SUSTAINABLE STORMWATER MANAGEMENT FOR SUCKER BROOK WATERSHED

Michael Conte, Timothy Dirgins, Ryan Kertanis, Will Mosto, Haley Noorgard, Rebecca Siegel, Alex Vitulano

with assistance from Jim Ochterski (co-instructor), Zachary Reed (teaching colleague), Robin Lewis (co-instructor), Jordan Mueller (teaching colleague)
This project summary was created as part of the work of Hobart and William Smith Colleges’ Spring 2015 class ENV 351 Sustainable Community Development Tools and Methods.

**Sucker Brook Watershed Student Team**
Michael Conte ’16, Ryan Kertanis ’16, Will Mosto ’15, Alex Vitulano ’16, Tim Dirgins ’16, Haley Norrgard ’15, Rebecca Siegel ’15

The report for the Sucker Brook watershed and stormwater wetlands in the Town of Canandaigua, NY is intended for the Town Board, municipal staff, and the Citizens Implementation Committee members. The report is a compilation of the team’s observations in the Town of Canandaigua and recommendations in response to those observations.

This report will provide a list with descriptions of the eight proposed project sites, which the team has ranked by top priority, as outlined below in the ‘Priority Site Recommendations’ section. These sites have been ranked according to their potential for improvement regarding water quality and stormwater flood prevention.

**Faculty advisors / instructors**
*Jim Ochterski* – Program Manager & Instructor, Finger Lakes Institute – Community Design Center (FLI-CDC) and Sustainable Community Development Program, Hobart and William Smith Colleges

*Robin Lewis* – Assistant Professor of Environmental Studies and Chair of Sustainable Community Development, Hobart and William Smith Colleges

**Teaching colleagues**
*Zachary Reed ’15* – Teaching Colleague, ENV351: Sustainable Community Methods and Tools, Environmental Studies Program, Hobart and William Smith Colleges

*Jordan Mueller ’15* – Teaching Colleague, ENV351: Sustainable Community Methods and Tools, Environmental Studies Program, Hobart and William Smith Colleges
# Table of Contents

- Introduction / Background .................................................................................................................. 2
- Canandaigua Lake and Sucker Brook .................................................................................................. 4
- Methods .................................................................................................................................................. 8
- Prioritization Matrix .......................................................................................................................... 19
- Priority Site Recommendations ........................................................................................................ 21
- Conclusion ............................................................................................................................................. 28
- Acknowledgements ............................................................................................................................. 29
- Works Cited .......................................................................................................................................... 30
Introduction / Background

The Town of Canandaigua requested assistance with a feasibility study of and preliminary plan for the Sucker Brook Watershed, specifically to increase wetland areas and stormwater detention sites by working with private landowners. The Town envisions a feasibility / prioritization study and preliminary site selection regarding constructed stormwater wetlands, predominantly on private property.

The Town of Canandaigua continues to seek ways to manage stormwater responsibly. Stormwater wetland development is considered desirable and there are at least eight alternative sites where constructed wetlands could be developed to improve flows related to Sucker Brook in the northern part of the Town. Prospective locations for stormwater wetlands all occur on private lands and will require long-term easements and agreements for development and ongoing maintenance.

### Project Objectives

- To provide evidence and a rationale to develop stormwater wetlands sites based on water quality, flooding mitigation, maintenance and related factors.
- To analyze and create a prioritized list of project sites where constructed wetlands are beneficial in order to protect agricultural and residential properties throughout the watershed area and help mitigate stormwater damage.

### Project Impacts

- To reduce the incidence and severity of water-borne pollutants reaching the waters of Canandaigua Lake from the Sucker Brook watershed.
- To reduce the incidence and severity of flooding associated with Sucker Brook in both the Town and City of Canandaigua.
## Project Timeline & Activities

The project involved three types of background work to understand the assignment and to meet project needs:

1) **SWOT Analysis (Strengths, Weaknesses, Opportunities, and Threats):** A five-week period, studying the characteristics of the Town of Canandaigua as it has developed over time. The student teams researched key issues facing the Town and presented their findings to Town representatives in early March 2015.

2) **Existing Conditions Analysis:** A two-week period, supported by other students in the ENV 351 course, exploring Canandaigua’s land use, community demographics, transportation systems, topography, soils, agriculture, forests, water resources, amenities, utilities, and housing.

