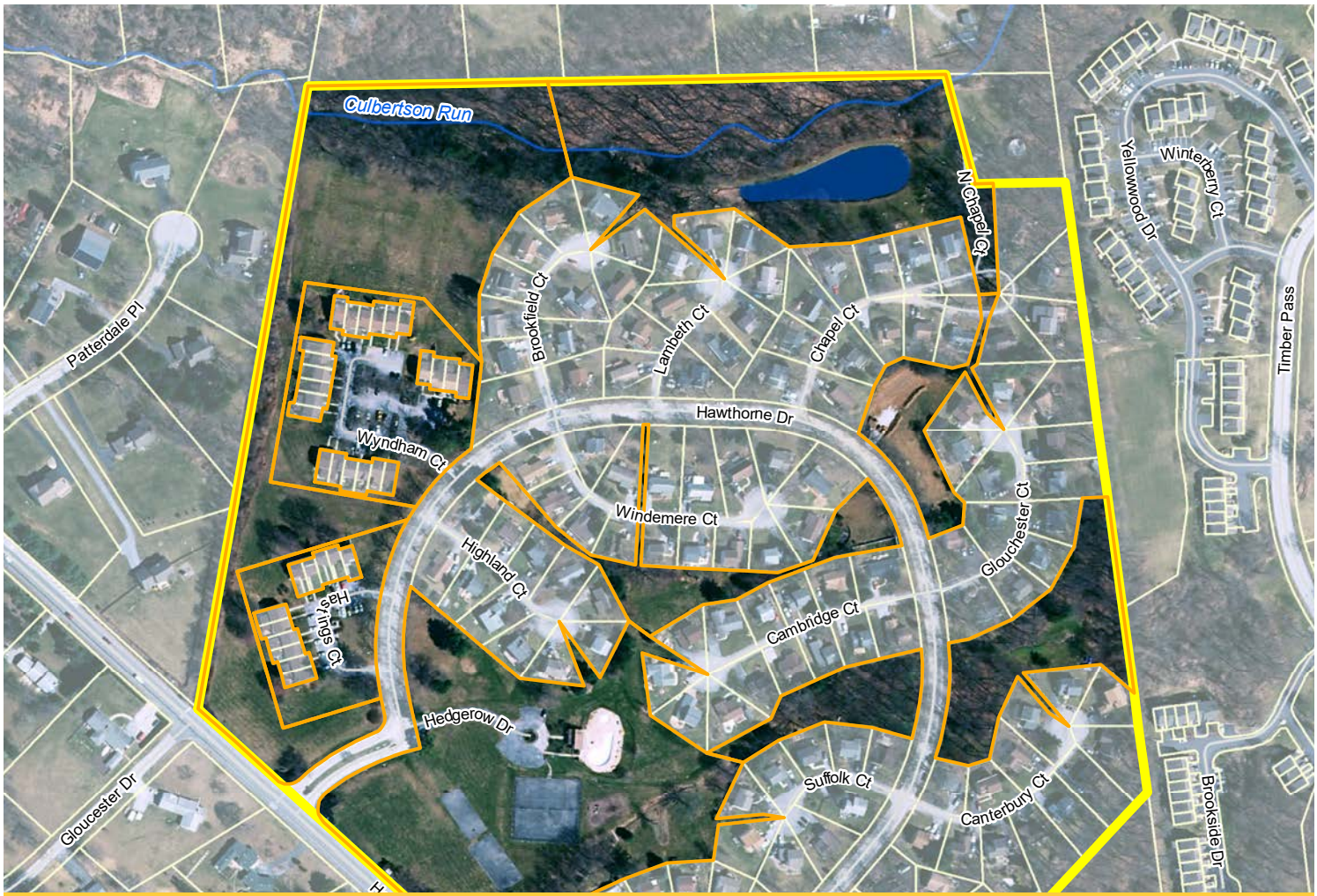

Hedgerow/Culbertson Run HOA

EAST BRANDYWINE TOWNSHIP, CHESTER COUNTY, PA

stormwater management assessment & recommendations

June 2020

BRANDYWINE CONSERVANCY

Natural Lands

background

Scott Piersol, Manager of East Brandywine Township, was contacted by the Hedgerow Culbertson Run HOA regarding concerns regarding stormwater runoff and flooding on their property. Natural Lands and Brandywine Conservancy visited the site the evening of August 13th, 2019. The property was toured with Mike Mize, the HOA President, Scott Piersol, and others from the HOA Board. Natural Lands submitted a proposal for site assessment and recommendations, which was approved by the HOA in October 2019. Natural Lands again visited the site in January of 2020 during a significant storm event to observe runoff patterns and issues. This report is based on the items as stated in the proposal, as well as the results of discussions, mapping and site visits.

