

**MUNICIPAL CASE STUDY**

**East Bradford Township, Pennsylvania**

*Motivated by watershed impairment caused by suburban development over the past 30 years, a township with a full slate of water quality improvement programs looks outside its boundaries and examines new funding strategies to continue protecting its waterways.*



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**Background**

East Bradford Township is a suburban community located in northwestern Chester County with abundant rural character. It contains many high-quality environmental resources, such as the Brandywine Creek and its tributary streams, floodplains, and woodlands. The township has prioritized open space preservation, conserving 34 percent of its land base through fee simple acquisition and conservation easements (*East Bradford Township Strategic Comprehensive Plan Update 2004–2014*). Steep slopes and floodplains place limits on the amount of new developable land in the township. The township is developing a greenway trail system that connects its parks and open spaces.

East Bradford is currently 40 percent developed, with about 95 percent residential land, as well as 5 percent commercial/industrial land focused on the southeast corner of the township. The township is located downstream of more densely developed municipalities, such as West Chester Borough and Downingtown Borough.

The total population of the township is 9,942 (2015 Five-Year American Community Survey [ACS]). The median household income is over \$109,000.

**Water Quality Problems**

Like many other municipalities, East Bradford Township is facing stormwater management and watershed impairment issues caused by urban and suburban development trends. Land converted from forests and meadows to impervious surfaces, such as roads, parking lots, and buildings, increases the amount of stormwater runoff. This in turn has led to increases in flooding, stream bank erosion, and water pollution.