3) **Input meetings:**
   - Met with and interviewed members of the Town’s Citizen Implementation Committee (CIC) on February 25, 2015 in Canandaigua.
   - Presented to and addressed questions from various Board members and community members during their mid-term presentation on March 11, 2015 in Geneva.

4) **Field tours:**
   - January 23, 2015: Orientation tour of the Town of Canandaigua
   - March 25, 2015: Stormwater management and outfall structures tour with Code Enforcement Officer Chris Jensen and Canandaigua Lake Watershed Manager Kevin Olvany
   - April 8, 2015: First round of wetland site scouting and characterization
   - April 15, 2015: Second round of wetland site scouting and characterization

5) **Presentations and special guest lectures**
   - Doug Finch, Town of Canandaigua Director of Development, addressing a wide range of current and near-term planning and community development issues in the Town.
   - Kevin Olvany, Canandaigua Lake Watershed Manager, explaining stormwater management projects and water quality in the Canandaigua Lake watershed.
   - George Frantz, Principal at Tioga Urbanscapes LLC and adjunct faculty member, Department of City & Regional Planning at Cornell University, sharing insights about how to gather community input and character while planning for development.
   - PJ Emerick, District Manager, Ontario County Soil and Water Conservation District, about green infrastructure and local stormwater management projects.
Canandaigua Lake and Sucker Brook

Canandaigua Lake is a top priority for the Town of Canandaigua. The Lake is a valuable asset to the Town, not just for its inherent aesthetic and recreational amenities, but also because it is the Town’s primary source of public drinking water. Furthermore, the Lake is one of Canandaigua’s major economic natural assets because of the tourism it draws into the area, making it a crucial resource to protect.

Sucker Brook is a major tributary of Canandaigua Lake. The watershed of Sucker Brook is of high interest for several reasons. Based on the 2014 Comprehensive Update of the Canandaigua Lake Watershed Management Plan, Sucker Brook ranks relatively high concentrations of phosphorus, nitrates, suspended solids, and fecal coliform (Canandaigua Lake Watershed Association, 2014). In a pollutant ranking table developed by the Canandaigua Lake Watershed Association, Sucker Brook rated higher than any other tributary of the Lake (Figure 1).

Sucker Brook is a large watershed in the northwest region of the Canandaigua Lake Watershed, encompassing 4,347 acres (6.9 square miles) that are located primarily in the Town of Canandaigua. The channel of Sucker Brook flows north at its higher elevations, then turns to flow south through the City of Canandaigua. The combined distance of stream courses that make up Sucker Brook totals 19.3 miles of tributary channels in the sub-watershed. (Makarewicz, Lewis & Lewandowski, 1999).

Smaller channels of Sucker Brook merge near North Bloomfield Road to form the main channel that eventually runs through the City. Fall Brook, on the northeast side of the lake, mirrors Sucker Brook in this pattern on the land. “Unlike Fall Brook, however, Sucker Brook is less linear and more dendritic (leaf-like) in form. The basin’s shape influences the time distribution of runoff, and in a dendritic pattern like Sucker Brook, tributaries feed into the mainstream
at the same time producing a sudden high peak flow” (Makarewicz, Lewis & Lewandowski, 1999, p. 11). This leaf-like shape and the linear extent of Sucker Brook’s tributaries allow for higher water volumes during storm events, which, in turn, leads to a high pollutant load in the Sucker Brook Watershed at these times.

During storm events and snowmelt periods, Sucker Brook becomes a major concern for both the Town and City of Canandaigua. The pollutants introduced to the stream throughout the watershed are condensed and magnified within the confines of the City, often leading to a high-velocity, polluted, stormwater surge that empties directly into the lake and potentially onto private lands and residences located near the stream.

With regards to precipitation, the Sucker Brook Watershed is considered unstable and inadequate to support the amount of precipitation that occurs. Explanations of why this occurs “include a relatively high percentage of impermeable surfaces in the watershed, direct transport of stormwater through the City’s drainage system, and agricultural drainage systems, which limit runoff storage in low spots and wetlands” (Makarewicz, Lewis & Lewandowski, 1999, p. 12).

**Stormwater wetlands and sustainability for the Town of Canandaigua**

Sustainability is based on the principle that human survival is dependent on the natural environment. “Sustainability creates and maintains the conditions under which humans and nature can exist in productive harmony, that permit fulfilling the social, economic and other requirements of present and future generations” (EPA, 2009). Community leaders in Canandaigua have expressed an interest in enhancing the ecosystem functions of natural features like wetlands to maintain a course toward sustainability.

