Protect the **E**ast **B**ranch **W**aterway (PEBW)

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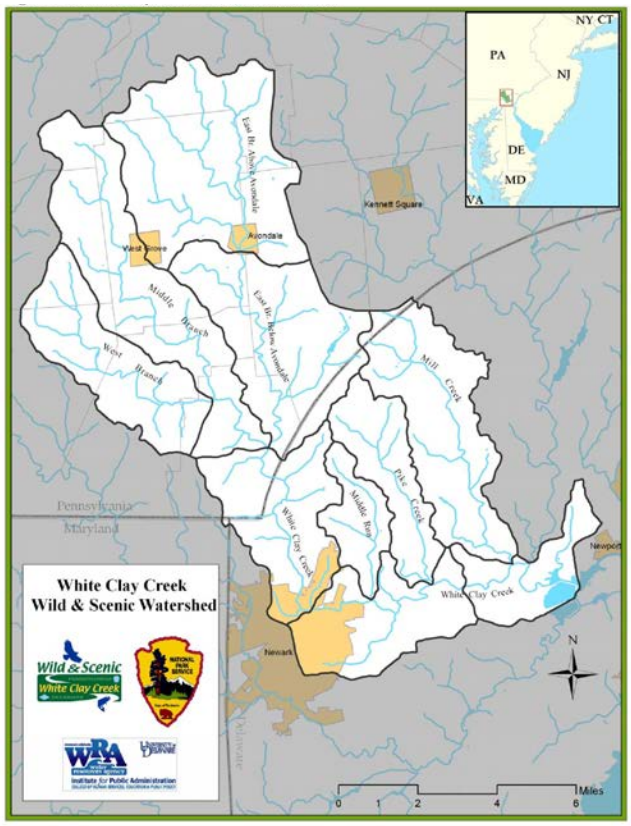
Mission Statement

Our mission is to maintain adequate water quality in the East Branch of the White Clay Creek Watershed to support the projected 30% increase in population of Chester County, PA, as well as the fishing industry and to maintain adequate water quality by 2040.

Background

White Clay Creek is a tributary of the Christiana River in Southern Pennsylvania and Northern Delaware. The White Clay Creek Watershed is 107 square miles, of which 55% lies in Pennsylvania and 45% lies in Delaware. The water flows south, from the Pennsylvania Piedmont geologic province to Newark, Delaware.

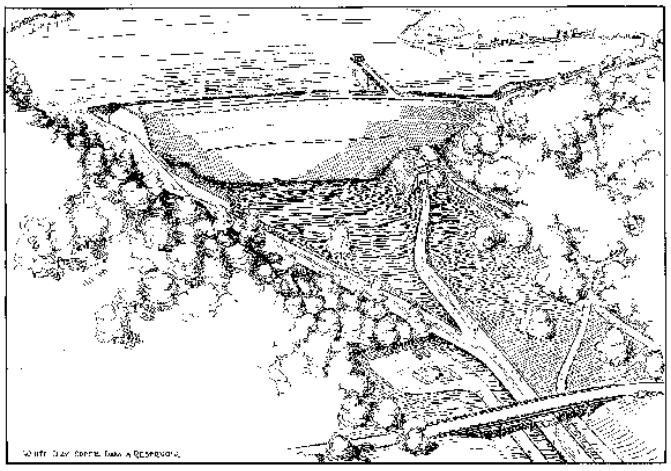


The watershed is home to over 24 species of fish. Every year the river is stocked for the fishing season with fish such as rainbow and brown trout, and largemouth and striped bass. Surveys estimate that 93 species of birds nest in the watershed, along with 33 species of small mammals and 27 species of amphibians and reptiles. The watershed lies along the Fall Line that separates the rocky Piedmont from the Coastal Plains Province. This unique geology produces soil types that support a wide array of flora and fauna. The Commonwealth of Pennsylvania has identified three endangered, one threatened and two rare plant species on it's side of the watershed.

East Branch is in the northern portion of the Whice Clay Creek Watershed, in Chester County, Pennsylvania. It flows southeast, passing through Avondale and Landberg before entering the White Clay Creek Preserve, and has a drainage area of 11.3 square miles.

