



Village Park Rain Garden in Cranbury Township

Final Report

By

Cranbury Environmental Commission
December 2014

**A Watershed Protection Project funded by the American
Water Company Environmental Grant Program**



Rain Garden Buffer to Brainerd Lake – Cranbury, NJ

American Water Company Environmental Grant Program Watershed Protection Project Evaluation and Final Report

BACKGROUND

Rainfall that is not used by plants or does not infiltrate the soil flows across the land surface into gutters, drains, streams, rivers and lakes as stormwater runoff. Stormwater washes away and carries pollutants into these waterways. Pollutants such as nitrogen, phosphorus, heavy metals which settle out of the atmosphere and deposit on impervious surfaces, and petroleum hydrocarbons from vehicular traffic will discharge to the nearest water body if not captured and removed beforehand.

Treatment can consist of a rain garden where the stormwater runoff is allowed to percolate into the ground and where pollutants such as sediments and hydrocarbons are captured within the soil and vegetation. A rain garden is a landscaped shallow depression that captures, filters and infiltrates stormwater at the source before it becomes runoff. The effect will be an improvement to the vitality of a water body.

The Cranbury Environmental Commission (EC) implemented a Watershed Protection Project consisting of the establishment of a rain garden to buffer Brainerd Lake from nonpoint source pollution. Brainerd Lake is an impoundment of Cranbury Brook, which is part of the Stony Brook-Millstone Watershed, and has been determined to have impaired water quality, mostly due to sedimentation.

The rain garden in Village Park was established in an area where rainfall runoff flows from a parking area directly to Brainerd Lake without the benefit of treatment or flow control. Controlling stormwater runoff volume and quality into Brainerd Lake will lead to improvements to the lake and the Stony Brook-Millstone Watershed, thus benefiting the residents of Cranbury, and also the larger population of the other communities in the watershed.

PROJECT DETAILS

Report Requirement - Grant Accomplishment(s)

Project Progress

The rain garden project was completed on September 26 & 27, 2014 by the professional staff from Rutgers Cooperative Extension (RCE) Water Resources Program with the help of fourteen township resident volunteers and EC and Parks Commission (PC) members. Cranbury Department of Public Works (DPW) staff helped with removal and reinstallation of parking

barriers in order to facilitate excavation activities and post-construction cleanup activities. The donation of equipment from two local business owners supported the volunteer efforts.

Additional rain garden improvements were constructed between October 27 and November 13, 2014 to improve drainage from the rain garden as described in the sections below. Additional maintenance of the rain garden mulch bed was performed in late November. The project sign was installed in late December 2014/early January 2015.

The Village Park rain garden occupies an area on the north side of Brainerd Lake that was in poor condition. See photos #1A & #1B. The area along the lake bank intercepted rainwater flows coming off the large portions of the parking lot area and some of the vegetated areas. A grass swale was incorporated into the design to help direct runoff from this large area into the rain garden.

The entrance of the rain garden was lined with river stone to prevent excess erosion at the entrance of the rain garden. The base of the rain garden is constructed with a 3-inch sand/soil mix covered by a 3-inch mulch layer. Several stone filled wicks 18 inches deep are provided in the garden base to further support drainage. A small berm around the sides was installed to control and temporarily contain the stormwater. A stone overflow outlet was constructed to handle storm events greater than the typical design storm for New Jersey. An atrium drain and buried drain pipe was included to prevent excess ponding during heavy rainfall events. The stone wicks penetrate through the bottom of the rain garden base to alleviate any potential for the water to sit more than 24 to 48 hours after a rain event.

The construction of the rain garden required excavation to a depth of approximately 12 inches, the installation of a more permeable soil mixture 3 inches in depth, the placement of 3 inches of mulch and the planting of a variety of small plants and shrubs. See photos #2A & # 2B. A 4-foot high temporary fence was erected around the rain garden to protect the plants during the initial months.

The Village Park rain garden is approximately 600 square feet in size and intercepts up to 2,400 gallons of stormwater runoff for a New Jersey design rainfall event of 1.25 inches before it enters Brainerd Lake. This equates to a 67,320-gallon volume treated annually. The drainage area which contributes to the rain garden is approximately 3,000 square feet. The design incorporates a 70-foot long grass swale constructed to direct the runoff to the rain garden entrance.