**Quick Stats**  
*East Bradford Township*

**Major water body:**  
 Brandywine Creek

**Population:** 9,942 (2015 Five-Year ACS)

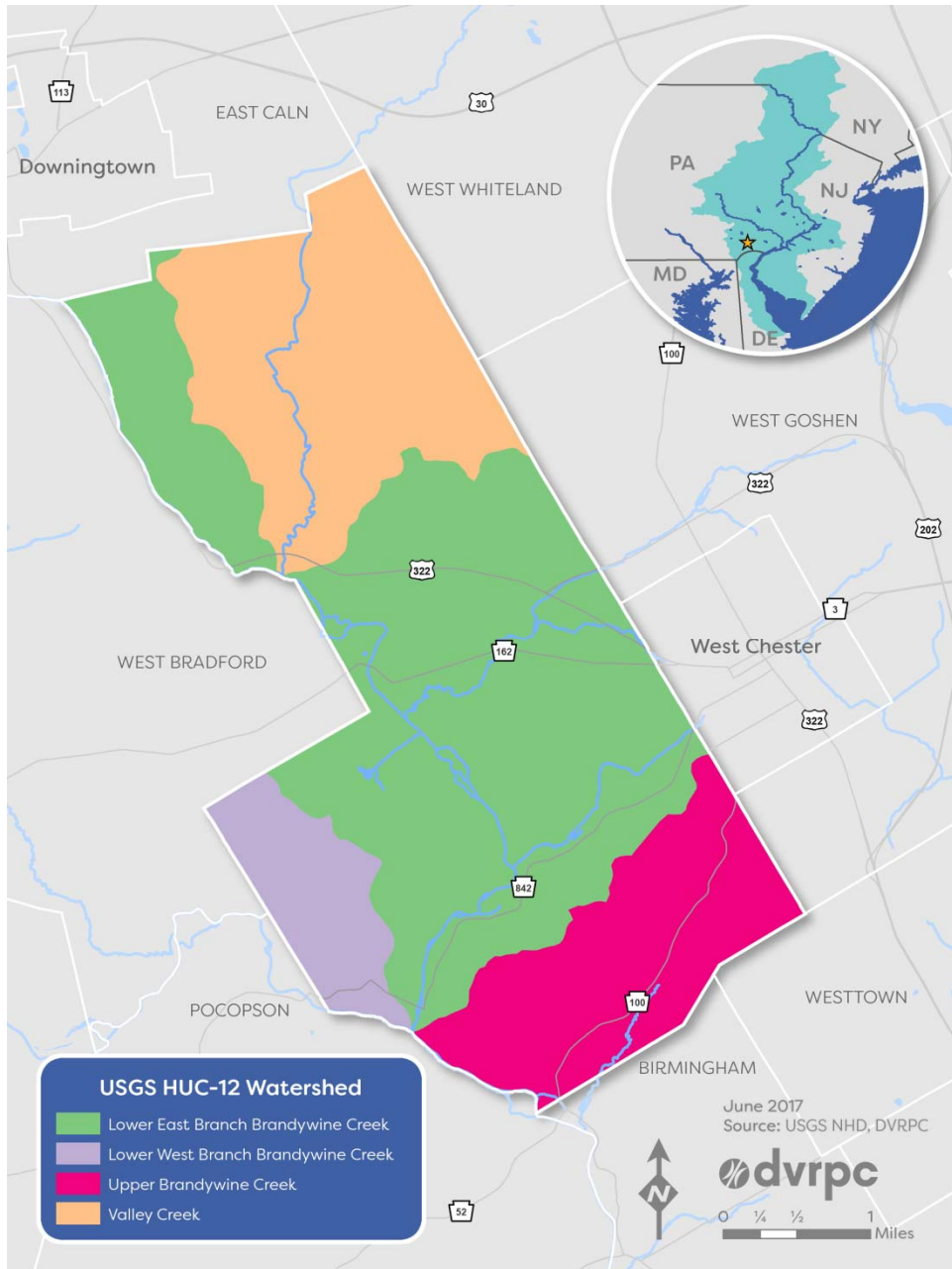
**Land area:** 15.0 square miles

**Water area:** 0.1 square miles (0.66%)

**Total stream miles:** 50.1

**Impaired stream miles:** 27.9 (55.7%)

## Map: East Bradford Township Watershed



Much of the township’s land development occurred between 1980 and 2008. The development from the earlier decades of this period of growth, having not been subject to stormwater management regulations, is likely a significant contributor to current runoff-related problems. In addition, the township has identified more developed upstream communities as a major source of runoff that is affecting water quality and stream health. Rapid runoff from these developed areas increases the volume and velocity of water in Brandywine Creek and its tributaries, causing stream bank erosion and sediment pollution in downstream areas.

Flooding is also an issue. The east and west branches of the Brandywine Creek converge in the township. Rapid runoff from upstream areas has resulted in flooding in the township, blocking access to roads and damaging bridges.

In response to these negative impacts on community safety and environmental health, regulatory agencies such as the U.S.

Environmental Protection Agency (U.S. EPA) and the Pennsylvania Department of Environmental Protection (PA DEP) are requiring municipalities to update their land development regulations and work to restore damaged streams.

East Bradford Township has updated its stormwater management regulations to reduce the amount of runoff that development and redevelopment are allowed to generate. The township incorporated the Chester County-Wide Act 167 Stormwater Management Ordinance in December of 2013. The Act 167 Ordinance expands

stormwater management requirements to smaller projects, and requires a suite of controls to reduce runoff, increase infiltration, and protect stream channels.

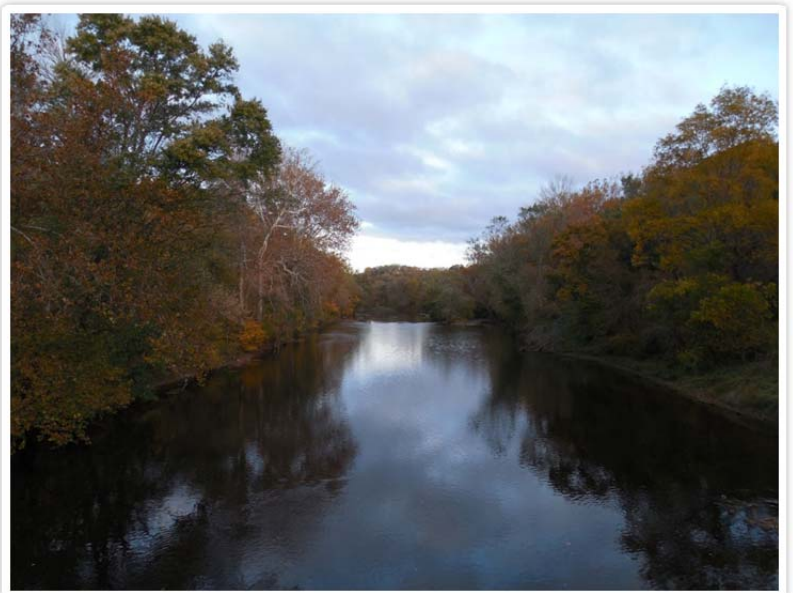
Regulatory agencies are also requiring municipalities to implement restoration projects that undo negative impacts created by past development. These projects are referred to as Total Maximum Daily Load (TMDL) plans and projects. The TMDL establishes the amount of pollution (for example, sedimentation in streams) that is currently occurring and how much it must be reduced to restore stream health. The TMDL plan adopted by municipalities must list the projects that will be implemented to facilitate the reduction in pollutants.

