DRAFT Hutchinson River Watershed Management Plan

The Hutchinson River along Sanford Boulevard near Glover Field (Mount Vernon)

Prepared for:

Save the Sound & Westchester County Department of Planning and Soil & Water Conservation District

Prepared by:

Biohabitats

January 2024

Acknowledgements

We would like to thank the following individuals and organizations for their contributions of time and effort to the development of this plan:

Project Steering Committee

Adjie Henderson	Hutchinson River Restoration Project + City Island Oyster Reef
Andrew Campbell	Stakeholder
Angela Schimizzi	NYS DEC
Anne Ruzek	NYC DEP
Barbara Zahm	Hutchinson River Restoration Project + City Island Oyster Reef
Catherine Gibson	The Nature Conservancy
David DeLucia	Westchester County Dept. of Parks, Recreation and Conservation
Gareth Hougham	Hudson Valley Stream Conservancy
James Rausse	Mount Vernon
Jan Blaire	Westchester County Soil and Water Conservation District
Jane Curtis	Mount Vernon
Jeff Carson	Stakeholder
John Waldman	Queens College
Karen Argenti	Bronx Council for Environmental Quality
Katherine Mella	Mount Vernon
Kelly Owusu-Asiamah	NYC DEP
Kevin Kain	City of New Rochelle
Liz Fried	City of New Rochelle
Lois Lovisolo	Lake Innisfree
Louis Kleinman	Stakeholder
Marlon Molina	Mount Vernon
Mary Arnold	NYS DEC
Melissa Sotelo-Wright	Hutchinson River Restoration Project
Michele Golden	NYS DEC
Patrick Gannon	Hutchinson River Restoration Project
Patty George	Stakeholder
Paul Anthony Presendieu	City of New Rochelle ENRAC
Peter McCartt	Eastchester / Office of the County Executive
Ruby Olisemeka	Westchester Land Trust
Sara Powell	NY Sea Grant / LISS
Shawn Fisher	USGS
Shino Tanikawa	SWIM Coalition
Tai Montanarella	Village of Pelham Climate Smart Community Task Force
Timon Malloy	Stakeholder
Yenna Chan	Village of Pelham

Save the Sound

Nicole Davis, Watersheds Project Manager
Katie Friedman, New York Ecological Restoration Program Manager
Megan Lung, New York Ecological Restoration Project Manager
Sam Marquand, Clean Water Advocacy Specialist

Westchester County Department of Planning and Soil & Water Conservation District

Nicole Laible, Principal Environmental Planner/ District Manager
Suzette Lopane, Landscape Architect

Consultant – Biohabitats, Inc.

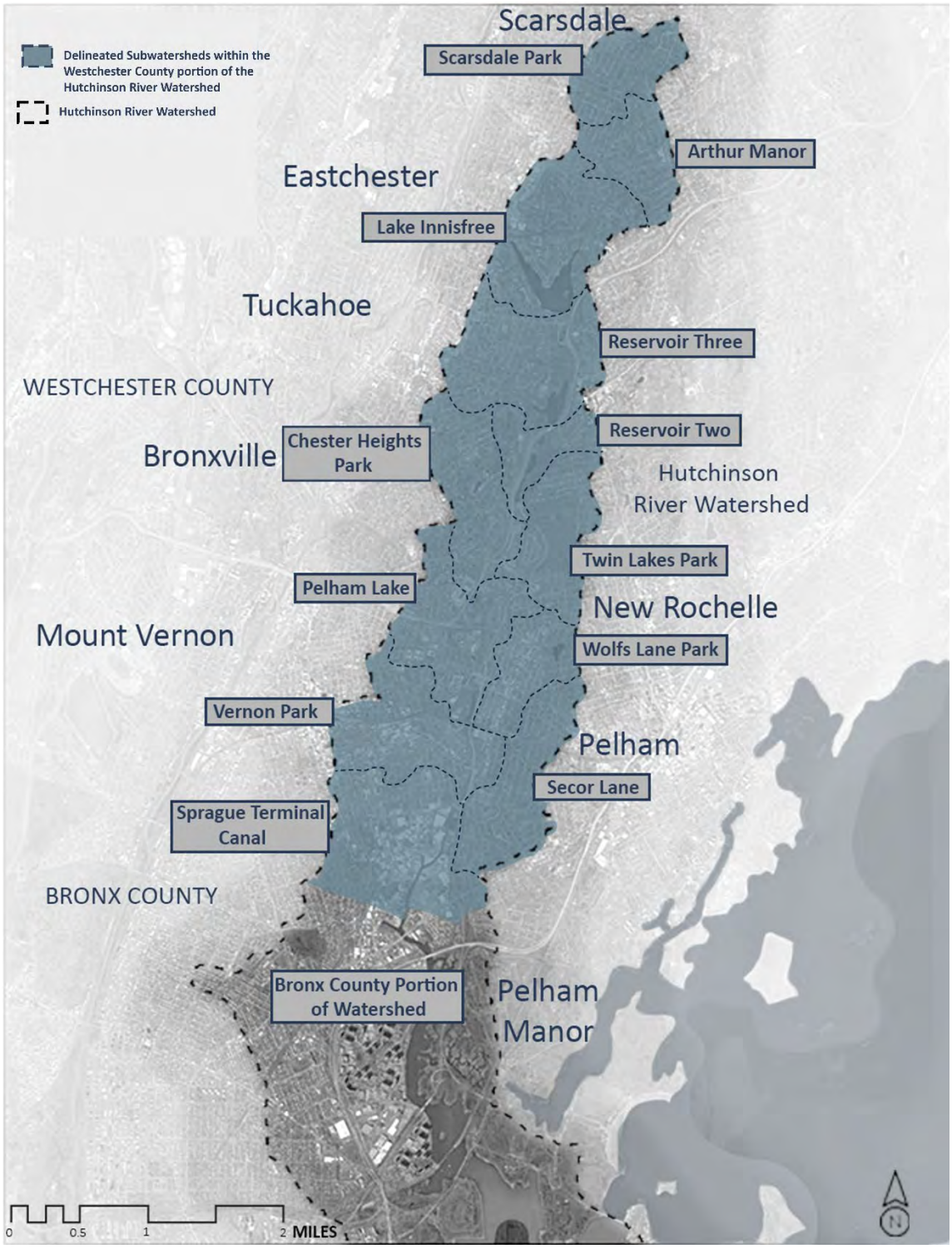
Kevin Dahms, PE, Water Resource Engineer
Meghan Gloyd, PE, Senior Water Resource Engineer
Jennifer Missett, PE, Eastern Bioregions Operations Leader
Ellie Month, EIT, Water Resource Engineer
Josh Wilson, PWS, Senior Ecologist
Rebecca Winer-Skonovd, Senior Project Manager

Funding for the Hutchinson River Watershed Plan was provided in part by the Long Island Sound Study, the Westchester County Soil and Water Conservation District, and the Owens and Minor Foundation

Table of Contents

1. Introduction

The Hutchinson River Watershed Management Plan (Plan) was undertaken to develop an understanding of the Westchester County portion of the watershed, identify likely water quality impairments, and improve watershed health through the identification of restoration opportunities including both water quality and ecological improvements. References to “the watershed” and the associated analyses, evaluations, and recommendations in this report are focused solely on the Westchester County portion of the Hutchinson River watershed unless explicitly noted. Future watershed planning efforts will address and tie-in the Bronx portion of the watershed. Figure 1 shows the watershed depicting the boundary between the Westchester County and Bronx County and the subwatersheds within the Westchester County portion of the watershed.



