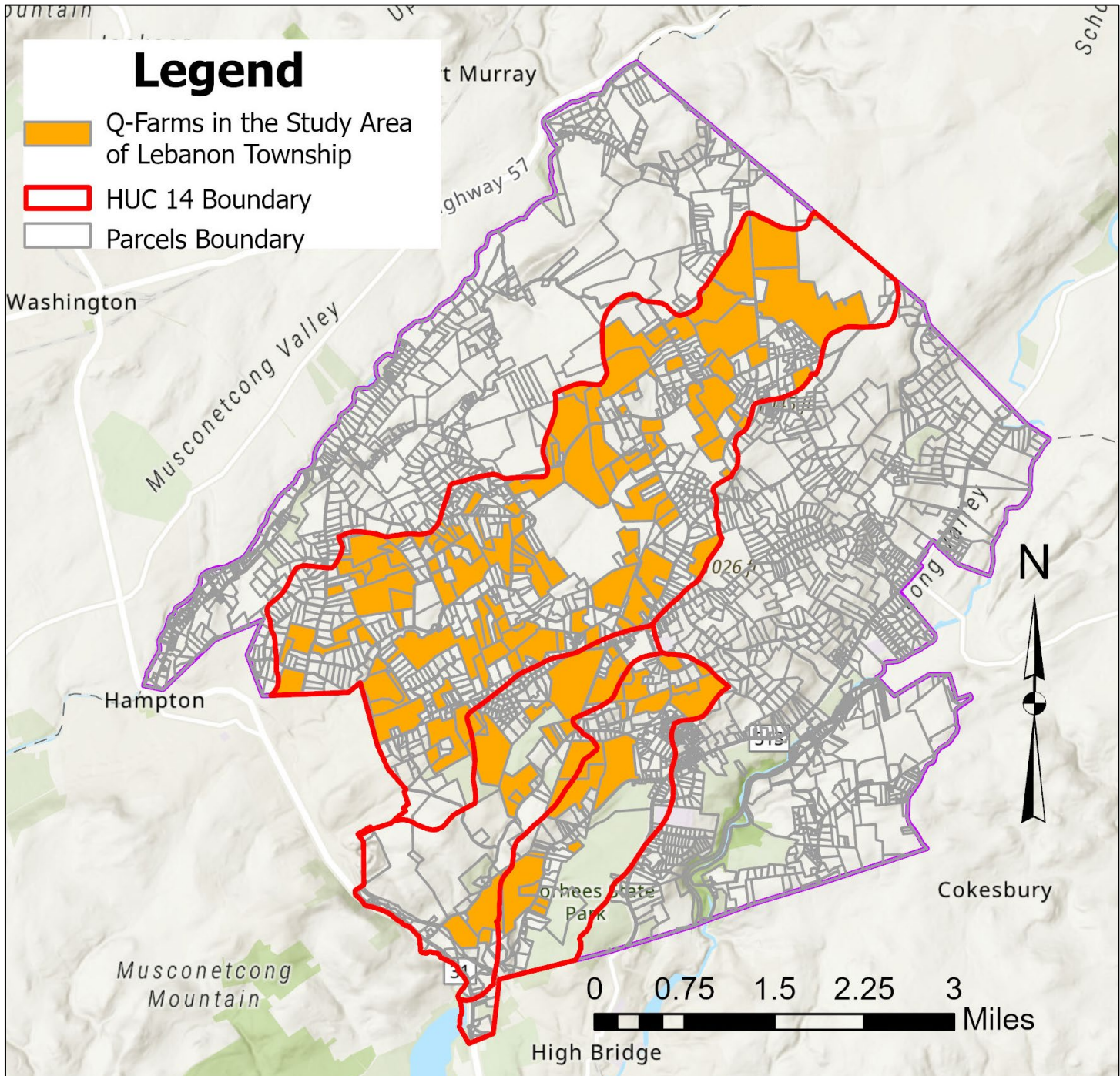




BLK	Lot	Q-Code	Prop Class	Location	Owner
10	3.02	Q0001	3B	7 Wendy Way	FLYNN, DANIEL F III & BRYNDA T
10	1	Q0002	3B	207-217 Rocky Run Rd	MILKOWSKI, A S
10	55	Q0003	3B	154 Buffalo Hollow Rd	MILKOWSKI, A S
30	48	Q0003	3B	258 Rocky Run Rd	MILKOWSKI, GARY RONALD & ANTHONY S

