Still River Watershed Management Plan

Prepared for
The Still River Partners and the Connecticut Department of Energy and Environmental Protection

In support of the
Still River Watershed Action Plan for Nonpoint Source Pollution Reduction
(CT DEEP Contract #14-03f)

Prepared by
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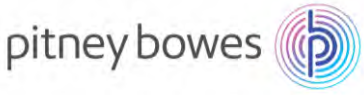


Housatonic River Natural Resource Damages Fund

Still River Watershed Management Plan
Executive Summary

The story of the Still River is a story of comeback.

The Still River has made a remarkable recovery after decades of being treated like an open industrial sewer. The 1972 federal Clean Water Act combined with state and local efforts to address pollution from industry and wastewater treatment plants have made great progress towards improving the water quality of the Still River, making it a healthier ecosystem and safer place for people to visit and enjoy.

But we still have work to do.

Despite these advances, the Still River continues to be one of the most polluted in the Housatonic Valley. 36% of all tributary streams in the watershed, including the majority of the Still River mainstem, are classified as “impaired” by the State of Connecticut for recreational use and/or aquatic life due to poor water quality. This means that concentrations of pollutants regularly spike above levels safe for human contact, and populations of aquatic organisms have changed dramatically from what would be expected in a healthy river.

Not only is poor water quality a problem for public health, fish and wildlife, but it also represents missed opportunities for watershed communities. The Still River has the potential to be an incredible resource; a place where residents and visitors alike can go to swim, paddle, fish, explore riverside trails, reconnect with nature and learn from the landscape.

Building Partnerships

Since 2014, people who care about the Still River and recognize its potential as a community asset have been working together to continue its comeback story. This group is called the **Still River Partners (SRP)**. SRP members come from watershed communities, state, federal and regional agencies, and non-profits with an interest in watershed protection and management. The SRP is the driving force behind this Watershed Plan. SRP members have collectively committed thousands of hours of effort to understanding the state of the Still River and its watershed, articulating a shared vision for its future, and identifying the steps we need to take to get there. The SRP identified six key focus areas for management of the Still River watershed, which became the framework of this Watershed Plan:

1. **Water Quality**
2. **Capacity Building and Collaboration**
3. **Outdoor Recreation**
4. **Climate Resilience and Floodplain Management**
5. **Species and Habitats**
6. **Education and Outreach**

Characterizing the Still River

The first step in the Watershed Plan development process was to gather existing research and planning relevant to watershed management, using the focus areas identified by the SRP as a guide. The Housatonic Valley Association (HVA) with support from other SRP members pulled together an inventory of over 300 references- things like water quality studies, town planning documents and maps of proposed trails. HVA and the SRP waded through this trove of relevant information to create a detailed summary, organized by focus area. Meanwhile, HVA staff were collecting new information about the state of the Still River and its watershed. HVA walked 30 stream miles in the watershed to look for restoration opportunities - places where the SRP can work to reduce pollution and flood risk, restore habitat and enhance river access.

The summary of existing research and planning and the results of HVA's field investigations were combined into the **Still River Watershed Existing Conditions Report (ECR).** HVA circulated a draft of the ECR to the SRP and other stakeholders with specific expertise, and incorporated the comments received into the document. This updated version of the ECR was then used as the basis for a public outreach effort. HVA staff visited public meetings in six watershed communities, presenting the findings of the ECR and explaining how people could submit additional comments. Comments received were incorporated into the final ECR document.

Envisioning the Future and Setting Goals

Using the final Still River Watershed Existing Conditions Report as a guide, the Still River Partners worked together to create the following **Vision Statement** for the Still River Watershed:

> ***"A healthy Still River is the heart of watershed communities, providing safe, easily accessible recreation opportunities for people of all backgrounds, ages and abilities - including swimming, boating, fishing, and riverside trails. The Still River provides opportunities for learning about and connecting with the natural world. Watershed stakeholders work collaboratively to:***
>
> - ***Protect and improve water quality and quantity***
> - ***Conserve important species and habitats***
> - ***Enhance the climate change resiliency of the built and natural environments***
> - ***Balance the economic development goals of watershed communities with conservation of natural resources***
>
> ***These efforts serve as a model for other industrialized watersheds in Connecticut."***

The next step in the Watershed Planning process was to develop a set of **Goals** that must be achieved in order to realize the SRP's vision for the future of the Still River. The SRP worked collaboratively to develop Goals for each of the six key Focus Areas:

Water Quality

1. Improve water quality of the Still River and its tributaries to meet Connecticut Water Quality Standards for recreation and habitat for fish, other aquatic life and wildlife by reducing, respectively, *E. coli* indicator bacteria and other pollutants. The latter includes but is not limited to metals, chlorine and nutrients, especially for waterbodies where Total Maximum Daily Loads have been established.
2. Maintain a water quality monitoring program.
3. Assist municipalities with Municipal Separate Storm Sewer System General Permit compliance.
4. Support adoption of policies and programs at the municipal level that restore and protect water quality and quantity consistent with the Connecticut State Water Plan.
5. Encourage use of green infrastructure (GI) and low impact development (LID) solutions for new development and seek opportunities to replace older infrastructure with GI and LID to reduce impervious cover throughout the watershed

Capacity Building & Collaboration

1. Enhance and maintain collaboration between watershed municipalities; regional, state and federal agencies; non-profits; utilities and other stakeholders to support the implementation of the watershed plan.
2. Secure adequate resources to accomplish watershed management goals.
3. Promote the sharing of data, technical support and other resources for watershed management.

Outdoor Recreation

1. Create, enhance and maintain safe, easily accessible river-based recreational opportunities for people of all ages and abilities, balancing recreational access with conservation.
2. Enhance connectivity of recreational trails both along the Still River and with watershed communities, as well as regional and statewide trail systems.

3. Integrate and include recreation enhancement with watershed management projects.

Climate Resilience and Flooding

1. Protect and restore fully functioning floodplains.
2. Implement climate resilient strategies in watershed communities.

Natural Heritage (Species & Habitats)

1. Create a natural flora and fauna resource inventory throughout the watershed to identify key areas of restoration and conservation. Share this information with land-use decision makers and other key stakeholders.
2. Promote habitat connectivity, urban biodiversity, and regional conservation through partnerships between land trusts, municipalities, and landowners.
3. Investigate and promote native habitat and invasive species management.
4. Promote land preservation and sustainable land management practices.

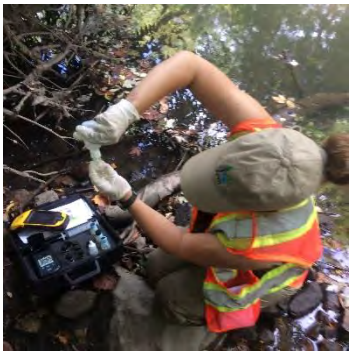
Education & Outreach

1. Educate community members about environmental stewardship and engage them in practical ways to improve water quality.

2. Create opportunities for people of all ages and backgrounds to learn about and from the Still River and its watershed.

Making the Action Plan

Once the Vision and Goals were established, the next step in the Watershed Planning process was to identify specific actions that the Still River Partners and the public can take to work towards a healthier, safer Still River. Actions were generally organized as **non-construction programs** (actions like water quality monitoring and educating youth about the Still River) and **construction projects** (actions like planting trees along a stream or capturing polluted runoff from a parking lot in a raingarden).



The Still River Partners identified over 50 programmatic action items over the six focus areas, aimed at everything from supporting municipal stormwater management programs to enhancing river access for paddlers and fishermen to providing advice for lawn management to homeowners wanting to make a difference on their own property.

HVA in cooperation with the SRP used the results of their field assessments to identify over 40 potential construction projects. The SRP worked collaboratively to prioritize these projects for implementation based on pollution reduction potential, landowner commitment and willingness to partner, and other potential benefits such as recreation enhancement or habitat restoration. The SRP then worked with Didona Associates Landscape Architects, LLC to create Preliminary Designs, cost estimates and implementation strategies for the top-ranked projects. Preliminary Design packages can be used cultivate support for projects and secure funding.

Implementing the Watershed Plan

The final Still River Watershed Management Plan is comprised of the Existing Conditions Report, the Vision and Goals and the Action Plan. The Watershed Plan was officially finalized on September 30th, 2019 - but completing the plan is just the start of our collective effort. We'll now begin the hard work of completing the Actions we've identified as essential to accomplishing our Goals and realizing our shared Vision for the Still River and its watershed.

Encouragingly, the SRP has already begun Watershed Plan implementation. Timely projects identified during the planning process have been completed, and resources to establish a water quality monitoring program and design and permit other priority projects have been secured through the Clean Water Act Section 319 Grants Program. Access to the Still River is dramatically improved with the completion of the Still River Greenway in Brookfield and the Erickson Road and Harrybrooke Park Canoe Launches in New Milford - each crucial pieces of a continuous riverside trail and canoe route from downtown Danbury to the Housatonic River. Each of these projects will help improve the environmental health of the watershed while bringing residents and visitors closer to the Still River, making watershed communities more resilient to the effects of climate change, and conserving important species and habitats. And we won't stop there- we'll keep working together to identify and pursue the work that moves us most quickly towards our goals.

The SRP has also built a framework for engaging young people living in the watershed with environmental restoration projects identified in the Watershed Plan. The Still River Watershed Connections program brings volunteer opportunities to local youth, through partnerships between the SRP, area schools and youth service organizations. Participating youth learn valuable job skills and develop a sense of stewardship for the watershed they call home, while providing the essential people-power we need for implementing Still River restoration projects. Connections will continue to be a cornerstone of Watershed Plan implementation; in turn, youth working to restore the Still River will become its loudest champions.

As we mark this milestone of Watershed Plan completion, we have a lot to be excited about. This planning process has built and strengthened partnerships that are crucial to addressing issues like pollution and flooding at a watershed scale. Now that we have this first version of the Still River Watershed Management Plan, the focus of the Still River Partners moves to fostering continued collaboration between all the people, organizations and agencies that have a stake in the management of the Still River watershed, in pursuit of the Vision for the Still River that we've agreed is common ground.

There is a long road ahead of us as we work towards realizing our shared Vision for the Still River- but we have the strength of our partnerships and the clarity of our shared purpose to see us through. **This Watershed Plan is our roadmap towards a Still River that is swimmable and fishable, that provides opportunities to connect with and learn from nature for people of all backgrounds, ages and abilities, which is resilient to the effects of climate change, and supports thriving species and habitats.** The Still River we envision is an asset for watershed communities, a point of pride for watershed residents, and a draw for visitors to the region. Implementing the Watershed Plan, together, is how we get there. We need you to make it happen! Visit www.StillRiverWatershed.org to learn more about how you can get involved.

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List of Acronyms

AMA	Agricultural Management Assistance
APA	Aquifer Protection Area
BMP	Best Management Practices
BWPCA	Brookfield Water Pollution Control Authority
CLEAR	Center for Land Use Education and Research
CSP	Conservation Stewardship Program
CWA	Clean Water Act
CWS	Community Water System
CT DEEP	Connecticut Department of Energy and Environmental Protection
CT DPH	Connecticut Department of Public Health
CT DOT	Connecticut Department of Transportation
CGS	Connecticut Geological Survey
CSP	Conservation Stewardship Program
DCIA	Directly Connected Impervious Areas
DHS	Danbury High School
DPS	Danbury Public Schools
EPA	U.S. Environmental Protection Agency
EWP	Emergency Watershed Protection Program
EQIP	Environmental Quality Incentives Program
ECR	Existing Conditions Report
FEMA	Federal Emergency Management Agency
GHG	Green House Gas
GI	Green Infrastructure
GIS	Geographic Information System
GPD	Gallons per Day
H2H	Hudson to Housatonic
HVA	Housatonic Valley Association
IDDE	Illicit Discharge Detection and Elimination
IC	Impervious Cover
IWQR	Integrated Water Quality Report
LID	Low Impact Development
MS4	Municipal Separate Storm Sewer System
MTBE	Methyl Tertiary Butyl Ether
N	Nitrogen
NAACC	North American Aquatic Connectivity Collaborative
NDDB	National Diversity Data Base
NEMO	Nonpoint Education for Municipal Officials
NFIP	National Flood Insurance Program
NFWF	National Fish and Wildlife Foundation
NTU	Nephelometric Turbidity Units
NPS	Nonpoint Source Pollution
NPDES	National Pollutant Discharge Elimination System
NRCS	USDA Natural Resources Conservation Service
NTNC	Non-Transient Non-Community
NWCD	Northwest Conservation District
P	Phosphorous
PCB	Polychlorinated biphenyl
QAPP	Quality Assurance Project Plan
SRGWT	Still River Greenway and Water Trail
TMDL	Total Maximum Daily Load
TCE	Trichloroethylene
TNC	Transient Non-Community
TSS	Total Suspended Solids
UCONN	University of Connecticut
USA	Unified Stream Assessment
USDA	United States Department of Agriculture
USGS	United States Geologic Survey
USSR	Unified Stream and Subwatershed Reconnaissance
WCSU	Western Connecticut State University
WestCOG	Western Connecticut Council of Governments

1. INTRODUCTION

1.1 Background

Figure 1.1.1 Still River Basin Location

The Still River watershed drains a 75-square-mile area in the southern portion of the Housatonic River watershed. It includes the communities of Bethel, Brookfield, Danbury, Newtown, New Fairfield, New Milford, Redding, and Ridgefield, CT in Litchfield and Fairfield counties. From its headwaters at Sanfords Pond just across the New York/Connecticut state line to its confluence with the Housatonic at Lover's Leap State Park in New Milford, the Still is about 19 miles long not including the many bends, meanders, and oxbows that make up this relatively slow moving river. Major tributaries that feed into the mainstem of the Still are East Swamp Brook, Limekiln Brook, Miry Brook, Padanaram Brook, Kohanza Brook and Sympaug Brook.

The Still River watershed is highly urbanized; over 36% percent of its land-use is developed and around 14% of its surface area is impervious cover. Development is concentrated along the Still River corridor. Major highways Interstate 84 and CT Route 7 parallel the Still River for nearly its entire length, with the exception of downtown Danbury where the Still is contained in a concrete channel to prevent flooding. The urbanized nature of the watershed has a significant impact on water quality in the Still River and its tributaries as well as the Housatonic River and Long Island Sound. While water quality of the Still River has improved considerably since the passage of the 1972 Clean Water Act, it continues to suffer from a litany of issues common to urban streams. Polluted stormwater runoff and other non-point sources of pollution are the primary cause of high concentrations of pathogens, excessive nutrients, thermal pollution, and sedimentation from upland runoff, as well as stream channel instability caused by "flashy" flow regimes and floodplain encroachment.

In the most recent (2018 Draft) State of Connecticut Integrated Water Quality Report to Congress, a significant portion of stream reaches in the watershed were listed as not supporting recreation and/or aquatic life. Five mainstem segments of the Still River, totaling 22.31 miles in length or 96.6% of the mainstem, were listed as "not supporting" for aquatic life. Four of six mainstem segments were listed as not supporting for recreational use (the remaining two segments were not assessed). Reaches along Miry Brook, Sympaug Brook, Padanaram, Kohanza Brook, East Swamp Brook, and Limekiln Brook were listed as not supporting for aquatic life. The Connecticut Department of Energy and Environmental Protection (CT DEEP) has put in place three Total Maximum Daily Loads (TMDL) covering 14 impaired waterbody segments.[1] A TMDL is a pollution "diet" that is created for a given waterbody not supporting its intended recreation or aquatic life uses. A TMDL quantifies the amount of pollution reduction required to move from a waterbody from not its supporting intended uses to supporting its intended uses. TMDLs will be discussed in more detail in Section 2.2.

These water quality issues can be addressed by implementing programs and projects that reduce stormwater pollution, illicit discharge, and physical impacts in streams throughout the watershed. This

watershed plan outlines many actions that can be taken and details programs and projects that will specifically address water quality as well as flooding, climate change resiliency, habitat restoration, and recreation. The Watershed Plan is a roadmap towards a Still River that is swimmable and fishable, that provides opportunities to connect with and learn from nature for people of all backgrounds, ages and abilities, which is resilient to the effects of climate change, and supports thriving species and habitats.

1.2 EPA Nine Element Watershed-Based Plan Development Process

A watershed plan is a guide for leading communities toward improved water quality as well as other watershed management goals. An EPA-approved watershed planning and implementation process involves nine elements and seven major steps.

In 2014 a group of conservation nonprofits, watershed municipalities and federal, state, and regional agencies came together to form the Still River Partners (Step 1). For the first two years the Still River Partners group met regularly to bring together information and resources that helped inform the Still River Watershed Existing Conditions Report (ECR), a document that outlined the state of the Still River watershed today (Step 2). Based on the findings in the ECR, the Still River Partners worked collaboratively a vision for the watershed as well as goals and solutions that will lead us to that vision (Step 3). Those goals and solutions laid the framework for the Still River Watershed Action Plan, which outlines an implementation strategy toward achieving the watershed planning goals (Step 4). The next step will be to put the outlined recommendations into action through implementation (Step 5); measure the progress of those actions on pollution loading and water quality and make adjustments (Step 6); which ultimately goes back into improving this action plan (Step 7).

The process described above ultimately results in this Nine-Element Watershed-Based Plan. The nine elements are listed below. Each element also refers to the location in the Watershed Plan where it is described in more detail.

1. Impairment - An identification of the causes and sources of pollution, that will need to be controlled to achieve the load reductions estimated to fix the impairment, and to achieve any other watershed goals identified in the watershed-based plan (see Section 2, page 14).
2. Load Reduction - An estimate of the load reductions expected for the management measures described (see Sections 4 and 5).
3. Management Measures - A description of the NPS management measures that will need to be implemented to achieve the estimated load reductions (see Sections 4 and 5).
4. Technical & Financial Assistance - An estimate of the amounts of technical and financial assistance needed, and/or the sources and authorities that will be relied on, to implement this plan (see Sections 4 and 5).
5. Public Information & Education - An information/education component that will be used to enhance public understanding of the project and encourage their early and continued participation in selecting, designing, and implementing the NPS management measures that will be implemented (See Section 3.3).
6. Schedule - An expedited schedule for implementing NPS management measures identified (See Section 3).
7. Milestones - A description of interim, measurable milestones for determining whether NPS management measures or other controls are being implemented (see Section 3).
8. Performance - Criteria to determine whether loading reductions are being achieved over time, and if progress is being made towards attaining water quality standards and, if not, the criteria to determine if this plan, or a related TMDL, needs to be revised (See Section 3.2).

9. Monitoring - A monitoring component to evaluate the effectiveness of the implementation efforts over time (See Section 3.2).

Still River watershed impairments are described in the Watershed Characteristics Section 2 of this plan with information on water quality and TMDLs addressed in this plan outlined in the Water Quality section (Section 2.2). Load reductions are estimated by both site (Site Specific BMPs Section 5) and throughout the watershed overall based on TMDL requirements for indicator bacteria *Escherichia coli* (*E. coli*). The bulk of the watershed based plan outlines the Management Recommendations found in sections General Management Recommendations (Section 4), General BMPs (Section 4), and Site-specific BMPs (Section 5). Key recommended actions are included in tables found throughout the plan. These tables include a schedule for implementation, milestones, estimated costs, and possible funding sources. Technical and Financial Assistance is described in Section 3.1 Collaboration & Capacity Building, which outlines potential funding sources for plan implementation projects. A list of potential funding sources and technical assistance for Site Specific projects outlined in Section 5 can be found in Appendix A: Potential Funding Sources & Technical Assistance.

Public participation and outreach has been a key element to the watershed planning process. Each step of the way the watershed planning process involves input from local experts (Still River Partners), CT DEEP, and the public. The Still River Partners group met nearly quarterly over the course of five years for a total of 12 meetings. The Existing Conditions Report (Watershed Characteristics) and watershed planning process was presented to the public through open forums in the six watershed communities at Board of Selectman meetings, Town Hall meetings, and Conservation Commission meetings. A public follow-up presentation was held at the Danbury Museum and Historical Society on September 24th, 2019 that presented the entire watershed plan. This meeting was advertised through social media, mailing lists, and the Still River Partners group and was open to the public. A total of seven public presentations were given. After each presentation, the writers of this plan (HVA) gathered feedback that was used to update, edit, and improve content and strategy outlined herein. Agendas and Meeting minutes from these public forums can be found in Appendix B: Public Participation & Outreach. Recommended Actions to continue involving the public through education and outreach is described in Section 3.3 Education & Outreach.

Performance criteria are defined in the Management Recommendations section (Section 3). The attainment of watershed goals (found in section 3 Management Recommendations) will be tracked through a Monitoring program as delineated in 3.2 Monitoring & Assessment.

The intention is for this plan to be a living document. To that end the HVA and other stakeholders (Still River Partners) plan to revisit this document each year to evaluate progress toward the recommended actions and goals herein. Every five years this plan will be updated based on progress made, results achieved, and priorities set.

1.3 Field Assessments

Field assessments were conducted by Still River Partner Housatonic Valley Association (HVA) to document impacts and identify restoration opportunities in the Still River watershed. HVA used protocols developed by the Center for Watershed Protection to assess over 30 miles of stream corridor, and more than 40 upland sites. All fieldwork was executed under a Quality Assurance Project Plan written by HVA and approved by both CT DEEP and the EPA[2]. Please refer to Appendix D – Unified Stream Assessment Results for overview maps of stream reaches assessed as well as the data results of each subwatershed.

1.4 Management Plan Recommendations

This document outlines a number of recommended actions developed by the Still River Partners that will help to improve water quality throughout the watershed. These recommendations vary both in terms of audience reach (municipality to individual homeowners) as well as project area (large commercial properties to individual homes). These recommendations - also called Best Management Practices - were generated from HVA's field assessments, conversations with Still River Partners and watershed residents, and common practices used in similar watersheds. This document is divided into three parts: 1) Background information 2) General Management Recommendations/General BMPs and 3) Site Specific BMPs. Both General and Site-specific BMPs highlight locations to implement a particular practice. The Site-specific BMP section goes into more detail including site designs and cost estimates developed by outside consultants Earth Tones and Didona Associates. None of the recommendations outlined in this plan will result in "shovel in the ground" projects without the active participation and buy-in by site owners and property managers. For this reason strong partnerships are key to watershed plan implementation. If successful the Still River watershed can boast clean waters, healthy ecosystem, and a natural environment that communities will be able to enjoy for generations.

2. Watershed Characteristics

2.1 Physical and Natural Characteristics

Geography

The 71.5 square-mile Still River Watershed is located in northern Fairfield County and southern Litchfield County, Connecticut (Figure 2.1.1, Still River Watershed Map). The Still River mainstem begins in the City of Danbury and flows north through the towns of Brookfield and New Milford, where it is meets the Housatonic River. Its drainage area also includes portions of Bethel, Newtown, Ridgefield, New Fairfield and Redding in Connecticut, as well as a small portion of the Town of Southeast, New York.

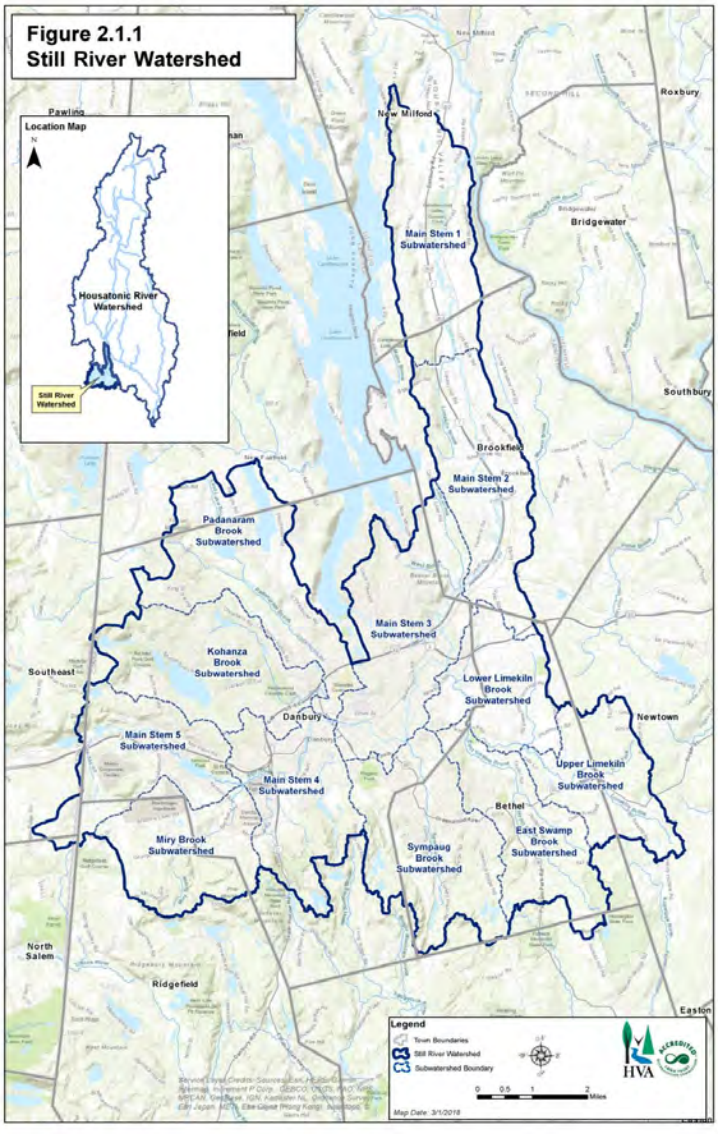
The Still River is Connecticut's tenth-longest watercourse and an important tributary of the Housatonic River due to its impact on water quality. It twists and meanders for 25.4 miles, shedding oxbows, rushing through four narrow gorges and finally snaking through a broad floodplain a half-mile wide in places in its northern reaches. From two small ponds near the Danbury/New York State border, its course runs eastward through an extensive wetland and pools at Lake Kenosia; after which, it is joined by Miry Brook near the Danbury Municipal Airport. It is then channelized through downtown Danbury before meeting up with Padanaram Brook. At Danbury Commerce Park, the river turns northeastward at the confluence of Sympaug Brook. Limekiln Brook is the last major tributary joining the Still River before it flows north to join the Housatonic River in New Milford.

Geology & Soils

Two prehistoric geological events are primarily responsible for creating the Still River and its valley. First, the valley played a one-time role as part of the shoreline of an early incarnation of the North American continent known as proto-North America. Layers of calcareous shells, sand and other sediments on that ocean edge gradually formed into soft sedimentary rock. This rock then metamorphosed with time, heat and pressure underground, into marble. The Inwood Marble and limestone of the Still River comprises the southernmost reach of the "Marble Valley" formation that extends northward into western Massachusetts and Vermont. Through this soft bedrock, the river eventually formed as drainage to the surrounding highlands.[3]

The second major formative force in the Still River's history was glaciation. Approximately 10-15,000 years ago, melting glaciers at the end of the last ice age left behind a low-lying limestone basin. This basin filled to become a large glacial lake, which at one point covered most of the watershed. Geologists called this area Lake Danbury. Rather than bedrock walls, the Still River's broad floodplain is mainly flanked by sand and gravel terraces.[4]

This geologic history gives rise to the soils throughout the Still River valley, which range from loam to fine sandy loam (See Still River Watershed Soils map in Appendix C). The highest percentage of soil types are Charlton (24% of Fairfield County) and Hollis (11%). Together, these two soil types form complexes found in 55% of the area. Charlton soils are well drained, formed in deep, friable loamy glacial till, and have a surface layer and subsoil of fine sandy loam. The substratum is gravelly sandy loam. Hollis soils are moderately to excessively drained and can be found in shallow as well as deep areas less than 20 inches from bedrock. Other soils in the area are Paxton, Woodbridge, Ridgebury, Agawam, Hinckley, Haven, Carlisle, Adrian, Saco, Udorthents, Stockbridge, Georgia, and Nellis, all of which make up less than 3% individually and the remaining 45% of the watershed's soil altogether. It is important to note that much of the area is urbanized, and consequently native soils have been disturbed and/or covered with fill (see Land Use section).[5]



Hydrology

The Still River watershed can be broken up into eight subwatersheds. Six tributaries make up seven of the subwatersheds: Padanaram Brook, Kohanza Brook, Miry Brook, Sympaug Brook, East Swamp Brook, and Upper and Lower Limekiln Brook. The Still River Mainstem is the eighth subwatershed which in turn can be divided into five subwatersheds of approximately 5 square miles. The boundaries of each subwatershed can be found in Appendix C: Still River Watershed Subwatersheds map.

The headwaters of the Still River begin near the NY/CT border at Sanfords Pond. From the headwaters, the river flows east towards Mill Plain Swamp and Lake Kenosia before draining through downtown Danbury. East of downtown, the river turns north and flows through Brookfield and New Milford to its confluence with the Housatonic River, just above Lovers Leap. The mainstem of the Still is only 19 miles long, but when one accounts for the bends and oxbows this distance stretches to 30 miles of stream. Known for its low dry season flow and named for its sluggish current in a low lying valley, the Still drops only 256 feet from beginning to end at an average gradient of 13.9 feet per mile.[6] Partly because of this the river has been the source of numerous disastrous and sometimes fatal floods throughout recorded history (see Flooding section). The river and its watershed include extensive wetlands, three white-water gorges, a small lake, several ponds, and streams that feed the reservoir system for the City of Danbury. Its mild gradient of ten feet per mile reflects its flow through the mostly flat terrain of an ancient glacial lakebed. However, the river narrows at several points, notably in Danbury and in Brookfield, where it falls 32 feet through a half-mile gorge called Halfway Falls. Two lesser gorges are located in Danbury, and a picturesque falls crashes through Harrybrooke Park near the river's mouth in the Lanesville section of New Milford.

Several human impacts have altered the hydrology of the Still River over time. Early industry constructed dams and mills attempting to harness and control the Still for commercial reasons. The Danbury Fair, resurrected after World War II by local entrepreneur John Leahy, constructed ponds in 1950 to complement a faux-New England Village feature, using water pumped from Mill Plain Swamp.[7] Shortly after the massive floods in 1955, the Mill Dam at Halfway Falls in Brookfield was removed, releasing a former millpond that had backed up the river for miles. In 1969, the crumbling dam that had created and impounded Oil Mill Pond, near what is now Lake Ave in Danbury, since the colonial era was dynamited by the City of Danbury. The only dams remaining today, out of what once were dozens are the 150-year-old White's Dam behind Beaver Street in Danbury and Tuck's Dam in the Ironworks Gorge in Brookfield, a structure dating from 1930. While most dams have been destroyed, one notable structure built relatively recently is the Still River Channel through downtown Danbury, constructed to protect downtown Danbury from flood damage after the 1955 flood. Around that same time (1950s) exploding residential and commercial construction stimulated large-scale sand and gravel mining in the terraces above the valley floodplain. Some of these resulted in permanent changes to the terrain, especially in Brookfield where a large groundwater-filled pond emerged over time, after extensive gravel mining near Limekiln Brook.

Climate

The climate of Fairfield County and southern Litchfield County (which includes the Still River watershed) is typical of New England. It is influenced by cold, dry air masses from the subpolar region in the northwest and warmer, moisture-bearing tropical air from the south. The average annual precipitation and snowfall are 48 inches and 41 inches, respectively.[8] Fifty one percent of precipitation falls between April and September.[9] Temperatures range from summer highs above 90°F to below 0°F in the winter; the average annual temperature is 51.7°F.[10] The average winter temperature is 29°F in the winter and 70°F in the summer. The ground is frozen from approximately November 3rd to April 2nd. The average relative humidity is between 60% and 75%. The sun shines 60% of the time in summer and 50% in winter.[11]

Climate Change

Climate change is affecting the Northeast U.S. in a variety of ways that impact water resources: sea levels are rising, snowpack is decreasing, and water temperatures are increasing. In the future, the climate is expected to get warmer and wetter with more frequent extreme storms. According to the Northeast Climate Impacts Assessments, the Northeast has been warming at a rate of 0.5° F since 1970 with winter temperatures rising by a faster rate of 1.3° F. [12] Western Connecticut temperature has increased an average of 2-2.5° F, twice as much as the rest of the contiguous lower 48 states. Additionally, climate change has led to increase precipitation both in frequency and amount.[13] This in turn leads to greater flooding of river systems such as the Still and threatens infrastructure built in the floodplain. As described in Section 5, the Still River has a history of flooding and climate change will aggravate this phenomenon

Historic Climatic Changes in the Northeast U.S.

Rising temperatures: Annual average temperature in the Northeast has increased by 1.43°F for the period 1986–2016 relative to 1901–1960. The average annual minimum temperature has risen by 1.70°F while the annual average maximum temperature has risen by 1.16°F. In general winters are becoming warmer with less snow and spring is coming earlier.

Increased Precipitation: The Northeast is getting wetter. Seasonally, autumn exhibits the largest precipitation increase (over 15%) through much of the region. Much of the increase is seen in heavy precipitation events.

More extreme precipitation events: Between 1958 and 2012, the Northeast saw more than a 70% increase in the amount of rainfall measured during heavy precipitation events.

https://science2017.globalchange.gov
https://19january2017snapshot.epa.gov/climate-impacts

These changes affect the ability to reach water resource management goals such as improving water quality, managing floods, rehabilitating ecosystems and habitats, and creating and maintaining recreational access. Climate change introduces an added level of uncertainty to water resources. However, there are steps that can be taken to anticipate and plan for the potential changes in future climate. It is necessary to understand these changes and integrate climate change data into planning processes and decision-making now and in the future. What follows is a summary of the historical climate in the region of the Still River and projections for the future. The majority of the data is from the National Climate Change Viewer (http://www2.usgs.gov/landresources/lcs/nccv/viewer.asp), modeling conducted by U.S. Geological Survey. The Viewer creates visualizations of the changes in temperature and water balance for USGS Hydrological Units through the end of the century. The projections here are for the Housatonic River Watershed, of which the Still River is a tributary. They model two emission scenarios- RCP4.5 in which greenhouse gas emissions (GHGs) are stabilized so they do not exceed about 650 ppm CO2 and RCP8.5 in which GHGs rise unchecked through the end of the century leading to about 1370 ppm CO2.

Maximum Temperature

Highs (annual mean max temperature) have risen in the Housatonic Watershed since 1950 (black) and will continue to increase under both high (red) and low (blue) emission scenarios through the end of the century. Relative to the period of 1981-2010 which saw an annual average high temperature of 58.1°F, for the period of 2025-2049, the watershed is projected to see warming of 2.9°F (low emissions) to 3.2°F (high emissions); by 2099 the warming increases to 5.2°F - 10.6°F. Although the warming is seen over all seasons, it is projected to be greater in summer months.[14]

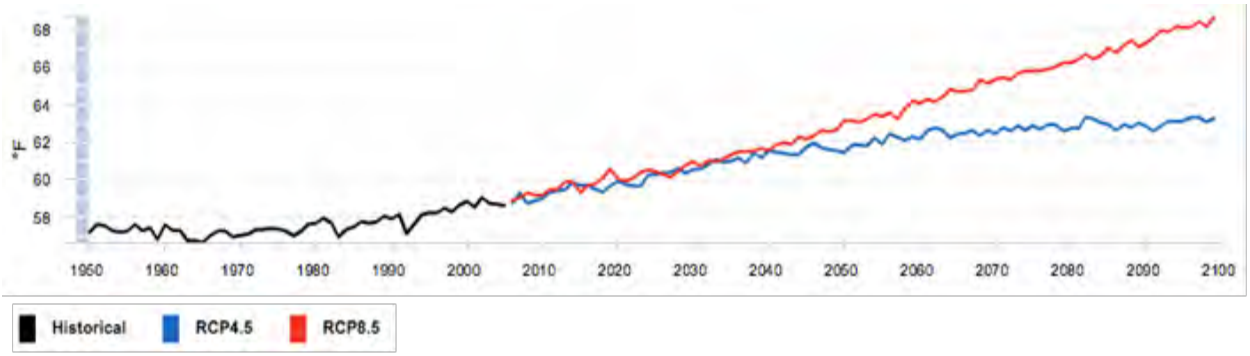


Figure 2.1.2 Historical (1950-2005) and Projected (2006-2100) Max Temperature Change in Degrees Fahrenheit

Minimum Temperature

Lows (annual mean min temperature) are also projected to rise by increments similar to the high temperatures scenario, or 2.9°F (low emissions) to 3.4°F (high emissions) for the period of 2025-2049. Whereas highs will see greater warming in the summer, lows will see greater increases in winter months. By the end of the century (2075-2099), January is projected to see a 5.9°F - 11.2°F temperature increase whereas July will see a 4.7°F - 9.4°F increase. Winter warming affects the number of extreme cold days and makes the coldest days warmer. The coldest winters of the future will be closer to the warmest winters of recent years.[15]

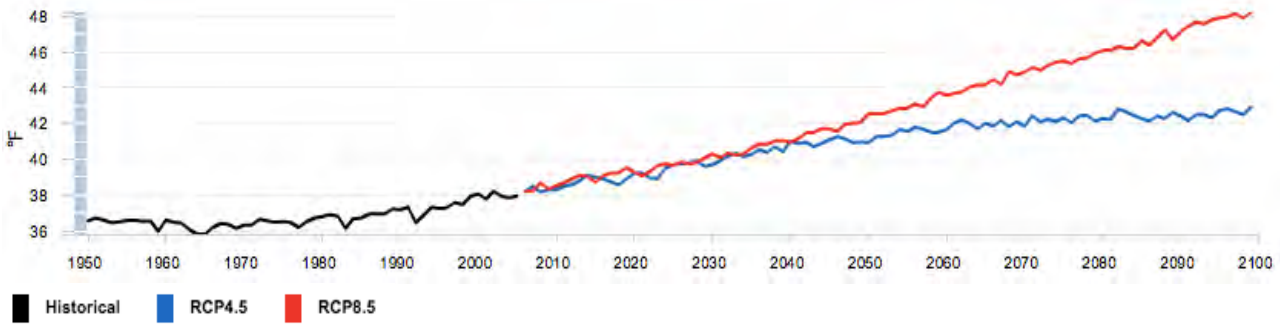


Figure 2.1.3 Historical (1950-2005) and Projected (2006-2100) Min Temperature Change in Degrees F

Precipitation

Precipitation will increase moderately throughout the year, especially in winter and spring. Annual mean precipitation is projected to increase 5% from 4.0 in/mo for the period of 1981-2010 to 4.2 in/mo for the period of 2025-2049 under the low emissions scenario. By the end of the century (2075-2099) this average is projected to be 4.3 in/mo (low emissions) to 4.5 in/mo (high emissions). Combined with warming winter temperatures, much of this increased precipitation will be seen as rainfall in the winter, increasing the amount of runoff in the winter and spring. Similar to current climate, precipitation is expected to decrease in the fall.[16]

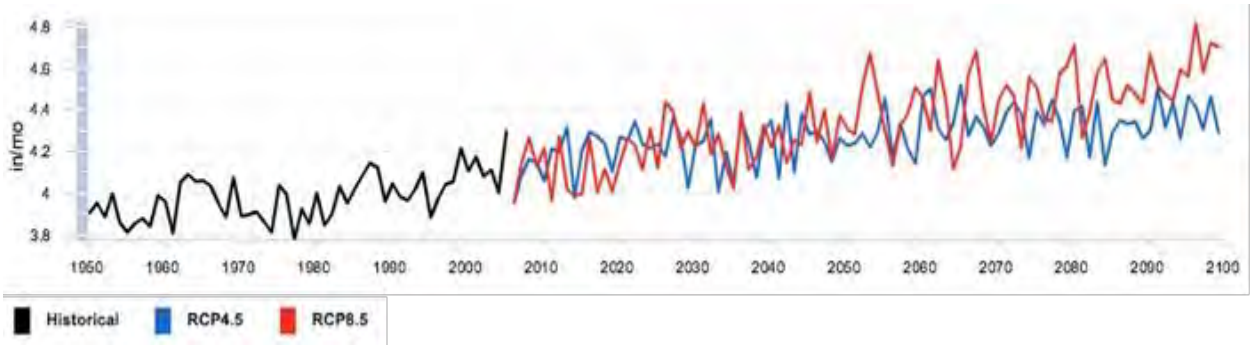


Figure 2.1.4 Historical (1950-2005) and Projected (2006-2100) Mean Precipitation in Inches/Month

Snow Water Equivalent

The snow water equivalent is the liquid water in inches that is stored in snowpack. Under both high and low emissions, the snowpack is decreasing in the Housatonic River Watershed throughout the 21st century. As seen in Figure 2.2.5, winter precipitation has increased and will continue to increase while the winter snowpack decreases. In general, increasing temperatures result in more precipitation falling as rain and less as snow. Snowpack is a strong control of seasonal runoff and less storage as snowpack combined with increases in precipitation as rain will result in earlier snowmelt and more runoff, which affect the timing and magnitude of the hydrograph.[17]

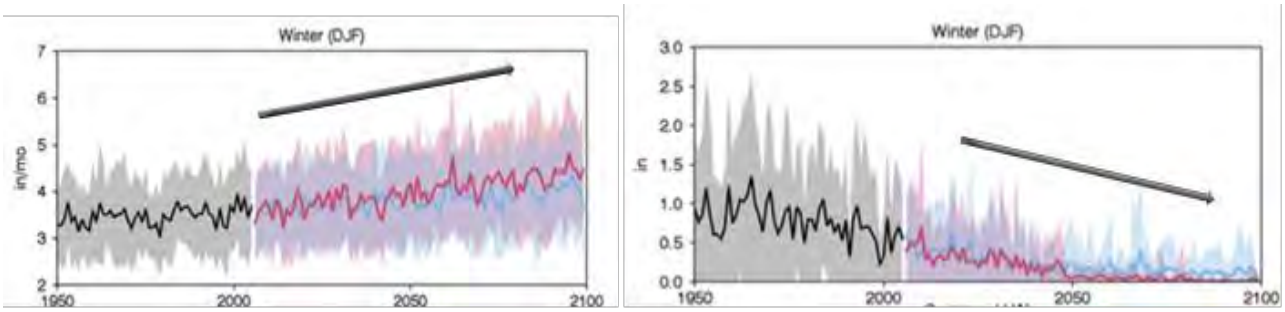


Figure 2.1.5 Increasing winter (Dec. – Feb.) precipitation (left) and decreasing winter snow water equivalent (right) historically (1950-2005) and projected (2006-2100)

Runoff

Runoff is defined as the sum of direct runoff that occurs from precipitation and snowmelt, and surplus runoff which occurs when soil moisture is at 100% capacity. Annually, there is no significant change projected for runoff. However, runoff will shift seasonally. Winter runoff is projected to increase while spring and fall runoff will decrease. January runoff is projected to increase by 0.3 in/mo (under both high and low emission scenarios) for the time period of 2025-2049 over the historical 1981-2010 average of 3.3 in/mo. By the end of the century, it is projected to be 0.4 - 0.7 in/mo higher than the historical period. Conversely, the spring and fall months of April and November are projected to experience a decrease in runoff, with November potentially seeing an almost 25% drop in runoff by the end of the century under high emission conditions. This seasonal change in runoff corresponds with predicted warmer winters with earlier snowmelt and increased precipitation coming down in the form of rain rather than snow.[18]

Nonpoint source pollution in the Clean Water Act: Glossary-at-a-Glance

The nonpoint source pollution watershed management process relies on information provided in specific sections of the CWA. Below is a brief outline and description of key sections that have subsequently become common terms in watershed management:

- Section 303(d): This section addresses impaired waters and total maximum daily loads. This section is often synonymous with a state's list of impaired waters.
- Section 305(b): This section requires states to monitor, assess and report on water quality in relation to the designated uses for each waterbody laid out in the state WQSs. The State of Connecticut reports to the EPA every two years.
- Section 319(h): This section provides grant funding to states through Section 319 Nonpoint Source Management Programs. Funding is used for a range of activities, including watershed planning, demonstration projects and monitoring.

2.2 Water Quality

The Clean Water Act (CWA) is a federal law, established in 1972, that regulates the discharge of pollutants into surface waters and the water quality of surface waters in the United States. The CWA made point source (or end-of-pipe) pollution discharges into navigable waters without a permit illegal through the National Pollutant Discharge Elimination System, or NPDES. It also required states and tribes to adopt and revise water quality standards. Connecticut's Water Quality Standards (WQS) represent the foundation of waterbody management across the state, including pollution discharge permits and the development of Total Maximum Daily Loads (TMDL) (See Sec. 3.1 below for definition). State WQS required by federal law, under section 303(c) of the Clean Water Act, indicate designated uses (e.g. drinking, swimming, fishing) and water quality classifications (goals) for surface water (e.g. AA, A, B), groundwater, and coastal/marine surface waters. A review of the State WQS is conducted every three years by governing state agencies.[19] Under CWA Section 305 (b) the State of Connecticut Department of Energy and Environmental Protection (CT DEEP) is required to monitor, assess and report on water quality with regard to meeting designated uses for each waterbody, as per Connecticut's WQS and Classifications to the U.S. Environmental Protection Agency (U.S. EPA). This report is called the Integrated Water Quality Report (IWQR) and it provides information on assessed and impaired waterbodies within Connecticut. Those waters that do not meet the State's WQS are listed as impaired for aquatic life and/or recreation depending on pollutant type and amount. In the Still River watershed, impairments for recreation are based on levels of the indicator bacteria *E. coli,* and impairments for aquatic life are based on habitat quality. CWA Section 303(d) mandates that impaired waters be placed under a Total Maximum Daily Load, or pollution diet.[20]

This document focuses on information pertaining to or stemming from State WQS for inland surface waters in the Still River watershed. While both point and nonpoint sources of pollution contribute to impairments for recreation and aquatic life in the Still River watershed, this plan is focused specifically on nonpoint sources of pollution. Watershed planning of this nature is crucial to addressing nonpoint source pollution- by its nature it is a diffuse issue with many contributing sources across the landscape. Consequently collaboration and strategic approaches are essential.

The CWA does not provide a detailed definition of nonpoint sources. Rather, they are defined by exclusion—anything not considered a "point source" according to the CWA and EPA regulations. All nonpoint sources of pollution are caused by runoff of precipitation (rain and/or snow) flowing over or through the ground that picks up and carries pollutants directly into nearby waterbodies. This includes

but isn't limited to stormwater associated with development and industrial activity, construction-related runoff, and discharges from municipal separate storm sewer systems (MS4s).

Congress chose not to address nonpoint sources through a regulatory approach, unlike its actions with "point" sources. Rather, when it added Section 319 to the CWA in 1987, it created a federal grant program that provides money to states, tribes, and territories for developing and implementing NPS management programs.

Under the Clean Water Act Section 319, states, territories, and delegated tribes are required to develop nonpoint source pollution management programs (if they wish to receive 319 funds). Once it has approved a state's nonpoint source program, EPA provides grants to these entities to implement NPS management programs under section 319(h). Section 319 is a significant source of funding for implementing NPS management programs, but there are other federal (e.g., Farm Bill), state, local, and private programs. The planning effort that resulted in this document was funded in large part through a CWA Section 319 grant.

Historically the Still River was the epicenter of the industrial hatting industry and treated as an open sewer for many years. With passage of the CWA point source pollution was identified and either eliminated or regulated through the issuance of permits. This improved water quality in the Still River immensely. Despite these improvements, one of the most significant threats to water quality is nonpoint source pollution (NPS). NPS pollution primarily occurs when rainfall runoff and snowmelt, flowing over the surface of and through the ground, picks up and carries pollutants directly into nearby waterbodies. According to the most recent IWQR (2016), the majority of Still River and many of its tributaries are impaired for aquatic life and/or recreation according to State WQS (Appendix D, Still River Watershed Impaired Streams). These reaches include: the Still River mainstem, Miry Brook, Kohanza Brook, Padanaram Brook, Sympaug Brook, East Swamp Brook and Limekiln Brook. Other notable waterways, particularly Dibble's Brook in Bethel, Stony Hill Brook in Bethel/Danbury and West Brook in Brookfield/Danbury, fully support aquatic life but are unassessed for recreation.

As far back as 1995, a study of water quality impacts of stormwater runoff conducted for the City of Danbury by Fuss & O'Neill (an environmental consulting firm) found that the biggest impact to water quality in the City of Danbury stemmed from a lack of stormwater "treatment" or attenuation. While this study is dated, it remains a valuable resource for understanding water quality impacts from the City of Danbury- the largest area of concentrated development in the watershed. Based on their monitoring results, suspended solids, metals, bacteria, nitrogen and phosphorous were identified as the principal pollutants of concern. Notably, highways I-84 and Route 7 and industrial land use contributed a large portion of metals to the watershed. Of the areas studied within Danbury, those that were heavily urbanized and industrialized contributed the most to pollutants. Fuss & O'Neil recommended stormwater controls around the subwatersheds of Lower Limekiln Brook, Mainstem Section 3, and Miry Brook would have the greatest impact in reducing pollutant loads throughout the watershed.[21]

All eight municipalities in the Still River watershed are Municipal Separate Storm Sewer System (MS4) communities, meaning they contain designated "Urbanized Areas" (as determined by the 2010 Census) and discharge stormwater via a separate storm sewer system to surface waters of the state. MS4 discharges are regulated as point sources under NPDES and Connecticut General Statutes Section 22a-430 and 22a-430b. MS4 communities are require to register for the CT DEEP General Permit for the Discharge of Stormwater from Small Municipal Separate Storm Sewer Systems (MS4 GP). DEEP issued its first General Permit requirements in 2004, covering 113 municipalities. In 2016, DEEP issued a new permit that became effective July 1, 2017, adding 8 additional MS4 municipalities. Communities in the

Still River watershed are currently working to come into compliance with the 2017 permit, which contains considerably more detail and guidance on the implementation of the MS4 program and compliance with the MS4 GP. **It's important to note that the implementation of this Watershed Plan provides many opportunities for supporting and complementing the MS4 compliance efforts of Still River communities.** See Section 3 for MS4-related recommendations developed by the Still River Partners.

