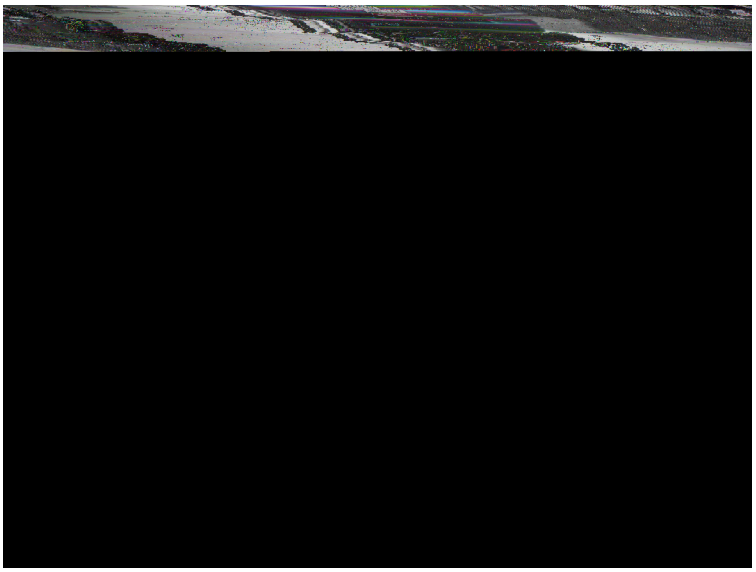
Assessing Stormwater Runoff and Policy in the Kayaderosseras Watershed, New York



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Abstract

Our study examines the impact of land-use on stormwater runoff in the Kayaderosseras watershed using the Long-Term Hydrologic Impact Assessment (L-THIA) model. We also examine local management goals aimed at fulfilling federal and state stormwater policy and assessed implementation success based on town annual reports. We interviewed local officials and site inspectors regarding the challenges of implementing local stormwater management policies, and in particular, sediment and erosion control at construction sites.

Introduction

Non-point source pollution is currently the leading cause of water contamination in the United States. Unfortunately, the regulation of non-point source pollution remains a considerable challenge because the exact sources of contamination are difficult to determine (Haejin et al. 2007). However, most non-point pollution enters surface waters via stormwater runoff (Carpenter, et al. 1998).

Stormwater runoff is the excess precipitation that does not infiltrate land surfaces, and flows through a watershed to its drainage basin, in most cases a lake. As the excess precipitation flows across various land-use types, it absorbs an assortment of chemicals. These include: lawn and golf course fertilizers, pesticides; metals, salts, vehicle related contaminants, sediment, and other compounds whose source is not immediately obvious (EPA 1995). These he

linings, weathered pains and rust. These pollutants are toxic to

originally functioned as the main federal legislation for managing point source pollution. The Act required states to develop their own water quality standards based on individual water bodies, however, methodology for monitoring water quality was still in its infancy and enforcement was nearly impossible. In 1972, the CWA was amended to require permits for polluting from point sources (Federal Water Pollution Control Act Summary). Permits are obtained from the National Pollution Discharge Elimination System (NPDES) and limitations can also be added to a permit in order to ensure that water quality is not only maintained, but also improved. This requires polluters to set up treatment and filtering facilities before wastewater can be piped to a body of water. In 1987, the Water Quality Act was passed, which also required industrial stormwater dischargers and municipal separate storm sewer systems (MS4s) and construction sites that disturb more than one acre obtain permits from the NPDES (NPDES 2007). MS4s are a network of stormwater drains that pipe runoff to an alternate location-this is the system in place in Saratoga Springs (Stormwater Management Report, Saratoga Springs 2008).

Stormwater Management in Saratoga County

To implement federal regulations, the New York State Department of Environmental Conservation (NYSDEC) also requires permits for MS4s and construction sites. In New York State laws, the governing body also has the authority to enforce these federal regulations. Recently, nation-wide attention has shifted towards assessing the impacts associated with stormwater runoff, though currently there are no laws or regulations (NYSDEC 2008). Locally, however, the Saratoga County Intermunicipal

During heavy rain events, water is released from the channels beneath the city at a high volume which flows at a rapid rate. This stormwater remains untreated as it is released into the environment and most likely contains concentrated levels of pollutants. Many of these pollutants are probably dissipated throughout the watershed on their way to Saratoga Lake, but it's likely that significant portion will still make it to the lake. Without a monitoring system in place, this is merely a speculative statement. The overarching goal of this project is to as r

runoff results to known ratios of runoff volume to pollutant mass, known as Event Mean Concentration (EMC) data, to generate a NPS pollution profile for each land-use type.