# Legend

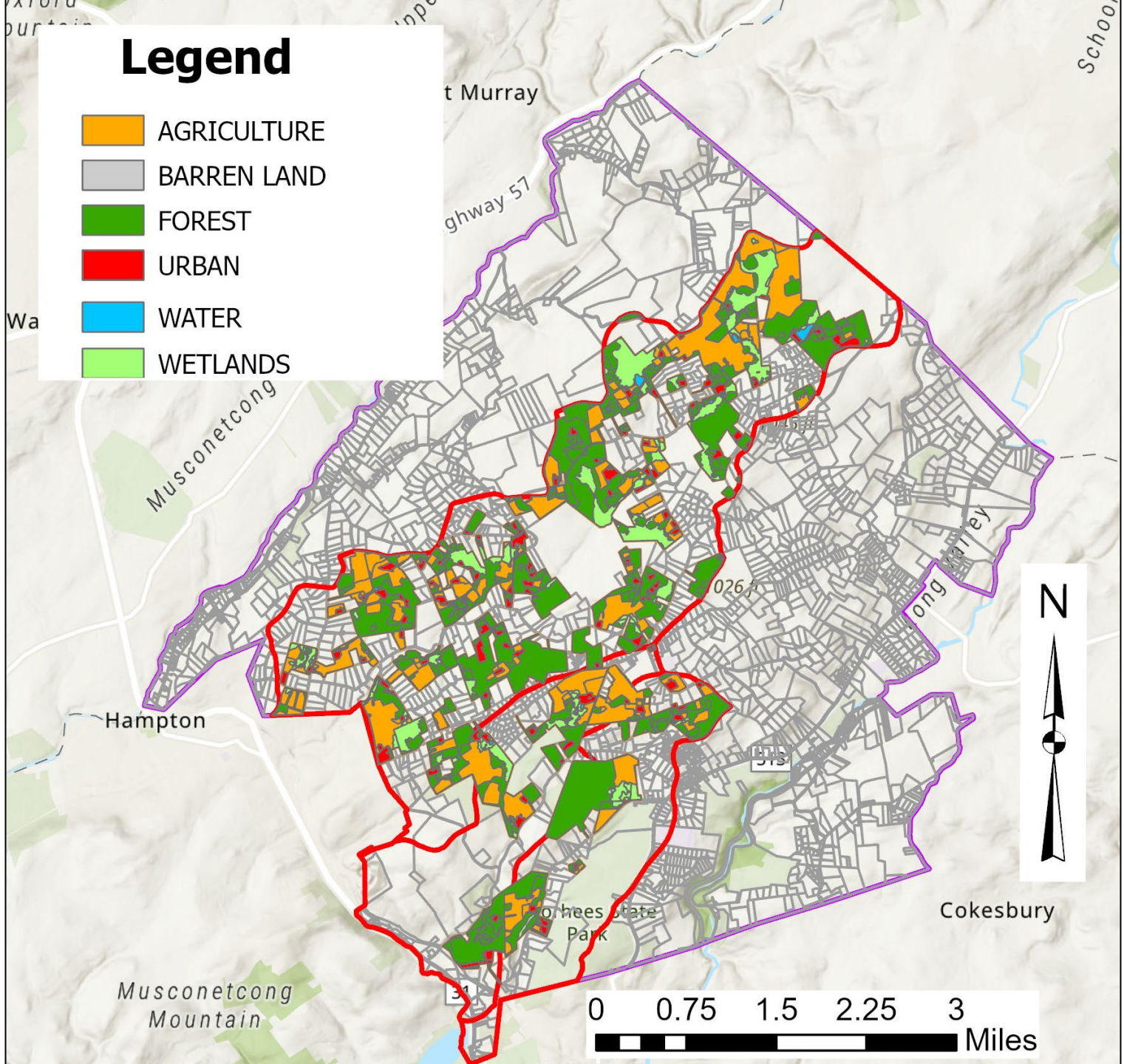
-  Q-Farms in the Study Area of Lebanon Township
-  HUC 14 Boundary
-  Parcels Boundary