In general, municipal requirements under the MS4 GP are:

Develop a Stormwater Management Plan that addresses six minimum control measures that the municipality will undertake to prevent and/or treat polluted runoff, and have this plan approved by CT-DEEP. The Stormwater Management Plan is the clearinghouse for all community stormwater management efforts, and is consequently the key component of the MS4 program. Each of the six minimum control measures includes several Best Management Practices (BMPs) meant to implement the control measure. Certain BMPs are required, and the permit provides for additional BMPs to be implemented, as necessary to address pollution, at the discretion of the MS4. The new MS4 general permit provides significantly more detail on the requirements and implementation of the six Minimum Control Measures as well as expanding certain requirements.

The six minimum control measures include:

a. **Public education and outreach:** This minimum measure provides detail on the types of outreach and the means of conducting the outreach that serve to educate the public about issues related to stormwater pollution. It specifies outreach targeting pet waste, application of fertilizers, herbicides, and pesticides, and impacts of illicit discharges and improper disposal of waste into the MS4.
b. **Public participation:** This measure provides detail on soliciting, providing for and responding to public input in the development of the Stormwater Management Plan.
c. **Illicit discharge detection and elimination (IDDE):** This section addresses how the municipality identifies, traces and eliminates non-stormwater discharges to its storm sewer system from sources such as sanitary sewer cross-connections, illegal dumping, industrial and commercial wastes, floor drains, animal wastes, lawn management chemicals and wastes.
d. **Construction stormwater management:** This section addresses controlling stormwater pollution from construction projects.
e. **Post-construction stormwater management:** This measure focuses on mitigating stormwater impacts from new and re-development by requiring practices that treat, store, and infiltrate stormwater onsite. Towns should use the minimum disturbance size they normally regulate (whether it's 0.5 acres per the Erosion Sediment Control Act or smaller if your town uses a lower threshold) for the stormwater retention standards in this section.
f. **Pollution prevention and good housekeeping:** maintenance of the MS4's property and operations including parks and open space, employee training, the management of pet waste and waterfowl, buildings and facilities, vehicles and equipment, parking lots, snow management practices, street sweeping, leaf management and catch basin cleaning. In addition to these standard requirements, this measure includes a Retrofit Program requiring the reduction of DCIA within the MS4 by retrofits or stormwater retention practices for redevelopment projects. This section also allows and encourages the MS4 to coordinate with other interconnected MS4s and includes targeted efforts to address water quality impairments.

MS4 communities are also required to submit Annual Reports to DEEP indicating the progress with implementing their Stormwater Plan, and monitor the quality of water bodies within their jurisdiction.

Water Quality Impairments, TMDLs & Pollutants

As mentioned above, according to the most recent IWQR (2018 draft), the majority of the Still River and many of its tributaries are impaired for aquatic life and/or recreation according to State WQS (Appendix D, Unified Stream Assessment Results). These reaches include: the Still River mainstem, Miry Brook, Kohanza Brook, Padanaram Brook, Sympaug Brook, East Swamp Brook and Limekiln Brook. Under the CWA, a Total Maximum Daily Load must be prepared for every waterbody listed as impaired. A TMDL is a "management tool used to restore impaired waters by establishing the maximum amount of pollutant". In other words, a TMDL is a "pollution diet" that determines the amount of a given pollutant a waterbody can receive without adverse impacts to fish, wildlife, recreation, or other public uses. A TMDL takes into account pollution loads, background levels, and incorporates a margin of safety to account for uncertainties in establishing the relationship between pollutant loadings and water quality. In some TMDLs such the one for recreation/indicator bacteria, shown in Table 2.2.2, pollution loads are expressed as percent reduction necessary to meet water quality standards and designated recreational uses.

TMDLs provide a scientific basis for local stakeholders to develop and implement watershed-based management plans, which describe the control measures necessary to achieve acceptable water quality conditions.[22] In other words, watershed planning is a roadmap to implementing the TMDL. This Watershed Plan is meant primarily to implement the following TMDL created to address NPS pollution entering the Still River:

A Total Maximum Daily Load Analysis for Recreational Uses of the Still River Regional Basin. Finalized July 8th, 2010. Primary pollutant: Indicator Bacteria. Sources identified: Urban runoff; other unspecified nonpoint source; other unspecified point source[23]

We also expect the implementation of this Watershed Plan to contribute to the implementation of the following TMDLs that cover portions of the Still River Regional Basin:

A Total Maximum Daily Load Analysis for Kenosia Lake in Danbury Connecticut. Finalized July 23, 2004. Primary pollutants: Nutrients (Phosphorus and Nitrogen). Sources identified: Stormwater runoff; surface water base flow; atmospheric deposition; waterfowl ; internal recycling

Connecticut Watershed Response Plan for Impervious Cover Appendix: Still River Regional Basin (CT6600). Finalized March 2015. Primary pollutant: Impervious Cover (meant to be a proxy for other pollutants). Note that this is an unofficial, experimental TMDL.

What follows in this section is a breakdown of the main pollutants entering surface waters from nonpoint sources in the Still River watershed. Information from relevant TMDLs is included in the descriptions of each pollutant.

Indicator Bacteria

EPA research estimates that *Escherichia coli* (*E.Coli*) bacterium causes an average of 8 illnesses per 1,000 swimmers exposed. An indicator of sanitary quality, *E. coli* is not pathogenic, but rather is a sign that water has been contaminated by fecal material and may introduce pathogenic organisms that cause gastrointestinal illness. The Connecticut Water Quality Standards (WQS) criteria for bacterial indicators are based on protecting recreational uses such as swimming (in both designated and non-designated

swimming areas), and other recreational uses such as kayaking, wading, water skiing, fishing, etc.[24] A 2010 TMDL for Recreational Uses of the Still River Regional Basin (Still TMDL 2010) has been developed due to the presence of excessive amounts of the indicator bacteria, *E. coli*. This Still TMDL 2010 provides information on the percent reduction in *E.coli* needed to meet WQS. (To see a list of percent reduction necessary to meet the Still TMDL 2010 by waterbody see Table 2.2.1 and Figure 2.2.1: Still River Basin Land Use and *E. coli* TMDL Percent Reductions Map.) To support recreational uses, the geometric mean of *E. coli* concentration must be less than 126 CFU/100mL. At a designated swimming area a single sample must be less than 235 CFU/100mL, and at other non-designated swimming areas, less than 410 CFU/100mL.[25] It should be noted that bacteria densities are highest during the warmer months (May - September), which is when people are more likely to come in contact with surface waters. This may occur because summer temperatures more closely approximate the body temperature of the warm-blooded animals from which bacteria originate. CT WQS do contain requirements for disinfection of treated sewage discharge to surface waters for sewage treatment plants. Continuous disinfection (year round) is required for all sewage treatment plants south of I-95. Disinfection is currently required for all sewage treatment plants north of I-95 from May 1 to Oct. 1. However, as per comments received on most recent WQS Triennial Review, DEEP is proposing to extend the latter disinfection period from Apr. 1 to Nov. 1.

The waterbodies included in the Still TMDL 2010 are: the Still River, Miry Brook, Kohanza Brook, Padanaram Brook, Sympaug Brook, East Swamp Brook, and Limekiln Brook. All of these watercourses are impaired according to the CT DEEP's 2016 Integrated Water Quality Report (IWQR) because they exceed the State's WQS for indicator bacteria. In the IWQR, these waterbodies are classified as "Category 4a" because they are impaired for a designated use, have an established TMDL and a pollutant has been identified as the cause of impairment.[26]

According to the Still TMDL 2010, approximately 18 industrial and commercial stormwater dischargers operate in the watershed under stormwater general permits. These facilities provide bacteria monitoring data for stormwater runoff. In addition, seven municipalities in the watershed collected bacteria samples at industrial and commercial sites, as required under the MS4 general permit. It is expected that implementation of this TMDL will be accomplished through watershed planning, implementation of the MS4 general permit and also through non-regulatory measures that address nonpoint source pollution.[27] **Note that a primary goal of this watershed planning effort is to implement the Still River Recreational Use TMDL.**

The 1995 study by Fuss & O'Neill mentioned previously found that areas upstream of downtown Danbury met water quality standards for total coliform, fecal coliform and fecal streptococcus, whereas in the downstream area, bacteria concentrations generally far exceeded the water quality standards in effect during this time period. Standards in effect at that time were defined as less than 200 organisms per 100 milliliters. In their sample stations, Fuss & O'Neil found that fecal coliform colony concentrations significantly increased during storm events, ranging from an average of 2417 cols/100mL during dry weather to an average of 6545 cols/100mL during wet weather. Similar to *E. coli*, fecal coliform often originates from the excrement of warm-blooded animals, such as pets.[28]

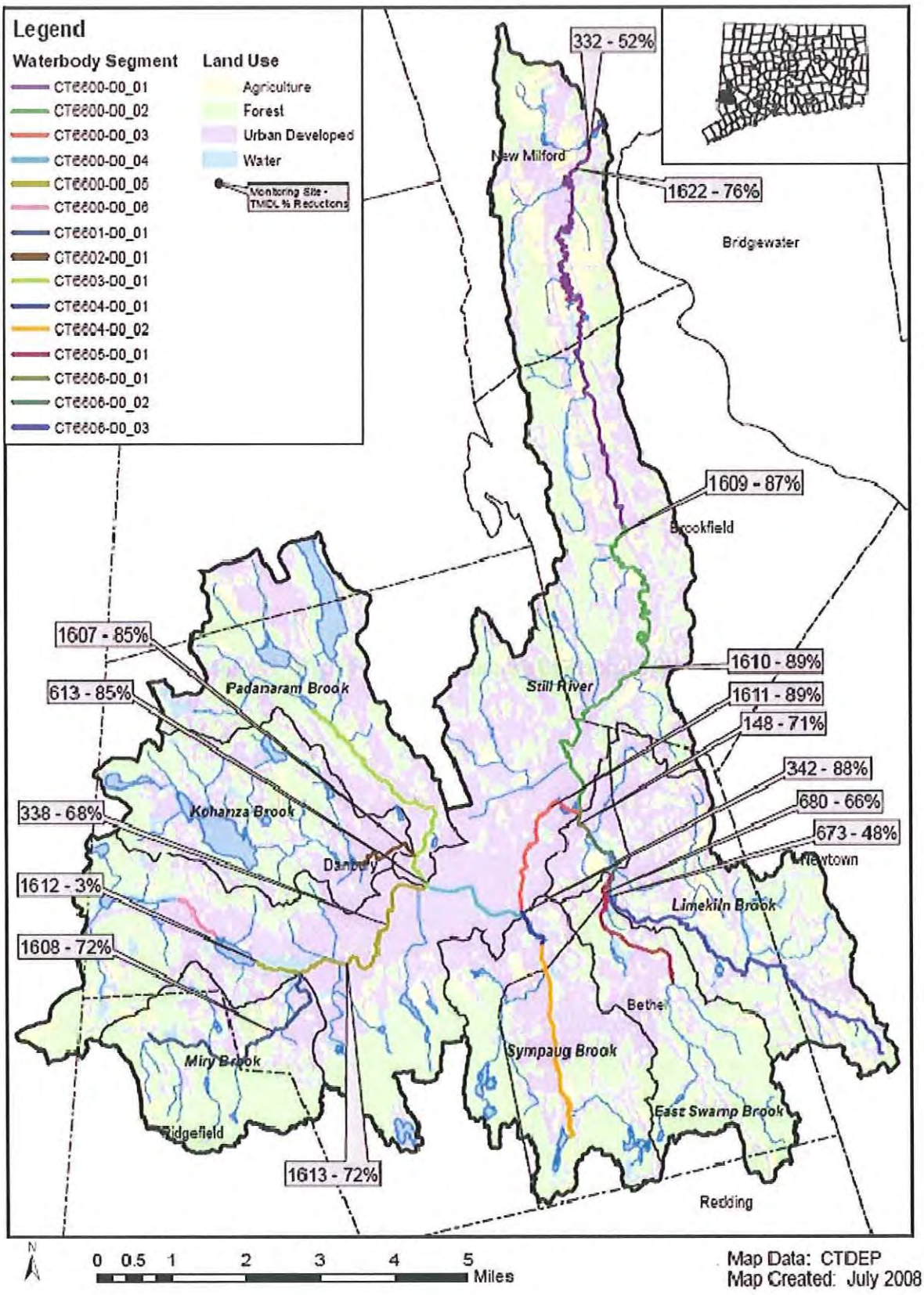
Table 2.2.1: TMDL Percent Reductions from "A Total Maximum Daily Load Analysis for Recreational Uses of the Still River Regional Basin", finalized July 2010 [29]

Waterbody Name	Waterbody Segment Description	Waterbody Segment	Monitoring Site	Average Percent Reduction to Meet Water Quality Standards
				TMDL
Still River (Brookfield / Danbury/ New Milford)	From mouth at confluence with Housatonic River, New Milford, upstream to Lake Kenosia, Danbury	CT6600-00 01	332	52
			1622	76
		CT6600-00 02	1609	87
			1610	89
		CT6600-00 03	1611	89
		CT6600-00 04*	338	68
		CT6600-00 05	338	68
			1613	72
			1612	3
Miry Brook (Danbury)	From confluence with Still River, Danbury, upstream to headwaters at North Ridgefield Pond outlet, Ridgefield.	CT6601-00 0I	1608	72
Kohanza Brook (Danbury)	From confluence with Padanaram Brook upstream to Ridgewood Country Club Pond outlet, Danbury.	CT6602-00_0I	1607	85
Padanaram Brook (Danbury)	From confluence with Still River upstream to headwaters at Padanaram Reservoir outlet, Danbury.	CT6603-00 01	613	85
Sympaug Brook (Danbury)	From confluence with Still River upstream to Greatpasture Rd crossing, Danbury.	CT6604-00_01	342	88
East Swamp Brook (Bethel)	From confluence with Limekiln Brook upstream to confluence with Wolf Pit Brook, Bethel.	CT6605-00 0I	680	66
Limekiln Brook (Danbury I Newtown)	From confluence with Still River upstream to confluence with Danbury WPCF outfall, Danbury.	CT6606- 00 01	148	71
		CT6606-00 03	673	48

Suspended Solids & Turbidity

Both suspended solids and turbidity measure physical material in water. Suspended solids in a waterbody may be caused by soil erosion and transport of and other solids such as pet droppings, vegetative matter (leaves and grass clippings), litter, street sand, solids from atmospheric deposition, and other debris that is washed away during stormwater run-off events. High amounts of suspended solids and turbidity can block or absorb sunlight, reduce photosynthesis, make food harder for fish to find, clog fish gills, smother fish eggs, suffocate the organisms that fish eat, and may be an indicator of other types of pollutants present in the water. Many pollutants can bond to and be transported by particulates, including but not limited to pathogens, nutrients, metals and persistent organic pollutants such as PCBs.

Figure 2 2 1: Still River Basin Land Use and TMDL Percent Reducations Map from A Total Ma imum Daily Load Analysis for Recreational Uses of the Still River Regional Basin , finali ed uly 2 1 by CT DEP



Turbidity measures the clarity of a water sample or how much material (soil, algae, pollution, microbes etc.) is suspended in the sample. Turbidity is reported in Nephelometric Turbidity Units (NTU), which is related to how easily light passes through the water sample. Total Suspended Solids (TSS) is a measurement of the amount of solids (including sand and silt) found in the water sample, usually from agricultural, urban and industrial stormwater runoff. While both TSS and turbidity can be caused by transport of soil and other debris in stormwater into a waterbody, turbidity can also increase as a result of failing septic systems, decaying plants or animals and other sources of nutrients that can contribute to excessive algal growth. According to the MS4 general permit, municipalities screening outfall discharges to impaired waters where turbidity in the outfall sample is more than 5 NTU greater than the required in-stream sample, must identify the outfall for further investigation. Similarly, while there is no standard for TSS, an average amount for outfalls across Still River towns is 48 TSS. Lower measurements indicate healthier water in both TSS and turbidity.[30]

Each municipality in the watershed measures both TSS and turbidity as part of their MS4 permit. Most towns in the Still River watershed are below the average of 48 TSS/measured outfall (with the exception of Bethel, Redding, and Brookfield). Similarly, turbidity for most towns are above the standard requirement of 5 NTUs (with the exception of Danbury and Newtown). Further investigation into turbidity is necessary and towns may be advised to put in more effective stormwater controls in place.[31]

According to the 1995 Fuss & O'Neill report for the City of Danbury, 20% of the total suspended solids come from low to medium density areas, likely from vegetative litter such as leaves and grass clippings. A more concentrated amount of total solids load came from heavy industrial areas (perhaps from materials storage) and highways I-84 and Route 7, where the source was likely winter road treatment with sand (note that this practice has been eliminated across the state in favor of using salt treatments- see the section on Chloride pollution below). TSS loading rates to the Still River were highest through downtown Danbury (Mainstem Section 4), out through the industrialized eastern side of Danbury (Mainstem Section 3) and Lower Limekiln Brook (Lower Limekiln Brook subwatershed).[32]

Nutrients

Nitrogen and phosphorous are the two main nutrients of concern throughout the Still River watershed. Excess nitrogen leaving the Still River watershed may contribute to eutrophication and hypoxic conditions downstream in Long Island Sound. Nitrogen is a growth-limiting nutrient in saltwater systems, and excessive nitrogen loadings can contribute to overgrowth of algae or phytoplankton, part of a process called eutrophication. As these organisms die and decay, oxygen is consumed in the process. Under extreme conditions, this can lead to oxygen depletion in the water column or hypoxia. Similarly, phosphorous is a growth-limiting nutrient for algae and other plant growth in freshwater systems. Excess phosphorous leaving the Still River watershed can exacerbate eutrophication in downstream freshwater impoundments of the Housatonic River, such as Lake Lillinonah and Lake Zoar. In the northeast, most of the nitrogen and phosphorous associated with non-point source pollution comes from atmospheric deposition or fertilizers used in landscaping. Waste from domesticated (dogs, horses, cows etc.) or wild animals (waterfowl) can also be a significant source of nutrients in some areas. Atmospheric deposition occurs largely due to the burning of fossil fuels, from power plants, or vehicles.[33]

The 1995 Fuss & O'Neill study measured ammonia, organic, nitrate, and nitrite in both wet and dry weather conditions. In these studies, nitrite was not generally detected during dry events but was measurable and therefore higher during wet weather events. Nitrate was highest downstream of downtown Danbury (Mainstem Sections 3 and 4) and ammonia was detected upstream and

downstream of downtown, which contributed the highest areal nitrogen loading rates. Areas in subwatersheds around Kohanza Brook, Padanaram Brook and Beaver Brook, contributed 50% of this study's nitrogen load. All three areas consist mainly of low to medium residential density, indicating that over application of fertilizer may be a significant contributor to nitrogen levels.[34]

Likewise, phosphorous increased slightly during wet weather events in dissolved form. The highest areas of contribution were the subwatersheds of Lower Limekiln Brook and the Mainstem Still through downtown Danbury (Mainstem Section 4). According to Fuss & O'Neill, low and medium density residential areas likely contribute more than 40% of total stormwater phosphorous load in Danbury, which may indicate greater fertilizer use in these areas. An additional 25% of phosphorous loads in Danbury come from industrialized areas. These areas are located in the Lower Limekiln Brook subwatershed and the southernmost tip of Mainstem Section 3, where there is a mix of low to medium residential and industrial areas.[35]

The 2018 Integrated Water Quality Report (IWQR) identifies seven waterbodies in the Still River watershed that have been identified by the Integrated Water Resource Management (IWRM) planning process for Action Plan development (by 2022) to address nutrient issues impacting habitat for fish, other aquatic life and wildlife, specifically: Still River, Miry Brook, Kohanza Brook, Padanaram Brook, Sympaug Brook, East Swamp Brook, Limekiln Brook. In addition, Lake Kenosia has been identified as having nutrient and eutrophication issues that impact recreation. A 2004 TMDL Analysis for Lake Kenosia examines nitrogen and phosphorus loading into the waterbody and establishes targets to reduce nutrient loading.[36]

Metals

Stormwater runoff and atmospheric deposition are the two most common sources of total metals in the Still River. While not widely recorded throughout the watershed, the 1995 Fuss and O'Neil Stormwater Study in Danbury showed concentrations of silver, cadmium, chromium, copper, nickel, lead, and zinc[37]. Concentrations were higher in the industrial areas found in subwatersheds for Lower Limekiln Brook, Still River Mainstem Section 3, and Still River Mainstem Section 4 (downtown Danbury and reaches along highways I-84 and Route 7)[38]. Industrial areas collectively contributed 35% of total lead, copper, and zinc although only comprising 11% of the watershed in Danbury[39]. Meanwhile, highway runoff contributed 20% of metals in Danbury. The most likely runoff sources come from the dissolution of exposed metals during rain events include: galvanized pipes, tires, wood preservatives, paints, roof gutters, and roofing materials, among others[40]. It's important to note that there is a TMDL for metals associated with the City of Danbury Wastewater Treatment Plant. This TMDL is focused on a regulated point source and is not dealt with in this watershed plan, however.

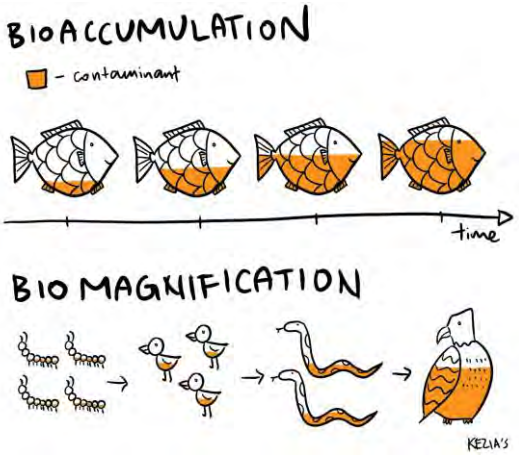
Mercury

One metal that has been very important to the history of Danbury and the Still River is mercury. Centered in Danbury and beginning soon after the American Revolution, the making of men's hats from fur and wool felt grew into the region's major industry. The processes for making felt and shaping hat bodies required prodigious amounts of water that was at first supplied to small shops throughout the region by the Still River and its tributaries. During the height of hat manufacturing, a process called "Carrotting", which used mercury nitrate to turn fur pelts into felt, was used to produce five million hats a year in the dozens of factories located in Danbury.[41]

Danbury's hat industry slowly declined beginning in the late 1920s. Although the use of mercury had been banned by state law in 1940 and largely phased out by large hat firms even before that, there is both empirical and anecdotal evidence of unused supplies of mercury being dumped into the river or into Limekiln Brook in Bethel as hat factory closings accelerated in the 1950s and '60s. Mercury was not routinely disposed of as normal factory waste, but it remains in bottom sediments of the Still River today.[42] Studies from 2003 by Johan Varekamp found mercury levels that range from 1-60 ppm. This is significantly greater than samples found elsewhere in Connecticut of 2-5ppm and the natural background amount of 0.5-1ppm.[43] It should be noted that Varekamp measured elemental mercury in sediment samples and not the more harmful form, methylated mercury.

Bioaccumulation & Biomagnification

Bioaccumulation is the increase of a contaminant in a single organism over time. For example, fish eat mercury contaminated macroinvertebrates. Because mercury doesn't leave the fish's system, the more bugs it eats the more mercury bioaccumulates. This can then lead to biomagnification.



Biomagnification is when a contaminant, such as mercury, increases in concentration as it moves up the food chain.

While the hatting industry may have had some impact on mercury levels in the Still River, throughout the State, the majority of mercury pollution comes from atmospheric deposition. This atmospheric mercury mythelates when it enters waterways in the presence of acid and dissolved organic carbon. Forty two percent of the mercury deposition comes from in state, while the remainder originates from surrounding states (NY 15%, PA 11.4%, MA 10.5%, and NJ 7.3%).[44] The mercury in the river washes downstream, especially during flood years, thereby depositing mercury into the Housatonic River and eventually into the Long Island Sound. This methylated mercury (methylmercury) both bioaccumulates and biomagnifies throughout aquatic food chains and therefore can be found in higher concentrations in fish, crayfish, shore birds, otters, and other aquatic organisms. As a result of the mercury concentrations, Connecticut has a statewide fish consumption advisory for freshwater that fish limits consumption to one meal per week of all freshwater fish (except trout) for the general population and no more than one meal per month for sensitive populations such as pregnant women and children under six.[45]

Built on efforts to address regional mercury emissions throughout the Northeast United States, state environmental protection agencies worked together to set TMDLs for methylmercury which was then approved by the US EPA to be managed at 0.3 ppm. Connecticut set a TMDL lower than that of 0.1 ppm.[46] This led to an implementation plan calling for a 50% reduction in regional mercury emissions by 2003 and a 75% reduction by 2010.[47] A study conducted by CT DEEP from 2006-2010 measuring methylmercury in crayfish in the Still River indicated levels of mercury higher than 0.3 ppm in 6% of samples. This amount was higher than crayfish tissue samples collected in any other project sites during the study.[48] The Still River is not regulated by a specific TMDL for mercury; rather, it is managed by the Connecticut Mercury TMDL of 0.1 ppm.

Polychlorinated biphenyls (PCBs)

Polychlorinated biphenyls (PCBs) are organic chlorine compounds used in manufacturing processes for items such as paint and plastics and as an insulator or coolant. PCBs are classified as a persistent organic pollutant and are a known carcinogen and endocrine disruptor that accumulate in lipids. Because of the dangers of PCBs, production was banned by US Congress in 1979. However, they still makes their way into the Still River through landfills, storm runoff, and sediments. Background concentrations of PCBs range between 0-0.1 ppm. Like mercury, PCBs bioaccumulate in the lipids of animals. For this reason, higher concentrations of PCBs can be found in predators further up the food chain.

Studies of PCBs in the region have focused mainly on the Housatonic River because of releases associated with the General Electric plant in Pittsfield, Massachusetts. The PCB levels in the Housatonic River are well above the current FDA limit of 2 ppm, creating a health concern for those fishing and consuming fish from the river.[49] As such there are health advisories for fish consumption posted along the Housatonic and communicated to the public. When PCBs levels in the Housatonic River were studied, samples were also taken from sites along the Still River. A 1982 study of sediment samples showed average PCB concentrations of 0.25 ppm, about double that of background concentrations.[50] A later study (1993) showed PCB concentration in crayfish tissue in the Still to be 0.36 ppm.[51] The difference in these two amounts is likely due to the bioaccumulative and biomagnified effect of PCBs, as opposed to an increase in PCB levels. More recent studies of the Housatonic River show that PCBs levels in fish and macroinvertebrate tissue have decreased significantly since PCBs were banned, although downstream transport of legacy PCBs in contaminated sediments from Massachusetts continues. The same conclusion about current levels of PCBs in the Still River cannot be drawn without a proper study of its PCB concentrations. That being said, the inference can be made that the Still River is not significantly elevating PCB levels in the Housatonic River, as concentrations above the mouth of the Still River (at stations in West Cornwall and Bull's Bridge) show higher concentrations than those below (Lake Lillinonah and Lake Zoar).[52]

Chlorides

Road salt is commonly used in the northern United States to melt ice and snow during winter months. Road salt can come in a few forms, magnesium chloride, calcium chloride, and sodium chloride. Sodium chloride (NaCL) is most commonly applied. Whatever form of salt is being used, it easily dissolves in water. Thus when roads are treated, salt makes its ways into surface waters through surface runoff and also into groundwater through the infiltration.[53] The impact of salt on surface water is detrimental to natural ecosystems of streams as it can lead to acidification and increased mobilization of metals in streams. Salt in water can alter the composition of riparian and wetland plant communities, giving a competitive advantage to more salt tolerant invasive species. Moreover, salt can interfere with the natural mixing of lakes and alter or inhibit the microbial communities which remove nitrate and water quality.[54] Salt in groundwater can interrupt healthy reproduction of plants and increase mortality by interrupting the ion exchange in plant root systems. [55]

In Connecticut road salt use has increased with greater development.[56] In the winter of 2013/2014 Connecticut Department of Transportation applied 227,511 tons total chloride. Compare this with 2003/2004 which experience roughly similar if not slightly greater snowfall but only applied 103,820 tons of chloride.[57] This is especially important in the Still River where impervious cover where salting is most likely to be applied (such as driveways, sidewalks, parking lots and roads), is concentrated around waterways. As a result there is an increase in salts both in surface and groundwater throughout the Still River watershed, as well as throughout the state of Connecticut. One study looked at this increase over the last century and found that levels of salt in the watershed increased from a baseline of 0-2.5 ppm chloride in 1894, to the current amount of 25-50 ppm of chloride measured from 2005-2007.[58]

2.3 Drinking Water

Drinking Water Sources

The Still River watershed consists of 179 drinking water sources and 128 public drinking water systems. Of these, 20 are Community Water Systems, 38 are Non-Transient, Non-Community Systems, and 70 are Transient Non-Community Systems. Four of these sources feed into drinking water reservoirs systems for the City of Danbury (Margerie Lake and West Lake) and the Town of Bethel (Chestnut Ridge Reservoir and Eureka Lake). Four sources are well fields located in glacial stratified drift (gravel) deposits that serve over 1,000 people and subsequently fall under the regulations of the CT DEEP Aquifer Protection Area Program. The remaining 171 sources are typically bedrock wells that serve Still River watershed residents and businesses via private wells.

Drinking Water Threats

To achieve the greatest public health protection, groundwater throughout the Still River watershed must be protected. This is true regardless of the source or whether that source supplies public water systems or private residences. In 2003, the Connecticut Department of Public Health (CT DPH) Drinking Water Section completed a state-wide survey of drinking water supplies under the Source Water Assessment Program as mandated by the 1996 reauthorization of the Safe Drinking Water Act. This survey reported on contaminants detected in the source water of each system in the Still River watershed. While this data is dated, it provides a framework for the scope of contamination within the source water area (Table 2.3.2) In addition to the Source Water Assessments, CT DPH reported water system violations from 2011 through 2015 to scrutinize human impact of drinking water sources contamination (Table 2.3.3).[59]

The following information was used to assess vulnerability under the Source Water Assessment Program:

- Sanitary conditions in the source water area
- The presence of potential or historic sources of contamination
- Existing land use coverages
- The need for additional source protection measures within the source water area

This process designated 39 systems with high susceptibility to potential contaminant sources, 36 with moderate susceptibility, and 29 with low susceptibility within the Still River watershed. No Source Water Assessments were available for 23 systems.

Table 2.3.1 Drinking Water Supply by Watershed Municipality as of 2017[60]

Municipality	Water supply description
Bethel	The Town of Bethel has had a municipal water supply since 1878. As of the publication of the Water Supply Resource Inventory (Nov. 2015), 26% of total land area (2,837 acres) in the southern part of Bethel is classified by CT DEEP as existing or potential water supply watershed land. CT Department of Public Health (DPH) recommends an overlay protection zone. The water supply for central Bethel originates in a northern land drainage that collects at the Eureka Reservoir and Mountain Pond Reservoir west of Bethel located in the Sympaug Brook Watershed in Danbury. An ongoing cosmetic issue with this drinking water is that the Eureka Lake supply has taste and odor problems that the existing plant cannot mitigate. Moreover, the Chestnut Ridge supply relies on an aged treatment plant in poor condition. A safe yield from both these water sources is .50 million gallons per day.
Brookfield	In 1987 Brookfield integrated a protection zone boundary for the Gallows Hill Aquifer and Still River Middle Aquifer into local regulations. Since 2001 Brookfield's small community water systems have been purchased centralized through Aquarion Water Company. This change resulted in the protection of Meadowbrook well fields, approved by CT DEEP as an Aquifer Protection Area Program.
Danbury	42% percent of Danbury's total land area use lies in its public water supply watershed, which includes Danbury and neighboring communities. Due to the need for an additional water supply, Candlewood Lake is being considered as a future source. This would affect drainage regulation for the western most sections of Brookfield. Danbury's zoning regulations maintain a protective overlay zone for the existing water supply watershed within the city which also cover Bethel, New York City, and Aquarion Water Company water supplies. This protective overlay zone compliments a citywide hazardous substance management ordinance. Danbury's surrounding watersheds; Lake Kenosia, Kohanza Brook, Padanaram Brook, and Sympaug Brook occupy a drainage area of 400 acres southeast of Danbury. Of these it should be noted that Lake Kenosia is used only occasionally during the non-swimming season and pumped to other surrounding reservoirs. Because of this a public push was made in 1997 to open Lake Kenosia up for development having been deemed a place of economic interest.
New Fairfield	Of the total water supply for New Fairfield, 30% is used to supply other communities in addition to its own. Of those the Padanaram Brook Watershed, part of the Still River watershed, drains south into Margerie Reservoir and East Lake Reservoir, important sections of Danbury's water supply system.
New Milford	All water for New Milford is supplied by ground water, as such there are no water supply watersheds after a small reservoir was decommissioned. Future water supplies may come from the drainage basins of West Aspetuck River Watershed and Shepaug River Watershed.
Ridgefield	Most of Ridgefield's land area (62%) is in use as water supply for other communities.

Table 2.3.2 Source Water Assessment Contaminant Summary assessed by CT DPH in 2003[61]

Contaminant Detected	Type & Number of Systems Impacted			
	Community Water System (CWS)	Non-Transient Non-Community (NTNC)	Transient Non-Community (TNC)	Total
Nitrate	12	19	23	54
Coliforms	0	17	17	34
Sodium	1	0	0	1
Trichloroethylene (TCE)	0	2	0	2
Methyl Tertiary Butyl Ether (MTBE)	1	0	1	2

The nitrate levels found in these wells are much lower than the maximum 10 mg/l allowed in drinking water and therefore are not a health risk; however, even at low levels they promote algal growth in surface waters. Detection of nitrate in public wells indicates that it has been released to surface and ground waters and is a potential contamination of concern. Typical sources of nitrates are septic systems, lawn care, and agriculture.

Table 2.3.3 CT DPH reported water system violations from 2011 through 2015[62]

Year	Type & Number of Systems Impacted			
	CWS	NTNC	TNC	Total
2011	1	0	8	9
2012	1	1	7	9
2013	1	2	8	11
2014	2	1	3	6
2015	0	2	5	7

Coliform bacteria often indicate poor physical conditions at or near the wellhead and can be made worse during heavy rains. Coliform bacteria is not a health threat in and of itself, but is used to indicate whether other potentially harmful bacteria may be present. The detection of both nitrate and coliforms indicate that human activity is negatively impacting groundwater.

Future Drinking Water Sources

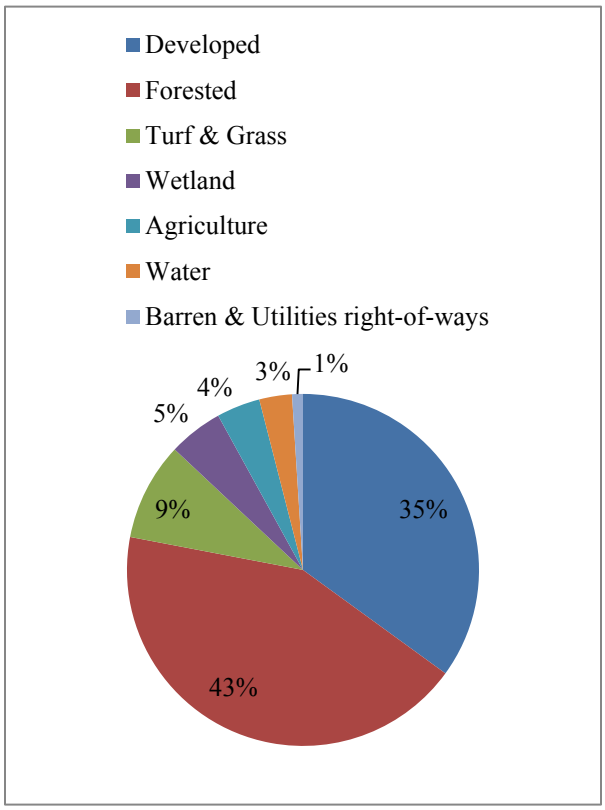
The Still River watershed contains stratified drift aquifers that may potentially be used as drinking water sources in the future. These areas have been identified by the Connecticut Geological Survey (CGS) and are delineated on the Surficial Aquifer Potential Map of Connecticut (Appendix C). This map identifies areas with greater potential for ground water supply, based upon the texture and thickness of surficial aquifer deposit and can be used to plan for statewide resource protection, water management, non-point source pollution prevention, and land use.

The map does not include information on saturated thickness, or depth to ground water, so further investigation is required to determine whether the aquifer will yield viable quantities of water. In addition, these aquifers often lie under and adjacent to the Still River in areas that have been developed, making them more susceptible to contamination (a map of the Still River Watershed Aquifer Protection Zone and Potential Geology can be found in Appendix C).

2.4 Land Use

The Still River watershed is considered a highly urbanized watershed. 35% of the watershed is developed with over 14% impervious cover (Still River Watershed Landcover map can be found in Appendix C). The

Figure 2.4.1 Still River Watershed Percent Landcover



remaining 65% is mostly forest but includes turf, wetland, agriculture, water, and some barren or utility right-of-ways (See Figure 2.4.1 - Still River Watershed Percent Landcover).[63]

The development of the watershed can be traced back to the hatting industry followed by new industries post-World War II that spurred rapid residential and commercial growth during the 1950s and '60s. This growth included several industrial parks and five different shopping centers with collectively hundreds of acres of paved parking in Danbury and Brookfield. These parking areas were built adjacent to or over tributaries of the Still River, beginning with the North Street Shopping Center in 1959. Mobile home parks around Lake Kenosia and Mill Plain Swamp in addition to new residential subdivision were built in or bordering the floodplain. Furthermore, there was the gradual development of an intensive commercial strip in the heart of the Still River valley (between White Street in Danbury and southern Brookfield) including stores, fast food, outlets, bowling alleys, bank branches, and warehouses.

All this development brought with it concentrated impervious cover around waterbodies in the watershed. A 1998 study surveyed land use within 500 feet on both sides of the Still River and found that 57% of land use was comprised of beneficial land cover such as wooded and scrub floodplain forest habitat. This left 43% of land cover comprised of non-beneficial or harmful land uses such as turf, or impervious cover.[64] While this study is dated, it demonstrates historical land use in areas close to the Still River.

Impervious Cover

Impervious cover (IC) refers to hard, landscape surfaces such as pavement or building roofs that that shed stormwater runoff. Runoff from these surfaces often picks up pollutants which are then transported to streams and other waterbodies. The amount of IC in a watershed affects both the quality and quantity of water resources, by disrupting the natural hydrological cycle. Increasing percentages of IC in a watershed is directly linked to decreasing stream health. Stormwater runoff from impervious surfaces contain pollutants such as oils, heavy metals, nutrients, bacteria and sediment. Runoff from hot surfaces can also cause temperature impacts to receiving waterbodies. Moreover, directly connected impervious areas (DCIA) exacerbate the impact of IC on streams by concentrating runoff and discharging it directly to nearby waterbodies. While IC has been calculated in the Still River basin, DCIA has not been calculated. Thus, the amount of DCIA in the watershed is largely unknown, and impacts on the Still have not been studied.

CT DEEP conducted studies on the relationship between impervious cover and water quality. A segment of the Still River (segment CT6600-00_05) is one of 15 impaired waterways selected for inclusion in the Connecticut Watershed Response Plan for Impervious Cover. The relationship between impervious cover and water quality impacts is well documented and in many cases the percent impervious cover

can be used to determine need for restoration. CT DEEP makes a recommendation limiting IC area to less than 12%. When IC within a watershed begins to exceed 12% water quality conditions that support healthy habitat for aquatic life often begin to noticeably deteriorate.

All municipalities within the Still River watershed are managed under the current MS4 General Permit. Under the provisions of this permit each community has developed outlined current stormwater management activities in a Stormwater Management Plans. While each town's stormwater management plans is different, they all delineate how they will reduce DCIA. Even though the presence of IC may not be the sole cause of aquatic life use impairment, reducing the effect of IC within the basin is expected to improve water quality and support aquatic life use goals.[65]

2.5 Flooding

The industrial revolution brought rapid urbanization in central Danbury. Dams were built for waterpower (especially for fur-processing operations), streambeds were filled in, and the river re-channeled in places to provide land for building lots. Some tributaries were buried and buildings constructed directly over the Still River in the valuable real estate areas of central Danbury. These changes to the natural stream channels contributed to frequent flooding, especially as much of the development was concentrated in floodplains. For example, Blind Brook, which flows from Tarrywile Park to join the Still River in central Danbury, was extensively buried, re-channeled and dammed, and continued to cause sporadic flooding events in residential neighborhoods through which it flowed into the early 2000s. The USDA Natural Resources Conservation Service, through their Emergency Watershed Protection Program (EWP) provided funding in 2000 and 2005 to restore flood damaged areas along Miry Brook and the Still River ($326k). Sheet piling was installed along the Still River to protect Cap City, and streambank stabilization (rip rap), installation of a box culvert and debris removal was done along Miry Brook.

Historic major floods along the Still River and tributaries include that of March 1936 (caused by rain & snowmelt); September 1938 (Great New England Hurricane/Long Island Express); and those of August and October, 1955 (caused by hurricanes Connie & Diane), which is the flood of record for the state.

Public perception of unfettered development started to change with the big floods of 1955. Two episodes of massive, deadly, and expensive flooding caused by hurricanes in August and October of that year killed four and caused millions of dollars of damage to factories and downtown Danbury businesses. Downtown residents had to be evacuated by boat and helicopter, and National Guard units from neighboring states had to be called in to help clean up the damage. The city's vulnerability threatened to halt the advance of Danbury's growing base of new industries. City officials, prodded by civic and business leaders, elected to participate in a federal flood control program. Structures built over the river were demolished, and flood control measures were combined with ambitious federally-funded redevelopment efforts. In the early 1960's as part of the Central Flood Urban Renewal Project, the U.S. Army Corp of Engineers (US Army Corps) created a design for a concrete walled open channel with an improved trapezoidal shape. This rechanneled and redirected the Still River through downtown Danbury. The result was a concrete river with an entirely artificial flow and no aquatic habitat value. This segment stretches from the Conrail Yard to Rose Street and was designed to confine the river in the event of a flood equal to the 1955 floods. Other projects by the US Army Corps. and the State of Connecticut have also channelized the river between Conrail yard and Cross Street (City of Danbury, 1995). The 1955 floods made the public aware for the first time of the connection between development of the floodplains upstream and throughout the City and the intensity of flooding within and downstream of the City.

Despite these major flood control projects, flooding remains an issue in the watershed. All Still River communities participate in the National Flood Insurance Program (NFIP). The NFIP is a federal program administered by the Federal Emergency Management Agency (FEMA) that provides assessments of flood risk in the form of Flood Insurance Studies/Flood Insurance Rate Maps (Still River Watershed FEMA Flood Hazard Zones can be found in Appendix C), establishes minimum regulations to guide development in floodplains, and provides federally subsidized flood insurance to property owners in participating communities. Most of the Still River Watershed (with the exception of New Milford) is covered by the Fairfield County Flood Insurance Study and associated Flood Insurance Rate Map that became effective in 2010. New Milford is part of Litchfield County, and is covered by Flood Insurance Study/Flood Insurance Rate Map that became effective in 1987. Note that new flood hazard data for New Milford, including the Still River, is an urgent need that is mentioned in Section 3 (Management Recommendations)

The following more recent storm events resulted in claims to the National Flood Insurance Program (NFIP) related to properties in the watershed:

- June 6-7, 1982 – Heavy Rain Event
- Sept. 16-17, 1999 – Tropical Storm Floyd
- April 15-16, 2007 – Nor'easter
- Sept. 6, 2008 – Tropical Storm Hanna
- March 25, 2010 – Rain & Snowmelt
- March 6-7, 2011 – Rain & Snowmelt
- August 28, 2011 – Tropical Storm Irene

Table 2.5.1 Flood Insurance Statistics for Still River watershed as of 8/31/2014[66]

Community	# Policies	Premium	# Claims	Claims Paid	RLP*	SRLP**
Bethel	226	$218,092	47	$657,647	5	1
Brookfield	66	$80,598	14	$164,532	3	0
Danbury	455	$631,185	162	$5,725,544	29	2
New Fairfield	38	$26,292	9	$41,423	0	0
New Milford	121	$203,505	113	$3,303,981	15	0
Newtown	83	$110,175	33	$212,141	3	0
Redding	43	$48,772	8	$49,118	0	0
Ridgefield	112	$104,894	36	$182,866	6	0

*RLP – Repetitive Loss Properties: Properties that have had four or more claims greater than $1000 within any rolling period Jan. 1, 1978 and/or two or more claim payments within any rolling 10-year period since Jan. 1, 1978 that appear to equal or exceed the reported property value
**SRLP – Severe Repetitive Loss Properties: A subset of RLP that have had at least four or more claim payments over than $5000 (building and contents) and where the total claim payments exceed $20,000 or in which two separate claim payments have been made in which the cumulative amount of the building portion of such claims exceed the market value of the building.

2.6 Watershed Management – Past & Present

Perhaps just as important as the physical or natural characteristics, the human impact, organizations, and laws that manage the watershed have had a tremendous influence on its health. Beginning in the early 1850s, the industrial revolution, stimulated by the first railroad that ran from Norwalk to Danbury following the route of the Sympaug Brook tributary of the Still, transformed the hatting industry. Large-scale industrialization and urbanization of Danbury and to a lesser extent some of the villages along the Still River, led directly to the degradation of the river. Large steam-powered hat factories in Danbury, Bethel, and Brookfield continued to be located on the Still River or one of its larger tributaries. After 1860, Danbury's hat factories increasingly relied on a growing reservoir system built from ponds, streams, and small lakes in northwestern Danbury that had fed the Still River. The first of these, Kohanza Reservoir, suffered a dam collapse that killed four people and devastated northern parts of Danbury in 1869. Danbury's reservoir system was expanded through the 1880s to stimulate industrial growth, and for almost a century provided the growing city with a sense of security about its water supply. Meanwhile, the rivers and streams adjacent to every hat factory were no longer needed for a source of clean water. They became instead a depository for factory wastes that included dyes and organic material from washing wool and fur, the contents of factory water closets and the residue of chemicals like copper sulfate and mercury, condensed from the massive amounts of steam generated in the plants, and washed into the streams.

Danbury's population doubled in the 1850s and again in the 1880s, prompting fears of water-borne disease from the now foul and discolored river, mostly due to the human waste from privies emptying into it. Casual dumping became a major problem as everything from household debris, store sweepings, and dead horses piled up in the river in the downtown area, a problem authorities had no success in stopping. Responding to fears of typhoid fever, cholera, and other water-borne diseases and lobbied by a local civic improvement group, municipal authorities began construction of a sewer system in the early 1890s. Rejecting expert advice, the city built a system that combined street and sanitary drainage and dumped the outflow with no treatment directly into the river in the narrow and swift-flowing gorge at Beaver Brook. Downstream mill owners and farmers formed an "alliance" of over 70 property owners, and, joined by the Town of Brookfield, sued the City of Danbury. The result was an injunction against the city, considered at the time a sweeping landmark decision in Superior Court and backed up by the State Supreme Court on appeal, which forced the city to provide a primary sewage treatment plant. City authorities purchased a farm in Beaver Brook district adjacent to East Swamp Brook where it built not only a treatment plant, only the fourth such plant in the state, but also a municipal dump on land abutting tributaries of the Still River.

North of Danbury the badly polluted river made its way through a valley increasingly being stripped of its natural resources. Large limestone-quarrying and lime-burning operations for production of agricultural lime took place in Beaver Brook and in Brookfield near the New Milford town line and along Lime Kiln Brook.

Danbury's hat industry slowly declined beginning in the late 1920s as fashionable men began to spurn hats and other formal outerwear. Although use of mercury had been banned by state law in 1940 and had been largely phased out by large hat firms even before that, there is both empirical and anecdotal evidence of unused supplies of mercury being dumped into the river or into Limekiln Brook in Bethel as hat factory closings accelerated in the 1950s and '60s. Mercury had been used in preliminary treatment of fur and was not routinely disposed of, but it remains in bottom sediments of the Still River today.[67]

Concurrent with hatting's decline, after World War II the Danbury area experienced a burst of new industrial growth in electronics, metal fabrication, precision optics and other instrumentation, and medical supplies. This renaissance led in turn to a quadrupling of the population, dramatic changes in

patterns of land use, and massive impacts on the Still River watershed. Virtually all of this growth took place in an atmosphere of little to no regulation until the mid-1960s. The prevailing attitude among both officials and the public was that any and all change represented progress. The maligned and foul-smelling Still River, hidden from sight for most of its course, was given little consideration. The exploding residential and commercial construction of the time also stimulated large-scale sand and gravel mining in the terraces above the valley floodplain into the 1970s, when towns began enacting ordinances to shut them down or prohibit new mining. Some of these operations have resulted in permanent changes to the terrain, especially in Brookfield, where a large groundwater-filled pond emerged over time after extensive gravel mining near a river tributary, Limekiln Brook.

Between 1960 and 1965, Connecticut experienced an extended drought that by 1965 had drawn Danbury's reservoirs down to only 10% of capacity, leading to emergency pumping of drinking water from Candlewood Lake. The drought shook the city's confidence that its seemingly overbuilt reservoir system would accommodate any future need. It particularly affected the thinking of Gino Arconti, who became Danbury's mayor in 1967 and who made protection of water supplies and open space a city priority for the first time. Underground aquifers, of which the Still River Valley, and Lake Kenosia in particular, were believed to be major sources, were mapped and incorporated into city planning and into regional planning, which at that time was in its infancy. As early as 1967, an engineering study recommended drilling ground water wells on the Owens-Kovacs property on the east side of Lake Kenosia, soon after it was acquired by the City ostensibly as a new school site. That recommendation proved to be prophetic when, during another drought in early 1981 which drew reservoir capacity to 40%, the Dyer administration added a $2 million water line to "skim" water from Kenosia to West Lake Reservoir. The City began to address serious pollution problems around the lake, closing down an illegal septic dumping site near the lake that also had a buried trailer filled with chemical solvents that included the carcinogens tricholoroethane and trichloroethylene that had infiltrated the community well at a trailer park downstream. A research report by the environmental study group King's Mark RC&D in 1981 recommended a ban on all industrial development and strict regulation of the area that surrounded the lake or that fed the Kenosia aquifer. With the exception of the city-owned beach already in operation (that has been closed to swimming since 2013), and pre-existing uses, development around the lake came to a halt after 1986. In 2008, the City established a Lake Kenosia Commission, and in 2013 planted a buffer of native plants.

