# GREEN STORMWATER INFRASTRUCTURE AT NORWICH FREE ACADEMY

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## ABSTRACT

***Motivation***: In urban areas such as Norwich, stormwater carries various pollutants. These pollutants are carried into the sewers or nearby bodies of water. Any pollutants that are left on roads are at risk of being washed into a river, lake or even ocean in a flood or large storm.

***Solution***:Green infrastructure (GI) is an avenue for stormwater in urban and developed areas. With various plants and soil, GI helps control pollutants going into the stormwater. Examples of GI such as rain gardens and green roofs help manage and sustain the environment

***Bringing Green Infrastructure Home***: We highlighted points for rain gardens, green roofs, or other environmentally friendly ways to reduce stormwater pollutant runoff at Norwich Free Academy (NFA). Also, I calculated the amount of runoff in certain areas and used that data to show that harmful runoff is a problem at NFA.

***Implications***: My hope of this project is that the the information we gathered and the GI suggestions we proposed will help NFA implement GI practices on the campus. The suggestions of this project will make this implementation more simple and effectively.

## INTRODUCTION

As shown in the picture to the right (Fig. 1a), much of the Norwich Free Academy (NFA) campus, in Norwich, CT, is made of impervious surfaces. Indeed this is a characteristic of many school campuses. With only a small amount of grassy zones, nine major buildings on campus, and seemingly endless parking lots, the campus is just over 706,000 square feet. It is apparent that rain runoff is a big problem on the NFA campus (Fig. 1b).

Stormwater runoff is not just a minor issue in only some areas, it is a big problem in any area covered by impervious surfaces. Trash and pollutants on these impervious surfaces will be picked up and carried by runoff to local bodies of water. This is where much of water pollution comes from.

We aimed to find issues in runoff management and identified ways to fix them. We mapped areas to place green infrastructure (i.e. practices that manage runoff pollutants using vegetation and soil) and calculated amount of runoff in certain areas.

## "WATER" THE FACTS?

- The campus has 540,283 0 square feet of impervious surfaces
  - Impervious surface takes up 76% of campus
- In a storm with 1 inch of rainfall, 336,800 gallons of runoff is produced
  - That is enough to fill an average swimming pool nearly 25 times
- The average yearly precipitation in Norwich is 54.75 inches
  - In one year, the runoff from NFA is roughly 18,439,789 gallons
  - This is equivalent to 1,365 swimming pools
  - Or almost enough to fill 43 football fields with a foot of water


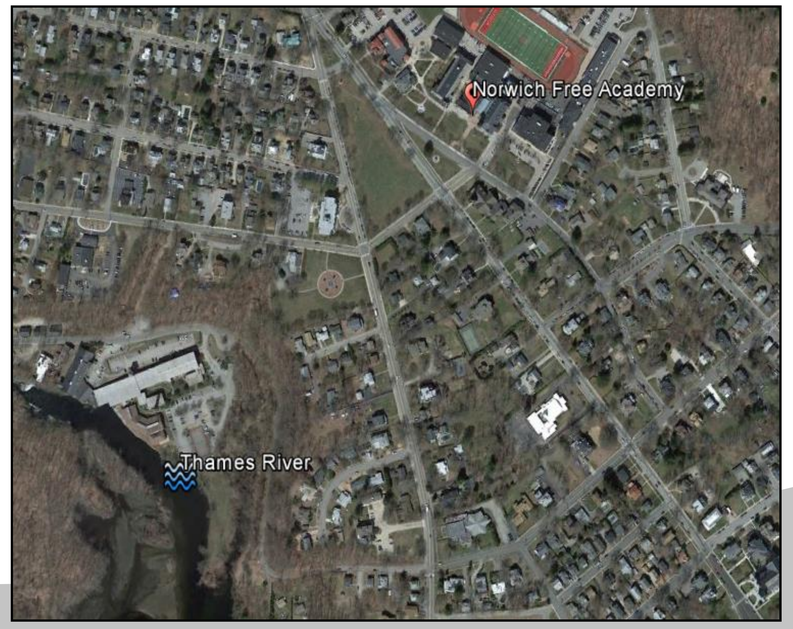


Fig 1a. (Photo above) An aerial view of the Norwich Free Academy campus. It helps to show the sheer scale of the area of impervious surfaces.

Fig 1b. (Photo to the left) Norwich Free Academy is only half a mile away from the Thames River. This river collects all road runoff and transports it to the Long Island Sound. Any pollutants that the surface may contain are washed down with it. Rain gardens can help infiltrate the rain into the ground, which safely filters harmful substances. By installing rain gardens in certain areas, there are thousands of gallons of water than can be filtered, therefore keeping the river and drinking water clean.

## RAIN GARDENS NEAR DRY WELLS

These locations have dry wells, wells that are essentially just holes about 10 feet deep with gravel at the bottom. The gravel allows runoff drained into them to infiltrate into the ground. This area has several in the grassy sections, as well as other locations across campus. The calculations have already been made to find what areas would catch runoff, so these are perfect for rain gardens (Fig. 2). Some of the locations marked would collect thousands of square feet of water each storm.

## CURB CUTS TO GUIDE WATER

Several locations near the parking lots have small streams of water during rainstorms. At these spots, a curb cut no more than a few feet wide could be made to guide the water from the road to a rain garden. Water would flow through a gravel path to a rain garden (Fig. 2) that would allow it to permeate into the soil.

## GREEN ROOF

The cafeteria at NFA is mostly underground, but the high ceilings of it put a wall about ten feet high on the surface level. Other than the ventilation for the kitchen, there is nothing on this roof. This is ideal for something similar to a green roof (Fig. 2). A green roof on the cafeteria would collect runoff from an area of about 8,000 square feet. Part of the roof can be blocked off to be small plants that get their water from rain only, reducing the amount of runoff from it. I envision not just the plants, but a staircase leading to a picnic area on the roof as well. Students can choose to eat lunch or breakfast on the cafeteria roof with a visually pleasing view.

Fig 2. Example of a rain garden (left) and roof garden (right).

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