Wetlands are one of the most productive and unique ecosystems in the world. They are defined as “areas where water covers the soil, or is present either at or near the surface of the soil all year or for varying periods of time during the year, including during the growing season” (EPA, 2012, n.p.). Saturation of the soil pore spaces with water is the main factor in controlling how the soil develops and the types of species living in the ecosystem. Wetlands can support both terrestrial and aquatic wildlife. The extended presence of water in wetlands allows conditions that favor the maturation of specially evolved plants (hydrophytes) and promote the development of characteristic wetland (hydric) soils (EPA, 2012, n.p.). Areas such as marshes, floodplains, swamps, pools, and bogs are all considered wetlands.

Wetlands provide many benefits to communities, ecosystems, and landscapes including:

- Sediment and pollutant filtration from runoff
- Natural water quality improvement
- Flood protection
- Stormwater retention
- Groundwater recharge
- Shoreline erosion control
- Enhancement of wildlife habitat
- Opportunities for recreation and aesthetic appreciation
- Harvestable natural products (e.g. berries, wild rice, timber, shellfish, medicines derived from wetland soils and plants)

(Saratoga Associates, 2003)
In the Town of Canandaigua, as is the case elsewhere in the world, natural wetlands can be enhanced and managed in a proactive way to correct past damages and reduce the impact of future water quality problems. In the case of Sucker Brook specifically, the Town can work toward developing a network of appropriate wetland areas that will recharge ground water and filter out pollutants. These wetlands may also reduce soil erodibility within areas that erosion occurs frequently, especially on agricultural land.

Stormwater wetland development can solve future problems before they happen, demonstrating the Town of Canandaigua’s progress toward sustainability. Not only will the creation of stormwater wetlands likely decrease flooding for residents downstream, these wetlands will also likely protect the users of lake-sourced water from contaminants in their drinking water. If the Town of Canandaigua creates more stormwater wetlands, the wetlands will collect stormwater runoff, preventing flooding, and filter the pollutants. The reduction of flooding in Sucker Brook could potentially decrease flood insurance and damage expenses in the Town and City (Figure 3).
Stormwater wetlands also provide additional benefits in the Sucker Brook watershed, such as wildlife sanctuaries or public outdoor recreation areas. Trails and boardwalks over wetland areas could add a secondary usage for the wetlands if a stormwater wetland was created in the community (Drexel Town Square, 2013).

Constructed wetlands are created for the purpose of treating wastewater, stormwater, or agricultural runoff. Constructed stormwater wetlands can only be developed on sites where existing conditions can produce and sustain a wetland. Although there are not necessarily specific criteria for constructing a wetland, hydrologic influences are the key to identifying candidate sites (Kentula, 2005). These constructed wetlands require monitoring to ensure that native species and vegetation are inhabiting the wetland, and not just adding pollutants and more nutrients like phosphorous into the system (Weiss, 2005). The Town of Canandaigua still has natural wetlands, and with the construction of new stormwater wetlands, the Town can derive long-lasting benefits.

The Sucker Brook Watershed drains into Canandaigua Lake, which supplies 60,000 residents in surrounding communities with drinking water. Stormwater wetlands could sustain the quality of water in the Lake and be very beneficial to the Town (Saratoga Associates, 2003). Therefore, wetlands play a crucial role in the Town’s sustainability plan. With the implementation of new stormwater wetlands, the Town would be proactively protecting water quality and reducing pollution, flooding, and erosion problems (Allis, 2015). With regard to agricultural water quality risks, stormwater wetlands can help reduce the flow of nonpoint source nitrates and phosphates in Sucker Brook’s tributaries (Allis, 2015). Implementing wetlands would not only collect agricultural runoff, but it would also be protecting the drinking water quality (Kovacic et al., 2000).

**Figure 3:** Flood zone map for parcels in the City of Canandaigua, depicting those that lie in the 100- and 500-year flood zones for Sucker Brook and other water bodies (Source: City of Canandaigua- FIRM MAP, 1982)
Methods and Prioritization

Prospect sites

One of the main challenges of stormwater wetland development in the Sucker Brook Watershed is the limited public land available and appropriate for such use. To attain the benefits of wetland development, the Town is obligated to extend its prospect sites to include private land, sometimes owned by multiple entities and/or individuals. The Town will likely consider conservation easements, contracts, land sale, and other techniques to legally use the land for stormwater wetland development require a high level of public investment.

