RUTGERS
New Jersey Agricultural
Experiment Station

Draft

Impervious Cover Assessment
for
East Amwell Township, Hunterdon County, New Jersey

Prepared for East Amwell Township by the
Rutgers Cooperative Extension Water Resources Program

February 2, 2015

Introduction

Pervious and impervious are terms that are used to describe the ability or inability of water to flow through a surface. When rainfall hits a surface, it can soak into the surface or flow off the surface. Pervious surfaces are those which allow stormwater to readily soak into the soil and recharge groundwater. When rainfall drains from a surface, it is called "stormwater" runoff (Figure 1). An impervious surface can be any material that has been placed over soil that prevents water from soaking into the ground. Impervious surfaces include paved roadways, parking lots, sidewalks, and rooftops. As impervious areas increase, so does the volume of stormwater runoff.

Figure 1: Stormwater draining from a parking lot

New Jersey has many problems due to stormwater runoff, including:

- Pollution: According to the 2010 New Jersey Water Quality Assessment Report, 90% of the assessed waters in New Jersey are impaired, with urban-related stormwater runoff listed as the most probable source of impairment (USEPA, 2013). As stormwater flows over the ground, it picks up pollutants including animal waste, excess fertilizers, pesticides, and other toxic substances. These pollutants are then able to enter waterways.

- Flooding: Over the past decade, the state has seen an increase in flooding. Communities around the state have been affected by these floods. The amount of damage caused also has increased greatly with this trend, costing billions of dollars over this time span.

- Erosion: Increased stormwater runoff causes an increase in the velocity of flows in our waterways. The increased velocity after storm events erodes stream banks and shorelines, degrading water quality. This erosion can damage local roads and bridges and cause harm to wildlife.

The primary cause of the pollution, flooding, and erosion problems is the quantity of impervious surfaces draining directly to local waterways. New Jersey is one of the most developed states in the country. Currently, the state has the highest percent of impervious cover in the country at 12.1% of its total area (Nowak & Greenfield, 2012). Many of these impervious surfaces are directly connected to local waterways (i.e., every drop of rain that lands on these impervious surfaces ends up in a local river, lake, or bay without any chance of being treated or soaking into the ground). To repair our waterways, reduce flooding, and stop erosion, stormwater runoff from impervious surfaces has to be better managed. Surfaces need to be disconnected with green infrastructure to prevent stormwater runoff from flowing directly into New Jersey's waterways. Disconnection redirects runoff from paving and rooftops to pervious areas in the landscape.

Green infrastructure is an approach to stormwater management that is cost-effective, sustainable, and environmentally friendly. Green infrastructure projects capture, filter, absorb, and reuse stormwater to maintain or mimic natural systems and to treat runoff as a resource. As a general principal, green infrastructure practices use soil and vegetation to recycle stormwater runoff through infiltration and evapotranspiration. When used as components of a stormwater management system, green infrastructure practices such as bioretention, green roofs, porous pavement, rain gardens, and vegetated swales can produce a variety of environmental benefits. In addition to effectively retaining and infiltrating rainfall, these technologies can simultaneously help filter air pollutants, reduce energy demands, mitigate urban heat islands, and sequester carbon while also providing communities with aesthetic and natural resource benefits (USEPA, 2013).

The first step to reducing the impacts from impervious surfaces is to conduct an impervious cover assessment. This assessment can be completed on different scales: individual lot, municipality, or watershed. Impervious surfaces need to be identified for stormwater management. Once impervious surfaces have been identified, there are three steps to better manage these surfaces.

1. ***Eliminate surfaces that are not necessary.*** For example, a paved courtyard at a public school could be converted to a grassed area.

2. ***Reduce or convert impervious surfaces.*** There may be surfaces that are required to be hardened, such as roadways or parking lots, but could be made smaller and still be functional. A parking lot that has two-way car ways could be converted to one-way car ways. There also are permeable paving materials such as porous asphalt, pervious concrete, or permeable paving stones that could be substituted for impermeable paving materials (Figure 2).

3. ***Disconnect impervious surfaces from flowing directly to local waterways.*** There are many ways to capture, treat, and infiltrate stormwater runoff from impervious surfaces. Opportunities may exist to reuse this captured water.

Figure 2: Rapid infiltration of water through porous pavement is demonstrated at the USEPA Edison New Jersey test site

East Amwell Township Impervious Cover Analysis

Located in Hunterdon County in central New Jersey, East Amwell Township covers approximately 28.6 square miles. Figures 3 and 4 illustrate that East Amwell Township is dominated by agricultural land uses. A total of 16.9% of the municipality's land use is classified as urban. Of the urban land in East Amwell Township, rural residential is the dominant land use (Figure 5).

The literature suggests a link between impervious cover and stream ecosystem impairment starting at approximately 10% impervious surface cover (Schueler, 1994; Arnold and Gibbons, 1996; May et al., 1997). Impervious cover may be linked to the quality of lakes, reservoirs, estuaries, and aquifers (Caraco et al., 1998), and the amount of impervious cover in a watershed can be used to project the current and future quality of streams. Based on the scientific literature, Caraco et al. (1998) classified urbanizing streams into the following three categories: sensitive streams, impacted streams, and non-supporting streams. Sensitive steams typically have a watershed impervious surface cover from 0 – 10%. Impacted streams have a watershed impervious cover ranging from 11-25% and typically show clear signs of degradation from urbanization. Non-supporting streams have a watershed impervious cover of greater than 25%; at this high level of impervious cover, streams are simply conduits for stormwater flow and no longer support a diverse stream community.

The New Jersey Department of Environmental Protection's (NJDEP) 2007 land use/land cover geographical information system (GIS) data layer categorizes East Amwell Township into many unique land use areas, assigning a percent impervious cover for each delineated area. These impervious cover values were used to estimate the impervious coverage for East Amwell Township. Based upon the 2007 NJDEP land use/land cover data, approximately 2.5% of East Amwell Township has impervious cover. This level of impervious cover suggests that the streams in East Amwell Township are likely sensitive streams.

