From Part of the Problem…
…to Part of the Solution

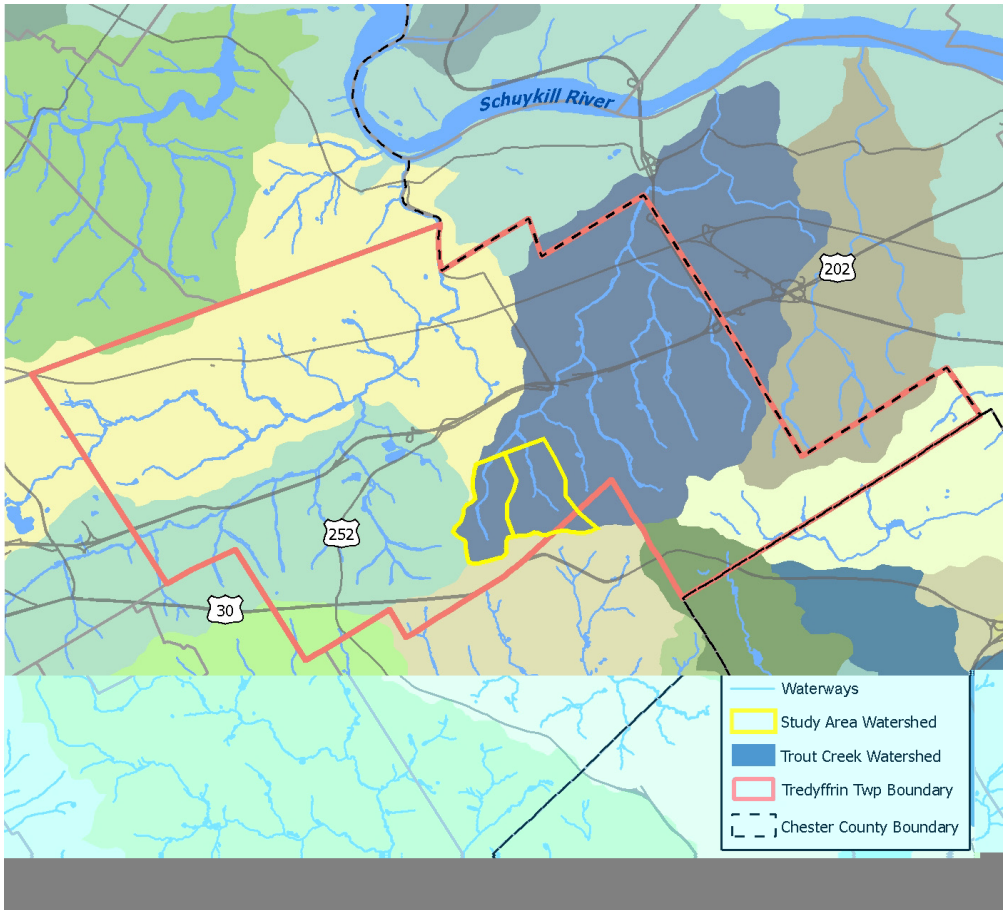
Becoming a Good Watershed Citizen through Stormwater Retrofitting:

Front Yard/Back Yard Watershed Solutions

Everyone lives in a watershed, which contains all the land surfaces from which water drains into stream and river channels. Tredyffrin Township is comprised of a variety of watersheds, including the Trout Creek which flows into the Schuylkill River. Trout Creek has problems, both in terms of water quality and water flows, with most of these problems linking to the changes brought about by the development which has proliferated in the Township – development which has lacked proper stormwater management practices. Since these residential developments were constructed, stormwater management regulations have been created and revised to consider controls, such as volume, peak rate, and water quality. Redevelopment and new development in this watershed as well as throughout Tredyffrin Township now incorporate stormwater management measures that address runoff.

The good news is that there is much that each of us can do to remedy (or retrofit) these problems, lot by lot, home by home. This brochure describes how **you**, as a homeowner, can do your part to integrate Best Management Practices (BMPs) into your yards – and hopefully make your home more usable, attractive, and even more valuable while helping the watershed and broader environment at the same time.