East Bradford Township is currently developing a sediment TMDL plan for Brandywine Creek and its tributaries. According to the township, its sediment reduction requirements are higher than those of other municipalities upstream. Township officials are unsure why this might be; specifically, they do not know how the TMDL modeling allocates pollutant reduction requirements. PA DEP is requesting that the township implement stream bank restoration projects to meet the TMDL requirements. However, township officials are concerned whether runoff upstream will be reduced sufficiently to make significant stream restoration investments by the township effective.

### Water Quality Solutions

East Bradford Township has adopted and continues to implement several key strategies to address stormwater management and watershed restoration issues. The township is pursuing these strategies as part of its planning, development, and parks and recreation activities, as well as through its response to regulatory requirements such as the sediment TMDL.

Key strategies include land conservation, natural resource protection, existing and new stormwater control measures, and stream restoration. These key strategies are in turn linked to the township's consideration of stormwater financing, multi-municipal collaboration, and changing public attitudes.



Source: Jimmy Emerson via Flickr, October 19, 2014. [www.flickr.com/photos/auvet/](http://www.flickr.com/photos/auvet/)  
Brandywine Creek in Autumn.

**Land Conservation:** East Bradford Township continues to pursue conservation of open space, agricultural, and natural lands. This preservation strategy protects surface and groundwater resources, as well as conserving farmland and creating recreational opportunities (most notably, a park and greenway trail network along Brandywine Creek). Township residents pay an open space fee that finances fee simple and conservation easement acquisitions.

As mentioned previously, the high priority that the township places on open space preservation has led to the protection of approximately 34 percent of its land area. The township's preservation effort continues and in the long term will contribute positively to the protection and restoration of water quality.

**Natural Resource Protection:** Natural resources, such as streams and wetlands, can be protected from the impacts of development by rules that restrict activities in areas surrounding them. Riparian buffer ordinances are one example of this strategy. The Brandywine Conservancy is promoting municipal riparian buffer ordinances in the Brandywine Creek watershed, with the goal of protecting streamside land that infiltrates and cleans stormwater runoff and provides other values such as wildlife habitat.

East Bradford has adopted a riparian buffer ordinance that restricts development in the area within 100 feet of streams, or up to 150 feet if the stream is designated as “impaired” or as having “special protection waters.” The riparian buffer ordinance requires native vegetation within the first 50 feet of the stream. Within the remaining buffer area, the ordinance requires vegetation that will reduce stormwater runoff velocities and pollutant loads.

**Existing and New Stormwater Control Measures:**

While some of the development in East Bradford Township predates more rigorous stormwater management requirements, the township views itself as an early adopter of strict development regulations. Officials report that most of their developments have been required to install stormwater runoff controls, such as extended detention stormwater basins, wet ponds, and underground storage. They note that only a few opportunities remain to reduce stormwater runoff volumes in the township, and that these projects are being pursued as part of the township’s TMDL implementation.

The township is now exploring how to foster and support stormwater runoff controls in more developed upstream municipalities. The township is also coordinating with PA DEP on a TMDL strategy that includes stream bank restoration projects and several additional strategies.

**Stream Bank and Flood Plain Restoration:** As mentioned previously, East Bradford Township is working with PA DEP to complete a sediment TMDL plan. With few additional opportunities to reduce stormwater volume and velocity on its developed land, the township is focusing its TMDL planning on stream bank

**Key Partners**

*East Bradford Township* representatives, including its three supervisors, the township manager, township engineer, and the Environmental Advisory Board chair, are engaged in stormwater management issues.

