



# Stevenson Flood Lot Action Plan

Noureen Badwi, Sean Christensen, Noah Rich, Jordan Van Doren, Tyler Yup, | Karsos 3B | June 12, 2018



## Background:

The culvert where Herring Run and Towson Run converge is too small causing five plots of land in Baltimore County to flood. Thus, Baltimore County bought the houses and knocked them down with the intention of converting the floodplain into an eco-friendly park that deals with the flooding issue. In addition, through a water, physical, and macroinvertebrate assessment of Towson Run, the stream that flows into Herring Run, Towson High students determined that Towson Run has marginal health due to its fair physical assessment, marginal macroinvertebrate count, and poor water quality. Therefore, the park must take this into consideration as well.



## Mission Statement:

To plan and develop a design for an eco-friendly park that works to absorb and purify storm water while also providing the community with a park as well as a means of education for future generations. The project is constrained to \$650,000 as that was the amount that the Knollwood Association was awarded by the local government for the construction of this project.

## Dry Well

Dry wells are pits of stones that allow water to flow through the spaces between the rocks, which helps the infiltration of impervious surfaces or of areas with heavy runoff. That is the reason we stationed it next to the permeable parking lots, one of the areas with potentially the highest amount of runoff. Dry wells are beneficial as they are versatile (they can be placed almost anywhere) and provide access to the groundwater meaning that they can help areas quickly dry out. The one concern with a dry well is that it can provide pollutants easy access to the groundwater. However, this is avoided due to the fact that plants in the rain garden can take in petrol pollution (the most likely type due to the proximity of the dry well and parking lot) and destroy it. Dry wells are very inexpensive, costing about \$200 total for the dry well (\$100 for a Flo-Well dry well that is made of 100% recycled materials and requires no heavy equipment to install) and the stones (about \$100) to build the dry well.



## Outdoor Classroom

The outdoor classroom would include rocks or bricks to sit on and work on as well as plaques mounted to rocks that could provide a learning experience for the nearby schools (Stoneleigh Elementary and Towson High) and community. This can result in a better awareness of activities that are beneficial and harmful to the area, which can make the area more eco-friendly as a whole. If the area is used as a learning experience, such as having a butterfly or insect garden of all the organisms that the rain garden plants attract, then it can contribute to a child's interest in eco-friendly activities from an early age, which can really benefit the children for the future. However, plants must be planted in the area strategically so that it does not become a run off hotspot and that it also works to mitigate the effects of run off and flooding.

## Pervious Parking Lot

A pervious parking lot is a great method of mitigating storm water since it provides the everyday function of a parking lot; which will be needed for this park as it could attract people from multiple neighborhoods surrounding the park. The pervious parking lot functions just like any other parking lot except for the fact that it has more space in it to let water infiltrate through it, turning one of the biggest contributors of runoff into a way to limit flooding. Pervious parking lots don't just minimize runoff. They also are great at reestablishing the natural hydrologic cycle, minimizing the peak discharge rate, and minimizing pollutant concentrations. Another added bonus is that the parking lot will need 0-25% salting of an impervious parking lot as the air trapped in the air pockets in the road heat the road, according to the U.S. Geological Survey. The pervious parking lot is very inexpensive (\$2-\$6.50 per square foot) when it's compared to the impervious parking lot (\$9.50-\$11.50) when ecological damage is accounted for. Even though the parking lot is permeable, it still will be one of the most runoff heavy pollutant heavy areas of the park. Therefore, it is surrounded by the tree and picnic area and a dry well.



## Riparian Buffer

The riparian buffer is one of the most important parts of the park in terms of storm water mitigation techniques. A well-developed riparian buffer benefits the stream greatly as it discourages nuisance animals, increases water quality, and provides an interesting, beautiful backdrop for the park (which is important for parents who will want to have something to interest them while they watch over their children). The riparian buffer (all unmarked areas on the diagram such as the slanted area on the top, the curved area around the playground, and the curved area on the bottom by the picnic area) will be instituted with the use of a no mow zone so that grass and other plants naturally come to the area, developing a small scale forest. This provides monetary benefits as the U.S. Forest Service finds that just one tree can generate \$31,250 worth of oxygen, provide \$62,000 worth of air pollution control, recycle \$37,500 worth of water, and control \$31,250 worth of soil erosion over a 50-year lifespan. The riparian buffer increases stream health as the roots of the plants and trees can filter pollutants before reaching the stream and hold the soil together (which reduces erosion and minimizes flooding events). In addition, the shade of the trees can act as a temperature control for the stream, which enhances habitat value for aquatic organisms. Finally, the vegetation of the riparian buffer can discourage nuisance geese from staying in the area, which helps limit disruption to other wildlife in the area. Unfortunately, riparian buffers can take many years to develop, so it would be beneficial to the park if trees and other native species were planted so that the riparian buffer could develop at a faster rate, rather than developing on a natural timescale (having the few current trees germinate over the area and eventually develop the riparian buffer) which would take many more years than beginning to start planting native species now (costs of that are in the Playground area section).