Trout Creek Watershed Study Area within Tredyffrin Township



The Township's storm drainage system is very important in keeping runoff from flooding roadways and damaging property. The inlets in the streets are interconnected by piping and eventually discharge to a larger pipe, which then discharges into a stream or drainage feature.

The Trout Creek Watershed has been the subject of numerous stormwater management studies, including
Trout Creek Watershed Restoration and Protection Plan (2004)
Trout Creek Study and Design Project (2007-2008)

The Trout Creek Watershed Problem

In March 2005, Tredyffrin Township submitted a successful Growing Greener grant application to the Pennsylvania Department of Environmental Protection (PADEP). This work, the Trout Creek Watershed Streambank Restoration Design, is intended to take the next steps in implementing the previously-prepared Trout Creek Watershed Restoration and Protection Plan (The Ratsep Group June 2004). The Design includes a variety of work elements, including preparation of this educational brochure which targets "…resident involvement and education."

This brochure is intended to encourage residents to participate in a voluntary program of lot-by-lot stormwater Best Management Practice (BMP) retrofitting. The BMPs are designed to be undertaken largely by homeowners on already-developed residential parcels. The BMPs work to disconnect and distribute existing stormwater runoff into back yard and front yard patios, driveways, walkways, rain gardens, and related "opportunity areas" – they put precipitation back into the ground, whenever feasible, rather than collecting and concentrating it into pipes. The educational goal of the brochure is to communicate to owners the important role that each home plays in watershed problems (From Part of the Problem…), and how owners can reduce and mitigate these problems through their own actions (…to part of the Solution…). In many cases, these watershed solutions can be integrated into already planned home improvement projects – a "two-for-one" benefit, which enhances the value and usability of each home, while reducing stormwater problems incrementally.

• Many homes in the Trout Creek Watershed have very steeply sloping yards.

• Yards that are planted with turf grass tend to be more compacted.

• Stormwater runoff from grassed yards adds to the flooding problems we see in Trout Creek.

Minimally stabilized lawn along Old State Rd.