The township receives support from the *Brandywine Conservancy and the Brandywine Red Clay Association*. These two non-governmental organizations help with ordinance development, stream restoration, and tree planting projects.

The *West Chester Fish, Game & Wildlife Association* has led a multi-decade effort to steward and protect West Valley Creek, a tributary stream that flows through the township into Brandywine Creek. The Association, initially formed in 1937, advocates for fish, game, and wildlife through habitat improvement projects, education, and outreach, and the operation of a trout hatchery which provides fish for West Valley Creek.

The township has received support from the *Chester County Water Resources Authority*. The Authority supports municipalities with model ordinances and TMDL plan development, and collects water quality data that it makes available to its townships. East Bradford Township also receives water quality monitoring support from the *Stroud Water Research Center*, which runs citizen science monitoring programming with a focus on Plum Run.

East Bradford officials are working with *PA DEP* on the development of TMDL plan for reducing sediment pollution, as well as on their overall Municipal Separate Storm Sewer System (MS4) permit.

*Upstream municipalities*, such as West Chester Borough, West Goshen Township, and Downingtown Borough, are key players in addressing sources of stormwater runoff. East Bradford Township is interested in collaborating with these and other upstream municipalities in the Brandywine Creek Watershed on watershed-wide efforts.

restoration. Stream restoration projects can improve water quality by filtering pollutants from overland flow and reducing stream bank erosion and associated sediment loading. The township's projects include stream bank re-contouring, followed by re-vegetation with native grasses, wildflowers, trees, and shrubs.

The township is working to restore its stream banks in partnership with several entities, including the Brandywine Red Clay Association. This organization supports restoration of the Plum Run, which originates in West Chester Borough and flows through the township before entering Brandywine Creek, through an initiative referred to as "Red Streams Blue." The initiative is so named because it aims to restore streams from an impaired (red) status to an un-impaired (blue) status. The Brandywine Red Clay Association is also conducting a National Fish and Wildlife Foundation funded TMDL pilot project to develop stream restoration strategies for urban, suburban, and agricultural use areas.

Where opportunities exist, additional stormwater volume storage can be restored when fill is removed from floodplains. Legacy sediments associated with historical mill pond dams are reported to be present in the township.

**Other TMDL Implementation Projects:** In addition to stream bank and flood plain restoration, the township has proposed other categories of projects, including stormwater basin retrofits; redevelopment strategies, where the township had developers over-control runoff from development projects in order to obtain stormwater management credits; and tree planting in riparian buffers.

The township reported it has completed nine projects that are included in its TMDL plan, which gets it to 20 percent compliance with its required sediment reduction loads. It is considering re-adjusting the proposed TMDL plan to "parse out" areas that do not discharge into its storm sewer system, understanding that this action could boost it to 50–60 percent of its required sediment reductions. If it "parses out" land from which runoff does not discharge into its MS4 storm sewer system, the township will not have to calculate pollutant loading or consider sediment reductions from these "parsed out" areas.

One point of controversy raised by the township is that the amount of sediment reductions required for its TMDL plan is higher than reductions required for similar upstream municipalities; PA DEP requested that extensive stream restoration projects (nine miles of projects) be included in the township's TMDL plan. The township recognizes it has stream bank restoration opportunities on its preserved lands, and it is willing to collaborate with partners, including the Brandywine Red Clay Association and upstream municipalities, on the projects. As noted previously, township officials are concerned about the scale and cost of stream bank restoration being placed under their TMDL responsibility.

The township is also concerned about the time and resources needed to get the required permits for stream bank restoration projects, noting that the process should be streamlined to make it easier to get restoration permits. Overall, the township reports that it does not have the funding to comply with PA DEP's stream restoration target (the nine miles will cost approximately five million dollars), and requests that the agency be more open-minded in identifying a workable solution.

**Stormwater Financing:** Several themes were raised by the township related to financing stormwater and stream restoration projects.