Use of native plants was included in the design of the rain garden as recommended by the RCE rain garden manual. The plants that were installed in this rain garden are native hardy perennial species that were selected since their well-established root systems survive well in both dry and

wet conditions in New Jersey. Native plants do not require substantial fertilization, absorb water more efficiently than turf-style lawns, and are much easier to maintain than exotic species. The native plants selected for this rain garden were selected based upon differing heights, shapes, textures, and blooming schedule for aesthetic appeal. The plants include Turtlehead, Spotted Joe-Pye Weed, Spotted Horsemint, Cinnamon Fern, Royal Fern, Pepperbush and Meadowsweet. Detail sheets for the native plants used in the rain garden are provided on the following pages.

Educational signage was designed and ordered from a professional interpretive sign company and has been installed at the rain garden. The sign explains the function and importance of the rain garden in promoting improved water quality and will be a permanent educational source that will help spur future projects. The sign provides acknowledgement of the grant funding and project partners. See attachment A.

In addition, a webpage has been created for the Cranbury township website and is currently functioning to educate the public about non-point source pollution and how rain gardens can help. See the rain garden educational web page at <http://www.cranburytownship.org/vp-raingarden/vp-index.html>

Project Objectives/Impact

The purpose of the project was to construct a demonstration project that would educate visitors to the park about preventing or reducing impacts from daily activities to our water bodies. This included both an educational component as well as a physical component (the rain garden construction). The education component has been achieved through the development of the rain garden webpage, the preparation of a fact sheet available at several locations (township web sites and pamphlets in the library and town hall), the construction of a permanent project sign and offering of educational events at Cranbury and through the Cranbury Public Library (CPL).

CPL held an event on October 4, 2014 at the library to review and demonstrate non-point source pollution and the present the Village Park rain garden story. See Attachment B. They also have provided support for the public education and community outreach goals in the form of published bookmarks (see Attachment C) and display of a project fact sheet.

The project sign includes a QR code that will allow visitors with smart phones to be directed to the Village Park web page using a free app. Since the webpage is a stand-alone page, we can determine how many hits it receives over time, as a measure of success.

The rain garden was intended to intercept and slow down stormwater flows, allowing a major portion of the rain to percolate down into the ground, effectively reducing the volume of runoff

and capturing pollutants and sediments that would otherwise reach Brainerd Lake and Cranbury Brook. The rain garden objective included increasing the infiltration rate from the pre-design rate of less than 1 inch/hour to a target rate of 2 inch/hour. The predesign rates were measured using an infiltrometer before the project; however, the post construction rates have not been measured because we did not want to impact the rain garden plants. However, an increase in infiltration rates has been observed from visual inspections after the stone wicks were installed. The second objective included reducing the overall mass of pollutants (such as hydrocarbons, phosphorous and total solids) that reaches the lake. While this is not directly measurable, the effects of the rain garden are determined by the runoff velocity reduction and an understanding of the principles of settling. Qualitative assessments such as visual observations of solids in the stormwater settling out in the rain garden have been made.

A collateral benefit of the project was to beautify this area of the park by the use of various flowering plants. We have documented the planting of over 150 native plant species buffering the lake via this project and the visual impacts are observable from photographs #3A and #3B.

One major factor in the project's success was that the EC partnered with the RCE Water Resources Program to design and install the rain garden. RCE calculated the total run off area and volume and prepared the project design details. Additionally, experienced RCE staff directed the project team volunteers during construction of the rain garden. At several stages RCE staff provided critical guidance and support in the design of the rain garden shape, depth, soil amendments and selection of plant species.

A second factor in the project success was the full support and collaboration of the PC members who spear head the maintenance and improvement planning of town parks for Cranbury Township. EC members attended several PC meetings during the planning stages and shared many formal communications between the two groups.

A third factor in the project success was the communications that were maintained between other Township staff (e.g. Department of Public Works, Finance), the Township Engineer and the Township Committee.