Trout Creek flooding

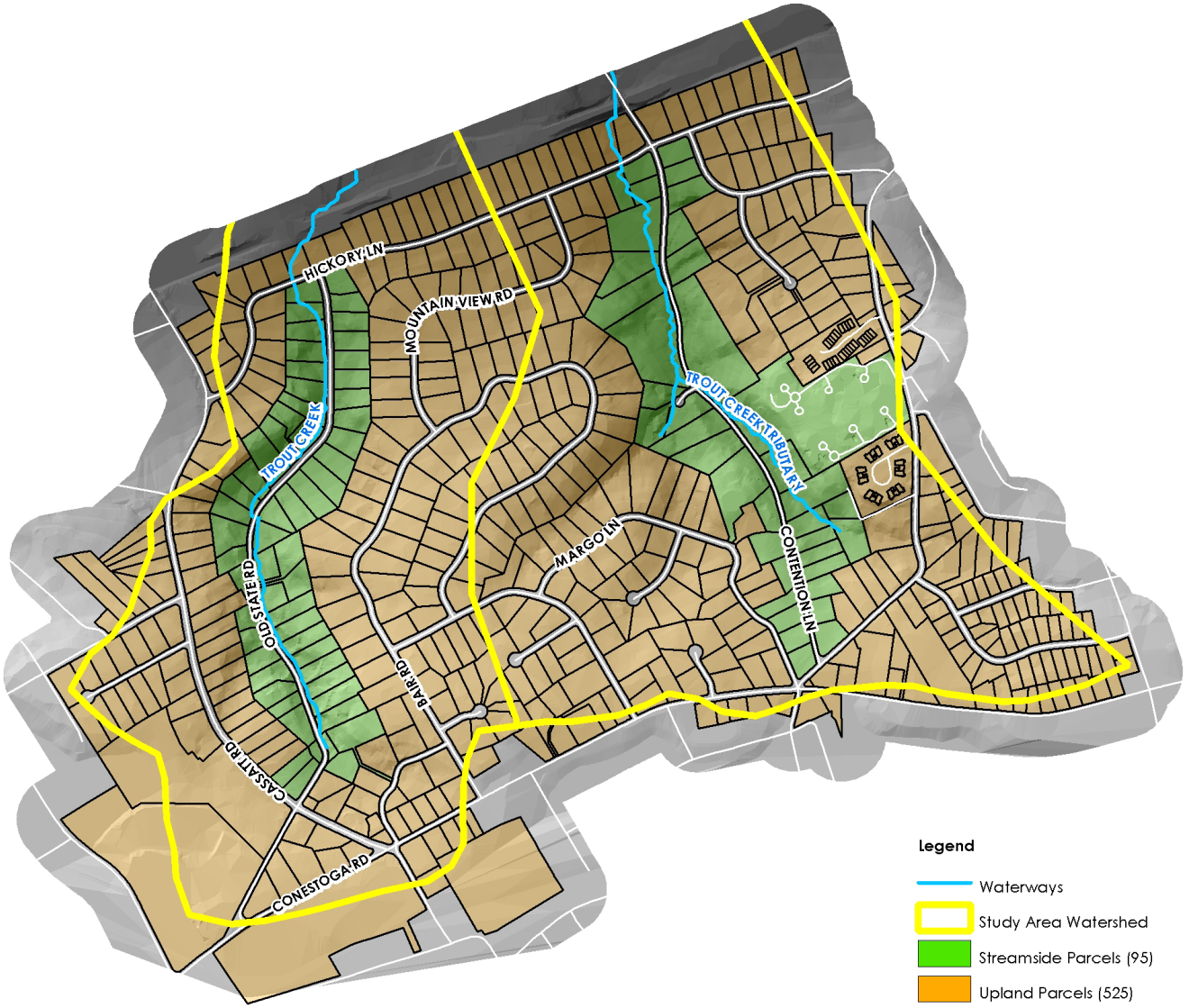
Images: Cahill Associates, Inc.

- *There are 95 parcels along Old State Road and Contention Lane, that drain directly into Trout Creek and it's tributary.*

- *There are over 600 parcels in our study area that ultimately drain into the headwaters of Trout Creek.*

- *We all have to do our part to make a difference in the health of Trout Creek.*

Trout Creek Watershed Study Area - Basemap



Background and Context of the Watershed Problem

Trout Creek, a tributary of the Schuylkill River, is a stream which has been heavily impacted by development, as is the case for many streams in Tredyffrin Township and older Mainline communities. Older, single-family residential developments, which were not originally designed with much stormwater planning have proliferated and resulted in major changes to the natural hydrology of the watershed system. In some cases, basic stormwater collection/disposal systems have been constructed. These are mostly inlets and pipes, typically in street/roadway rights-of-way, and are owned and maintained by the Township in many cases. The functions of this stormwater collection system, however, are extremely limited, as they focus on the rapid removal (i.e., "disposal") of the stormwater runoff to points downstream. Such "traditional" stormwater systems provide little control of volume, water quality, or peak rate. Downstream flooding tends to increase, since upstream piping and channelization allows more water to get downstream in more quickly. The way the streams flow when it rains and when it's not raining – the natural hydrologic regime - has been significantly impacted, lot by lot, house by house.

Trout Creek above Hickory Lane

Properties along Old State Road have very steep driveways and front yards

Images: Cahill Associates, Inc.

Watershed Problems and their Causes

Taken individually, impacts from any one home on any one lot seem marginal, barely even detectable. Taken together as part of a total watershed system, impacts accumulate and become much more serious. Total volumes and peak rates of runoff have increased for the frequent small storms as well as for large storms. Water quality has suffered. Severe channel erosion and undercutting, increased flooding, declining stream baseflows and a lowered water table, dried up wetlands, impacted aquatic communities and other problems are now all too common. In sum, many portions of Tredyffrin and surrounding areas suffer from serious stormwater management problems. Based on inventory and analysis performed as part of the Trout Creek Watershed Restoration and Protection Plan, these problems are especially severe in two small tributaries of Trout Creek, the Headwaters of the Main Branch paralleling Old State Road and the Contention Lane Branch of Trout Creek. Similar problems are documented throughout the Trout Creek Watershed. Methods like the BMPs in this CD are ways that **you can help** combat this problem.