Mapping data sources: NYS DEC 2019.; Westchester County 2019; ESRI 2023; Biohabitats 2023

Figure 1. Hutchinson River Watershed Depicting the Subwatersheds within Westchester County and the Portion of the Watershed Located in Bronx County

1.1. Nine Element Watershed Plan

This Plan was developed by following the United States Environmental Protection Agency's (U.S. EPA) Nine Element (9E) planning process for watershed plans. The nine elements are intended to ensure that sources of nonpoint source pollution (NPS) are identified, establish water quality targets to address nonpoint source pollution, identify sources of nonpoint source pollution, identify restoration opportunities to reduce nonpoint source pollution, and establish a plan for implementation of restoration opportunities to address water quality concerns. Nonpoint source pollution typically refers to pollutants carried by stormwater or when the source of pollution either cannot be identified or may come from many sources. Point source pollution is defined as coming from a single point, such as a pipe from a factory or sewage treatment plant.

The nine elements are identified in Table 1 below along with the sections of the Plan where they are addressed. A Quality Assurance Project Plan (QAPP) was developed for the watershed plan and can be found in Appendix H. The QAPP meets funding requirements and was intended to help ensure that data are collected credibly and used for their intended purpose.

Table 1. Hutchinson River Watershed Plan and the Nine Elements

US EPA Watershed Plan Element	Relevant Watershed Management Plan Sections
A: Identify and quantify sources of pollution	Section 2. Baseline Conditions
B: Identify the water quality target or goal and pollution reductions needed to achieve water quality goal/target	Section 3. Watershed Goals Section 7. Pollutant Load Reductions
C: Identify the best management practices (BMPs) that will help achieve reductions needed to meet water quality goal/target	Section 6. Management Measures and Section 7. Pollutant Load Reductions
D: Describe the financial and technical assistance needed to implement the BMPs identified in Element C	Section 8. Implementation Plan
E: Describe the stakeholder outreach, explain how their input was incorporated and include the role of stakeholders in implementing the plan	Section 4. Community Involvement and Section 8. Implementation Plan
F: Estimate a schedule to implement the BMPs identified in the plan	Section 8. Implementation Plan
G: Describe the milestones and estimated timeframes for BMP implementation	Section 8. Implementation Plan
H: Identify the criteria that will be used to assess water quality improvements as the plan is implemented	Section 8. Implementation Plan
I: Describe the monitoring plan to collect water quality data that will be used to measure improvements	Section 9. Monitoring Plan

1.2. Watershed Planning Process

Development of the Hutchinson River Watershed Management Plan consisted of the following tasks for the Westchester County portion of the watershed.

Public Kick of Meeting

The watershed planning process was launched with a public kick off meeting to provide background information on the Hutchinson River watershed, explain the need for a watershed plan, and outline the proposed planning procedure. Participants were asked a series of questions to learn what aspects of the watershed were important to them, what they would like to see protected or changed, who should be involved in the planning process, and the resources that exist. Information at this initial meeting helped shape watershed planning goals. Participants were also invited to join the watershed plan Steering Committee to help shape the Plan.

Project Steering Committee

A Project Steering Committee (the Steering Committee) was formed to help guide the development of the Plan. The Steering Committee consisted of representatives from municipalities located within the watershed, local land trusts, non-profit organizations and watershed residents. Meetings were held regularly throughout the development of the Plan to develop watershed goals, identify concerns and priorities, and provide input on restoration opportunities and implementation strategy. Additional community outreach is described in Section 4.

Existing Watershed Conditions (Baseline)

A baseline assessment was conducted to review existing documentation, delineate the Hutchinson River subwatersheds, identify the causes of impairment and pollutant sources for waterbodies within the watershed, and develop a general characterization of the watershed. This effort also included a Comparative Subwatershed Analysis to assess the relative restoration potential of the subwatersheds and target subwatersheds for more detailed field investigations. Baseline conditions are summarized in Section 2 and the full Baseline Assessment is available in Appendix B.

Restoration Opportunity Identification

Field assessments were performed throughout the watershed within Westchester County to identify restoration opportunities for site-specific projects within the Hutchinson River watershed. Identification of opportunities included a prioritization schema to identify the most promising restoration opportunities based on a variety of factors including ability to address water quality concerns, ease of implementation, and other potential project benefits such as visibility to the public. The process is discussed in further detail in Section 5.

Three types of assessments were conducted to identify a broad range of restoration opportunities: Hotspots, Retrofits, and Reforestation. These restoration opportunity types were selected for their feasibility of implementation based on watershed

characteristics and ability to reduce the majority of pollutants associated with stormwater runoff including the pollutants of concern (described in Section 2.3).

Hotspot Assessment: targeted locations that may be contributing large amounts of debris, eroding pavement, bulk storage of materials, chemicals, or oil and grease into the watershed. These locations can contribute to the watershed's pollutants of concern including low dissolved oxygen and oil and grease. This assessment identifies actions that can be taken to improve stormwater runoff from these sites.

Retrofit Assessment: targeted large areas of untreated impervious cover and examined opportunities to provide runoff reduction. Climate resiliency considerations focused on practices that would be suitable for more frequent and intense storm events. Selected solutions leaned towards cost-effective practices known to be effective at volume management and that include an overflow system (e.g., bioretention areas and submerged gravel wetlands, on sites where larger footprints were feasible).

Reforestation Assessment: targeted areas with the potential to increase tree canopy cover and remove impervious cover. These sites also had the potential to provide co-benefits such as ecosystem services (i.e., heat island mitigation, habitat corridors), enhance community aesthetics, provide erosion control, and remove non-native invasive species.

Field assessments and identified restoration opportunities are described in further detail in Sections 5 and 6 and Appendices D, E and F.

Pollutant Load Modeling

The Watershed Treatment Model (WTM) was used to understand existing water quality conditions based on impervious cover and land use information. The WTM was also used to determine the load reduction from the proposed restoration opportunities. Pollutant load modeling results are detailed in Section 7.

Management Strategies

Recommended management strategies to improve water quality and the ecological health of the Hutchinson River watershed are presented in Section 6 of this Plan. Recommendations were derived from baseline condition observations, field assessment, restoration opportunity prioritization, two public meetings on September 21, 2022, and February 21, 2023, respectively, input from the Steering Committee, and feedback received during public review of the draft plan and a public information session on [*February 6, 202*].

1.3. Additional Relevant Efforts

The Plan was developed in the context of numerous studies and projects focused on water quality, ecological health, and stormwater management. This Plan builds on and complements these efforts. Recent and relevant efforts are summarized in Table 2 below.