During the era of hectic growth in the region, two new laws had a profound effect on the eventual cleanup of the river. In 1967, the State of Connecticut passed its own Clean Water Act, five years before the federal Clean Water Act would be passed. The act called for an upgrading of water quality in the Still River to make it suitable for fishing and boating, and ultimately as an approved source of water supply. Specific towns, including Danbury and Brookfield, were ordered by the Connecticut Water Resources Commission to "construct new or expanded sewage treatment facilities to abate water pollution." With no sewage treatment facilities of its own, Brookfield planned to utilize the treatment plants in Danbury and New Milford, opening up the southern Route 7 corridor in that town to intensive commercial growth. Eighteen Danbury industrial firms received orders to modernize their industrial waste treatment facilities. While some longstanding businesses folded as a result of the order, others successfully upgraded, eliminating multiple sources of pollution.

A second law, the Inland Wetlands and Watercourses Act of 1972, established local regulation of the river, its tributaries and its floodplain for the first time. The act established a permit process for any activity within a hundred feet of a river. The main towns of the valley responded in different ways: Brookfield established a Wetlands Commission that began operation in 1974, while Danbury opted for a hybrid body composed of a panel representing municipal agencies and environmental expertise, a compromise intended to dampen any potential slowdown for environmental reasons of the rapid

economic growth the city had been experiencing. New Milford allowed the state Department of Environmental Protection to enforce regulations as well as it could over the town's vast territory until finally establishing its own commission in 1988 over organized opposition from powerful development interests.

More recent development has reflected the impact of these laws. All major towns within the watershed regulate development through an Inland Waterways and Wetlands Commission or regulatory equivalent (for example, Danbury manages permits through the Danbury Environmental Impact Commission). Projects that would have impinged on the floodplain or feeder wetlands of the Still River had been scaled down or rejected. For example, the Danbury Fair Mall, the largest enclosed shopping mall in New England at the time it was built, was constructed along a series of ring roads to allow harmless flooding and with ponds to mitigate wetland loss adjacent to the river and Mill Plain Swamp.

2.7 Species & Habitats

Despite the impacts of urbanization, the Still River watershed contains a number of notable species and habitats of conservation concern. The CT DEEP Natural Diversity Data Base (NDDB) indicates areas of the state that contain federally listed species and significant natural communities. According to the NDDB, Lake Kenosia and areas downstream, the main stem of the Still from downtown Danbury north, the upper section of Miry Brook, a southern section of Parks Pond Brook and westward, Braumies Brook, upper Sympaug Brook, Putnam Park Brook, Wolf Pit Brook, and lower Limekiln Brook are home to species and/or habitats of conservation concern (a map of the NDDB areas in the Still River Watershed can be found in Appendix C).

Terrestrial

The Still River is unusual among river systems in Connecticut in that it flows through calcareous bedrock for virtually its entire length, with a broad, low gradient floodplain.[68] This calcareous influence brings together many elements of biodiversity, potentially including unusual fauna.[69] A few notable species found in the watershed are those listed as rare, endangered, threatened, or a species of special concern by the State of Connecticut. Among those are a number of sedges such as Davis' sedge (*Carex davisii*), Tuckerman's sedge (*C. trichocarpa*), and hairy-fruited sedge (*C. trichocarpa*). Davis' sedge is currently listed as "Threatened" with only nine populations in the state with a likelihood of becoming endangered in the foreseeable future. Both Tuckerman's sedge and hairy-fruited sedge are classified as "Special Concern." Also found in the region are Great St. John's wort (*Hypericum ascyron*) and pale green orchid (*Platanthera flava* var. *herbiola*), both "Special Concern" species that have recorded populations as far back as 1990. Not on the CT DEEP list but of importance are the swamp agrimony (*Agrimonia parviflora*) and the cursed crowfoot (*Ranunculus sceleratus)*. Many of these species are rare throughout the state, in particular hairy-fruited sedge, which seems to be abundant only in the Still River corridor and is found in few other places in Connecticut.

The biggest threat to all of these plant species is the pervasive spread of invasive species in floodplain forest habitat. Floodplains are highly susceptible to invasive species population growth and biotic homogenization due to the available water (soil moisture), nutrient-rich soil, and flowing waters that help spread seed. The invasives found most prevalently throughout the watershed include: Japanese stiltgrass (*Microstegium vimineum*), Japanese knotweed (*Fallopia japonica*), Mugwort (*Artemisia vulgaris*), mile-a-minute weed (*Persicaria perfoliata*), multiflora rose (*Rosa multiflora*) and the common reed (*Phragmites australis*).[70] While no comprehensive database exists on the extent of invasives, one can assume based on smaller mapping of invasive populations throughout the watershed that invasive species dominate the landscape of riparian zones and this watershed generally, making up the majority of plants. Moreover a warming climate creates conditions conduce to the spread of invasives as areas that were previously too cold become warmer.[71]

Aquatic

Given the extensive history of industrial pollution paired with heavy development, the existence of any aquatic life in the Still River and its tributaries was questionable without significant improvements in water quality. However, in 1997 and 1998, after the completion of the upgrade to tertiary treatment of the Danbury sewage plant, CT DEEP was surprised to find populations of fish which they remarked were "astounding, both in the numbers of species found and the total of individual fish in each species group."[72] According to CT DEEP fish surveys, 35 species of fish have been found in the watershed since 2001, the most common of which are bluegill sunfish, white suckers, blacknose daces, and largemouth bass.[73] Since the 1993 upgrade to the Danbury Sewage Treatment Plant and subsequent decrease of ammonia in the plant discharge, the quality of aquatic life has greatly increased.[74] A survey by CT DEEP in the late 1990s resulted in a diversity of fish in areas that were previously devoid of any fish populations (according to a 1991 baseline survey). That being said, many of the waterways in the Still River continue to fail to support healthy habitat for aquatic life.

Impervious surface has a significant impact on aquatic life. A strong relationship between the percentage of IC in a watershed and aquatic life impacts has been identified, with changes in the biotic community expected at around 10% IC.[75] To read more about impervious cover, see Section 3.3 Impervious Cover.

2.8 Recreation

Due to the many efforts of municipalities and local volunteer groups along the Still River, its health has improved tremendously since the mid-1990s. Many efforts to develop recreation opportunities within the watershed are underway. Significant progress has been made on river trails, both on and adjacent to the river. Open spaces and preserves within the watershed are encouraging accessibility, visibility, and awareness of the waterway as a recreational resource in a fairly urbanized area. Some of the major opportunities and notable projects related to recreation within the watershed are detailed in this section.

Parks & Open Space

There are a variety of parks and open space areas located in the watershed, several of which are located on or near the water. Approximately 24% of the Still River watershed land area is classified as Open Space (a designation which includes public parks and municipal lands, such as closed landfills and airports can be found at Still River Watershed Public Lands and Open Spaces map in Appendix C). The City of Danbury alone claims over 1,200 acres of public parks and open spaces including Lake Kenosia, Pine Mountain Preserve, Danbury Dog Park, Danbury Cemetery, and Ridgewood Country Club, as well as smaller urban parks such as Joseph Sauer Memorial Park.[76] North of Danbury, the river flows through Brookfield Municipal Center, a large public park then through the Candlewood Valley Country Club, before emptying into the Housatonic River near Lovers Leap State Park and Harrybrooke Park. Across the river from Lovers Leap State Park is Pickett District Park (10 acres), which contains four baseball fields. A proposed recreational improvement project in this area involves the construction of a steel truss pedestrian bridge over the Still River to connect this park with Lovers Leap State Park.[77]

To the east of Danbury, several Still River tributaries are adjacent to recreational spaces. East Swamp Brook and Limekiln Brook both flow through Bennett Memorial Park (Bethel). Dibbles Brook runs by Mitchell Park (Bethel), which contains four baseball fields and Bethel Supercross BMX Track. In southern Bethel, Wolf Pit Creek flows through Huntington State Park. Other recreational areas within the

watershed include Rogers Park, Tarrywile Park and Mansion, Old Quarry Nature Center, Wooster Mountain State Park, and the Richter Park Golf Course (adjacent to West Lake Reservoir). See Appendix C for locations of parks and open spaces.

Boating

The goal of the water trail portion of the SRGWT is to provide continuous river access from Brookfield to Danbury. There are currently three main boat launches on the Still River. Starting upstream, the first is located at Lake Kenosia the head of the Still River mainstem, a CT DEEP boat launch. Moving downstream, the second is behind the Danbury Marriot Hotel on Eagle Road, built in 2001 as part of the Still River water trail. From this launch, a paddler can travel 6.7 miles downstream before reaching a takeout point at the Brookfield Craft Center. The last and most recent boat launch is located off Erickson Road in New Milford, just north of Cross Road. Future boat launches are in development by way of the Still River Watershed planning process (Figure 3.4.1 - Still River Greenway and Water Trail Project Map). There is a small informal put-in for kayaks and canoes behind the condos just north of the Halfway Falls gorge.

To fully implement a river trail, portage points and trails would need to be established around treacherous sections of rapids and signage updated. Some of this work has begun as signage has been established throughout the Still River by the Housatonic River Valley Trail noting dangerous rapids. However, there are still several sections of the river that require a portage, most notably Halfway Falls in Brookfield and the Harrybrooke rapids in New Milford.[78] In addition to these considerations, a river trail would require regular monitoring and maintenance to clear trees and debris that often block this river in particular.* There have been resources in the past that helped in cleanup efforts, such as a river trail manager who checked on conditions and coordinated volunteer groups for litter cleanup. Additionally, Eastern Mountain Sports has sponsored an annual river clean-up day in May since 2005. Continued regular maintenance of the water trail will be necessary to avoid blockages and ensure continued use by boaters.[79]

Hiking

The hiking trail that most highlights the Still River is the Still River Greenway. To date two sections have been completed in what is planned to be an 11 mile multiuse trail along the mainstem of the Still. The first section is approximately one mile that starts behind the Marriott Hotel on Eagle Rd. in Danbury. The second, most recently constructed section is a 2 mile stretch of paved trail in Brookfield. In addition to the Still River Greenway, trails are found in parks throughout the watershed including Wooster Mountain State Park and the Pine Mountain Preserve. The Ives Trail Greenway runs through Tarrywile Park and briefly along Parks Pond Brook, a tributary of the Still River. Near the area where the Still River flows past the Stew Leonard's in Danbury, there is a small area known as the Greenway Bird Sanctuary, which includes a half mile loop hike through a meadow, a wetland forest, and a riverine ecosystem.[80]

Fishing

According to a CT DEEP Trout Stocking Map (updated May 2016), there are four active stocking sites along a stretch of the Still River in northeast Danbury near the junction of routes 7 and 84, with about 300 trout stocked annually. These stocking sites are near the Danbury portion of the SRGWT and are likely popular fishing sites. In Bethel, the East Swamp Brook and the Limekiln Brook contain seven active stocking sites, with about 400 trout stocked annually. Another reported popular fishing site is located at the junction of the Still River and the Housatonic River, near the Pickett District Park.[81] For most up to date information see the Connecticut Fishing Guide – Inland & Marine published annual by CT DEEP.

*for more information on management of woody debris in streams check out CT DEEP Fisheries "Large Woody Debris Factsheet at: https://www.ct.gov/deep/lib/deep/fishing/restoration/LargeWoodyDebrisFactSheet.pdf

3. VISION, GOALS, AND MANAGEMENT RECOMMENDATIONS

Vision

Using the Still River Watershed Existing Conditions Report as a guide, the Still River Partners worked together to develop the following Vision Statement for the Still River Watershed:

> *A healthy Still River is the heart of watershed communities, providing safe, easily accessible recreation opportunities for people of all backgrounds, ages and abilities - including swimming, boating, fishing, and riverside trails. The Still River provides opportunities for learning about and connecting with the natural world. Watershed stakeholders work collaboratively to:*
>
> - *Protect and improve water quality and quantity*
> - *Conserve important species and habitats*
> - *Enhance the climate change resiliency of the built and natural environments*
> - *Balance the economic development goals of watershed communities with conservation of natural resources*
>
> *These efforts serve as a model for other industrialized watersheds in Connecticut.*

Goals

The Still River Partners then identified six key focus areas for management of the Still River watershed, and developed a set of Goals for each of them that are essential to realizing our shared Vision for the Still River and its watershed. Those focus areas and associated goals are:

Water Quality

1. Improve water quality of the Still River and its tributaries to meet Connecticut Water Quality Standards for recreation and habitat for fish, other aquatic life and wildlife by reducing, respectively, *E. coli* indicator bacteria and other pollutants. The latter includes but is not limited to metals, chlorine and nutrients, especially for waterbodies where TMDLs have been established.
2. Maintain a water quality monitoring program.
3. Assist municipalities with MS4 compliance.
4. Support adoption of policies and programs at the municipal level that restore and protect water quality and quantity consistent with the Connecticut State Water Plan.
5. Encourage use of green infrastructure (GI) and low impact development (LID) solutions for new development and seek opportunities to replace older infrastructure with GI and LID to reduce impervious cover throughout the watershed.

Species & Habitat

1. Create a natural flora and fauna resource inventory throughout the watershed to identify key areas of restoration and conservation. Share this information with land-use decision makers and other key stakeholders.
2. Promote habitat connectivity, urban biodiversity, and regional conservation through partnerships between land trusts, municipalities, and landowners.
3. Investigate and promote native habitat and invasive species management.
4. Promote land preservation and sustainable land management practices.

Recreation

1. Create, enhance and maintain safe, easily accessible river-based recreational opportunities for people of all ages and abilities, balancing recreational access with conservation.
2. Enhance connectivity of recreational trails both along the Still River and with watershed communities, as well as regional and statewide trail systems.
3. Integrate and include recreation enhancement with watershed management projects.

Flooding & Climate Change

1. Protect and restore fully functioning floodplains.
2. Implement climate resilient strategies in watershed communities.

Capacity Building & Collaboration

1. Enhance and maintain collaboration between watershed municipalities; regional, state and federal agencies; non-profits; utilities and other stakeholders to support the implementation of the watershed plan.
2. Secure adequate resources to accomplish watershed management goals.
3. Promote the sharing of data, technical support and other resources for watershed management.

Education & Outreach

1. Educate community members about environmental stewardship and engage them in practical ways to improve water quality.
2. Create opportunities for people of all ages and backgrounds to learn about and from the Still River and its watershed.

Management Recommendations

The vision and goals developed by the Still River Partners provided the foundation for general management recommendations under the key focus areas outlined above. The following section lays out how stakeholders will achieve the above vision through: Collaboration & Capacity Building, Monitoring & Assessment, Education & Outreach, Recreation Enhancement, Floodplain Management & Climate Change Resiliency, and Species & Habitat Conservation. Included in these are recommended actions – concrete steps to take along with who will take them, a timeline, milestones and potential funding sources outlined in a series of tables throughout the section.

3.1 Collaboration & Capacity Building

One of the main objectives to the Still River Watershed Plan is to bring together watershed municipalities, environmental organizations, and engaged groups of residents to share information and resources and better implement specific projects within the watershed. While the interests of each of these entities may vary, the vision and set of goals is the same; to see a restored healthy watershed for all to enjoy. To make this vision a reality requires active participation and "buy-in" of the Still River watershed plan and its recommendations as well as resources put toward implementation projects identified herein. This work has started through the formation of the Still River Partners, a core group of municipal staff, recreation enthusiasts, environmental groups, and engaged residents brought together to create the Still River Watershed Plan. Already we have seen the effectiveness of this collaboration through the implementation of watershed projects. The next step to building capacity will come through greater engagement with watershed residents interested in volunteering, a growth of programs started during the watershed planning process, and the addition of project funding through grants and corporate sponsorship. Below are some recommendations aimed at accomplishing these goals:

Recommended Actions

- Continue the active engagement of Still River Partners group through quarterly meetings.
- Hire one part-time Still River Watershed staff person to liaison between watershed stakeholders, seek and secure funding as well as coordinate watershed implementation projects.
- Seek adoption of the watershed plan by watershed municipalities who will support the projects and recommendations of the watershed plan through funding, staff hours, and other resources.
- Seek and secure funding through a variety of sources including federal grants, state grants, private foundations, and corporate sponsorship. Some potential funding sources include:

  State & Federal
  - CT DEEP Section 319 Nonpoint Source Grants
  - National Fish and Wildlife Foundation Long Island Sound Futures Fund
  - Connecticut Clean Water Fund
  - FEMA Grants for Flood Mitigation

  Private Foundations
  - Fairfield County Community Foundation
  - Northwest Hills Community Foundation
  - Horizon Foundation
  - Werth Foundation
  - Meserve Memorial Foundation
  - The Conservation Fund

  Corporate/Business Sponsorship
  - Lowe's
  - Union Savings Bank
  - Locally-owned businesses

Program Highlight - Sustainable CT

Sustainable CT is a voluntary certification program that helps cities and towns across the state become more vibrant, healthy, resilient, and thriving places for all their residents and future residents. Municipalities can learn more, access resources, and see what best practices have been implemented in other towns to make their communities, greener, cleaner, and more inclusive at sustainablect.org. After municipalities pass a resolution demonstrating their intent to pursue Sustainable CT certification, municipalities can earn points towards certification by documenting past sustainability efforts and pursuing future actions. Registered municipalities also have access to funding opportunities for various projects, a list of which can be found here: https://sustainablect.org/funding/.

The towns of Bethel, Brookfield, and Newtown have registered and passed resolutions to seek Sustainable CT certification. New Milford and Ridgefield have gone one step further and gained Bronze status certification. You can check out New Milford Certification Overview at the Sustainable CT website here[82]. This indicates the interest of watershed towns in incorporating Sustainable CT practices into their town culture and infrastructure.

Support for this program has grown in the last few years in no small part to entities that have jumped in to provide resources, making it easier for towns to complete a certification process. One such entity in Southwest Connecticut is the Western Connecticut Council of Governments (WestCOG). WestCOG is a regional organization that provides community planning resources to 18 municipalities in the western and southwestern area of Connecticut including all the towns in the Still River Watershed. They have partnered with Sustainable CT to provide their municipalities resources to help guide them through the Sustainable CT certification process.

Recommended Actions

- Encourage Danbury and New Fairfield to join other watershed towns and pass a city resolution outlining their intent to seek Sustainable CT certification. Passing a resolution does not commit the municipality to seek certification within a closed time frame but marks an intention to incorporate Sustainable CT best practices into municipal decision making.
- Encourage watershed towns to utilize the Sustainable CT and WestCOG resources, explore best practices implemented in other municipalities, and implement qualifying projects in their own municipalities to qualify for Sustainable CT certification.
- Consider Sustainable CT guidance and point opportunities when designing and implementing watershed-based plan projects. Record watershed plan projects that count toward Sustainable CT certification.
- When ready, encourage the towns of Bethel, Brookfield, and Newtown to apply for Sustainable CT Bronze certification and recertify New Milford and Ridgefield for Silver certification.

Table 3.1.1 Capacity Building Recommendations

Recommended Actions & Milestones	Who	Timeframe (Schedule)	Deliverables & Evaluation Criteria	Estimated Costs	Potential Funding Sources
Continue coordination of the Still River Watershed Plan • Continue to hold bi-annual Still River Partners meetings • Hire a Still River Watershed Coordinator	Still River Partners	0-1 year Ongoing	• Published meeting minutes • Hired Coordinator	$$$	Various sources
Municipal support of the Still River Watershed Plan • Adoption of Still River Watershed plan during municipal meetings (Board of Selectman, Town Hall, and City Hall meetings)	Still River Partners	0-2 years	• Municipal meeting minutes that indicate adoption • Integration of the Still River Watershed plan in municipal POCDs	$	Various sources
Identify and secure funding • Review and prioritize funding sources • Prepare and submit grant applications • Secure grants	HVA and other watershed stakeholders	0-5 years Ongoing	• Funding sources secured for watershed-based projects	$$	See appendix XX for a full list of potential funding sources

$ = $0 to $5,000 $$ = $5,000 to $10,000 $$$ = $10,000 to $50,000 $$$$ = Greater than $50,000
HVA = Housatonic Valley Association POCD = Plan of Conservation and Development

3.2 Monitoring and Assessment

While monitoring has been performed both by CT DEEP and HVA during the course of the watershed planning process, this plan recommends additional monitoring and assessment to support watershed plan implementation. This includes the continued efforts of assessments already performed such as the Unified Stream Assessment (USA) and Unified Stream and Subwatershed Assessments (USSR), discussed below, as well as new programs, such as Ambient Water Quality Monitoring and Pollution Trackdown Surveys. These assessments could inform an updated TMDL and help set a new baseline for water quality in the Still. Further assessments will continue to help the Still River Partners identify areas for restoration, locate pollution sources, and help develop a more detailed action plan.

HVA and other stakeholders (Still River Partners) plan to revisit this Watershed Plan on a regular basis. Each year they will evaluate progress toward the recommended actions and goals in the Action Plan. Every five years the full plan will be updated based on progress made, results achieved, and new priorities set. This update will include an assessment of progress made, update with new data, and an update with new projects. Revisions to the Watershed Plan will be made to improve the effectiveness of implementation efforts if monitoring shows no improvement post BMP efforts.

Unified Stream Assessment (USA)

In order to identify negative impacts and potential restoration opportunities, HVA conducted stream corridor field assessments in the Still River and associated tributaries between 2016 and 2018. HVA used USA continuous stream walk methods to survey all reaches within the watershed that are classified as impaired (approximately 30 stream miles). This protocol was developed specifically for urban watersheds by the Center for Watershed Protection. During USA field assessments, HVA staff and volunteers walked prioritized impaired reaches of the Still River and its tributaries, and recorded data on reach conditions, potential impacts, and potential restoration sites. The HVA team was unable to access certain impaired reaches for field assessments for a variety of reasons (i.e., wetlands, buried streams, extreme channelization). Thus, ten reaches were desktop assessed, using aerial imagery to identify stream impacts. Stream impacts were recorded on one of eight electronic data collection forms, according to type: Stormwater Outfall, Utility, Trash and Debris, Stream Crossing, Severe Erosion, Impacted Buffer, Channel Modification, and Miscellaneous. For each impact, multiple photos were taken and location data (points for the single point data and lines for Erosion, Impacted Buffers, and Channel Modification) were collected using a handheld GPS unit. Overall reach conditions were detailed on a reach data form. The reach form included fields for average bank stability, in-stream habitat, riparian vegetation, floodplain connectivity, access, flow, and substrate throughout the entire reach.

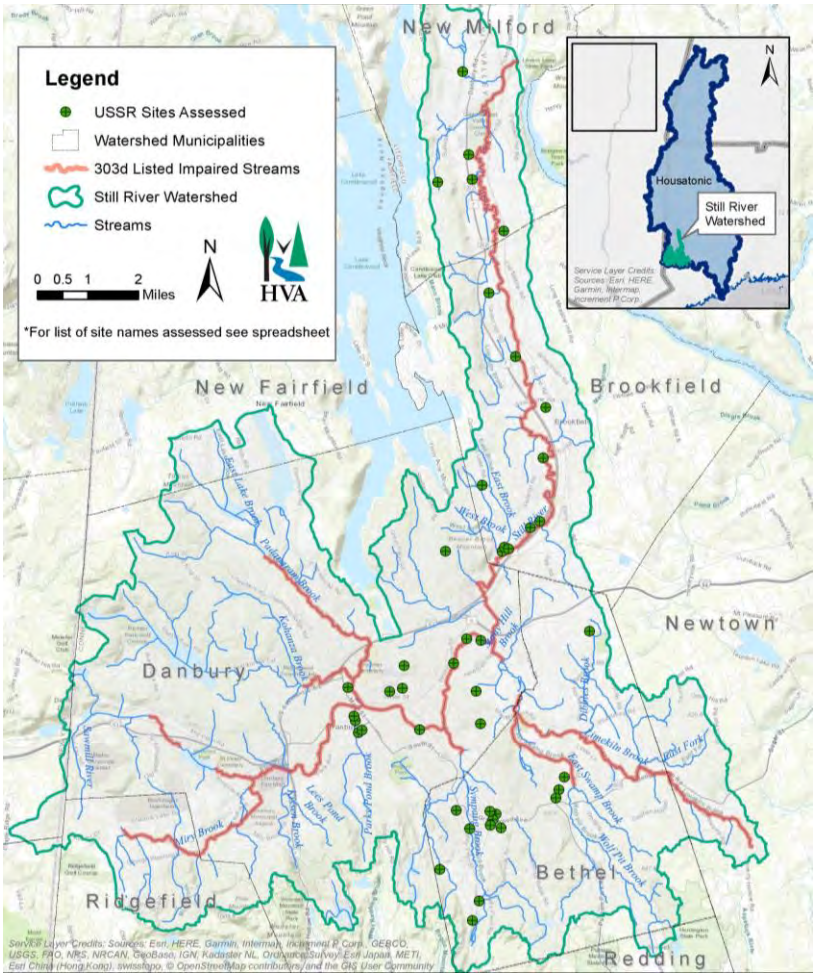
Outfalls included all storm water and other discharge pipes. If an outfall was flowing (all field assessments were conducted at least 48 hours after the most recent rainfall) and/or had a suspicious odor or color, a grab sample of the effluent was taken and tested for ammonia nitrogen concentration. This allowed HVA to flag certain outfalls for additional investigation and potential pollution trackdown surveys. Utilities in the stream corridor include exposed pipes and sewers. Trash and debris was noted if the accumulation was greater than the average trash levels throughout the reach, and was quantified by estimated number of truck loads. All stream crossing (i.e., bridges, culverts) assessments were conducted using methods outlined by the North American Aquatic Connectivity Collaborative (NAACC). NAACC data forms include details on the overall crossing and on the structure itself. Channel modifications included channelized and concrete-lined sections of stream. Severe bank erosion was noted if the conditions were significantly worse than erosion throughout the entire reach. Impacted

buffers were noted when a portion of the reach lacked a 25 foot wide, naturally vegetated buffer. Impacted buffers included both areas of overgrown invasive and areas where turf lawn bordered the stream. Miscellaneous included all other impacts that did not fit in those categories, such as livestock presence or fish kills. Taken together, this data will allow HVA to identify and prioritize future restoration projects focusing on pollution reduction and overall improved water quality within the Still River watershed. This GIS analysis combined with the USA data has allowed HVA to narrow down to a select number of sites that present a greater potential for negative impact on water quality. Appendix D – Unified Stream Assessment Results includes maps of all assessed reaches and more details maps of impacts found by subwatershed.

Unified Stream and Subwatershed Reconnaissance (USSR)

The next step after identifying areas along the stream corridor for restoration through the USA protocol was to conduct reconnaissance at upland sites that may be contributing to water quality issues. In order to locate appropriate upland sites for assessment, HVA used GIS to overlay USA data with impervious cover layers, parcel ownership data, and aerial imagery. Through an initial desktop examination, HVA compiled a list of 130 sites. Each site was then analyzed based on the following criteria; potential pollutant loading, amount of connected impervious cover, area available for retrofit/green infrastructure installation, estimated project cost, educational opportunity and partnership viability.

Figure 3.2.1 Still River USSR Sites Assessed as of September 10, 2019

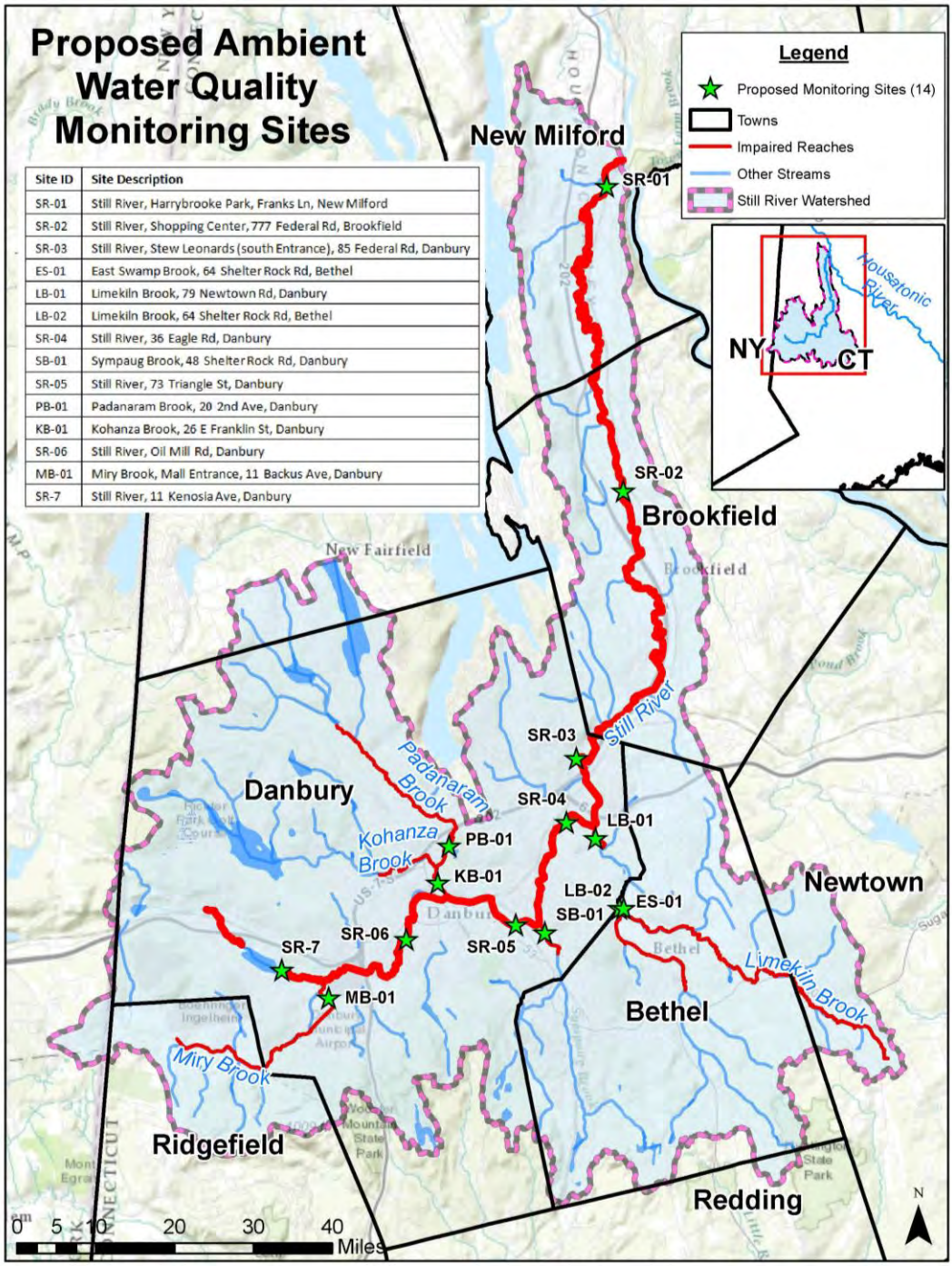


From this initial list, HVA then conducted a Unified Stream and Subwatershed Reconnaissance (USSR) assessment for 42 sites using methodology developed by the Center for Watershed Protection for Hotspot Investigation and Streets and Storm Drains Assessment. Hotspot Investigation was used in locations where there was a higher risk of pollutants due to the use of the property. For example, Brookfield and Bethel Public works were assessed as "hotspots" because of the storage of fuel, salts, and other chemicals. The Streets and Storm Drains protocol records impervious cover and stormwater management. This protocol was used at all sites with an attempt to assess properties in the rain so that the HVA team could get a better sense of stormwater flow and management. USSR assessments provided the Still River Partners with greater detail about the impact of each site and paved the way for prioritization of potential restoration projects.

Water Quality Monitoring

The Still TMDL 2010 was based on water quality monitoring data collected and analyzed prior to 2010. Updated data will help inform how the water quality of the Still has changed over the past 10 plus years. HVA has received additional funding from the CT DEEP Nonpoint Source Pollution grant program to perform ambient water quality monitoring throughout the watershed. HVA will conduct bi-weekly sample collection and lab analysis for *E. coli,* fecal coliform, and nutrients at the 14 fixed locations used by CT DEEP. These samples will be collected both in the dry (after 48 hours without rain) and in the wet in order to analyze the impact of stormwater loading.

Figure 3.2.2 Still River Watershed Proposed Ambient Water Quality Monitoring Sites 2019



Site ID	Site Description
SR-01	Still River, Harrybrooke Park, Franks Ln, New Milford
SR-02	Still River, Shopping Center, 777 Federal Rd, Brookfield
SR-03	Still River, Stew Leonards (south Entrance), 85 Federal Rd, Danbury
ES-01	East Swamp Brook, 64 Shelter Rock Rd, Bethel
LB-01	Limekiln Brook, 79 Newtown Rd, Danbury
LB-02	Limekiln Brook, 64 Shelter Rock Rd, Bethel
SR-04	Still River, 36 Eagle Rd, Danbury
SB-01	Sympaug Brook, 48 Shelter Rock Rd, Danbury
SR-05	Still River, 73 Triangle St, Danbury
PB-01	Padanaram Brook, 20 2nd Ave, Danbury
KB-01	Kohanza Brook, 26 E Franklin St, Danbury
SR-06	Still River, Oil Mill Rd, Danbury
MB-01	Miry Brook, Mall Entrance, 11 Backus Ave, Danbury
SR-7	Still River, 11 Kenosia Ave, Danbury

Program Highlight - Pollution Trackdown Surveys

One of the most efficient ways of decreasing pollution is through pollution trackdown surveys of suspicious outfalls. This method tests outfall discharge and isolates the source of pollution so that towns can address pollution at the source through regulatory means. In 2017, HVA was awarded a 319 Nonpoint Source Pollution grant by CT DEEP to test ambient water quality monitoring and perform pollution trackdown surveys in priority locations throughout the watershed. In order to determine which outfalls to screen HVA will pull on its USA streamwalk data where outfalls were mapped, characterized and photographed. From these records HVA developed a list of suspicious outfalls (flowing during dry weather events) requiring further investigation.

HVA will combine this USA outfall data with GIS-based analysis of the remaining outfalls that were not flagged as flowing. This analysis will be based on characteristics of each outfall's catchment area taking into account available spatial data, which may include layers such as aerial photography/LIDAR, land use, hydrology, topography, parcels and, results from the ambient monitoring. Working with its partners, HVA will prioritize catchments that are suspicious due to characteristics such as: proximity to pollution hotspots (e.g. gas stations), poor condition, outfall density, etc. Depending on the type and quality of the data available in each town, HVA will choose a suite of key screening factors that may indicate a higher risk of polluted discharge and assign a range of scores to each factor. Each outfall will receive a normalized cumulative score that will be used to prioritize outfalls for follow-up investigation. Priority outfalls that score highly will be screened for excess nutrients, bacteria and surfactants (detergents) among other parameters. Those outfalls that demonstrate higher levels of pollutants will be investigated through pollution trackdowns; a modified procedure for investigating outfalls that involves following stormwater flow up the pipe till the source of pollutant is isolated. After identifying the source, HVA will work with municipalities and other stakeholders to address and ultimately mitigate pollutants.

<u>Recommended Actions</u>

- Revisit plan annually and every 5 years to assess progress, update with new data, and update with new projects. Revisions to Watershed Plan will be made to improve the effectiveness of implementation efforts if monitoring shows no improvement post BMP efforts.
- Establish and implement bacteria monitoring program Conduct regular monitoring for *E. coli,* nutrients and other pollutants as applicable at fixed locations throughout the Still River watershed. Sampling should be collected during April - October and during both wet and dry weather conditions.
- Establish baseline water quality prior to action plan site implementation and measure water quality post-project installation. These samples should be collected both upstream and downstream of the project site.
- Continue to perform USA streamwalks recording impacts in areas with high restoration potential.
- Investigate suspicious (flagged) outfalls, isolating pollution source(s), and addressing causes with solutions outlined in this watershed-based plan. Continue to monitor trackdown sites for improved water quality conditions.
- Continue to assess sites for stormwater retrofit potential using USSR protocol as areas of concern arise.

Table 3.2.1 Monitoring and Assessment Recommendations

Recommended Actions & Milestones	Who	Timeframe (Schedule)	Deliverables & Evaluation Criteria	Estimated Costs	Potential Funding Sources
Revisit Watershed Plan on a regular basis (minimum every year Action Plan; every 5 years full plan) to: • Assess progress • Update with new data • Update with new projects Revisions to Watershed Plan will be made to improve the effectiveness of implementation efforts if monitoring shows no improvement post BMP efforts.	Still River Partners	Annually (Action Plan) Every 5th year (entire Watershed Plan)	• Update appendix • Revisions to plan document as necessary	$$	CT DEEP 319 Funds; NFWF Long Island Sound Futures Fund
Establish and implement bacteria and nutrients monitoring program • Prepare QAPP • Train staff, interns, and volunteers • Conduct monitoring • Analyze samples • Compile data and create reports	HVA with assistance from CT DEEP	Establish 0-1 year Seasonal sampling (Apr – Oct)	• Approved QAPP • Staff, interns & volunteers trained • Monitoring results/reports	$$	CT DEEP 319 Funds; NFWF Long Island Sound Futures Fund
Continue to do USA Streamwalks • Train any new staff and volunteers • Complete streamwalks • Compile and analyze data • Identify restoration areas and publish updated streamwalk data	HVA	2-5 years (repeat every 5 years)	• Streamwalk assessment results published • Restoration sites identified	$$$	CT DEEP 319 Funds, NFWF Long Island Sound Futures Fund
Establish and conduct pollution trackdown surveys • Develop methodology • Create QAPP • Complete pollution trackdown surveys of suspicious outfalls identified during streamwalks • Analyze testing results and complete report • Report findings to municipalities	HVA	0-2 years	• Approved QAPP • Track down survey results and recommendations	$$$	CT DEEP 319 Funds

$ = $0 to $5,000 $$ = $5,000 to $10,000 $$$ = $10,000 to $50,000 $$$$ = Greater than $50,000

HVA = Housatonic Valley Association, CT DEEP = Connecticut Department of Energy and Environmental Protections, QAPP = Quality Assurance Project Plan, NFWF = National Fish and Wildlife Foundation

3.3 Education and Outreach

Over 120,000 people call the Still River watershed home and many more work or visit the area. As an urbanized watershed, the public plays a crucial role in the restoration of the Still. Therefore, outreach and education is necessary to accomplish watershed planning success as it empowers people with the knowledge and skills to abate practices that deteriorate the watershed and contribute to restoration actions. Under the current MS4 stormwater management permit, municipalities are required to provide information to their residents on what they can do to minimize the impacts of stormwater pollution. Regional and statewide entities such as Western Connecticut Council of Governments and University of Connecticut's CLEAR NEMO program has published information on the impacts of stormwater pollution and best management practices for municipalities, residents, and businesses. One particularly helpful resource is CT CLEAR NEMO 2004 CT Stormwater Quality Manual which includes an appendix of a number of different GI/LID concepts. It can be found at https://ctstormwatermanual.nemo.uconn.edu/. In addition, public education is part of the mission of local nonprofits such as HVA, Candlewood Lake Authority, Lake Kenosia Commission, the Still River Alliance, and local land trusts Weantinoge, Bethel Land Trust, Candlewood Valley Land Trust, and Brookfield Open Space Legacy. As such, a number of programs already exist that work to educate the public on local environmental issues including Still River Environmental Education Day, Still River Watershed Connections, and CT RiverSmart. Outlined below are programs and goals organized by the specific target audiences. Each one is important in accomplishing lasting stewardship throughout the watershed.

Youth and Students

Still River Environmental Education Day

The Still River watershed includes five school districts and over 15,000 students in grades Pre-K through 12th grade. While hiking trails, town parks and open space are more accessible to many children outside of the urban center, there are relatively few opportunities for environmental education when compared to more rural areas throughout the state. This makes educational opportunities all the more important as organizations such as HVA, the Still River Alliance, municipal parks & recreation departments and local school districts work together to deliver watershed education that addresses water quality, water conservation, and issues specific to the Still River. In addition to K-12 students, Danbury is home to Western Connecticut State University (WCSU). This institution, especially the Biology Department, has the potential to engage more in watershed issues, education and research. The sustainability of the watershed plan is only possible in the long-term when the adults of tomorrow are taught to be good environmental stewards today.

Program Highlight - Still River Environmental Education Day

The Still River Environmental Education Day (Still River Day) is an annual field trip and educational event for Danbury 3rd grade students to learn about the Still River. The event brings about 100 students each year to the Still River and engages them in a variety of river related topics including, nonpoint source pollution, aquatic life in the river, the history of the Still and how to be a good river steward. This collaboration between Danbury Elementary Schools, the Still River Alliance Commission, and HVA is in its 5th year and works with a number of presenters. Those presenters have included CT DEEP Inland Fisheries, Western Connecticut State University Biology Department, the Danbury History Museum and Historical Society, and Candlewood Lake Authority. Future plans will allow the program greater

integration into year-long science curriculum by switching to 5th grade level and focusing on presentations that teach to material covered in the classroom**.**

Recommended Actions

- Improve Still River Day - Increased collaboration with science curriculum developers in Danbury Public School will strengthen presentations made at Still River Day through classroom learning. Review and update presentation material to fit with Next Generation Math and Science Standards

Program Highlight - Still River Watershed Connections

The Still River Watershed Connections program connects high school students from the Danbury area with environmental restoration projects to provide hands-on environmental education, teach about environmental careers, provide job skills training, and raise awareness of the Still River in watershed communities. The program also provides a reliable source of volunteer labor for restoration project installation and maintenance. The Connections program is built on strong partnerships between area schools, youth service non-profits, watershed municipalities, and conservation groups working to implement the Still River watershed plan.

The program is broken up into two programmatic tracks over three seasons. During the spring and fall, students from the Alternative Center for Excellence and Danbury High School's AP Environmental Science class work on one restoration project through an annual field trip. Prior to this field trip, HVA visits the classroom and works with the teacher to integrate watershed concepts and work these concepts into the curriculum. During the summer, HVA and Danbury Youth Services partner on 6-week paid internships for low-income students. Participants gain invaluable job skills in environmental restoration from HVA as well as professional development through Danbury Youth Services programming.

Still River Watershed Connections 2018 Summer Crew

Projects sites are located in municipalities in the watershed (see Figure 3.3.1 for a map of site locations). Projects include riparian buffer plantings, removing invasives, improving recreation access, mapping rare

plant species, and so much more. As of 2019 the program has served nearly 300 youth, planted 2,200 native plants, removed 64,000 square feet of invasives, and pulled over 500 pounds of trash out of the river.

As of 2019 HVA, WCSU, and Danbury Public Schools (DPS) were awarded a grant to expand and develop the Connections program to serve 250 additional students a year through hyper-local, project-based environmental education that reinforces classroom instruction. Students will design and implement solutions to environmental problems in their community. The Connections program will be delivered throughout the school year as an integrated part of the Aquatic Science class, a new unit of study being developed by DPS and WCSU. Not only will this more than double the number of students served through the Connections program, but it will also reach more low-income students of color - a population that is often impacted the most by the environmental pollution addressed in this plan.