The impact to the township resident included environmental education, reduction of pollution entering Brainerd Lake, lakeside enhancement, general park beautification, community involvement and the availability for student service opportunities. A demonstration project Fact Sheet titled Rain Garden at Brainerd Lake in Village Park was also prepared and is available at the CPL and at Town Hall. It will also be available during Cranbury Day held every September. See Attachment D. The rain garden completion was also publicized on the Township Fall Newsletter – see Attachment E.

Report Requirement - Sustainability & Planning for the Future

Community Involvement

Support for this project was provided from both the Cranbury EC and PC, who agreed upon the location and design details. They also supported the project by supplying volunteers during construction.

The CPL has provided support for the public education and community outreach goals. They held a rain garden educational event on October 4, 2014, have published bookmarks and are displaying the project fact sheet.

The Middlesex County Planning Department (MCPD) also provided support in terms of preparation of the sign and other educational materials.

The Rocky Brook Garden Club (RBGC) has agreed to provide annual financial funding to support annual spring replanting and mulch replenishment. This is the first instance of the grant money allowing us to leverage additional money.

Planning support was provided by the Rutgers Cooperative Extension of Middlesex County (RCE-MC). The support of RCE-MC environmental scientists included rain garden construction experience and other resources such as plant materials and other educational materials.

Support was provided from the Stony Brook-Millstone Watershed Association (SBMWA) in terms of confirming the need and benefit of the project. SBMWA will continue to support the project via the annual stream cleanup program which are promoted and supported by the EC.

PARTNER	CONTRIBUTION
Cranbury Environmental Commission	Lead in the planning, design, construction, reporting and overall coordination
Cranbury Parks Commission	Support in site evaluation and volunteers
Cranbury Public Library	Public education and community engagement
Middlesex County Planning Board	Educational Materials and Sign Development
Rocky Book Garden Club	Financial support for Annual Maintenance
Rutgers Cooperative Extension (Middlesex County)	Technical support for the design, maintenance, and plant options.
Stony Brook Millstone Watershed Association	Support in promotion and public education

Sustainability

The long term benefits of the program will include improvement of water quality (by a reduction of pollutant loading) in the watershed and in particular Brainerd Lake and Cranbury Brook, decrease in the erosion of the lake bank, reduction in stormwater runoff volumes, and

improvement of the vitality of the lake. This has an overall impact in terms of a potential reduction in the treatment requirements for potable water supplies.

The project offers environmental sustainability by providing a natural no cost reduction in water pollution, that will result in savings of money and energy needed to treat water at downstream locations. The rain garden provides for beautification of a natural water body resource and provision of an education resource to the many County residents who use Village Park all year long. It will be a highly visible example for homeowners to gain insight and information in order to plan and install their own rain gardens.

Planning for the Future

The long-term viability of the rain garden will be achieved through volunteer efforts of local environmental groups and scouting organizations and maintenance funding from the RBGC and periodic scouting projects.

Local scouting leaders have been contacted and they have identified a desire and need for local scouts to participate on their way to achieving rank advancements and merit badges. Local boy scouts and girl scouts will be available to do routine maintenance and even long-term maintenance as part of their required volunteer service requirements. Local environmental groups such as the Princeton High School environmental club or the RBGC have many members who are seeking opportunities to learn and contribute their time.

Lastly, through the efforts of the SBMWA, annual stream cleanups are conducted in Cranbury and usually focus on Brainerd Lake and Cranbury Brook. This annual spring cleanup usually occurs in April and has over 50 participants.

The rain garden will require some care during the initial year (offering a local scout or high school student community service hours), but should become self-sustaining in future years. Watering during the first growing season should continue and be achieved through the support of EC volunteers and the Public Works Department, as well as weeding/pruning throughout the growing season. Plants which do not survive the initial winter season will be replaced through funding from the RBGC.

Other near term planned activities include minor maintenance of the parking area disturbed during the rain garden construction and removal of the temporary fence after the winter. These activities will be conducted by the township (DPW) staff.

The donation of \$400 from the RBGC is the first instance of the grant money allowing us to leverage additional money. The EC has made contact with a local corporation to see if they would be interested in adopting the rain garden to provide volunteers and funds for maintenance activities in the long term.

Report Requirement - Challenges & Lessons Learned

Project Evaluation Measures

Project challenges included both planning and construction items, as detailed below.