Table 2. Summary of Additional Effort Relevant to the Hutchinson River Watershed Management Plan

Relevant Study/ Project	Summary
Resilient New York	New York State launched the Resilient NY in 2018. Studies will be produced for 48 high-priority flood-prone watersheds. Hutchinson River Watershed Flood Study is currently underway and will address the causes of flooding and develop effective and ecologically sustainable flood and ice jam hazard-mitigation projects. The flood study will take 6-9 months to be completed and once complete, the report will be posted on the Resilient NY website.
Reservoir #2 Fish Passage Feasibility Study	Hudson Valley Stream Conservancy conducted a feasibility study to evaluate design alternatives for fish passage and the associated impacts to flood mitigation at Reservoir #2.
New Rochelle Drainage Study (2022)	The City of New Rochelle conducted a study to identify drainage problem areas and potential drainage improvement projects. Study can be found online here.
New Rochelle Green Infrastructure (GI) Report (2018)	The City of New Rochelle conducted a report to identify and assess GI opportunities into capital municipal projects and land use development regulations. Report can be found online here.
NYS DOS Hutchinson River Revitalization Plan	The City of Mount Vernon is working to prepare a Hutchinson River Revitalization Plan to establish regional strategies for community and waterfront revitalization and include preliminary planning for watershed management and a water trail.
Village of Pelham Stormwater System Upgrades	The Village of Pelham is conducting a study on upgrading its stormwater system, which is currently overwhelmed during rain events, affecting Village and private properties in the watershed. The engineering firm doing the study issued a draft report in 2022 and a final one is underway.
Hutchinson Parkway Historic Designation	Led by the Village of Pelham Manor, the Hutchinson Parkway will be listed on the State and National Registers of Historic Places (Edwards, 2023).

2. Baseline Conditions

The Hutchinson River flows through Westchester County into the Borough of the Bronx in New York City and empties into Eastchester Bay. It is a tributary of the Long Island Sound. The history of the region is long, robust, and an informative parameter to the Hutchinson River's current condition.

2.1. Watershed History and Current Profile

History of the Hutchinson River Watershed

The region was originally inhabited by Native American tribes including the Siwanoy and Weckquaesgecks, both Algonquin-speaking sub bands of the Lenape (Delaware) people. The Indigenous name for the River is "Aqueanouncke" after the red cedar trees found nearby (Lederer, 1978). Its proximity to New York City and the navigable waters surrounding it made the region heavily sought after by European colonists. By the mid-1600s, the Native American population were increasingly being pushed out of their homelands by the colonists.

The Hutchinson River is named after Anne Hutchinson. Hutchinson was a woman from the Massachusetts Bay colony who was outspoken against the Puritan doctrine. After her exile from the colony, she and her family settled in New Netherlands near the river that now bears her name. In 1643, Hutchinson was killed during a battle between the Native Americans and white settlers in Keifts's War (Tribal History, n.d.). She is remembered for being a proponent of religious and women's freedoms (Hutchinson River Parkway, NYC Parks).

Throughout the late seventeenth century, the Hutchinson River basin continued being developed by Europeans that settled in towns such as Pelham, Eastchester, and New Rochelle (Town of Eastchester, 2017; Davis & Kump-Leghorn, 2013). Areas surrounding these towns remained rural until the mid-nineteenth century when industrialization brought railroad lines through the region. The new transit increased the movement of goods between New York City and its surrounding areas and spurred industrial, economic, and community growth in southern Westchester County (Town of Eastchester, 2017).

In 1895, the US Army Corps of Engineers deepened and removed obstructions from the Hutchinson River in Mount Vernon to allow easier movement through the Eastchester Creek Channel. After its dredging, the channel was noted to be 12 feet deep at high tide (*The Iron Age*, 1895). By 1925, most of the land in the southern portion of the Hutchinson River watershed was heavily developed. Under a 1930 authorization, the portion of the Eastchester Creek Channel in Westchester County was approved to be 70 feet wide and 8 feet deep (Army Corps of Engineers, 2022).

The rise of automobile use and creation of the parkway system further surged development of Westchester County in the early twentieth century. The parkway system from New York City into Westchester County expanded with construction of the

Hutchinson River Parkway, and eleven miles were constructed in Mount Vernon and Pelham to ease traffic. When the Hutchinson River Parkway was completed in 1941, it was one of the first major roads east of Lake Innisfree (Figure 2).

