Back River Action Group

BRAG About It

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Back River Action Group (BRAG) About It

Mission Statement:

The Back River Watershed is a valuable resource of Baltimore, Maryland. The mission of the Back River Action Group is to restore the Back River waters to fishable by 2025, and swimmable by 2035.

Background & History:

The Back River Watershed located in Baltimore County, Maryland, is one of the most impaired tributaries to the Chesapeake Bay. The Back River Watershed is a stream-system that encompasses approximately 28,000 acres of land and 139 miles of stream. Major stream-systems included in this watershed are Stemmers Run, Herring Run, and Red House Run, all of which ultimately empty into the Back River.We eventually see litter from each of these streams, carried by storm water generated by the vast expanse of impervious surface in the region" (Save Back Rivers Mission, 2014). About two-thirds of the watershed is located in Baltimore County, Maryland. The watershed has components that are in both the urban and suburban areas within the Baltimore area.

Figure 1. Back River Watershed (Provided by Baltimore Country Department of Environmental Protection and Resource Management)

During the 60s and the 70s, significant development occurred resulting in approximately 70% of the watershed being built out. As a result of such overbuilding, many of the currently implemented stormwater management practices are extremely outdated. As a result of outdated stormwater management procedures as well as urbanization, there is a significant amount of pollution found in this stream in the form of both chemical and trash

pollution. Major pollutants found in this watershed include chlordane, a pesticide, and high levels of nutrients such as nitrogen and phosphorous. In addition to the trash and chemical pollution problems, two superfund sites located along the river drain hazardous waste into it. The Back River Wastewater Treatment Plant, located in Baltimore, Maryland, has been operating and treating Baltimore City and Counties wastewater since 1911. Prior to upgrades to this facility that began in 1998, discharge from this facility had high concentrations of nitrogen oxides as well as phosphorus, both of which contributed to the river's severe algal blooms. Water at this plant is currently treated using chemicals and biological processes in order to remove a large percentage of phosphorous and nitrogen. Prior to the water being discharged into the Back River, it is aerated. Despite the changes made, these nutrients still contribute to major inputs of contamination into the river and lead to high levels of algal growth. Although there are large amounts of pollutants entering, people are working to improve the quality of this water, primarily through cleaning up litter. While there have been some improvements in both the quality of water the habitability of this stream for wildlife, there are still significant steps that need to be taken in order to make the Back River Watershed fishable and swimmable.

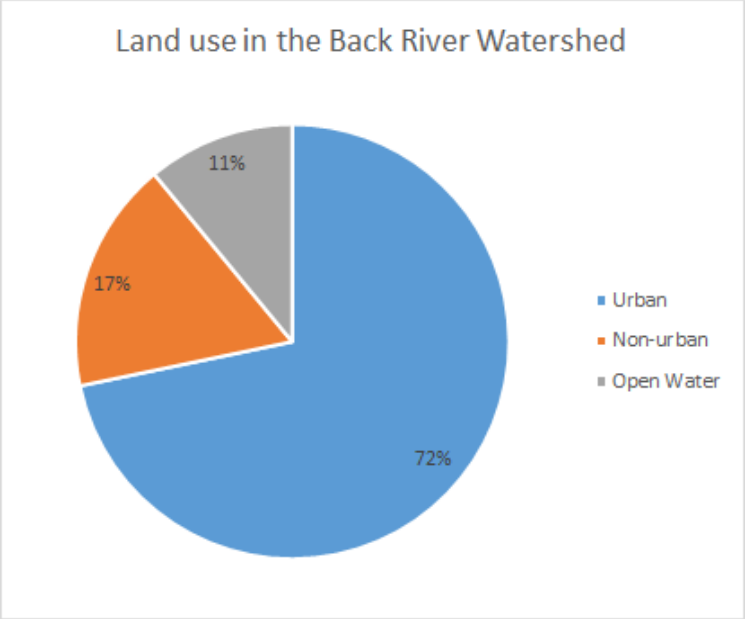

Figure 2. Land Use in the Back River Watershed graph

"The dominant land uses in the watershed are urban (28,037 acres or 71.7%) and non-urban which is comprised of mixed agriculture and forest and other herbaceous (6,753 acres or 17.7%) and open water (4,295 acres or 11%) (United States EPA Region 3 Office Of Standards, Assessment And TMDL's, 2005).