Figure 3.3.1 Still River Watershed Connections Project Locations 2015-2019

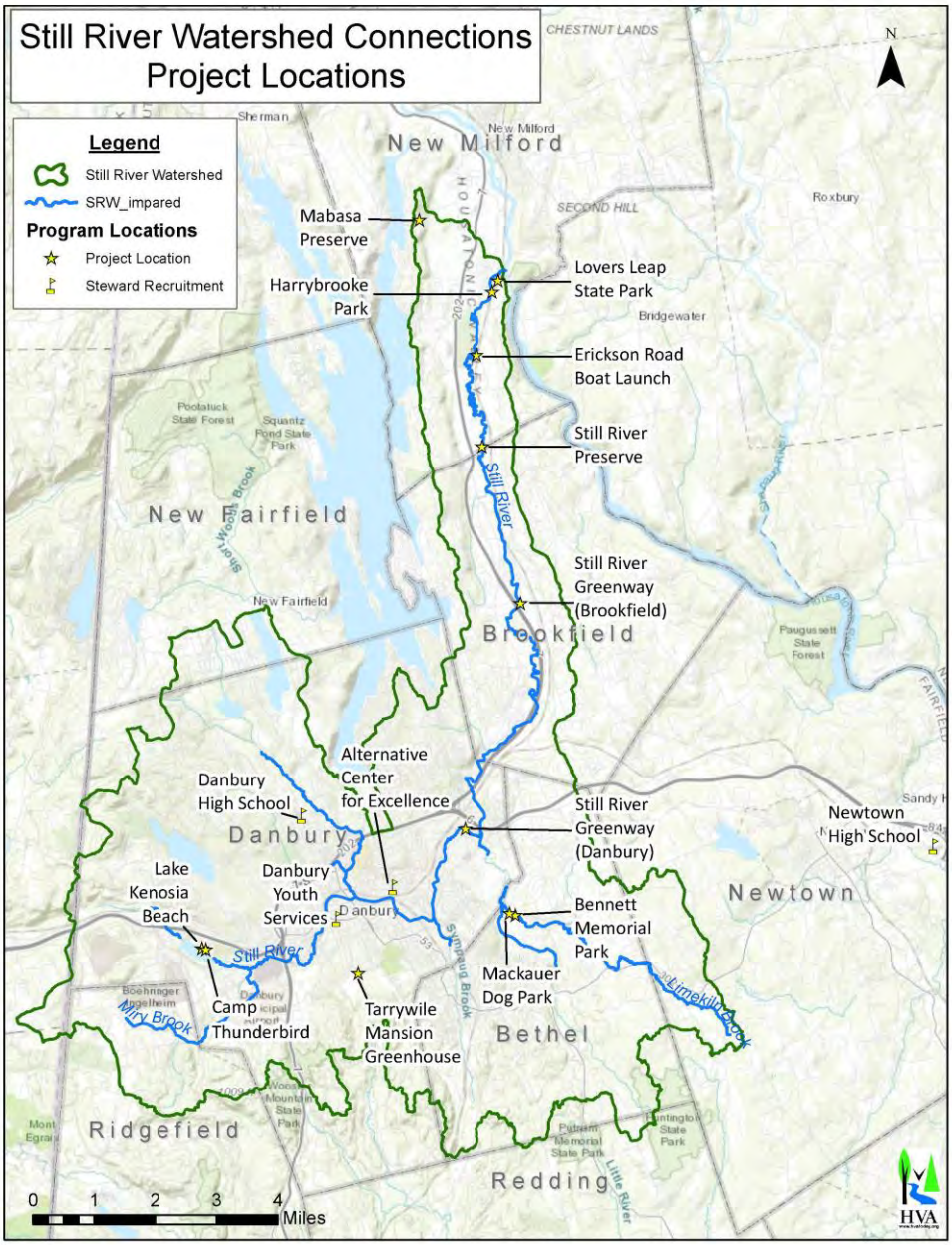


Table 3.3.1 Education and Outreach Recommendations

Recommended Actions & Milestones	Who	Timeframe (Schedule)	Deliverables & Evaluation Criteria	Estimated Costs	Potential Funding Sources
Youth Outreach and Education					
Improve Still River Day • Updated outreach materials to conform with NGSS • Recruit presenters to increase participation beyond one day • Increase school participation	HVA with DPS	0-5 years	• Updated materials approved by DPS • Increased number of Still River Environmental Education days • Increased number of schools participate annually	$$	Local businesses, Meserve Foundation
Expand Still River Watershed Connections in Danbury. • Identify BMP project sites and partner with site owners to secure permission • Partner with teachers at Danbury Public Schools to expand connections into more classrooms • Co-develop curriculum with DPS • Organize field trips and service projects for school groups • Provide support on an ongoing basis • Survey students on program learning and satisfaction and continuously improve program goals	HVA, DPS, WCSU, Site Partners	0-5 years (in Danbury) 5-10 years (to other towns) Ongoing	• Number of students reached throughout the watershed • Number of BMP projects implemented and maintained • Project metrics tracked (ex. square feet of invasives removed, length of riparian buffers established, lbs of trash removed, etc.)	$$$	Fairfield County Community Foundation, Horizon Foundation, Meserve Foundation, NOAA B-WET, NFWF Five Star Urban Waters

Recommended Actions & Milestones	Who	Timeframe (Schedule)	Deliverables & Evaluation Criteria	Estimated Costs	Potential Funding Sources
Expand Still River Watershed Connections to students in New Milford, Brookfield, and Bethel public schools as well as alternative education organizations such as Workspace Education • Reach out to education entities in New Milford, Bethel, and Brookfield • Identify BMP project sites in those towns and secure permission for BMP installation • Organize and implement BMPs through field trips and community service programs	HVA, New Milford Public Schools, Bethel Public Schools, Brookfield Public Schools, Workspace Education, Other private schools	2-5 years	• Number of students reached throughout the watershed • Number of BMP projects implemented and maintained • Project metrics tracked (ex. square feet of invasives removed, length of riparian buffers established, lbs of trash removed, etc.)	$$$	Fairfield County Community Foundation, Horizon Foundation, Meserve Foundation, NFWF Five Star Urban Waters, local business sponsorship
Expand Still River Watershed Connections summer program to implement and steward water quality BMPs and habitat restoration • Explore partnership with other summer youth service programs • Recruit student volunteers during the school year • Hire assistant crew leaders to expand summer crew. • Explore student volunteer days that work with the summer crew • Implement summer program	HVA, DYS, NMYS, Public School System, Site partners	2-5 years	• Number of students reached throughout the watershed • Number of BMP projects implemented and maintained • Project metrics tracked (ex. square feet of invasives removed, length of riparian buffers established, lbs of trash removed, etc.)	$$$	Fairfield County Community Foundation, Horizon Foundation, Meserve Foundation, NFWF Five Star Urban Waters, local business sponsorship

Recommended Actions & Milestones	Who	Timeframe (Schedule)	Deliverables & Evaluation Criteria	Estimated Costs	Potential Funding Sources
Residents and Landowners					
Implement a refined place specific *RiverSmart* public outreach campaign • Evaluate and redevelop/update *RiverSmart* outreach materials and website to issues particular to the Still River watershed • Distribute outreach materials along with pledge forms • Collect pledge forms and follow-up with participants to explore implementation • Develop incentive program for implementation	HVA, Municipalities, NWCD	2-5 years	• *Be RiverSmart* materials updated and refined to the Still River watershed • *RiverSmart* program implemented - public outreach messages delivered to homeowners • Number of pledges submitted • Number of homeowner projects implemented	$$$$	CT DEEP 319 NPS Grants, EPA EE Grants
Provide homeowner outreach on LID, sustainable landscaping, pet waste disposal, and septic system maintenance • Develop outreach messages/materials • Distribute outreach materials • Facilitate public education programs	HVA, Municipalities, NWCD	5-10 years Ongoing	• Education programming throughout the watershed • Number of people reached through social media, website traffic, email open rates, print media distribution) • Number of program participants	$$$	CT DEEP 319 NPS Grants, EPA EE Grants, Municipalities

Recommended Actions & Milestones	Who	Timeframe (Schedule)	Deliverables & Evaluation Criteria	Estimated Costs	Potential Funding Sources
Evaluate and implement residential LID incentive program • Research existing programs in other locations (ex. Save the Sound's Reduce Runoff initiative, Hartford Climate Stewardship Initiative's *Retain the Rain* program) • Evaluate feasibility of similar programming, and adapt program to the needs of the Still River watershed • Develop partnerships with organizations • Implement LID incentives program	HVA, NWCD, Municipalities	2-5 years Ongoing implementation	• Program implementation • Number of households signed up for incentive program • Number of LID projects implemented	$$$$	CT DEEP 319 NPS Grants, business in-kind donations and sponsorships
Implement Pollinator Pathways program throughout the Still River watershed • Identify Pollinator Pathway champions in each town • Develop and distribute outreach materials • Host Pollinator Pathways education event • Partner with Native plan nurseries and find funding to distribute plant material to interested residents • Sign - up residents to be on the Pollinator Pathway	HVA, H2H, Land Trusts, Garden Clubs, Nature Centers, Norwalk River Valley Trail, Municipal Conservation Commissions, Earth Tones Nursery and Native Nursery, NWCD	0-2 years Ongoing implementation and maintenance	• Distribution of outreach materials • Number of people reached through outreach materials and education events • Number of households signed up to be on the Pathway • Number of gardens established • Number plants distributed and planted • Square feet of invasive plant abatement • Square feet of riverbank restored	$$	Local Private Foundations, Rotary Clubs, Garden Clubs, Women's Clubs, Utilities companies such as Aquarion & Eversource, Corporations such as REI, Patagonia, FactSet, and ASML

Recommended Actions & Milestones	Who	Timeframe (Schedule)	Deliverables & Evaluation Criteria	Estimated Costs	Potential Funding Sources
Evaluate and implement residential vegetative buffer program • Evaluate residential areas of high priority • Develop and distribute outreach materials • Organize homeowners education event • Distribute plant material upon completion of the workshop and assist homeowners in planting and maintenance	HVA, H2H, Garden Clubs, Earth Tones Nursery and Native Plant Nursery	2-5 years	• Distribution of outreach materials • Number of people reached through outreach materials and education events • Number of gardens established • Number plants distributed and planted	$$	Grants to be researched, business in-kind donations and sponsorships
Municipal Staff and Volunteer Commissions					
Provide education and training for municipal employees, planning and zoning boards, and other volunteer commissions dealing with land use and development on LID retrofit, septic systems, sustainable landscaping, and stormwater management (MS4 permit) • Develop outreach messaging • Facilitate education and training programs on the above topics with appropriate experts • Provide ongoing support to municipalities to comply with the MS4 permit	Municipalities, HVA, UCONN NEMO/CLEAR, WestCOG	2-5 years	• Municipal outreach and education program implemented • Number of municipal staff and volunteer commissioners reached through program • Accomplished goals of the MS4 permit	$$	Municipalities, additional grants as researched

Recommended Actions & Milestones	Who	Timeframe (Schedule)	Deliverables & Evaluation Criteria	Estimated Costs	Potential Funding Sources

Educate and engage Parks and Recreation Departments on vegetative buffers, habitat restoration, opportunities for LID and pet waste management.
• Review Park and Facility Maintenance Plans in each of the major watershed municipalities
• Make recommendations that encourage the following:
  ○ Native plan gardening
  ○ Increase pollinator plants in garden beds
  ○ Reduce the use of pesticides/herbecides
  ○ Install pet waste bag stations and educational signage along trails and parks
  ○ Update and create new signage around watershed education in popular recreation areas
• Meet with Parks and Recreation staff to educate them on the above recommendations areas and work with them to create working plans that incorporate those recommendations
	Municipal Parks and Recreation, HVA	0-2 years	• Review of Park and Facility Maintenance Plans complete
			• Recommendations report delivered to each town
			• Meetings held with each watershed municipal parks and recreation department
			• Number of projects installed in Parks and Recreation areas
			• Number of Parks and Recreation staff participating in meetings and educational programming
				$$	National Recreation and Park Association (nrpa.org), Municipalities, CT DEEP 319 Grants

Recommended Actions & Milestones	Who	Timeframe (Schedule)	Deliverables & Evaluation Criteria	Estimated Costs	Potential Funding Sources
Businesses, Commercial Landowners, and Institutions					
Conduct outreach to businesses, commercial landowners and institutions as well as the landscape companies that service their properties. Educate these entities on LID retrofit opportunities, illicit discharge, and sustainable landscaping practices • Compile a contact list of major landscape companies and properties of highest priority • Develop outreach materials and incentives to program participants • Contact businesses and institutions and distribute outreach material • Implement outreach and incentives program to landscape companies and participating businesses.	Danbury Chamber of Commerce, UCONN CLEAR/NEMO, NWCD, CT DEEP, municipalities, WestCOG	2-5 years Ongoing outreach	• Outreach materials developed • Number of businesses, commercial landowners, institutions, and landscape companies contacted (materials distributed) • Number of participants in education and incentives program • Number of properties converted to sustainable landscaping	$$$	CT DEEP 319 Grants, Small Business Innovation Grants, Green Communities Grants, Crowdfunding
Additional Education and Outreach Recommendations					
Integrate signage about watershed stewardship in recreation areas • Identify areas for signage • Develop outreach messages and appropriate signage specific to each area (kiosk, road sign, interpretative sign, nature trail, etc.) • Work with appropriate parties to finalize signage and secure landowner permission • Install signage	HVA, CT DOT, CT DEEP, Municipal Commissions, Recreation Groups, Parks and Rec. Departments	5-10 years Ongoing as new recreation areas are developed	• Number of signage projects installed throughout the watershed	$ per project	National Recreation and Park Association (nrpa.org), Municipalities, CT DEEP Recreation Trails Grant

Recommended Actions & Milestones	Who	Timeframe (Schedule)	Deliverables & Evaluation Criteria	Estimated Costs	Potential Funding Sources
Collaborate with local non-profits, volunteer groups, and civic organizations in watershed stewardship • Update list of community organization contacts • Distribute educational material and contact folks about potential collaboration • Facilitate educational programming and host meetings • Explore potential project collaboration and build a volunteer list for restoration projects	HVA	Ongoing	• Updated contacts list • Increased partnership with non-profits, volunteer groups, and civic organizations. • Number of volunteers engaged in restoration projects	$$$	Fairfield County Community Foundation
Participate in community events • Research list of relevant events in the watershed • Promote, publicize, support, and participate in existing events • Grow a list of local volunteers through event signups	HVA	Ongoing	• Created event list published to stillriverwatershed.org • Amount of event participation (tabling, presentation, etc.) • Number of volunteer signups garnered through event participation	$	HVA General Funds

$ = $0 to $5,000 $$ = $5,000 to $10,000 $$$ = $10,000 to $50,000 $$$$ = Greater than $50,000

HVA = Housatonic Valley Association, CT DEEP = Connecticut Department of Energy and Environmental Protections, NFWF = National Fish and Wildlife Foundation, NWCD = Northwest Conservation District, WestCOG = Western Connecticut Council of Governments, UCONN = University of Connecticut, CLEAR = Center for Land Use Education and Research, NEMO = Nonpoint Education for Municipal Officials, H2H = Hudson to Housatonic Regional Conservation Partnership, NGSS = Next Generation Science Standards, DPS = Danbury Public Schools, NOAA B-WET = National Oceanic and Atmospheric Administration Bay Watershed Education and Training, WCSU = Western Connecticut State University

Recommended Actions

- Expand Still River Watershed Connections in Danbury. Focus outreach to under-resourced students in Danbury Public Schools through a re-design of the Aquatic Science curriculum.
- Expand Still River Watershed Connections to students in New Milford, Brookfield, and Bethel public schools. Engage students in deeper-dive student-driven projects through alternative education entities such as Workspace Education.
- Expand Still River Watershed Connections summer program to implement and steward water quality BMPs and habitat restoration.

Residents and Landowners

The watershed is highly urbanized, with two main urban cores concentrated in the center of Danbury and Bethel. Residents in both areas have a role to play in land stewardship that reduces water quality impacts.

Program Highlight - RiverSmart

Some effort has been established to reach this audience through the *RiverSmart* program. Through this program, a number of educational brochures for homeowners can be found at www.riversmartct.org. Sections are broken up into four categories that guide residents on best practices for landscaping and lawn care, home specific green infrastructure, in-home water conservation, pet waste disposal, septic care, and more. These brochures are a ready-made resource for municipalities to use as part of their MS4 permit educational requirements and can be distributed more widely throughout the watershed. Outlined below are some highlighted specific practices for residents to employ.

Encourage the Use of Residential Green Infrastructure

Many of the green infrastructure or low impact development solutions can be scaled to a residential home. These solutions include:

- Reducing impervious areas such as driveways, walkways, and patios by converting those areas to permeable pavement, gravel, or dire that allow for stormwater infiltration.
- Allow runoff from roofs and pavement to infiltrate by installing rain gardens, vegetated bioswales, gravel-filled infiltration trenches, and dry-wells. More can be found at the Connecticut NEMO website https://nemo.uconn.edu/tools/index.htm where one can also register their LID project as part of a national database.
- Conserve water through the use of rain barrels which collect rain from rooftops to be used in gardens and landscaping.

Create Backyard Habitat and Promote Sustainable Landscaping

Sustainable landscaping and lawn care can reduce excess nutrient loading and toxic chemicals in stream systems, and promote water conservation, biodiversity and pollinators. While many landowners take care of their own landscaping, a good number use landscape companies. Therefore, reaching out to landscaping firms can be an efficient way to promote sustainable practices at many different locations. Outreach to property owners and landscapes encourage the following:

- Fertilizers: Use of slow-release and reduction in fertilizer use according to soil needs. Application of fertilizers during dry periods to reduce runoff into streams.
- Pesticides/Herbicides: Discourage or reduce the use of pesticides and herbicides and instead switch to Integrated Pest Management practices.
- Lawn care: Aerate the soil to allow for rain infiltration and mow high to conserve water and improve turf health.
- Grass: Reduce turf areas and replace with low to no-mow grass, sprawling ground cover, or native flowering plant species.

Establish and Maintain Riparian Buffers

Riparian buffers can be a great way for streamside homeowners to protect the streams on their property and introduce low maintenance gardens as well. Buffers serve to slow the flow of runoff into the stream, stabilize the bank, deter resident geese from settling, provide stream shade, and reduce sediment, nutrients, pet waste and other pollutants carried during a rain event. Buffers provide an opportunity to landowners to beautify their property and reduce maintenance. By selecting native shrubs, trees, and tall grasses, homeowners increase the natural biodiversity and bring wildlife into their backyard. For guidance on native plants perfect for riparian buffers, search for New England native plant guides or visit local native plant nurseries in the area such as Native in Fairfield and Earth Tones in Woodbury.

Proper Disposal of Pet Waste

Proper disposal of pet waste is a relatively small and simple way to reduce bacteria loading in the watershed. Pet waste should generally be picked up promptly and pets kept away from defecating near streams. One relatively easy and sustainable way to dispose of pet waste is by creating an in-ground Pet Waste Digester. Much like a septic system for human waste, a Pet Waste Digester will take your pet's fecal matter and break it down with the addition of digester bacteria. Digester systems and bacteria can be found in pet stores and online.

Maintain Septic Systems

Septic systems can contribute significantly to nutrient and bacteria loading. Septic systems located in floodplains, near bodies of water and storm sewer systems present an even greater threat. It is important that homeowners are encouraged to understand the potential water quality issues associated with septic systems, regularly inspect and maintain their septic systems and recognize and address failing septic systems. Information should be distributed by municipalities and local health districts, especially targeting existing owners living on or near waterbodies and new homeowners.

<u>Recommended Actions</u>

- Implement a redeveloped/refined *RiverSmart* public outreach campaign
- Provide homeowner education and outreach on the following topics
    - Green infrastructure/Low Impact Development
    - Sustainable landscaping, vegetative buffers and backyard habitat
    - Pet waste
    - Septic Systems
- Evaluate and implement incentive programs to encourage homeowners to install LID and vegetative buffers, and pollinator gardens

Municipal Staff and Volunteer Commissions

Perhaps the most direct impact on the success of the watershed plan lies in comprehensive outreach and partnership with municipalities. Municipalities have an enormous amount of impact on water quality through their public works activities, infrastructure maintenance, and parks and recreation open space. Full participation by municipalities is paramount to the success of the watershed plan goals; education regarding best practices is the first step in reaching those goals. Many of the goals in the watershed plan are required practices for towns, in particular through requirements covered in the MS4 permit. Particular audiences that should be targeted are public works departments, environmental commissions, inland wetland commissions, land use departments, planning and zoning boards, and parks and recreation departments. Below outlines some suggested outreach to each of these audiences.

Public Works Departments

- Work with public works to implement green infrastructure at town/city owned properties where possible.
- Educate public works staff about water quality benefits of regular maintenance of catch basin, storm sewer systems, outfalls, and street sweeping.
- Encourage the use of salt alternatives and low salting areas especially near waterways.
- Review and provide input to public works facilities to decrease runoff pollution and ensure proper management of on-site pollutants.

Environmental Commissions/Inland Wetland Commissions/Land Use Departments/Planning and Zoning Boards

- Support those staff responsible for MS4 permitting through educational materials such as RiverSmart, UCONN Center for Land Use Education and Research (CLEAR), and NEMO.
- Provide training for reviewers of land development projects and designs on green infrastructure/LID, riparian buffer protection, and wetlands preservation, wastewater treatment, stormwater pollution prevention, septic system installment and maintenance, construction erosion and sediment controls, and floodplain management.

Parks and Recreation Departments/Trails

- Educate parks and rec. on the benefits of vegetated riparian buffers. Identify areas lacking vegetative buffers and work with parks and recreation departments to install buffers that integrate into and/or enhance with park use.
- Review park and facility maintenance plans. Educate on practices that reduce the use of pesticides and herbicides and encourage native plant gardening. Provide information on areas where green infrastructure can reduce stormwater pollution loading in parks and rec. facilities and work with departments to install rain gardens, pervious pavement, bioswales and other green infrastructure.
- Integrate educational signage along trails and at parks wherever possible.
- Unify watershed branding and signage along areas such as Still River Greenways and parks along the river.

General Outreach Practices

- Continue to involve and work to grow the number of municipal staff and commission members in Still River Partners meetings and collaborative projects.
- Notify municipal partners of funding opportunities for implementation projects.

Businesses, Commercial Landowners, and Institutions

Given the high concentration of industrial facilities and businesses in the Danbury area, this plan should reach businesses, commercial landowners, nonprofits and institutions. This outreach should inform owners, management and maintenance staff about the following:

- Potential impact of impervious cover, landscaping techniques, and business practices. Specified plans to reduce stormwater pollution through sustainable landscaping, green infrastructure and regular ground maintenance.
- Awareness of suspicious outfalls and targeted outreach to address causes leading to pollutants found in outfall investigation and excess nutrients and bacteria loading.
- Protection and restoration of vegetated buffer areas.
- Upkeep, maintenance, and solutions to poor trash management through dumpster design.
- Parking lot and road maintenance.

- Continued and increased involvement in restoration efforts, outreach events, stream monitoring programs, stream cleanups, and plan project sponsorship.

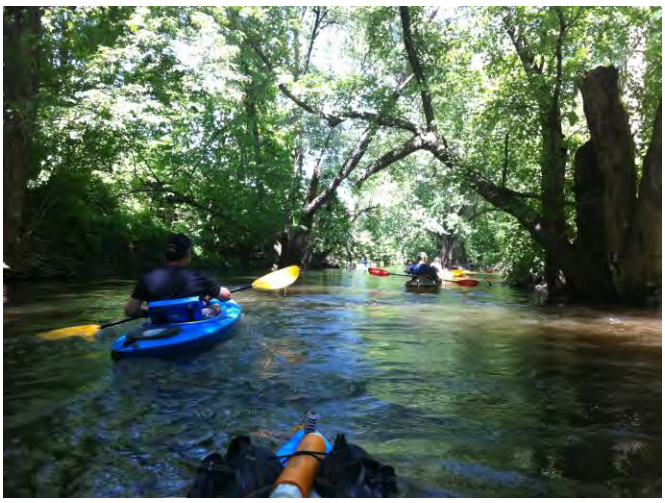
Additional Education and Outreach Strategies

Each of the above strategies target particular audiences. However, there are a number of strategies that inform the public in general. These include:

- Integration of watershed stewardship Signage in Recreational Areas: Passive education such as signage is a great way to inform the public about the Still River watershed, water quality issues, and watershed planning efforts. Signs exist in open spaces throughout the watershed including the Still River Greenway, parks, and land trust preserves. One area of growth could include stenciling of storm drains.
- Engagement and Collaboration with Local Volunteers and Civic Organizations: This is an area of growth in the Still River. While a number of civic organizations and local volunteer groups exist, there hasn't been a concentrated focus on environmental efforts. Therefore, there is a great opportunity to engage groups like the Moose Lodge at Lake Kenosia as well as grow a cadre of enthusiastic volunteers to help with stream clean-ups watershed monitoring, restoration projects and more.
- Participation in Community Events: One simple way to spread the word about watershed planning efforts could be for HVA to increases participation at existing events. A list of existing community events include Bethel Earth Day, Bethel Fishing Derby, CT Trails Day, New Milford River Fest, and Danbury Farmers Market.

3.4 Recreation Enhancement

It's been over 20 years since the initial section of the Still River Greenway in 1996, but energy to enhance recreation in the Still River has rekindled in the past 3 years. Since 2016 the Town of Brookfield built a paved, multi-use section of the Still River Greenway, HVA worked with the Town of New Milford to install a boat launch to the Still Mainstem at Erickson Road, and plans for a boat portage are planned for the summer of 2019 at Harrybrooke Park in New Milford.



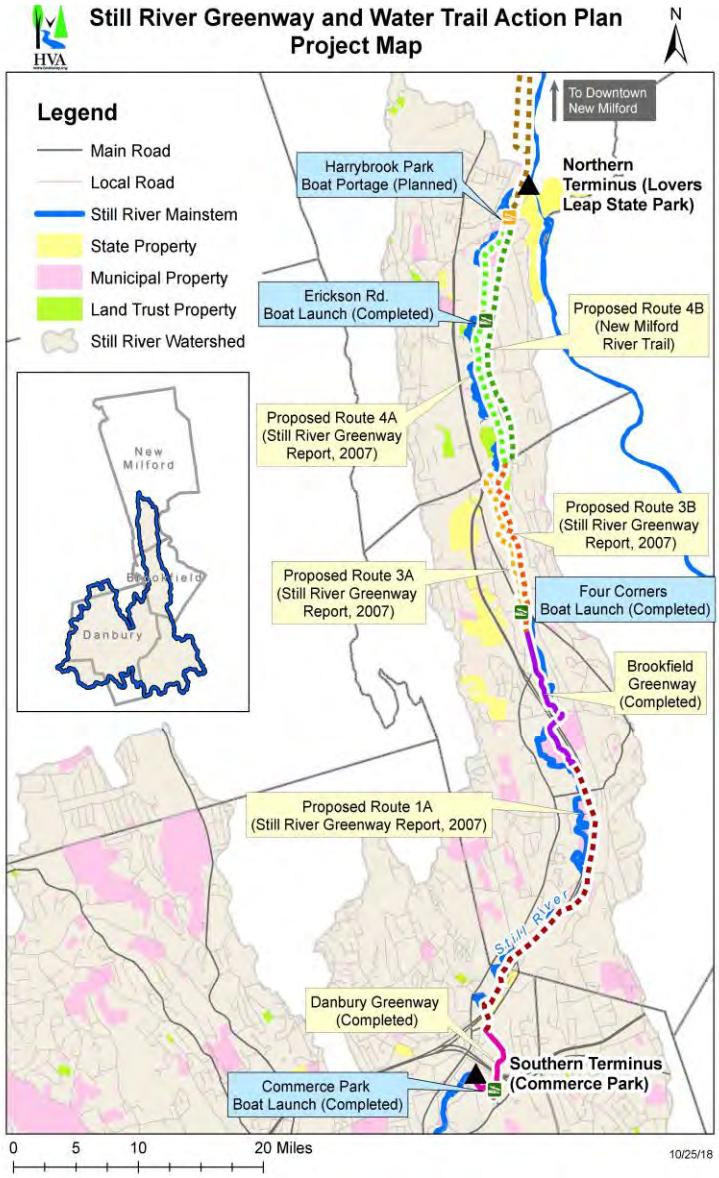
The Brookfield section of the Still River Greenway in particular marks the popularity of these local recreation enhancements. According to 2018 Connecticut Trail Census counts compiled by UConn's CLEAR, an average of 310 people use the Greenway daily, with traffic growing as great as 1,000 visitors in a weekend (learn more about the CT Trail Census at https://cttrailcensus.uconn.edu). The convenience and accessibility of the Greenway play a big role in its heavy use. Encouraging outdoor recreation along the Still River is one of the main goals of this watershed-based plan and there are a number of recreation groups working to increase river access and recreation opportunities in their town. Brookfield has created a temporary commission to explore routes extending the current 2.25 mile section north to New Milford, and New Milford has multiple groups working on river access for boaters, hikers, and bikers. This past year WestCOG applied for funding to create a regional inventory of trails, parks, and open space, and to evaluate access to these resources, especially by persons who are unable or unwilling to drive, or who do not have a car. Through further funding and

support from towns and local enthusiasts, the Still can transform its once maligned status to a place that people seek out.

Project Highlight - Still River Greenway and Water Trail (SRGWT)

Given the urban and exurban nature of the watershed, trails are not as abundant as they are in other subwatersheds throughout the Housatonic. That being said, there has been much progress made on a plan to build a trail along the length of the Still River mainstem. The Still River Greenway and Water Trail was originally proposed by Arthur Harris, Chair of Brookfield Conservation Commission who envisioned a "Linear Park" along the Still River. It was then built upon in the 1970s as a long term compensatory mitigation for the construction of Route 7.[83] In 1996, the Still River Alliance (a collaboration among public agencies, conservation groups, corporate sponsors, and private citizens) began development and construction of the trail in Danbury, with funds raised from corporate and environmental sponsors and government grants. Later in 2016, funds were secured another section in Brookfield, connecting the Brookfield Municipal Center to Four Corners. This is now completed, has educational signage, a pedestrian bridge, and is quite popular.

Figure 3.4.1 Still River Greenway and Water Trail Project Map



The SRGWT is intended to be both a continuous recreational multi-use trail and uninterrupted waterway for boaters (kayak and canoe). The completed trail will roughly mirror highway 7 as it parallels the Still River, and will run from the commercial park in Danbury near Pitney Bowes, continuing northward along the river and ending at the river mouth near Lover's Leap State Park in New Milford. Of the entire reach, two major sections have been completed: a 2.2 mile corridor follows the floodplain starting behind the Kimchuck building at Eagle Road and Corporate Drive and a 2.25 mile corridor in Brookfield, from the Brookfield Municipal Center to the Brookfield Town Center (Figure 3.4.1 - Still River Greenway and Water Trail Project Map). Over half (mostly in Brookfield) of the completed miles are handicap accessible, paved, and 10 feet wide.

The resurgence of paddlers and hikers who wish to utilize the Still River is an encouraging sign, and the completion of the SRGWT will provide new opportunities for people of all abilities to enjoy the Still River. While some unique challenges must be addressed (i.e., a proposed section of the trail near a golfing area Candlewood Valley Country Club, where a covered bridge walkway to protect hikers has

been proposed) the ultimate completion of the SRGWT will complement regional efforts to expand river recreational opportunities. For example, a planned connection with the New Milford River Trail would provide nearly 20 miles of trail.[84]

Recommended Actions

- Establish a Still River Recreation Subcommittee that brings together individuals from the different groups working on recreation enhancement to collaborate across municipalities. One primary function of this group will be the planning, design, and completion of the Still River Greenway and Water Trail. This group can be used to pool resources, seek and secure funding, and coordinate efforts to develop and maintain a network of recreational opportunities throughout the watershed. After projects are completed, this group can help ideate and organize solutions for ongoing maintenance issues that present barriers to recreation such as woody debris. Groups that should be represented in this subcommittee include:
    - Brookfield's Greenway Temporary Routing Commission
    - New Milford River Trail Association
    - New Milford Bike and Trails Committee II
    - Parks and Recreation Departments of Danbury, Bethel, Brookfield, and New Milford
    - Housatonic Valley Association
    - Danbury's Still River Alliance Commission
    - Housatonic Valley Paddle Club
- Complete the Still River Greenway and Water Trail - a continuous multi-use trail that runs parallel to the Still River from the southern terminus at Commerce Park in Danbury to Lover's Leap State Park in New Milford. Boating access points that allow paddlers the ability boat from Commerce Park to the confluence. This includes the following actions:
    - Coordinate with the New Milford River Trail Association and New Milford Bike and Brookfield Trails Commission II, Danbury Still River Alliance Commission and municipal Parks and Rec. Departments to plan route, secure easement and access permission, design, and secure funds.
    - Create consistent messaging and branding for the Still River Greenway and Water Trail to be used across all sections, access points, trailheads and boat launches.
    - Plan, design, secure funds for and install boat launches, portages and access points along the Still River mainstem in a way that allows paddlers to boat the Still River continuously from Commerce Park in Danbury to the confluence with the Housatonic River.
- Incorporate educational signage, workshops, activities, and materials into recreation projects that inform users about the Still River watershed, its history, and ongoing restoration.
- Study existing and potential recreation opportunities throughout the watershed and create linkages between open space, parks, trails, public transportation, sidewalks, pathways, river access points and other forms of transportation infrastructure where possible.
- Increase accessibility to people of all ages, abilities, and backgrounds. Promote the accessibility of recreation such as hiking, boating, fishing, etc. to low-income people of color, those with disabilities, children and the elderly. Study the connectivity and impact of public transit and city/town infrastructure on recreation accessibility in the watershed. Institute programming that cater to and excite these audiences in creative and engaging ways to encourage use of recreation infrastructure. Examine and create messaging, branding and design of watershed recreation that pulls these audiences in, engages them in creative ways, and generates a sense of belonging.

Table 3.4.1 Recreation Enhancement Recommendations

Recommended Actions & Milestones	Who	Timeframe (Schedule)	Deliverables & Evaluation Criteria	Estimated Costs	Potential Funding Sources
Establish a Still River Recreation Subcommittee • Recruit Still River Partners currently involved in recreation activities to the Recreation Subcommittee • Formulate vision, mission, goals, and programs/projects that will enhance recreation in the watershed • Schedule regular meetings to update on the progress of those goals	HVA, Municipal trails commissions, local recreation groups, Parks and Rec. Departments, WestCOG	0-2 years	• Complete vision, mission, and goals statement • Meeting minutes • Number of engaged parties in the subcommittee • Number of completed projects/programs	$$	CT DEEP Rec Trails, National Recreation and Park Association,
Complete the Still River Greenway and Water Trail • Coordinate with the New Milford River Trail Association and New Milford Bike and Brookfield Trails Commission II, Danbury Still River Alliance Commission and municipal Parks and Rec. Departments to plan route, secure easement and access permission, secure funds, and create consistent messaging and branding for the Still River Greenway and Water Trail to be used across all sections, access points, trailheads and boat launches. • Hire engineering consultants to complete design plans for each section of the Greenway. • Plan, design, secure funds for and install boat launches, portages and access points along the Still River mainstem in a way that allows paddlers to boat the Still River continuously from Commerce Park in Danbury to the confluence with the Housatonic River.	HVA, CT DOT, CT DEEP, New Milford Bike and Trail Committee, New Milford River Trail Assoc. Brookfield Still River Greenway Commission, Danbury, Brookfield and New Milford Parks and Rec. Departments, Still River Alliance Commission WestCOG	0-2 years (Subcommittee formed)	• Completed branding guidelines for the Still River Greenway adopted by all trail collaborators • Planned routing design plans • Secured easements and access permissions along planned route • Engineering designs for all sections of the Greenway • Boat launches/access points installed around all major paddling barriers • Constructed sections of the Greenway installed	$$$$	CT DEEP Rec Trails, Municipalities, Private Foundations, Crowdfunding

Recommended Actions & Milestones	Who	Timeframe (Schedule)	Deliverables & Evaluation Criteria	Estimated Costs	Potential Funding Sources
Integrate signage about watershed stewardship in recreation areas • Identify areas for signage • Develop outreach messages and appropriate signage specific to each area (kiosk, road sign, interpretative sign, nature trail, etc.) • Work with appropriate parties to finalize signage and secure landowner permission • Install signage	HVA, CT DOT, CT DEEP, Municipal Commissions, Recreation Groups, Parks and Rec. Departments	0-2 years Ongoing as new recreation areas are developed	• Number of signage projects installed throughout the watershed	$$	National Recreation and Park Association, Municipalities, CT DEEP Recreation Trails Grant
Create linkages between recreation opportunities throughout the watershed • Create an inventory of existing and potential recreation opportunities • Study linkages between recreation opportunities including trails, public transportation, sidewalks, pathways, river access points and other forms of transportation infrastructure. • Identify gaps in access and work with stakeholders to strengthen access	CT DOT, Municipalities, Land Trusts, H2H, WestCOG	2-5 years	• Completed inventory of recreation opportunities • Linkages/Access report including recommendations for improved access to open space and recreation • Improved access	$$$	EPA Environmental Justice Grant, Meserve Foundation

Recommended Actions & Milestones	Who	Timeframe (Schedule)	Deliverables & Evaluation Criteria	Estimated Costs	Potential Funding Sources
Increase accessibility to people of all ages, abilities, and backgrounds. • Research accessibility gap in current recreation areas including but not limited to the connectivity of public transit and city/town infrastructure as well as handicap accessibility • Propose site specific solutions to improve access • Design and implement programming that cater to and excite these audiences in creative and engaging ways to encourage use of recreation infrastructure • Create messaging, branding and design of watershed recreation that pulls these audiences in, engages them in creative ways, and generates a sense of belonging. • Secure funding to implement accessibility projects	HVA, WestCOG, Municipal Parks and Recreation Depts., Still River Alliance Commission,	2-5 years	• Report on accessibility gap including recommended solutions • Programs and projects implemented that increase accessibility • Increased usership among targeted populations (low-income communities, people of color, those with disabilities, children and the elderly)	$$$$	EPA Environmental Justice Grant

$ = $0 to $5,000 $$ = $5,000 to $10,000 $$$ = $10,000 to $50,000 $$$$ = Greater than $50,000

HVA = Housatonic Valley Association, CT DEEP = Connecticut Department of Energy and Environmental Protections, WestCOG = Western Connecticut Council of Governments, CT DOT = Connecticut Department of Transportation, H2H = Hudson to Housatonic Regional Conservation Partnership, EPA = Environmental Protection Agency

3.5 Climate Change Resiliency Floodplain Management

The Still River has a history of repeated flooding. Indeed, due to the geology of the valley, frequent flooding is a natural process for the Still. Moreover, an increase in precipitation amount and frequency due to climate change will likely lead to an increase in flood events and the average 100 year floodplain is expected to increase 45% (https://www.epa.gov/green-infrastructure/manage-flood-risk). These two factors mean that proper floodplain management is imperative to development in the Still.

Current development and infrastructure within the floodplain vary greatly between municipalities. For example, the towns of Brookfield and New Milford have minimal existing structures, buildings, roads, and infrastructure built in the floodplain. Therefore, floodplains around the Still functions naturally, allowing overflow of the river's waters to flood the surrounding undeveloped area and recede as waters rise and fall. For these towns the objectives of floodplain management are aimed toward protecting those floodplains from future development, and determining future needs for development setbacks as floodplain areas increase due to climate change realities. To accomplish this, a number of solutions exist. Towns could put in place setback policies according to updated FEMA floodplain maps, prohibiting development within the 100 year floodplain area; inland wetlands agents and planning and zoning boards can be trained on flood dynamics in order to most appropriately assess construction permits; up to date floodplain maps and flood regulations can be standardized across towns and with the State so that information is consistent across all parties.

Other areas, such as Danbury and parts of Bethel were historically built around the waterways, utilizing the river for industry and other uses. In these cases, balancing the current built environment with the realities of flooding becomes more of a challenge. Fill, impervious cover, and development in the floodplain exacerbate problems of flooding in the region by increasing the amount and intensity of floods threatening infrastructure built close to the river and its tributaries. Given these conditions, Danbury and Bethel should take the approach of restoration in addition to the above suggestions aimed at protecting current undeveloped and functioning floodplains. The key to this restoration can be found in green infrastructure practices. Green infrastructure when integrated with existing grey infrastructure can reduce stormwater loads therefore buffering the intensity of floods and mitigating impact. This plan recommends a comprehensive look at where impervious cover exists with the floodplain and a process of prioritization and partnership development with property owners to determine project viability. With a list of possible projects in place, we suggest property owners work with HVA and other conservation groups to seek and secure funding for green infrastructure projects to mitigate stormwater loading.

<u>Recommended Actions</u>

- Increase floodplain storage according to the most up to date FEMA floodplain mapping of the 100-year floodplain.
- Standardize floodplain regulation and floodplain management across all towns.
- Implement climate resilient strategies in watershed communities through the development of green infrastructure especially in floodplains.

Table 3.5.1 Climate Change Resiliency Floodplain Management Recommendations

Recommended Actions & Milestones	Who	Timeframe (Schedule)	Deliverables & Evaluation Criteria	Estimated Costs	Potential Funding Sources
Increase floodplain storage to adjust to increased flood potential. Standardize floodplain regulation and floodplain management across all towns. • Review current zoning ordinances/code in watershed towns • Propose changes zoning to increase floodplain storage in new development	HVA	2-5 years	• Proposed changes to zoning code presented to municipal planning and zoning commissions and land use departments	$$	FEMA Hazard Mitigation Assistance
Implement climate resilient strategies in watershed communities • Examine areas of high flood risk due to increase in precipitation • Design LID and GI solutions that can mitigate flooding in those areas • Install LID and GI solutions	HVA and Municipalities	2-5 years	• Number of LID/GI projects installed in flood risk areas • Decreased impact of flooding on infrastructure	$$$$	FEMA Hazard Mitigation Assistance

$ = $0 to $5,000 $$ = $5,000 to $10,000 $$$ = $10,000 to $50,000 $$$$ = Greater than $50,000

HVA = Housatonic Valley Association, FEMA = Federal Emergency Management Agency

3.6 Species & Habitat Conservation

Land use in the watershed can be generalized into two categories. The watershed center around Downtown Bethel and Danbury are more developed, habitats are more fragmented and open space managed for human use. Outside of this center there is more open space, low density housing, and habitats with more area. The approach to these landscapes differ in their needs, which will be roughly characterized as restoration vs. protection.

Urban areas are not by definition bad for native species and habitat. With smart urban planning, cities can be places for nature to flourish and wildlife to thrive. One of the principle ways this happens is by encouraging areas of native habitats wherever possible - namely parks, backyards, resident gardens, and business landscaping - and creating corridors for wildlife to move throughout cities and into less managed outskirts. Biophilic design, urban ecology, and sustainable development provide tools to encourage habitat friendly design. Rethinking basic city infrastructure to integrate habitat friendly design is an excellent place to start. For example, culverts often create barriers to fish and aquatic life and often force terrestrial animals to cross roads to move from one area to another. Replacing culverts with stream simulated design bridges allows animals to cross under a road as if the road does not exist. Mapping current infrastructure, exploring where opportunities exist, and having example redesigns seeds the ground for when failing infrastructure can be replaced with a more eco-friendly alternative.

Invasive species

Invasive species are a wide-spread problem in the watershed. Invasive species grow aggressively and out-compete native species leading to lower levels of biodiversity and native habitat. Most notably Japanese Knotweed, Barberry, Mugwort, Phragmites, and Japanese Hops dominate the landscape of many riparian areas throughout the Still. Management of these areas present a challenge due to the size of the problem. That being said, invasive removal and restoration with native plants transforms the amount of habitat available to native New England species. Areas where this is particularly helpful include the following:

- Lake Kenosia - Phragmites encroaches on the Lake Kenosia Park beach near the buffer planting. Water Chestnut has been noted near Jensen Mobile Home Park and estimated to have infested approximately five acres.
- Danbury Still River Greenway - Japanese Knotweed towers above the Greenway trail at a stretch between the trailhead to the boat launch behind Marriot Hotel. For the past four years, HVA has been working with Danbury's Still River Alliance Commission to manage knotweed along the Greenway using the cut-and-cover method.
- Brookfield Still River Greenway - Japanese Barberry blankets specific areas along the Greenway just south of the Route 7 crossing. Managing Barberry in this area also helps allow the rare Pink Cress flower to spread at this location.
- Still River Nature Preserve - 115 acres of continuous protected open space along the Still River corridor. A number of invasives plague the unique biodiversity of this preserve which includes a number of natives such as spicebush and sycamore as well as rare and state-listed species. These include barberry, Japanese hops, multiflora rose, bittersweet, and most notably mugwort.

<u>Recommended Actions</u>

- Continue to manage invasive species in areas previously identified and seek areas where invasive management is both cost efficient and impactful.
- Stay current with research on effective invasive management approach and prevention.
- Restore areas of invasive removal with native planting and habitat restoration to prevent the colonization of additional invasives.

Land Protection & Conservation

In areas with less development the focus is less on restoration and more on protection. Often these areas are closer to the watershed's headwaters and therefore keeping these areas natural and healthy takes on particular significance due to their impact downstream. When land trusts collaborate to protect and link open spaces in the watershed, it amplifies the amount accomplished. The Hudson to Housatonic (H2H), a Regional Conservation Partnership of land trusts and conservation organizations, is leading the way in this regard. H2H has mapped priority areas of protection that link protected land trust parcels thereby creating natural corridors throughout the region. H2H has identified focus areas for their region where partners want to collaborate on and invest in land protection projects. The Still River watershed falls in H2H's Focus Area 10, an area that includes the towns of Bethel, Danbury, Redding, and Newtown.

Recommended Actions

- Continue to participate in the H2H partnerships, pooling knowledge and resources.
- Collaborate with H2H partners, specifically the land protection working group, on seeking larger funding opportunities to purchase parcels of high conservation value and linkage opportunity.

Program Highlight - Pollinator Pathways

One initiative H2H is promoting is the Pollinator Pathway. Galvanized by volunteer efforts of the Wilton Land Trust, Woodcock Nature Center, Wilton Garden Club, the Norwalk River Watershed Association, and other H2H members, Pollinator Pathways works to establish a pesticide-free corridor of pollinator friendly native plant gardens throughout Connecticut and New York In two years this program, organized locally by volunteers from town conservation groups, land trusts, and garden clubs, has spread to over 75 towns. We rely on the European honey bee, our 349 species of native CT bees, butterflies and other insect pollinators to fertilizer the plants in our yards, parks, roadside gardens, and on the farms that provide the food we eat. Pollinators are experiencing an ever greater threat due to pesticide use, loss and fragmentation of habitat, and climate change. Monarch butterflies have declined by 94.6% in the last 20 years, according to the US Wildlife Federation. A recent German study shows a 75% decline in all flying insects in the last 25 years (https://www.pollinator-pathway.org/about). The Pollinator Pathway combats these trends by providing education and connecting people across town and state lines, so they can work together to contribute to a coordinated effort to save our pollinators. The idea is to "de-fragment" the land by encouraging residents to use their properties to help form a pathway that connects protected open space, such as parks and land trust properties, which provide food and shelter to pollinators.

Joining the Pollinator Pathway is relatively easy. Residents and property owners are encouraged to stop using pesticides that will inadvertently kill pollinator species along with targeted pests, use low amounts of slow-release fertilizer and plant native pollinator friendly gardens

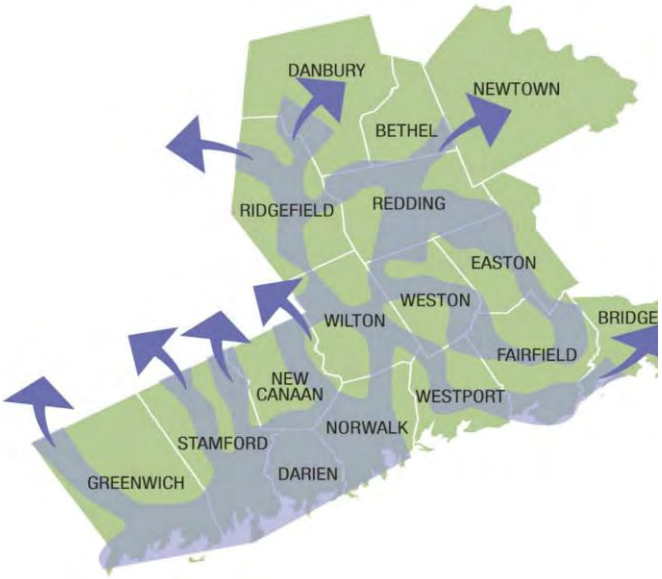
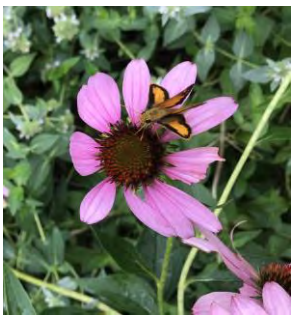


Figure 3.6.1 Pollinator Pathways in Southwestern Connecticut provided by the Norwalk River Watershed Assoc.

designed to bloom throughout the growing season. Design ideas are plentiful and one can find information on what plants to buy, where, and how to maintain your garden at the Pollinator Pathway website at https://www.pollinator-pathway.org/. Homeowners can sign on to be a stop along the pathway and advertise themselves as such through signage. This serves as a form of outreach to neighbors, encouraging whole neighborhoods to sign up and plant pollinator gardens of their own. Towns in the watershed participating in the program include Brookfield, Newtown, Ridgefield, and Redding, but there is room for growth. Working with local garden clubs and land trusts this plan encourages Bethel, New Milford, and Danbury to join the pathway, educate landowners of the benefits of pollinators, and create incentive programs to start gardening.

Recommended Actions

- Contact the Pollinator Pathway at info@pollinator-pathway.org to access shared, open-source information about how to start or build a pathway. Available are a list of first steps, access to templates for brochures and customized logos, signs to order, downloadable handouts with plant lists and alternatives to pesticides, guest speaker lists, fundraising ideas, FAQs, and other support materials.
- Distribute Pollinator Pathway educational materials to homeowners, landscaping companies, schools and places of businesses with landscaped areas inspiring them to incorporate pollinator friendly plants in their landscaping plans. Some towns have added to their POCDs a requirement that all new development include only native plants in landscaping plans.
- Work with Garden Clubs in Bethel, New Milford and Danbury, Bethel Land Trust, Candlewood Valley Land Trust, New Milford Revitalization Commission and other conservation groups to make native pollinator gardens a priority.
- Collaborate across town lines to identify areas with less pollinator habitat, target those areas for gardening, and plan how to connect pathways across town lines.
- Encourage the use of pollinator-friendly native plants in riparian buffer plantings, creating a pollinator corridor along the Still River and its tributaries.
- Create an incentive program to provide free native plants when landowners sign up to be a part of the pollinator pathway.
- Work with the Connections program to provide initial startup maintenance to institutions who sign on to the Pollinator Pathway program.
- Participate in the mapping of pollinator gardens to create pathways
- Encourage citizen science data collection through the Pollinator Pathway umbrella project on INaturalist.
- Help make the connection between creating healthy pollinator habitat and protecting water quality: 1. Native plants require less water because they are naturally adapted to this area; 2. Avoiding pesticides and fertilizers keeps these contaminants out of our waterways; 3. Reducing lawn size reduces the need to irrigate and water. (In Southwest CT, 70% of water is used outside in the summer. Outdoor use has contributed significantly to drought conditions over the last 7 years and has led to more diversions of water from our rivers to meet demand.)


Photos provided by the Norwalk River Watershed Association

Table 3.6.1 Species & Habitat Conservation Recommendations

Recommended Actions & Milestones	Who	Timeframe (Schedule)	Deliverables & Evaluation Criteria	Estimated Costs	Potential Funding Sources
Continue to manage invasive species and restore native habitat. • Identify areas where invasive management is both cost efficient and highly impactful • Research effective removal and management practices • Employ Still River Watershed Connections and local volunteers in management practices and native habitat restoration	HVA, Local Land Trusts, Parks and Rec. Departments	0-2 years Ongoing	• Volunteer program implemented	$$	FCCF, Horizon Foundation
Identify and protect areas of highest conservation value throughout the watershed through conservation easements, and other conservation mechanisms. • Develop criteria to define "conservation value" • Apply criteria to regional watershed areas and identify areas of high conservation value • Among those, identify parcels available for protection along with potential partners • Engage land owners in educational programming around land protection • Set in place easements where possible with willing landowners	H2H	0-2 Years Ongoing	• Mapped areas of high conservation value • Number of acres of protected land throughout the watershed	$$$	Highlands Act, Forest Legacy Fund
Increase open space, public access, and recreation opportunities throughout the watershed • Identify and evaluate areas of potential open space • Analyze feasibility of procurement • Secure funds for protection • Develop open space access and features (trails, recreation opportunities, signage, etc.)	H2H, Local Land Trusts	2-5 years Ongoing	• Acres of open space protected	$$$$	Highland Act, Forest Legacy Fund

Recommended Actions & Milestones	Who	Timeframe (Schedule)	Deliverables & Evaluation Criteria	Estimated Costs	Potential Funding Sources
Continue to collaborative across land trusts to pool knowledge and resources through regional conservation partnership • Develop partnership agreement among local land trusts • Create unified vision and goals • Host regular meetings to work on land conservation projects	H2H, HVA, Land Trusts	Ongoing	•	$$	Local land trusts

$ = $0 to $5,000 $$ = $5,000 to $10,000 $$$ = $10,000 to $50,000 $$$$ = Greater than $50,000

HVA = Housatonic Valley Associations, H2H = Hudson to Housatonic Regional Conservation Partnership, FCCF = Fairfield County Community Foundation

4. GENERAL BEST MANAGEMENT PRACTICES

4.1 Green Infrastructure and Low Impact Development

Green Infrastructure (GI) and Low Impact Development (LID) are practices and methods that reduce stormwater runoff. This is accomplished by incorporating vegetation, soils, and natural filtration systems in the built environment, allowing stormwater to infiltrate. The use of green infrastructure captures and filters rainwater reducing pollution loading and stormwater quantity in urban stream systems. Examples of GI/LID include rain gardens, bioswales, permeable pavement, infiltration planters, green roofs, catch basin separators, and rainwater barrels. Because green infrastructure blends plan material alongside grey infrastructure it has the additional benefit of sequestering carbon, combating heat island effect, and contributing to the health and wellbeing of residents. As such, green infrastructure and LID are important elements to climate change resiliency, one reason among many that cities and towns are looking to these practices more and more as alternatives to traditional grey infrastructure. Towns in the watershed such as Bethel have updated land use and zoning requirements mandating green infrastructure and low impact development practices be incorporated in all new development, a practice that this plan endorses. There are a number of opportunities to install green infrastructure throughout the watershed. Municipal properties, institutions, and nonprofits have been assessed using USSR protocol as likely candidates. Those that rose to the top of the list are listed in the Site Specific BMPs section below.

Care should be taken when considering which LID/GI practices to use. Like traditional infrastructure, green infrastructure requires maintenance; vegetation should be watered and weeded especially for the first few years and underground systems need regular cleaning similar to traditional catch basins. Without regular maintenance, debris and sediment build up can reduce infiltration and therefore lead to ineffective water treatment. Partnership development is key in finding the right type of GI/LID system so that maintenance is seamless with regular operations.

<u>Recommended Actions</u>

- Encourage municipal regulation that requires green infrastructure and LID in new private development projects.
- Encourage watershed municipalities to incorporate GI/LID into municipal projects, including all new development, catch basin replacements, parking lot replacement, road repairs, and infrastructure upgrades. This will have the dual effect of counting toward MS4 permit requirements to reduce impervious cover by 2%.
- Determine locations and partners throughout the Still River watershed where GI/LID can be implemented. Work with partners to find GI/LID systems that work for their needs and operations. Secure funding and implement site-specific GI/LID retrofits. Focus should primarily be on public properties, nonprofits, and institutions such as those outlined in the Site-specific BMP section.