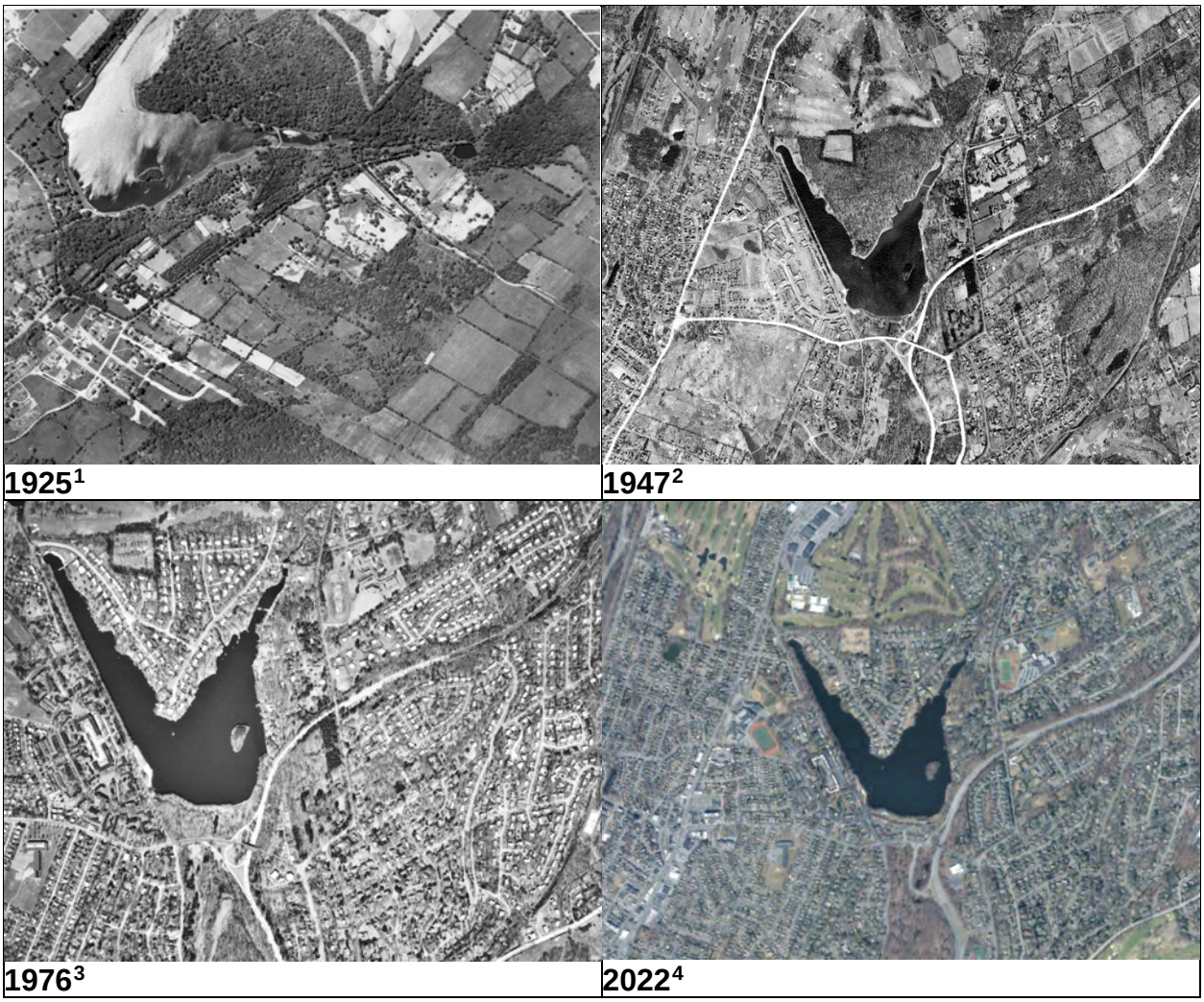


Figure 2. Aerial Footage of Development Around Lake Innisfree in New Rochelle Before the Construction of the Hutchinson River Parkway (1925) and Subsequent Years After (1947, 1976, 2022)

The industry and towns near the Hutchinson River were constructed before the enactment of the Clean Water Act in 1972. Infrastructure and development that occurred prior to the Clean Water Act continue to have water quality implications today. According to the ASCE Infrastructure Report Card for New York State (2022), approximately 40% of the sewer infrastructure is more than 60 years old. Aging sewer infrastructure leads to

[1] Underwood and Underwood. 1925 Aerial Survey. Westchester Count, Department of Planning. 1925.
[2] Fairchild Aerial Surveys, Inc. 1947 Aerial Survey. Westchester Count, Department of Planning. 1947.
[3] Aerial Data Reduction Services, Inc. 1976 Aerial Survey. Westchester Count, Department of Planning. 1976.
[4] Google Maps. Aerial Image of Lake Innisfree. 2022.

increased infiltration and inflow, broken pipes, clogging, exfiltration, and equipment failure which can lead to combined sewer overflows.

Present Day Watershed Profile

The Hutchinson River watershed within Westchester County encompasses over 8 square miles, eight municipalities, and is home to over 200,000 people. The river begins at Brookline Avenue in Scarsdale and continues south, flowing through the Bronx to the Long Island Sound. A basic profile of the watershed is provided in Table 3 and key features along the Hutchinson River are identified in Figure 3.

Table 3. Profile of the Hutchinson River Watershed in Westchester County[5]

Metric	Description
Area in Westchester County	8.2 square miles (5,234 acres)
Stream Length	Approximately 9.5 miles
Land Use & Water Coverage	— 50% residential — 21% roadways — 14% parks — 9% commercial — 3.5% industrial — 2.5% open water
Subwatersheds[6]	12 subwatersheds
Jurisdictions	— Village of Scarsdale — City of New Rochelle — Town of Eastchester — Village of Tuckahoe — Village of Bronxville — Village of Pelham — Village of Pelham Manor — City of Mount Vernon
Water Quality[7]	— Middle Branch: Class “C” — Lower Branch: Class “B”

[5] Westchester County Department of Planning. Planimetrics Data. Westchester County GIS: 2022.
[6] A watershed is the area of land that contributes runoff to a lake, river, stream, wetland, estuary, or bay. Land use activities within a watershed affect the water quality of the receiving waters. Watersheds are made up of numerous smaller watersheds, which are called subwatersheds.
[7] NYS DEC provides letter classifications to denote a waterbody’s best use. Class B are primary and secondary contact recreation and fishing. Class C are suitable for fish, shellfish, and wildlife propagation.

Metric	Description
Impoundments Leading to Timed Releases	— Lake Innisfree[8] Impoundment — Reservoir No. 3 Impoundment — Reservoir No. 2 Impoundment — Pelham Lake Impoundment
Major Transportation Routes	— I-95 — Cross County Parkway — Hutchinson River Parkway — Metro-North Railroad

The northern portion of the watershed is primarily residential with low to medium density single family homes. The area includes small parks and outdoor recreational spaces, as well as two large golf courses.

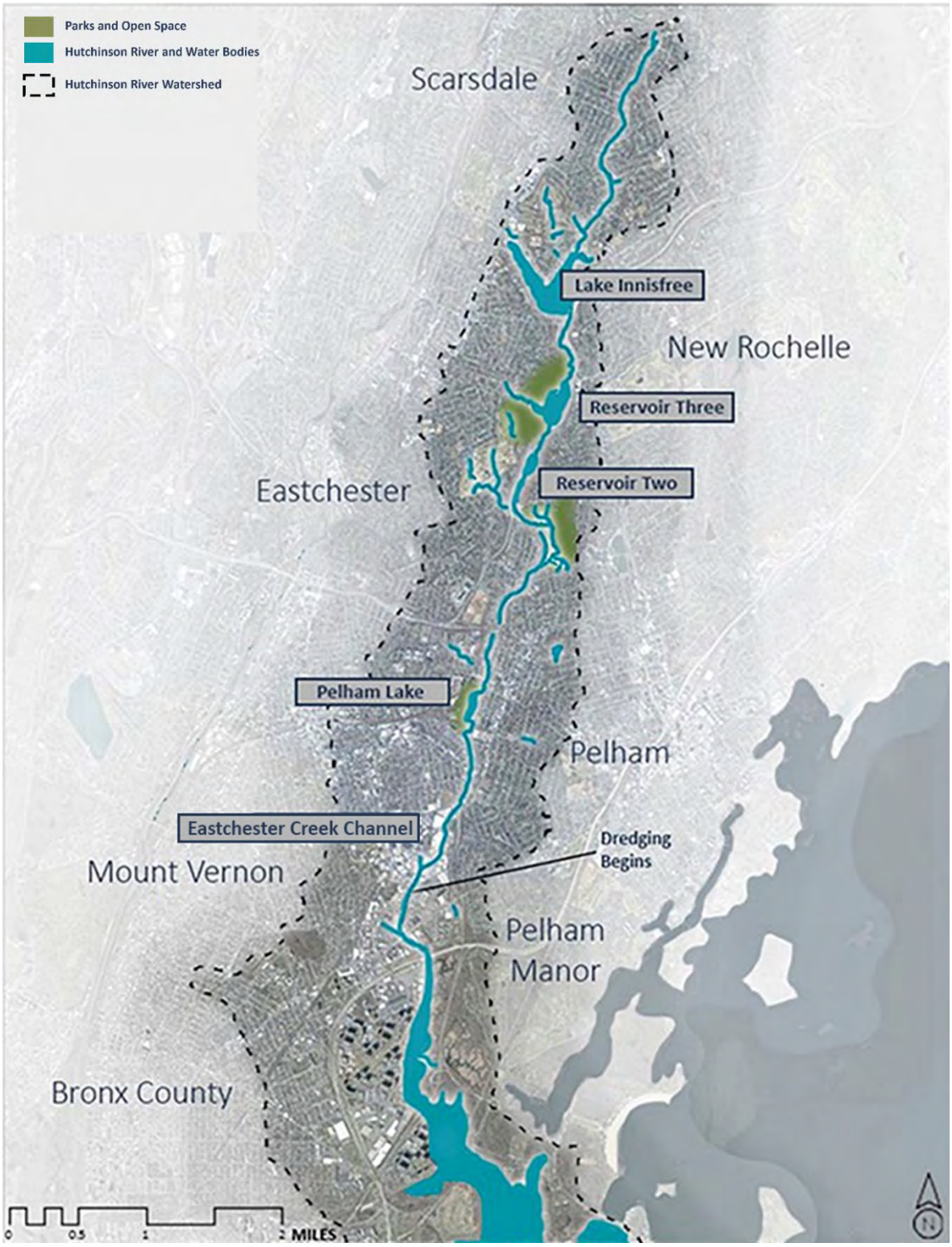
After two miles, the river reaches Lake Innisfree in New Rochelle, which is the most upstream impoundment along the Hutchinson River. This artificial lake and dam were constructed in 1894 to create a water supply for New Rochelle and Mount Vernon. The dam is 680 feet long, and earth dikes retain water in the 1,043 acre-feet capacity reservoir (Koch, 1979a). Lake Innisfree is no longer used as a drinking water source and now is maintained as a water body used for swimming, boating, and fishing (Figure 4).