Back River Watershed

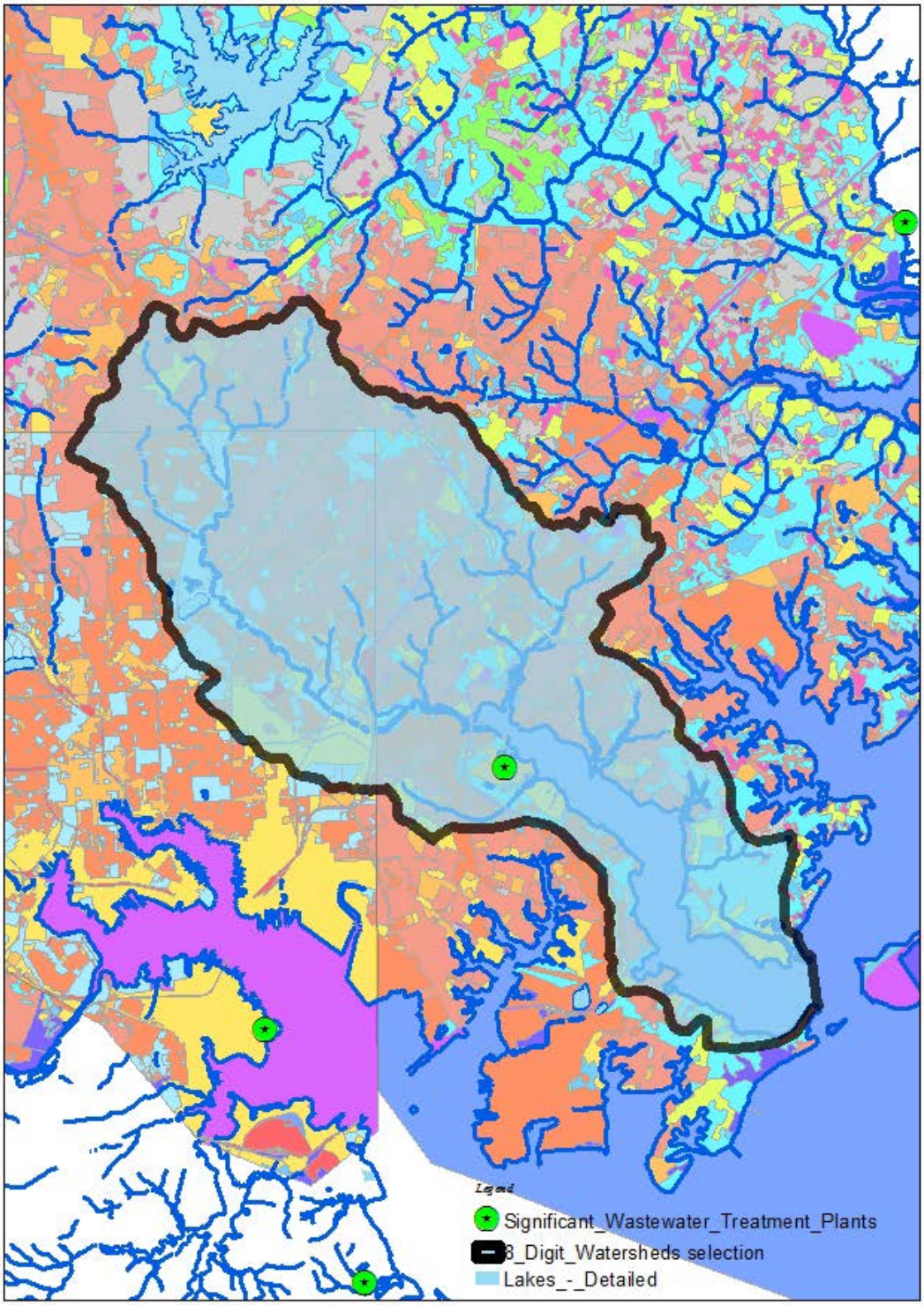

Figure 3.1. Land Use Map of the Back River Watershed