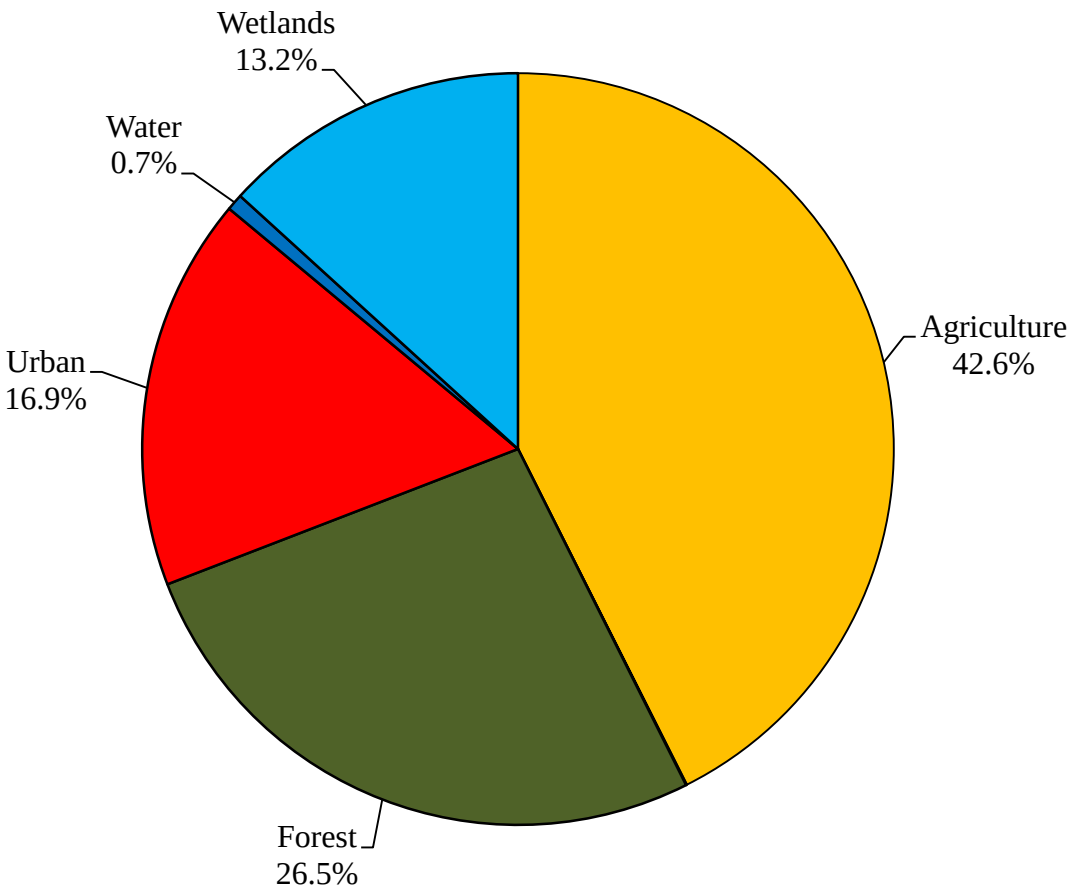


Figure 3: Pie chart illustrating the land use in East Amwell Township

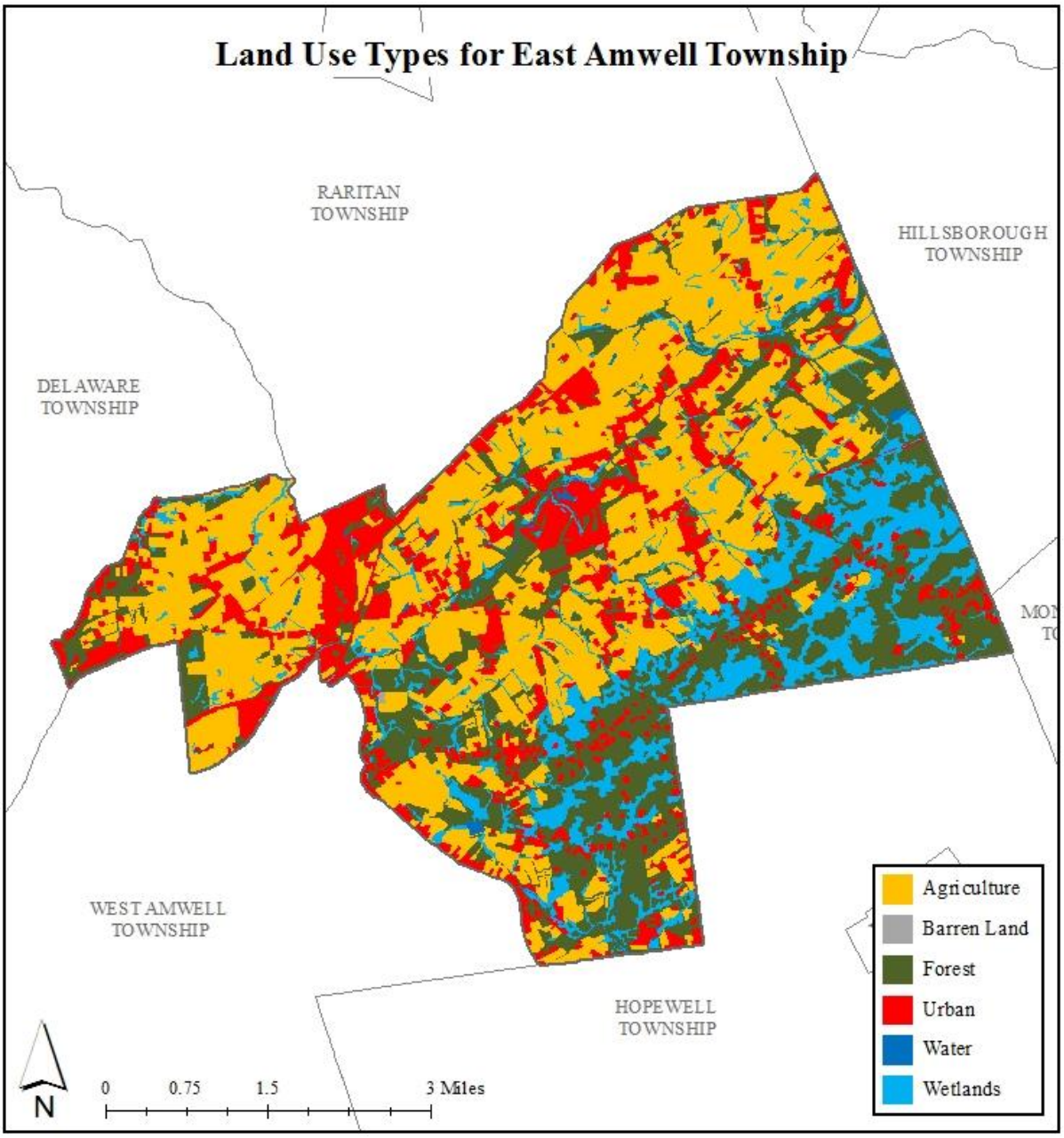


Figure 4: Map illustrating the land use in East Amwell Township

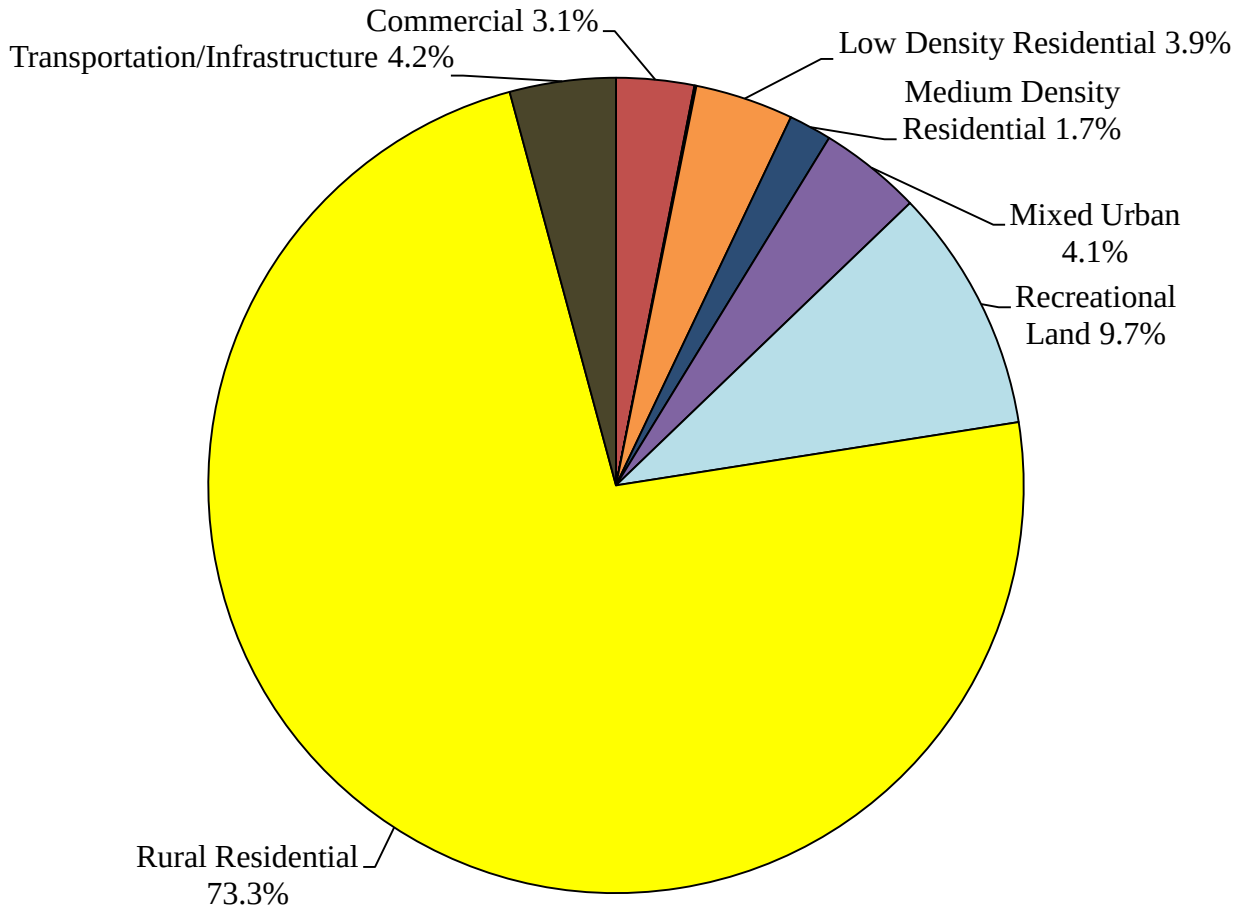


Figure 5: Pie chart illustrating the various types of urban land use in East Amwell Township

Water resources are typically managed on a watershed/subwatershed basis; therefore an impervious cover analysis was performed for each Raritan River subwatershed within East Amwell Township (Table 1 and Figure 6). On a subwatershed basis, impervious cover ranges from 1.1% in the Beden Brook subwatershed to 3.8% in the Alexauken Creek subwatershed. Evaluating impervious cover on a subwatershed basis allows the municipality to focus impervious cover reduction or disconnection efforts in the subwatersheds where frequent flooding occurs.

In developed landscapes, stormwater runoff from parking lots, driveways, sidewalks, and rooftops flows to drainage pipes that feed the sewer system. The cumulative effect of these impervious surfaces and thousands of connected downspouts reduces the amount of water that can infiltrate into soils and greatly increases the volume and rate of runoff that flows to waterways. Stormwater runoff volumes (specific to East Amwell Township, Hunterdon County) associated with impervious surfaces were calculated for the