History

Of the land



The land on which White Clay Creek resides was originally sold to William Penn in 1683 by Lenape Chief Kekelappen. In the 1950's and 60's, a white clay creek reservoir was proposed. This reservoir would act as a source of water for the growing community of New Castle County, and it would also give DuPont the reassurance that it's water supply needs for the planned expansion of it's Newport and Edge Moor Plants would be met. By 1967, DuPont had bought 87% of the 1556 acres of land it needed, with real estate agents using strong armed tactics to get landowners to sell. By the mid 70's there was a good bit of opposition to the proposed reservoir. The 1200 foot wide, 100 foot high dam was a source of contention. Suggestions put together by the opposition were practical and eventually implemented. In 1984, DuPont donated the land it had bought to the states of Pennsylvania and Delaware to establish the White Clay Creek preserve.

Of its name

The name White Clay Creek comes from kaolin clay, which is produced from the weathering of white feldspar. Kailin clay, also called China clay, is a soft white clay that is essential in the manufacturing of porcelain. In 1912, Victor Ullman capitalized on this resource with the opening of the China Clay Company, and claypits 50 to 100 feet deep and 30 feet wide were dug to mine the clay. Even though the pits have since been filled, veins of white clay still remain.

Of its crop

Pennsylvania produces 68% of all mushrooms grown in the US, and Chester County has the largest concentration of growers anywhere in the country. It's Pennsylvania's largest cash crop, worth over $400,000,000 yearly. The industry dates back to the mid 1880's, when according to local lore, a quaker, the son of a flower grower, was looking for a way to optimize the wasted space under the flower beds in the greenhouse. He went to Europe, where the mushroom business was booming, to collect spores to bring back to America. This is how the mushroom industry began.

Policy

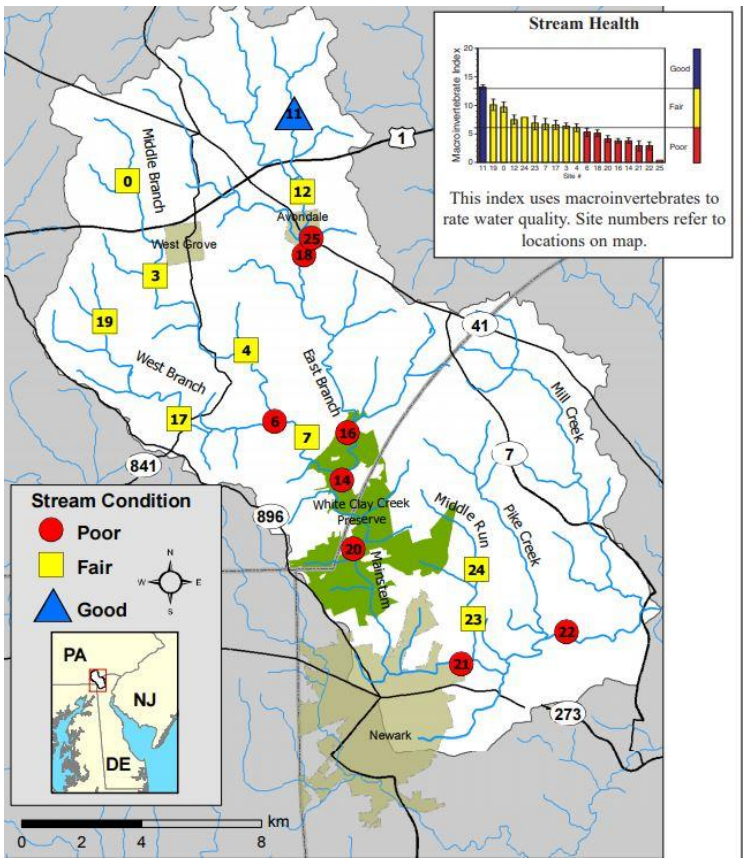
According to the article “Crafting Better Urban Watershed Protection Plans” a main reason watershed protection plans fail is because they are conducted at too great a scale. It defines too great a scale as 50 or more square miles, which the White Clay Creek watershed exceeds. There are important differences in subwatersheds, specifically differences in stream water quality and development patterns, that are too often ignored when it comes to implementing these watershed plans. Even though more stakeholders are involved in a bigger plan, people are less likely to take responsibility for implementing the plan. East Branch of White Clay Creek is a manageable unit of watershed consisting of less than 50 square miles that has distinct water quality issues, and by focusing on this tributary a more meaningful watershed plan will be produced.