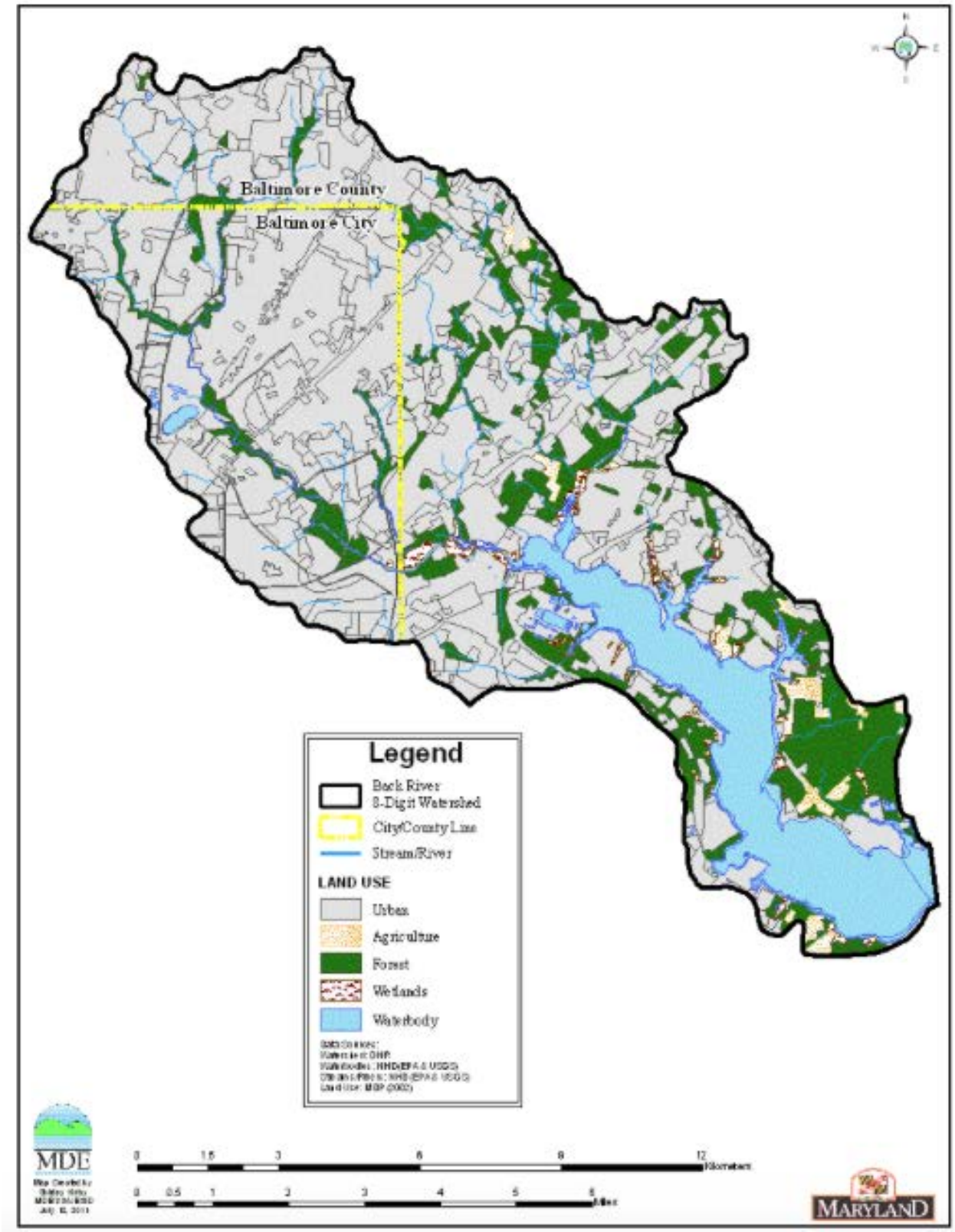

Figure 3.2. Back River Watershed Land use map (Provided by Maryland Department of the Environment)