Many homeowners have installed "rip rap" treatments to manage the harmful effects of stormwater runoff...

...but another way to manage the problem is to fix it at the source - right on your own property!

Images: Cahill Associates, Inc.

Township Role

Tredyffrin Township, through its professional staff and its related agencies and agents (such as the Environmental Advisory Council and PA Department of Environmental Protection), is sponsoring this brochure and this Trout Creek retrofitting program. Staff are available to answer questions, technical and otherwise, and provide modest levels of guidance to homeowners. At the same time, the program is heavily dependent on individual homeowner action and initiative. In this sense, as with so many Township efforts, the goal is to solve problems through a public/private partnering which maximizes individual actions and public benefits.

Watershed Solutions

What You Can Do! From Part of the Problem to Part of the Solution - Becoming a Good Watershed Citizen through Retrofitting Front Yard/Back Yard Watershed Solutions

Understanding the problem is essential to understanding the solution. In these headwater tributaries of the Trout Creek Watershed, as well as throughout broader watershed areas, large-lot single-family residential development now occupies the bulk of land area. The impervious surfaces created on these lots, as well as the compacted lawns which have followed, have translated into significant reductions in natural infiltration which occurs in the undisturbed forest floor. Runoff volumes and rates also increase - more water running off and running off faster!

What can be done? Since the watershed problem is being caused by existing homes, the watershed solution must focus on homeowners (there are precious few open space opportunities for area-wide stormwater solutions to be developed). There are approximately 95 residential properties located immediately adjacent to the headwater Trout Creek tributaries. In addition, approximately 500 properties also drain to the identified Trout Creek tributaries indirectly.

What can be done to reduce - maybe even solve - stormwater related problems which plague the watershed?

Every home in the watershed contributes to watershed problems...

...and every home in the watershed can contribute to watershed solutions.

Image: Cahill Associates, Inc.

Existing residential properties can be retrofitted with any number of different types of BMPs. BMPs can be integrated into front yards or back yards, making homes more livable, more valuable – while addressing a portion of the existing stormwater problems. In most cases, there are a variety of actions which can be taken which will make each lot more like it was before development occurred - more absorbent and sponge-like. For example:

1. Integrate infiltration-oriented BMPs into driveways, walkways, patios and other existing impervious areas, as appropriate.
2. Integrate capture/re-use rain barrels and cisterns to reduce runoff and reduce water supply needs.
3. Integrate vegetative BMPs, such as rain gardens and vegetated swales and filter strips, into the lot as appropriate.
4. Integrate more comprehensive re-forestation/native landscaping themes into the lot, as appropriate.
5. Apply native riparian plantings along stream banks

One home can make an impact to the overall health of the watershed.

Consider installing as many BMPs on your property as possible!