Less than a mile downstream from Lake Innisfree are two smaller, dammed impoundments referred to as Reservoirs No. 3 and 2 respectively. Like Lake Innisfree, these reservoirs were made by damming the Hutchinson River for drinking water supply but now are two aesthetic and recreational features of Twin Lakes County Park.

Reservoir No. 3 was built in 1908 by the New Rochelle Water Company, and in 1949 Westchester County took ownership of the dam and reservoir and renovated the spillway. The reservoir is now maintained for recreation (Koch, 1979b). Reservoir No. 2 was constructed in 1892. The Hutchinson River Parkway was constructed along the reservoirs and the river, which led to a portion of the impoundment being filled, making the reservoirs longer and narrower with steep embankments.

The Hutchinson River continues flowing south to Pelham Lake in Willson's Woods Park, about two miles downstream of Reservoir No. 2. The area surrounding Pelham Lake is heavily developed; approximately 98% of the land parcels that drain to Pelham Lake are developed or have development planned.

[8] Lake Innisfree is also known as Reservoir 1. For this Plan the waterbody is referred to as Lake Innisfree.



Mapping data sources: NYS DEC 2019; Westchester County 2019; ESRI 2023; Army Corps of Engineers 2022

Figure 3. Map of the Hutchinson River Watershed

Pelham Lake is currently impacted by sediment accumulation in the northern end of the lake (Figure 5). A 2020 study done by Jacobs Engineering found that there is little floodplain connectivity along the river between Lake Innisfree and Pelham Lake, the river is channelized, and erosion has lowered and degraded the riverbed and contributed to sedimentation in Pelham Lake (Jacobs, 2020).

Figure 4. Lake Innisfree (New Rochelle) and Nearby Homes (left). A Home on Lakeshore Drive along the Hutchinson River (right)

Figure 5. 1950s North Facing Postcard View of Pelham Lake (Mount Vernon) (left). Stream Bank Erosion along the Hutchinson River (right)

Moving south, past Glover Field in Pelham, the Hutchinson River was dredged to make it navigable to the Long Island Sound. This portion of the river is now used for shipping resources including petroleum, sand and gravel, and scrap metal cargo (Figure 6) (US Army Corps of Engineers, 2022). Maintenance dredging in 2010 removed 21,000 cubic yards of sediment. Slightly upstream of the Boston Road bridge, the Hutchinson River crosses from Westchester County to the Bronx. Further into the Bronx, the shipping channel widens to 150 feet (US Army Corps of Engineers, 2022). Finally, before entering the Long Island Sound, the Hutchinson River flows past Co-Op City to the west and through a series of wetlands in Pelham Bay Park.

Figure 6. Petroleum Storage Tanks by the Eastchester Creek Channel (Mount Vernon) (left). Built-up of Litter in the Hutchinson River Behind Homes on Beechwood and Farrell Ave (Pelham) (right)

Point Sources

While the focus of this plan is to identify and work towards reducing nonpoint source pollution, there are also potential sources of point source pollution. Point source pollution is defined as coming from a single point, such as a factory or sewage treatment plant. There are no wastewater treatment plants within the watershed.

Six industrial facilities are located within the watershed with active Multi-Sector General Permits for Stormwater Discharges Associated with Industrial Activities. This permit addresses stormwater runoff from certain industrial activities. It requires facilities to develop stormwater pollution prevention plans and report the results of industry-specific monitoring to the NYS DEC on an annual basis. All six of these facilities are located within the Sprague Terminal subwatershed and their pollutant load contributions are accounted for as industrial land use within the water treatment model described in further detail in Section 7.

Additionally, the Sprague Mount Vernon Terminal and the City of Mount Vernon Public Works Garage have individual discharge permits which regulate stormwater discharges from these sites.

2.2. Geomorphology

The Hutchinson River is a part of the larger Long Island Sound Watershed, and lies in the Hudson Valley, an area with streams and rivers shaped by glaciers. The massive ice sheets that covered the region (formed approximately 2.6 million years ago) left behind striations and exposed bedrock. Today, the bedrock in the Hutchinson River watershed may be close to a foot from the surface (Cadwell, 1989).

Soil type influences the velocity and pathways that water will take to get to a waterbody. Prior to development, the soil around the Hutchinson River was sandy loam: soils having a good mix of large particle sizes that are optimal for drainage and retaining

water. However, centuries of development combined with excavation and filling has resulted in changes to the soil; according to the USDA's Natural Resource Conservation Service, soils in the Hutchinson River watershed are primarily defined as urban land complexes (Natural Resource Conservation Service Soil Survey, 2019). Urban soil characteristics typically provide poor drainage and a weakened capacity to support good vegetative growth (USDA, 2019).

Land Modification

Land use and land cover impact the velocity and volume of stormwater runoff within a drainage area. Stormwater runoff occurs when rain and snowmelt flow over land or impervious surfaces, such as paved streets, parking lots, and building rooftops and picks up and carries pollutants such as trash, chemicals, and dirt/sediment into streams, lakes, and groundwater. Hard, impervious surfaces alter the natural water balance by preventing rainfall from soaking into the ground and creating stormwater runoff (Figure 7).