The first challenge was the “dual” stakeholders in the project, the PC who is concerned with township park maintenance and planning and the EC who solicited the funds for the project. Coordination between the two commissions was achieved by EC members attending and presenting at the PC meetings.

The need to coordinate the planned rain garden construction activity along the lake as part of the Brainerd Lake dam reconstruction project that was ongoing simultaneously with this project. Early communication with the Township engineer and Committee members alleviated the potential problems with this issue. The lesson learned is to allow several months for coordination and planning.

The project location presented a challenge in the fact that the runoff was expected to be heavily laden with sediments. RCE Water resource program staff designed in a grass swale with 2 check dams to address this concern.

Excessive runoff detention occurred after the first heavy rainfall. The problem was determined to be a clay lens about 18 to 20 inches below the base of the rain garden. This was approximately 36 inches below the original grade and not observed during the infiltration testing which showed rates were not sufficient. However, the designed improvements to the soil did not address the underlying problem. Stone-filled wicks which went past the layer have helped to relieve the problem. The lesson learned is that a geotechnical boring should be advanced well beyond the depth of the infiltrometer test which is approximately 1 foot.

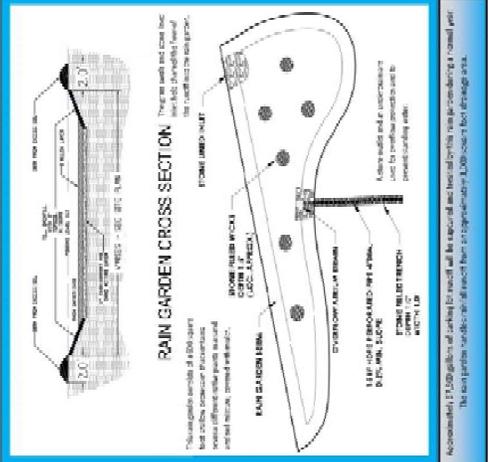
A project financial accounting is provided at the end as Attachment F.

ATTACHMENT A – RAIN GARDEN PROJECT SIGN

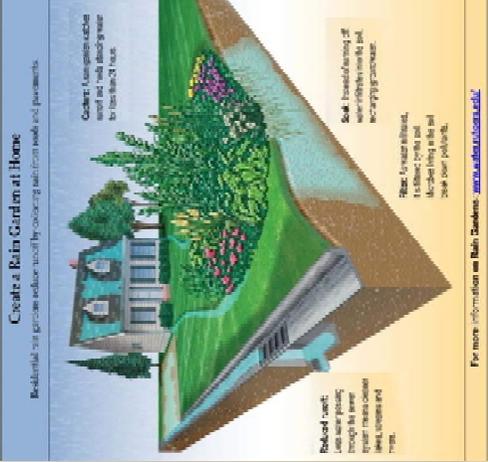
Rain Garden At Brainerd Lake in Village Park

A Project of the Cranbury Township Environmental Commission

This Rain Garden is designed to capture, clean and infiltrate stormwater runoff, leading to improved water quality in Brainerd Lake. Stormwater runoff is a leading cause of pollution in our streams and lakes. Impervious surfaces such as driveways, roads, roofs, parking lots, and even compacted lawns direct pollutant-laden rain water directly into our water bodies and prevent rain water from being naturally filtered by soil and plants to replenish groundwater.



RAIN GARDEN CROSS SECTION: This diagram shows the internal structure of the rain garden. It includes a 10" deep gravel layer at the bottom, a 2" deep sand layer, and a 2" deep mulch layer. The garden is designed to capture and infiltrate stormwater runoff from a 10' x 10' area. The diagram also shows the location of the rain garden relative to the driveway and the street.



Create a Rain Garden at Home: Residential rain gardens reduce runoff by capturing rain from roofs and pavements. They also help to filter pollutants and improve water quality. The illustration shows a house with a rain garden in the front yard, capturing runoff from the roof and driveway.

DO YOU KNOW? Rain gardens can capture and filter pollutants from parking lots, driveways, roofs, and lawns. They also help to filter pollutants and improve water quality.

BE PART OF THE SOLUTION: Rain gardens can capture, clean and infiltrate stormwater runoff, leading to improved water quality in our streams and lakes.