The Town of Canandaigua, in cooperation with the Canandaigua Lake Watershed Council, identified eight sites on private land in the Sucker Brook Watershed that meet basic criteria for stormwater wetland development. These eight sites each have the capacity to retain stormwater flow with the installation of engineered structures that can either divert peak flows to a constructed wetland or impound stormwater flow in-stream.

To establish a more structured and impartial analysis of prospective sites, the Town of Canandaigua requested the student team to develop a concept and implementation plan for stormwater wetland development. This plan would include a preliminary evaluation of eight prospect sites for stormwater wetland development in terms of water quality and quantity management.

Figure 4: Prospect stormwater wetland sites overview map (Source: ESRI/Town of Canandaigua)
## Stormwater candidate site characteristics

<table>
<thead>
<tr>
<th>Site A</th>
<th>“Cattle Farm”</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>A 31.5-acre site on the western edge of the Watershed. Currently exists as a large secluded marsh, surrounded by woodlands.</td>
</tr>
</tbody>
</table>

### Characteristics:
- Forested / open marsh and swamp
- Elevation in watershed: 850’ (mid-elevation)
- Proximity to agriculture land use
- Natural wetland, already forested
- Low additional water retention
- Currently regulated by NYSDEC
- Four landowners
- Edge of watershed, adjacent to Beaver Creek Watershed (tributary to Ganargua Creek)
Site B  
“Little Woods”

A 1.9-acre site along the stream course of Sucker Brook, north of State Routes 5 and 20 and just south of the Buffalo Road Extension. Currently exists as a small floodplain woodlot.

Characteristics:
- Periodically flooded forest
- Elevation in watershed: 900’ (mid-elevation)
- Receives runoff from State Routes 5 and 20
- Natural floodplain
- Moderate retention capability
- One landowner
- Stream channel flows directly through site
- Flanked by agricultural land
A 23.2-acre site central in the watershed, just south of States Routes 5 and 20 and west of Canandaigua Town Hall. Currently exists as a mix of hay fields, woodlands with a high water tables, and the Sucker Brook stream channel.

Characteristics:
- Mix of open field and periodically wet woods
- Elevation in watershed: 924’ (higher elevation)
- Proximity to agriculture land use
- Natural wetland, already forested
- Stormwater retention based on diversion during peak flow
- Currently regulated by NYSDEC
- Four landowners
- Easily visible from Routes 5 and 20
Site D “Culverts”

A 24.8 acre site in the southern upland portion of the watershed. Currently exists as a floodplain and wet woodlot.

Characteristics:
- Forested, with small agriculture land inclusions
- Elevation in watershed: 970’ (higher)
- Proximity to agriculture land use / tilled cropland
- Natural inundation area where several small stream courses join together
- Moderate water retention capacity
- Currently regulated by NYSDEC
- Three landowners
- Highest site elevation under consideration in watershed
Site E
“Cornfield”

A 9.3-acre site on a minor feeder stream of the main Sucker Brook channel. Currently exists as a woodlot surrounded by agriculture land.

Characteristics:
- Forested, with small agriculture land inclusions
- Elevation in watershed: 900’ (mid-elevation)
- Proximity to agriculture land use / tilled cropland
- Natural inundation area with level, waterlogged soils
- Moderate water retention capacity
- Three landowners
- Small drainage area compared to other sites
- Stormwater retention based on diversion during peak flow
- Town-owned land across road to the south
| Site F  
| “5 and 20 Bypass” |

| A 1.4-acre site on minor stream that leads to the main Sucker Brook channel. Currently exists as mown grass and a deep roadside swale. |

| Characteristics: |
| • Open field / roadside waterway |
| • Elevation in watershed: 860’ (mid-elevation) |
| • In-between agriculture land use / state highway |
| • Lower impact site |
| • Limited water retention capacity due to smaller size |
| • One landowner / state highway right-of-way |
| • Small drainage area compared to other sites |
| • High visibility, on high-volume road |
**Site G**  
**“Outhouse North”**

A 24.9-acre main stream channel site near the northern edge of the Watershed. Currently exists as a brushy field with moderately well-drained to somewhat poorly-drained soils.

**Characteristics:**
- Large brushy field / roadside waterway
- Elevation in watershed: 782’ (lower-elevation)
- Surrounding lands are brushy lots / recreational / institutional / agriculture
- Stormwater retention based on diversion of peak flow
- Substantial water retention capacity due to larger size
- Soil drainage suitable for infiltration, limited retention
- Two landowners
- High visibility / conspicuous
- Town-owned land across road to the south
Site H
"Brookside"

A 1.7-acre site where several smaller streams join together. Currently exists as a partially-wooded floodplain next to a residential area.