Drainage Area	• 27, 716.7 acres (43.3 mi^2)	
Stream length	• 139.0 miles	
Land Use	• Low-Density residential (8.5%) • Med-Density Residential (26.5%) • High-Density Residential (20.4%) • Commercial (9.9%)	• Industrial (6.5%) • Institutional (8.0%) • Open Urban (6.2%) • Forest (11.5%)
Current Impervious Cover	• 30.7% of watershed	
Jurisdictions as Percent of Subwatershed	• Baltimore City (44.5%) • Baltimore County (55.5%)	
Soils	• A Soils – 0.0% • B Soils – 17.9%	• C Soils – 33.2% • D Soils – 46.7%

Table 1. Summary of Key Watershed Characteristics (Baltimore County Department of Environmental Protection and Resource Management, 2008)

Goals & Objectives:

G1. Meet fishable and swimmable standards.
G2.Reduce the amount of litter being brought into this watershed through nearby streams as well as storm water drainages.
G3.Upgrade and improve nearby wastewater treatment plants.
G4.Inform and reach out to the public and neighboring communities.

Problems Summary:

Problem	Description	Cause
Litter	Abundance of litter flowing into the Back River.	Weak enforcement of "no littering" laws which exist within the watershed area in Baltimore City and Baltimore County.
Wastewater Discharge	Excess wastewater discharged into the Back River and streams in the Back River watershed.	Infiltration and discharge of wastewater contaminants into the water and groundwater that flows into the watershed.
Stormwater Runoff	Stormwater sediment and chemical contamination.	Runoff from rain and snowstorms resulting in the transport of contaminants into Back River waters. Highly industrial and urban areas resulting in extremely high runoff rates.

Table 2. Problem Summary

Regulations Affecting the Back River Watershed:

Clean Water Act:
In 1972, the Clean Water Act was passed with the goal of making all waters in the United States both fishable and swimmable. In order to do this, the Act stated that every two years the Environmental Protection Agency (EPA) must create a list of impaired waters (303(d)) and Total Maximum Daily Load (TMDL) reports for all waters on the list. The Act also established a Federal Leadership Committee to include members of the Department of Agriculture, Commerce, Defense, Interior, Homeland Security, Transportation and several others. In addition to the Clean Water Act, in 2011 President Obama issued an Executive Order to allocate more funding and resources to the Chesapeake Bay. The Executive Order states that the primary causes to the pollution are nitrogen, phosphorus and sedimentation caused from runoff, water treatment plants, trash, and multiple other causes (About the Executive Order, 2015).

Chesapeake Bay TMDL:
Due to most waters within the Chesapeake Bay being on the impaired streams list, a TMDL report was created by the EPA for the entire Chesapeake Bay and all of its watersheds. The TMDL lists criteria for the Watershed Implementation Plans (WIP) that explains the reductions in pollutants and how to implement the plans. Each state in the Chesapeake Bay Watershed proposed a WIP for its respective states and the watersheds within it. After those were submitted, the EPA made a plan to deal with the major pollutants: nitrogen, phosphorus and sedimentation. Each state was required to create its own state legislation to update wastewater plants and possible programs to reduce the effect of agriculture on the watershed. In order to meet the EPA standards, a 30% reduction in nitrogen and a 50% reduction in phosphorus are needed in the Chesapeake Bay (Chesapeake Bay Total Maximum Daily Load for Nitrogen, Phosphorus and Sediment, 2010).

Back River TMDL:
In 2005, due to the watershed being on the impaired streams list, a TMDL was created for Back River. The river was placed on the impaired streams list due to the high levels of nitrogen and phosphorus coming into the watershed from point and nonpoint sources. The TMDL states that the primary point source causing the influx of phosphorus is the Back River Wastewater Treatment Plant. The TMDL states that, “the Back River Wastewater Treatment Plant could reduce its annual average load, with current permit flow (130 MGD) and concentrations (8 mg/L of Total Nitrogen, 0.2 mg/L Total Phosphorus) from 4,080,417 to 3,167,002 lbs/yr, a reduction of 22%” (United States EPA Region 3 Office Of Standards, Assessment And TMDL's, 2005). The other primary source of nutrients is stormwater runoff. The TMDL states a 15% reduction in the runoff discharge is needed (United States EPA Region 3 Office Of Standards, Assessment And TMDL's, 2005).