Table 4.1.1 Green Infrastructure and Low Impact Development Recommendations

Recommended Actions & Milestones	Who	Timeframe (Schedule)	Deliverables & Evaluation Criteria	Estimated Costs	Potential Funding Sources
Encourage municipal regulation that requires green infrastructure and LID in new private development projects. • Review zoning regulations around new development in all watershed municipalities • Make recommendations where zoning can encourage or require GI and LID practices, especially near streams	HVA	0-2 years	• Recommendations report submitted to each municipality	$	
Incorporate GI/LID into municipal projects • Identify projects on municipal property where GI/LID projects can be installed. Assess projects identified in this watershed plan for viability • Work with municipalities to design GI/LID solutions that work with maintenance and land use of the site • Secure funds for GI/LID projects and hire engineering consultant to create engineering designs • Install project • Conduct ongoing monitoring of pollutant loading	HVA	0-2 years (2 projects complete) 2-5 years (3 projects complete) Ongoing until all GI/LID installed at all possible priority sites	•	$$$$	CT DEEP 319 Grant

Recommended Actions & Milestones	Who	Timeframe (Schedule)	Deliverables & Evaluation Criteria	Estimated Costs	Potential Funding Sources
Install GI/LID projects throughout the watershed that reduce pollutants in the Still River • Determine locations and partners throughout the Still River watershed where GI/LID can be implemented, starting with the projects recommended in this Action Plan • Work with partners to find GI/LID systems that work for their needs and operations. • Secure funding and implement site-specific GI/LID retrofits • Install GI/LID projects and monitor project for pollutant load reduction	HVA	0-2 years (2 projects complete) 2-5 years (3 projects complete) 5-10 years (5 projects complete) Ongoing until GI/LID installed at all possible priority sites	•	$$$$	CT DEEP 319 Grant

$ = $0 to $5,000 $$ = $5,000 to $10,000 $$$ = $10,000 to $50,000 $$$$ = Greater than $50,000

HVA = Housatonic Valley Association, LID = Low Impact Development, GI = Green Infrastructure, CT DEEP = Connecticut Department of Energy and Environmental Protection

4.2 Vegetated Buffers

A vegetated buffer is an area where tall grass, shrubs, and trees buffer a river, stream, or lake from an upland areas. An ideal vegetative buffer runs the length of the stream and is about 50 feet wide with three distinct zones. A streamside zone includes aquatic plants, species who require near constant inundation, and plants that like to "get their feet wet." Starting at the top of the bank, the middle zone includes riparian adapted trees, shrubs and perennial plants. The outer zone upland of the bank exists between human-impacted space and the buffer itself. This zone can include a yard, garden, or meadow planted with perennials.[85] Even small strips along waterways can create a big impact given limited area. Buffers are one of the most cost effective ways to reduce stormwater runoff. They slow down the flow of stormwater runoff, allowing it to infiltrate into the soil, in turn allowing beneficial microbes in the soil to remove many pollutants and toxins. Vegetation along streams and rivers can also stabilize banks and prevent erosion, deter geese settlements, and provide shade to aquatic life thereby combating the effects of climate change on warming water temperatures. When planted with native plants, buffers can provide habitat to a myriad of wildlife. The success of vegetative buffers on water quality is well documented.[86] As such, buffers are recommended as a practice for all property owners who abut streams in the watershed, especially smaller tributaries where buffering has proven the most beneficial. Priority areas in the watershed that have been flagged for vegetative buffer installation are:

- Bennett Memorial Park (Bethel)
- Mackauer Park along the Bethel Bark Park (Bethel)
- Rourke Field (Bethel)
- Ridgefield Country Club and Golf Course (Danbury)
- Laurel Gardens (Danbury)
- Danbury Police Station (Danbury)
- Condominium complexes along Kohanza Brook (Danbury)
- Covered Bridge Condominiums (Danbury)
- Wooster School (Danbury)
- Mystery Acres (Brookfield)

Figure 4.2.1 Riparian Buffer Three Zone Buffer System Diagram courtesy of Connecticut River Joint Commission

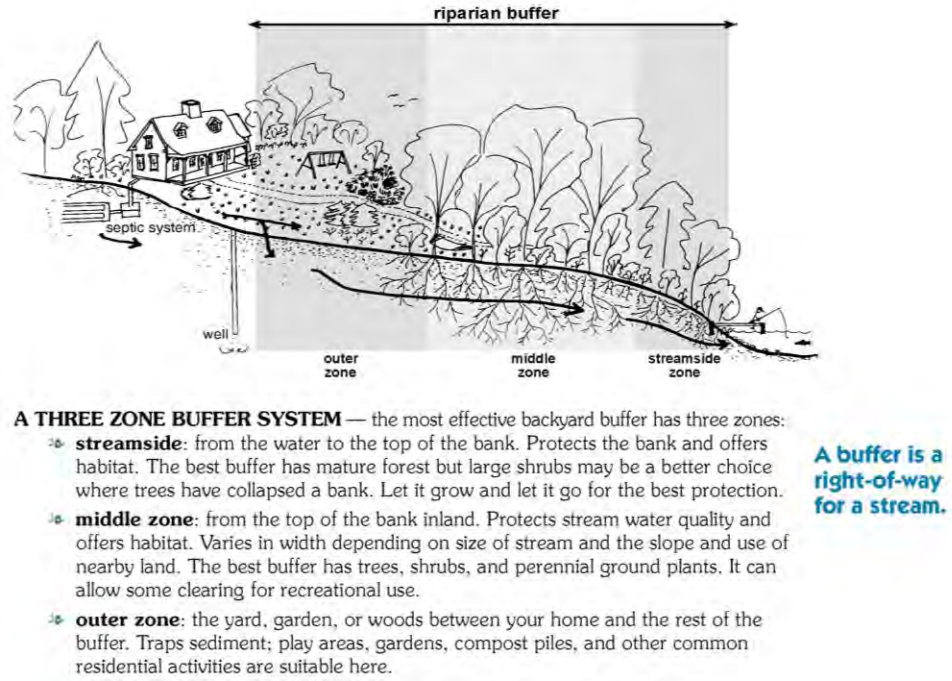


Table 4.2.1 Vegetative Buffers Recommendations

Recommended Actions & Milestones	Who	Timeframe (Schedule)	Deliverables & Evaluation Criteria	Estimated Costs	Potential Funding Sources
Encourage vegetated buffers in residential, institutional, and commercial property • Distribute educational material developed (see Education and Outreach recommendation) • Incentivize homeowners by providing plants to program participants	HVA, Local Garden Clubs	0-2 years	• Educational materials distributed • Number of program participants	$$	
Establish vegetative buffers in priority areas identified in Unified Stream Assessment • Develop partnerships and secure permissions from landowners of the priority areas identified above • Design and establish buffer plantings utilizing local volunteers, school groups or Connections	HVA, Local Garden Clubs, DPS	0-2 years Ongoing	• Projects designed and established	$$$	
Implement and enforce setback zones in Inland and Watercourses regulations • Review existing regulation • Amend regulation	Municipalities Inland Wetland Commissions and Environmental Commissions	2-5 years	• Updated zoning regulations	$$	Municipal funds

$ = $0 to $5,000 $$ = $5,000 to $10,000 $$$ = $10,000 to $50,000 $$$$ = Greater than $50,000

HVA = Housatonic Valley Association, DPS = Danbury Public Schools

Project Highlight - Lake Kenosia Vegetated Buffers

Lake Kenosia is an impoundment of the Still River. The City of Danbury has worked over a number of years to establish a large riparian buffer at Lake Kenosia park on the northern side of the lake. The buffer was established in two phases and is managed today by the Lake Kenosia Commission alongside local partners such as HVA and Western Connecticut State University. The vegetative buffer garden at Lake Kenosia Park has been part of a larger effort to reduce nutrient loading in Lake Kenosia, which is covered by a TMDL for nitrogen and phosphorous. This buffer along with other efforts have slowed the aging of the lake from eutrophication. As a result, most recent water quality tests indicate an improved water quality with lower measured levels of nitrogen, phosphorous, and indicator bacteria. To find out more about the Lake Kenosia restoration go to http://www.lakekenosia.org or visit the lake. Educational signs throughout the park outline the many efforts and plants found in the buffer.

Recommended Actions

- Use Unified Stream Assessment data to determine where in the watershed lacks adequate vegetative buffering and prioritize those areas for plantings. Work with landowners to educate and incentivize them to build buffers along streamside properties.
- Utilize the Connections program to plant buffers in public areas such as the Still River Greenway, parks and open spaces.
- Encourage backyard buffers in residential areas by providing resources to homeowners and businesses willing to put in gardens.
- Incorporate native pollinator friendly plants wherever possible and install signage at heavily trafficked areas explaining the benefits of pollinator plants and vegetative buffers on water quality.
- Continue vegetative buffers around Lake Kenosia until 100% of the lakeside is buffered from surrounding properties. Key areas to plant include Moose Lodge, CT DEEP boat launch, Meyer Jabara Hotels, along Lake Kenosia Avenue, and at various residences on the south side of the lake.
- Implement and enforce setback zones in Inland and Watercourses regulations

4.3 Wildlife and Pet Waste

Dog parks and open spaces where dog owners visit are sometimes located near streams and storm drains. When dog waste isn't picked up, that fecal matter ends up in our streams, contributing to indicator bacteria. Many dog parks distribute plastic bags, have "pooper scooper" ordinances requiring dog owners to clean up after their pets, and post signage on proper waste disposal. These methods are effective and more of them should be encouraged in less managed areas. Achieving 100% compliance requires regular monitoring and maintenance of dog spaces. One particular area to note is Bethel's Bark Park in Mackauer Park. Located ten to fifteen feet from the bank of Limekiln Brook, this park if managed improperly has the potential to contribute a good amount of fecal matter into the brook. To address this, HVA has partnered with Bethel's Parks and Recreation Department as well as Earth Tones Landscaping to design a stormwater mitigation project that would redirect flow from the dog park away from the stream and allow runoff to infiltrate into the ground.

Another contributor of indicator bacteria is wildlife, in particular domestic Canadian Geese. These waterfowl habituate to a location where there are large areas of open short turf and standing or slow moving water. Golf parks and parks with wetlands, ponds or lakes are ideal environments. The Candlewood Valley Golf Course, Lake Kenosia, and Bennett Memorial Park are just a few areas that have experienced problems with domestic goose populations. While there are many solutions to geese - egg addling/oiling, visual deterrents such as dog dummies, and hunting - perhaps the most effective

solutions are to enforce a no-feed ordinance and install a tall grass/shrub vegetated buffer (find out more at https://www.ct.gov/deep/cwp/view.asp?a=2723&q=325942&deepNav_GID=1655). Geese settle where they can safely see across a field to water, a buffer interrupts their line of sight and therefore their sense of safety. As a bonus, this buffer serves the dual purpose of slowing fecal contaminated runoff and allowing it to infiltrate before impacting the body of water. This method has been implemented effectively at Lake Kenosia Park in Danbury and Bennett Memorial Park in Bethel with plans to continue efforts outlined later.

Recommended Actions

- Research where dog owners commonly visit with their pets. Install pet waste bag stations and signage at high-use areas frequently and conveniently spaced.
- Work with Parks and Rec departments and land trusts to monitor and maintain existing dog bag stations making sure bags are stocked and trash is regularly emptied.
- Educate the public on the impact of pet waste on water quality.
- Establish regulatory control, signage and enforcement for geese-feeding emphasizing waterfowl health and water quality.
- Continue to establish and maintain thick vegetative buffers in problem areas such as Lake Kenosia and Bennett Memorial Park. Work with landowners to plant vegetative buffers at locations around their lakeside property.

4.4 Trash & Stream Cleanups

Waste debris in rivers in streams is an issue that plagues every urbanized watershed. It's all too easy for trash from sidewalks, roads and dumpsters to make their way into waterways through the storm sewer system. HVA recorded large collections of trash (one truckload or greater) for later cleanups. The good news is that trash is a relatively easy project that can be addressed with unskilled volunteers. Stream cleanups are a great way to not only remove waste debris from a stream but also engages the public in a meaningful way in the watershed plan implementation. The more difficult task is addressing trash at the source. For this a "litter free city" outreach campaign targeting residents and visitors through social media, newsletters, and in person is recommended. In addition, it is important that dumpsters be managed, closed and regularly emptied to prevent trash from blowing out in the first place.

Recommended Actions

- Establish an outreach campaign for "litter free cities" especially in the Danbury area. Target more urban areas where the bulk of the trash is coming from. Inform the public of the connection between littering and trash in their waterways.
- Work with school groups and youth programs to spread the word about trash in our waterways.
- Install signage around trash cans in areas such as parks and public spaces and near dumpsters in dense residential areas regarding proper trash disposal and ways to prevent debris spread.
- Engage volunteers, youth groups, and civic organizations in stream cleanups, concentrating efforts on areas identified in the unified stream assessment.
- Work with businesses, commercial properties, and property managers to address poor dumpster management.

Table 4.3.1 Wildlife and Pet Waste Recommendations

Recommended Actions & Milestones	Who	Timeframe (Schedule)	Deliverables & Evaluation Criteria	Estimated Costs	Potential Funding Sources
Install pet waste bag stations and signage at high-use areas. • Research where dog owners commonly visit with their pets • Collaborate with landowners (parks and rec. departments, land trusts, etc.) to secure permissions to install bags stations and signage • Install signage and bag stations • Monitor bag stations for regular maintenance and stocking • Distribute educational materials about pet waste (see Education and Outreach recommendations)	HVA, Municipalities, Land Trusts, Open Space landowners	0-2 years	• Installed signage and bag stations • Education materials distributed	$$	Local business sponsorship
Deter domestic geese populations • Establish regulatory control, signage, and enforcement for geese-feeding • Install and maintain thick vegetative buffers at key locations along slow moving water and lakeside properties • Distribute educational materials (see Education and Outreach recommendations	HVA	0-2 years Ongoing	• Increased amount of waterfront with vegetative buffers • Regulation updates where necessary • Materials distributed	$$	Municipal funds, CT DEEP 319 Grant

$ = $0 to $5,000 $$ = $5,000 to $10,000 $$$ = $10,000 to $50,000 $$$$ = Greater than $50,000

HVA = Housatonic Valley Association, CT DEEP = Connecticut Department of Energy and Environmental Protection

Table 4.4.1 Trash and Stream Cleanups Recommendations

Recommended Actions & Milestones	Who	Timeframe (Schedule)	Deliverables & Evaluation Criteria	Estimated Costs	Potential Funding Sources
Establish an outreach campaign for "litter free cities" • Create messaging for outreach campaign • Distribute materials throughout watershed, especially targeting Danbury • Incorporate messaging in outreach to school groups and youth programming.	HVA	0-2 years	• Materials developed and distributed	$	
Control garbage around disposal receptacles (trash cans and dumpsters) • Identify areas where garbage is not controlled • Distribute "litter free city" outreach materials • Work with property owners and maintenance staff to install and maintain dumpsters and trash cans to keep garbage in receptacles	HVA	2-5 years	• Landowners contacted • Number dumpsters and trash cans fixed/regularly maintained	$	
Establish volunteer "stream team" cleanup crews • Recruit and build a local volunteer list engaging residents, youth groups, civic service organizations, etc. • Use USA data and local knowledge to identify areas of trash collection in stream • Host stream clean days to pick up trash out of the river	HVA	0-2 years	• Number of volunteers recruited • Ongoing stream clean days hosted	$$	

$ = $0 to $5,000 $$ = $5,000 to $10,000 $$$ = $10,000 to $50,000 $$$$ = Greater than $50,000

HVA = Housatonic Valley Association, USA = Unified Stream Assessment

4.5 Homeowner BMPs

Homeowner BMPs contribute to improving water quality through smaller scale project implemented on the residential level. Many of the BMPs discussed in the Green Infrastructure/Low Impact Development section can be installed in residential homes on a smaller scale. Rain gardens, rain barrels, vegetated buffers, permeable pavement and sustainable landscape design captures and cleans rain water before draining to nearby stormwater systems or streams. These in conjunction with sustainable land and home maintenance can go a long way in conserving and improving water quality. Homeowner BMPs that involve vegetation can dovetail with watershed plan goals to restore native species and habitat by planting native species and pollinator gardens. Education, technical assistance and incentive programs can catalyze the resident investment in BMPs. Homeowners can explore different BMPs using the Be RiverSmart program at https://www.riversmartct.org/ and take the pledge to become "RiverSmart."

High Density Housing

Much of the housing in the watershed is high density housing such as apartments buildings and condominium complexes. Projects/programs implemented at high density housing areas must address two audiences - residents/renters and property owners/managers. Each audience has a unique set of needs when considering BMPs. For residents, solutions need to be visually pleasing and fit into the ease of the unit use. For property owners/managers, BMPs need to be cost effective and fit into the everyday operations and ongoing maintenance of the property. The most successful solutions are ones that garner buy-in from both audiences. The following areas were identified during streamwalks as potential restoration candidates:

- Covered Bridge Condominiums (Padanaram Brook in Danbury)
- Willow Springs Condominiums (Unnamed Tributary to Still River in New Milford)
- Cedar Court Condominiums (Kohanza Brook in Danbury)
- Greensview Condominiums (Kohanza Brook in Danbury)
- Ridgewood Condominiums (Kohanza Brook in Danbury)

Neighborhood Highlight - Candlewood Point Neighborhood

The Candlewood Point neighborhood is located on the northwestern portion of the Still River basin where the watershed borders with Candlewood Lake watershed. This neighborhood is at a steep grade and experiences frequent flooding during storm events. Specific outreach to this neighborhood through RiverSmart should emphasize BMPs that will address issues of flooding and erosion. These include, the benefits of riparian vegetated buffers and disconnecting impervious cover and runoff from the stream. An incentive program, paired with education, and implementation support to residents can encourage residents to install BMPs that will reduce water quantity in the adjacent stream and mitigate some flooding in the area.

Recommended Actions

- Continue to educate and promote homeowner BMPs through the RiverSmart program.
- Reduce impervious areas by installing permeable pavement and green roofs and reducing pavement.
- Disconnect rooftop drainage by installing rain barrels and rain gardens.
- Employ sustainable landscaping practices
    - Reduce short turf lawn
    - Cut grass higher to conserve water
    - Aerate lawn to allow better percolation
    - Replant lawns with no-mow or native grasses
    - Reduce or eliminate the use of pesticides

    - Limit or eliminate the amount of fertilizers, apply fertilizers during dry weather conditions, and/or use slow-release fertilizers, organic fertilizers or compost as alternatives.
    - Plant pollinator gardens, rain gardens, bioswales and vegetative stream buffers
- Implement Green Infrastructure/LID incentive programs to assist residents with the cost of BMP installation. Resources include:
    - Still River Watershed Connections youth crew can help install and maintain garden and buffer installation.
    - Grants and give-away programs to support residential green infrastructure installation.
    - Property tax credits for residents who install green infrastructure, water quality improvements.
    - Create certification programs similar to the pollinator pathways program that offer recognition for homeowners who implement BMPs.
    - Workshop series to teach residents everyday water conservation techniques and green infrastructure installation.
- Encourage regular inspection, pumping, maintenance, and upgrades/repairs to septic systems.
- Work with neighborhood associations and developers to incorporate Homeowner BMPs on a neighborhood/community complex scale.

4.6 Septic Systems (Subsurface Sewage Disposal Systems)

Much of the watershed's human waste is treated by the Danbury Sewage Treatment Plant. Those that are not are typically on a septic system. Septic systems can contribute to excess nutrients in waterways when they fail or are located in floodplains. As such, homeowners should be aware of signs that indicate failing septics and regularly maintain septics to prevent leaching. One area in which this is a particular issue is along Dean Rd. in Brookfield. Below details the project proposed at Dean Road as well as general recommendations to mitigate the impact of septics on water quality.

Figure 4.6.1 Dean Road Septic System Area of Study provided by Brookfield WPCA

Project Highlight - Dean Road Septic Systems

The Dean Road Septic Systems project includes properties along Pocono Road and Dean Road from Silvermine Road to Station Road on the east side of the Still River (See Figure 4.6.1). The study area is along the Still River in the mainstem 2 subwatershed (see Subwatershed map in Appendix C) that was identified as requiring 87% reduction in E-Coli to meet TMDL reduction requirements. There are 91 single family 1960- era homes with septic systems that are not conforming according to current standards. Many septic systems are located in the water table. The BWPCA has identified the study area as an area of concern for wastewater management and has investigated sewering the area to address study

area wastewater management problems. The cost of conventional sewer systems is greater than the properties can sustain by the typical Benefit Assessment approach.

Brookfield WPCA has proposed a study that will establish the attenuation capability of the soils which are expected to be low, given that nearly half of the properties have reported septic failures. If the soils do not remove appreciable amount of septic nitrogen and phosphorus, then the study area properties would be discharging approximately 1,870 lbs. of nitrogen per year (5.1 lbs. N/day) and 208 lbs. of phosphorus per year (.57 lbs. P/day) to the Still River. These estimates are based upon each property's wastewater flow of 150 gpd, septic tank effluent of 60 mg/L nitrogen with 25% removal in drainfield and 5 mg/L phosphorus with no drainfield P removal. Bacterial contamination from septic system occurs when there is less than 2 feet between the bottom of the drainfield and groundwater and/or surface breakout of septic effluent.

The Brookfield WPCA identified the Study Area as an Area of Concern in its Wastewater Management Map of the Town, with Figure 4.6.1 illustrating the boundaries of the area. Within this area, 47% of the properties were designated as Failure Recorded / Special Flood Area, 39% of the properties were designated as Possible Failure / Flood Area and 14% of the properties require additional information. Odors attributed to failing septic systems and conditions indicative of septic surface breakouts in the Study Area have been reported to the WPCA.

Creative solutions need to be developed to address the cluster of inadequate septic systems. This can be accomplished by first determining the impact of these properties on bacterial (*E. coli),* nitrogen, phosphorus, and PFAS to water quality of the Still River. This will be done in collaboration with HVA ambient water quality monitoring program adding an additional site and parameters to isolate the Dean Rd property impact. Moreover, Brookfield WPCA plans to contract with a consultant to measure attenuation in the study area's soil through subsurface probes. Those results will inform wastewater management solutions to eliminate negative water quality impacts due to septic leaching. Creative project solutions will be explored and implemented emphasizing the need for solutions that are passive, simple to operate and maintain. With additional funding, these design solutions will be implemented and water quality monitored for improvement in the subsequent years.

<u>Recommended Actions</u>

- Identify and map areas where there is a concentration of septic systems near bodies of water. Coordinate with municipalities and CT DEEP to review records related to system performance and determine areas of high leaching potential. Work with the municipality and town to study and address leaching.
- Seek and secure funding to study and implement solutions at Dean Road Study Area.
- Encourage regular maintenance of septic systems through education and outreach. Teach residents how to identify malfunctioning systems.
- Develop a septics maintenance fund to assist low-income residents with proper septic inspections, cleaning, repairs and upgrades. Utilize this fund to provide discounted group septic maintenance in hotspot areas.
- Strengthen local regulation to:
    - Require the regular inspection and maintenance of septics as well as upgrades/repairs to septics found malfunctioning.
    - Build all new septics within a safe required minimum setback from all wetlands and floodplains.
    - Require septic systems to pass an inspection upon the sale of property.

Table 4.5.1 Homeowner BMPs Recommendations

Recommended Actions & Milestones	Who	Timeframe (Schedule)	Deliverables & Evaluation Criteria	Estimated Costs	Potential Funding Sources
Educate homeowners on RiverSmart practices • Distribute RiverSmart materials and collect pledges (see Education and Outreach recommendations)	HVA	0-2 years	• Education materials distributed • Households pledged	$$$	CT DEEP 319 Grant Funding
Disconnect rooftop drainage • Establish rain barrel giveaway program • Distribute materials	Municipalities	2-5 years	• Number of rain barrels distributed	$$	Business sponsors
Encourage sustainable landscaping practices • Distribute materials on lawn care, pollinator pathways, and vegetative buffers • Reach out to landscape companies and work with them to alter business practices to sustainable lawn care and landscaping practices	HVA	0-2 years	• Number of households signed on to the Pollinator Pathway • Education materials distributed • Number of landscape companies integrating sustainable practices	$	
Establish GI/LID incentive program • Utilize Still River Watershed Connections youth crew can help install and maintain garden and buffer installation. • Research grants and give-away programs to support residential green infrastructure installation. • Explore property tax credits for residents who install green infrastructure, water quality improvements. • Create certification programs similar to the pollinator pathways program that offer recognition for homeowners who implement BMPs. • Workshop series to teach residents everyday water conservation techniques and green infrastructure installation.	HVA, Municipalities, Local school groups	2-5 years	• Certification program established and homes certified • Number workshop participants • Number of GI/LID projects established	$$$	

Recommended Actions & Milestones	Who	Timeframe (Schedule)	Deliverables & Evaluation Criteria	Estimated Costs	Potential Funding Sources
Encourage responsible septic system maintenance • Develop and distribute materials around septic system impact (as part of RiverSmart, see Education and Outreach recommendations)	HVA, Brookfield WPCA, Municipalities	0-2 years	• Education materials distributed	$	

$ = $0 to $5,000 $$ = $5,000 to $10,000 $$$ = $10,000 to $50,000 $$$$ = Greater than $50,000

HVA = Housatonic Valley Association, CT DEEP = Connecticut Department of Energy and Environmental Protection, GI/LID = Green Infrastructure/Low Impact Development, WPCA = Water Pollution Control Authority

Table 4.6.2 Septic Systems (Subsurface Sewage Disposal Systems) Recommendations

Recommended Actions & Milestones	Who	Timeframe (Schedule)	Deliverables & Evaluation Criteria	Estimated Costs	Potential Funding Sources
Study and address septic system leaching in priority areas such as Dean Rd. in Brookfield • Identify and map areas where there is a concentration of septic systems near bodies of water • Coordinate with municipalities and CT DEEP to review records related to system performance and determine areas of high leaching potential • Seek and secure funding to study and implement solutions	Brookfield WPCA, Municipalities	2-5 years	• Mapping of septic systems in potential high leaching areas • Funding secured for study to determine impact of leaching in priority areas on water quality • Solutions implemented and follow-up monitoring results published	$$$$	NFWF Long Island Sound Futures Fund, CT DEEP 319 Grant
Develop a septics maintenance fund to assist low-income residents with proper septic inspections, cleaning, repairs and upgrades • Research program feasibility and potential funding sources for fund	Municipalities	5-10 years	• Funds raised for program • Number of households accessing funds and upgrading septic systems	$$$$	Community Block Grants?
Strengthen local regulation to reduce impacts of septic systems on pollution loading in the watershed. • Review septic system regulation • Amend regulation where necessary to: o Require the regular inspection and maintenance of septics as well as upgrades/repairs to septics found malfunctioning o Build all new septics within an X setback from all wetlands and floodplains o Require septic systems to pass an inspection upon the sale of property	Municipalities	2-5 years	• Municipal ordinances reviewed	$$	Municipal funds

$ = $0 to $5,000 $$ = $5,000 to $10,000 $$$ = $10,000 to $50,000 $$$$ = Greater than $50,000

HVA = Housatonic Valley Association, CT DEEP = Connecticut Department of Energy and Environmental Protection, NFWF = National Fish and Wildlife Foundation

4.7 Commercial Businesses, Institutions, and Industrial BMPs

Commercial businesses and industrial facilities often have a greater amount of impervious area combined with a higher potential for pollutants due to chemicals and processes used during operations. During the industrial revolution, the hatting industry used the Still River in its manufacturing. The legacy is that commercial landowners, businesses and institutions continue to be located around the river and its major tributaries. Particular areas in Danbury such as Commercial Park near Eagle Rd, Danbury Fair Mall near Mill Plain, and downtown Danbury contain high concentrations of impervious cover and little green space for stormwater infiltration. Moreover, poor dumpster management in apartment complexes and at businesses lead to increase waste debris in streams. These areas are likely contributing more to stormwater runoff through Danbury's stormwater system. Facilities registered under CT DEEP's General Permit for the Discharge of Stormwater associated with Industrial Activity are Eaton Industries and a couple of gas stations. That being said, all facilities should take stock of, monitor, and mitigate stormwater pollutant sources contributing to poor water quality. Areas with higher concentration of impervious cover should be the focus of these efforts, namely those located around the mainstem throughout Danbury.

<u>Recommended Actions</u>

- Reach out to commercial businesses and institutions and explore how their activities are contributing to poor water quality. Particular areas of focus:
    - Businesses near or abutting the Still River Greenway in Danbury
    - Western Connecticut State University
    - Danbury Public Housing Authority
- Strengthen and enforce municipal ordinances around dumpster management, required proper coverage, stream setback, and maintenance frequency.
- Using pollution trackdown surveys, identify facilities not registered under CT DEEP's industrial and commercial stormwater permit and work with businesses and CT DEEP to address illicit discharge.
- Encourage and provide resources for businesses to incorporate green infrastructure, stormwater retrofits, pollinator friendly landscaping, and vegetated buffers especially in conjunction with facility updates.

Table 4.7.1 Commercial Businesses, Institutions, and Industrial BMPs Recommendations

Recommended Actions & Milestones	Who	Timeframe (Schedule)	Deliverables & Evaluation Criteria	Estimated Costs	Potential Funding Sources
Outreach to commercial businesses and institutions and explore how their activities are contributing to poor water quality starting in priority areas identified in the watershed plan. Encourage GI/LID project installation • Develop and distribute outreach materials (see Education and Outreach recommendations) • Sign on RiverSmart pledges from businesses and institutions	HVA	0-2 years Ongoing	• Education materials distributed • Number of businesses and institutions take the RiverSmart pledge	$$	
Strengthen and enforce municipal ordinances around dumpster management, required proper coverage, stream setback, and maintenance frequency	Municipalities	0-2 years	• Regulation amended	$	
Eliminate unregulated illicit discharge • Conduct pollution trackdown surveys at suspicious outfalls • Identify facilities not registered under CT DEEP's industrial and commercial stormwater permit • Work to address and eliminate illicit discharge	HVA, Municipalities	0-2 years	• Pollution trackdown surveys complete and mapped • Illicit discharge analyzed, source isolated, and addressed	$$$	CT DEEP 319 Grant Funding, Municipalities

$ = $0 to $5,000 $$ = $5,000 to $10,000 $$$ = $10,000 to $50,000 $$$$ = Greater than $50,000

HVA = Housatonic Valley Association, GI/LID = Green Infrastructure/Low Impact Development CT DEEP = Connecticut Department of Energy and Environmental Protection

4.8 Municipal BMPs

Municipal Stormwater Management

Every municipality in the Still River watershed is regulated under the updated MS4 General Permit. This permit, which went into effect July 1, 2017, requires towns to comply with six minimum control measures including public education and outreach, public involvement/participation, illicit discharge detection and elimination (IDDE), construction site stormwater runoff control, post-construction stormwater management in new development or redevelopment, and pollution prevention/good housekeeping. Each community has put together stormwater management plans which include practices to control stormwater runoff into the impaired streams throughout the watershed thereby addressing TMDLs for indicator bacteria and nutrients, metals, and other pollutants where applicable.

HVA and the Western Connecticut Council of Governments have responded to MS4 permit mandates by developing programs to support communities in meeting these goals. Moreover UCONN's Center for Land Use Education and Research and CT NEMO have developed a comprehensive online resource for cities and towns to fulfill permit requirements found here, https://nemo.uconn.edu/ms4/index.htm. As part of this they have hired a coordinator to answer questions regarding MS4 requirements and help educate towns on the ins and outs of the permit.

Both the MS4 General Permit and this watershed-based plan address TMDL's in place in the watershed. Therefore, BMPs projects implemented according to the recommendations outlined here will often address MS4 requirements as well as watershed plan goals. Indeed, many of the efforts accomplished through the watershed planning process have supported town MS4 goals; USA outfall mapping can be used to supplement town efforts; IDDE program requirements are similar in scope to trackdown surveys; good housekeeping practices are those that also reduce pollution to watershed surface waters; and many of the site-specific stormwater retrofits count toward the MS4 requirements to reduce directly connected impervious cover by 1% each year.

While the state issues MS4 requirements for towns and cities, there are a number of ways municipalities can mitigate stormwater pollution through zoning regulation. Zoning regulations govern the amount of land that may be covered by buildings and other permanent structures. These regulations can inadvertently contribute to increased stormwater runoff and increase stream pollution – especially when lot coverage standards are extremely permissive. One of the greatest concerns with traditional approaches to lot coverage is that they impose the least restrictions on those land uses that have the greatest potential for generating the most impacts to stormwater quality. As can be seen from the table below, the highest lot coverage standards in Western Connecticut municipalities are found for manufacturing, commercial and industrial parks.

Table 4.8.1 Lot Coverage Standards in Western Connecticut Municipalities

Western CT Land Use Categories (Based on 2019 Zoning)	Range of Lot Coverage Standards	Average Lot Coverage Standard
Light Industrial Land Uses	10 to 80%	50%
Industrial Park Uses	30 to 80%	40%
Commercial Land Uses	10 to 80%	45%
Low Density Residential Uses	None to 25%	15%
High Density Residential Uses	None to 38%	23%

The region's municipalities are shifting from building cover to lot cover and even further to impermeable cover and, as an extreme outlier, to Green Area standards like those found in Greenwich. This transition reflects a growing realization that the availability of light and air are not the only important public health factors influencing the livability and safety of the built environment. Assessing the value of building lot coverage standards and implementing impervious surface cover standards would provide a more appropriate tool for a systemic approach to stormwater management at the municipal level. Currently, about 20% of the municipalities in Connecticut have adopted impervious surface cover standards as a means to address important stormwater management issues associated with development.

Recommended Actions

- Towns of New Milford, Brookfield, Bethel and the City of Danbury continue to implement stormwater management programs required by the MS4 permit. Requirements that address the goals for water quality improvement in this plan include:
    - Education and outreach to residents, businesses, and the public on specific actions that will reduce stormwater pollution
    - Disconnecting impervious surfaces in urbanized areas from streams
    - Dry weather outfall investigation of suspicious outfalls or illicit discharge
    - Address of illicit discharge through regulation
    - Wet weather monitoring of directly connected stormwater outfalls to impaired streams
    - Update local land use regulation to require green infrastructure and LID practices
- HVA continue to work with MS4 communities to meet the requirements of the permit, sharing outfall mapping created during USA streamwalks, pollution trackdown survey results, and ambient water quality monitoring data. Continue to provide outfall mapping services and help watershed towns disconnect impervious surface through GI/LID projects.
- Municipalities implement GI/LID projects in their community utilizing partnership organizations and funding sources in the region.
- Western Connecticut Council of Governments continue to support watershed municipalities through online resources at https://westcog.org/environmental-management/water-conservation/stormwater/municipal-stormwater-support/
- Encourage municipalities to continue good housekeeping practices that reduce stormwater pollution and start implementing additional practices where possible such as:
    - Education of public works staff on sustainable maintenance practices that reduce stormwater pollution
    - Repair, rehabilitate and retrofit failing infrastructure in ways that reduce runoff pollution. Consider GI/LID practices as alternatives to traditional infrastructure repair.
    - Minimum annual street sweeping especially in the spring after snow, if cleared
    - Frequently clean catch basins
    - Pet-waste prevention
    - Ordinances that prohibit the feeding of waterfowl
    - Alternative salting practices that reduce salt
    - Eliminate, reduce and/or optimize use of fertilizers, pesticides, and herbicides in public parks and municipal landscaping
    - Toxins and pollutant management at municipally owned facilities/public works
        - Covered fuels stations
        - Covered and controlled salt and sand bays
        - Covered materials storage such as gravel
        - Set back materials storage areas away from streams and catch basins

        - Install GI/LID and stormwater management systems that catch, clean/filter, and separate pollutant runoff of facility operations from stormwater systems.
- Encourage changes in zoning regulations that adopt Green Area standards including the use impervious surface cover standards.

Illicit Discharge

Illicit discharge is any unauthorized discharge or leak that drains into surface waters other than clean stormwater. Types of illicit discharge include:

- Sanitary wastewater
- Effluent from septic tanks
- Car wash and laundry wastewaters
- Improper disposal of auto and household toxins such coolant and radiator flushing
- Improper oil disposal
- Sediment and pollutants from construction sites
- Hosing down roads and sidewalks

MS4 communities such as those in the Still River watershed are required to implement an Illicit Discharge Detection and Elimination (IDDE) program under Minimum Control Measure #3 of the CT DEEP MS4 General Permit. In this program, municipalities are responsible for finding and eliminating non-stormwater discharges to the storm sewer system. The outfall mapping completed by HVA streamwalks as part of this watershed plan identifies some potential outfalls with illicit discharge. Cities and towns may use this data and work with HVA to locate those outfalls for further investigation. Investigation can be done most effectively in dry weather conditions to isolate discharge other than stormwater. In addition to addressing current illicit discharge, communities must put in place regulation that prevents illicit discharge from draining into surface water. Municipalities that have not already done so should pass ordinances or utilize another regulatory mechanism that prohibit the disposal on non-stormwater discharge into storm drainage systems and develop an action plan to ensure compliance.

<u>Recommended Actions</u>

- Watershed municipalities continue to implement IDDE programs that includes illicit discharge detection, elimination, and prevention by passing and enforcing regulation.
- Municipalities use data, staff and resources provided by WestCOG, HVA, and UCONN's CLEAR to accomplish the implementation of their IDDE programs.
- Conservation organizations provide educational materials to town and city staff regarding how best to implement IDDE programs.
- HVA continue to map and test suspicious, flowing outfalls during streamwalks. Particular attention paid to areas with high industrial or commercial uses such as gas stations. They should continue to flag those outfalls and bring suspected illegal dumping and illicit discharge concerns to the municipalities for further investigation.

Table 4.8.2 Municipal BMPs Recommendations

Recommended Actions & Milestones	Who	Timeframe (Schedule)	Deliverables & Evaluation Criteria	Estimated Costs	Potential Funding Sources
Continue to implement municipal Stormwater Management Programs required by MS4 including outfall mapping, IDDE programming, regulatory updates	Municipalities	Ongoing	• Compliance with MS4 permit requirements and deadlines	$$$$	Municipal funds
HVA and WestCOG continue to assist watershed municipalities during implementation of MS4 Stormwater Management Programs • Share outfall mapping collected during USA, pollution trackdown survey results, and USSR data to identify GI/LID disconnection projects • Provide educational materials, training, and outreach	HVA, WestCOG, UCONN CLEAR/NEMO	0-5 years	• Shared data and information • Shared educational materials	$	
Encourage good housekeeping practices to reduce stormwater pollution as recommended in this watershed plan • Education materials developed and distributed • Ongoing outreach with city and town staff, elected officials, and volunteer commissioners	HVA, UCONN CLEAR/NEMO	Ongoing	• Education materials created • Meetings with municipal staff, officials, and volunteer commissions	$$	
Regulate illicit discharge through • IDDE program that maps, screens, and samples outfalls and catch basins • Establishes IDDE legal authority • Implements discharge removal regulation • Provides education and outreach to municipal staff and the public	Municipalities, HVA (assist through pollution trackdown)	0-5 years	• Compliance with permit deadlines and criteria • Mapping of outfalls, suspicious outfalls, and survey results from outfall and catch basin screening	$$$$	Municipal funds

Recommended Actions & Milestones	Who	Timeframe (Schedule)	Deliverables & Evaluation Criteria	Estimated Costs	Potential Funding Sources
Install and enhance municipal properties to support native habitat and pollinators and reduce stormwater pollution (vegetative buffers, GI/LID retrofits) • Identify areas for invasive management, sustainable landscaping practices and GI/LID retrofits • Works with municipal Public Works Depts. and Parks and Rec. to develop tailored site specific plan at key locations • Assist in installation and maintenance through volunteer groups	HVA	0-5 years Ongoing	•	$$$$	CT DEEP 319 Grant, National Recreation and Park Association

$ = $0 to $5,000 $$ = $5,000 to $10,000 $$$ = $10,000 to $50,000 $$$$ = Greater than $50,000

HVA = Housatonic Valley Association, GI/LID = Green Infrastructure/Low Impact Development CT DEEP = Connecticut Department of Energy and Environmental Protection, WestCOG = Western Connecticut Council of Governments, UCONN = University of Connecticut, CLEAR = Center for Land Use Education and Research, NEMO = Nonpoint Education for Municipal Officials

Habitat Restoration on Municipal-Owned Property

Municipal parks and landscaped areas around municipal properties present a dearth of opportunities for habitat restoration. Town properties with streams can be evaluated for vegetated buffer projects and many properties and parks include landscaped gardens that can be enhanced through native and pollinator friendly plantings. Planting trees and maintaining existing trees will increase ecosystem services. Where needed trees dying of invasive pests such as Emerald Ash Bore should be removed and replaced with immune/resistant varieties such as chestnuts and elms. This is increase biodiversity in many areas as well as overall watershed resilience. Transition zones, areas between landscaped lawn areas and forest areas, can be utilized to provide habitat to animals throughout the urbanized area with the installation of natural landscaping. In areas where invasive plants dominate the landscape whether at a park or other municipal owned property, those invasives should be managed and then replaced with native plantings, with regular maintenance to ensure the success of plantings. Outreach and collaboration with Parks and Recreation Departments as well as Municipal Public Works Departments is key to the implementation and long-term maintenance of these projects. Projects in parks and municipal properties can involve local volunteers, garden clubs, schools groups, and HVA's Still River Watershed Connections participants in order to foster stewardship and educate the public about the efforts of the Still River Watershed Plan.

<u>Recommended Actions</u>

- Look for areas where streams run through public property and determine areas that would benefit from vegetative buffers. Discourage mowing along stream and riverbanks and plant native plants at possible areas.
- Install or enhance landscaped garden areas with native plants and pollinator friendly species. Utilize volunteers from the local community and work with Public Works and Parks and Recreation Departments to do ongoing/long-term maintenance.
- Encourage sustainable landscaping that reduces nutrient loading and stormwater runoff, deters geese populations, and allows rainfall to infiltrate through GI/LID retrofits.

4.9 BMPs on State-Owned Land

State-owned land refers to those properties within the watershed that are owned or managed by either CT DEEP or Connecticut's Department of Transportation. CT DEEP manages Lover's Leap State Park, which includes the confluence of the Still and the Housatonic as well as three boat launches throughout the watershed. Many of the practices recommended to municipal parks also apply to State Parks. There is a opportunity at these locations for habitat restoration, invasives management, and promotion of native species. As with city and town parks, areas in state parks should be evaluated for potential invasives removal and control and areas identified where native trees and shrubs as well as pollinator friendly plants can be established.

Another area CT DEEP can pay particular attention to is boat launches as they are often points of entry for aquatic invasives. As such boat launch signage should be inventories, assuring the presence of signs that inform boaters how to properly clean their boats and reduce invasive transference. Volunteers can take part in CT DEEP's Invasives Investigator program (https://www.ct.gov/deep/cwp/view.asp?a=2702&q=480642&deepNav_GID=1620) in which monitors are trained by CT DEEP to inspect boats at launches for invasives and show boaters proper cleaning techniques and inform them on invasives prevention.

The State of Connecticut Department of Transportation (CT DOT) is subject to the requirements of the MS4 General Permit issued by CT DEEP with the goal to reduce stormwater discharged to surface waters and wetlands. In accordance with this permit CT DOT developed a Stormwater Management Plan (found at https://portal.ct.gov/-/media/DOT/documents/dpolicy/MS4/SWMPFinalSignedpdf.pdf?la=en) that outlines actions to be taken in support of the above stated goal. The Still River watershed is located in District 4 of CT DOG Stormwater Management Plan's Priority Areas. Since the Still River mainstem and some tributaries are listed as impaired, CT DOT is responsible for determining and mapping which state-owned outfalls and catch basins are connected. Additional requirements are similar to those outlined in the Municipal Stormwater Management section, namely, identifying location, source, and results of illicit discharge investigation, disconnecting impervious areas, and installing GI/LID retrofits.

Recommended Actions

- Assess state parks and DEEP owned land for opportunities to install riparian buffers, remove invasives and restore native habitat. Collaborate with HVA's Still River Watershed Connections program to supply student volunteer projects.
- Install signage at all boat launches informing boaters of the threat of invasives and how they can help manage spread through proper boat cleaning and maintenance. Station boat inspectors at boat launches where possible to do inspection, cleaning and outreach to boaters.
- CT DOT compliance with MS4 General Permit requirements.

4.10 Winter Maintenance of Paved Areas

According to a 2014 study on the "Safety Impacts of Deicing Salt" conducted by University of Waterloo, salting roads reduces car collisions by 20% to 85% during the winter. [87] While the safety benefits are clear, the impact on our environment must also be taken into account. During snow melt, road salts impact planted areas alongside roads, highways and driveways and salt is carried with stormwater to streams throughout the watershed. The spike of chlorides in streams impacts the chemical balance which in turn can have deleterious effects on fish and aquatic life reducing biodiversity and creating conditions for invasives species to dominate.[88] Moreover, increased chloride in groundwater has started to pose a threat to human health in certain areas of the Still River such as Brookfield where increased levels have been found in well water. Some municipalities in the region have initiated testing of public wells to pin-point the source of salt contaminants from either bed rock salt or road salts.

USGS has conducted a study of the impacts of salt use in the Milwaukee region [89] and has plans to release an updated report on chloride impact throughout the northeast US. Winter maintenance must balance all these impacts, preserving healthy surface and groundwater while ensuring public safety. While much of these decisions lie with municipal public works departments, residents and business owners play their role to reduce road salting as well. Below are recommendations for winter maintenance whether on the municipal, commercial or homeowner level. General information on the impacts of road salt and how to improve winter maintenance can be found at the Cary Institute for Ecosystem Studies [90] and CT DEEP website [91]. In addition, WestCOG recently completed a winter maintenance study where you can learn more about best practices mentioned above, in addition, what is currently being practiced in the region. You can find it here: https://westcog.org/wp-content/uploads/2019/01/Winter-Maintenance-Guide_Final.pdf and here: https://westcog.org/wp-content/uploads/2019/01/Winter-Maintenance-Baseline-Assessment-Report.pdf

Table 4.9.1 BMPs on State-Owned Land Recommendations

Recommended Actions & Milestones	Who	Timeframe (Schedule)	Deliverables & Evaluation Criteria	Estimated Costs	Potential Funding Sources
Install riparian buffers, remove invasives and restore native habitat on all state-owned land in the watershed • Assess state parks and CT DEEP owned land for opportunities • Collaborate with HVA's Still River Watershed Connections program to supply student volunteer projects	HVA	2-5 years	• Acres of invasives removed • Feet of riparian restoration • Amount of student participation	$$	FCCF, Horizon Foundation
Establish boat launch programming to reduce aquatic invasives • Install signage at all boat launches informing boaters of the threat of invasives and how they can help manage spread through proper boat cleaning and maintenance. • Station boat inspectors at boat launches where possible to do inspection, cleaning and outreach to boaters.	CT DEEP	2-5 years	• Signage installed at all CT DEEP boat access sites • Boat inspector program implemented at key locations • Number of boaters reached	$$	CT DEEP Funds

$ = $0 to $5,000 $$ = $5,000 to $10,000 $$$ = $10,000 to $50,000 $$$$ = Greater than $50,000

HVA = Housatonic Valley Association, CT DEEP = Connecticut Department of Energy and Environmental Protection, FCCF = Fairfield County Community Foundation

Table 4.10.1 Winter Maintenance of Paved Areas Recommendations

Recommended Actions & Milestones	Who	Timeframe (Schedule)	Deliverables & Evaluation Criteria	Estimated Costs	Potential Funding Sources
Municipalities					
Encourage watershed public works departments to utilize resources on the most up to date winter maintenance techniques and equipment • Public works departments can join or follow Clear Roads, a research program that brings together transportation professionals and researchers to develop better winter maintenance practices	Municipal Public Works Departments	Ongoing	• Number of public works departments research salt alternatives	$$	
Properly store salt material in covered and fully contained areas away from streams and lakes on impervious cover to reduce salt material loss. • Assess salt storage to determine proper storage and make adjustments where recommended	Municipal Public Works Departments	0-2 years	• Assessments of road salt facilities • Facility upgrades where needed	$$$	
Encourage Best Management Practices that reduce salt use on public roads: • Pre-treat and pre-wet roads to reduce materials used • Anti-icing treatments prior to storms • Maintain and calibrate road-salting equipment • Clean up accidental salt spills and releases • Collect salt brine from vehicle washing and recycle	Municipal Public Works Departments	0-2 years	• Number of practices implemented • Monitoring results for salt loading in surface water and wells	$$$	
Upgrade winter maintenance equipment where possible • Explore and secure funding sources for equipment purchases • Research possible equipment such as automated spreader controls, road cameras, and live edge/flexible plow blades • Purchase and use new equipment • Monitor salt use to determine reduction	Municipal Public Works Departments, WestCOG	5-10 years	• Funds secured • Equipment replaced	$$$$	

Recommended Actions & Milestones	Who	Timeframe (Schedule)	Deliverables & Evaluation Criteria	Estimated Costs	Potential Funding Sources
Establish low/no salt areas • Survey public opinion to find where lower winter service would be acceptable. • Identify low/no salt areas – areas with low to no traffic in the winter • Discontinue salting or reduce salting in these areas • Install safety signage and conduct outreach to local residents and users about road maintenance changes and safety risks in these areas	Municipalities, CT DOT	2-5 years	• Areas identified and low/no salting practices established • Signage installed and outreach materials distributed	$$$	
Institute road salt alternatives • Research road salt alternatives impact and cost effectiveness • Present findings to Public Works departments to decision making • Implement where logical to reduce environmental impact and salt loading	HVA, Municipal Public Works Departments	0-2 years	• Road salt alternatives outreach materials developed and distributed to Public Works depts.	$$$	
Advocate for flexible regulation that allows public works departments and CT DOT to reduce salting where possible. • Examine local and state laws and ordinances around winter maintenance and safety • Recommend changes in regulation	HVA	2-5 years	• Recommended amendments made	$$	
Homeowners					
Encourage residents to practice smart winter maintenance practices on their property • Develop outreach materials on winter maintenance practices that lead to reduced need for salt use • Distribute materials • Incorporate these materials into the *RiverSmart* education materials (see Education and Outreach section) • Reward residents for salt reduction	HVA	0-2 years Ongoing	• Education materials developed and distributed	$$	

Recommended Actions & Milestones	Who	Timeframe (Schedule)	Deliverables & Evaluation Criteria	Estimated Costs	Potential Funding Sources
Businesses, Institutions and Private Property Maintenance Companies					
Encourage businesses to reduce salt use in the following ways through education materials and outreach programming to facility decision makers: • Offer flexible work schedules during the winter to allow non-essential employees to work from home during winter storms • Request reduced salt application of winter maintenance service providers • Reduce liability for service providers by offering liability relief in exchange for participation in salt reduction classes • Incorporate reduced salt practices into company Environmental Sustainability Plans	HVA, Municipalities	0-2 years Ongoing	• Education materials developed and distributed through *RiverSmart* program for businesses • Meetings held with priority businesses • *RiverSmart* pledges	$$	
Encourage winter maintenance service providers to employ best management practices through outreach and education • Materials developed based on public works recommendations • Outreach and meetings with interested companies	HVA	0-2 years Ongoing	• Education materials developed and distributed through *RiverSmart* program for businesses • Meetings held with winter service providers	$$	

$ = $0 to $5,000 $$ = $5,000 to $10,000 $$$ = $10,000 to $50,000 $$$$ = Greater than $50,000

HVA = Housatonic Valley Association, WestCOG = Western Connecticut Council of Governments, CT DOT = Connecticut Department of Transportation

Recommended Actions

Municipalities

- Encourage watershed public works departments to utilize resources on the most up to date winter maintenance techniques and equipment. Public works departments can follow Clear Roads, a research program that brings together transportation professionals and researchers to develop better winter maintenance practices and join the UCONN Green Snow Pro Initiative to stay up to date with new technology and participate in Connecticut specific initiatives and trainings
- Properly store salt material in covered and fully contained areas away from streams and lakes on impervious cover to reduce salt material loss.
- Practice anti-icing as a proactive treatment to use prior to a storm. Anti-icing is the application of rock salt or liquid deicer that prevents the snow and ice from bonding to the pavement, applied prior to the storm, allowing for less material needed overall.
- Pre-treat roads with brine solution. Pre-treating refers to spraying rock salt with a brine or proprietary chemical that is then applied to the roadway after the road has been plowed. This jump starts the melting process.
- Pre-wet road to allow salt to stick to roadways more effectively. Pre-wetting refers to the application of brine or other proprietary liquid to the salt as it is coming out of the spinner. Having a similar effect to pre-treating. Both pre-treating and pre-wetting allow operators to use less material to see the same result.
- Maintain and calibrate road-salting equipment to measure the exact amount of salt applied.
- Explore funding sources and upgrade winter maintenance equipment such as:
    - Automated spreader controls which can adjust salt amounts according to ground curvature, hills, and speed to reduce bounce of scatter of excess salt
    - Road cameras and pavement temperature sensors that can give live updates to travelers and public works crew on roadway conditions and need for salting.
    - Live edge or flexible plow blades that conform to roadway surfaces reducing snow and ice left behind during plowing.
- Clean up accidental salt spills and releases from vehicles.
- Collect salt brine from vehicle washing and recycle material for use on roadways.
- Survey public opinion to find where lower winter service would be acceptable. Identify low/no salt areas - namely non-arterial roads and parking areas near lakes, streams, and the mainstem of the Still that experience lower traffic volume. Signage indicating lower winter maintenance areas and appropriate speed can inform travelers to exercise greater caution and adjust driver expectation when driving in these areas.
- Explore road salt alternatives such as those below. It should be noted that these products may be more costly and have their own impact on surface water health.
    - Sand, grit-salt, or different types of salt products
    - Corn steepwater
    - De-sugared molasses
    - Cheese and pickle brine
    - Fermentation byproducts
- Examine local and state laws and ordinances around winter maintenance and safety. Advocate for flexible regulation that allows public works departments and CT DOT to reduce salting where possible.