Characteristics:
- Compact floodplain / stream confluence area
- Elevation in watershed: 768’ (lower-elevation)
- Surrounding lands are residential / brushy lots
- Stream channels drain eastern area of watershed into Sucker Brook main channel
- Limited water retention capacity due to smaller size
- Soil drainage suitable for infiltration
- One landowner – a homeowners association
- Moderate visibility
- Adjacent to City border
Stormwater wetland site prioritization

The Town of Canandaigua wants to more actively and sustainably manage stormwater and do so with financial efficiency in mind. Stormwater wetland development is one of the management techniques under consideration. There are at least eight alternative sites described previously where constructed wetlands could be developed, as identified by the Town of Canandaigua and the Canandaigua Lake Watershed Council. The prospective locations for stormwater wetlands each have their advantages and disadvantages with the added challenge that most occur on privately-owned land, requiring easements and agreements that will span generations of landowners ahead. A structured prioritization process will go a long way toward consensus, planning, implementation, and subsequently achieving the goals of effective stormwater management.

One strategy to make such complex choices transparently is the development and use of a prioritization matrix. Such quantitative ranking scales guide decision making in more complex situations, taking into account potentially conflicting influences and assigning numerical values to rank and rate the choices (Gosenheimer, 2012).

The prioritization matrix used in this study combines water quality, stormwater management, and constructed wetland development criteria with the relevant characteristics of each prospect wetland site. Each potential wetland site was evaluated by primary and secondary factors culminating in a ranking scale that indicates higher priority stormwater wetland development versus lower priority.

A consultant for the City of Sandy Springs, GA used a prioritization matrix in a similar way to determine watershed management choices for two creeks subject to urban flooding in the northern suburbs of Atlanta, GA. They demonstrated that a prioritization matrix can take into account multiple site characteristic criteria and still present objective conclusions (Visone & Hawks, 2009).

In this project, the quality of water improvement and the ability to mitigate downstream flooding are the determining factors of a stormwater wetland usefulness. Potential water quality improvement and flood control can be influenced by the size of a wetland, the types of soils in the wetland, when water is detained or retained on the site, and the amount of nutrients and water flowing into the wetland. These primary factors were weighted more heavily than secondary factors because they are of main importance when determining which site can function most efficiently.
We created the criteria for a high priority wetland site based on information from the EPA website and information provided by the Ontario County Soil Water Conservation District. Using the prioritized criteria, we created a decision matrix to evaluate, compare and ultimately rank the sites. We deduced that a project requiring the least amount of engineering, fewer zoning challenges, few property owners and already has the Sucker Brook flowing through are of high priority.
### Prioritization Matrix

#### Primary factors scored using a scale of 1 (least) to 10 (greatest)

<table>
<thead>
<tr>
<th>Wetland Site</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>F</th>
<th>G</th>
<th>H</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Quality of water improvement</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sediment removal</td>
<td>1</td>
<td>7</td>
<td>9</td>
<td>8</td>
<td>5</td>
<td>1</td>
<td>10</td>
<td>6</td>
</tr>
<tr>
<td>Nutrient removal</td>
<td>4</td>
<td>7</td>
<td>10</td>
<td>10</td>
<td>8</td>
<td>6</td>
<td>10</td>
<td>7</td>
</tr>
<tr>
<td>Temperature influence</td>
<td>5</td>
<td>9</td>
<td>8</td>
<td>6</td>
<td>9</td>
<td>10</td>
<td>9</td>
<td>9</td>
</tr>
<tr>
<td><strong>Potential stormwater flood mitigation</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Watershed/wetland scale</td>
<td>10</td>
<td>5</td>
<td>8</td>
<td>9</td>
<td>8</td>
<td>8</td>
<td>6</td>
<td>5</td>
</tr>
<tr>
<td>Capacity</td>
<td>10</td>
<td>5</td>
<td>9</td>
<td>9</td>
<td>8</td>
<td>5</td>
<td>9</td>
<td>5</td>
</tr>
<tr>
<td>Amount of watershed</td>
<td>3</td>
<td>10</td>
<td>10</td>
<td>6</td>
<td>3</td>
<td>1</td>
<td>10</td>
<td>6</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td>33</td>
<td>43</td>
<td>54</td>
<td>48</td>
<td>41</td>
<td>31</td>
<td>54</td>
<td>38</td>
</tr>
</tbody>
</table>