field assessment & mapping

East Bradford purchased the 7.6-acre Birmingham Tract Natural Lands conducted two field visits in August of 2019 and January of 2020 in order to assess existing site conditions. Specific observations included the following:

- Property boundaries
- Runoff and drainage patterns
- Existing vegetation

The entire property was mapped, including topography, hydrology and soils, and existing conditions and structures. These are included within the drawing set ***(see Maps)***.

The development site slopes steadily and in some case steeply to the north, with the majority of site runoff draining towards Culbertson Run, although in the eastern portion of the site, runoff is collected in a swale that drains into

an unnamed dry detention basin just north of Canterbury Court which then drains off-site. The also site collects water from adjacent properties and roads.

Soils are primarily considered impermeable urban land (UrmB type) but along the east and northern boundary of the site there are Gladstone (GdB, GdC and GdD) and Cokesbury (CaB) type soils which are considered to be well-draining.

While much of the public areas are mown grass, there are woodland areas. The majority of woodlands in public areas contain invasive species: trees, shrubs, and groundcover/ grasses.

issues identified

- During significant storm events, many areas of the development experience significant issues with stormwater runoff, including flowing water channels, sheet runoff, and flooding. Due to existing site topography, individual homeowners attempting to solve runoff issues on their own property often affect properties below. The majority of runoff collects in either the non-functional dry detention basin to the east, or the Chapel Court wet retention basin to the north.

- An existing swale running through the property from Route 322 no longer effectively directs water flow through the HOA site. Water is forming new runnels and channels and saturating the rear yards of individual properties and flooding the existing woodland area at the eastern boundary of the development, ***photo 1*** and ***photo 2***. A non-functioning dry basin adjacent to the far east boundary of the property collects most of this runoff, leading to issues with standing water, saturated soils and insects, ***photo 3***. Observation of damp soil and ruts from attempted mowing around and within the basin show evidence of difficulty with ongoing maintenance.
- The lawn area and communal space between Route 322 and the HOA Clubhouse, to the south of the entrance, is underutilized, with drainage issues and standing water adjacent to the tennis courts, ***photo 4***.
- The Chapel Court Basin to the north end of the property is in need of maintenance, ***photo 5***.
- Excess runoff from properties above the Chapel Court Basin contribute to flooding and wet soils around the basin area.
- The development is affected by runoff from adjacent roads and non-HOA properties.

- The large open space area north of Wyndham Court in the northwest of the development is underutilized and requires planning *(not addressed in this plan)*.
- Many homes experience runoff issues from the roadways throughout the HOA *(currently being addressed by others)*.

recommendations

entire development site

on-site management/education – introduce educational program and potential rebate program for homeowners in order to promote on-site stormwater management on individual properties. The purpose of on-site practices is to help reduce the volume and peak of stormwater runoff at its source, improve water quality by filtering runoff, and increase the infiltration of rainfall by retaining stormwater to slow its discharge into sewer systems, nearby waterways, and adjacent properties. Costs can range from $3–10 per square foot. Placement and design are important elements that will influence effectiveness of these elements. The more that stormwater is mitigated on individual properties, the less will be running through the development and causing flooding or other issues. Examples of recommended practices are as follows:

rain gardens – planted landscape depressions that retain and filter stormwater in order to allow rainwater runoff from impervious areas such as roofs, driveways, walkways, patios and compacted lawn areas to be absorbed and infiltrated. Landscaping can be designed to be beneficial both aesthetically and ecologically, ***photo 6***.

