Recommended Low Impact Development Implementation in the Old Saybrook School District

Natural Resources Conservation Academy
Conservation Ambassador Program

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ABSTRACT

This project reviews the properties of the Old Saybrook school district to determine effective and realistic solutions to prevent pollutants carried by storm water runoff from impacting the quality of the receiving waterbodies. The method used to suggest possible solutions was done by evaluating the strengths, weaknesses, opportunities and challenges that are presented at each site. The results are suggestions for lowering negative impacts from development on water quality based upon the varied geological and structural factors of each location. The conclusion is that simple solutions such as bioretention centers and permeable pavement are possible if the schools are willing to meet the ultimate challenge of covering the cost to install and maintain these systems.

INTRODUCTION

What is Low Impact Development? Low impact development (LID) includes numerous strategies that act as a natural drainage process and is used for storm water management. LIDs use a sites natural and manmade features to preserve water quality.

Why is it important? In an urban setting where pavement and non-permeable surfaces cover large portions of the land, water from rainfall cannot infiltrate causing the water to run off into a nearby watershed, picking up pollutants in the process. This process leads to large amounts of untreated water that end up in streams and rivers, which jeopardizes both water quality and the wellbeing of those ecosystems.

Examples of LIDs - Different methods of LID are used depending on the geology of a site and amount of water running off. Examples of LID include bioretention centers, pervious pavement, vegetation or green roofs and rainwater harvesting.

METHODS AND MATERIALS

Given the opportunity to closely evaluate the schools in the Old Saybrook school district, we looked specifically at the strengths, weaknesses, opportunities and challenges that presented at each site. This was accomplished by reviewing both current and dated aerial imagery to see changes in each property over time, visiting the site to see smaller, less obvious landforms that do not show in photos, and looking at maps to see water flow and watershed orientation.

Figure 2. School location relative to proximate bodies of water

RESULTS: Middle School

1) Green Roofs: While reviewing aerial imagery of the middle school, there was a lot of open space on the flat areas of the school's roof. These spaces on the roofs are also structurally sound enough be used for a green roof. Green roofs partially cover the roof in layers of vegetation reducing runoff onto the ground below by replacing non-permeable surfaces with permeable ones. Green roofs work by intercepting rainwater before it runs off. From there it eventually evaporates or it is held in the substrate of the garden until transpiration and evaporation. A plant that is commonly used in vegetated roofs is sedum due to its ability to maximize water retention in sun exposure.

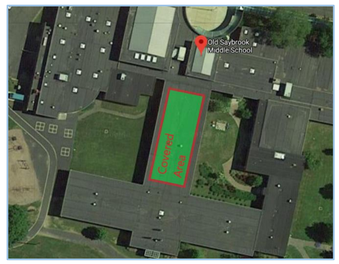

Figure 1. Aerial imagery of the middle school with an outlined area for a potential green roof

2) Drainage System: Another area of potential improvement at the middle school are storm drains near the sidewalk where there is a rain shield for students. By having rain covers, it directs the rain in the direction of the pavement, making a storm drain more effective because it reduces the amount of sediment and other pollutants the water is picking up by having a storm drain closer to the point of origin.

3) Bioretention Center: The area near the entrance to the school could be improved by increasing the pre-existing vegetation in order to absorb more water coming from the gutter right behind it. By adding a bioretention center to this area, the specific layers of the garden will be able to absorb more water than just shrubs alone. Bioretention centers assist in removing pollutants from runoff using processes that include absorption, filtration, and plant uptake. In addition to the shrubs already in place at this location, additionally trees and more diverse shrubs, as well as mulch or ground cover, will significantly improve infiltration.

RESULTS: High School

1) Extending Gardens:
Around the outside of the school's greenhouse there are gardens. Due to the building's slanted roof, this garden has the potential to reduce runoff onto the ground. By extending the garden further into the parking lot and adding layers of vegetation, increasing the biodiversity of the plants and improving the planting soil, it will improve plant uptake and minimize runoff.

Figure 3. Vegetated area surrounding the greenhouse

2) Permeable Pavement: Another area of potential improvement is in the space between the school parking lot and tennis court. The tennis court sits above the parking lot with a small hill in between. This causes water from the tennis court to run off into the parking lot. By adding a drainage system such as permeable pavement in the parking lot near the bottom of the hill, it will catch runoff water from the tennis courts and parking lot due to the angle of the lot. Permeable pavement serves as an alternative to normal pavement and is made to increase infiltration and reduce runoff. Different types include pervious concrete, porous asphalt and permeable interlocking concrete pavers.

3) Replanting lost vegetation: It was observed that there are sizeable gaps in vegetation on the islands in the parking lots. A higher diversity of plants and an abundance of species will allow water to infiltrate through allowing minimal water to run off into the Oyster River watershed. Replanting the vegetation lost on the islands would help reduce runoff.

RESULTS: Elementary School

1) Meadow: A potential solution for the elementary school is a meadow. The elementary school has large fields not being used for sports. By turning these unused areas into meadows, it will not only increase the biodiversity of the habitat, but it will also increase infiltration and reduce runoff. Meadows are made up of herbaceous vegetation and grasses. This includes both native and foreign grasses as well as blooming flowers and soil that thrives in different climates.

Figure 4. Potential Area for meadow

2) Drainage System: Like those at the middle school, the elementary school has covers over the walkways that not only shield students from weather but direct the rain water down towards the parking lot. By adding a drainage system along these areas where rain falls from the covers, it will not only reduce pollutants caught in runoff but minimize erosion over time.

Figure 5. Rain covers and possible drainage area

3) Dry Well Leaching: Another possible solution for the elementary school is dry well leaching. Dry wells reduce and treat runoff using a process of infiltration, absorption, filtration, and bacterial degradation. The Dry Well system is a small trench that is filled with aggregate used to reduce the amount of runoff from a site.

DISCUSSION

Low impact development provides a variety of solutions that can be tailored to a specific location in order to be most efficient, as shown in the recommendations for the schools of the Old Saybrook school district. However, there are implications to these recommendations that the district will face, including cost and resources.

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