#### Secondary factors scored using a scale of 1 (least) to 5 (greatest)

<table>
<thead>
<tr>
<th>Wetland Site</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>F</th>
<th>G</th>
<th>H</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Startup of project</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Site engineering needs</td>
<td>3</td>
<td>3</td>
<td>2</td>
<td>4</td>
<td>3</td>
<td>5</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>Site acquisition</td>
<td>1</td>
<td>4</td>
<td>2</td>
<td>3</td>
<td>3</td>
<td>2</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Zoning</td>
<td>3</td>
<td>2</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td><strong>Recreation potential</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Public recreation</td>
<td>0</td>
<td>3</td>
<td>1</td>
<td>3</td>
<td>4</td>
<td>0</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td>7</td>
<td>12</td>
<td>8</td>
<td>13</td>
<td>13</td>
<td>10</td>
<td>12</td>
<td>11</td>
</tr>
</tbody>
</table>
## Total score

<table>
<thead>
<tr>
<th>Wetland Site</th>
<th>Site Name</th>
<th>Primary Factors</th>
<th>Secondary Factors</th>
<th>Total Composite Score</th>
<th>Final Priority Ranking</th>
</tr>
</thead>
<tbody>
<tr>
<td>G</td>
<td>Outhouse North</td>
<td>54</td>
<td>12</td>
<td>66</td>
<td>1</td>
</tr>
<tr>
<td>C</td>
<td>Red Fox</td>
<td>54</td>
<td>8</td>
<td>62</td>
<td>2</td>
</tr>
<tr>
<td>D</td>
<td>Culverts</td>
<td>48</td>
<td>13</td>
<td>61</td>
<td>3</td>
</tr>
<tr>
<td>B</td>
<td>Little Woods</td>
<td>43</td>
<td>12</td>
<td>55</td>
<td>4</td>
</tr>
<tr>
<td>E</td>
<td>Cornfield</td>
<td>41</td>
<td>13</td>
<td>54</td>
<td>5</td>
</tr>
<tr>
<td>H</td>
<td>Brookside</td>
<td>38</td>
<td>11</td>
<td>49</td>
<td>6</td>
</tr>
<tr>
<td>F</td>
<td>5 and 20 Bypass</td>
<td>31</td>
<td>10</td>
<td>41</td>
<td>7</td>
</tr>
<tr>
<td>A</td>
<td>Cattle Farm</td>
<td>33</td>
<td>7</td>
<td>40</td>
<td>8</td>
</tr>
</tbody>
</table>
Priority Site Recommendations

Priority sites 1 - 4

Priority Site #1: Site G “Outhouse North”
Of the eight candidate sites, Site G (Outhouse North) is ranked as a top priority for several reasons. It is a large site relative to the other sites, and is located downstream in the lower part of the Sucker Brook Watershed (Figure 5). The site can encompass the main channel of Sucker Brook and includes runoff of about half of the entire Sucker Brook Watershed.

Furthermore, Site G was ranked high in both pollutant control and flood prevention. Being located at a lower elevation, this site is exposed to many forms of pollutants from the watershed above it. A large amount of water flows to this site due to the size of the drainage area. It has the ability to store excess water and possibly mitigate contaminants included in roadside, residential, and agriculture runoff from a large portion of Sucker Brook. Site G is also located close to the City, which is important for slowing the flood waters that enter the City at a higher than average velocity during flood events. A new stormwater wetland at the Outhouse North site would also reduce flooding in Outhouse Park itself, making the park more accessible following storm and runoff events. The possibility of turning Outhouse North into a nature park is also high due to its easy road access, bird life, scenic views and central location.

Figure 5: Site G and location of prospective stormwater wetland (Source: ESRI)
Positives:
Site G has the largest amount of watershed flowing into the wetland of the eight proposed sites and the second largest capacity of water detention by the acreage. These factors together allow Site G to detain a large amount of the stormwater.

Engineering Site G as a type of relief valve for excess flow during storm events also increases the ability to slow water. When the velocity of water is low, it decreases downstream flooding and increases the ability for sediments that carry nutrients and pollutants to settle out. When water is in this wetland, it will likely infiltrate to recharge the groundwater, which reduces the possibility of thermal pollution (artificially warm water due to sunlight heating) in Sucker Brook.