# Legend

- AGRICULTURE
- BARREN LAND
- FOREST
- URBAN
- WATER
- WETLANDS



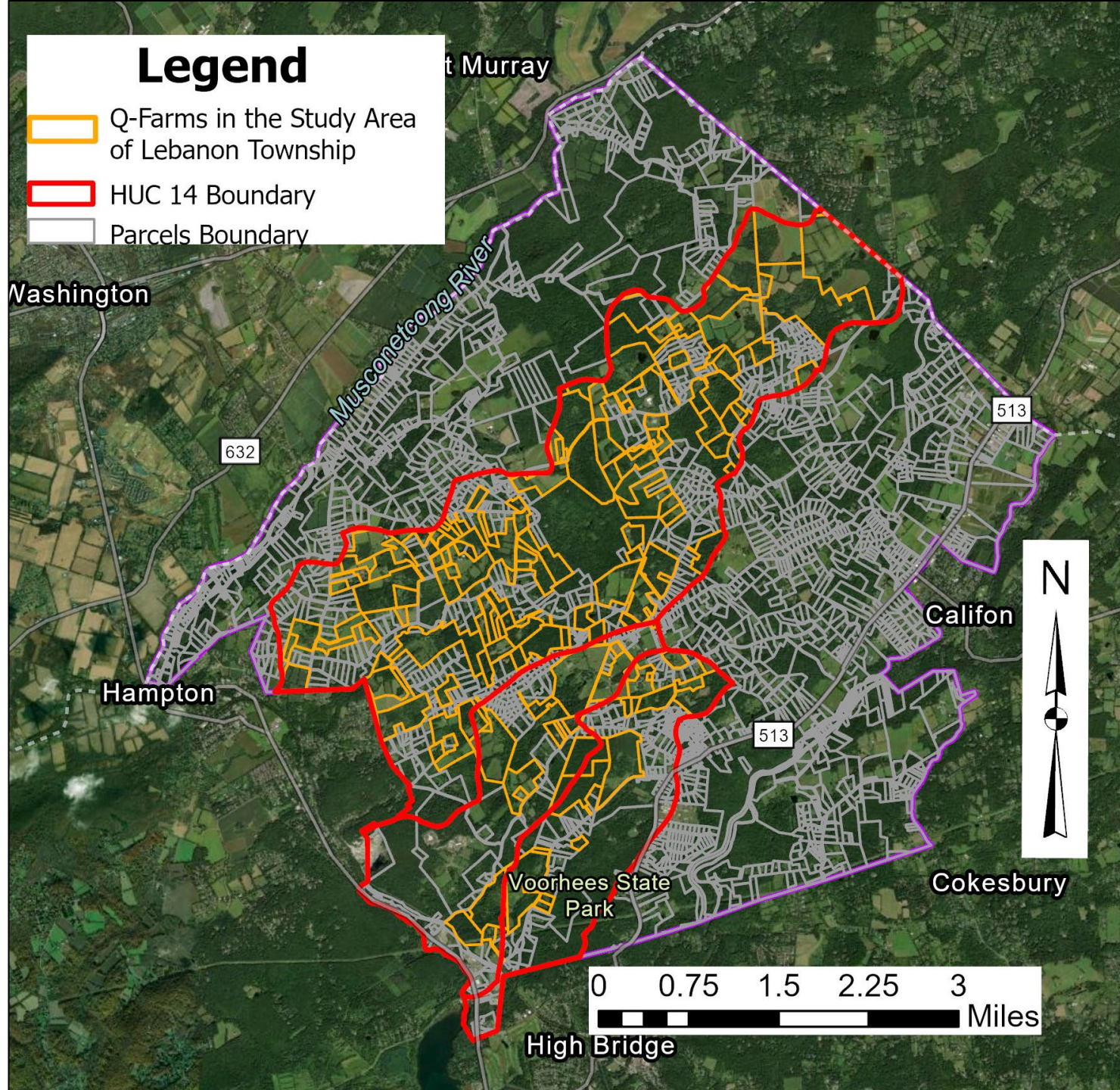
There are **1,524 areas** of agricultural land use in the HUCs in the Study Area


Land Use	Area (acres)
Agriculture	1,125
Barren Land	0.6
Forest	1,873
Urban	263.1
Water	22.2
Wetlands	454.7
Total:	3,738



# Legend

-  Q-Farms in the Study Area of Lebanon Township
-  HUC 14 Boundary
-  Parcels Boundary





Blk	Lot	Q-Farm Code	Municipality	Cover Crop	Enhance Stream Buffer	Impervious Cover Mgt.	Rainwater Harvesting	Manure Mgt.
68	1	Q0209	Lebanon Twp	X				
34	9	Q0063	Lebanon Twp	X	X			
34	7	Q0062	Lebanon Twp		X			
36	39	Q0070	Lebanon Twp	X				
50	12	Q0142	Lebanon Twp		X			
51	13	Q0217	Lebanon Twp	X	X			
51	1	Q0141	Lebanon Twp	X				





## Identifying Watershed Improvement Projects



# We Look Here First

- ✓ Schools
- ✓ Places of Worship
- ✓ Libraries
- ✓ Municipal Building
- ✓ Public Works
- ✓ Firehouses
- ✓ Post Offices
- ✓ Elks or Moose Lodge
- ✓ Parks/ Recreational Fields