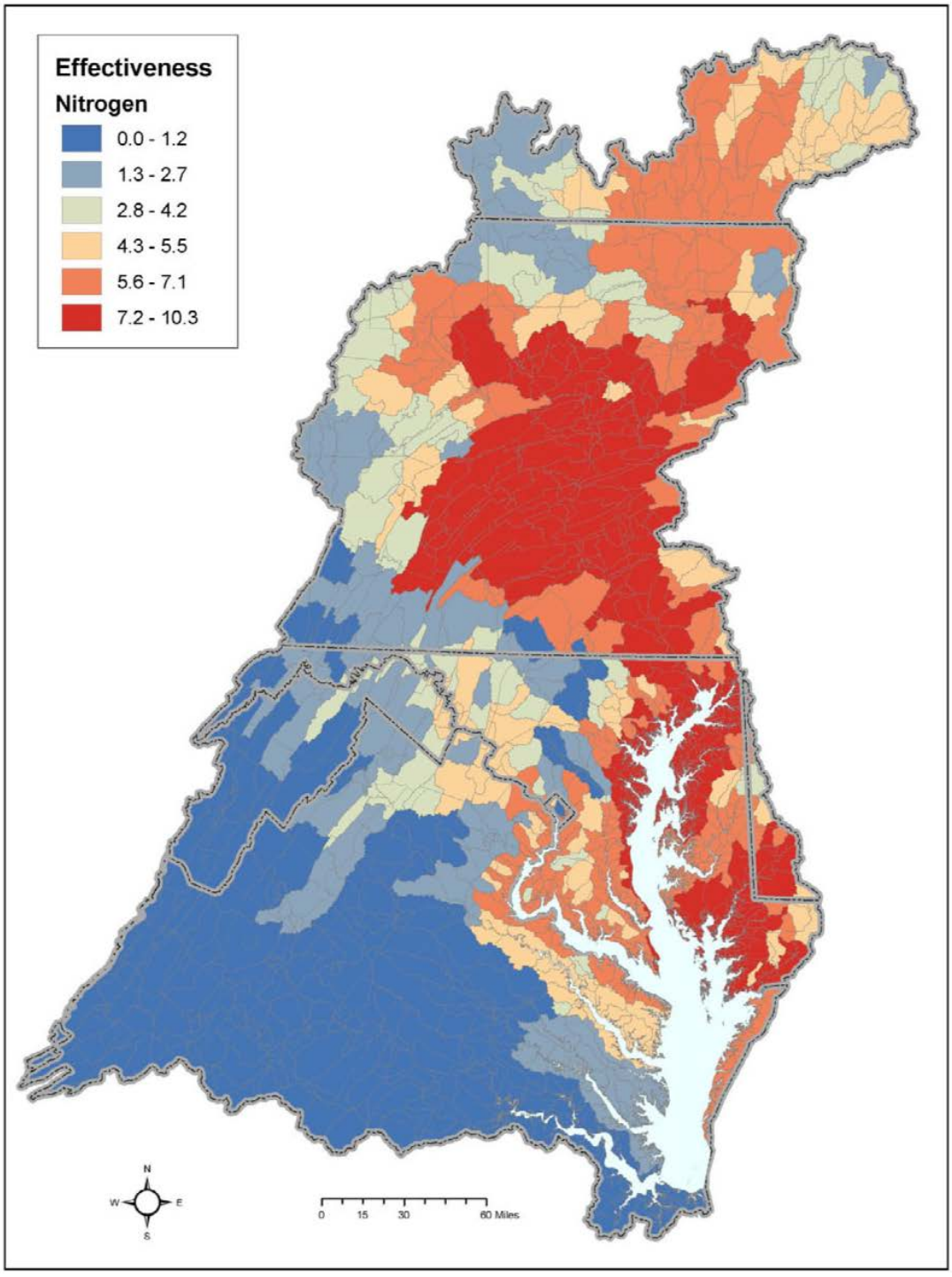

Figure 4. The picture above shows the Nitrogen Levels in the Chesapeake Bay (Chesapeake Bay Total Maximum Daily Load for Nitrogen, Phosphorus and Sediment, 2010)

Summary of Phosphorous and Nitrogen TMDLs for the Back River

Flow Regime Period	Parameter	TMDL	Waste Load Allocation	Load Allocation	Margin of Safety
Low Flow (May 1 -October 31)	Nitrogen (lbs/month)	113,321	111,299	1,345	677
	Phosphorus (lbs/month)	7,995	7,888	34	73
Average Flow (November 1 – April 30)	Nitrogen (lbs/year)	1,773,100	1,737,626	26,323	9,151
	Phosphorus (lbs/year)	99,171	96,896	1,239	1,036

Table 3. (United States EPA Region 3 Office Of Standards, Assessment And Tmdl's, 2005).