bioswales – swaled drainage courses with gently sloped sides filled with vegetation, compost and/or rip-rap, designed to maximize the time water spends in the swale. This aids in the trapping of pollutants and silt from adjacent impervious areas, and encourages infiltration. Landscaping can be designed to be beneficial both aesthetically and ecologically, ***photo 7***.

disconnected downspouts – in many developments downspouts from individual homes are connected directly to a collective storm sewer system. During major storm events, these systems can overflow and contribute to flooding. Downspouts can be connected to rain barrels

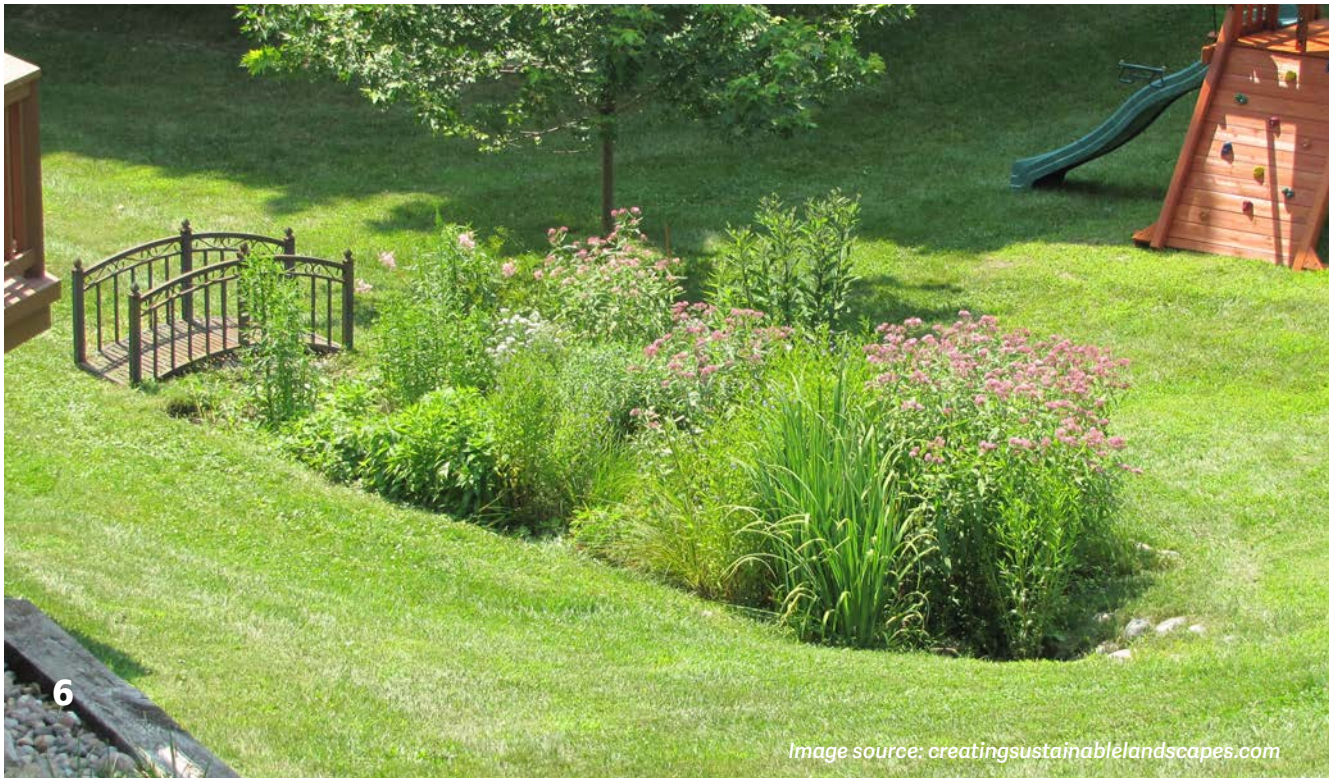

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Image source: creatingsustainablelandscapes.com

to provide onsite water storage for later use. They help conserve water, reduce discharge into storm sewers, and they provide free water for the landscape. Downspouts can also be disconnected entirely and allowed to discharge over pervious land areas which will allow the rainwater to infiltrate. Although this will contribute to more runoff water on the property, the use of a rain garden will mitigate these effects.