# Or you can identify tax exempt parcels:

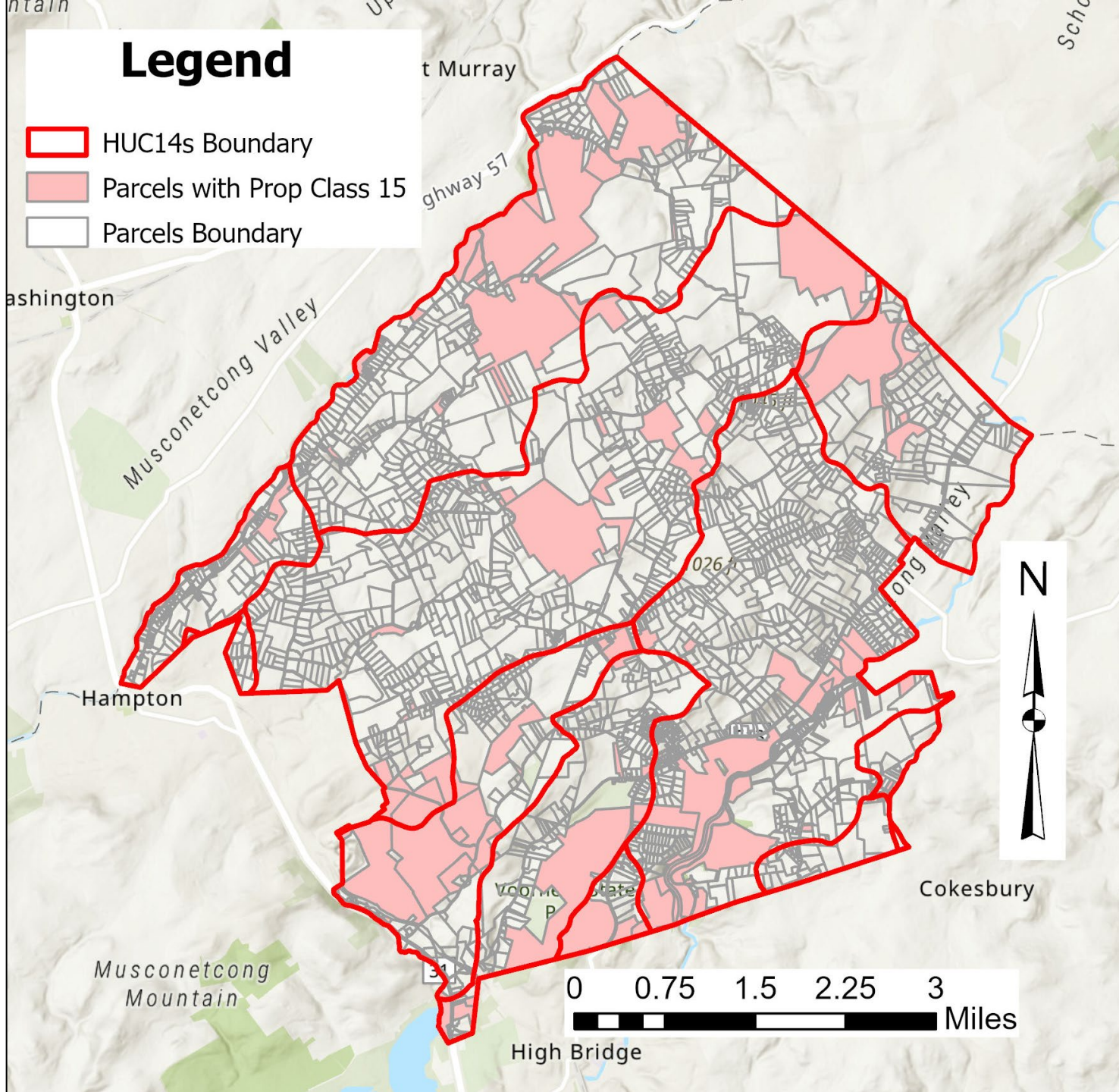
## *Tax Exempt Property Class Codes for NJ:*

- 15A Public School Property
- 15B Other School Property
- 15C Public Property
- 15D Church & Charitable
- ~~• 15E Cemeteries & Grave~~
- 15F Other Exempt