Agencies Affecting the Back River Watershed:

1. Maryland Environmental Service.

The Maryland Environmental Service (MES) is an independent state agency that was founded by state legislators and governor Marvin Mandel in 1970. MES combines funds from both the private and public sectors in order to address important environmental issues involving stormwater, water, and wastewater among many others (Maryland.gov).

2. Maryland Department of the Environment

The Maryland Department of the Environment was founded in 1987 in order to protect the air, water, and land resources in Maryland. The Department enforces environmental laws and regulations to protect Maryland's environmental health. The Department is also involved in planning and environmental research to provide technical resources to the many industries in the state (About MDE Home).

3. Save Back River (BRRC) Foundation

The Back River Restoration Committee is a nonprofit organization that aims to restore the Back River watershed. The Committee aims to improve the health of the watershed by focusing on litter removal from the Back River by implementing new trash collection technologies and organizing community cleanups. The Committee completes most of its

work through community outreach and independent fundraising activities (SaveBackRiver's Mission, 2014).

Problem Analysis:

P1: Litter

One primary reason for the high level of pollution is the back up of litter into the Back River Watershed. Since the majority (72%) of the land is urban, there is more litter in the area than can be handled. A Baltimore Sun article by Mary Gail Hare states, “All of Baltimore's uncollected trash — from the bottles tossed in storm drains to the litter dropped carelessly on the streets — seems to wash into Back River” (Hare, 2011). The litter in the river includes a variety of debris from plastic bottles to tires. Back River was the first river Maryland Attorney General Gansler visited where trash “dominated his visit” (Hare, 2011). In fact, the Baltimore Sun article states, “on a daylong tour that took him to shorelines, an island, wetlands and the Back River Wastewater Treatment Plant, Gansler found trash dominated all the conversations” (Hare, 2011). One primary cause of this is the lack of enforcement of current litter laws. The fine for littering for a first time offender with less than 100 lb of litter is up to a $1000 fine and up to 30 days of imprisonment (419 Senate, 2012). However, due to poor enforcement of these laws, Back River is plagued with more litter than it can handle.

P2: Wastewater Plant Discharge

Discharge from the Back River Wastewater Treatment Plant has led to Back River’s high concentrations of nitrogen oxides and phosphorous. These high concentrations have led to severe and frequent algal blooms where the water would appear a bright green color as a result of extremely high concentrations of chlorophyll. In the past, the chlorophyll concentrations in the river exceeded a value of 200 micrograms per liter (Back River Wastewater Treatment Plant Improvements). This value far exceeds the standard range of 25-35 micrograms per liter that the chlorophyll concentration should fall within.

P3: Stormwater Runoff

Stormwater runoff includes any precipitation that does not evaporate or soak into the ground and instead runs off the surface and into surrounding waterways. Depending on the area, stormwater runoff can include a variety of contaminants and pollutants. Highly industrial and urban areas result in extremely high runoff rates, and such runoff normally include high levels of nitrogen and phosphorus.

P3.1: Excessive Nitrogen and Phosphorus Loads in Runoff

The Back River Watershed is composed of mostly urban areas with high impervious surface cover. As a result there are excessive nitrogen and phosphorus loads being input into the Back River Watershed. Nutrients such as nitrogen and phosphorus are important for the health of waterways and aquatic organisms. However, when too much nitrogen and phosphorus are added to the waterway, it can cause unhealthy algal blooms, low oxygen dead zones, and extreme spikes in pH. The majority of nutrient pollution comes from runoff, sewage, vehicle exhaust, and industrial sources which is why it is such an issue in the Back River Watershed. (Nitrogen & Phosphorus CBF, 2010)