In 1991, the White Clay Creek Study Act amended the Wild and Scenic Rivers Act to consider the White Clay Creek for protection under the Wild and Scenic Rivers System. Section 1 (b) of the Wild and Scenic Rivers Act states "Certain selected rivers of the Nation which, with their immediate environments, possess outstandingly remarkable scenic, recreational, geologic, fish and wildlife, historic, cultural or other similar values, shall be preserved in free-flowing condition, and that they and their immediate environments shall be protected for the benefit and enjoyment of present and future generations.” As part of this designation, no federal authority is allowed to support a water resources project that has a direct adverse effect on creek. The process to designate the White Clay Creek took 9 years, and involved a task force that was established to prepare the watershed management plan. The White Clay Creek was designated by congress as a National Wild and Scenic River in 2000. This historic designation marks the first time an entire watershed, as opposed to a section of one, has been designated under the Wild and Scenic Rivers Act.

Problems

Although the East Branch of the White Clay Creek Watershed faces various problems, two of the main problems that the watershed faces include high levels of nutrients and turbidity as well as well as high levels of contaminants and conductivity due to impervious surfaces. These issues are the most prevalent due to the area and conditions that surround this part of the watershed. The reason that we choose to focus on two main problems is that there are many causes that can be tackled in order to fix these issues.

Problem	**Description**	**Causes**
P1: Nutrients and Turbidity	Mushroom farms and other farms have lots of nutrients/ fertilizers, containing chemicals such as nitrate and phosphorus, that leak into waterways and cause a lot of algae growth. Many samples taken in the watershed are shown to have nitrate/nitrite amounts about the allowable 10mg/l	Runoff from agricultural land use, Erosion of natural deposits
P2: Negative Effects Due to Increase in Impervious Surface	There are several contaminants in the watershed that need to be lowered under the Clean Water Act. Samples taken from the watershed show that conductivity is high, which indicates that there are more chemicals dissolved in the water.	There are several brownfield sites located throughout the White Clay Creek Watershed. There is also an increase in impervious surfaces throughout the watershed that leads to an increase in runoff from impervious surfaces.



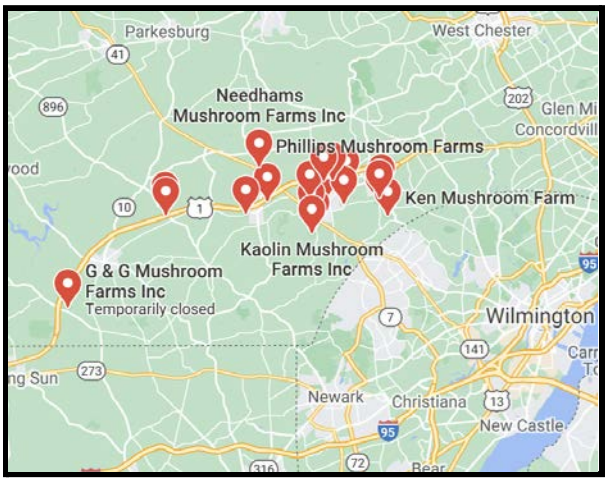
This map shows the ratings of the stream conditions in White Clay Creek. The health of the stream is determined by studying the macroinvertebrates. Macroinvertebrates are a good indicator of stream quality because they are affected by the physical, chemical, and biological components of the stream, and show effects of both short and long term pollution. The water quality of East Branch starts out in good condition north of Avondale, but as it passes through Avondale it changes to poor condition. This change continues down into the White Clay Creek Preserve.

Problem 1:

Over 54% of the white clay creek is made up of first order streams. First order streams are the smallest classification of streams, and flow into and feed larger streams. First order streams are narrow enough to jump across. They have a low capacity to dilute pollutants in comparison to the larger second or third order streams. This makes them susceptible to non point source contaminants such as the large amounts of fertilizer that come from the mushroom farms.

A quick search for local mushroom farms indicates that there are an abundance of mushroom farms in the area, especially near the east branch of the White Clay Creek Watershed. Chester County has 61 mushroom farms and farms 47% of the total U.S. mushroom production.