# Legend

-  HUC14s Boundary
-  Parcels with Prop Class 15
-  Parcels Boundary






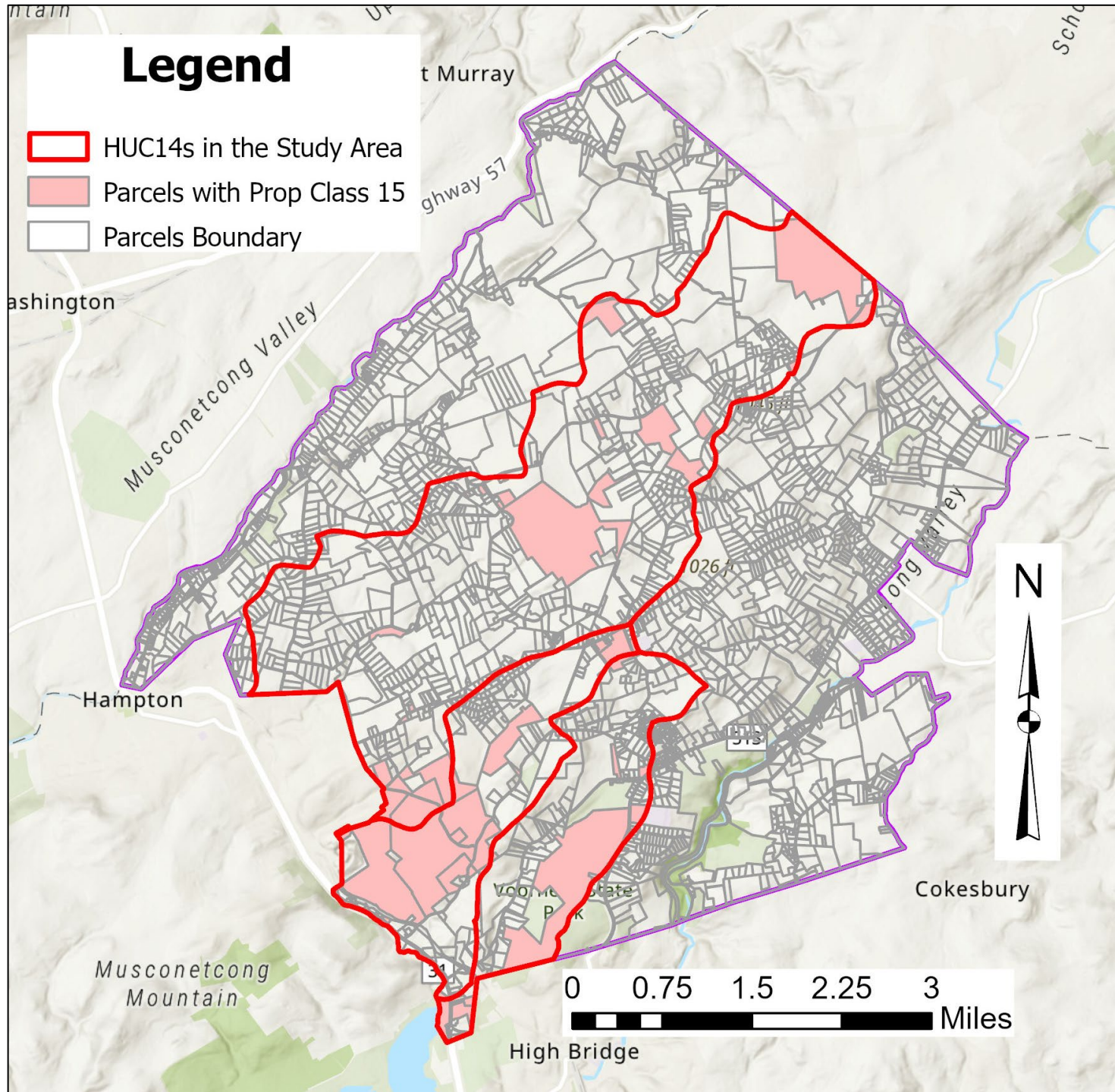


Block	Lot	Prop Class	Location	Owner	Facility Name
12	44.01	15A	256 Route 513	North Hunterdon Reg. High School	Voorhees H S
21	8	15A	400 Route 513	Lebanon Twp Bd of Education	School
24	6	15A	70 Bunnvale Rd	Lebanon Twp Bd of Education	Schools
16	16	15B	104-105 Lockheed Rd	Hunterdon Co Edu Services Comm	Esc
1	2	15C	171 Cregar Rd	High Bridge Borough	Golf Course