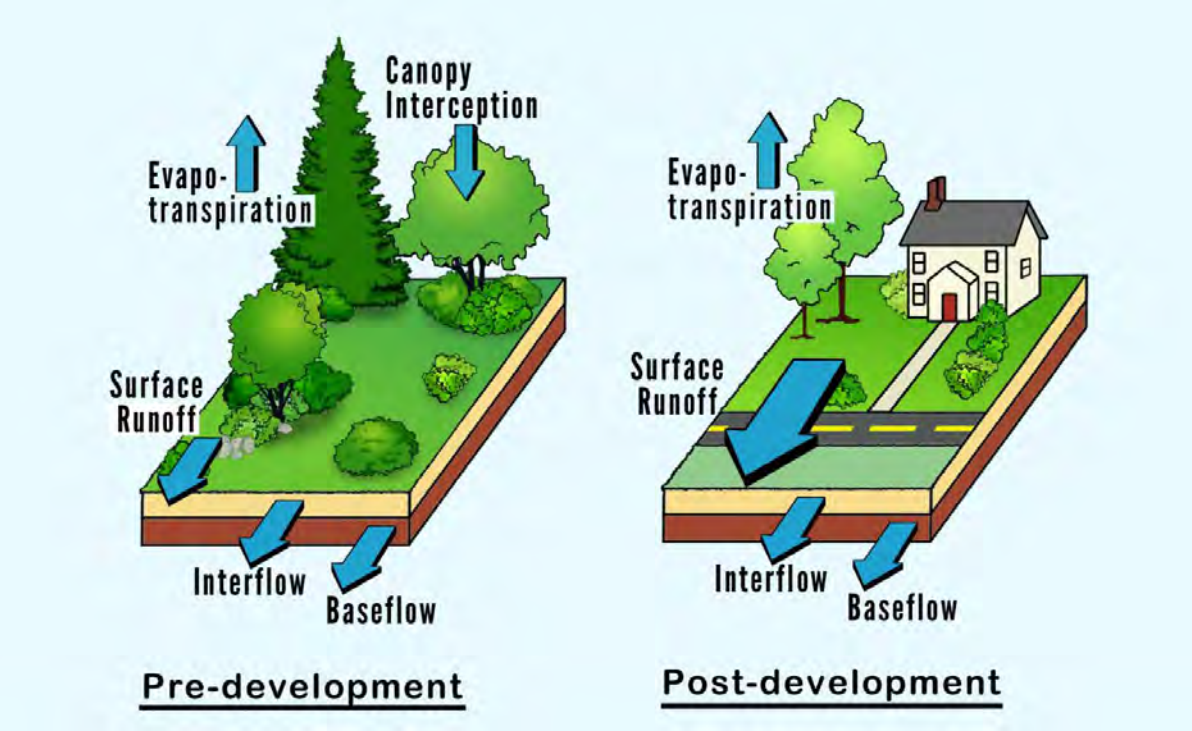


Figure 7. Water Balance Depicted in Undeveloped and Developed Settings (Source: Scheuler, 1987)

This study focused on impervious land cover data to better understand the primary source pollutants that enter the Hutchinson River. Land use in the Hutchinson River watershed is primarily residential land with many roadways throughout. Table 4 summarizes land use in the watershed and how much of each land use type is covered by impervious surfaces and Table 5 summarizes the percent impervious cover within

each subwatershed. Figure 8 depicts the land use distribution in the Hutchinson River watershed.

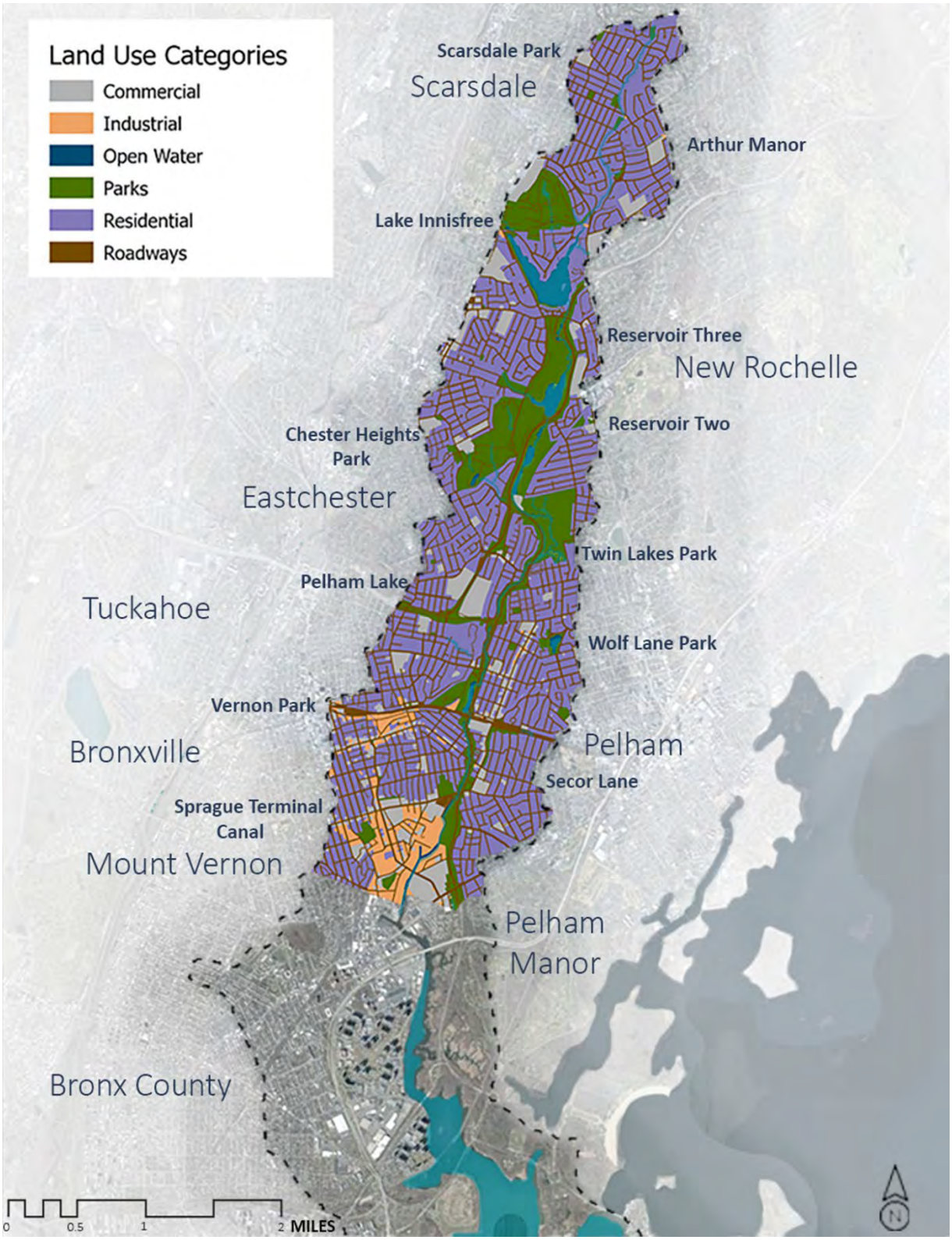
Table 4. Hutchinson River Watershed Land Use in Westchester County[9]