following storms: the New Jersey water quality design storm of 1.25 inches of rain, an annual rainfall of 44 inches, the 2-year design storm (3.4 inches of rain), the 10-year design storm (5.0 inches of rain), and the 100-year design storm (8.0 inches of rain). These runoff volumes are summarized in Table 2. A substantial amount of rainwater drains from impervious surfaces in East Amwell Township. For example, if the stormwater runoff from one water quality storm (1.25 inches of rain) in the Back Brook subwatershed was harvested and purified, it could supply water to 69 homes for one year[1].

[1] Assuming 300 gallons per day per home

Table 1: Impervious cover analysis by subwatershed for East Amwell Township

Subwatershed	Total Area		Land Use Area		Water Area		Impervious Cover		
	(ac)	(mi^2)	(ac)	(mi^2)	(ac)	(mi^2)	(ac)	(mi^2)	(%)
Alexauken Creek	781.2	1.22	777.8	1.22	3.42	0.01	29.9	0.05	3.8%
Back Brook	7,020.5	11.0	6,967.9	10.9	52.6	0.08	224.5	0.35	3.2%
Beden Brook	392.5	0.61	392.3	0.61	0.20	0.00	4.37	0.01	1.1%
Headquarter Tributary	967.1	1.51	964.3	1.51	2.80	0.00	21.0	0.03	2.2%
Neshanic River	5,103.6	7.97	5,059.3	7.91	44.3	0.07	103.9	0.16	2.1%
Raritan River South Branch	7.21	0.01	7.21	0.01	0.00	0.00	0.20	0.00	2.8%
Rock Brook	534.0	0.83	533.1	0.83	0.96	0.00	6.48	0.01	1.2%
Stony Brook	3,465.9	5.42	3,440.1	5.38	25.8	0.04	70.9	0.11	2.1%
Total	18,272.1	28.6	18,142.1	28.4	130.0	0.20	461.3	0.72	2.5%