# Legend

-  HUC14s in the Study Area
-  Parcels with Prop Class 15
-  Parcels Boundary



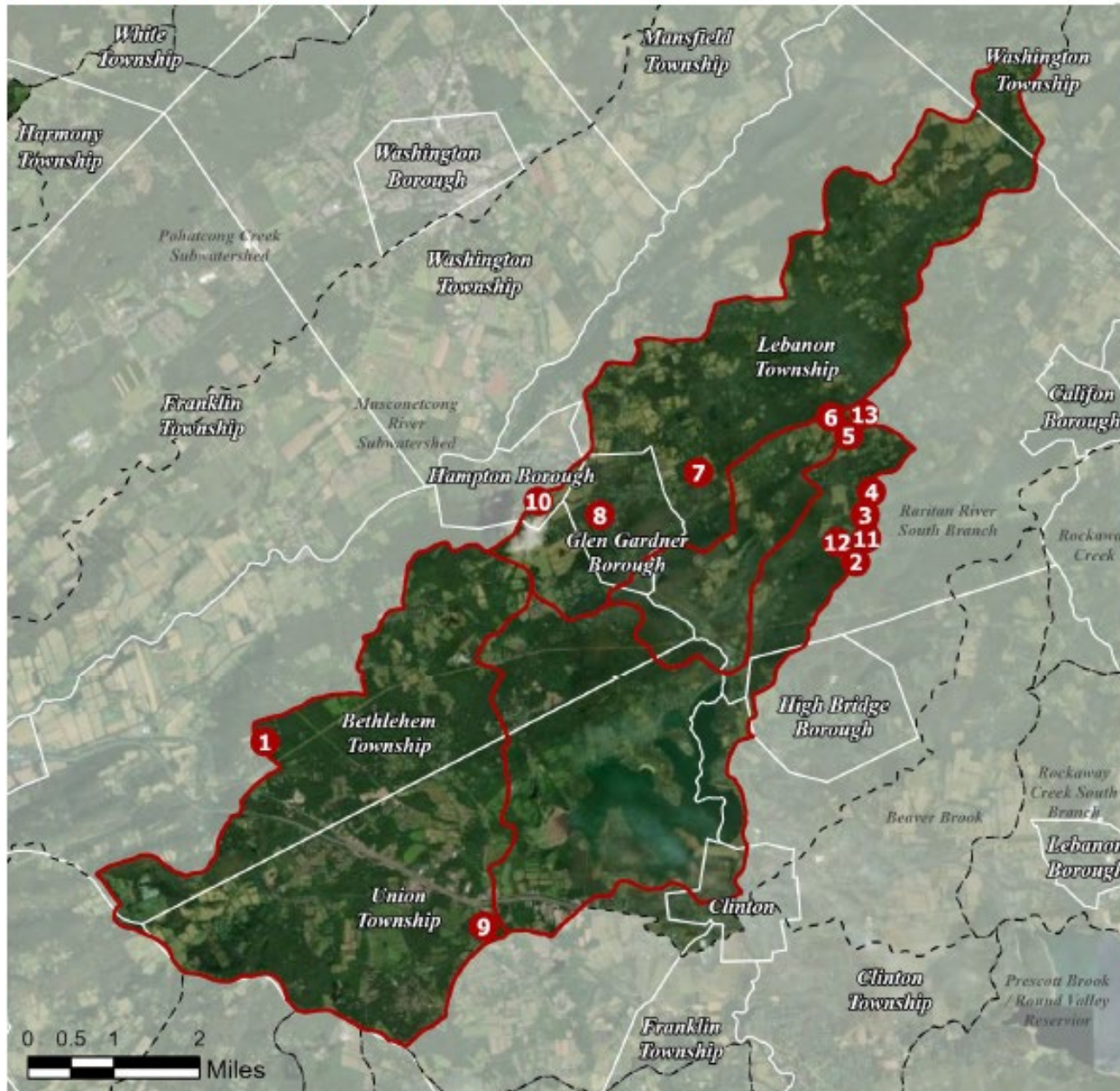




Blk	Lot	Prop Class	Location	Owner	Facility Name
12*	44.01	15A	256 Route 513	North Hunterdon Reg. High School	Voorhees H S
24*	6	15A	70 Bunnvale Road	Lebanon Twp Bd of Education	Schools
1	2	15C	171 Cregar Road	High Bridge Borough	Golf Course
2	3	15C	1 Van Syckles Rd	NJ Water Supply Authority	Fish/Wildlife Offic

# SPRUCE RUN & MULHOCKAWAY CREEK WATERSHED: POTENTIAL GREEN INFRASTRUCTURE SITES

SITES WITHIN THE SPRUCE RUN &  
MULHOCKAWAY CREEK WATERSHED:  
HUCs 02030105020010, 02030105020020,  
02030105020030, 02030105020040