Land Use	Total Area (acres)	Percent of Watershed	Percent Impervious
Residential	2,634	50.32%	31%
Roadways	1,110	21.21%	100%
Parks	716	13.68%	5%
Commercial	472	9.02%	58%
Industrial	185	3.54%	85%
Open Water	117	2.23%	0%

Table 5. Impervious Acreage and Percentages within each Subwatershed in the Hutchinson River Watershed[9]

Subwatershed	Municipalities within Subwatershed	Impervious Area (acres)	Imperviousness (%)
Arthur Manor	Eastchester, New Rochelle, Scarsdale	116	41%
Chester Heights Park	Bronxville, Eastchester, Tuckahoe	169	38%
Lake Innisfree	Eastchester, New Rochelle	182	31%
Pelham Lake	Bronxville, Mount Vernon, Pelham	228	44%
Reservoir Three	Eastchester, New Rochelle	235	40%
Reservoir Two	Eastchester, New Rochelle	56	26%
Scarsdale Park	New Rochelle, Scarsdale	117	39%
Secor Lane	New Rochelle, Pelham, Pelham Manor	201	45%
Sprague Terminal Canal	Mount Vernon, Pelham Manor	473	68%
Twin Lakes Park	Eastchester, New Rochelle	128	34%
Vernon Park	Mount Vernon, Pelham	302	58%
Wolfs Lane Park	New Rochelle, Pelham	149	54%
Total in Westchester County	Not Applicable	2,358	45%

[9] Westchester County Department of Planning. Planimetrics Data. Westchester County GIS: 2022.



Mapping data sources: NYS DEC 2019; Westchester County Department of Planning 2022; ESRI 2023

Figure 8. Land Use in the Hutchinson River Watershed

2.3. Utilities

Stormwater

Westchester County and the jurisdictions within the watershed operate under a Municipal Separate Storm Sewer System (MS4) permit and maintain separate drainage systems for stormwater and wastewater. Runoff from rain and snow events picks up fine particles, trash, debris, chemicals and other contaminants before making its way, untreated, into the stormwater system which directly discharges into the Hutchinson River and its tributaries. Additionally, any sewage from leaking pipes can make its way into the stormwater system and discharge directly to the nearest waterbody. Based on input from jurisdictions within the watershed as well as commentary during public meetings, it is understood that the current stormwater conveyance systems are aging and undersized for large storm events that are becoming more frequent as a result of climate change and are causing increased pollution problems for the river (NYS DEC, 2023).

To address the issue of water quality, the MS4 permittees are required to undertake minimum control measures (MCM), which include:

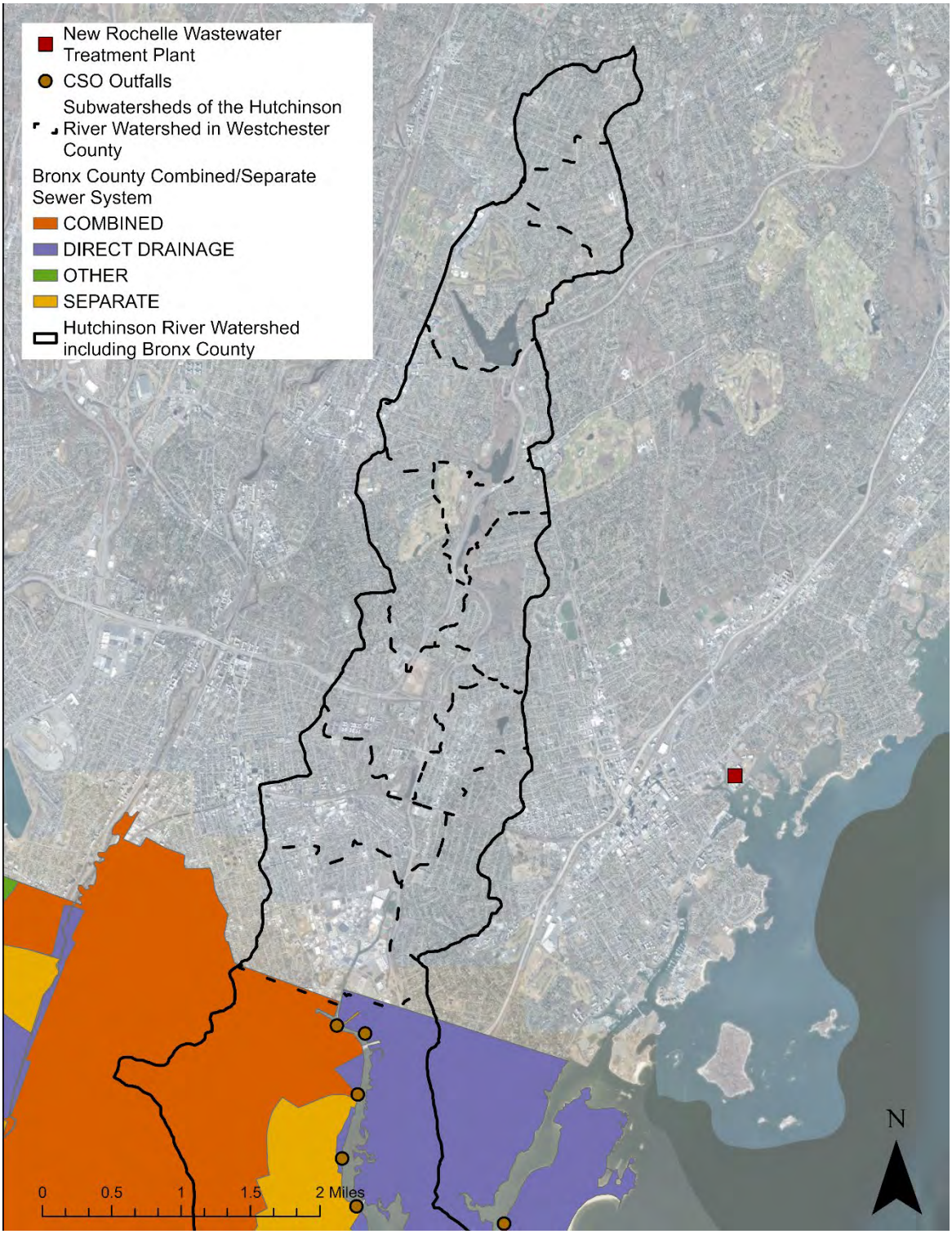
1. Targeted Public Education and Outreach
2. Public Involvement and Participation
3. Illicit Discharge Detection and Elimination
4. Construction Site Stormwater Runoff Control
5. Post Construction Stormwater Management
6. Stormwater Management for Municipal Operations

Each permittee is required to report on the progress of implementing these minimum control measures. Biohabitats acquired all publicly accessible 2021 MS4 reports from the municipalities in the watershed. Review of these reports helped to understand current management practices within the watershed. The reports showed that the permittees have made progress on:

- Public outreach and education campaigns
- Mapping stormwater outfalls and drainage networks
- Detecting and eliminating illicit discharges
- Preparing Stormwater Pollution Prevention Plans (SWPPPs) for construction sites
- Implementing, inspecting, and maintaining stormwater best management practices such as filter systems, open channels, ponds, wetlands, and bioretention systems
- Sweeping streets and parking lots

Wastewater

The watershed is within the Hutchinson Sewer District and treatment is provided by the Yonkers and New Rochelle wastewater treatment plants, both located outside of the watershed. There is a combined sewer system (stormwater and sewage) located in the Bronx portion of the watershed with five permitted combined sewer outfalls located within the New York City boundary (all of which are located outside of the Westchester County portion of the watershed). The location of the New Rochelle wastewater treatment plant and combined sewer outfalls are depicted in Figure 9 (Yonkers wastewater treatment plant is located outside of the map area).