We ran the model for each municipality within the watershed and combined the results to create NPS pollution profiles for each. By doing so, we have determined the extent to which municipalities generate specific NPS pollutants (Figures 2-5). We have also identified the municipalities that have the greatest NPS impact on the Kayaderosseras watershed (Figure

- Dave Carr, Architect and construction site inspector, LA Group, LLC.
- Matt Gabryshak, Owner, Gabryshak Constructions
- John Witt, Owner, Witt Constructions

We also attended the annual meeting of Saratoga County stormwater coordinators.

Construction Site Inspections

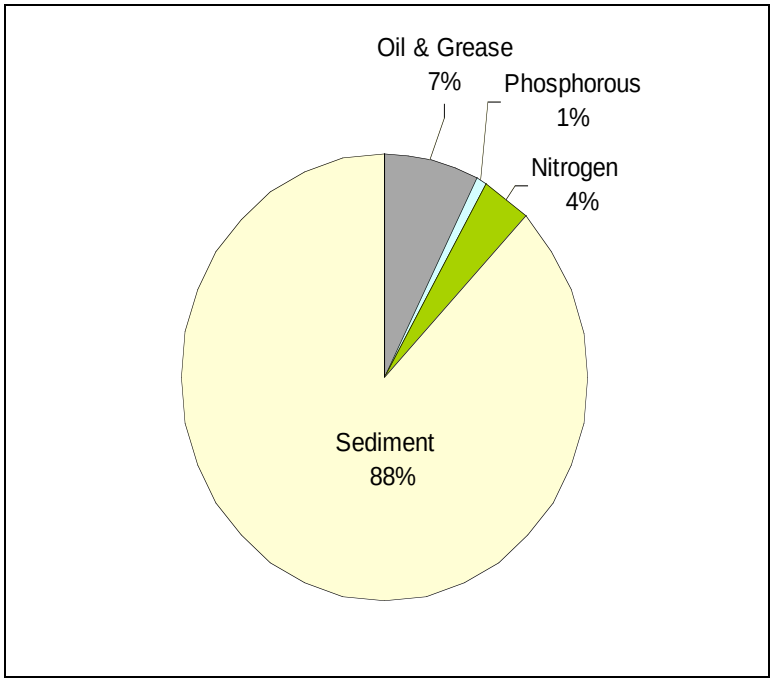
To see first hand how sediment runoff control methods work, how regulations are monitored and enforced, and how a developer implements methods to comply with federal and state regulations, we accompanied Dave Carr and Paul Males on several construction site inspections. Two of the inspections were large-scale residential developments: Ridgewood Estates in Malta, and Saratoga Farms, just outside of Saratoga Springs. Additionallw3l

Long-Term Hydrologic Impact Assessment Model

The L-THIA model provided estimates of various contaminants contributed annually to the watershed from stormwater runoff (Table 1). Among these, we identified four major pollutants in the watershed, based on mass: suspended solids, nitrogen, phosphorous

easiest forms of non-point pollution to manage, as they primarily originate from construction site runoff and winter road maintenance.

Figure 1. Percentage of Major Non-Point Source Pollutants in the Kayaderosseras Watershed