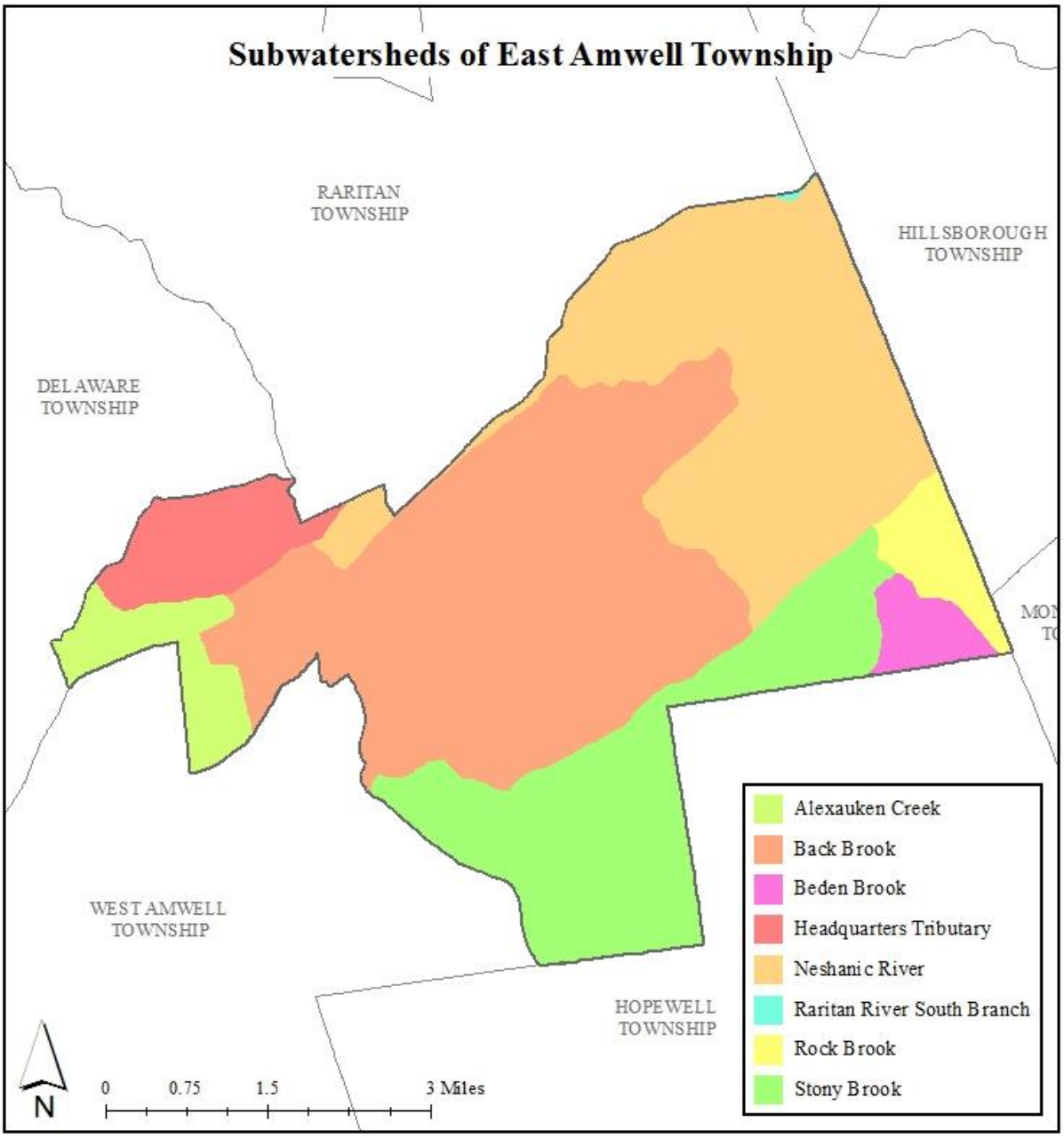


Figure 6: Map of the subwatersheds in East Amwell Township

Table 2: Stormwater runoff volumes from impervious surfaces by subwatershed in East Amwell Township

Subwatershed	**Total Runoff Volume for the 1.25" NJ Water Quality Storm (MGal)**	**Total Runoff Volume for the NJ Annual Rainfall of 44" (MGal)**	**Total Runoff Volume for the 2-Year Design Storm (3.4") (MGal)**	**Total Runoff Volume for the 10-Year Design Storm (5.0") (MGal)**	**Total Runoff Volume for the 100-Year Design Storm (8.0") (MGal)**
Alexauken Creek	1.0	35.7	2.8	4.1	6.5
Back Brook	7.6	268.2	20.7	30.5	48.8
Beden Brook	0.1	5.2	0.4	0.6	0.9
Headquarter Tributary	0.7	25.1	1.9	2.9	4.6
Neshanic River	3.5	124.1	9.6	14.1	22.6
Raritan River South Branch	0.0	0.2	0.0	0.0	0.0
Rock Brook	0.2	7.7	0.6	0.9	1.4
Stony Brook	2.4	84.7	6.5	9.6	15.4
Total	15.7	551.1	42.6	62.6	100.2

The next step is to set a reduction goal for impervious area in each subwatershed. Based upon the Rutgers Cooperative Extension (RCE) Water Resources Program's experience, a 10% reduction would be a reasonably achievable reduction for these subwatersheds in East Amwell Township. While it may be difficult to eliminate paved areas or replace paved areas with permeable pavement, it is relatively easy to identify impervious surfaces that can be disconnected using green infrastructure practices. For all practical purposes, disconnecting an impervious surface from a storm sewer system or a water body is an "impervious area reduction." The RCE Water Resources Program recommends that all green infrastructure practices that are installed to disconnect impervious surfaces should be designed for the 2-year design storm (3.4 inches of rain over 24-hours). Although this results in management practices that are slightly over-designed by NJDEP standards, which require systems to be designed for the New Jersey water quality storm (1.25 inches of rain over 2-hours), these systems will be able to handle the increase in storm intensities that are expected to occur due to climate change. By designing these management practices for the 2-year design storm, these practices will be able to manage 95% of the annual rainfall volume. The recommended annual reductions in runoff volumes are shown in Table 3.

As previously mentioned, once impervious surfaces have been identified, the next steps for managing impervious surfaces are to 1) eliminate surfaces that are not necessary, 2) reduce or convert impervious surfaces to pervious surfaces, and 3) disconnect impervious surfaces from flowing directly to local waterways.

Elimination of Impervious Surfaces

One method to reduce impervious cover is to "depave." Depaving is the act of removing paved impervious surfaces and replacing them with pervious soil and vegetation that will allow for the infiltration of rainwater. Depaving leads to the re-creation of natural space that will help reduce flooding, increase wildlife habitat, and positively enhance water quality as well as beautify neighborhoods. Depaving also can bring communities together around a shared vision to work together to reconnect their neighborhood to the natural environment.