## Fencing

The rain and edible gardens would require fencing so that disruptions to the growth of the gardens are minimal. There would also need to be a fence along the Stevenson Ln side of the park so that kids do not run into the street. The price for vinyl coated chain link fences cost between \$12.85 per foot-\$18.45 per foot, which may seem expensive, but is worth the cost. The vinyl coated chain link fence is good as it is low maintenance needing just a quick cleaning (such as being hosed down) every few months, is safer than non-vinyl coated fences, and provides a nice aesthetic for the rain and edible gardens, which is one of the few interesting sights for parents. The fence is one of the more expensive types originally, but the overall maintenance means that it is less of a hassle as well as the fact that the companies who supply vinyl-coated chain link fences often compete with each other, meaning that you can haggle down the price by mentioning cheaper prices at a rival company.

## Picnic Area:

The majority of the left side of the flood plain will be taken up by the trees and picnic area. As there is so much space on the plane, it makes sense to have a simple area for families to gather together for activities and picnics. Furthermore, trees have many benefits when it comes to controlling for erosion and improving the environment. Trees recycle \$37,500 worth of water and control \$31,250 worth of soil erosion over a 50-year lifespan while generating oxygen. The only things to consider is making sure that floodwater in this area drains to one of the gardens or dry well. The picnic area faces similar circumstances to the playground as it can't have any anchorable surfaces and the costs of trees are the same at either \$75 per seed for a community member to plant them, or about \$108 per tree with a professional planting the trees. As for the picnic tables, the park would have to use concrete picnic tables that are inlaid with steel, so that they can't be swept away by storm water in the case of flooding. These picnic tables cost about \$850 per table, which may seem expensive, but these picnic tables make the park an entire family experience where families can hang out or have a picnic. This community activism in the park would benefit the park overall as it would increase community participation in the park, especially in features such as the rain garden and edible garden, making the cost worth it.



## Elements and Layout of the Ecological Park

The layout of the eco-friendly park is shown to the left. The park will include many features that provide the community with something to come together around as well as mitigating the effects of storm water in the area. These features are a rain garden, edible garden, riparian buffer, playground, outdoor classroom, dry well, and pervious parking lot, which will be discussed and explained throughout this poster.



## Rain Garden

The rain garden would be very beneficial for the park as the rain garden can help retain and purify water so that it does not degrade the water quality of Herring Run and Towson Run even more. According to the Kansas City Star, rain garden root systems can go as far deep as 20 feet and absorb 8 inches of rain without runoff. This absorption also means that plants can take in petrol pollution and destroy it, as stated by sightline.org. The rain gardens provide this benefit, but they also seamlessly blend into the landscape. For its benefit, the costs of the rain garden are small, costing around \$3-\$4 per square foot, \$10-\$15 for installation. The plants themselves all cost at or under \$5 per plant, which may seem expensive, however in this case the pros outweigh the cost. Plus, Herring Run Nursery supplies many native plants to the Baltimore area, such as the Blue Flag iris to the left, and is affiliated with Blue Water Baltimore so the park may be able to get the plants at a discount. Also, maintenance can be an issue, but the park could delegate responsibility to the nearby high school, Towson High, or ask the community to help maintain it.

## Edible Garden

The edible garden has the same benefits as the rain garden since it also takes in water during times of flooding. However, the edible garden provides a tangible benefit to the community and provides an incentive for community participation, which means that other features of the park will flourish as well. However, some guidelines must be set for the plants, which would be that the plants must be able to tolerate both dry and wet periods up to 48 hours, plants must be non-invasive, must have one plant species per 10-20 feet with the deep-rooted plants nearer the stream side. This results in a couple of plants being the best for the garden, which are asparagus, spicebush, wild red raspberries, Scarlet Beebalm tea, White Bergamont tea, Purple Bergamont tea, and Redbay tea. The one concern with implementing the edible garden is that the plants could become dangerous for consumption if they do absorb pollutants, according to the University of Vermont. The edible garden would have the same costs of developing soil as the rain garden, but the costs of the seedlings would come down to the community, not the park, which is beneficial for the budget.

## Playground

The playground will not include the typical playsets that many parks have, but rather non-anchorable objects and eco-friendly objects due to the strength of the storm water that could wash away play features. For that reason, the playground would include open area, trees, and boulders; for kids to climb on, play hide and seek with, or just to play around in. The playground would attract families as it is something different from the typical playsets at the other playgrounds in the area. The park can also utilize trees if they were blown over in a storm, per se, using the stump or a sideways piece of lumbars as a means for kids to climb on and try to balance. This succession of play opportunities means that the park can transition through time and be flexible, which is important in considering the development of the park (the Lady Bird Johnson Wildlife Park is a great example of using natural features for developing a play area). Also, boulders and trees can divert the flow of water, meaning that it doesn't hit the bank so forcefully, meaning that there'll be less sedimentation and erosion, which benefits the environment as a whole. The cost of boulders and trees are fairly small, costing between \$100 and \$600 per ton (\$100 being for the common types of boulders for the area, which the park would most likely use). A 1x1x1 boulder typically ways about 100 lbs; so a 2x3x5 boulder would weigh about 3,000 lbs and cost about \$150 or \$450. The price to move boulders are about \$40 for delivery, but can go up to \$200, which is still small when you buy multiple boulders at a time. The trees are also very cheap to buy as a seedling for a 4-6ft tree costs about \$75, implementation costs are \$38 per hour when trees take around 50 minutes to plant, and total costs range around \$108 per tree or \$75 if a community member plants it. The park would not have to buy many trees as overtime the trees will germinate, creating more trees to make the area flourish. All this means that the area would be beneficial in that it provides a reason for community involvement as well as mitigating the effects of storm water.

