

Blackbird Creek Preservation and Action Charter (BCPAC)



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Mission Statement

BCPAC's mission is to continue restoration of newly acquired land, increase the area of the natural reserve, reduce pollutant loads, and uphold current water quality standards of the Blackbird Creek Watershed in lower New Castle County, Delaware. This will be for immediate short-term efforts and provide an action plan for the years 2018 – 2023.

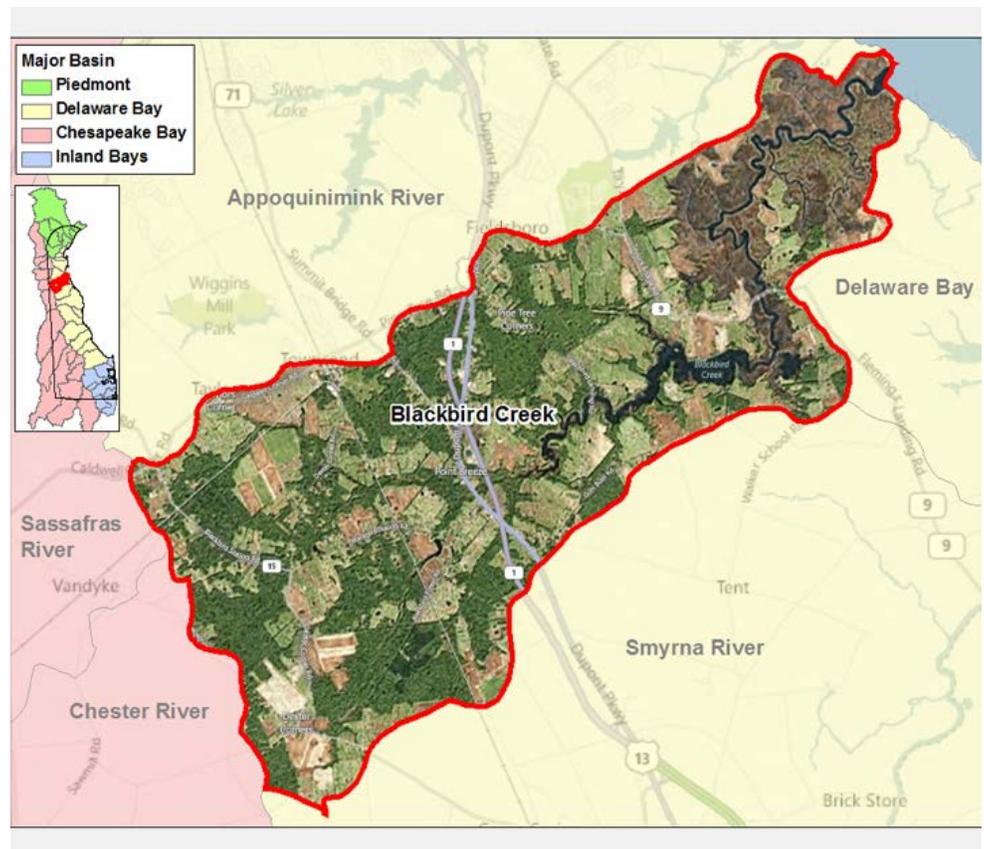
History/Background of Blackbird Creek

The Blackbird Creek watershed drains a 31 square mile area in southern New Castle County, Delaware, and flows directly into the Delaware River, just upstream from the Delaware Bay. Blackbird creek is considered one of the few pristine watersheds in central and northern Delaware, especially