Homeowners

- Encourage residents to practice the following:

    - Shovel snow early and often to prevent icing, which in turn requires greater amount of salt.
    - Remove as much ice as possible to allow salt to be most effective on a thin layer of ice.
    - Remove slush during freeze/thaw conditions to prevent ice from reforming.
    - Reduce salt use on driveways, utilize salt alternatives, and plowing. Use approximately one handful of rock salt per square yard of pavement and about one handful per every three yards of calcium chloride.
- Incorporate salt reduction practices into the *RiverSmart* pledge activities
- Educate residents of the impacts of salt use on freshwater systems, groundwater, and they're gardens.

Businesses, Institutions and Private Property Maintenance Companies

- Encourage businesses to offer flexible work schedules during the winter to allow non-essential employees to work from home during winter storms.
- Educate business owners on salt impacts and encourage businesses to:
    - Request reduced salt.
    - Reduce liability for service providers by offering liability relief in exchange for participation in salt reduction classes implemented by municipalities.
    - Develop or incorporate reduced salt practices into company Environmental Sustainability Plans.
- Work with service providers to store salt appropriately and employ practices recommended to public works departments outlined above where possible.

4.11 Agricultural BMPs

While very little of the watershed is agricultural (4% of land use) there are a few farms and agriculturally zoned land, for example: Holbrook Farm, Blue Jay Orchard, and Hollandia Nursery in Bethel, and Sunny Valley Farm in New Milford. The majority of agriculture is vegetable, orchard or nurseries and very few, if any, manage livestock. This means the threat to water quality is mainly from fertilizers and less likely to come from manure that can lead to greater levels of *E. coli*. Farm managers can help mitigate nutrient loading and stream sedimentation by installing vegetated buffers and managing fertilizer and pesticide use to minimize runoff from fields. As described previously, vegetated buffers along stream edges reduce stormwater velocity, bank erosion, and nutrient loading, allowing runoff from field to infiltrate. Slow release fertilizers and well-timed application can ensure nutrient allocation is maximized and fertilizer is not wasted by washing away with rainfall. Other solutions to crop management that can protect stream health include:

- Cover crops
- Soil management that reduces soil disturbance - growing a diverse selection of crops, rotating crops so that living plants occupy fields at all times, and keeping bare soil covered
- Contour planting
- Filter berms
- Livestock exclusion fencing and manure storage where livestock present
- Use of organic and biodynamic practices on farmland
- Use of Integrated Pest Management practices
- Soil fertility testing and nutrient management planning

There are a number of resources available to farms to help with best management practices. The US Department of Agriculture offers grants and technical assistance programs through the Natural Resource Conservation Service's Regional Conservation Partnership Program; Agricultural Management Assistance (AMA), Environmental Quality Incentives Program (EQIP), Conservation Stewardship Program (CCP), Watershed and Flood Prevention Operations Program (PL 83-566 Watershed

Program). In the past the State of Connecticut Department of Agriculture has offered farm planning help through the Environmental Assistance Program (found here: https://www.ct.gov/doag/cwp/view.asp?a=3260&q=398986).

For areas that are more environmentally sensitive the federal government will help offset the costs of putting portions of farmland under conservation easement through the Conservation Reserve Program (administered through Farm Service Agency).

Recommended Actions

- Encourage agricultural businesses to put in place Sustainable Farm Management Plan that include best practices outlined above to reduce pollution caused by farm practices.
- Support farms in sustainable farm practices and implementing through grant and technical support.
- Promote the State Department of Agriculture's Purchase of Development Rights program and encourage farmer participation.

Table 4.11.1 Agricultural BMPs Recommendations

Recommended Actions & Milestones	Who	Timeframe (Schedule)	Deliverables & Evaluation Criteria	Estimated Costs	Potential Funding Sources
Encourage agricultural businesses to put in place Sustainable Farm Management Plan that includes best practices above to reduce pollution caused by farm practices • Develop outreach materials with best management practices for farms to protect or restore water quality • Distribute materials	HVA	0-2 years	• Education materials distributed	$$	
Support farms in sustainable farm practices and implementing through grant and technical support • Collate a list of potential funding sources for farmers to assist in sustainable farm practices • Distribute to farmers and assist in securing funding where possible	HVA	0-2 years Ongoing	• Grant funding list included in education materials • Number of farms implement BMPs (filter strips, vegetative buffer strips, etc.)	$	

$ = $0 to $5,000 $$ = $5,000 to $10,000 $$$ = $10,000 to $50,000 $$$$ = Greater than $50,000

HVA = Housatonic Valley Association

5. SITE-SPECIFIC BMP CONCEPTS

Sites in this section were identified through stream walks using the Unified Stream Assessment (USA) and Unified Stream and Subwatershed Assessments (USSR) protocols developed by the Center for Watershed Protection. HVA assessed over 40 sites for implementation project potential. The following thirteen site sites were chosen based on need for pollutant load reduction, partnership potential, and project viability. The Still River Partners then ranked a top ten sites (sections 5.1 – 5.10) from most important to treat water quality to the least. The top ten sites are presented by order of that ranking.

Each of the first top ten sites includes a review of the existing conditions, a conceptual stormwater management diagram, a project description, an estimated reduction in pollutants, and an implementation budget. HVA consultants Didona Associates – Landscape Architects assessed each site through conversations with site managers, owners, staff, and other stakeholders as well as additional site visits.

The last three sites are sites in which BMPs were already installed or are in the process of installation. Those efforts are outlined in sections 5.11 through 5.13. Lastly section 5.14 lists potential sites that did not rank as highly but could prove to be good sites for future BMPs as partnership and funding allows.

Please note that the concept diagrams are recommendations only and do not reflect final designs or budgets. More detailed collaboration from all relevant stakeholders as well as intensive site analysis will be required to develop plans that can be bid and installed. Therefore, these concepts represent possible project ideas to address water quality in the Still River watershed and are subject to change through further exploration and development.

BMP Tools and Their Benefits

BMP	Type	Application	Target Pollutants	Notes
Filtration Structure	Subterranean	Filtration	Solids, hydrocarbons, nutrients and metals	A grated inlet with filter inline that targets open areas that may contain high amounts of specific pollutants
Hydrodynamic Separator	Subterranean	Separation	Trash, debris, sediment, and hydrocarbons	Inline or grated inlet
Bio Filtration Swale	Channel	Filtration Treatment	Hydrocarbons, nutrients, and heavy metals	Vegetated swale that provides a linear treatment along streets, drives and parking areas.
Bio Filtration Basins or Rain Gardens	Basin	Filtration Treatment	Hydrocarbons, nutrients, and heavy metals	Vegetated basin installed to intercept and bio retain runoff mimicking natural hydrology
Permeable Pavements	Pavement	Infiltration Treatment Storage	Hydrocarbons, nutrients	Several types including bituminous, concrete, pavers and gravel. Can also be decorative. Reduces icing. Should not be installed in slopes that exceed 5%.
Riparian Buffers	Vegetated Areas	Filtration Infiltration Treatment Storage	Hydrocarbons, nutrients, solids, and heavy metals	Comprised of native forbs, shrubs and trees placed between impervious surfaces and receiving water body.
Level Spreader	Structure	Erosion Control	Reduces velocity of water	Prevents scouring at end of pipe or swale
Rain Barrels and Rainwater harvesting	Structure	Storage	Collect and store water for later use	Conservation of water and water source for gardens








Examples of *BMPs*

1. A riparian buffer garden in a children's garden with a permeable gravel trail
2. Two views of a riparian buffer at a public park with educational signs
3. Permeable paver driveway entrance at a senior housing community
4. Lawn to meadow at multi-family housing community
5. Rain garden at a private residence with permeable gravel path
6. Downspout disconnect to rain barrel
7. Biofiltration swale as a filter strip to parking area

The plants add filtration, habitat and beauty to the BMP

Joe Pye weed, aster, baptisia and cardinal flower are just a few of the native perennials that add carefree color to the landscape, habitat to the pollinators and filtration of the runoff. The trees such as river birch and shadblow as well as the shrubs like winterberry, summersweet, and red twig dogwood add structure and winter interest to the garden and stabilize the soil, soak up nutrients and create shade to cool the water. These native plants are a beautiful way to treat our water.

5.1 Brookfield Public Works

Address: 81 Grays Bridge Rd., Brookfield, CT 06804
Coordinates: 41.438202, -73.403207
Sub watershed: Still River Mainstem
Location: Brookfield, Connecticut
Phase 1 MS4 town

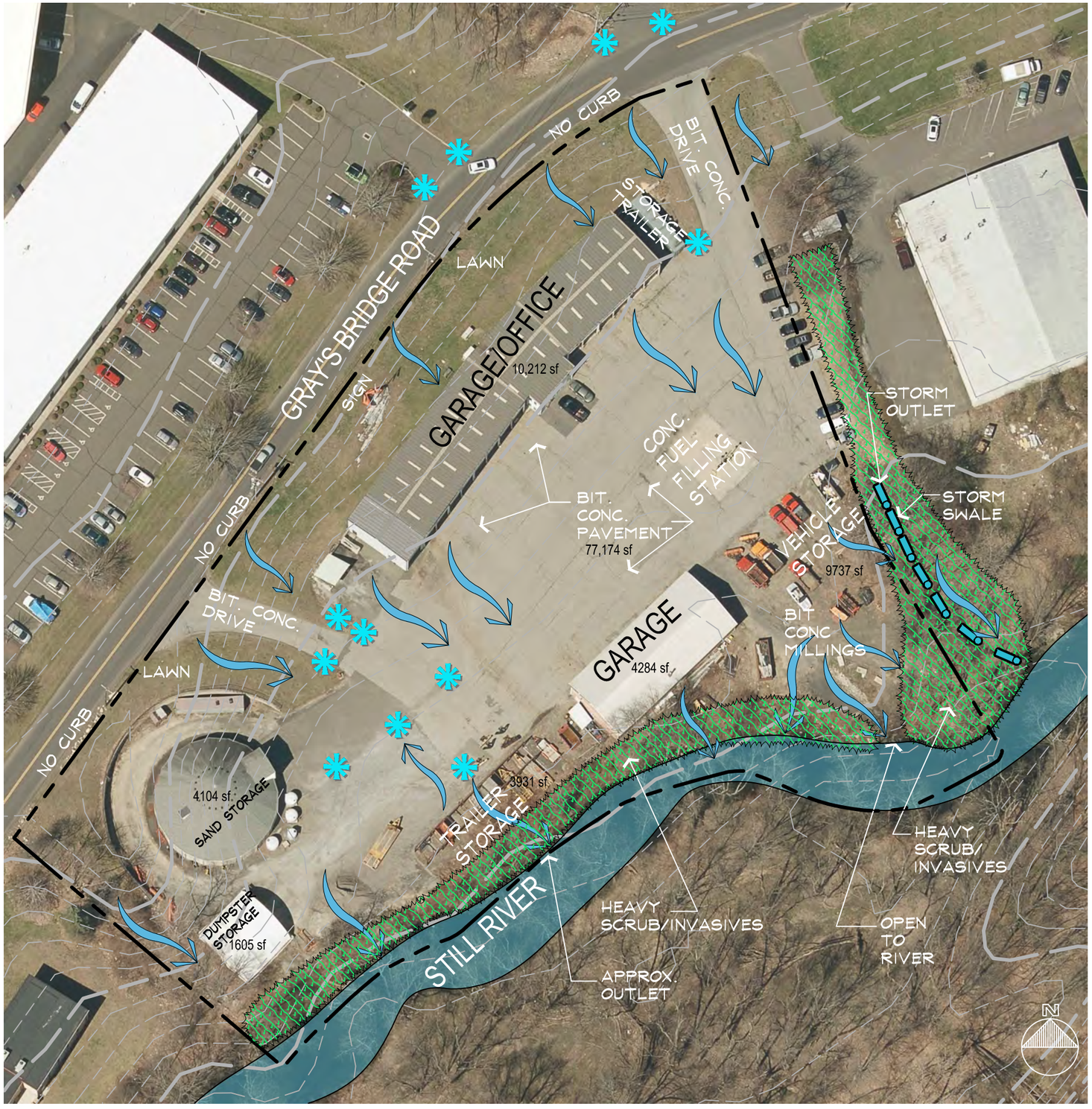
Site Area: 161,500 SF
Impervious Area: 135,343 SF
% Impervious: 83%

Site Description: Brookfield Public Work's approximately 135,343 square feet of impervious cover is comprised of 20,116 sf buildings/outbuildings and 122,765 impervious pavement. It is bounded to the east /west by commercial properties, to the north by Grays Bridge Road and to the south by the Still River. It is accessed by Grays Bridge Road at curb cuts on the north boundary of the property. There are no drains or curbs on Grays Bridge Road along the north boundary of the property.
The site pitches from the road to the Still River at various slopes and stormwater sheet drains toward the river. Some of the runoff enters into storm drains that outlet at two points into the Still River. The balance of the runoff sheet drains into the river through bare lawn, eroded channels, equipment storage areas and bituminous millings and enters the river through a barrier of non-native invasive species. At the south eastern boundary, an end wall releases stormwater water into an eroded channel that flows directly into the river. There is a sizeable area with grass, bare earth and bituminous millings located to the south of the storage sheds. Throughout the site, there is salt storage, uncovered fuel storage, equipment, and gravel piles. Snow is plowed to the gravel parking area at the south east corner of the property. These existing conditions lead to many concerns of pollutants entering the Still River with no or little treatment.

Pollutant Concerns: Suspended Solids
Chlorides
Hydrocarbons
Heavy Metals

Brookfield Public Works: Location map

Brookfield Public Works: Photos of existing conditions



LEGEND

- PROPERTY LINE
- 2 FOOT CONTOUR LINE
- 10 FOOT CONTOUR LINE
- EXISTING SWALE
- EXISTING CATCH BASIN
- STILL RIVER
- SHEET FLOW

EXISTING CONDITIONS

BROOKFIELD PUBLIC WORKS

81 GRAYS BRIDGE ROAD
BROOKFIELD, CONNECTICUT
PROJECT #1

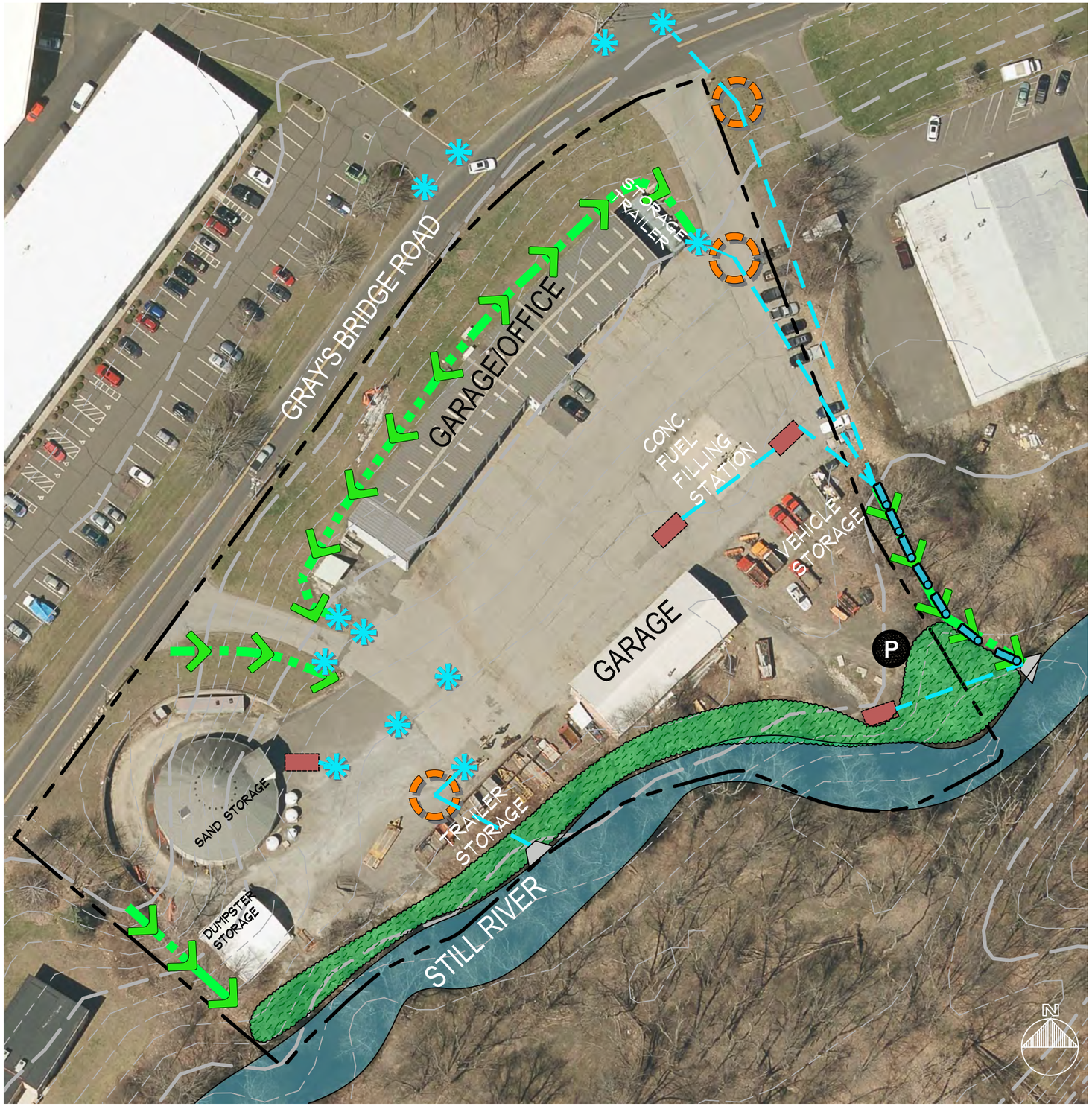
The Brookfield Public Works is a utilitarian landscape designed mainly for the purpose of storing and servicing the equipment needed to perform the various maintenance and installation tasks of the Town. 83% of the 3.7 Acre site is impervious. The areas used for storing equipment and vehicles around the whole perimeter of the site includes the south property line are adjacent to the Still River. The existing buffer is full of invasive plants that do not provide the diversity of treatment and habitat. Storage of sand and salt as well as snow during the winter is a source of other pollutants. A refueling station has potential for accidently contamination. This whole site including the road drains right to the river.

The challenges for implementing BMPs on this property are:

- The utilitarian nature of the site does not warrant a decorative landscape
- The storage of equipment, vehicles, materials, sand, salt and snow and the refueling station requires all BMPs to be filtration not infiltration. This limits the BMP selection.
- The public is discouraged from entering the site.
- The road is not curbed allowing runoff to enter site.
- The storage/snow storage area is adjacent to the Still River with little area for treatment
- The plants of the existing vegetated buffer along the Still River and existing drainage swale are invasive species and the removal and replanting takes commitment and vigilance
- The existing drainage swale appears to be on neighbor's property therefore cooperation and maybe easements will be required

The opportunities for implementing BMPS on this property are:

- The Public Works Director and town are receptive to the installation of BMPs at this site
- The major areas of green space on the site are located north of the garage/office building and between the end of the parking area and the river. This allows for larger areas for interception and treatment.
- The Public Works Director would be interested in a small seating/picnic area for the BPW employees only which provides an opportunity for ownership of the buffers and the river.
- The amount of impervious and possible contaminants provide a greater opportunity to show improvement of the TMDLs.
- The location of these structures in the public works facility offer demonstration to the BPW employees of design, installation and monitoring that can then be translated to implementation throughout the watershed on town property.



LEGEND

- PROPERTY LINE
- 2 FOOT CONTOUR LINE
- 10 FOOT CONTOUR LINE
- EXISTING CATCH BASIN TO BE INSPECTED, CLEANED AND IMPROVED
- STILL RIVER
- PROPOSED RIPARIAN BUFFER
- PROPOSED LEVEL SPREADER
- PROPOSED BIOFILTRATION SWALE
- PROPOSED STORM LINE
- PROPOSED FILTRATION STRUCTURE
- PROPOSED HYDRODYNAMIC SEPARATION STRUCTURE
- P — PROPOSED PICNIC AREA

PROPOSED BMP PLAN
BROOKFIELD PUBLIC WORKS

81 GRAYS BRIDGE ROAD
BROOKFIELD, CONNECTICUT
PROJECT #1

The concept of this Stormwater Management Concept Plan for the Brookfield Public Works is "treat the water first" and then provide some opportunity for employees to observe and monitor the effectiveness of the treatment train. With this more utilitarian approach, the BMPs recommended are:

1. Installation of subterranean filtering and hydrodynamic separation structures in the main area of the site in order to separate debris, sediments, and hydrocarbons as well as filtration of solids, hydrocarbons, nutrients and heavy metals from the runoff.
2. The two green areas on site provide opportunities for substantial bio filtration and conveyance.
    a. The biofiltration swale at the north property line is at the bottom of the slope from Grays Bridge Road. It will intercept the water before it pools at the building as well as improve the view of the building at the road and decrease the amount of lawn to be mowed.
    b. The southern BMP is a combination of a bio filtration swale developed in the existing swale and renovation of the vegetation at the river into a native riparian buffer. This is the last treatment before the runoff enters the river and also provides shade to the cool the water before it enters the river.
    c. Level spreaders at the end of each storm drain outlet to reduce the velocity of the water before it enters the river.
3. A picnic area is an place for congregation, eating and access to the river is a part of this plan as an opportunity for the BPW employees to enjoy the beauty of the river as well as observe the improvements to the river due to the installation of this treatment train.

The combined BMP treatment train has an impressive impact on the water quality of the runoff from Greys Bridge Road and the Brookfield Public Works as it exits into the Still River. The water will be cleaner and cooler. Using the STEPL 10ws urban tool, we were able to calculate the Total Maximum Daily Load (TMDL) improvement for many of the pollutants. Nitrogen and phosphorus are improved by over 30%. The subterranean filters and separation units improve the TMDL for sediments by 60% and the BOD by 40%. The filters also provide a measure of safety from any leaching or spills that could occur on the site. The location of the BMPs also provide easy access for cleaning and monitoring and since the BPW has the equipment to clean roads and catch basins, they will be able to maintain the structures.

These plans are only recommendations that are meant to show a possible treatment train for the property. More investigation, accurate surveys and detailed plans will be required prior to the installation of the BMPs. Therefore, the costs for installation are only expressed as a potential budget.

Brookfield Public Works: Budget Calculation Table

BMP	Quantity	Unit Cost	Budget number
Filtration Structure and Hydrodynamic Separator	7	$15,000	$105,000
Biofiltration Swale	641 lf	$50/lf	$32,050
Riparian Buffer	12,518/sf	$1/sf	$12,518
Picnic Table	1	200	$200
		budget	$149,768

5.2 Bethel Public Works

Address: 1 Sympaug Park Rd., Bethel, CT 06801
Coordinates: 41.352624, -73.417260
Subwatershed: Sympaug Brook
Location: Bethel, Connecticut
Phase1 MS4 town

Site Area: 326,057 SF
Impervious Area: 147,157 SF
% Impervious: 45%

Site Description: Bethel Public Works 147,157 square feet of impervious cover is comprised of 35,912 sf of buildings/outbuildings and 111,245 square feet of impervious pavement. It is bounded by the railroad to the west, industrial property and swamp to the north, transfer station to the south and the swamp to the east. The site pitches from the center to the swamp on the north and east property lines. The transfer station's two drives pitch into the south side of the BPW parking area. The western parking area is extremely flat with a slight pitch to a low point at the main driveway entrance. The rear parking area contains several existing catch basins with two outlet points in the swamp. Vehicle and equipment are stored in the area between the BPW buildings and the swamp to the east. There are uncovered fueling stations, equipment, and materials storage throughout the site leading to a potential for stormwater pollutants from spills and leaks into the swamp. Snow is plowed and stored in areas adjacent to the swamp. These existing conditions lead to many concerns of pollutants entering the Sympaug Brook subwatershed and eventually the Still River with no or little treatment.

Pollutant Concerns: Suspended Solids
Chlorides
Hydrocarbons
Heavy Metals

Bethel Public Works: Location Map






Bethel Public Works: Photos of Existing Conditions

LEGEND

- PROPERTY LINE
- 2 FOOT CONTOUR LINE
- 10 FOOT CONTOUR LINE
- EXISTING DRAIN PIPE
- EXISTING CATCH BASIN
- SCRUB/INVASIVE AREA
- SHEET FLOW

EXISTING CONDITIONS

BETHEL PUBLIC WORKS

1 SYMPAUG PARK ROAD
BETHEL, CONNECTICUT
PROJECT #2

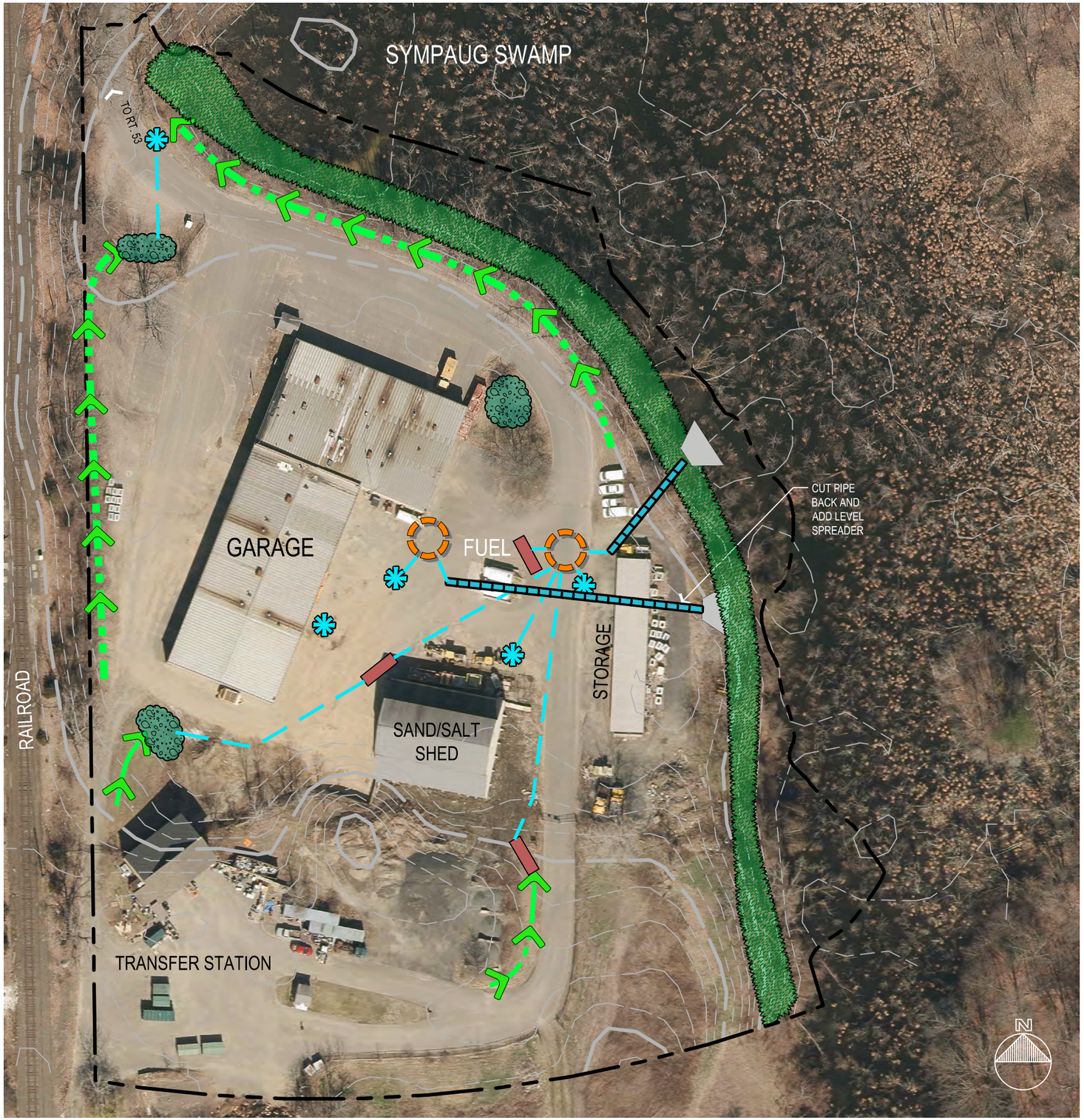
Similar to the Brookfield Public Works, the Bethel Public Works is a utilitarian landscape designed mainly for the purpose of storing and servicing the equipment needed to perform the various maintenance and installation tasks of the Town. The property includes the transfer station and a large green area at the west of the property including part of the swamp. 45% of the 7.5 Acre site is impervious. The areas used for storing equipment and vehicles includes the west property line adjacent to the swamp. The existing buffer is full of invasive plants that do not provide the diversity of treatment and habitat. Storage of sand and salt as well as snow during the winter is a source of other pollutants. A refueling station has potential for accidently contamination. This whole site drains right to the swamp.

The challenges for implementing BMPs on this property are:

- The utilitarian nature of the site does not warrant a decorative landscape
- The storage of equipment, vehicles, materials, sand, salt and snow and the refueling station requires all BMPs to be filtration not infiltration. This limits the BMP selection.
- The public is discouraged from entering the site.
- The storage/snow storage area is adjacent to the swamp
- The plants of the existing vegetated buffer along the swamp are invasive species and the removal and replanting takes commitment and vigilance

The opportunities for implementing BMPS on this property are:

- The Public Works Director, Assistant Public Works Director, Town Planner and town staff are receptive to the installation of BMPs at this site
- The major area of green space on the site is located adjacent to the swamp. This allows for for interception and treatment.
- The amount of impervious and possible contaminants provides a greater opportunity to show improvement of the TMDLs of pollutants into the watershed.
- The location of these structures in the public works facility offer demonstration to the BPW employees of design, installation and monitoring that can then be translated to implementation throughout the watershed on town property.



LEGEND

- PROPERTY LINE
- 2 FOOT CONTOUR LINE
- 10 FOOT CONTOUR LINE
- EXISTING CATCH BASIN TO BE INSPECTED, CLEANED AND IMPROVED
- EXISTING DRAIN PIPE
- PROPOSED RIPARIAN BUFFER
- PROPOSED LEVEL SPREADER
- PROPOSED BIOFILTRATION SWALE
- PROPOSED STORM LINE
- PROPOSED FILTRATION STRUCTURE
- PROPOSED HYDRODYNAMIC SEPARATION STRUCTURE
- PROPOSED RAIN GARDEN

PROPOSED BMP PLAN

BETHEL PUBLIC WORKS

1 SYMPAUG PARK ROAD
BETHEL, CONNECTICUT
PROJECT #2

The concept of this Stormwater Management Concept Plan for the Brookfield Public Works is "treat the water" and then provide some opportunity for employees to observe and monitor the effectiveness of the treatment train. With this more utilitarian approach, the BMPs recommended are:

1. Installation of subterranean filtering and hydrodynamic separation structures in the main area of the site in order to separate debris, sediments, and hydrocarbons as well as filtration of solids, hydrocarbons, nutrients and heavy metals from the runoff.
2. The two green areas on site provide opportunities for substantial bio filtration and conveyance.
    a. The biofiltration swale/basins at the west property line is at the bottom of the slope from the railroad. It will intercept the water before it pools at the parking.
    b. The northern/western BMP is a renovation of the vegetation at the swamp into a native riparian buffer. This is the last treatment before the runoff enters the swamp.
    c. Level spreaders at the end of each storm drain outlet to reduce the velocity of the water before it enters the swamp.

The combined BMP treatment train has an impressive impact on the water quality of the runoff from the railroad, transfer station and public works properties as it exits into the Sympaug Swamp/Brook. The water will be cleaner and cooler. Using the STEPL 10ws urban tool, we were able to calculate the Total Maximum Daily Load (TMDL) improvement for many of the pollutants. Nitrogen and phosphorus are improved by over 30%. The subterranean filters and separation units improve the TMDL for sediments by 36% and the BOD by 36%. The filters also provide a measure of safety from any leaching or spills that could occur on the site. The location of the BMPs also provide easy access for cleaning and monitoring and since the BPW has the equipment to clean roads and catch basins, they will be able to maintain the structures.

These plans are only recommendations that are meant to show a possible treatment train for the property. More investigation, accurate surveys and detailed plans will be required prior to the installation of the BMPs. Therefore, the costs for installation are only expressed as a potential budget.

Bethel Public Works: Budget Calculation Table

BMP	Quantity	Unit Cost	Budget number
Filtration Structure and Hydrodynamic Separator	5	$15,000	$75,000
Biofiltration Swale	863 lf	$50/lf	$43,150
Biofiltration Basins	2632 sf	$20/sf	$52,640
Riparian Buffer	19428sf	$1/sf	$19,428
		budget	$190,218

5.3 Prince of Peace Lutheran Church

Address: 119 Junction Rd., Brookfield, CT 06804
Coordinates: 41.454276, -73.399086
Subwatershed: Still River Mainstem
Location: Brookfield, Connecticut
Phase 1 MS4 town

Site Area: 192,000 SF
Impervious Area: 94, 042 SF
% Impervious: 49%

Site Description: The Prince of Peace Lutheran Church's approximater 94,042 impervious area is comprised of 23,422 sf of building and 70,620 sf of impervious pavement. It is bounded to the north by Junction Road, the east by the former rectory property of the church and the Still River, the south by a cemetary, and to the west by commercial property. The church is located on a knoll that slopes to the drive or a retaining wall. There is significant green space between the road and the church with a significant amount of mown lawn. The main entrance drive leads to the front entrance of the church and drop off and continues into the parking lots and driveway that encircles the church and intersects the entrance drive to the north of the church. There is a significant vegetated area between that drive and the Still River. The parking lot and driveways drain into a storm drain system with several catch basins and two outfalls that release limited treated water into the Still Mainstem. Both outfalls have a significant amount of gullying that HVA noted during USA stream walks. The pavement is pitched and the storm drains connected in such a way that all the storm water makes its way to one catch basin near the outfall adjacent to the river. After meeting with the church's Facility and Grounds Committee, there is initial interest in installing stormwater system that also provides opportunities for recreation, education and beauty.

Prince of Peace Lutheran Church: Location Map






Prince of Peace Lutheran Church: Photos of Existing Conditions

LEGEND

- PROPERTY LINE
- 2 FOOT CONTOUR LINE
- 10 FOOT CONTOUR LINE
- EXISTING CATCH BASIN
- STILL RIVER
- SCRUB/INVASIVE AREA
- SHEET FLOW

EXISTING CONDITIONS
PRINCE OF PEACE CHURCH

119 JUNCTION ROAD
BROOKFIELD, CONNECTICUT
PROJECT #3

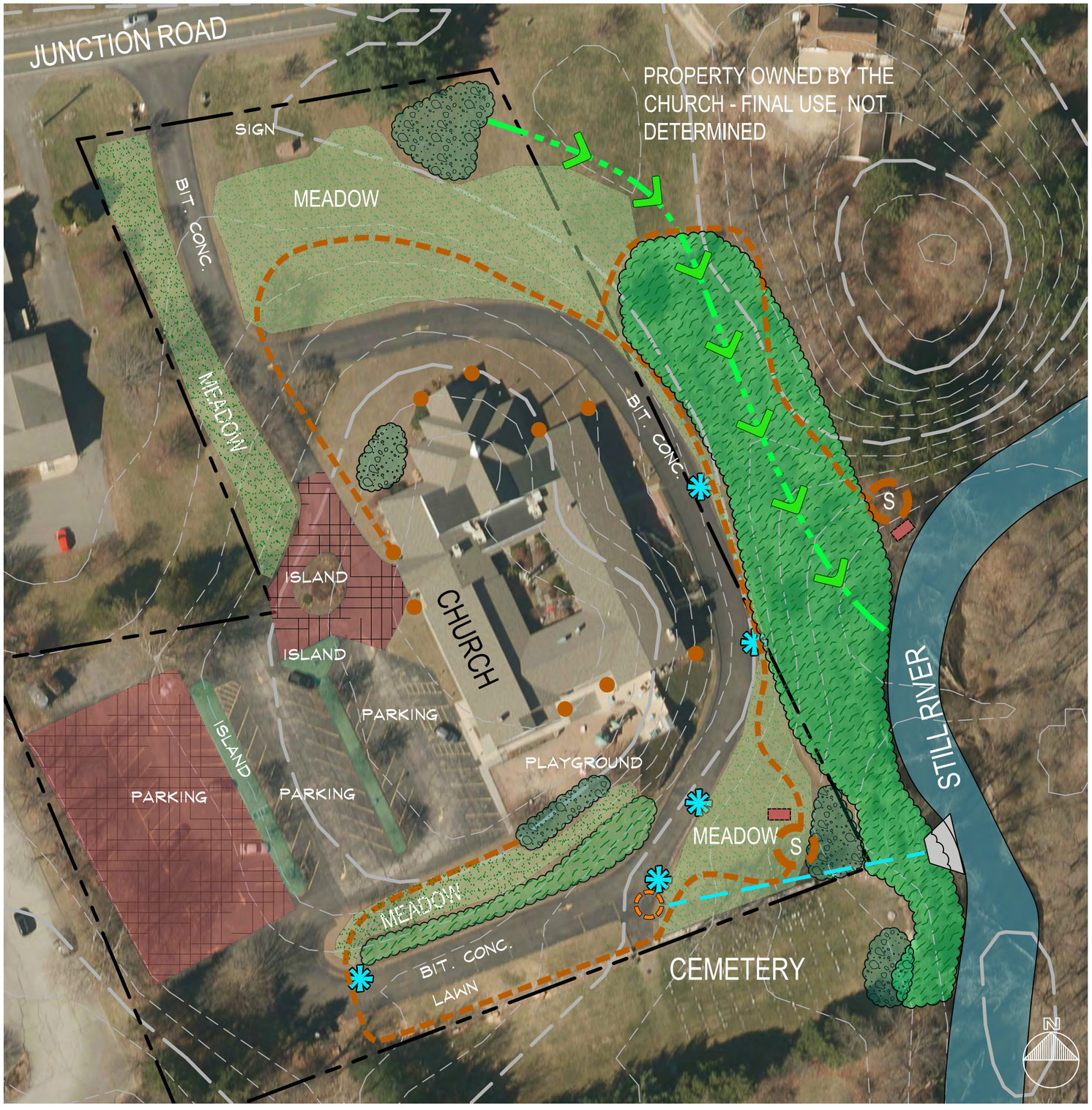
The Prince of Peace Lutheran Church landscape is simple and monoculture. It consists of mainly lawn with some shade and flowering trees planted at the main entrance and in and around the parking areas. There are some overgrown evergreen screens, lawn and a large vegetated area with many invasive species. The maintenance of the landscape is a great concern. The interest of the church is tempered with the concern of maintenance and sustainability. There is a playground area to the south of the church and the committee seemed interested in the idea of creating a landscape that incorporates trails, signs, seating areas as an extension of that recreational asset.

The challenges for implementing BMPs on this property are:

- The monoculture landscape is easy to maintain but provides no treatment to the runoff
- The property next door that is still owned by the church may be sold
- The church has installed gardens in the past and has had difficulty maintaining them therefore maintenance is a major challenge
- The plants of the existing vegetated buffer along the Still River contain invasive species and the removal and replanting takes commitment and vigilance
- The outfalls into the Still River have already scoured to river bank

The opportunities for implementing BMPS on this property are:

- The church is cautiously receptive to the installation of BMPs at this site
- The major areas of green space on the site are located between the road and the church and the drive and the river. This allows for larger areas for interception and treatment.
- The church would be interested in a plan that includes opportunities for a trail, signs, and gathering area for the children.
- The existing untreated runoff will provide opportunity of improvement to the water quality once treatment is installed.
- The parking areas are in need of renovation therefore permeable pavement as an infiltration and treatment BMP is viable.
- There are no major sources for contamination, therefore the BMPs can treat water quality as well as infiltrate into the ground water providing greater opportunities in BMP selection.



LEGEND

- PROPERTY LINE
- 2 FOOT CONTOUR LINE
- 10 FOOT CONTOUR LINE
- EXISTING CATCH BASIN TO BE INSPECTED, CLEANED AND IMPROVED
- STILL RIVER
- PROPOSED RIPARIAN BUFFER
- PROPOSED PERVIOUS PAVEMENT
- PROPOSED MEADOW
- PROPOSED LEVEL SPREADER
- PROPOSED BIOFILTRATION SWALE
- PROPOSED STORM LINE
- PROPOSED TRAIL
- PROPOSED SIGN
- PROPOSED HYDRODYNAMIC SEPARATION STRUCTURE
- PROPOSED SEATING AREA
- PROPOSED RAIN GARDEN
- PROPOSED RAIN BARREL

PROPOSED BMP PLAN

PRINCE OF PEACE CHURCH

119 JUNCTION ROAD
BROOKFIELD, CONNECTICUT
PROJECT #3

The concept of this Stormwater Management Concept Plan for the Prince of Peace Lutheran Church is to create an interactive landscape that provides opportunities for recreation, education, respite, beauty as well as water quality and quantity treatment. With this more comprehensive approach, the BMPs recommended are:

1. Subterranean hydrodynamic separation structures will separate debris, sediments, and hydrocarbons from the runoff.
2. The two main green areas on site provide opportunities for substantial bio filtration/infiltration and conveyance.
    a. The biofiltration swales/basins will intercept the water before is released in the river, treat it, infiltrate some to reduce velocity and improve water quality. They will provide natural habitats that can be part of an integrated trail/education system.
    b. Educational signage along the trails will provide information about the Still River, the habitat, the history and the outcomes of the BMP treatment.
    c. Level spreaders at the end of each storm drain outlet will reduce the velocity of the water before it enters the river.
3. Permeable pavement including pervious asphalt and/or permeable pavers will allow for reduction of quantity of water exiting the outfalls and the site as well as a more decorative entry focal point.
4. Rain barrels can collect roof drainage as well as provide water for the plants.
5. Lawn to meadow program will reduce the nitrogen and phosphorus in the runoff as well as provide habitat and reduce maintenance.

The combined BMP treatment train with the inclusion of trails, signs, seating and gathering areas will have an impressive impact on the water quality of the runoff from the site as it exits into the Still River. The water will be cleaner and cooler. Using the STEPL 10ws urban tool, we were able to calculate the Total Maximum Daily Load (TMDL) improvement for many of the pollutants. Nitrogen and phosphorus are improved by over 60%. The subterranean filters and separation units improve the TMDL for sediments by 75% and the BOD by 12%.

These plans are only recommendations that are meant to show a possible treatment train for the property. More investigation, accurate surveys and detailed plans will be required prior to the installation of the BMPs. Therefore, the costs for installation are only expressed as a potential budget.

Prince of Peace Lutheran Church: Budget Calculation Table

BMP	Quantity	Unit Cost	Budget number
Filtration Structure and Hydrodynamic Separator	1	$15,000	$15,000
Bio infiltration Swale	408 lf	$50/lf	$20,400
Bio infiltration Basin/Rain Garden	2632 sf	$20/sf	$52,640
Riparian Buffer	31,382 sf	$1/sf	$31,382
Permeable Pavement	21,841 sf	$10/sf	$210,841
Lawn to Meadow	30,000 sf	$1/sf	$30,000
Rain Barrels	9	100/ea	$900
		budget	$361,163

5.4 Danbury Fire Department

Address: 19 New St., Danbury, CT 06810
Coordinates: 41.394389, -73.455562
Subwatershed: Still River Mainstem
Location: Danbury, Connecticut
Phase I MS4 town

Site Area: 67,385 SF
Impervious Area: 43,164 SF
% Impervious: 64%

Site Description: The Danbury Fire Department on New St. impervious area is comprised of 9247 square feet of buildings/outbuildings and 33,917 square feet of pavement. The site drains from New Street to Park Pond Brook through two outfalls and sheet runoff. The site is bounded by New Street to the west, Parks Pond Brook to the east, and commercial properties to the north and south. There is a significant end wall structure located at the southeast corner of the property that includes outfalls into Parks Pond Brook from the southern area of the property and the southern commercial properties. There are two green spaces at the northern and southern property line and catch basins in the parking areas that collect most of the parking runoff. At the northeastern corner there is a leak off the collects the balance of the parking runoff. Along the brook there is storage of vehicles and equipment.

Pollutant Concerns: Suspended Solids
Chlorides
Hydrocarbons
Heavy Metals

Danbury Fire Department: Location Map

Danbury Fire Department: Photos of Existing Conditions

LEGEND

- PROPERTY LINE
- 2 FOOT CONTOUR LINE
- 10 FOOT CONTOUR LINE
- EXISTING SWALE
- EXISTING CATCH BASIN
- STILL RIVER
- SCRUB/INVASIVE AREA
- SHEET FLOW

EXISTING CONDITIONS
DANBURY FIRE DEPARTMENT

19 NEW STREET
DANBURY, CONNECTICUT
PROJECT #4

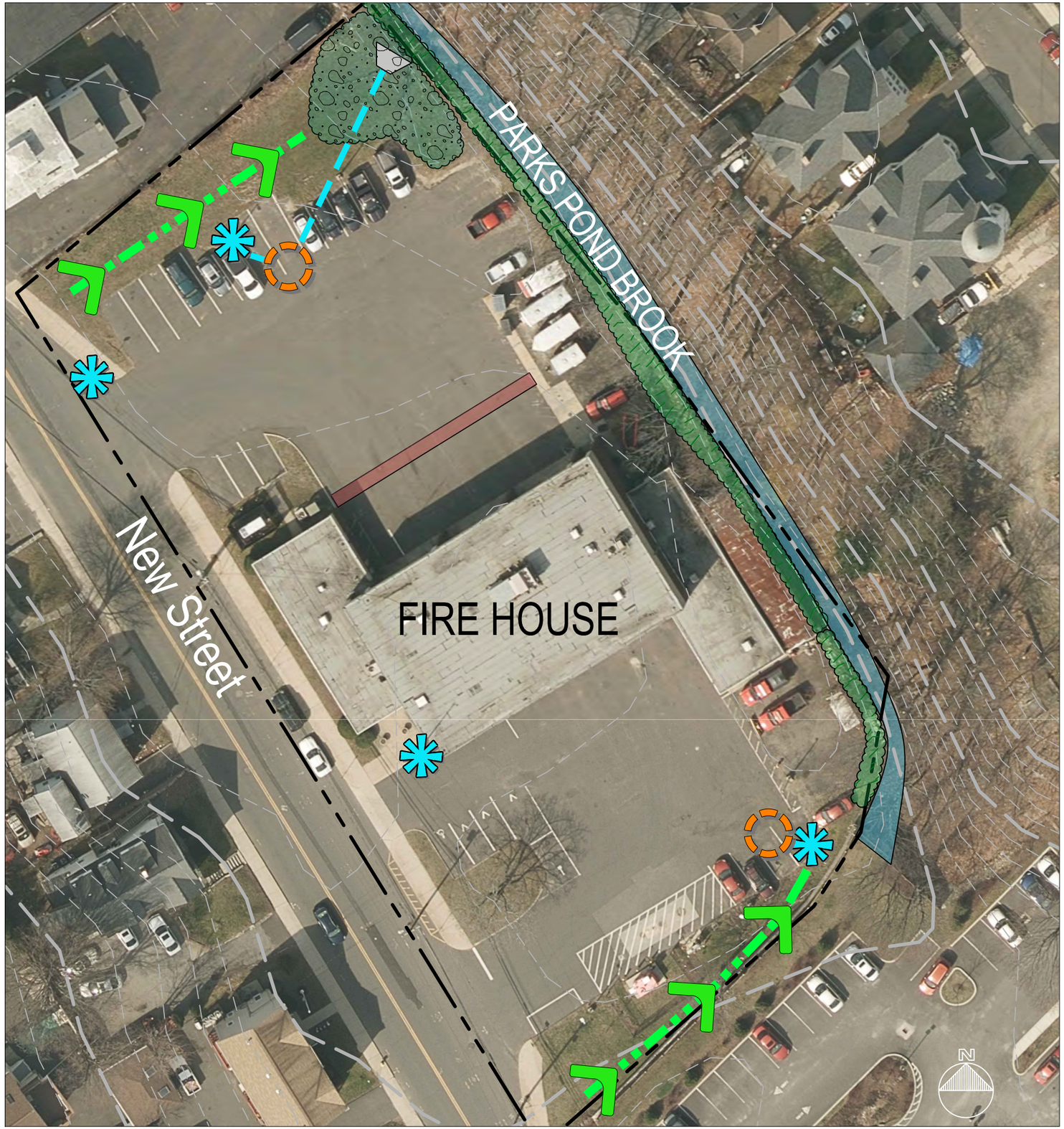
The Danbury Fire Department is a utilitarian landscape designed mainly for the purpose of storing and servicing the equipment needed to perform firefighting duties for the town the Town. 64% of the 1.5 Acre site is impervious. The outside areas used for storing equipment and vehicles is at the property line are adjacent to the Still River. The existing buffer is narrow and full of invasive plants that do not provide the diversity of treatment and habitat. The two green spaces are mainly lawn. This whole site including the road drains into the brook.