P3.2 Sediment Loads in Runoff

Sediment is any type of loose soil particles that settle at the bottom of a body of water. Sediment can be carried into a waterway via both erosion and runoff. The Environmental Protection Agency lists sediment as the most common pollutant of bodies of water and has found that 70% of sediment pollution is caused by human land use. Sediment runoff is caused largely by construction in urban and suburban areas, which is why it is such an issue in the Back River Watershed. It is important to address this issue because sediment loads increase turbidity, which causes increased aquatic organism death and disease. Sediment also prevents the growth of aquatic vegetation and increases the chance of flooding (What is Sediment Pollution EPA).

Solutions:

S1. Litter Removal and Prevention

Progress is already being made in litter removal of the Back River watershed. In fact, a trash boom has been placed in part of the River and in its first year, collected almost 350,000 pounds of trash and tires (Hare, 2011). In order to continue this progress, more trash booms need to be used on the watershed further upstream. Baltimore County recently signed a "trash treaty" with the goal of removing all trash from the river by 2020 (Blumberg, 2011). This program provides funding for trash removal and trash prevention through the parts of the county and city that run into the watershed. The "treaty" also provides incentives for clean ups. "For example, if a community organized a cleanup, it might receive trees that would be planted in its neighborhoods" (Blumberg, 2011). Finally, the "treaty" provides funding to cleanup groups such as the Back River Restoration Committee. Further incentives and cleanups would allow for the goal of a fishable and swimmable river. It is hoped that the "treaty" can be expanded upon so that more community programs and events could be developed to raise awareness about the litter that is polluting the Back River Watershed. Some of these programs could include monthly community cleanups, improved education programs in the Baltimore schools system, and fundraisers to raise money for improved trash removal technologies.

Figure 5. Image of Trash Boom (Chesapeake Bay Program)

S2. Back River Wastewater Treatment Plant Upgrades

The Back River Wastewater Treatment Plant was built in 1911 and the most recent upgrade was in 1998. There are current plans to upgrade the treatment plant and the upgrades will help minimalize concentrations nutrients such as nitrogen, phosphorus, and plant effluent (Back River Wastewater Treatment Plant Improvements). The plans should include upgraded treatment processes such as biological-chemical phosphorus and nitrogen removal (BCFS) processes and BioActiflo® Processes. These processes are adaptive so they would not require any major construction and are significantly less expensive than other upgrades. These processes would be very beneficial in preventing nutrient input into the Back River (Emerging Technologies ,2013).

S3. Stormwater management techniques

There are a wide variety of stormwater management techniques that could be used to address excessive stormwater runoff. These techniques will allow better management of the amount of stormwater runoff and protect water quality (Managing Stormwater, 2005).

S3.1 Infiltration basins

Infiltration basins will be created throughout the watershed to contain runoff, remove pollutants, and prevent flooding. Infiltration basins model natural environments and allow stormwater to soak into the ground and recharge the groundwater systems. By modeling natural systems infiltration basins will allow pollutants to will removed from the runoff as it soaks into the ground. The infiltration basins will be implemented in areas with lower water tables and highly permeable soil so that they are most successful (Managing Stormwater, 2005).

S3.2 Green Technologies

There are many new green technologies and best management practices that could be applied to our management plan. The first approach would be bioretention cells, which use plants and soils to remove pollutants and recharge groundwater through filtration. This is a viable solution because the cells are designed to look like landscaping which makes them both functional and aesthetically pleasing. The implementation of vegetation filters and riparian buffers will filter water and runoff

before it enters the waterways and are also very effective at absorbing high amounts of stormwater (Managing Stormwater, 2005).

Problem	**Goal**	**Solution**
Litter	G2.Reduce the amount of litter being brought into this watershed through nearby streams as well as storm water drainages. G4.Inform and reach out to the public and neighboring communities.	S1: Trash Booms and further legislation
Wastewater Discharge	G3. Upgrade and improve nearby wastewater treatment plants.	S2. Chemical and biological treatment of plant effluent.
Stormwater Runoff	G1: Meet Fishable and Swimmable standards	S3: Stormwater management techniques

Table 4. Solutions Summary

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