Table 3: Impervious cover reductions by subwatershed in East Amwell Township

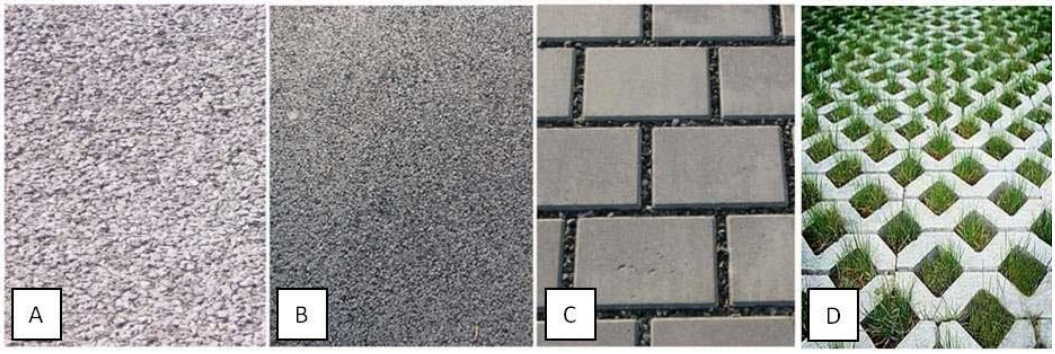
Subwatershed	**Recommended Impervious Area Reduction (10%) (ac)**	**Annual Runoff Volume Reduction [2] (MGal)**
Alexauken Creek	3.0	3.4
Back Brook	22.5	25.5
Beden Brook	0.4	0.5
Headquarter Tributary	2.1	2.4
Neshanic River	10.4	11.8
Raritan River South Branch	0.0	0.0
Rock Brook	0.6	0.7
Stony Brook	7.1	8.0
Total	46.1	52.4

[2] Annual Runoff Volume Reduction =
Acres of impervious cover x 43,560 ft^2/ac x 44 in x (1 ft/12 in) x 0.95 x (7.48 gal/ft^3) x (1 MGal/1,000,000 gal)
All green infrastructure should be designed to capture the first 3.4 inches of rain from each storm. This would allow the green infrastructure to capture 95% of the annual rainfall of 44 inches.

Pervious Pavement

There are four different types of permeable pavement systems that are commonly being used throughout the country to reduce the environmental impacts from impervious surfaces. These surfaces include pervious concrete, porous asphalt, interlocking concrete pavers, and grid pavers.

> "*Permeable pavement is a stormwater drainage system that allows rainwater and runoff to move through the pavement's surface to a storage layer below, with the water eventually seeping into the underlying soil. Permeable pavement is beneficial to the environment because it can reduce stormwater volume, treat stormwater water quality, replenish the groundwater supply, and lower air temperatures on hot days (Rowe, 2012).*"



Permeable surfaces: (A) pervious concrete, (B) porous asphalt, (C) interlocking concrete pavers, (D) grid pavers (Rowe, 2012)

Pervious concrete and porous asphalt are the most common of the permeable surfaces. They are similar to regular concrete and asphalt but without the fine materials. This allows water to quickly pass through the material into an underlying layered system of stone that holds the water allowing it to infiltrate into the underlying uncompacted soil.

Impervious Cover Disconnection Practices

By redirecting runoff from paving and rooftops to pervious areas in the landscape, the amount of directly connected impervious area in a drainage area can be greatly reduced. There are many cost-effective ways to disconnect impervious surfaces from local waterways.

- Simple Disconnection: This is the easiest and least costly method to reduce stormwater runoff for smaller storm events. Instead of piping rooftop runoff to the street where it enters the catch basin and is piped to the river, the rooftop runoff is released onto a grassed

area to allow the water to be filtered by the grass and soak into the ground. A healthy lawn typically can absorb the first one to two inches of stormwater runoff from a rooftop. Simple disconnection also can be used to manage stormwater runoff from paved areas. Designing a parking lot or driveway to drain onto a grassed area, instead of the street, can dramatically reduce pollution and runoff volumes.

- Rain Gardens: Stormwater can be diverted into shallow landscaped depressed areas (i.e., rain gardens) where the vegetation filters the water, and it is allowed to soak into the ground. Rain gardens, also known as bioretention systems, come in all shapes and sizes and can be designed to disconnect a variety of impervious surfaces (Figure 7).

Figure 7: Rain garden outside the RCE of Gloucester County office which was designed to disconnect rooftop runoff from the local storm sewer system

- Rainwater Harvesting: Rainwater harvesting includes the use of rain barrels and cisterns (Figures 8a and 8b). These can be placed below downspouts to collect rooftop runoff. The collected water has a variety of uses including watering plants and washing cars. This practice also helps cut down on the use of potable water for nondrinking purposes. It is important to divert the overflow from the rainwater harvesting system to a pervious area.

Figure 8a: Rain barrel used to disconnect a downspout with the overflow going to a flower bed

Figure 8b: A 5,000 gallon cistern used to disconnect the rooftop of the Department of Public Works in Clark Borough to harvest rainwater for nonprofit car wash events

Examples of Opportunities in East Amwell Township

To address the impact of stormwater runoff from impervious surfaces, the next step is to identify opportunities in the municipality for eliminating, reducing, or disconnecting directly connected impervious surfaces. To accomplish this task, an impervious cover reduction action plan should be prepared. Aerial photographs are used to identify sites with impervious surfaces in the municipality that may be suitable for inclusion in the action plan. After sites are identified, site visits are conducted to photo-document all opportunities and evaluate the feasibility of eliminating, reducing or disconnecting directly connected impervious surfaces. A brief description of each site discussing the existing conditions and recommendations for treatment of the impervious surfaces is developed. After a number of sites have been selected for inclusion in the action plan, concept plans and detailed green infrastructure information sheets are prepared for a selection of representative sites.

For East Amwell Township, three sites have been included in this assessment. Examples of concept plans and detailed green infrastructure information sheets are provided in Appendix A. The detailed green infrastructure information sheets describe existing conditions and issues, proposed solutions, anticipated benefits, possible funding sources, potential partners and stakeholders, and estimated costs. Additionally, each project has been classified as a mitigation opportunity for recharge potential, total suspended solids removal, and stormwater peak reduction. Finally, these detailed green infrastructure information sheets provide an estimate of gallons of stormwater captured and treated per year by each proposed green infrastructure practice. The concept plans provide an aerial photograph of the site and details of the proposed green infrastructure practices.

Conclusions

East Amwell Township can reduce flooding and improve its waterways by better managing stormwater runoff from impervious surfaces. This impervious cover assessment is the first step toward better managing stormwater runoff. The next step is to develop an action plan to eliminate, reduce, or disconnect impervious surfaces where possible and practical. Many of the highly effective disconnection practices are inexpensive. The entire community can be engaged in implementing these disconnection practices.