The challenges for implementing BMPs on this property are:

- The utilitarian nature of the site does not warrant a decorative landscape
- The storage of equipment, vehicles and materials requires all BMPs to be filtration not infiltration. This limits the BMP selection.
- The public is discouraged from entering the site.
- The plants of the existing vegetated buffer along the brook are invasive species and the removal and replanting takes commitment and vigilance
- The buffer along the brook is very narrow
- The city has not provided input in this plan

The opportunities for implementing BMPS on this property are:

- There is a major area of green space located north of the parking area. This allows for larger areas for interception and treatment.
- The amount of impervious and possible contaminants provides a greater opportunity to show improvement of the TMDLs.



LEGEND

- PROPERTY LINE
- 2 FOOT CONTOUR LINE
- 10 FOOT CONTOUR LINE
- EXISTING CATCH BASIN TO BE INSPECTED, CLEANED AND IMPROVED
- PARKS POND BROOK
- PROPOSED RIPARIAN BUFFER
- PROPOSED LEVEL SPREADER
- PROPOSED STORM LINE
- PROPOSED BIOFILTRATION SWALE
- PROPOSED FILTRATION STRUCTURE
- PROPOSED HYDRODYNAMIC SEPARATION STRUCTURE
- PROPOSED RAIN GARDEN

PROPOSED BMP PLAN
DANBURY FIRE DEPARTMENT
19 NEW STREET
DANBURY, CONNECTICUT
PROJECT #4

The concept of this Stormwater Management Concept Plan for the Danbury Fire Department is simply "treat the water". With this more utilitarian approach, the BMPs recommended are:

1. Installation of subterranean filtering and hydrodynamic separation structures in the main area of the site in order to separate debris, sediments, and hydrocarbons as well as filtration of solids, hydrocarbons, nutrients and heavy metals from the runoff.
2. The two green areas on site provide opportunities for bio filtration and conveyance.
    a. The biofiltration swales at the north and south property line will treat the water and decrease the amount of lawn to be mowed.
    b. The northern biofiltration/rain garden will treat the runoff from the leak off and expand the riparian buffer
    c. The Riparian buffer will be improved with the installation of native species
    d. Level spreaders at the end of each storm drain outlet to reduce the velocity of the water before it enters the brook.

The combined BMP treatment train has an impressive impact on the water quality of the runoff from Greys Bridge Road and the Brookfield Public Works as it exits into the Still River. The water will be cleaner and cooler. Using the STEPL 10ws urban tool, we were able to calculate the Total Maximum Daily Load (TMDL) improvement for many of the pollutants. Nitrogen and phosphorus are improved by over 30%. The subterranean filters and separation units improve the TMDL for sediments by 60% and the BOD by 40%. The filters also provide a measure of safety from any leaching or spills that could occur on the site. The location of the BMPs also provide easy access for cleaning and monitoring and since the BPW has the equipment to clean roads and catch basins, they will be able to maintain the structures.

These plans are only recommendations that are meant to show a possible treatment train for the property. More investigation, accurate surveys and detailed plans will be required prior to the installation of the BMPs. Therefore, the costs for installation are only expressed as a potential budget.

Danbury Fire Department: Budget Calculation Table

BMP	Quantity	Unit Cost	Budget number
Filtration Structure and Hydrodynamic Separator	3	$15,000	$45,000
Biofiltration Swale	229 lf	$50/lf	$32,050
Biofiltration Basin/Rain Garden	1952 sf	$20/sf	$39,040
Riparian Buffer	2,080 sf	$1/sf	$2,080
		budget	$118,170

5.5 Bethel Fire Department

Address: 36 South St #38, Bethel, CT 06801
Coordinates: 43.36936, -73.41139
Subwatershed: Sympaug Brook
Location: Bethel, Connecticut

Site Area: 48,610 SF
Impervious Area: 53,832 SF
% Impervious: 80%

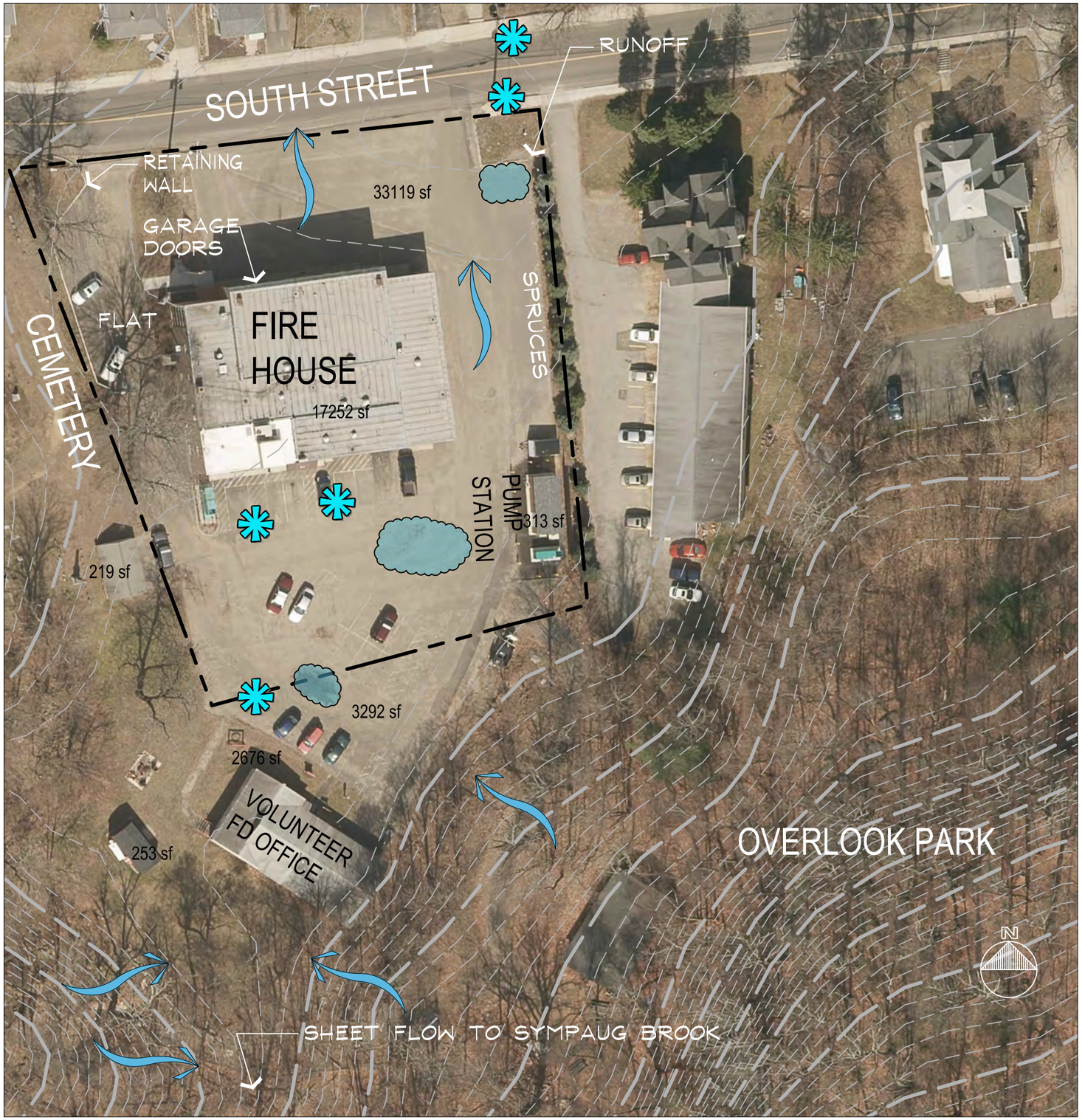
Site Description: Bethel Fire Department's impervious area is approximately 20,713 square feet of building and 33,119 square feet of pavement. The property drains to the street from the middle of the fire department building to the road and is collected by a catch basin in the road whose outfall is located to the south of the property. It meanders through wooded areas and wetlands before it finally drains into the Sympaug Brook. The rear of the property drains into three antiquated catch basins that also outfall to the rear of the property as well as sheet drains towards the rear woodland. South STree is to the north and the low point to the road is at the driveway to the Fire Department. There is a cemetary to the east that drains toward the property, a commercial property and Overlook Park to the west which also drain to the property. These two knolls meet at a swale in the woodland to the south of the property. The property seems to include the Bethel Volunteer fire department offices but in reality, they are two separate properties. However, for this study, both properties were included.

Bethel Fire Department: Location Map






Bethel Fire Department: Photos of Existing Conditions



LEGEND

- PROPERTY LINE
- 2 FOOT CONTOUR LINE
- 10 FOOT CONTOUR LINE
- EXISTING CATCH BASIN
- PONDING WATER
- SHEET FLOW

EXISTING CONDITIONS
BETHEL FIRE DEPARTMENT

36 SOUTH STREET
BETHEL, CONNECTICUT
PROJECT #5

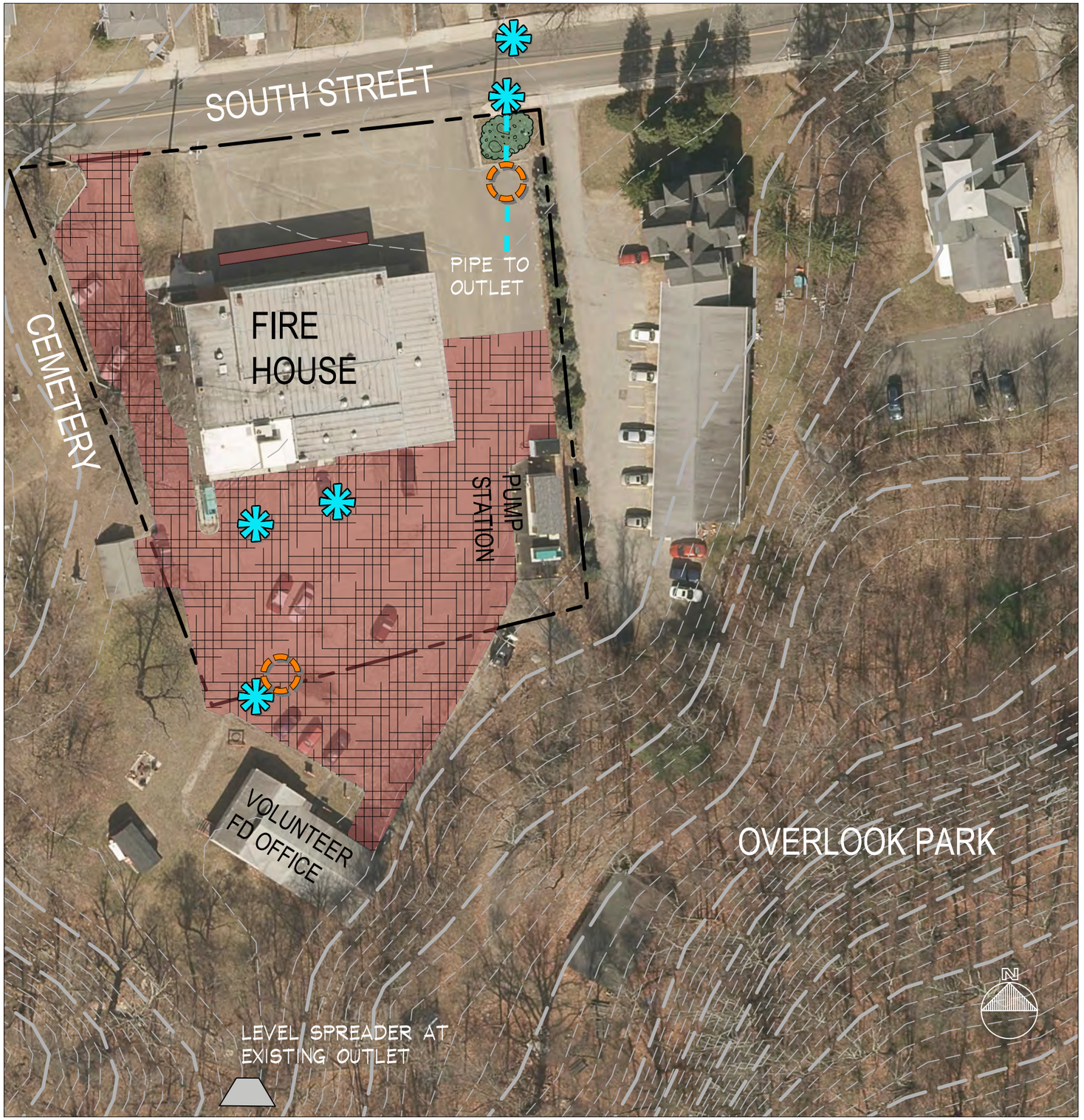
The Bethel Fire Department is a utilitarian landscape designed mainly for the purpose of storing and servicing the equipment needed to perform the firefighting duties of the Town. 80% of the 1.25 Acre site is impervious. This site is not directly located next to a watercourse or water body but eventually drains into the Sympaug Brook. The front driveway and parking drain towards the road with no treatment. The rear parking drains into three catchbasins that require repair and replacement. The outfall was not found but according to maps is located in the rear woodland beyond the property.

The challenges for implementing BMPs on this property are:

- The utilitarian nature of the site does not warrant a decorative landscape however there are occasional events held at the site so some decorative improvements could be incorporated
- The public is discouraged from entering the site.
- The site is the low point of a major drainage area
- The site is not adjacent to a water course or water body making improvements seem less impactful
- There are two properties however the impervious surface is continuous

The opportunities for implementing BMPS on this property are:

- The town is receptive to the installation of BMPs at this site
- The parking area needs improvement and provides an opportunity for permeable pavement
- The site is surrounded by green sites and improving the water quality will improve the health of the adjacent woodland.



LEGEND

- PROPERTY LINE
- 2 FOOT CONTOUR LINE
- 10 FOOT CONTOUR LINE
- EXISTING CATCH BASIN TO BE INSPECTED, CLEANED AND IMPROVED
- PROPOSED PERVIOUS PAVEMENT
- PROPOSED STORM LINE
- PROPOSED LEVEL SPREADER
- PROPOSED HYDRODYNAMIC SEPARATION STRUCTURE
- PROPOSED RAIN GARDEN
- PROPOSED FILTRATION STRUCTURE

PROPOSED BMP PLAN
BETHEL FIRE DEPARTMENT

36 SOUTH STREET
BETHEL, CONNECTICUT
PROJECT #5

The concept of this Stormwater Management Concept Plan for the Bethel is treat the water with utilitarian and decorative BMPs. The BMPs recommended are:

1. Installation of subterranean filtering and hydrodynamic separation structures in the main area of the site in order to separate debris, sediments, and hydrocarbons as well as filtration of solids, hydrocarbons, nutrients and heavy metals from the runoff.
2. The two green areas on site provide opportunities for substantial bio filtration and conveyance.
    a. The biofiltration swale at the north property line is at the bottom of the slope from Grays Bridge Road. It will intercept the water before it pools at the building as well as improve the view of the building at the road and decrease the amount of lawn to be mowed.
    b. The southern BMP is a combination of a bio filtration swale developed in the existing swale and renovation of the vegetation at the river into a native riparian buffer. This is the last treatment before the runoff enters the river and also provides shade to the cool the water before it enters the river.
    c. Level spreaders at the end of each storm drain outlet to reduce the velocity of the water before it enters the river.
3. The Permeable Pavement in the rear parking can be either pervious asphalt or permeable pavers or a combination of the two.

The combined BMP treatment train will improve the water quality of the runoff from South Street, the surrounding sites and the site itself as it exits on its path to the Sympaug Brook. The water will be cleaner and cooler. Using the STEPL 10ws urban tool, we were able to calculate the Total Maximum Daily Load (TMDL) improvement for many of the pollutants. Nitrogen and phosphorus are improved by over 35%. The subterranean filters and separation units improve the TMDL for sediments by 60%. The filters also provide a measure of safety from any leaching or spills that could occur on the site. The location of the BMPs also provide easy access for cleaning and monitoring.

These plans are only recommendations that are meant to show a possible treatment train for the property. More investigation, accurate surveys and detailed plans will be required prior to the installation of the BMPs. Therefore, the costs for installation are only expressed as a potential budget.

Bethel Fire Department: Budget Calculation Table

BMP	Quantity	Unit Cost	Budget number
Filtration Structure and Hydrodynamic Separator	2	$15,000	$30,000
Biofiltration Basin/Rain Garden	373 sf	$20/sf	$7,460
Permeable pavement	24,904/sf	$10/sf	$240,904
		budget	$278,364

5.6 Alternative Center for Excellence

Address: 26 Locust Ave., Danbury, CT 06810
Coordinates: 41.401404, -73.441843
Subwatershed: Still River Mainstem

Location: Danbury, Connecticut
Phase 1 MS4 town

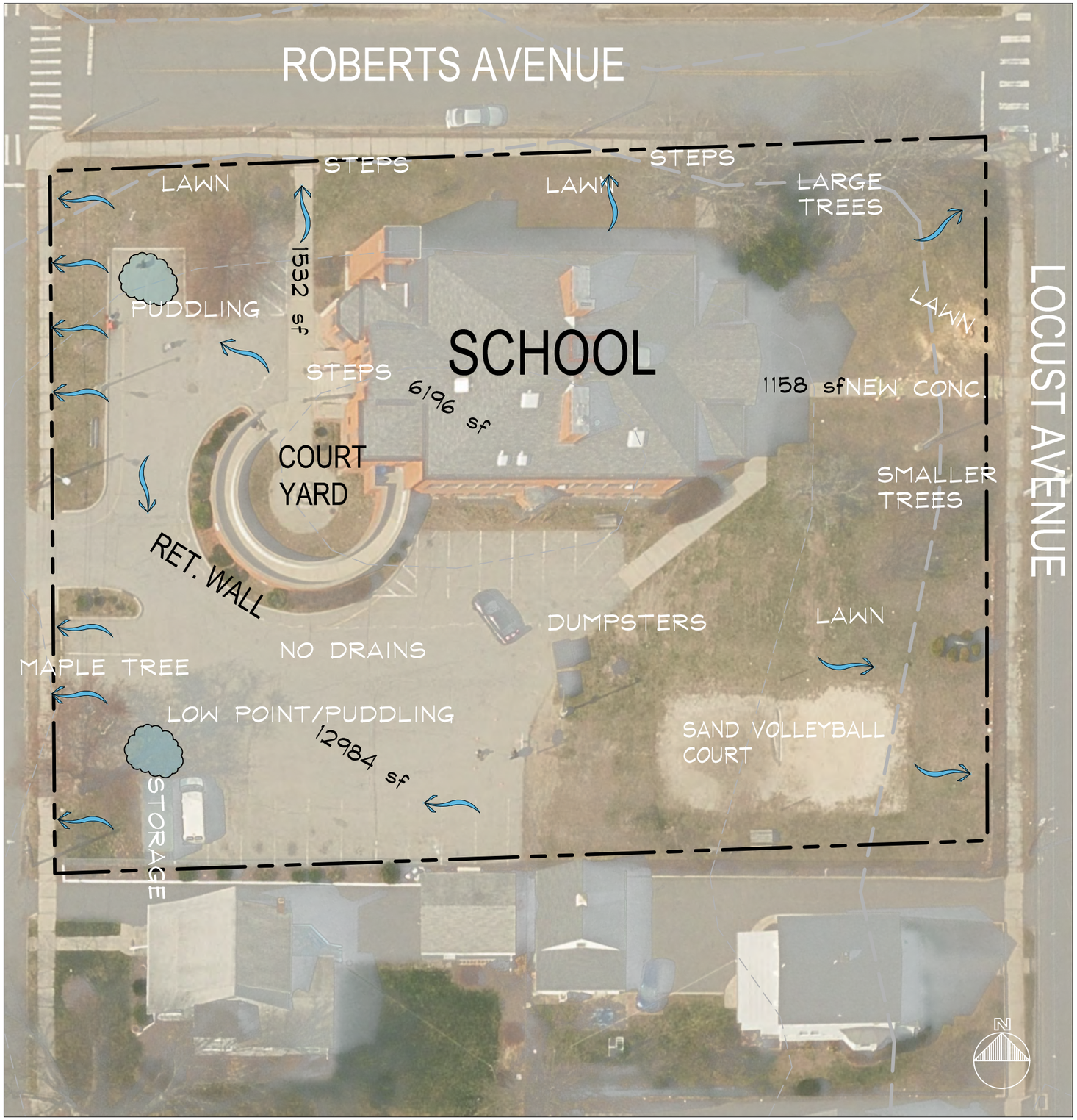
Site Area: 47,671 SF
Impervious Area: 20,870 SF
% Impervious: 44%

Site Description: Danbury's Alternative Center for Excellence (ACE) is a high school within the Danbury Public School system for at-risk students. The grounds are located near Western Connecticut State University (WCSU) in downtown Danbury and within one of the drainage areas identified in Fuss & O'Neil's 1994 Still River Stormwater Management Study as having high pollution loading. The impervious surface is comprised of 6196 square feet of building and 14674 square feet of pavement. The parking area does not have a stormwater management system. The runoff sheet flows off the school grounds into the street and the Western Connecticut State University property to the north west. The property is bounded on the west, north and east by roads and to the south by residential properties. Flooding is the major concern due to the lack of any stormwater infrastructure.

Pollutant Concerns: Suspended Solids
Hydro carbons

Alternative Center for Excellence: Location Map

Alternative Center for Excellence: Photos of Existing Conditions



LEGEND

- PROPERTY LINE
- 2 FOOT CONTOUR LINE
- 10 FOOT CONTOUR LINE
- EXISTING CATCH BASIN
- PONDING WATER
- SHEET FLOW

EXISTING CONDITIONS
ALTERNATIVE CENTER FOR EDUCATION

26 LOCUST STREET
DANBURY, CONNECTICUT
PROJECT #6

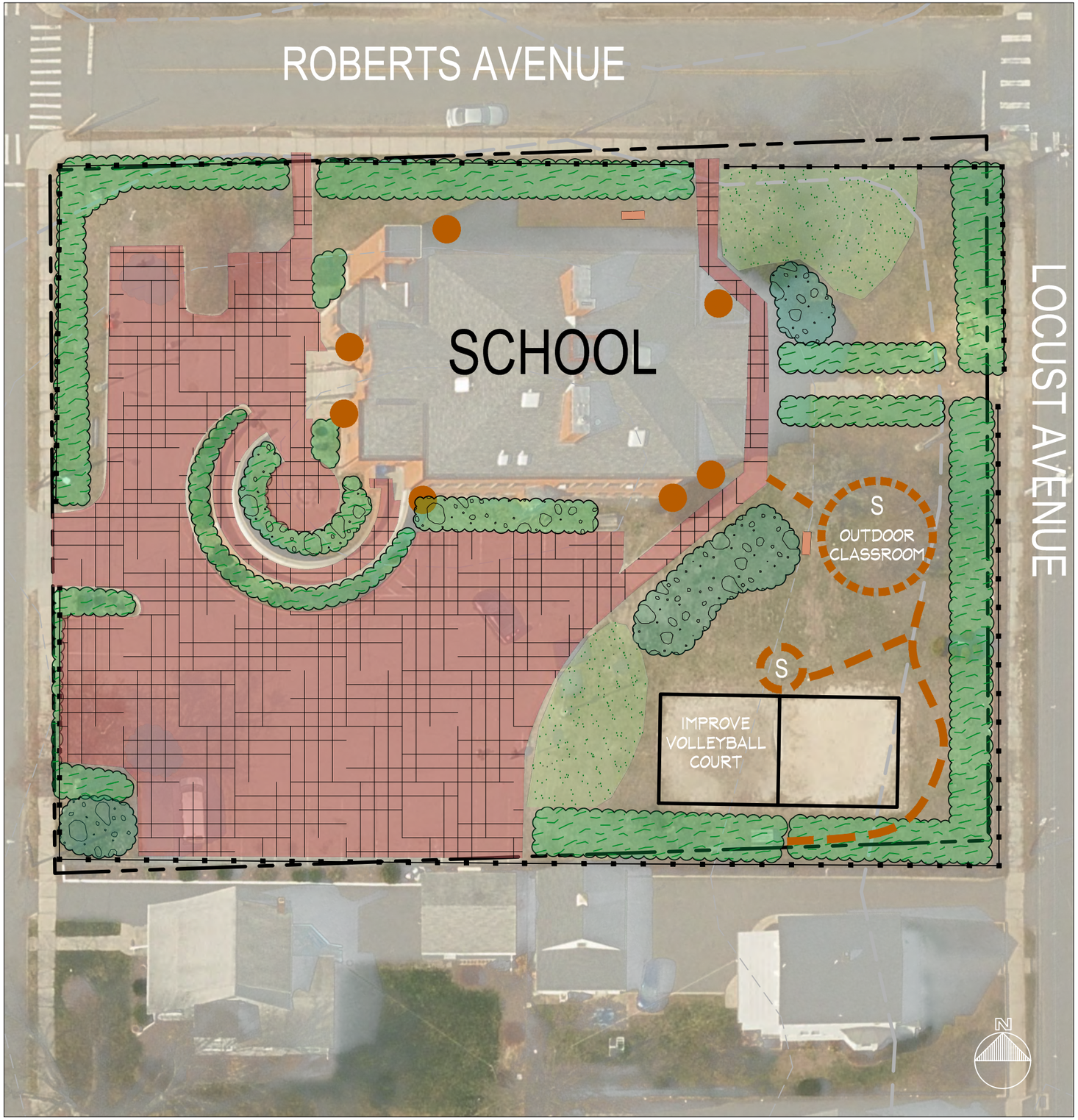
The Alternative Center for Excellence is an institutional landscape designed mainly for the purpose of servicing a school community in an urban environment. The building is historic and there are decorative features to the property including a walled courtyard to the southwest corner of the building. 44% of the 1.1 Acre site is impervious. The parking area is in disrepair and after a rain event retains water in two locations. The property is a monoculture lawn with some ornamental plantings. There is a sand volleyball court to the south east corner of the property that is in disrepair. At the northeast corner of the property is a stand of large trees. There is no security fencing or border to the property.

The challenges for implementing BMPs on this property are:

- The urban location of the property
- The lack of any stormwater infrastructure in the area
- The lack of a water course in proximity of the area as direct impacts will not be apparent
- The narrow green space to the west of the property where the majority of the rear parking area drains

The opportunities for implementing BMPS on this property are:

- ACE has been a consistent partner in HVA's Still River Watershed Connections program and would likely be an enthusiastic partner for a green infrastructure project.
- The major areas of green space on the site are located northeast of the property providing opportunities for major infiltration areas
- The parking area needs improvement therefore an opportunity to place some or all permeable pavement
- The integration of educational components to the stormwater plan opens up opportunities for teaching and funding.



LEGEND

- PROPERTY LINE
- 2 FOOT CONTOUR LINE
- 10 FOOT CONTOUR LINE
- EXISTING CATCH BASIN TO BE INSPECTED, CLEANED AND IMPROVED
- PROPOSED NATIVE PLANTINGS
- PROPOSED PERVIOUS PAVEMENT
- PROPOSED MEADOW
- PROPOSED FILTRATION STRUCTURE
- PROPOSED HYDRODYNAMIC SEPARATION STRUCTURE
- PROPOSED SEATING AREA
- PROPOSED RAIN GARDEN
- PROPOSED TRAIL
- PROPOSED PERIMETER SECURITY FENCE
- PROPOSED RAIN BARREL

PROPOSED BMP PLAN

ALTERNATIVE CENTER FOR EDUCATION

26 LOCUST STREET
DANBURY, CONNECTICUT
PROJECT #6

The concept of this Stormwater Management Concept Plan for the Alternative Center for Excellence is "stormwater as an opportunity for education". With this expanded approach, the BMPs recommended are:

1. Installation of permeable pavement for all the parking and walks provides opportunity for infiltration, storage and treatment.
2. The border hedge can provide needed security as part of a hedge/fence boundary, and be comprised of native species that provide treatment as water leaves the site.
3. Bio infiltration basins/ rain gardens provide opportunities for treatment, habitat, and education
4. Lawn to meadow increases biodiversity will decreasing lawn areas and also can be another opportunity for education.
5. Roof drainage collected into rain barrels will provide water for plant care as well as decorative and rain art for another educational opportunity.
6. Trails to outdoor classroom and a refurbished volleyball site create opportunities for education and a campus feel to the school.

The combined BMP treatment train has an impressive impact on the water quality of the runoff from ACE as exits into the Still River watershed. The water will be cleaner and cooler. Using the STEPL 10ws urban tool, we were able to calculate the Total Maximum Daily Load (TMDL) improvement for many of the pollutants. Nitrogen and phosphorus are improved by over 30%. TMDL for sediments is improved by 60%. The stormwater management plan also provides an educational tool that can impact the students' perception of stormwater and hopefully become stewards to the BMP structures as well as the watershed. The location of the BMPs also provide easy access for cleaning and monitoring.

These plans are only recommendations that are meant to show a possible treatment train for the property. More investigation, accurate surveys and detailed plans will be required prior to the installation of the BMPs. Therefore, the costs for installation are only expressed as a potential budget.

BMP	Quantity	Unit Cost	Budget number
Permeable Pavement	15,150	$10/sf	$151,500
Biofiltration Basins/Rain Gardens	1937 sf	$20/lf	$38,740
Hedge Buffer	7599 sf	$5/sf	$37,995
Lawn to Meadow	9000 sf	$1/sf	$9,000
Rain Barrels	7	$100/ea	$700
		budget	$237,935

5.7 Danbury Public Schools Administrative Center

Address: 63 Beaver Brook Rd., Danbury, CT 06810
Coordinates: 41.407364, -73.426402
Subwatershed: Still River Mainstem
Location: Danbury, Connecticut
Phase 1 MS4 town

Site Area: 111,870 SF
Impervious Area: 35,247
% Impervious: 32%

Site Description: The Danbury Public Schools Administrative Center is located adjacent to the Still River mainstem downstream of downtown Danbury. The impervious surface is approximately 10,446 sf buildings and 24801 sf of pavement. There is a significant existing wooded buffer to the east of the parking area with steep slopes to the river. There are several catch basins on the site and in Beaver Brook Road that appear to be connected to a culverted stream that runs under the parking lot. This stream daylights at an outfall within the wooded buffer area. To the north of the property is commercial property and to the south of the property is Old Newtown Road. There are ornamental plantings, some which are invasive species around the building. The rest of the landscape is lawn.

Danbury Public Schools Administrative Center: Location Map

Danbury Public Schools Administrative Center: Photos of Existing Conditions

LEGEND

- PROPERTY LINE
- 2 FOOT CONTOUR LINE
- 10 FOOT CONTOUR LINE
- EXISTING CATCH BASIN
- STILL RIVER
- SCRUB/INVASIVE AREA
- SHEET FLOW

EXISTING CONDITIONS
DANBURY SCHOOL ADMINSTRATION BUILDING

63 BEAVER BROOK ROAD
DANBURY, CONNECTICUT
PROJECT #7

The Danbury Public Schools Administrative Center is an institutional landscape designed mainly for the purpose school offices and parking. 32% of the .81 Acre site is impervious. The site drains toward the river but does flow through a substantial buffer. The use of the site is offices and parking. This whole site including the road drains right to the river.

The challenges for implementing BMPs on this property are:

- The site is disconnected from the river by a substantial wooded buffer.
- This site is not for education of students.
- The road drains into a system that outfalls into the river.
- The plants of the existing wooded buffer along the Still River as well as some of the ornamental plantings are invasive species and the removal and replanting takes commitment and vigilance
- The surrounding sites are more impervious with less treatment than this site, so improvements will not be as impactful.

The opportunities for implementing BMPS on this property are:

- The Danbury school system has been a partner with HVA in the past and may be receptive to the installation of BMPs at this site
- The major areas of green space on the site are located between the parking and the river. This allows for larger areas for interception and treatment.
- There is a small picnic area at the top of the wooded slope for employees which provides an opportunity for ownership of the buffers and the river.
- The location of these structures offer demonstration to the school system employees of design, installation and monitoring that can then be translated to green school/infrastructure solutions throughout the school system.

LEGEND

- PROPERTY LINE
- 2 FOOT CONTOUR LINE
- 10 FOOT CONTOUR LINE
- EXISTING CATCH BASIN TO BE INSPECTED, CLEANED AND IMPROVED
- STILL RIVER
- PROPOSED RIPARIAN BUFFER
- PROPOSED PERVIOUS PAVEMENT
- PROPOSED BIOFILTRATION SWALE
- PROPOSED FILTRATION STRUCTURE
- PROPOSED HYDRODYNAMIC SEPARATION STRUCTURE
- PROPOSED PICNIC AREA
- PROPOSED RAIN GARDEN
- PROPOSED RAIN BARREL

PROPOSED BMP PLAN
DANBURY SCHOOL ADMINSTRATION BUILDING

63 BEAVER BROOK ROAD
DANBURY, CONNECTICUT
PROJECT #7

The concept of this Stormwater Management Concept Plan for the Danbury Public Schools Administrative Center is treat the water not only to benefit the Still River but as a demonstration of the impact and beauty of BMPs to a school landscape. With this more demonstrative approach, the BMPs recommended are:

1. Installation of permeable pavement as a demonstration of the efficacy of that pavement in parking and as an infiltration, storage and treatment tool in an area that would require repaving in the future.
2. The east and west green areas on site provide opportunities for substantial bio filtration and conveyance.
    a. The biofiltration basin in the front provides treatment of some of the runoff before it enters the catch basin. Raising the catch basin by 6" provides the opportunity for first flush treatment.
    b. The western bio filtration swales and basins will treat the parking area runoff if the parking area is disconnected from the underground storm system by putting leakoffs in the curb.
    c. Improvement to the wooded buffer by removal of invasive plants and installing native plants at the waters edge will improve the water quality before it exits into the Still River.
    d. Level spreaders at the end of the outfall to reduce the velocity of the water before it enters the river.
3. Rain Barrels to collect water for the plants and demonstrate the importance of water conservation
4. A picnic area as a place for congregation, eating and access to the beauty of the BMPs.

The combined BMP treatment train has an impact on the water quality of the runoff from Beaver Brook Road and the site as it exits into the Still River. The water will be cleaner and cooler. Using the STEPL 10ws urban tool, we were able to calculate the Total Maximum Daily Load (TMDL) improvement for many of the pollutants. Nitrogen and phosphorus are improved by over 35%. The subterranean filters and separation units improve the TMDL for sediments by 40%. The location of the BMPs also provide easy access for cleaning and monitoring and demonstration.

These plans are only recommendations that are meant to show a possible treatment train for the property. More investigation, accurate surveys and detailed plans will be required prior to the installation of the BMPs. Therefore, the costs for installation are only expressed as a potential budget.

BMP	Quantity	Unit Cost	Budget number
Permeable Pavement	19,907 sf	$10/ sf	$199,070
Biofiltration Swale	309 lf	$50/lf	$15,450
Riparian Buffer	12,518/sf	$1/sf	$12,518
Biofiltration Swale/ Rain Gardens	2000 sf	$20/sf	$40,000
Rain Barrels	5	$100/ea	$500
		budget	$267,538

5.8 Parloa Field

Address: 1 Sympaug Park Rd., Bethel, CT 06801
Coordinates: 41.369210, -73.420837
Subwatershed: Sympaug Brook
Location: Bethel, Connecticut
Phase 1 MS4 town

Site Area: 303,267 SF for total property
Parking Area: 30,000 SF
Impervious Area: 19,907 SF
% Impervious: 66%

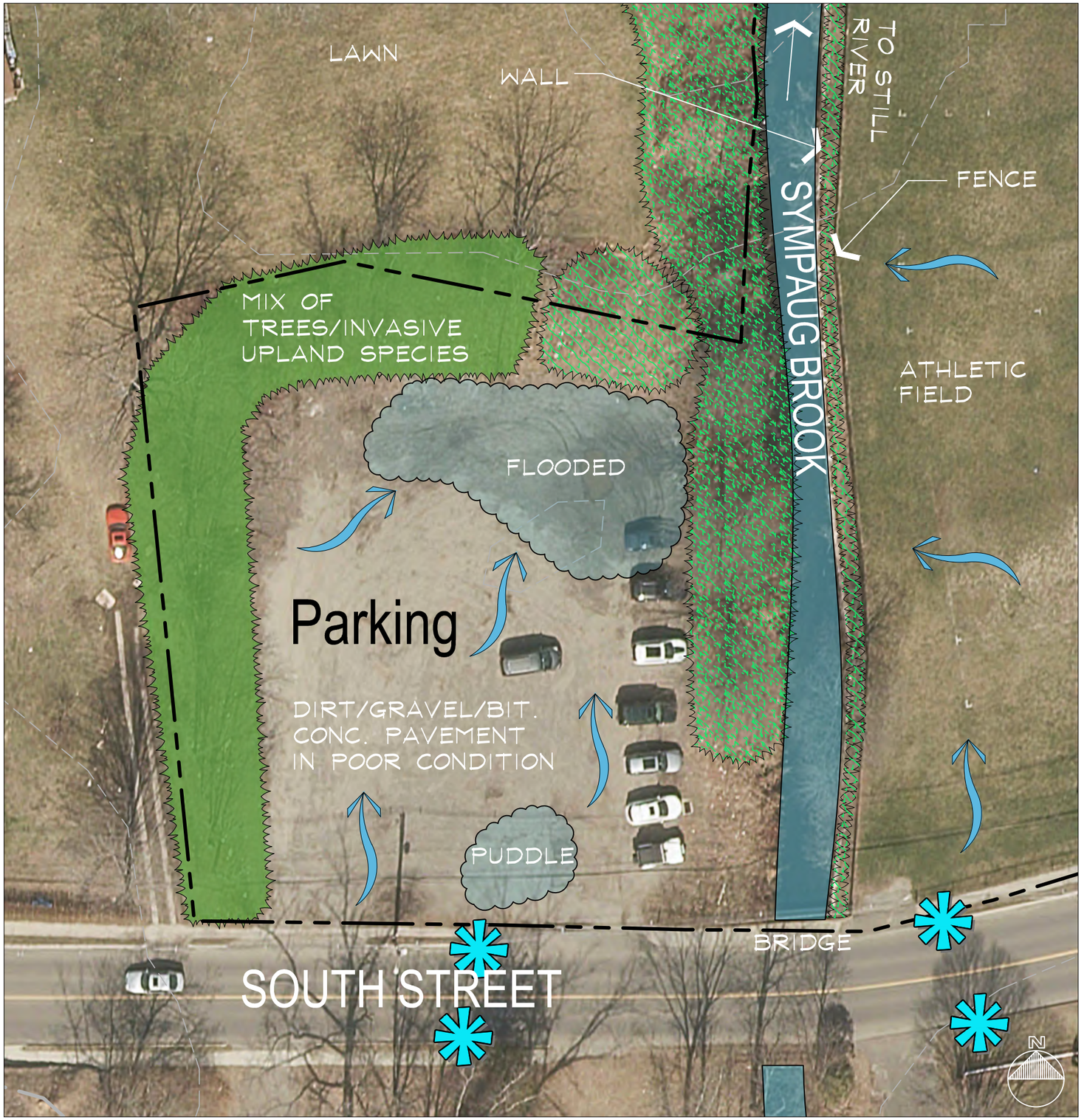
Site Description: Parloa Field is an active recreation park with ball fields on the east side of the Sympaug brook and a informally paved parking area on the west side of the brook. The main area of concern is the parking area as there are plans to renovate this area and repave. There are catch basins on in the street however the flat parking area drains to mainly the north east corner of the site and the south boarder of the parking. Although there are catch basins in the road, the pitch of the entrance allows some road drainage into the site. The site is bounded to the north and west by residential properties that also pitch towards the brook.

Parloa Field: Location Map





Parloa Field: Photos of Existing Conditions



LEGEND

- PROPERTY LINE
- 2 FOOT CONTOUR LINE
- 10 FOOT CONTOUR LINE
- EXISTING CATCH BASIN
- SHEET FLOW
- SYMPAUG BROOK
- SCRUB/INVASIVE AREA
- WOODED AREA
- PONDING WATER

EXISTING CONDITIONS
PARLOA PARK
SOUTH STREET
BETHEL, CONNECTICUT
PROJECT #8

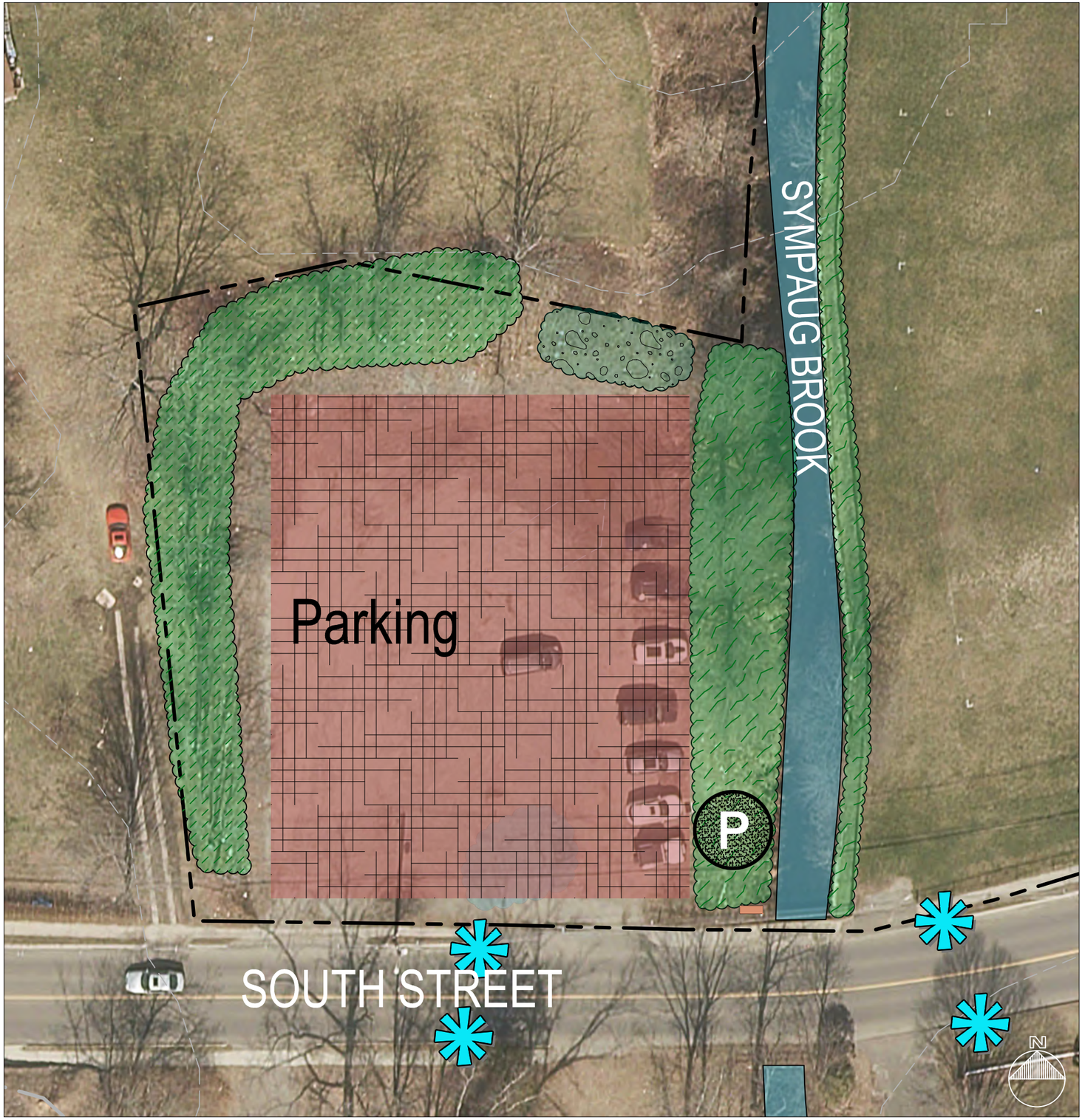
The Parloa Field is an invasive and deteriorated landscape with invasive species and deteriorating pavement. 66% of the .68 Acre site is impervious compacted dirt, gravel and some pavement. The main purpose of the site is for parking for the ball fields. The existing buffer is full of invasive plants that do not provide the diversity of treatment and habitat. Storage of snow during the winter is a source of other pollutants. This whole site including the road drains right to the brook.

The challenges for implementing BMPs on this property are:

- The utilitarian nature of the site does not warrant a decorative landscape
- The storage of snow could be an issue with infiltration structures.
- The road drains into the site.
- The plants of the existing vegetated buffer along the Still River and existing drainage swale are invasive species and the removal and replanting takes commitment and vigilance.
- The green spaces are narrow.

The opportunities for implementing BMPS on this property are:

- The Public Works Director and town are receptive to the installation of BMPs at this site
- The parking area is used during the week by truck drivers and workers who need a quiet place to eat their lunch and rest.
- The location of these structures could offer a more park like, maintained area that links to the rest of the park.



LEGEND

- PROPERTY LINE
- 2 FOOT CONTOUR LINE
- 10 FOOT CONTOUR LINE
- EXISTING CATCH BASIN
- SYMPAUG BROOK
- PROPOSED RIPARIAN BUFFER
- PROPOSED PERVIOUS PAVEMENT
- PROPOSED NATIVE PLANTINGS
- PROPOSED RAIN GARDEN
- PROPOSED PICNIC AREA
- PROPOSED SYMPAUG BROOK SIGN

PROPOSED BMP PLAN
PARLOA PARK

SOUTH STREET
BETHEL, CONNECTICUT
PROJECT #8

The concept of this Stormwater Management Concept Plan is to improve the parking area to not only create treatment but a park like experience:

1. Installation of permeable pavement for treatment, and storage. It will need underdrain as the water table may be quite high is this location.
2. The three green areas on site provide opportunities for substantial bio filtration.
    a. The biofiltration basin at the north property line is adjacent to the ponding in the parking and will provide water quality treatment.
    b. The western vegetated area will be renovated to native plant buffer to treat any water that comes on site from residential neighbors.
    c. The riparian buffer will be renovated and native plants will be installed to create treatment and a beautiful backdrop to the existing brook thereby creating a park like experience.
    d. A small picnic area is a place for congregation, eating and access to the brook. Included is a sign that describes the history of the brook and the importance of the treatment.

The combined BMP treatment train will improve the quality of the water as it exits into the Sympaug Brook but also provide a better parking experience and park like environemtn. The water will be cleaner and cooler. Using the STEPL 10ws urban tool, we were able to calculate the Total Maximum Daily Load (TMDL) improvement for many of the pollutants. Nitrogen and phosphorus are improved by over 40%. The basin and buffer will improve the TMDL for sediments by 46%. The pavers and basin also provide a measure of safety from any leaching from snow storage. The location of the BMPs also provide easy access for cleaning and monitoring.

These plans are only recommendations that are meant to show a possible treatment train for the property. More investigation, accurate surveys and detailed plans will be required prior to the installation of the BMPs. Therefore, the costs for installation are only expressed as a potential budget.

BMP	Quantity	Unit Cost	Budget number
Permeable pavement	15,090sf	$10	$150,900
Biofiltration Basin/ Rain Garden	677	$50/lf	$33,850
Riparian Buffer	5000/sf	$5/sf	$25,000
Picnic Table	1	200	$200
		budget	$209,950

5.9 Workspace Education

Address: 16 Trowbridge Dr., Bethel, CT 06801
Coordinates: 41.349277, -73.419854
Subwatershed: Sympaug Brook
Location: Bethel, Connecticut
Phase 1 MS4 town

Site Area: 140,890 SF
Impervious Area: 95,184 SF
% Impervious: 68%

Site Description: Workspace Education is an alternative education non-profit that provides resources to self-directed learners. Their center is located in south Bethel next to Sympaug Pond separated by railroad tracks. There are two parking areas on the property, the front parking area drains about 46,000 square feet into two outfalls which in turn empty storm water into an unnamed tributary of Sympaug Pond. Storm water off the front parking area generally flows to the two storm drains adjacent to the outfalls. These storm drains are adjacent to a grassy area with space for a BMP. The back parking lot parking lot will be part of a major expansion and renovation of the school so will not be considered in this plan. Workspace Education is an enthusiastic partner, excited to integrate green infrastructure at their location and in particular, the front parking lot. Additionally, there are a number of opportunities to include their learners into the project through the Still River Watershed Connections program.