Mushroom farmers in Chester County use compost as fertilizer. This compost contains decomposed hay, corn cobs, and horse manure, among other things. Mushroom farmers use so much hay for the substrate that it is Pennsylvania's second largest cash crop. The disposal of this spent compost poses significant environmental threat. This threat manifests itself primarily in the form of runoff, which can contaminate the water supply. In addition to pesticides, the compost could potentially contain harmful viruses that can harm the ecosystem. Both mushroom farms and other farms utilize a large amount of compost as fertilizers that contain high levels of nitrite and phosphorus. High levels of nutrients are bad for waterways because they cause excessive algae growth which leads to a depletion of oxygen and harms the other plants and living organisms in the water.



Goal 1:

A goal of this plan is to lower the amount of nitrite and phosphorus found in the watershed. A way to do this could be to regulate the amount of fertilizer that the farms are using and ensure that only the necessary amount is being used. Another idea could be to include buffers between the farms and the waterways so that water and nutrients would not be flowing directly into the watershed. These buffers would act as a filter for the water before it gets to the stream. They slow the stormwater down and allow it to be filtered by the plants and soil. It is essential that policy and guidelines regarding vegetative buffers and swales be put in place so that the water has time to settle before entering the waterway.

Oftentimes, mitigating environmental impact is cost prohibitive to the farmer. A plan to lower the amount of fertilizer found in watersheds needs to take this into account. By re-using spent mushroom compost, the environmental risk from pesticides and harmful viruses is decreased. Spent compost has water retaining properties and can retain nitrate levels. Although it's typically more economical for mushroom farmers to replace the substrate so that it has all the nutrients the mushrooms need, the substrate would be a useful addition for soil to grow other crops in commercial farming. In addition, research shows that spent mushroom compost can increase the quality of turfgrass by promoting drainage, increasing microbial activity, and

providing nutrients to the turfgrass. It can also provide cover for newly seeded lawns. Another way to decrease the environmental risk of spent compost is to pasteurize it with steam to kill any pathogens present in the substrate. The mushroom industry can sell it's spent mushroom compost while also mitigating environmental risks associated with disposal. In addition to mitigating the harmful effects of runoff from mushroom farms, more outreach effort is needed to educate both farmers and the public on the potential reusability of spent compost.

Problem 2:

There are many dissolved chemicals and contaminants found in the East Branch of the White Clay Creek Watershed. The East Branch faces many contaminant related issues due to a wide variety of reasons. One concern has to do with the increase in impervious surfaces surrounding the watershed as the population of Chester County increases. When there is an increase in impervious surfaces, there is an increase in the amount and speed of runoff, which can pollute the waterway and alter the flow. An increase in impervious surface also limits the amount of precipitation that's able to soak into the ground and replenish the groundwater supply. Types of runoff from these surfaces include salt from excess salt on the roads during the wintertime. Another contaminant comes from fecal matter from pets, wildlife, and agriculture that runs into the waterway when it rains. Total suspended solids (TSS) also get into the waterways that come from roads and construction sites.

Goal 2:

A goal to reduce this problem would be to limit the amount of construction and impervious surfaces near the watershed and waterways. Although limiting the contaminants all together is a step that should also be taken into consideration, we found that there were so many sources of contamination that turn into runoff, that a way to help reduce them all together would be to limit the impervious surfaces. This could be by creating a limit on how close development can be to the waterways or by looking into permeable alternatives as construction materials. These permeable alternatives as construction material, such as porous pavement, could be used for driveways and sidewalks. Nonstructural stormwater management techniques should be considered by homeowners and developments. Vegetative swales can help trap and filter pollutants and reduce the speed of stormwater runoff.

Conclusion and Recommendations

In conclusion, the East Branch of the White Clay Creek Waterway is greatly affected by the surrounding area and will be greatly affected by an increasing population expected to come to the area. Keeping track and regulating the amount of fertilizer used on farms in the area will keep contaminants out of the water and make sure there is not an excess of algae growth that can harm

the current ecosystem. As the population size increases, it is also important to regulate the amount of impervious surfaces as new developments are likely to be built. Keeping runoff to a minimum will help ensure that the watershed stays a safe ecosystem.

In order to keep track and maintain “adequate” water quality:

- Keep track of nitrate level in water
- Set regulation for impervious surfaces around watershed
- Keep track of water conductivity (due to salt), total suspended solids, and harmful bacteria
- Outreach efforts to educate on use of spent mushroom compost, and to inform homeowners of ways to manage runoff
- Mandate post construction stormwater controls for new developments

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