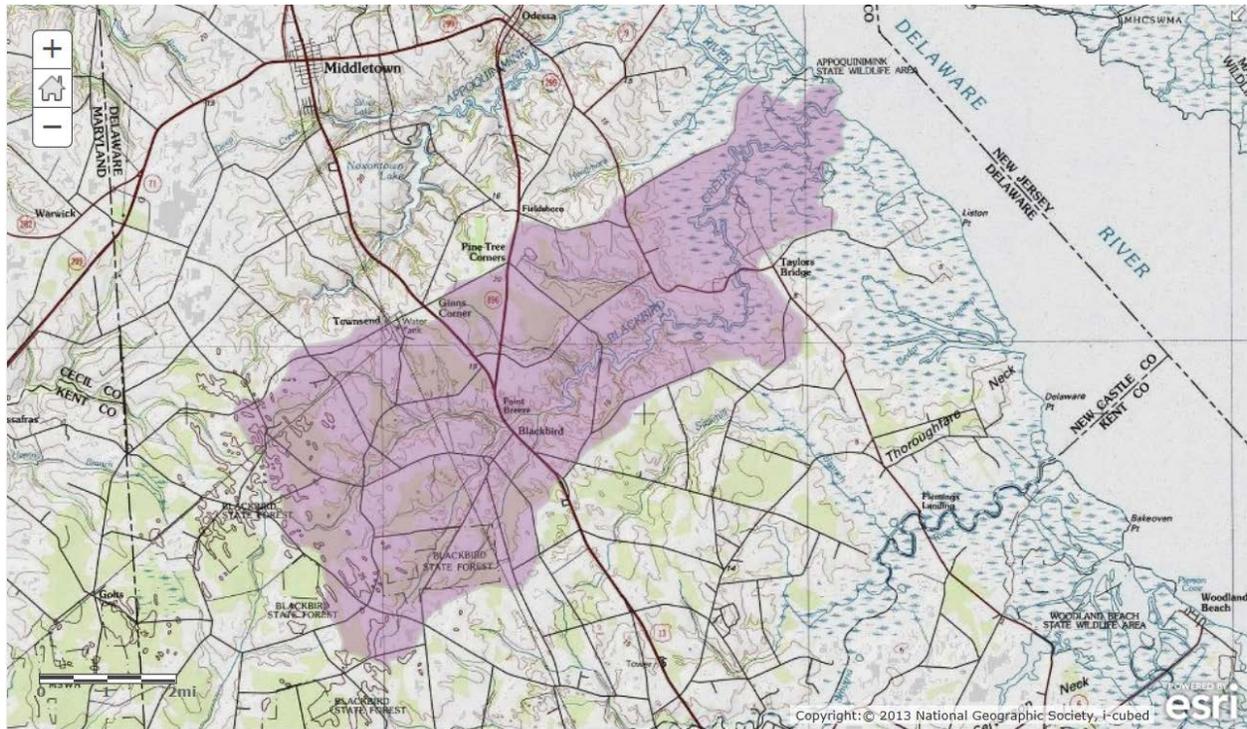
when compared against the heavily altered streams and rivers, commonly found in northern Delaware. Since the days of colonial America, the Blackbird Creek Watershed has been used for farming, fishing, hunting and other activities closely tied to the use of its natural resources. Because of this long history of use, current watershed residents and stakeholders continue this tradition of valuing this rich natural and aesthetic resource. The Blackbird Creek Reserve was created in

1972, which preserves 360 acres in the Blackbird Creek Watershed for hunting, fishing and recreational purposes, and also for preservation of its natural state.

The Blackbird Creek Reserve comprises a small part of the overall watershed, containing only 0.6 square miles, compared to the 31 square mile watershed. The rest of the watershed is largely rural, with 50% forest or wetland, 44% used for agriculture, 3% water, and 3% urban use. See the figure below for division of land use within the watershed. Due to the large agricultural presence in the watershed, high nutrient and bacterial concentrations, and low dissolved oxygen (DO) levels are continual challenges to water quality. These conditions can



lead to eutrophication of the water bodies in the watershed, which can cause the formation of toxic algal blooms and devastate native fish and wildlife populations. To prevent these problems, the BCPAC will review current policies that aim to reduce pollutants in the Blackbird Creek Watershed, and propose new practices to improve water quality in the Blackbird Creek watershed.