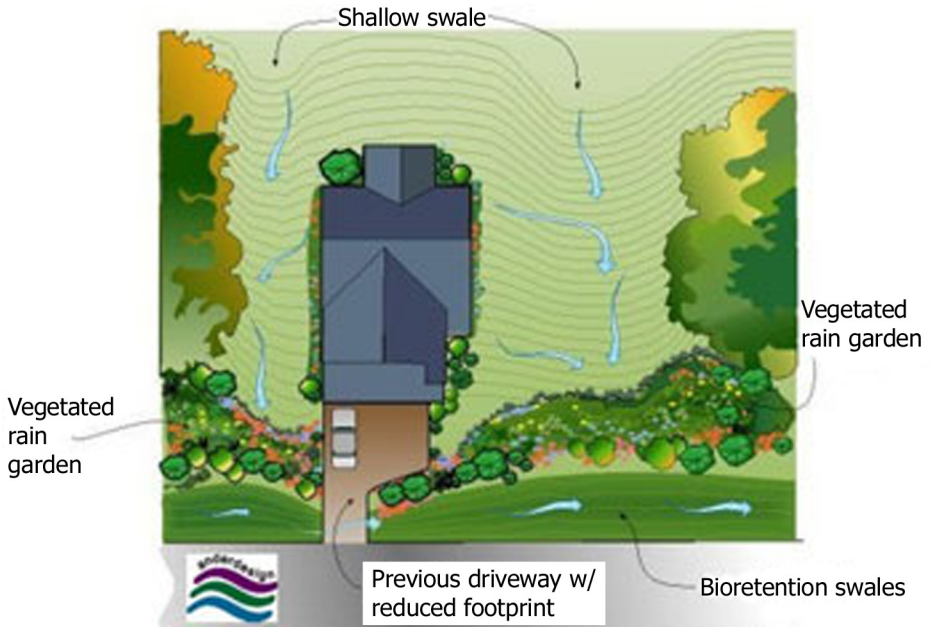


Image: Pierce County/WSU Extension, with modifications by Cahill Associates

These retrofitted stormwater solutions vary with different lot conditions and site conditions. Homeowners need to be given guidance in order to pick what will work best. Clearly, important considerations will relate to:

- ease of maintenance
- ease of development (slope, vegetation, soils, other natural features)
- cost
- aesthetics
- other user factors.

This guidance – and more – can be found in this brochure.

Important Homeowner Objectives

Reliance on individual homeowner action wouldn't work in every neighborhood. Fortunately, Trout Creek residential neighborhoods, like so much of Tredyffrin Township, continue to thrive. Housing values have more than kept pace with regional and State averages. Home improvements occur frequently, often being reflected in increased home values. Although this trend might present troubling challenges in other contexts, one positive manifestation is that homeowners are apt to make substantial improvements in their homes, confident that any additional investment will be more than returned in the long run. At the same time, household incomes have risen, and many homeowners are able to afford (if reluctantly) a variety of home improvements (of course, there are exceptions!). Simultaneously, Tredyffrin's residential neighborhoods appear to be remarkably tightly-knit and civic-minded. One might expect an especially strong response to civic-minded and environmentally-spirited overtures, including the mitigation of long-recognized stormwater problems plaguing the watershed. And finally, the thrust of this program – each individual home – makes sense in terms of equity. **If each home is contributing to the problem, each home should help to solve the problem.**

Important Technical Issues

A large number of developed residential lots, usually at least 1-acre in size, characterize Trout Creek and these specific tributaries of Trout Creek. This residential retrofitting program and this brochure are built around the concept of disconnection and distribution of runoff at the source –each home. If rooftop and other impervious area runoff can be disconnected and re-directed into a variety of volume control "opportunities," lot by lot and house by house, designed for at least the smaller storms (not the hurricanes), the cumulative impact of this "shaving" of runoff flows from the combined routing of the stormwater collection system will be significant. 1) Downstream flooding problems will be reduced; 2) Groundwater recharge and stream base flow will be moderated and enhanced; 3) Given the dozens of parcels which comprise these sub-basin areas and the hundreds in the Trout Creek Watershed, even modest participation by watershed homeowners can provide meaningful levels of stormwater flow reduction.

Important Site Variability Factors

This disconnection and distribution of runoff will have to happen at each lot. The feasibility of individual BMPs depends on a number of site factors, including lot size, existing impervious cover, slope and topography, existing vegetation. All of the site factors are coupled with existing stormwater runoff conditions based on these factors. Oftentimes, observing your property in the midst of a rainstorm is a wonderful way to characterize and understand the way stormwater flows on your property! Consider the following questions based on your observations:

Site Variability Questions:

1. Characterize the nature and extent of your site's stormwater flow. Where does existing water flow when it rains?
2. What is the total property size and location?
3. What percentage of your parcel is paved or covered with a hard surface, like a rooftop or driveway?
4. How does your property drain currently?
5. How much of your property drains into a storm inlet? Where do you think the storm inlet discharges?
6. What land cover types (grass, woodland, driveway, rooftop) drain to these inlets?
7. How many downspouts outlet water from the roof? Where does this water runoff go?
8. Are there areas of concentrated stormwater flow, such as streams, channels, or pipes?
9. Are there areas of known flooding problems on your property, or downstream from your property?
10. Are there any soggy areas that are constantly wet, even in dry weather?
11. Are there locations that pool or pond during storms? For how long?
12. What percent of your site is vegetated with undisturbed wooded areas, trees, undisturbed meadow, planting beds, grass, etc.)?

These site variability factors do not require advanced degrees or specialized training to address. Virtually every homeowner is capable of responding to these questions with useful answers. The questions are important in that they provide meaningful guidance in the selection of the BMPs included in this brochure.

Potential BMPs: Ways to Retrofit in your Front Yard or Back Yard

Once a reasonable attempt is taken to understand the nature and extent of the existing stormwater runoff problem at the home, the homeowner should begin to think about solutions, ideally relating stormwater solutions with already-planned home maintenance and improvement projects. Sometimes, these retrofit BMP solutions can be planned in the front yard of the home, sometimes in the back yard, or even side yards. The list of possible solutions - disconnection options - is impressive:

- Rain Garden
- Vegetated Swale
- Dry Well
- Subsurface Infiltration (under hardscaping)
- Infiltration Trench
- Planter Box
- Rain Barrel
- Riparian Buffer Plantings
- Native and Landscape Restoration

Most of this brochure is devoted to explaining each of these BMPs, what they are, what they can do for you, how to install them at your home. Each BMP description includes the following information:

- **Description of BMP**
- **Benefits (volume reduction, flow reduction, water quality improvement)**
- **Cost Considerations**
- **Ease of Development/Construction**
- **Aesthetics**
- **Township Review (if necessary)**
- **Site Constraints or Limitations**
- **Variations**
- **Maintenance**

Although some homeowners may be motivated to undertake BMP retrofits simply to mitigate stormwater problems, this retrofit program revolves around the notion that owners are already considering home and yard rehab projects. **If a homeowner intends to undertake a project anyway, and if the stormwater elements can be reasonably and efficiently integrated into the overall project design, then they might incorporate stormwater BMPs into their project designs.**

Defining what the owner wants to do in the way of project improvements is important in order to make the best fit possible between owner needs and stormwater needs:

Homeowner Rehab Projects that could link to Stormwater BMP Retrofits

Hardscaping	Softscaping
New Driveway?	Screening, Buffering, or Shading?
New Patio?	Aesthetics or Curb Appeal?
New Walkway?	Gardens: trees, shrubs, etc.
Other?	Other?

Additional Resources

This retrofit CD is being brought to you by Tredyffrin Township with a Growing Greener grant funded by the Pennsylvania Department of Environmental Protection. This CD is intended to provide conceptual level guidance only, which can be used by owners to get started. Tredyffrin Township maintains a professional staff, including an in-house Township Engineer, who can answer your questions and/or discuss your project.

You may choose to hire professional contractors for your project depending upon its nature and size. On the other hand, many of these frontyard/backyard actions can be planned and developed by folks who do not have professional training or experience – just a decent amount of energy and common sense.

We would note that major project additions may trigger certain Township requirements in the Subdivision and Land Development Ordinance or in other Township ordinances, specifically new or redevelopment of impervious surfaces over 500 square feet. This brochure does not waive any of these requirements! When in doubt, call the Township at (610) 644-1400.

This CD provides guidance relating to individual BMPs and includes pictorial examples of BMPs constructed. Unit costs are estimated and should not substitute for a homeowner's estimate of likely cost - make sure that you do enough research to minimize surprises during your design and BMP construction. Maintenance requirements are provided so that the homeowner understands the short-term and long-term maintenance that may need to be considered. The Additional Resource section (accessed via the Main Menu) includes literature, examples, web sites, and brochures that should be consulted by the homeowner.

Good Luck!