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Appendix A

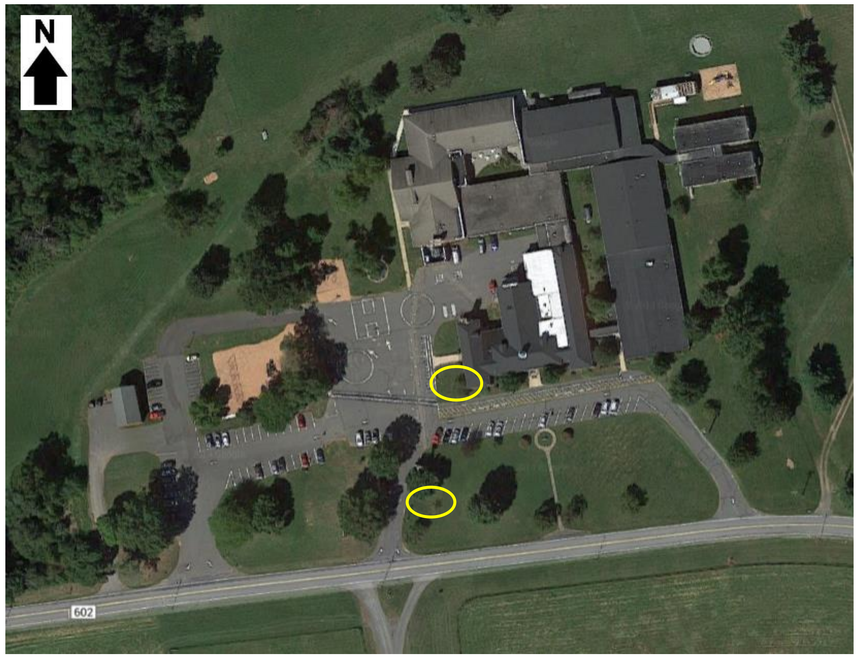
Examples of Impervious Cover Reduction Action Plan Projects

Concept Plans and Detailed Green Infrastructure Information Sheets

East Amwell Township
Impervious Cover Assessment

East Amwell Township Elementary School, 43 Wertsville Road

PROJECT LOCATION:



SITE PLAN:

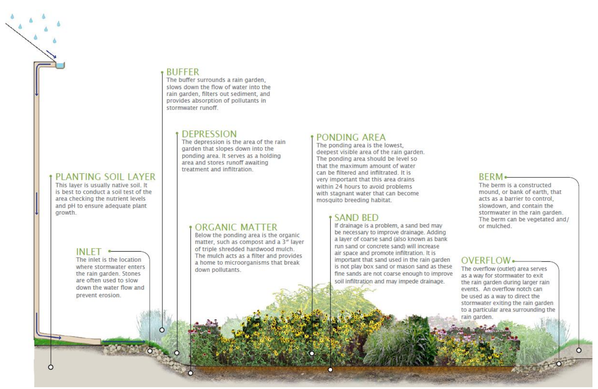
A

B

1 **BIORETENTION SYSTEM:** Curb cuts can be used to allow stormwater runoff from the parking area and center driveway to enter into a bioretention system that is adjacent to the center driveway. Downspouts can be redirected to the bioretention system that is proposed for the southwest corner of the building. The bioretention systems will reduce sediment and nutrient loading to the local waterway.

EDUCATIONAL PROGRAM: The RCE Water Resources Program *Stormwater Management in Your Schoolyard* program could be delivered at the East Amwell Township Elementary School to educate the teachers and students about stormwater management and engage them in the design and construction of the bioretention systems.

1 BIORETENTION SYSTEM



EDUCATIONAL PROGRAM

East Amwell Township Elementary School
Green Infrastructure Information Sheet

Location: 43 Wertsville Road Ringoes, NJ 08551	**Municipality:** East Amwell Township
	Subwatershed: Back Brook
Green Infrastructure Description: bioretention systems (rain gardens)	**Targeted Pollutants:** total nitrogen (TN), total phosphorous (TP), total suspended solids (TSS) in surface runoff
Mitigation Opportunities: recharge potential: yes stormwater peak reduction potential: yes total suspended solids removal potential: yes	**Stormwater Captured and Treated Per Year:** bioretention system #1: 145,074 gal. bioretention system #2: 15,633 gal.

Existing Conditions and Issues:
This site is on Wertsville Road and contains impervious surfaces such as parking lots and buildings that contribute to stormwater runoff which carries nonpoint source pollution to local waterways. There are several open turf grass areas that could be retrofitted with bioretention systems to better manage stormwater runoff from this site.

Proposed Solution(s):
A bioretention system could be constructed in the turf grass area adjacent to the school's center paved entrance from Wertsville Road. This system would capture, treat, and infiltrate stormwater runoff from the parking lot and paved entrance. At the southwest corner of the building, a second bioretention system could be constructed to capture stormwater from the roof downspouts. Since this is a school, there are educational opportunities for the teachers and students as part of the design and installation of the bioretention systems. The RCE Water Resources Program has a program entitled *Stormwater Management in Your Schoolyard* where Water Resources Program staff provide educational programming about stormwater management and work with the students to actually design and implement bioretention systems.

Anticipated Benefits:
Since the bioretention systems would be designed to capture, treat, and infiltrate the entire 2-year design storm (3.3 inches of rain over 24 hours), these systems are estimated to achieve a 95% pollutant load reduction for TN, TP, and TSS. A bioretention system would also provide ancillary benefits such as enhanced wildlife and aesthetic appeal to the local residents, employees, and students of East Amwell Township Elementary School. Rutgers Cooperative Extension could additionally present the *Stormwater Management in Your Schoolyard* program to teachers and students and include them in the design and construction of the bioretention system. This may also be used as a demonstration project for the East Amwell Public Works staff to launch educational programming.

Possible Funding Sources:
mitigation funds from local developers
NJDEP grant programs
East Amwell Township
local social and community groups

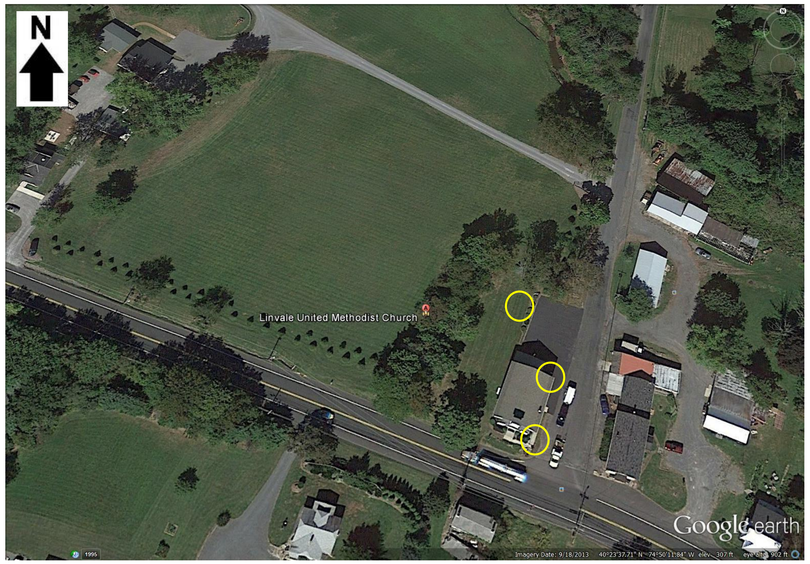
Partners/Stakeholders:
East Amwell Township Elementary School
East Amwell Township
local community groups
students and parents
Rutgers Cooperative Extension