Negatives:
Outhouse North is a large area with more substantial engineering will be required here than at some of the smaller proposed wetland sites in the Watershed. Although the upfront costs of this area are likely to be higher than other sites, the amount of flood control and increase in water quality due to the handling of larger volumes cause this site to be more critical than smaller sites.

Priority Site #2: Site C “Red Fox”
Like Site G, Site C is one of the larger sites under consideration. It is located upstream from Site G in the middle of the largest drainage area within the Sucker Brook Watershed. Site C falls along the course of the main stream channel (Figure 6). By decreasing the flooding from the main channel, downstream flooding could be reduced significantly. Site C could also be potentially useful in managing residential, roadside and agricultural pollutants.

Figure 6: Site C and location of prospective stormwater wetland (Source: ESRI)
**Positives:**
Site C is ranked third in terms of water flowing into the wetland out of the eight proposed sites and the third largest capacity of potential water detention by the acreage. Similar to Site G, Site C is thus able to detain a large amount of stormwater. A larger site presumably can offer more pollutant retention and breakdown, as well as reduce flood force further downstream.

Engineering Site C as a “relief valve” for excess flow during storm events also increases the ability to slow water. When the velocity of water is low, it decreases downstream flooding and increases the ability for sediments that carry nutrients and pollutants to settle out. When water is in this wetland, it will recharge into the groundwater, reducing the risk of thermal pollution in Sucker Brook.

**Negatives:**
Site C is a large area, with more engineering necessary than smaller proposed wetland sites. Although the initial stormwater wetland development investment in this area is likely to be higher than smaller sites, the amount of flood control and increase in water quality will be greater.

**Priority Site #3: Site D “Culverts”**
Site D is another large site located in the uplands in the southern part of the Sucker Brook Watershed. Several channels converge at this site, bringing a lot of water into the area (Figure 7). A stormwater wetland at this site would likely help reduce potential nutrient loads from the surrounding agricultural lands, and help store flood waters at the top of the Watershed. The expansiveness of Site D would assist in preventing water from reaching high velocity high in the Watershed and likely decrease downstream erosion. There are signs of heavy water flow, like debris in the stream and stream bank erosion, as well as agricultural pollution in the vicinity of Site D; such issues would
both be addressed by establishing a constructed stormwater wetland at this site.

**Positives:**
Site D has the fourth largest amount of watershed flowing into the wetland and the third largest capacity of water detention by the acreage. One advantage of this site is its capacity to detain a large amount of the stormwater flow, increasing the beneficial effects provided by wetlands.

Engineering Site D as a stormwater wetland with Sucker Brook flowing through at all times allows for the site to potentially reduce water flow and increase water quality continuously. During storm events, the large acreage would be inundated, reducing the outflowing volume and velocity of water. When the velocity of water is low, it decreases downstream flooding and increases the ability for sediments that carry nutrients and pollutants to settle out.

**Negatives:**
Site D is a relatively large area, with more engineering necessary than smaller proposed wetland sites. Yet, the Sucker Brook already flows through the proposed wetland, perhaps making the project easier than Site C or Site G. Although the likely upfront cost of this area is higher than other sites, the amount of flood control and increase in water quality will be greater than the smaller sites. The site lies across three parcels with different owners. The study team did not contact the owners for direct testimony, but this split-ownership characteristic could create logistical and time-consuming complications.

**Priority Site #4: Site B “Little Woods”**
Site B is a small wooded site located between Buffalo Street and State Routes 5 and 20 (Figure 8). Site B would mitigate mainly agricultural and roadside runoff as well as slow water velocity in Sucker Brook. Site
B is located near the middle elevation point of the Watershed so it can simultaneously catch pollutants upstream and slow water going downstream. Yet, Site B is also located on a comparatively small acreage. For these reasons, when our group visited the site after a rainfall event, the site was inundated with water. We believe that it may already be effectively working as a wetland, although an engineer is required to assess how much more water it could retain.

**Priority sites 5 - 8**

**Priority Site #5: Site E “Cornfield”**
Site E is a lower priority site for stormwater wetland development at this point but has several key characteristics that could make it more effective in the future. Compared with the other seven potential sites, it is medium-sized and located mid-elevation and it does not abut the main channel of Sucker Brook (Figure 9).

Right now, developing a stormwater wetland at Site E would deal with a comparatively smaller amount of potential nutrient-loaded runoff; however, in the future it could deal with runoff from the residential projects that are likely to develop near the site. It also has the capability to serve as a public recreation resource due to the creation of Miller Park across the street. The position of this site would allow wetland development to be more focused on stormwater retention than on water quality enhancement in the future.