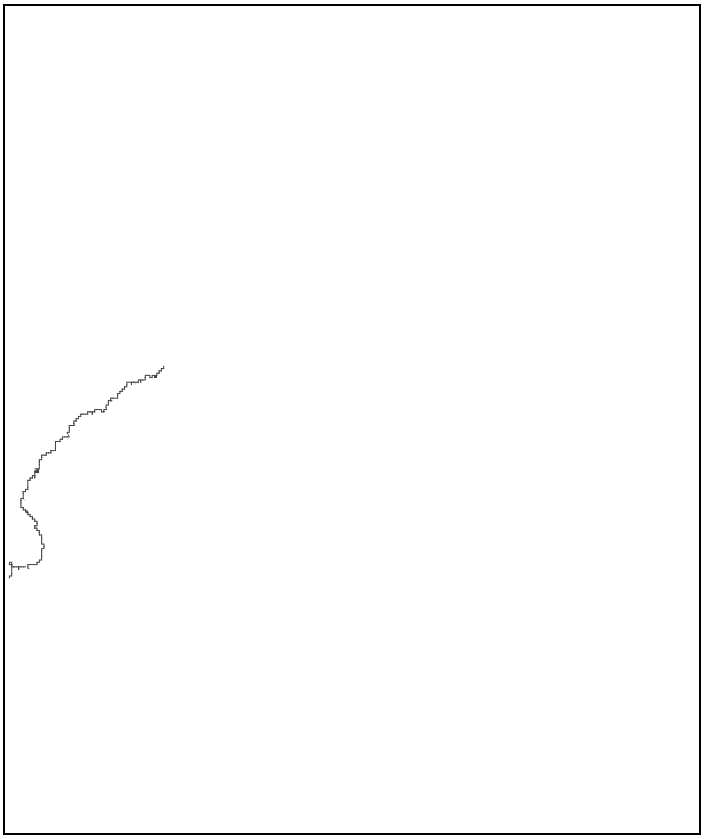


Individual Municipalities

Individual municipalities input varying

more permeable soils, will generate substantially less runoff and NPS pollution than municipalities characterized by greater development and impermeable soil types. Our results indicate which stormwater NPS pollutants municipalities should focus their stormwater management programs on.

Figure 2. Municipalities within the Kayaderosseras Watershed



Of all the municipalities within the watershed (Ballston, Wilton, Milton, Malta, Saratoga Springs, Greenfield, Corinth, Providence, Galway, and Charlton) (Figure 2), we found that Saratoga Springs and Milton are the top two contributors for all four of the identified major pollutants (Figures 2-5). Saratoga Springs contributes 32% to the total sediment load, 44% to the total oil & grease load, 30% to the total phosphorous load, and 23% to the total nitrogen load. Milton contributes 19% to the total sediment load, 16% to

the total oil & grease load, 21% to the total phosphorous load, and 19% to the total nitrogen load. These results are most likely attributed to increased levels of development within Saratoga and Milton, compared to other towns within the watershed. Our results indicate the need for more stringent and progressive action particularly within municipalities that are a

Figure 3. Predicted Phosphorous Contribution by Municipality within the Kayaderosseras Watershed

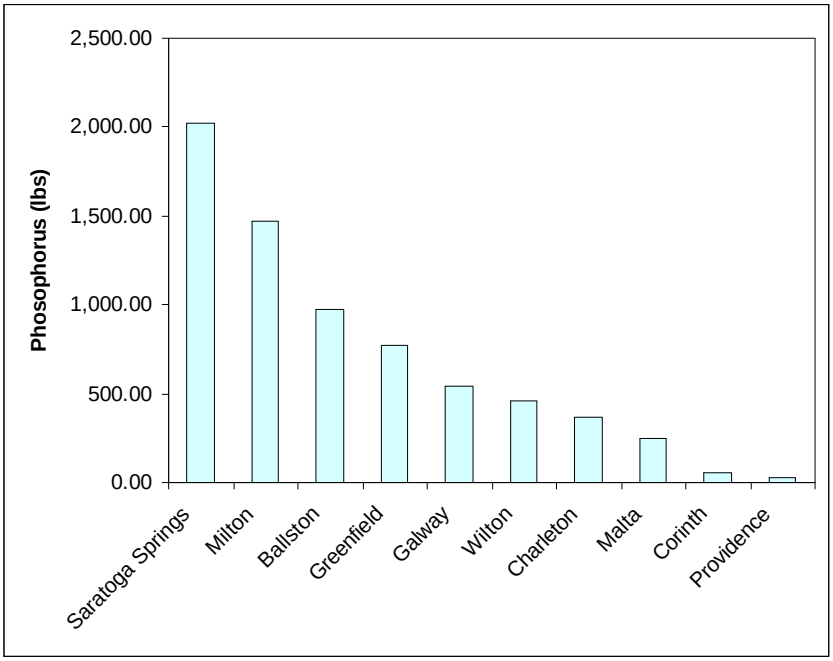


Figure 4. Predicted Nitrogen Contribution by Municipality within the Kayaderosseras Watershed

Figure 5. Predicted Oil and Grease Contribution by Municipality in the Kayaderosseras Watershed