Current Status

Current Water Quality

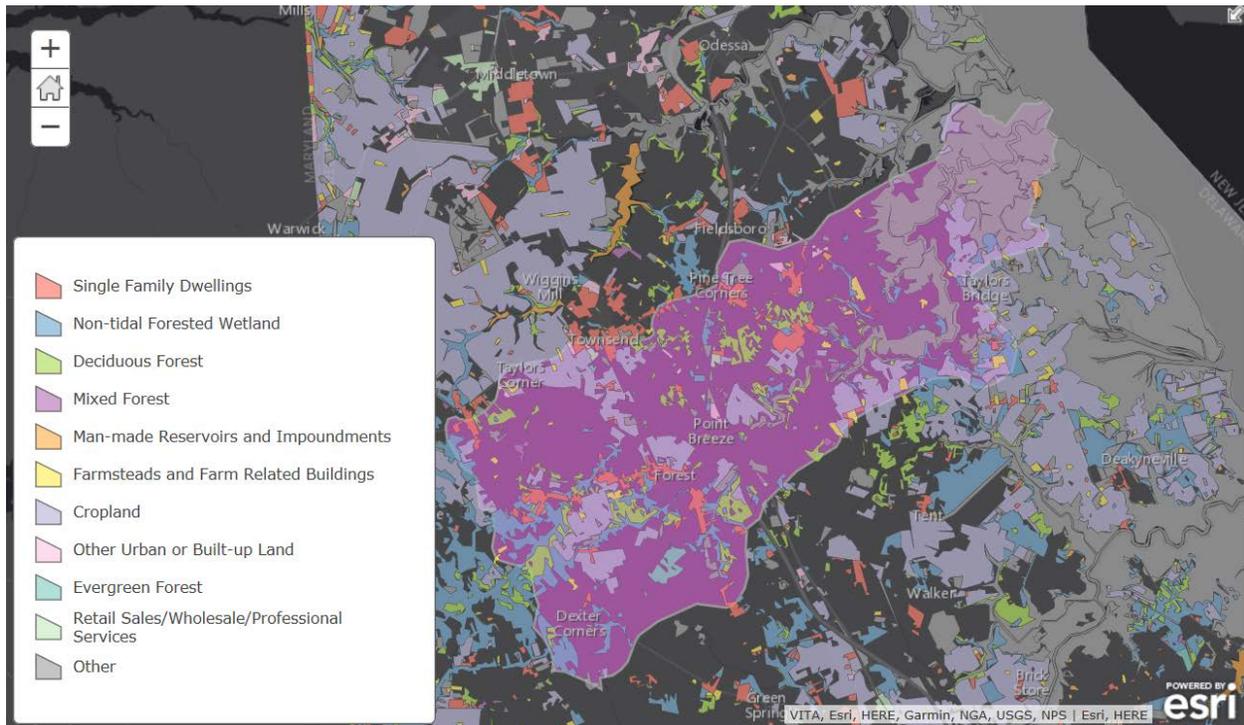
State of Delaware Surface Water Quality Standards (Effective October 11, 2014)

The Surface Water Quality Standards for the State of Delaware specifies regulations for acceptable concentrations of bacteria and chemical constituents. Blackbird Creek is a freshwater source with fish and wildlife that has allowed use for industrial supply and primary contact recreation. The maximum allowable concentrations for the parameters of concern are as followed:

Parameter	Single Sample Value	Geometric Mean
<i>Enterococcus</i>	185 colonies/100mL	100 colonies/100mL
Nitrate	10 mg/L (MCL)	
Dissolved Oxygen (minimum values)	4 mg/L	5.5 mg/L

Delaware Department of Natural Resources and Environmental Control (DNREC)

Numeric concentrations for total nitrogen and total phosphorus have not been established in Delaware, but DNREC used 3.0 milligrams per liter (mg/L) for total nitrogen and 0.2 mg/L total phosphorous as threshold limits in determining the Total Maximum Daily Loads (TMDLs).



Current Water Quality Data

Comparing the standards above to data from a study done by Delaware State University from 2012-2015, the following water quality conditions have been determined. Green indicates levels meeting the standard, and red indicates a failure to meet the standard

Parameter	Standard	Existing Levels
Dissolved Oxygen	5.5 mg/L average	5.1-6.4 mg/L*
Phosphate	0.2 mg/L	0.51-0.60 mg/L
Nitrate	3.0 mg/L	0.20-0.35 mg/L*
<i>Enterococcus</i>	185 col/100mL	2000 col/100mL** highest

*Data is within the standard for most of the year, but exceeds standard during one part of the agricultural season

**Data is from 2002-2003, obtained from the proposed TMDLs (2006)

As illustrated above, the main water quality issues are phosphate and *enterococcus* levels. They far exceed the standards, and should be addressed.

Current Policies for Conservation of Blackbird Creek

Delaware National Estuarine Research Reserve Management Plan

In order to establish a partnership between the National Oceanic and Atmospheric Administration (NOAA) and the Delaware Department of Natural Resources and Environmental Control (DNREC), the Delaware National Estuarine Research Reserve (DNERR) was established. The DNERR has control of the two reserves in the State of Delaware, one of which is Blackbird Creek Reserve. This division is in control of the following four tract areas in the Blackbird Creek Reserve: the Lowe Tract, Manwaring Tract, Cornelius Tract, and the Union Church-Taylor's Bridge Tract. These four tracts make up an approximated 357 acres and include both freshwater and brackish water estuaries (Biohabitats 2007).