Estimated Cost:
Rain garden #1 would need to be approximately 1,400 square feet. At $5 per square foot, the estimated cost of the rain garden is $7,000. Rain garden #2 would need to be approximately 150 square feet. At $5 per square foot, the estimated cost of the rain garden is $750. The total cost of the project is thus $7,750.

East Amwell Township
Impervious Cover Assessment
Linvale United Methodist Church, 373 Route 31 North

RUTGERS
New Jersey Agricultural Experiment Station

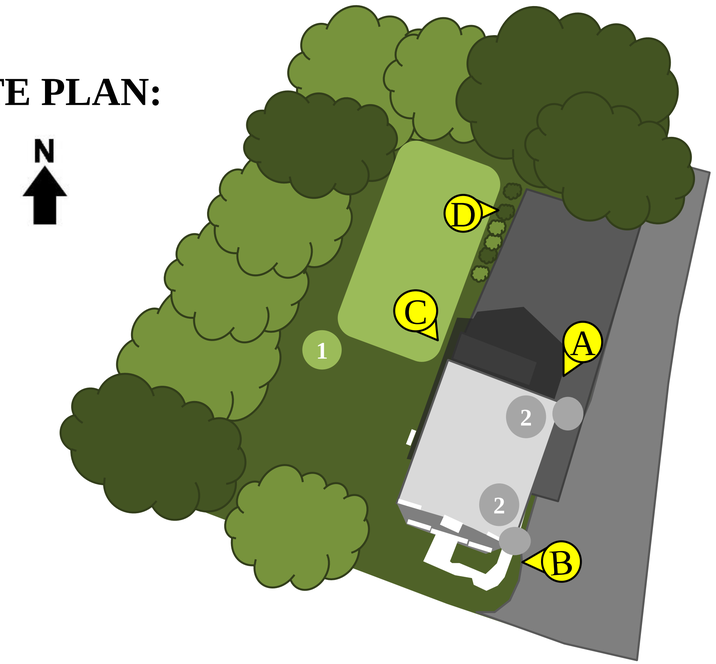
PROJECT LOCATION:



1 **BIORETENTION SYSTEM:** On this property a rain garden can be used to reduce sediment and nutrient loading to the local waterway and increase groundwater recharge.

2 **DISCONNECTED DOWNSPOUTS:** Downspouts can be disconnected to allow rainwater to flow into turf grass areas which will help remove pollutants and allow for the stormwater to infiltrate into the ground.

SITE PLAN:



A

B

C

D

1 BIORETENTION SYSTEM

2 DISCONNECTED DOWNSPOUTS

Linvale United Methodist Church
Green Infrastructure Information Sheet

Location: 373 Route 31 North Ringoes, NJ 08551	**Municipality:** East Amwell Township **Subwatershed:** Stony Brook
Green Infrastructure Description: bioretention system (rain garden) disconnecting downspouts	**Targeted Pollutants:** total nitrogen (TN), total phosphorous (TP), total suspended solids (TSS) in surface runoff
Mitigation Opportunities: recharge potential: yes stormwater peak reduction potential: yes total suspended solids removal potential: yes	**Stormwater Captured and Treated Per Year:** bioretention system: 46,040 gal. disconnected downspout #1: 13,946 gal. disconnected downspout #2: 10,491 gal.

Existing Conditions and Issues:

This site is located at the corner of Route 31 and Linvale Rd. The site has significant impervious cover that contributes to increased stormwater runoff. At the southeast corner, there is a downspout flowing directly onto the walkway. At the northeast corner, there is a downspout flowing into the parking lot. At the west face, the downspout is connected to a pipe that is conveying water toward the parking lot. This same pipe extends in the opposite direction and carries water from the basement sump pump.

Proposed Solution(s):

At the southeast corner, the downspout could be disconnected with a small cut made into the walkway to convey water into the nearby turf grass area. At the northeast corner, the downspout can be rerouted to flow into the adjacent turf grass area. The downspout tube extension can be rerouted to flow into a bioretention system which could be built in the turf grass area near the parking lot. This bioretention system will capture, treat, and infiltrate stormwater runoff from the roof.

Anticipated Benefits:

Since the bioretention systems would be designed to capture, treat, and infiltrate the entire 2-year design storm (3.3 inches of rain over 24 hours), these systems are estimated to achieve a 95% pollutant load reduction for TN, TP, and TSS. A bioretention system would also provide ancillary benefits such as enhanced wildlife and aesthetic appeal to the local residents and members of the congregation of Linvale United Methodist Church. The disconnected downspouts will allow stormwater to penetrate into the ground naturally, promoting groundwater recharge and reducing loads of TN, TP, and TSS.

Possible Funding Sources:
mitigation funds from local developers
NJDEP grant programs
East Amwell Township
local social and community groups

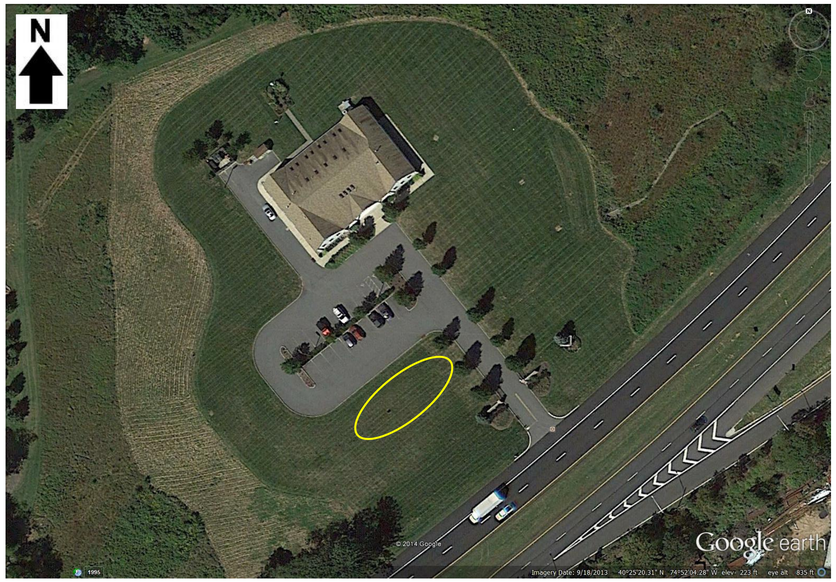
Partners/Stakeholders:
Linvale United Methodist Church
East Amwell Township
local community groups
Rutgers Cooperative Extension

Estimated Cost:
A rain garden to capture the roof runoff would need to be approximately 450 square feet. At $5 per square foot, the estimated cost of the rain garden is $2,250. Disconnecting the downspouts will cost about $250 each for a total cost of $500. The total cost of the project will be approximately $2,750.