PRINT IS A RAIN GARDEN: A rain garden is a shallow depression, generally 12" deep, designed to capture and infiltrate stormwater runoff from roofs, parking lots, and lawns.

For more information on Rain Gardens, visit www.njraingardens.com/



Technical assistance provided by:

- RUTGERS Center for Watershed Protection
- Monmouth County Office of Planning and Public Works
- Cranbury Township

For more information on the Village Park Rain Garden go to: www.villageparknj.com/

Or scan the QR Code below with your smart device using Apple or Google for more information.



Supported provided by:

The Cranbury Township Parks and Environmental Commission Members



This project was made possible by a grant from:



NEW JERSEY AMERICAN WATER

ATTACHMENT B - PROMOTIONAL MATERIALS (LIBRARY EDUCATIONAL EVENT)



**KEEPING
BRAINERD LAKE
*CLEAN!!***

**Saturday, October 4
10:00 a.m., Village Park***

Will discuss local water pollution
and how rain gardens can help.
See demos of the new rain garden
in the park. Meet near Dirt Mountain!

***In case of rain, program will be
held at the library.**

ATTACHMENT C - PROMOTIONAL MATERIALS (BOOK MARKS)



Keeping Brainerd Lake Clean

In partnership with the Cranbury Environmental Commission, the Cranbury Public Library will host **Keeping Brainerd Lake Clean on Saturday, October 4th at 10:00 a.m. in Village Park.**

Learn about local water pollution and how you and your family can help keep Brainerd Lake clean.

Children in grades K-8 can participate in water pollution demonstration and see the new rain garden. We will meet near the lake at 'dirt mountain'.



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Check out these great books related to rain gardens at the library!

Creating Rain Gardens
Cleo Woelfle-Erskine

Beautiful No-Mow Yards
Evelyn J. Hadden

Plantiful
Kristin Green

How to Eradicate Invasive Plants
Teri Dunn Chace

50 High-Impact, Low-Care Garden Plants
Tracy DiSabato-Aust



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ATTACHMENT D - PROMOTIONAL MATERIALS (FACT SHEET)

Rain Garden at Brainerd Lake in Village Park Fact Sheet

What is a Rain Garden?

A rain garden is a landscaped, shallow depression that allows precipitation to be collected and infiltrated into the ground. By capturing stormwater, rain gardens reduce the polluted runoff (or nonpoint source pollution) that enters local waterways. Pollutants may include road sediment/salt, fertilizers, pesticides, bacteria from pet waste, eroded soil, grass clippings or litter. The Village Park rain garden prevents pollution from reaching Brainerd Lake, and therefore, Cranbury Brook.

Rain gardens are designed to manage stormwater runoff from rooftops as well as from driveways, lawns, roads, and parking lots. During a storm, a rain garden fills with water, allowing the water to slowly filter into the ground rather than running into storm sewers and streams. Rain gardens are planted as perennial gardens, but they are much more. Rain gardens add beauty to neighborhoods and, with the use of native plants, provide habitat for wildlife including butterflies and songbirds.

Project History

The Village Park demonstration rain garden project was funded by a generous grant from the New Jersey American Water Company. The Environmental Commission partnered with the Rutgers Cooperative Extension (RCE) Water Resources Program to design and install the rain garden. On September 26 & 27, 2014, Cranbury's Environmental and Parks commissioners, RCE staff members and several other township volunteers completed the installation of the rain garden. The donation of equipment from two local business owners helped support the volunteer efforts.

Rain Garden Description

The rain garden in Village Park is approximately 600 square feet in size and includes a 6 to 8 inch depression to intercept and collect stormwater runoff before it enters Brainerd Lake. The design also incorporates a 70 foot long grass swale (shallow channel) to direct runoff to a stone lined inlet at the rain garden entrance. The base of the rain garden is constructed of a 3-inch sand/soil mix covered by a 3-inch mulch layer. Several stone filled

wicks were installed 18 to 20 inches deep into the base of the garden to improve infiltration. The perimeter berm is approximately 4 to 6 inches high. A stoned lined overflow and buried drain pipe prevents excess ponding during heavy rainfall events.