The most recent management plan submitted by DNERR is the 2nd revision, August 2013. This plan provides, for the nation as a whole, current framework for the protection of estuaries and coasts under the Coastal Zone Management Act. Then, a more focused mission for the DNERR for the years 2013 - 2018 is presented. With regards to the Blackbird Creek Reserve, a detailed description of the public access plan, regulations on facility maintenance and public use areas, and resource protection and management framework, including land acquisition policies, are all provided within this management plan.

Ecological Restoration Master Plan

An independent company, Biohabitats Inc., prepared a restoration plan for DNREC in March 2007 following the purchase of some of the forenamed parcels of land just a few years prior. The goal of the Ecological Restoration Master Plan is to ensure environmental quality is preserved, to minimize detrimental impacts, and to mitigate invasive species. A few key components of this plan are to provide long-term research, educational insight and understanding, and best management practices for the reserve's natural resources.

Total Maximum Daily Loads

Given data from the DNREC's water quality monitoring data collected predominantly from 2002-2003, and a computer model from HydroQual, DNREC proposed the following TMDLs for Blackbird Creek watershed in 2006:

Parameter	Total Maximum Daily Load
Total Nitrogen (lb/day)	175.5
Total Phosphorus (lb/day)	19.97
<i>Enterococcus</i> (#/day)	4.67E10

The model was operated under the assumption of all non-point sources for nitrogen, phosphorous, and *enterococcus*. The phosphorous and nitrogen likely come from the agricultural activity in the area, and the bacteria was modeled as coming from the wildlife inhabiting the watershed.

Watershed Plan Improvements

Water Quality

Agriculture comprises 44% of the Blackbird Creek watershed, the second biggest land use category in the watershed (State of Delaware-2017). Modern agricultural activities are often associated with over fertilization, as fertilizer is relatively cheap and farmers seek to maximize their crop yields. This over fertilization leads to excess nutrients making their way into creeks and rivers, causing water-based organisms, such as algae, to grow exponentially. This rapid algae growth from excess nutrients leads to low DO levels and poor water quality. To remedy this, several strategies are recommended to prevent transport of nutrients from agricultural lands to the creeks and stream of the watershed. First, riparian buffer zones should be restored on agricultural lands to capture excess nitrogen and phosphorus before it reaches streams and ponds. Riparian buffer zones will have the effect of reducing groundwater nutrient transport as well as erosion and sediment transport, two of the primary ways nutrients travel to the watershed. To facilitate this, government subsidies will be needed to compensate farmers for the loss in use of a portion of their land. This is especially important for headwater streams, where nutrient concentrations have been observed to reach high levels.

Secondly, scientists and land managers can work with farmers to determine current levels of nutrients in the soil, and suggest rates of fertilizer application based on this information. This will enable farmers to know how much nutrients are in the soil, so they can apply only as much fertilizer is needed for their next growing season, preventing over-fertilization. This can be used in combination with nutrient timing strategies, such as limiting fertilizer application during the non-growing seasons, to minimize nutrient runoff.

Success for water quality improvement from agricultural controls will be measured by DO, nitrate, and phosphate concentrations in the watershed creeks. Measurements of these parameters will be conducted semi-annually and compared to DNREC standards. Measurements that are below the DNREC threshold levels for these pollutants will be positive indicators that watershed quality is being upheld.

Ecological Preservation

The main objectives in ecological preservation will be to preserve current land quality by upholding current regulations and policies, protect sensitive areas, and improve currently owned DNREC and DNERR areas to pristine status. Various techniques, proposals, and strategies to uphold these core values will be discussed within this subsection.

It is important to first think about the current land and water assets that the State of Delaware own, before thinking about acquiring new assets. These areas are under the control of DNERR and other divisions of DNREC where direct treatment and attention can be provided without intervening with private landowners. These areas should be evaluated as high, moderate, and low priority areas with respect to water quality standards, invasive species, endangered species, and land conditions. All high priority areas shall be focused on immediately and primarily until the issue can be resolved and the area can be reduced to moderate or low priority. Any future change of ownership for parcels that are within the

Blackbird Creek watershed shall be reviewed by DNREC prior to finalization of the sale of the land parcel. This will ensure that DNREC can review the future owner's intended use of the land, conduct a current assessment and analysis of land and water conditions, and obtain an opportunity to purchase easement areas on the property if necessary. A suggested regulation of no development on agricultural fields within the first 5 years of purchase and restricted development for the remaining 5 years shall be proposed and used as an exemplary standard.