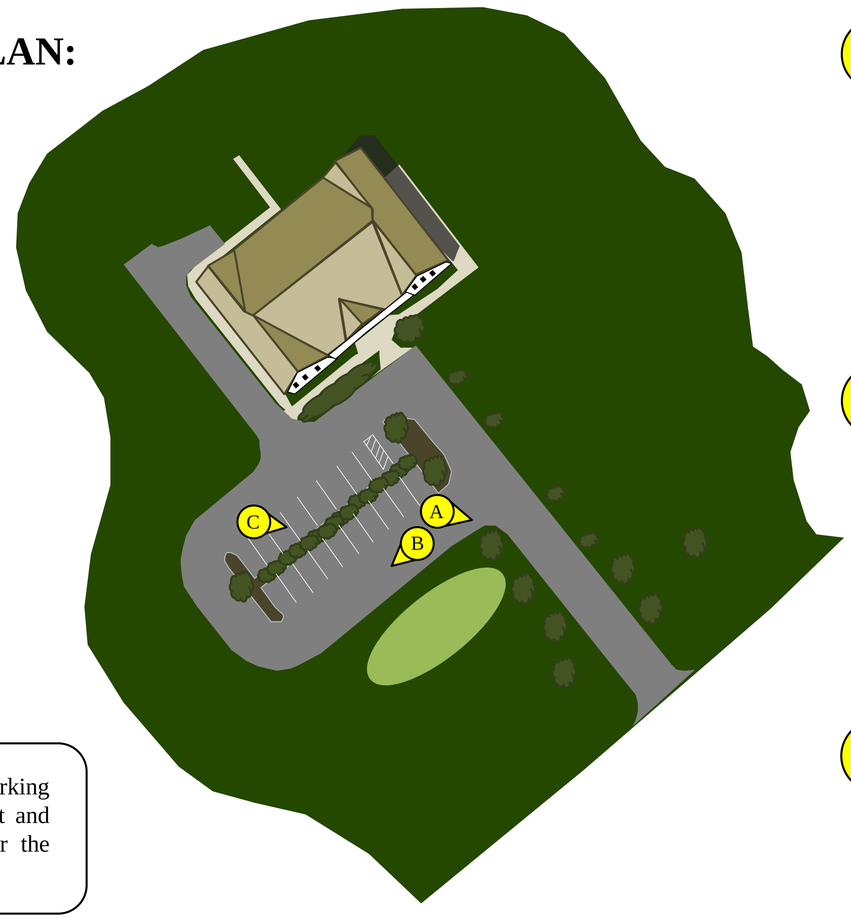
East Amwell Township
Impervious Cover Assessment
Tabby's Place: A Cat Sanctuary, 1100 US Route 202

RUTGERS
New Jersey Agricultural Experiment Station

PROJECT LOCATION:



SITE PLAN:



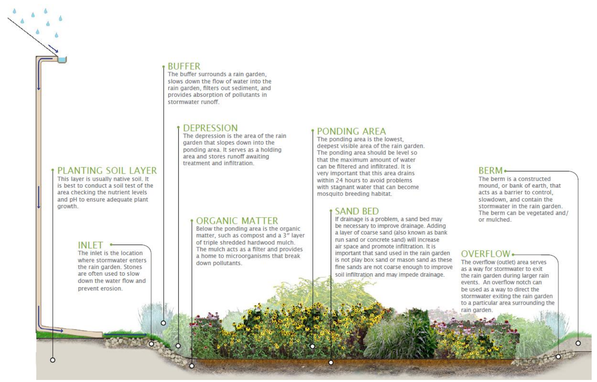
A

B

C

1 **BIORETENTION SYSTEM:** Curb cuts can be used to allow stormwater runoff from the parking areas to enter into the bioretention system. The bioretention system will reduce sediment and nutrient loading to the local waterway. The existing detention basins will be used for the bioretention system's overflow.

1 BIORETENTION SYSTEM



CURB CUTS

Tabby's Place: A Cat Sanctuary
Green Infrastructure Information Sheet

Location: 1100 US Route 202 Ringoes, NJ 08551	**Municipality:** East Amwell Township
	Subwatershed: Back Brook
Green Infrastructure Description: bioretention system (rain garden) curb cuts	**Targeted Pollutants:** total nitrogen (TN), total phosphorous (TP), total suspended solids (TSS) in surface runoff
Mitigation Opportunities: recharge potential: yes stormwater peak reduction potential: yes total suspended solids removal potential: yes	**Stormwater Captured and Treated Per Year:** bioretention system: 136,634 gal.

Existing Conditions and Issues:
This site is located along US Route 202. The site has a parking lot which generates high stormwater runoff volumes and nonpoint source pollution. There are two storm grates located near the exit of the parking lot area on each side. There is a turf grass area adjacent to the parking lot.

Proposed Solution(s):
Curb cuts can be made before the storm drains to allow stormwater to flow into the turf grass area instead of directly into the storm drains. In the area south of the parking lot, a bioretention system could be implemented to better capture, treat, and infiltrate stormwater runoff from the parking lot.

Anticipated Benefits:
Since the bioretention systems would be designed to capture, treat, and infiltrate the entire 2-year design storm (3.3 inches of rain over 24 hours), these systems are estimated to achieve a 95% pollutant load reduction for TN, TP, and TSS. A bioretention system would also provide ancillary benefits such as enhanced wildlife and aesthetic appeal to the local residents and employees of Tabby's Place. Curb cuts would allow stormwater runoff to flow into the vegetated areas and bioretention systems rather than flow into storm drains.

Possible Funding Sources:
mitigation funds from local developers
NJDEP grant programs
East Amwell Township
local social and community groups

Partners/Stakeholders:
Tabby's Place: A Cat Sanctuary
East Amwell Township
local community groups
Rutgers Cooperative Extension

Estimated Cost:
A rain garden to capture the parking lot runoff would need to be approximately 1,300 square feet. At $5 per square foot, the estimated cost of the rain garden is $6,500.