The first is the overall challenge of funding the projects. The township is concerned with the potential costs associated with its TMDL requirements for stream restoration. It views the cost of restoration as a steep financial challenge, noting that restoration and retrofitting costs are not incorporated into the township's budget. It has received grants to do projects, especially through partnerships with the local watershed non-profits, and views additional grant funding as essential. It has achieved some water quality improvements through new construction and redevelopment.

The township is open to establishing its own sources of funding, such as through stormwater fees. Officials recognize the political challenges associated with new fees; residents may view the fees as a tax, or fail to recognize PA DEP as the body spurring the township to raise fees, which helps give the township political cover.

The township is also interested in incorporating stormwater credits as part of its TMDL planning. For example, it would like to be able to collaborate and share costs with other entities in East Bradford on projects in their own township (for example, a stream restoration project) or with upstream municipalities within that municipality's jurisdiction (for example, a runoff reduction project). In this situation, the most cost-effective projects can be prioritized at a regional scale, and each party receives partial credit. The township would also like to know more about how PA DEP determines credits for different project types.

Another finance issue is private landowners' inability or unwillingness to pay for streambank planting projects, and even more critically, their long-term maintenance. Township landowners currently access state Treevitalize funds for streamside plantings. Another incentive program is the Conservation Reserve Enhancement Program (CREP) run by the U.S. Department of Agriculture, which funds stream planting projects on private land. CREP allows property owners to rent their land for a period of time and be reimbursed for the cost of restoration and associated maintenance. Triple-bottom-line incentives such as improved property values can be highlighted to encourage landowner participation.

Another proposal is to create a municipal funding program for riparian buffer improvements that covers both installation and maintenance. Townships typically do not have budgets for maintenance activities such as removing invasive vines, protecting buffers from deer, and uprighting trees after flooding. It is often difficult to maintain volunteer programs for such maintenance. The township suggested a streamlined, municipal-only buffer restoration grant program.

**Multi-Municipal Collaboration:** The township is located midway down the Brandywine Creek Watershed, where the East and West branches converge. The township has implemented an array of conservation and stormwater management programs within its jurisdiction and is considering how to address upstream sources of runoff that have a detrimental impact on township resources. The township is willing to work with upstream partners, and is exploring collaboration options. A key issue is how the township can receive credit for upstream investments.

**Changing Public Attitudes:** Another theme raised by township representatives is the need to provide education and outreach programs to shift public attitudes toward land management (for example, changing preferences for turf lawn to appreciation for native landscapes). Since paved surfaces and compacted turf grass landscaping are major causes of increased stormwater runoff, there needs to be a shift to a broader public acceptance of meadows, rain gardens, and forested stream banks. It was noted that this change in

public attitudes and aesthetics may be generational, and may come about as people see successful restoration projects.

It was also reported that while people generally “support water quality,” they do not fully understand how to protect water quality. The general public tends to be reactive, meaning they will not address water quality issues until directly affected (for example, their tap water is polluted, there is neighborhood flooding, or they receive a stormwater bill in the mail). As such, it is hard to win over broad audiences unless a specific action is required. In the case of a new stormwater fee, residents need to understand that the fee they are paying is addressing larger issues (the township’s entire ecosystem and risks to long-term watershed health) in addition to the issues that directly impact them (which may include local flooding and stream bank erosion).

The township expressed a desire for an outside party to help provide programming on community-wide best practices to educate homeowners about water quality issues and solutions.

### Progress to Date

One of the case study interviewees suggested several key practices for a successful municipal conservation and water quality protection program, including land protection, agricultural programs that protect streams, and strong stormwater development ordinances. This interviewee noted that such practices should be implemented early in development trajectories before the “tipping point” to water quality impairments occurs. Before the tipping point occurs, a healthy watershed can deliver ecosystem services such as clean water and healthy streams. But without a commitment to sustainable development, ecosystem services are degraded and the cost to restore them increases as unsustainable land development practices continue.

East Bradford Township has been implementing proactive land conservation, natural resource protection, and stormwater management programs. Motivations for these actions may be attributed to a number of factors, ranging from goals to protect open space and create parks for residents, township concerns about flooding, and township requirements to comply with water quality regulations. A tipping point has been reached in the township, with some (but not all) of the stream corridors impaired. A pathway to successful restoration is open through the implementation of sound redevelopment and development practices, and restoration efforts implemented through watershed-wide TMDL plans.