Preserving and protecting ecological life will remain a key component of this charter. The American bald eagle (*Haliaeetus leucocephalus*) is currently on the Delaware State Endangered list (DNEER 2013). Land use where the bald eagle is observed to be nesting shall be restricted. There shall be no development within a half mile radius of the bald eagle nesting ground. Any and all tampering, endangering, or non-compliance to the rules within this law shall be punishable by fines and/or imprisonment. Possible techniques that can create habitats for species that are rare and/or endangered throughout all aspects of the watershed shall be investigated. The current assessment of land and water conditions should include rare species survey (plant and wildlife), study, and inventory. There should be semi-annual monitoring of all inventory to ensure no disturbances and current conditions are either maintained or improving.

Soil Erosion

The Blackbird Creek Reserve has soil erosion issues in a few regions, due to high headwater stream velocity in areas with easily eroded soils. This problem is encountered throughout the Blackbird Creek Watershed as well, with the root cause being heavy overland runoff from fields and roads. Heavy erosion leads to large values of total suspended solids (TSS), which can impair creeks and streams in the watershed. This problem is exacerbated by vegetative loss by over-foraging of geese, and marsh losses due to rising sea levels. Both vegetation and wetlands prevent soil erosion, so the decline of these means future erosion may increase severely. To prevent this, strategies must be employed to impede heavy surface runoff, rebuild vegetative cover, and preserve wetlands. Water bars or spreaders can be installed in critical areas to slow water flowing from surface runoff from fields. Planting native species, including vegetation that geese do not normally consume will help preserve soil-stabilizing vegetation. Marshland preservation should be prioritized and expanded to prevent future losses from sea level rise.

Total suspended solids should be measured in affected streams in the watershed to determine if these erosion mitigation strategies are effective. TSS values will be evaluated against the DNREC TSS standard for water quality. Measurements that are below the DNREC threshold levels for TSS will be positive indicators that erosion preventative measures are successful.

Conclusions

The Blackbird Creek Watershed has very good water quality, and it is considered in pristine condition. Since the Blackbird Creek is the main body of water that drains the Blackbird Creek Watershed, its quality is an accurate indicator of the health of the entire watershed as a whole. Overall, the Blackbird Creek Watershed is in very good health, but there are a few issues that need to be improved upon, or preventative measures instituted to ensure current conditions do not deteriorate over time.

First, phosphorus concentrations in the Blackbird Creek currently exceed DNREC threshold limits. This causes a host of problems, such as toxic algae growth and the death of native plants and animals. The most likely cause of this issue is the large agricultural presence in the watershed. The reduction of phosphorus in the watershed is best accomplished by working with the farmers in the area, and implementing BMPs such as soil testing and smarter fertilizer application rates and timing. Subsidizing farmers to use some of their land as riparian buffer zones should also prove effective in lowering phosphorus concentrations.

Second, ecological preservation is detrimental to maintaining a pristine watershed. Land assets in control of DNREC shall be evaluated and treated. Future real estate transactions within the watershed shall be monitored by the State to prevent overdevelopment and misuse of the land. Endangered species shall be protected under laws and regulations, and the creation of new wildlife habitats shall be researched and implemented.

Third, erosion and sediment loss causes decreased water quality, and can exacerbate nutrient loading issues. To prevent this, strategies must be employed to slow overland flow to creeks, and restore previously vegetated areas to slow sediment transport. Wetlands must also be preserved against rising sea levels, to capture and retain eroded soils.

The Blackbird Creek Watershed is a good example of a well preserved natural watershed. Even though the area is shared by urban, agricultural, and recreational use, it still has pristine conditions in most parameters due to nature's ability to regulate itself. Some issues, such as bacteria, phosphorus and erosion are becoming an issue in the watershed, and this watershed plan addresses those issues before they become major problems. In addressing these issues early, we will be able to keep the Blackbird Creek watershed a pristine example of what America's watersheds should be.

Sources

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