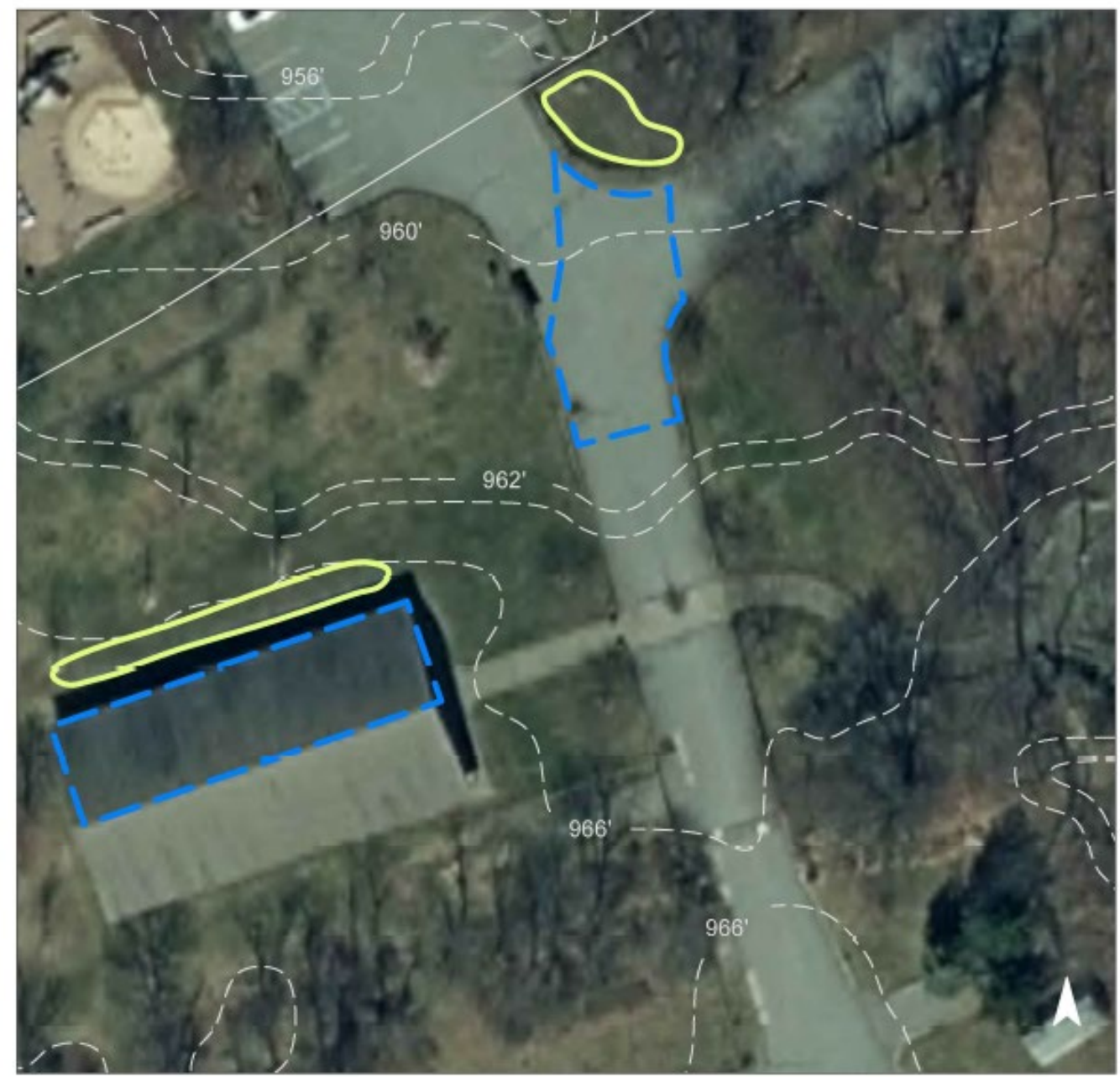


1. Bethlehem Township Municipal Court
2. Body of Christ Ministries
3. Bunnvale Assembly of God
4. Bunnvale Library
5. Lebanon Township Memorial Park
6. Lebanon Township Municipal Center
7. Spruce Run Lutheran Church
8. The Ginger Tree Preschool of the Arts
9. Union Township Middle School
10. United States Postal Service
11. Voorhees High School
12. Voorhees State Park Headquarters
13. Woodglen School





# GREEN INFRASTRUCTURE RECOMMENDATIONS



## Lebanon Township Memorial Park

SUBWATERSHED	SPRUCE RUN
SITE AREA	1,560,810 SQ. FT.
ADDRESS	100 HIDDEN HOLLOW LANE CALIFON, NJ 07830
BLOCK AND LOT	BLOCK 29. LOT 32.03



# GREEN INFRASTRUCTURE RECOMMENDATIONS



**Lebanon Township  
Municipal Center**

SUBWATERSHED	SPRUCE RUN
SITE AREA	284,800 SQ. FT.
ADDRESS	530 WEST HILL ROAD, GLEN GARDNER, NJ 08826
BLOCK AND LOT	BLOCK 29, LOTS 32.01, 32.04, 32.05