The timeline for achieving water quality restoration goals is driven by the township’s MS4 permit cycle (typically five years), during which PA DEP requires a certain percentage reduction in pollution loading from storm sewers into local impaired waterways. Several permit rounds will likely be required before water quality restoration goals can be met in the township and across the watershed.

### Barriers to Overcome and Potential Solutions

The township has made great strides in the effort to protect and restore water quality, but barriers remain in the path toward water quality and watershed health. Key barriers and potential solutions include:

**Better Understanding of How Sediment Load Reduction Requirements Are Determined:** The township is concerned with the scale of stream restoration being proposed by PA DEP for the township’s TMDL plan. It has raised issues of fairness in the manner in which TMDL sediment load requirements have been apportioned to it and other municipalities. It wants to determine a way forward that results in positive, incremental progress in improving water quality in a manner that addresses multi-municipal stormwater flow. The township and PA

DEP need to discuss and resolve the fairness issue raised by the township, and establish TMDL project goals and timelines that result in steady improvements in water quality at costs that the township can sustain.

**Better Understanding of How Restoration Projects Are Credited:** The township has asked for clarification on how stormwater and stream restoration projects are assigned pollutant reduction credits. Pollutant removal efficiencies are available for general project categories (e.g., they are cited in the PA DEP *Best Management Practices Manual*, and in the general literature). PA DEP is moving toward a Performance Standard approach to calculating pollutant reduction efficiencies that relies in part on site-specific conditions (for example, drainage area and storage volume). Guidance on this approach was provided by PA DEP at recent Pollutant Reduction Plan (PRP) training in Fall 2016.

**Streamlining Collaboration:** The township is interested in collaborating with upstream municipalities on stormwater runoff reduction projects and is exploring financing options for projects both inside and upstream of the township. The recent PA DEP workshop on how to prepare PRP/TMDL plans provides direction on where such project collaboration may occur. The guidance allows municipalities to share credits for projects that are located within a common drainage area, and a municipal agreement must be established to enable credit sharing.

**External and Internal Funding:** The township is exploring both internal and external funding sources. Its collaborations with the Brandywine Conservancy and the Brandywine Red Clay Association have led to the successful procurement of grant funds. The availability of open space land is a factor (i.e., projects with site control and a willing landowner are more eligible for grant funds). The use of riparian buffer planting funding programs such as CREP would also benefit restoration efforts on private land.

The township is open to self-financing in the form of stormwater fee programs. Its upstream neighbor West Chester Borough recently passed such a fee program.

**Raising Awareness and Changing Perceptions:** The township recognizes the need for increased public awareness of how residents can contribute to clean water programs. This includes increased awareness of watershed-wide water quality issues and a broader acceptance of green stormwater management practices. The township is interested in water quality education and outreach programs that are targeted to homeowner and property manager audiences. Continuing efforts in this area are needed to boost the number of landowners who are open to managing water on their own properties, and residents who are willing to accept a stormwater fee. Constituents who understand and work to improve water quality will more likely support elected officials who propose municipal finance options.

### Motivating Factors

**Flooding:** Riverine flooding from storms has damaged local infrastructure and caused erosion.

**Local Champions:** Township staff, residents, and elected officials support the concept and the practice of improving water quality, and are devoting time and energy to determining solutions.

**Regulatory:** U.S. EPA and PA DEP discharge regulations requiring water quality improvements.

**Local Partners:** Partnerships developed with the township by diverse groups, such as the Brandywine Conservancy, the Brandywine Red Clay Association, the Stroud Water Resources Center, the Chester County Water Resources Authority as well as others mentioned herein, have contributed greatly to progress in East Bradford.



**Replicating Good Land Use and Stormwater Management Practices:** East Bradford Township has exhibited leadership in adopting sound land conservation, natural resource protection, and stormwater management ordinances. The replication of these practices in other municipalities will enable the achievement of broader Brandywine Creek Watershed restoration goals.

### Sources

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