permeable paving materials – Using permeable paving materials to replace impervious driveways, patios, and walkways is likely to be the most expensive option. There are several options ranging from gravel to porous concrete to interlocking pavers, based on budget and aesthetic preference. Pervious paving allows for water infiltration on what would otherwise be an impervious surface, such as drives, walkways or patios, ***photo 8*** and ***photo 9***.

meadow conversion - Typical lawn areas do not infiltrate water as well as meadow-type plantings. Underutilized lawn areas could be converted to meadow.

off-site management – from observation, it appears that significant stormwater runoff is entering the site from off-site sources. It is recommended that the HOA speak with East Brandywine Township about potential reduction of off-site stormwater entering the site from 322 and other adjacent properties. If possible, the same residential stormwater management education as suggested earlier could be offered to adjacent homeowners.

existing swale

The existing swale that runs northeast through the site no longer adequately channels stormwater through the site and to the intended dry detention basin just north of Canterbury Court. Historically, there was a channel running through the grassy area, leading northeast from 322 to the wooded area below. Residents recall that its banks were planted and the channel itself was rock-lined. Over time, runoff has increased and sedimentation has all but eradicated the channel. Stormwater runs downhill via a myriad of naturally forming channels through a mowed lawn area which affords little means of slowing or infiltrating runoff. The length of the swale is divided into several specific zones, with associated recommendations ***(see Concept Plan)***.

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Image source: Stormwater Commission, Lake County, IL

8

Image source: Houzz.com

9

Image source: Belgard Pavers

upper open grass area

For the upper open grass area, several solutions are recommended:

- ***installation of weirs*** – weirs (ornamental landscape stone or riprap) will allow more space for slowing flow rates and increasing retention and potential infiltration of runoff, reducing the amount and rate of flow downstream, ***photo 10***, ***photo 11***, and ***photo 12***. Ponded areas behind the individual weirs can be landscaped to increase aesthetic and ecological value for the landscape within the development, and also to help manage runoff (*no image available)*.
- ***native riparian buffer planting*** – the existing turf the stormwater runs through and across has no ecological or stormwater management value. Replacing some of the adjacent turf areas with planted native riparian buffers will serve to increase aesthetic and ecological value, as well as provide further ability to treat stormwater runoff, ***photo 13***.
- ***expanded swale depth and width*** – in addition to weir installations, the swale needs to be widened, with gently sloping banks planted with native riparian shrubs, grasses and trees, ***photo 14.***

10 *Image source: Meliora Design, Cliveden Park*

11 *Immaculata University, Malvern, PA*

12 *Immaculata University, Malvern, PA*

- ***invasive species management and removal*** – the heavily overgrown area adjacent to 322 should be cleared of invasive plant material and replanted with appropriate native material if possible. The area should be regularly monitored and managed for invasives.
- ***meadow conversion*** – where not required/desired, turf areas can be converted to lower maintenance, more ecologically beneficial meadow areas. Meadow grass areas are better able to slow and infiltrate stormwater and will reduce the amount of runoff running into swaled areas and into the property from 322, ***photo 15***. They also require less frequent mowing.
- ***installation of raingardens/raingarden plantings in key areas*** – flooding, standing water and saturated soils can be problematic in areas adjacent to the tennis courts and playground. By treating these areas as what they are—natural basins—they can be seen in a different light. Wet areas can be sloped and planted with wetland grasses and perennials, creating areas that are more ornamental, better able to manage and infiltrate stormwater, and are more beneficial to the environment in terms of water purification and wildlife habitat, ***photo 16***.

13 *Image source: Lessonplanet.com*

15 *Image source: Moormeadows.org*

14 *Image source: Researchgate.net*

16 *Immaculata University, Malvern, PA*


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18

lower woodland area

During storm events, the woodland area becomes flooded, with a series of meandering channels running through it, culminating in a culvert running under Hawthorne Drive and down into a neglected and inadequate stormwater basin. Flooding of this area extends into the rear yards of adjacent properties, causing saturated soils and rendering the yards virtually unusable, ***photo 17*** and ***photo 18.*** While improving conditions upstream will help reduce stormwater flow in this area, several additional solutions are recommended:

- ***channel restoration*** – where possible without excessive tree removal, water flow should be directed into a wider meandering channel with shallow banks heavily planted with native riparian shrubs, grasses and trees.
- ***supplemental planting*** – this entire forested area could be treated as a wet forest, and seeded with an appropriate seed mix, as well as supplemental plantings of appropriate native woodland grasses, shrubs, and trees in order to help absorb and slow stormwater flow, ***photo 19***.
- ***invasive species management and removal*** – invasive plant material should be removed and replanted with appropriate native material if possible. The area should be regularly monitored and managed for invasives.