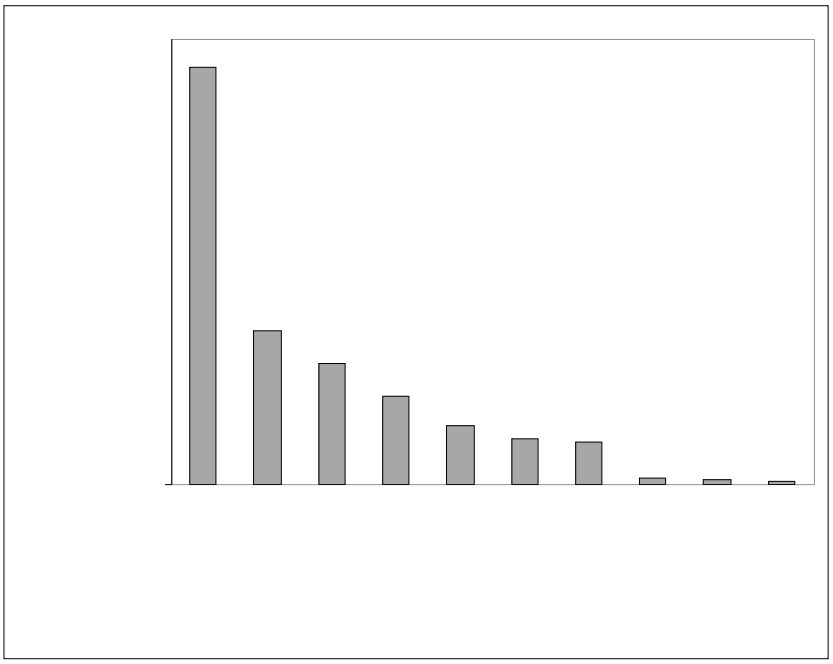
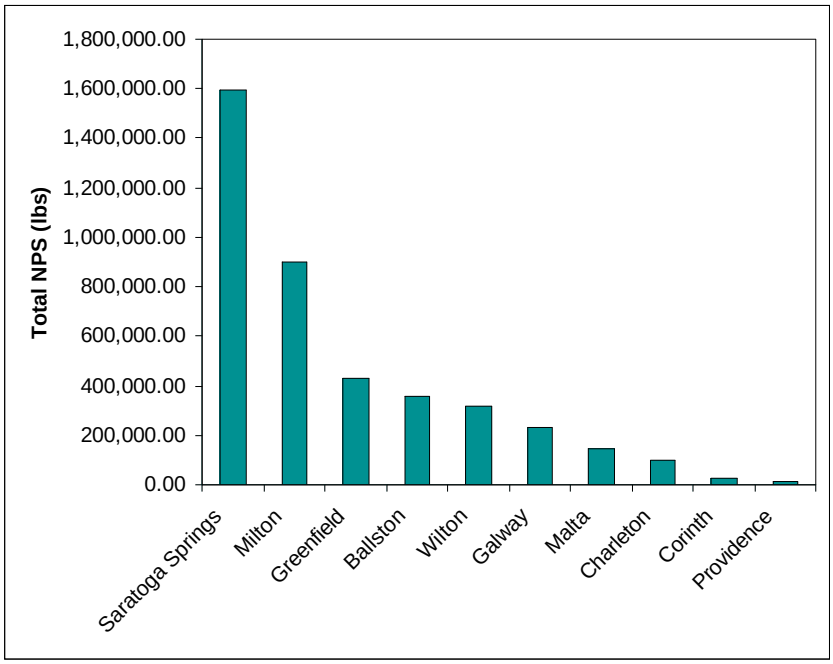


Figure 6. Total Predicted Non-Point Source Pollutant Loading by Municipality



information provided in town newsletters. These actions are easily done at little cost. Additionally, public involvement and participation is also achieved through the participation of local community interest groups, such as the Friends of the Kayaderosseras, and Boy and Gi

that the town have the funds to hire a stormwater coordinator that is able to focus entirely on t

Future Permits

The stormwater management program was designed to be a five-year

In order to explore the

research revealed that in order to improve successful implementation and compliance at the municipal level municipalities must seek to use both of these strategies.

Through our research on compliance, we also determined that while local governments can be as effective as state governments in administering and inspecting implementation of municipal stormwater policies, in most municipalities of the Kayaderosseras watershed these issues cannot be given priority status due to a lack of time, resources, and manpower. Therefore, our study suggests that the role of the state should be much larger in the regulation of stormwater practices at the municipal level in order t

the leading cause of water contamination i

Carpenter, S.R. et al. 1998. Nonpoint Pollution of Surface Waters with Phosphorous and Nitrogen. Ecological Applications. 559