Workspace Education: Location Map






Workspace Education: Photos of Existing Conditions

LEGEND

- PROPERTY LINE
- 2 FOOT CONTOUR LINE
- 10 FOOT CONTOUR LINE
- EXISTING SWALE
- EXISTING CATCH BASIN
- SYMPAUG POND
- SCRUB/INVASIVE AREA
- SHEET FLOW

EXISTING CONDITIONS
WORKSPACE ACADEMY

16 TROWBRIDGE DRIVE
BETHEL, CONNECTICUT
PROJECT #9

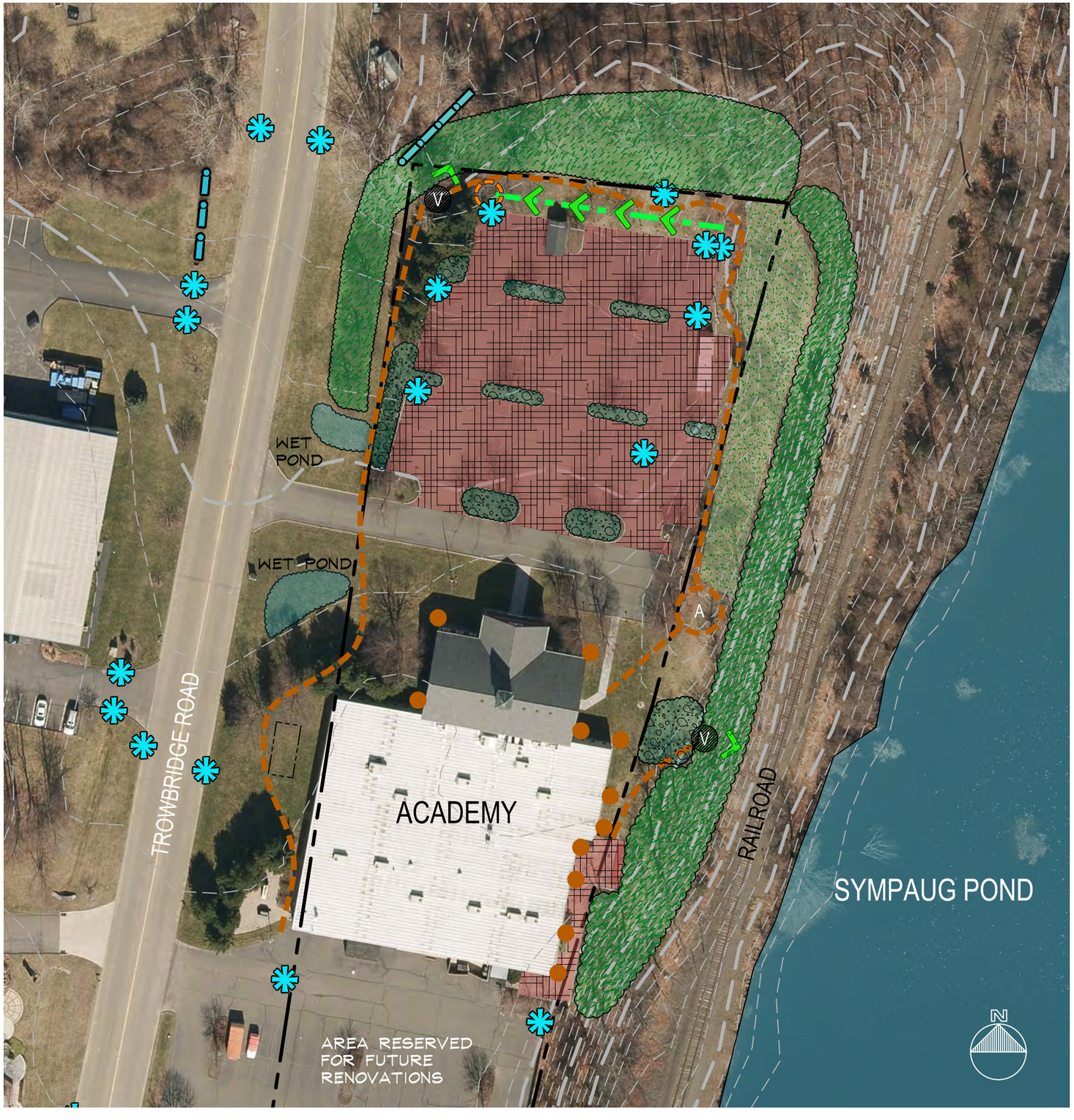
The Workspace Academy is a ornamental landscape designed mainly for the purpose of the school and parking for the school with some minor outdoor areas for gardening, congregating and recreation. 68% of the 3.7 Acre site is impervious. The parking and buildings are located in the middle of the site and all the runoff drains either into the area above the Sympaug Pond or a stream to the north of the property that drains into the Sympaug pond. The existing buffer is full of invasive plants that do not provide the diversity of treatment and habitat. The ornamental landscape has many invasive species and mowed lawn. Two knobs to the east of the parking area are covered in invasive species and drain into the area east of the building. There are interrupted views of the Pond from the grass area to the east of the building.

The challenges for implementing BMPs on this property are:

- The quantity of lawn, invasive species and impervious surface
- The railroad tracks between the Academy and the pond prevents access to the pond
- Steep slopes
- The tributary stream is not on the Academy property

The opportunities for implementing BMPS on this property are:

- The Owner is very receptive to the installation of BMPs at this site as well as including education and recreation in their design
- The major area of green space on the site is located north of the front parking and between the end of the parking area and the stream. This allows for larger areas for interception and treatment.
- The opportunities for demonstration of several different types of treatments provide areas for monitoring with the help of the students.
- The opportunity to create a HVA/Workspace Academy Connections group for installation, maintenance and monitoring



LEGEND

- PROPERTY LINE
- 2 FOOT CONTOUR LINE
- 10 FOOT CONTOUR LINE
- EXISTING SWALE
- EXISTING CATCH BASIN TO BE INSPECTED, CLEANED AND IMPROVED
- SYMPAUG POND
- PROPOSED RIPARIAN BUFFER
- PROPOSED PERVIOUS PAVEMENT
- PROPOSED MEADOW
- PROPOSED LEVEL SPREADER
- PROPOSED BIOFILTRATION SWALE
- PROPOSED TRAIL
- PROPOSED FILTRATION STRUCTURE
- PROPOSED HYDRODYNAMIC SEPARATION STRUCTURE
- PROPOSED RAIN GARDEN
- PROPOSED WET POND
- PROPOSED VIEWING PLATFORM
- PROPOSED AMPHITHEATER
- PROPOSED RAIN BARREL

PROPOSED BMP PLAN
WORKSPACE ACADEMY

16 TROWBRIDGE ROAD
BETHEL, CONNECTICUT
PROJECT #9

The concept of this Stormwater Management Concept Plan for the Workspace Academy is to treat, recreate and educate. With this more diverse approach, the BMPs recommended are:

1. Installation of permeable pavement for all the parking provides opportunity for infiltration, storage and treatment.
2. The riparian buffer and native plants can provide treatment as water leaves the site as well as biodiversity and habitat. This is an opportunity for education on plants, insects, etc.
3. Bio infiltration basins/ rain gardens provide opportunities for treatment, habitat, and education
4. Lawn to meadow increases biodiversity while decreasing lawn areas and also can be another opportunity for education.
5. Roof drainage collected into rain barrels will provide water for plant care as well as decorative and rain art for another educational opportunity.
6. Trails to outdoor classrooms, amphitheater, viewing platforms with scopes and a refurbished patio area create opportunities for education and a campus feel to the school.

The combined BMP treatment train has an impressive impact on the water quality of the runoff from Workspace Academy as it exits into the Sympaug Pond. The water will be cleaner and cooler. Using the STEPL 10ws urban tool, we were able to calculate the Total Maximum Daily Load (TMDL) improvement for many of the pollutants. Nitrogen and phosphorus are improved by over 30%. The TMDL for sediments by is improved by 45%. The location of the BMPs also provide easy access for cleaning and monitoring and education.

These plans are only recommendations that are meant to show a possible treatment train for the property. More investigation, accurate surveys and detailed plans will be required prior to the installation of the BMPs. Therefore, the costs for installation are only expressed as a potential budget.

BMP	Quantity	Unit Cost	Budget number
Permeable Pavement	31635 sf	$10/sf	$316,350
Biofiltration Basins/ Rain Gardens	6530sf	$20/lf	$130,600
Riparian Buffer	25,531/sf	$1/sf	$25 531
Wet Pond	1907 sf	$5/sf	$9,535
Rain Barrels	11	$100/ea	$1,100
Trials, platforms, scopes	TBD		TBD
		budget	$482,027

5.10 Danbury City Hall Staff Parking

Address: Next to 158 Deer Hill Ave., Danbury, CT 06810
Coordinates: 41.391294, -73.45444
Location: Danbury, Connecticut
Phase 1 MS4 town
Subwatershed: Still River Mainstem

Site Area: 25,210 sf
Impervious Area: 17412 sf
% Impervious: 70%

Site Description: The Danbury City Hall Staff Parking lot located across from City Hall on Deer Hill Ave is adjacent to Park Pond Brook. The site pitches towards the brook. Storm drains lead to outfalls that direct stormwater directly into the brook. Each storm drain is located adjacent to a grassy island. There is a buffer between the parking and the brook. There is commercial property to the north and south. Deer Hill Avenue is to the west. There is a bank of stormwater manholes in the lower third of the parking.

Danbury City Hall Staff Parking: Location Map

Danbury City Hall Staff Parking: Photos of Existing Conditions

LEGEND

- PROPERTY LINE
- 2 FOOT CONTOUR LINE
- 10 FOOT CONTOUR LINE
- EXISTING CATCH BASIN
- EXISTING MANHOLE COVER
- STREAM
- SCRUB/INVASIVE AREA
- SHEET FLOW
- PONDING WATER

EXISTING CONDITIONS
DANBURY CITY HALL STAFF PARKING

DEER HILL AVENUE
DANBURY, CONNECTICUT
PROJECT #10

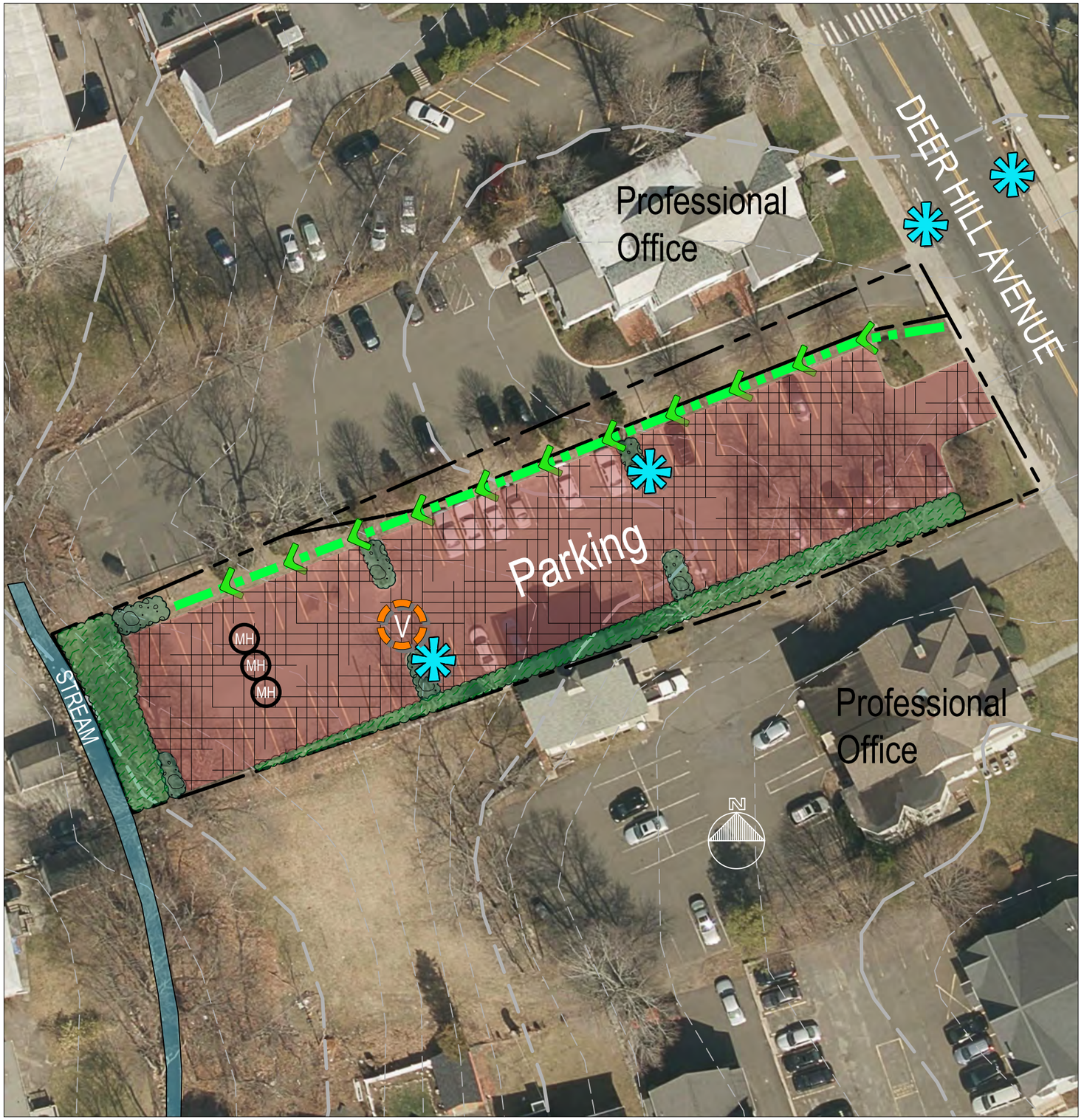
The Danbury City Hall Staff Parking is a utilitarian landscape designed mainly for the purpose of staff parking for the employees at town hall. 70% of the .58 Acre site is impervious. The runoff drains into catch basins adjacent to curbed parkin islands. The existing buffer is full of invasive plants that do not provide the diversity of treatment and habitat. Storage of snow during the winter is a source of other pollutants. The condition of the parking area, specifically closer to the brook is poor.

The challenges for implementing BMPs on this property are:

- Due to the nature of use, there appears to be limited interest in improving this area
- The brook overflows its banks during high rainfall and floods the riparian area
- There is a major stormwater structure with four manholes that may impede any use of permeable pavement.

The opportunities for implementing BMPS on this property are:

- The site is 70% impervious so any treatment will improve the water quality
- It is directly abutting the Parks Pond Brook.
- There are opportunities for small treatment areas to the north and south of the parking area
- The site is adjacent to City Hall.



LEGEND

- PROPERTY LINE
- 2 FOOT CONTOUR LINE
- 10 FOOT CONTOUR LINE
- EXISTING CATCH BASIN TO BE INSPECTED, CLEANED AND IMPROVED
- EXISTING MANHOLE COVER (MH)
- STREAM
- PROPOSED RIPARIAN BUFFER
- PROPOSED PERVIOUS PAVEMENT
- PROPOSED VORTEX HYDRO-SEPARATOR (V)
- PROPOSED BIOFILTRATION SWALE
- PROPOSED RAIN GARDEN

PROPOSED BMP PLAN
DANBURY CITY HALL STAFF PARKING

DEER HILL AVENUE
DANBURY, CONNECTICUT
PROJECT #10

The concept of this Stormwater Management Concept Plan for the Danbury City Hall Staff Parking is "treat the water". With this more utilitarian approach, the BMPs recommended are:

1. Installation of permeable pavement as the major bmp to the site.
2. The two green areas on site provide opportunities for bio filtration and conveyance.
    a. The biofiltration swale at the north and south of the property line will intercept the water from neighboring properties before it drains into the parking area.
    b. The western buffer could provide the last line of treatment before the runoff enters the brook. The plants should be able to withstand wet feet when the brook overflows.
    c. A hydrodynamic separator could be an opportunity separate out sediments if the permeable pavement is not a viable budgetary solution.

The combined BMP treatment train has an impact on the water quality of the runoff from the parking area as it exits into the Parks Pond Brook. The water will be cleaner and cooler. Using the STEPL 10ws urban tool, we were able to calculate the Total Maximum Daily Load (TMDL) improvement for many of the pollutants. Nitrogen and phosphorus are improved by over 30%. The subterranean filters and separation units improve the TMDL for sediments by 60% and the BOD by 40%. The filters also provide a measure of safety from any leaching or spills that could occur on the site. The location of the BMPs also provide easy access for cleaning and monitoring and since the BPW has the equipment to clean roads and catch basins, they will be able to maintain the structures.

These plans are only recommendations that are meant to show a possible treatment train for the property. More investigation, accurate surveys and detailed plans will be required prior to the installation of the BMPs. Therefore, the costs for installation are only expressed as a potential budget.

BMP	Quantity	Unit Cost	Budget number
Permeable Pavement	17,412 sf	$10/sf	$174,120
Filtration Structure and Hydrodynamic Separator	1	$15,000	$15,000
Biofiltration Swale	296 lf	$50/lf	$14,800
Biofiltration parking islands	540 sf	$20/sf	$10,800
Riparian Buffer	3,054/sf	$5/sf	$15270
		budget	$229,990

5.11 Bennett Memorial Park

Address: 14 Shelter Rock Rd., Bethel, CT 06801
Coordinates: 41.393433, -73.402942
Subwatershed: Lower Limekiln Brook
Site Description: Bennett Park is located at an impounded section of Limekiln Brook in Bethel. The park is enjoyed daily by dog owners whose pets enjoy a swim in the pond, and can accommodate larger gathering with the facilities of a pavilion, commercial kitchen and bathrooms. Bennett is the home of the Annual Bethel Fishing Derby, a popular event in which the pond is stocked with fish by CT DEEP and dozens of Bethel families gather. This area was identified during HVA's streamwalks as a potential restoration site. Short turf was mowed up to the pond edge along both banks and rip rap stabilized the bank from erosion. Some areas lacking rip rap were eroding and adding to sedimentation in the pond. Adding to the issue of pond sedimentation, runoff from the pavilion roof was causing erosion at the drainpipe, washing away the dirt under the large rock rip-rap along the bank. Perhaps as a result of this sedimentation, the town reported the need to dredge the pond periodically. Moreover, a resident Canada Geese population had made their home, leaving the park scattered with droppings in the field adjacent to the pond.

HVA worked closely with the Town of Bethel's Parks and Recreation, Inland Wetlands, and Earth Tones Native Nursery and Landscaping to design a solution that addressed the environmental issues while also taking into account the public's use of the park as well as Parks and Rec. maintenance practices. Using student volunteers from Danbury and Newtown High School, a continuous vegetative buffer was installed along both banks of the pond that incorporated a 10 foot winding grassy path allowing visitors to access the pond's shore in places. Perennial plants were selected to be tall enough to deter geese by disrupting clear lines of site between the field and the pond, low enough for the average person over 4' to see above and hardy enough for people to walk over once established. Upland meadow wildflowers were planted nearer to the fields to attract pollinators. A rain garden was designed to catch runoff from the pavilion stabilizing the bank and walking path along the pond.

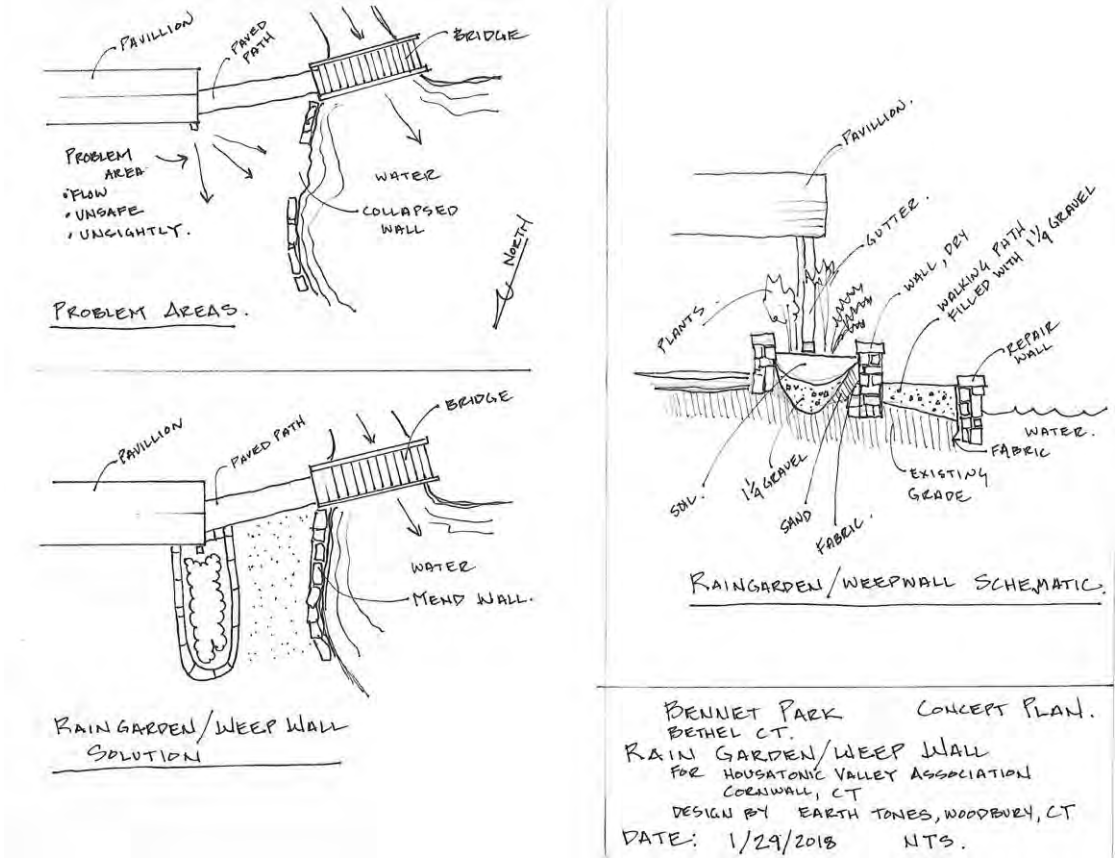
Cost Estimates:

Bennett Pond Vegetated Buffer Planting: $10,500

Bennett Memorial Park Pavilion Rain Garden and Weep Wall: $12,005

Bennett Pond Vegetated Buffer Planting Design Sketch by Earth Tones Landscape Architects

Bennett Memorial Park Pavilion Rain Garden/Weep Wall Design Plans by Earth Tones Landscape Architects



5.12 Mackauer Dog Park

Mackauer Park is downstream and adjacent to Bennett Memorial Park. While there is a healthy vegetative buffer along Limekiln Brook, invasive species dominate the area and use the existing fence line as a trellis. Moreover, a dog park (Bethel Bark Park), located within 10-15' of the stream edge presents two water quality threats. First, pet waste could end up in the stream carried with stormwater runoff. Second, because dogs play in the park, the park is mostly loose dirt that drains down the slope of the park and into the stream during rain events. Again working with Bethel Parks and Rec and Earth Tones, HVA utilized Connections students to remove invasives and plant a native buffer along the fence line. Earth Tones has created designs that terraform the dog park and adjacent areas to redirect stormwater to a bioswale where sediment and uncontrolled pet waste can collect and settle. This coincides with the town's plans to expand the dog park into the adjacent area.

Elsewhere in the park a number of invasives crowd out native habitat. More specifically phragmites dominates the bank of the Mackauer Pond and bittersweet, olive and mugwort line the wooded areas. Bethel's Garden Club has proposed the removal of these invasives and installation of native alternatives that will restore a more natural habitat to the area. They plan to work with local scout troops as well as the Connections Summer Crew to accomplish this.

5.13 Brookfield Municipal Center

The Brookfield Municipal Center and Police Station make up a large complex located close to the newly constructed section of the Still River Greenway. The drainage from this area flowed to a failing sedimentation structure in need of replacement. With funding from CWA 319 funding, the Northwest Conservation District (NWCD) partnered with HVA and the Town of Brookfield in 2016 to replace this failing structure with an extended detention wetland, removing invasives and landscaping in the area and replacing them with native wetland and upland non-invasive species along the Still River Greenway. These actions serve to protect the Still River by capturing, treating, and cleaning polluted stormwater run-off from the parking area and the adjacent town road before it reaches the Still River.

The constructed wetland retrofit captures water from Brookfield Municipal Center and the adjacent Police Station through two outfall pipes. Stormwater from these outfalls are captured in the two basins, an upper forebay and a lower basin. Stone berms and wide earth berms were installed throughout the structure to slow the flow, prevent erosion and create a long flow path (distribute the water over a larger area). Berms were filled and silt fencing was installed along the stream side of the structure to capture water and a pipe was laid under the Greenway trail to allow excess flow to the Still River. See Figure 5.13.1 for full plan details of the constructed wetland retrofit.

Upon completion of the contracted wetlands retrofit, NWCD staff partnered with HVA's Still River Watershed Connections program to enlist the help of high students from Danbury's Alternative Center for Excellence to assist in planting the bottom and sides of the wetlands with native vegetation. An interpretive, designed by NWCD staff was installed to explain how the constructed wetland retrofit functions to protect the Still River from polluted stormwater run-off.

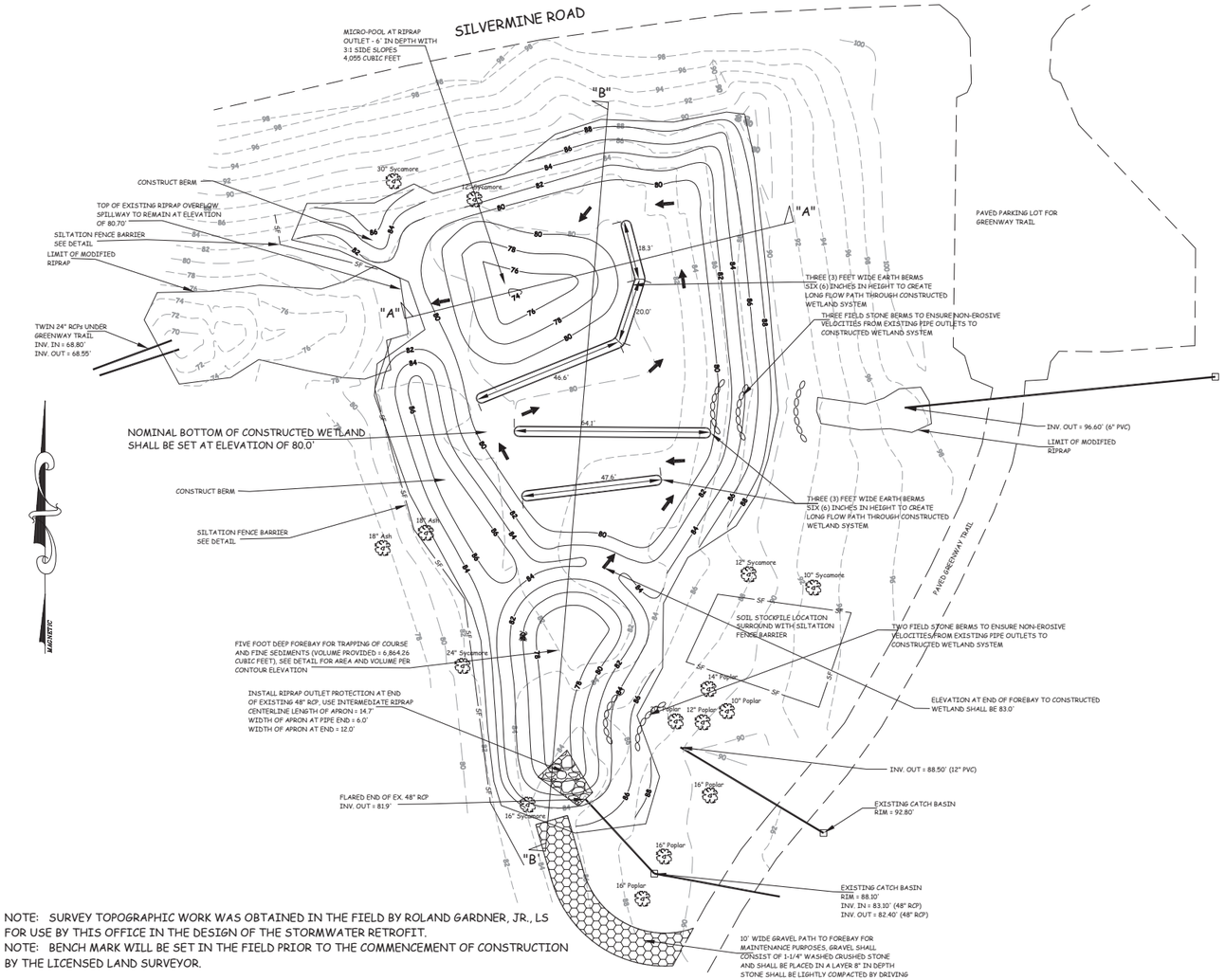
Load Reduction Estimates

Calculations below were made by design engineer Steve Trinkaus, Trinkaus Engineering based on the size and design of the constructed wetlands retrofit. Loads were calculated by using the Simple method

by Tom Schueler based on an annual rainfall of 51 inches. Total removal efficiencies were based on UNHSC and BMP Database.

Table 5.13.1 Estimated Load Reductions of Brookfield Wetlands Retrofit calculated by Steve Trinkaus, Trinkaus engineering based on annual rainfall of 51 inches

Pollutant	Loads	Total removal efficiencies	Total estimated annual load reductions (lbs.)
Total Suspended Solids	4095	89%	3644.55
Total Phosphorous	19	65.5%	12.44
Total Nitrogen	141	61.8%	87.13
Zinc	13	75%	158.25
Total Petroleum Hydrocarbons	211	-	-



NOTE: SURVEY TOPOGRAPHIC WORK WAS OBTAINED IN THE FIELD BY ROLAND GARDNER, JR., LS FOR USE BY THIS OFFICE IN THE DESIGN OF THE STORMWATER RETROFIT.
NOTE: BENCH MARK WILL BE SET IN THE FIELD PRIOR TO THE COMMENCEMENT OF CONSTRUCTION BY THE LICENSED LAND SURVEYOR.

EROSION NARRATIVE:

DESCRIPTION OF PROJECT: This project involves retrofitting the existing sedimentation basin which collects runoff from the Town of Brookfield municipal complex as well as the police station. The existing basin is almost full of sediment and is dysfunctional. The retrofit will convert this sedimentation basin into a constructed wetland with a forebay, shallow marsh areas, and micropool. The purpose of the retrofit is to improve the water quality from the contributing area prior to the discharge to the Still River.

CONSTRUCTION SEQUENCE:

1. Clear trees and brush within the proposed grading limits and approximately five (5) feet outside the proposed contours to provide adequate working room for the contractor.
2. Install siltation fence barriers in the two locations shown on the plan and in accord with the submitted detail.
3. Remove stumps from area of proposed work and remove from site.
4. If runoff is flowing out of existing 48" RCP, excavate temporary pump pit at the outlet of the 48" RCP and install a submersible pump in a cone of 3/4" crushed stone to dewater the area. The discharge line for the pump shall be located at the eastern limit of the existing riprap outlet on the downhill side of the top.
5. The regraded side slopes along the north and east sides of the basin shall be regraded in accordance with the proposed contours shown on this plan. Topsoil from this area shall be placed in a temporary stockpile location as shown for reuse when the grading is complete. After the slopes have been regraded, a minimum of 4" of topsoil shall be placed on the newly graded slopes, seeded with the Erosion Control/Restoration seed mix by New England Wetland Plants.
6. The micro-pool shall be excavated at this time in accord with the grading shown on this plan. The bottom of the constructed wetland shall also be graded to be level per the plan.
7. The three earth berms shall be constructed in the bottom of the constructed wetland. They shall be seeded with Wetmix Seed mix from New England Wetland Plants. All seeded areas shall be covered with hay mulch to protect the seeds during the germination period.
8. The new berms located along the west side of the constructed wetland shall be built using the excavated material from the side slopes and/or the excavation of the micro-pool. After the rough grading has been done, the berms shall be covered with a minimum of 4" of topsoil, seeded with the Erosion Control/Restoration seed mix. The seeded area shall be covered with hay mulch.
9. The forebay shall be excavated at this time in accordance with this plan. After the excavation has been completed, the intermediate riprap apron shall be installed per the plan and detail.
10. Native wetland plant plugs shall be planted in the bottom of the constructed wetland system.
11. The field stone berms shall installed on the slope below the other existing drainage discharge pipes.
12. It is suggested that invasive and overgrown native species be removed or thinned out in the upland area surrounding the constructed wetland system.
13. After all disturbed areas have been covered with vegetation, the erosion control measures may be removed from the site.

PLAN OBJECTIVES AND PRINCIPALS:

The objectives of the Soil Erosion and Sediment Control Plan are to manage both the runoff and the earthwork operations by using Best Management Practices. The objectives are as follows:

a. Control erosion at its source with temporary control measures, minimize the runoff from areas of disturbance, distribute stormwater through natural vegetation before being discharged into wetland systems.

b. Keep land disturbance to a minimum. The site layout has been designed to minimize any potential impacts to wetlands.

c. Construct the project in phases to minimize the area of the site under active construction at one time.

d. Retain existing vegetation wherever feasible. Siltation fence or other barriers will be used to limit the extent of earthwork.

e. Stabilize disturbed areas as soon as practical. Earth disturbance shall not occur on a given area until active construction is to take place in this area.

f. Minimize the length and steepness of slopes.

g. Maintain low runoff velocities.

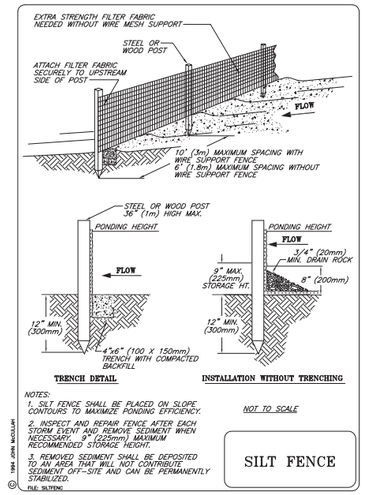
h. Trap sediment on site. Siltation fence barriers and driveway construction entrance will trap sediment during the construction period.

i. Establish a maintenance and repair program during the construction period. Erosion control measures will be inspected weekly during the spring months, twice a month during the summer and/or following rainfall events of greater than 0.5 inches and repaired as needed to ensure that they function properly.

j. Assign responsibility for the maintenance program. The responsibility for the maintenance program will be assigned to the contractor who shall designate one of its supervisory personnel to be the liason to the owner's representative. the owner shall retain the services of a licensed professional who shall inspect and monitor the contractor's methods and have the authority to require modifications to the Erosion and Sediment Control Plan. The town will be copied on all inspection reports prepared on behalf of the project.

TEMPORARY EROSION AND SEDIMENT CONTROL MEASURES - MAINTENANCE REQUIREMENTS:

1. Siltation fence barriers: Accumulated sediment shall be removed when it has reached a height of 25% of the exposed sediment barrier and disposed off is an appropriate manner.



ESTIMATED CUT AND FILL VOLUMES

CUT VOLUME = 839 CUBIC YARDS
FILL VOLUME = 95 CUBIC YARDS
NET EXCESS = 744 CUBIC YARDS

SAMPLE PLANT LIST FOR BOTTOM OF CONSTRUCTED WETLAND, TOP EDGE OF FOREBAY AND TOP EDGE OF MICRO-POOL:

SWEET FLAG (Acorus americana)
WATER PLANTAIN (Alisma subcordatum)
BIG BLUESTEM (Ammophila brevigulata)
SWAMP MILKWEED (Asclepias incarnata)
BEARDED SEDGE (Carex comosa)
FRINGED SEDGE (Carex crinita)
BROOM SEDGE (Carex scoparia)
BLUE FLAG IRIS (Iris versicolor)
CANADA RUSH (Juncus canadensis)
SOFT RUSH (Juncus effusus)
GREAT BLUE LOBELIA (Lobelia cardinalis)
ARROW ARUM (Peltandra virginica)
FOWL BLUEGRASS (Poa palustris)
PICKERELWEED (Pontederia cordata)
NORTHERN ARROWHEAD/DUCK POTATO (Sagittaria latifolia)

NOTE: A MIXTURE OF THE ABOVE SPECIES AS PLUGS SHALL BE PLANTED IN THE CONSTRUCTED WETLAND WHEN GRADING IS COMPLETE. PLUGS SHALL BE PLANTED AT APPROXIMATELY 18 - 24" ON CENTER SPACING IN A RANDOM PATTERN IN THE CONSTRUCTED WETLAND. PLANT INSTALLATION SHALL BE OVERSEEN BY SEAN HAYDEN OF THE NORTHWEST CONSERVATION DISTRICT.

CONTROL PLAN IMPLEMENTATION:

1. The contractor shall inspect the effectiveness and condition of erosion control devices during storm events, and after each rainfall event of 0.5" or more, prior to weekends and prior to forecasted large storm events.
2. The contractor shall repair or replace damaged erosion control measures immediately, and in case, more than four hours after observing such deficiencies.
3. The contractor shall be prepared to implement interm drainage controls and erosion control measures as may be necessary during the course of construction.
4. The constactor shall make available on-site all equipment, materials and labor necessary to effect emergency erosion control measures within four hours of any impending emergency situation.
5. The contractor shall make a final inspection, and clean up any tracked sediment on the existing road.
6. The contractor shall have on call at all times, a responsible representative who, when authorized, will mobilize the necessary personnel, materials and equipment and otherwise provide the required action when notified of any impending emergency situation.
7. The contractor shall supply a telephone number to the town engineer, planning agent so that the contractor may be contacted during the evenings and on weekends, if necessary.
8. The contractor shall maintain a minimum of 100 lf of silt fence on the site for emergencies.

GENERAL EROSION AND SEDIMENTATION CONTROL PLAN NOTES:

1. Regrading on this site shall done in such a manner as to prevent stagnant water from collecting in depresssions.
2. All erosion and sedimentation control measures will be installed prior to the start of any construction activity.
3. All erosion and sedimentation control measures shall be constructed in accordance with the submitted construction details and in compliance with the specifications and standards found in the "Guidelines for Soil Erosion and Sediment Control" as prepared by the State of Connecticut, revised to 2002.
4. Siltation fence barriers will be installed at the limit of all disturbed areas. Staked straw bales, will be utilized as necessary during the construction period. All work done shall be in accordance with the details shown on the plans.
5. Land disturbance will be kept to a minimum. Restabilization of all disturbed areas will occur as soon as final grading in complete.
6. All erosion and sedimentation control measures will be maintained in an effective conditions throughout the construction period.
7. Accumulated sediment will be removed from the control structures and disposed of in a lawful and safe manner.
8. Additional control measures will be installed during the construction period if the Zoning or Wetland Enforcement Officer requires them. The design engineer shall inspect the site periodically to ensure the proper installation of erosion control measures.
9. Regular inspections of the construction site shall be made by a representative of the Town of Westport and a professional retained by the owner to assure compliance with the approved plans.
10. The responsibility for implementing the erosion and sedimentation control plan, informing all parties engaged on the construction site of the requirements and objectives of the plan, notifying the appropriate town agencies of any transfer of this responsibility and for conveying a copy of the erosion and sedimentation control plan if title to the land is transferred is placed upon the owner of record.

IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO CALL "CALL-BEFORE-YOU-DIG" AT 1-800-922-4455 AT LEAST TWO WORKING DAYS PRIOR TO THE COMMENCEMENT OF CONSTRUCTION FOR THE LOCATION OF ANY UNDERGROUND UTILITIES ON THIS PROPERTY.

TRINKAUS ENGINEERING, LLC
CIVIL ENGINEERS
114 HUNTERS RIDGE ROAD
SOUTHBURY, CONNECTICUT 06488
203-264-4558 (ph & fax)
Email: strinkaus@earthlink.net

LOW IMPACT SUSTAINABLE DEVELOPMENT TRINKAUS ENGINEERING

STORMWATER RETROFIT
SHEET 1 OF 2
PROJECT #007-2016
SCALE: 1" = 20'
DATE: 3/14/16

PREPARED FOR
TOWN OF BROOKFIELD
SILVERMINE ROAD
BROOKFIELD - CONNECTICUT

5.14 Additional Sites Under Consideration

There were a number of sites discovered during the watershed planning process that were promising opportunities for stormwater retrofits, but that did not rank quite as high for the Top 10 list. This section gives a brief introduction to these sites. As funding, partnerships, and interests align, any of these sites might be ripe for implementation. The same criteria used to assess the above sites apply to the sites below as well; partnership viability and amount of pollution load reduction. Project selection will also prioritize those that provide opportunities to incorporate multiple watershed goals - recreation, education, species and habitat revitalization, and flood prevention/climate change resiliency. See Table 5.14.1 for a full list of addition sites under consideration.

Western Connecticut Station University Midtown Campus (WCSU in Danbury)- WCSU Midtown Campus is located in one of the most highly polluted subwatersheds in the Still River and drains into the downtown Danbury city stormwater system. The campus is 34 acres and includes a number of storm drains located in turfed areas, providing opportunities for student-designed green infrastructure projects with little need for engineering. Projects at this location provide the unique opportunity for collaboration with WCSU faculty and students and could become educational exemplars for the campus community.

Laurel Gardens (Danbury) – Laurel Gardens is an apartment complex of 64 1-3 bedroom, federal low-income family housing units located next to Padanaram Brook. The two impacts at this site are uncontrolled debris (trash) and stormwater pollution. Projects at this site would improve the environmental health of the residents and may include outreach campaigns, addressing waste control, or mitigating stormwater pollution of the 3-acre property. Partners for this project are Danbury Housing Authority and the City of Danbury.

Eden Drive (Danbury) – Similar to Laurel Gardens, Eden Drive contains 55 2-3-bedroom federal low-income family housing units. It is located uphill of the Danbury Public Works complex and borders an unnamed tributary to the section of Limekiln Brook regulated by TMDLs for zinc, chlorine, ammonia, and copper. Similar to Laurel Gardens there is a significant amount of trash uncontrolled by the 4 dumpsters on site and there are a number of outfalls carrying stormwater from the approximately 5 acres of impervious cover causing erosion in the stream corridor.

Fire Engine Co. 24 (Danbury) - Fire Engine Co. 24's fire station is downstream of the Danbury section of the Still River Greenway and adjacent to the Still Mainstem next to the Eagle Rd. stream crossing. The parking area and pullout bay drains into three storm drains which also capture some of Eagle Rd. runoff. The outfall to these storm drains is directly connected to the river mainstem. There are grassy median areas near all the storm drains on this property which could be repurposed to catch stormwater.

Clifford J. Hurgin Municipal Center (Bethel) - The Clifford J. Hurgin Municipal Center, Bethel's Town Hall, is located in downtown Bethel and drains into the XX stream. The parking lot in the back of the center looks to be in need of some repairs. Discussions with the town showed some interest in repaving this area at which point there will be an opportunity to incorporate BMPs and green infrastructure to reduce stormwater quantity from the town stormwater sewer system.

Bethel Middle School (Bethel) - Bethel's Middle School is part of a Bethel's Educational complex all of which drains into East Swamp Brook through outfalls located adjacent to the stream. There are a number of islands in the Bethel Middle School parking lot that could be transformed to bioswales and pollinator gardens. Additionally there are grassy areas with stormdrains that present further opportunity for gardening. All projects at the Middle School could incorporate student input in design and implementation, elements that could be tied into classroom curriculum and serve as an educational example for current and future students.

Northern Terminus of the Still River Greenway (Brookfield) - This location has two outfalls flagged during USA streamwalks due to the considerable amount of gullying. About 10-15 feet of rip rap was added to each outfall. This works to mitigate erosion caused by stormwater flow for that 10-15' feet but stormwater scours the bank just downstream, effectively connecting these outfalls with the mainstem of the Still. The turf along the Brookfield Greenway provides an opportunity for green infrastructure (ex. bioswale) installation that can catch stormwater coming from the road. Reducing the amount of stormwater that drains into these outfalls can reduce gullying and the consequent sedimentation into the Still River mainstem.

Know of a potential project site? Let us know!

COMMENTS AND DISSEMINATION

This document, as with the entire watershed planning process, is intended to be iterative. Comments and feedback are not only suggested, but required as part of any comprehensive planning process. Please submit feedback and suggestions to HVA by emailing Courteny Morehouse at courtenymorehouse.hva@gmail.com. Thank you!

Table 5 14 1

Full List of Prospective Projects Sites Under Consideration

	Location Name	Location	Stream	Impact	Owner	Notes
Bethel	Bennett/Mackauer Park	14 Shelter Rock Rd.	Limekiln	Impacted Buffer	Town of Bethel	
	Rourke Field	43 Plumtrees Rd.	East Swamp	Impacted Buffer	Town of Bethel	
	Parloa Field	134 South St	Sympaug	Impacted Buffer IC/Stormwater	Town of Bethel	
	Bethel Middle School	300 Whittlesey Dr.	Wolf Pitt	IC/Stormwater	Town of Bethel	
	Bethel Town Hall	1 School Street	Sympaug	IC/Stormwater	Town of Bethel	
	Bethel Fire Dept.	36 South St.	Sympaug	IC/Stormwater	Town of Bethel	
	Bethel Public Works	1 Sympaug Park Rd.	Sympaug	IC/Stormwater	Town of Bethel	
	Workspace Education	16 towbridge rd	Sympaug	IC/Stormwater		
Brookfield	Public Works	81 Grays Bridge Rd	Mainstem	IC/Stormwater	Town of Brookfield	
	Northern terminus of Still River Greenway	731 Federal Rd. Intersection of Old Rte 7, Laurel Hill Rd, and 202	Mainstem	Two "5" suspicious outfalls	DOT	
	Mystery Acres	673 Federal Rd. Brookfield	Mainstem	Impacted Buffer	Town of Brookfield	
	Prince of Peace Lutheran Church	119 Junction Rd	Mainstem	IC/Stormwater	Prince of Peace Lutheran Church	Also Preschool
	Kohl's	84 Federal Rd.	East Brook	IC/Stormwater	Samuels & Assoc. Development	
	The Goddard School	1 Production Dr.	Mainstem	IC/Stormwater	Goddard School	
	Laurel Gardens Housing Units	381-387 Main St.	Padanaram	Impacted Buffer IC/Stormwater	City of Danbury Housing Authority	
	Eden Drive Housing Units	146 Eden Dr.	Lower Limekiln			
	Police Station	375 Main St.	Padanaram	Impacted Buffer IC/Stormwater	City of Danbury	
	ACE	26 Locust Ave.	Mainstem	IC/Stormwater	City of Danbury	
	Danbury Public Schools Admin Building	63 Beaver Brook Rd.	Mainstem	IC/Stormwater	City of Danbury	
	Danbury Fire Department	19 New St	Park Pond	IC/Stormwater	City of Danbury	
	City Hall Staff Parking	158 Deer Hill Rd.	Park Pond	IC/Stormwater	City of Danbury	
	Broadview Middle School	72 Hospital Ave.	Mainstem	IC/Stormwater	City of Danbury	
	Fire Engine 24	36 Eagle Rd.	Mainstem	IC/Stormwater	City of Danbury	

Danbury	Moose Lodge	75 Boulevard Dr.	Lake Kenosia	Impacted Buffer	
	Stadley Rough Elementary	25 Karen Dr.	Mainstem	IC/Stormwater	City of Danbury
	Shelter Rock Elementary	2 Crows Nest Ln.	East Brook Swamp	IC/Stormwater	City of Danbury
	Western Connecticut State University	181 White St.	Mainstem	IC/Stormwater	WCSU
	Tubar	1-5 Tooley Ln.	Kohanza	Impacted buffer Erosion	Tubar LLC
	Shopping Center	23-41 North Street	Kohanza	Impacted buffer Channel mod	Deep's Family Limited Partnership
	Cedar Court Condos	103 Kohanza	Kohanza	Impacted Buffer	Zielinski
	Ridgewood Condos	Kohanza st.	Kohanza	Impacted Buffer Suspicious outfall	RRS Property Management
	Greensview Condos	17 Kohanza	Kohanza	Impacted Buffer Suspicious outfall	Greensview Properties LLC
	Covered Bridge Condos	60 Padanaram	Padanaram	Impacted Buffer Suspicious outfall	Greenfield Management
	Mobile Gas Station	54 Padanaram	Padanaram	Erosion	Alliance Energy
	Danbury Fireworks	52 Padanaram	Padanaram	Erosion	Danbury Fireworks
	Wooster School	91 Miry Brook Rd.	Miry Brook	Impacted buffer	Wooster School
	Stew Leonard's	99 Federal Rd	Mainstem	Suspicious outfall Impacted buffer	
	Henry Abbott Tech School	21 Hayestown Ave.	Padanaram Brook	IC/Stormwater	City of Danbury
	Still River Greenway	35 Eagle Rd.	Mainstem	Impacted Buffer	City of Danbury
w Milford	Candlewood Valley Country Club	401 Danbury Rd	Mainstem	Impacted Buffer	Candlewood Valley Country Club
	Harrybrooke Park	100 Still River Dr.	Mainstem	Recreation	Harrybrooke Park
	Candlewood Point Housing Community	Candlewood Lake Rd. North	Trib of Mainstem	Targed RiverSmart Program	Various

Ne					
	Erickson Rd.	96 Erickson Rd.	Mainstem	Recreation	Town of New Milford
	Pond Meadow/Still River Preserve	585 Danbury Rd.	Mainstem	Habitat Restoration	Weantinoge

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[15] USGS (2016)

[16] USGS (2016)

[17] USGS (2016)

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Comments and Dissemination

This document, as with the entire watershed planning process, is intended to be iterative. Comments and feedback are not only suggested, but required as part of any comprehensive planning process. Please submit feedback and suggestions to HVA by emailing Courteny Morehouse at courtenymorehouse.hva@gmail.com. Thank you!