The drainage area which contributes runoff to the rain garden is approximately 3,000 square feet and captures 2,400 gallons of water for a New Jersey design rainfall event of 1.25 inches. This equates to an overall volume of 67,320 gallons of water treated annually.



Plant Layout

Over 150 plants line the base and sides of the rain garden. The Village Park rain garden plants are native perennial species. Native plants are usually chosen for rain gardens because they do not require substantial fertilization, adapt well to both dry and wet conditions, establish root systems that absorb water more efficiently than grass and require less annual maintenance than non-native plants.

The native plants in this rain garden were also selected for aesthetic appeal ---targeting different heights, shapes, textures, and blooming schedule. The plants include turtlehead, spotted Joe-Pye weed, spotted horsemint, cinnamon fern, royal fern, sweet pepperbush and meadowsweet.

Detailed fact sheets for these native plants and design details are provided on the following Cranbury Environmental Commission webpage.

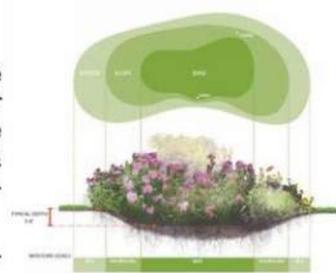
[<http://www.cranburytownship.org/vp-raingarden/vp-index.html>]]

ATTACHMENT E - ARTICLES (TOWNSHIP FALL NEWSLETTER)

ENVIRONMENTAL COMMISSION

Rain Garden

The Environmental Commission and Parks Commission have partnered with the Rutgers Cooperative Extension (RCE) Water Resources Program to design and install a rain garden at Village Park. The rain garden project was completed on September 26th & 27th with the help of 14 township resident volunteers and the donation of equipment from two local businessmen.



Rain gardens are designed to manage stormwater runoff from driveways, lawns, rooftops, roads and parking lots. Rain gardens are planted as perennial gardens, but they are much more. During a storm, a rain garden fills with water, allowing the water to slowly filter into the ground rather than running into storm sewers. By capturing stormwater, rain gardens help to reduce nonpoint source pollution (i.e., road sediment/salt, fertilizers, pesticides, bacteria from pet waste, eroded soil, grass clippings, litter, etc.) and help to protect local waterways. Rain gardens also add beauty and provide habitat for desirable wildlife including butterflies and songbirds by the use of native plants.

The rain garden in Village Park is 600 square feet in size and intercepts stormwater runoff before it enters Brainerd Lake. The drainage area, which contributes to the rain garden, is approximately 3,000 square feet and captures 2,400 gallons for a New Jersey design rainfall event of 1.25 inches. This equates to a 67,320-gallon volume treated annually. The design also incorporated a swale construction to improve drainage to the rain garden. Temporary fencing has been provided to protect the rain garden improvements until they are well established.

To learn more about the benefits and construction of rain gardens, please visit the Rutgers Cooperative Extension web site:

http://water.rutgers.edu/Rain_Gardens/fs513.pdf



Funding for the rain garden is through a generous grant from the New Jersey American Water Company.

PHOTOGRAPHS – BEFORE / AFTER

Village Park Lakeside Before - Photos #1A and #1B



Village Park –Rain Garden Under Construction - Photos #2A and #2B



Village Park – Completed Rain Garden - Photos #3A and #3B



ATTACHMENT F - FINANCIAL SUMMARY REPORT

The Village Parks Rain Garden project has required over 300 man-hours to date, with an additional 40 to 60 expected to be required yearly to maintain the rain garden functionality and beauty.

Project Expenses Summary	Costs
Rutgers Cooperative Extn (Invoice #1)	\$ 2,791.75
Rutgers Cooperative Extn (Invoice #2)	\$ 500.00
Materials (fencing, landscaping materials, incidentals) - Payment #1	\$ 512.37
Materials (fencing, landscaping materials, incidentals) - Payment #2	\$ 79.48
Materials (concrete, rebar, bracing materials - Payment #3	\$ 19.83
Landscape/Excavator Contract Costs	\$ 258.94
Project Educational Sign	\$ 782.48
Total Costs to Date	\$ 4,944.85

We expect to require an additional \$500 to be spent between the date of this report and next spring for the sign installation and plant replacement after the first winter.