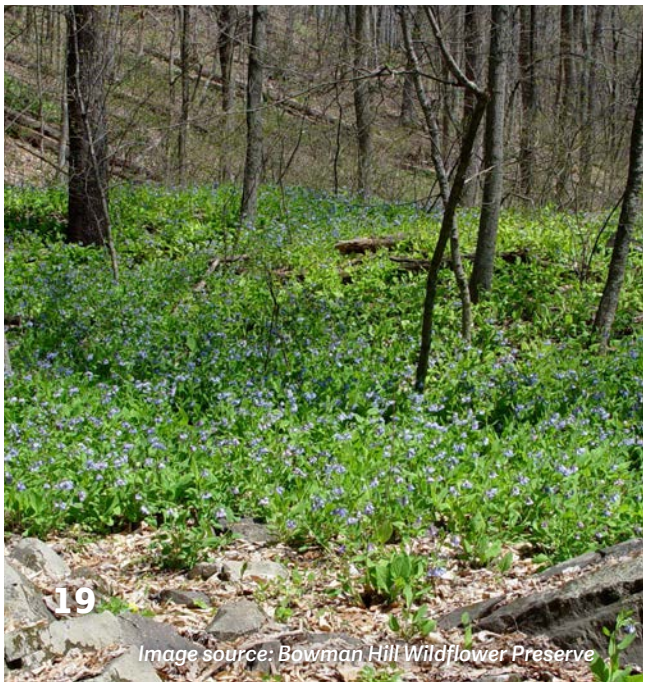
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Image source: Bowman Hill Wildflower Preserve

dry detention basin area

The detention basin just north of Canterbury Court appears inadequate due to sedimentation and lack of maintenance. Banks are steep and planted with turf grass, which creates issues with maintenance and management, ***photo 20***. The following potential solutions are recommended:

- ***evaluation of existing basin structures*** – the built features of this basin (outlet, riser, etc.) should be evaluated by a professional and cleared/unclogged/repaired if necessary to ensure functionality ***(see Recommended Contractor List)***.
- ***enlarged basin*** – in order to better treat stormwater and reduce maintenance, retrofitting this dry basin into a natural ecosystem should be considered. The basin footprint could be enlarged to allow for more gradual slopes for ease of maintenance and access.
- ***basin and buffer planting*** – any area not owned by the adjacent property owner should be converted to a type of landscape better suited to stormwater management. Turf grass can be converted to meadow which is more ecologically beneficial, and better able to slow and infiltrate stormwater flow. The basin itself can be planted with appropriate native trees, shrubs and grasses for habitat and stormwater mitigation, and to cut down on the need for regular mowing, ***photo 21***.
- ***invasive species management and removal*** – invasive plant material should be removed and replanted with appropriate native material if possible. The area should be regularly monitored and managed for invasives.

Refer to Table - Planting Recommendations, Table - Maintenance Recommendations, Stormwater Mitigation Estimates and Concept Plans for additional information.

Chapel Court basin

The existing wet retention basin is located below the development, and collects significant runoff from the development. The areas around the basin are turf, with evidence of saturated soils and puddling, particularly to the east. The basin lies within the 100-year floodplain of Culbertson Run, which runs just north of the basin area. It also overlaps a designated wetland area to the north. Significant runoff flows down the gravel/asphalt drive (North Chapel Court Road, which leads to what appears to be a utility building). This untreated runoff floods the base of the road, either entering the basin or flowing directly to Culbertson Run, which then runs directly to the East Branch of the Brandywine Creek ***(see Concept Plan)***.