**Priority Site #6: Site H “Brookside”**
Site H is a relatively small wetland area located adjacent to the Brookside development, an expanding higher-density residential area. Site H sits at the meeting point of a tributary and the main channel of Sucker Brook at the edge of the City (Figure 10). This position is crucial for both pollutant retention as well as flood prevention.

Figure 9: Site E and location of prospective stormwater wetland (Source: ESRI)
A wetland here could intercept the residential pollutants and to a lesser extent, potential agricultural and road-generated pollutants that flow through this tributary. The stormwater wetland could slow the water velocity down before it meets the rest of Sucker Brook and enters the City of Canandaigua. Creating a wetland here would not likely have a noticeable effect on water quality or quantity during storm events. Its location near a residential community increases the opportunity for public education; however, we do not feel this secondary benefit is sufficient enough to rank this site higher.

**Priority Site #7: Site F “5 and 20 Bypass”**

Site F is at the bottom of a roadside embankment on the west side of the State Routes 5 and 20 bypass (Figure 11). Its main function as a stormwater wetland would be to catch roadside pollutants from Routes 5 and 20 and to store the stormwater running off of this stretch of impermeable surface. This site does not show promise as a full-functioning wetland as much as the other sites, so it is ranked low on the priority list. The roadside pollutants are already being caught and partially filtered by the large vegetated swale on the west side of State Routes 5 and 20. While this site would increase that storage capacity, it sits high in drainage area of this part of the Watershed. It would likely do little to decrease water flow in a flood event or retain more pollutants than it already does.

**Priority Site #8: Site A “Cattle Farm”**

Site A is the largest proposed stormwater wetland development area in the Sucker Brook Watershed (Figure 12). It is located at the western edge of the watershed, meaning it has a smaller drainage area than the other sites. This large forested area is already regulated by the New York State Department of Environmental Conservation (NYSDEC). This forested swamp area retains a lot of the water that flows through this area, slowing it down and catching any pollutant runoff. The sheer size of this forest is slowing down much of the stormwater already.

This site ranks low in our rating due to its limited capacity to retain pollutants and to slow additional stormwater. It is our belief that it is already mitigating flood waters, and based on its classification as a NYSDEC-regulated wetland, it does not require additional engineering at this point in time.
Figure 11: Site F and location of prospective stormwater wetland (Source: ESRI)

Figure 12: Site B and location of prospective stormwater wetland (Source: ESRI)
Conclusion

Wetland sites are of vital importance to stormwater management in the Town of Canandaigua and particularly in the Sucker Brook Watershed. Wetlands, whether natural or properly designed and constructed, filter pollutants, retain stormwater, create habitat for native species and provide a sustainable stormwater management solution.

This project focused on prioritizing eight proposed wetland sites within the Sucker Brook Watershed. Sites G, C and D provide major water quality improvements with regard to pollutant filtration and flood water retention. Of these three options, Site G is the best candidate for further stormwater wetland development for two main reasons: 1) it is positioned low in elevation which means a large amount of water flows through it, and 2) the large volume of water is likely to transport much of the lake water contaminants as well as a large amount of floodwater. These factors make Site G the highest priority.

Sites C and D are second and third priority locations, respectively, for very similar reasons to those discussed above. Their size and location within the watershed positions them to be highly effective and efficient by our standards. These wetlands will prove beneficial for the Town of Canandaigua and for the health of the Sucker Brook watershed.

With these recommended priority stormwater wetland development sites for the Sucker Brook watershed, the Town of Canandaigua is better positioned to follow through and develop detailed engineering and structural plans. The next steps regarding wetland development are best made in conjunction with the Canandaigua Lake Watershed Association and the City of Canandaigua, in cooperation with Ontario County Soil and Water Conservation District.
Acknowledgements

Amanda Catalfamo, Town of Canandaigua Development Office Specialist
PJ Emerick, District Manager, Ontario County Soil and Water Conservation District
Doug Finch, Director of Development, Town of Canandaigua
Pam Helming, Supervisor, Town of Canandaigua
Chris Jensen, PE, Town of Canandaigua Code Enforcement / Zoning Officer
Kevin Olvany, Canandaigua Watershed Manager, Canandaigua Lake Watershed Association
Members of the Town of Canandaigua Citizens Advisory Committee, the Town Board, and the community of the Town of Canandaigua
Works Cited