**Can Watershed Improvement Projects be designed to manage extreme weather events?**





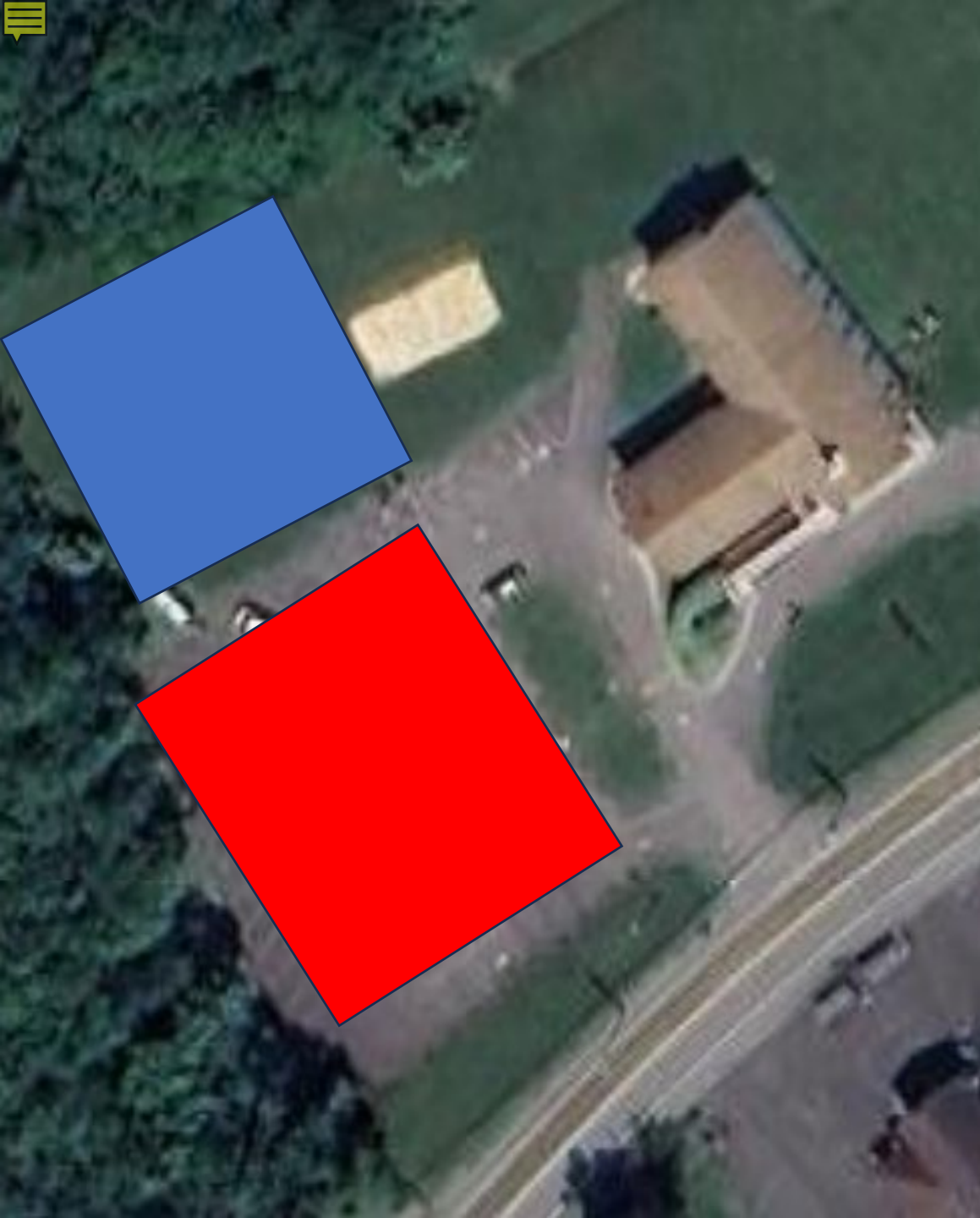
# GREEN INFRASTRUCTURE RECOMMENDATIONS



## Bunnvale Assembly of God

SUBWATERSHED	SPRUCE RUN
SITE AREA	203,875 SQ. FT.
ADDRESS	285 COUNTY ROAD 513 #1, GLEN GARDNER, NJ 08826
BLOCK AND LOT	BLOCK 10, LOT 30





1.28 ac of Impervious  
Cover

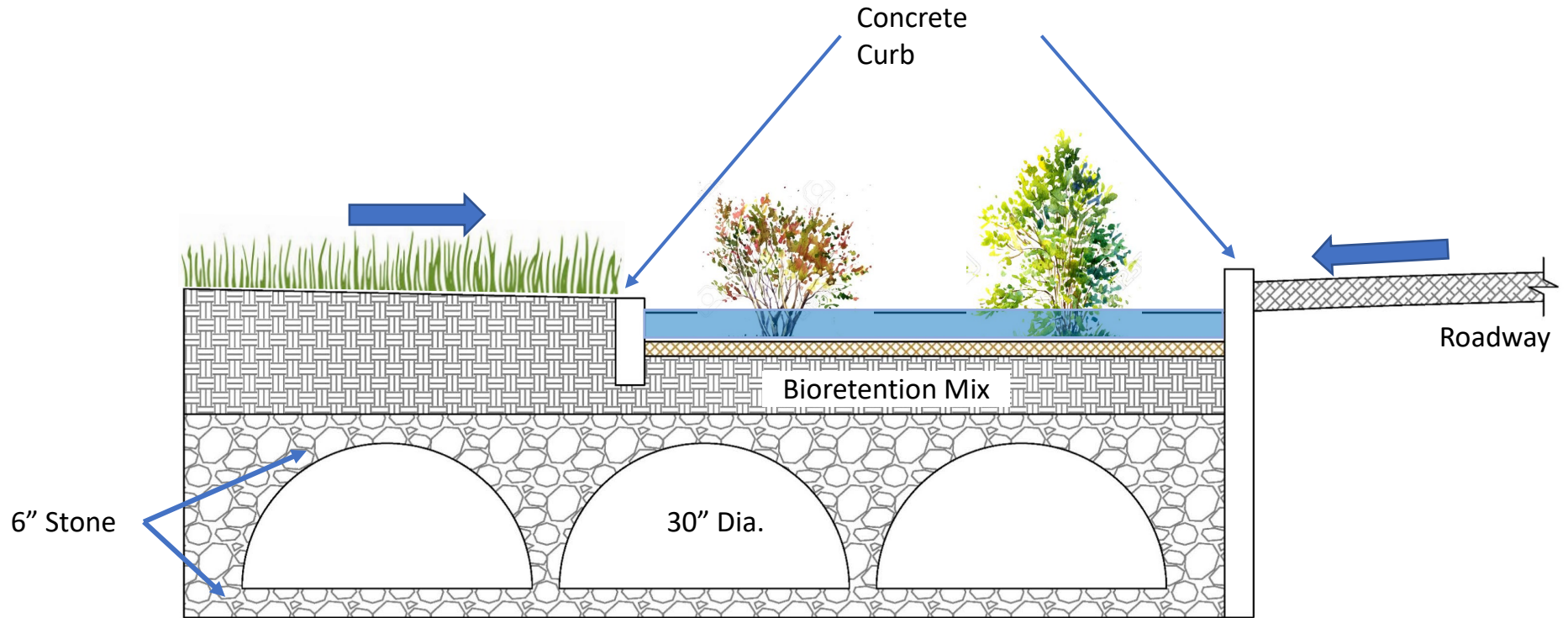
11.4 in = 100-yr storm

397,000 gallons of  
runoff

115'x115' basin 4 ft  
deep

or

Permeable Pavement







# RUTGERS

New Jersey Agricultural  
Experiment Station



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