retention basin area

The basin is not functioning as intended. The basin appears inadequate due to sedimentation and lack of ongoing maintenance. Banks are shallow and planted with turf grass, which does little for safety and does little in terms of stormwater management, wildlife habitat or aesthetics, ***photo 22***. The following potential solutions are recommended:

- ***evaluation of existing basin and structures*** – the basin and built features of this basin (outlet, riser, etc.) should be evaluated by a professional and dredged/cleared/unclogged/repaired if necessary to ensure functionality (*see Recommended Contractor List*).
- ***enlarged basin*** – in order to better manage stormwater runoff volume, expanding the basin to the south and planting with native wetland species is recommended.
- ***basin and buffer planting*** – any area not owned by the adjacent property owner should be converted to a type of landscape better suited to stormwater management. Turf grass can be converted to riparian meadow or forested buffer which is more ecologically beneficial, and better able to slow and infiltrate stormwater flow. The basin banks can be planted with appropriate trees, shrubs and grasses for habitat and stormwater mitigation, and to cut down on need for regular mowing, ***photo 23***.
- ***invasive species management and removal*** - invasive plant material should be removed and replanted with appropriate native material if possible. The area should be regularly monitored and managed for invasives.
- ***on-site management/education*** – *refer to Recommendations - Entire Development Site section*.

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Image source: Stormwater Commission, Lake County, IL

gravel road management

North Chapel Court Road acts as a direct channel of untreated runoff (sediment and potential pollutants such as oil and fertilizers/pesticides) into the basin and Culbertson Run, ***photo 24***. Simple water diversion interventions could be installed to better manage runoff from the neighborhood above, such as:

- ***adjacent swales*** – installation of planted depressed areas to the sides of the drive could serve to collect, slow and infiltrate water, as well as directing it towards specific areas instead of allowing it to fan out at the bottom of the hill. Swales could be directed towards "lead-offs" which surface drain into planted or forested areas, or to designed "sumps" which are dug depressions that are planted or filled with rock and can serve to detain water and act as sediment collectors. Swales can also incorporate rock or timber check-dams to further slow water, ***photo 25***.
- ***water bars*** – Often installed on steep trails, these are barriers of stone, wood, or other materials embedded in order to divert water into adjacent planted or forested areas, which can better act to slow and infiltrate water than the drive's impervious surface, ***photo 26*** and ***photo 27***.

Refer to Table - Planting Recommendations, Table - Maintenance Recommendations, Stormwater Mitigation Estimates and Concept Plans for additional information.


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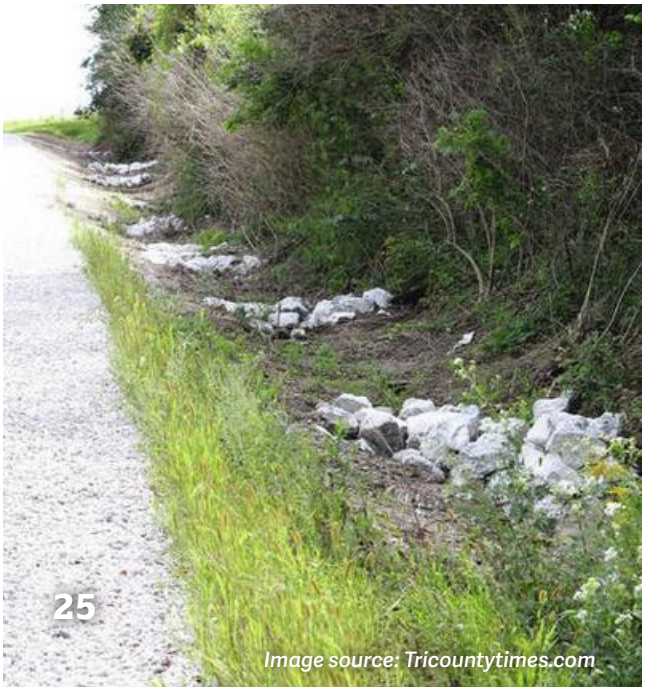
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Image source: Tricountytimes.com


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Hildacy Preserve, Media, PA


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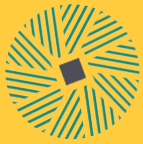
Image source: Kerr Center for Sustainable Agriculture



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