Mapping data sources: Westchester County 2019; Open Sewer NYC 2014; New York State Department of Energy & Environment 2020

Figure 9. Wastewater Inputs Relative to the Westchester County Portion of the Hutchinson River Watershed

Drinking Water

Public drinking water supply is operated by multiple sources across the watershed. Most of the water systems are maintained by the private supplier, Veolia, with the exception of Mount Vernon and Scarsdale which are operated by their respective municipal governments.

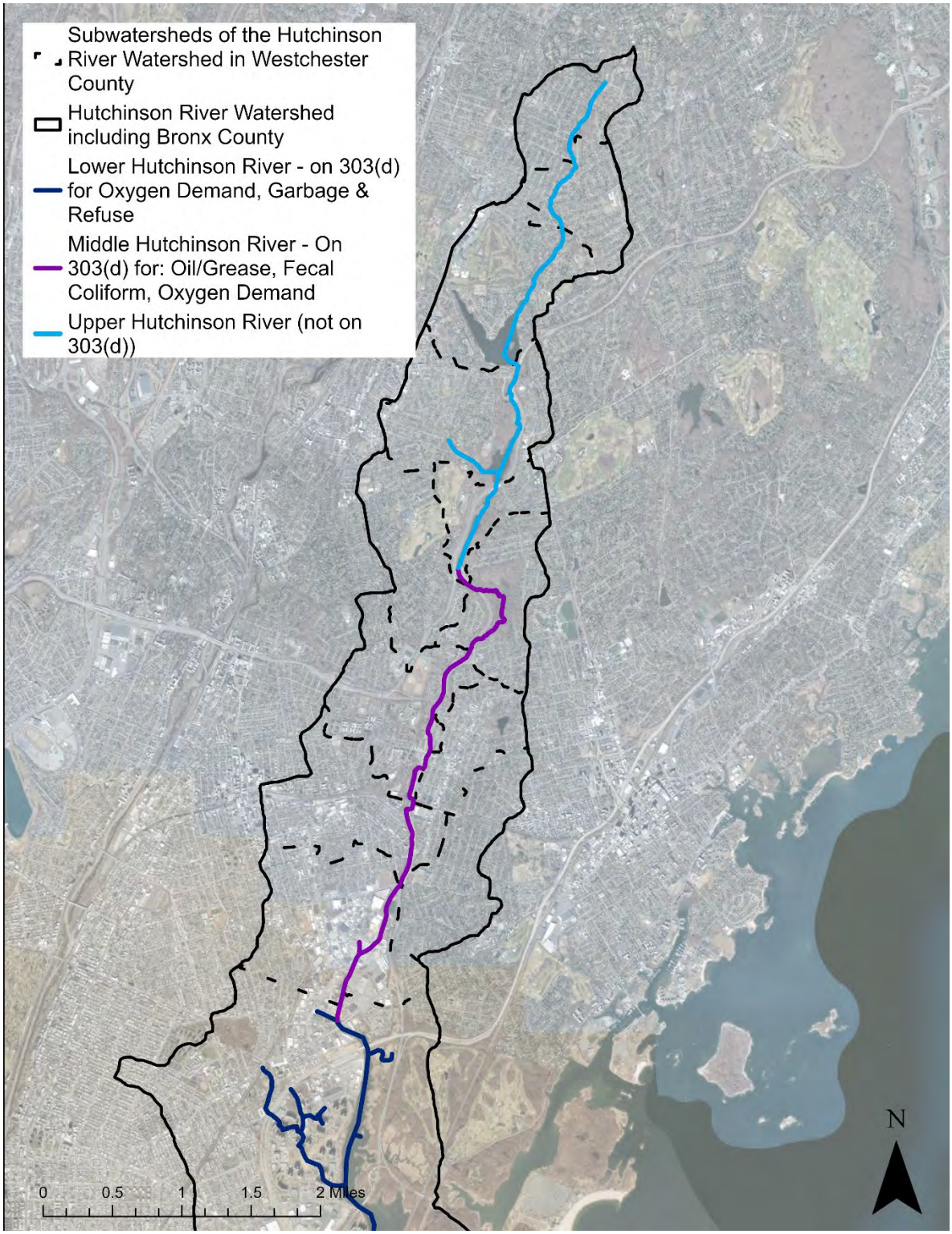
Electricity and Gas

Electrical lines crisscross the watershed, with most of the major power transmission lines underground. Gas is provided through subsurface utilities by Consolidated Edison (ConEd) (Department of Public Service, 2022).

2.4. Water Quality

Like other urban streams in the Northeast, the water quality of the Hutchinson River has been severely degraded over the last century. The New York State Department of Environmental Conservation (NYS DEC) classifies streams based on existing or expected water quality conditions to help residents and local officials understand the extent they can interact with that stream. The Westchester County portion of the Hutchinson River is categorized as a Class “B” and “C” streams. Class B streams are “best for swimming and contact recreation, but not for drinking” while Class C streams are suitable for fish, shellfish, and wildlife propagation (NYS DEC, 2022).

In 2002, the Class B waters of the middle Hutchinson River and tributaries were placed on the New York State 303(d) List of Impaired Waters. The causes for impairment are identified as oil/grease, low dissolved oxygen, and fecal coliform (Figure 10). As of the last draft, released in 2022, the Hutchinson River was still categorized as an impaired waterbody (List of Impaired/TMDL Waters, NYS DEC, 2022). An overview of current conditions relative to these pollutants is provided below. Additional water quality data is available through the New York State’s Division of Water Monitoring Portal.



Mapping data sources: NY Environmental Resource Mapper 2022; ESRI 2023.

Figure 10. 303(d) List Impairments within the Westchester County Portion of the Hutchinson River Watershed

Low Dissolved Oxygen

The Hutchinson River was identified as an Impaired Waterbody due to high oxygen demand, resulting in low dissolved oxygen (DO) levels. Low dissolved oxygen in waterways is often due to nonpoint source pollution containing nutrients, sediment, and organic matter. High levels of nutrients result in increased algal and plant growth in waterbodies. When the algae and plants die, they are decomposed by microbes which consume oxygen in the water through respiration. Similarly, when organic matter is delivered to a waterbody it results in increased rates of decomposition and consumption of oxygen, lowering the dissolved oxygen in the waterbody. These concepts are further emphasized within the Long Island Sound DO Total Maximum Daily Load (TMDL) which states that DO is "linked to an overabundance of nitrogen combined with the naturally occurring density stratification of the water column (NYS DEC and CT DEP, 2000)."

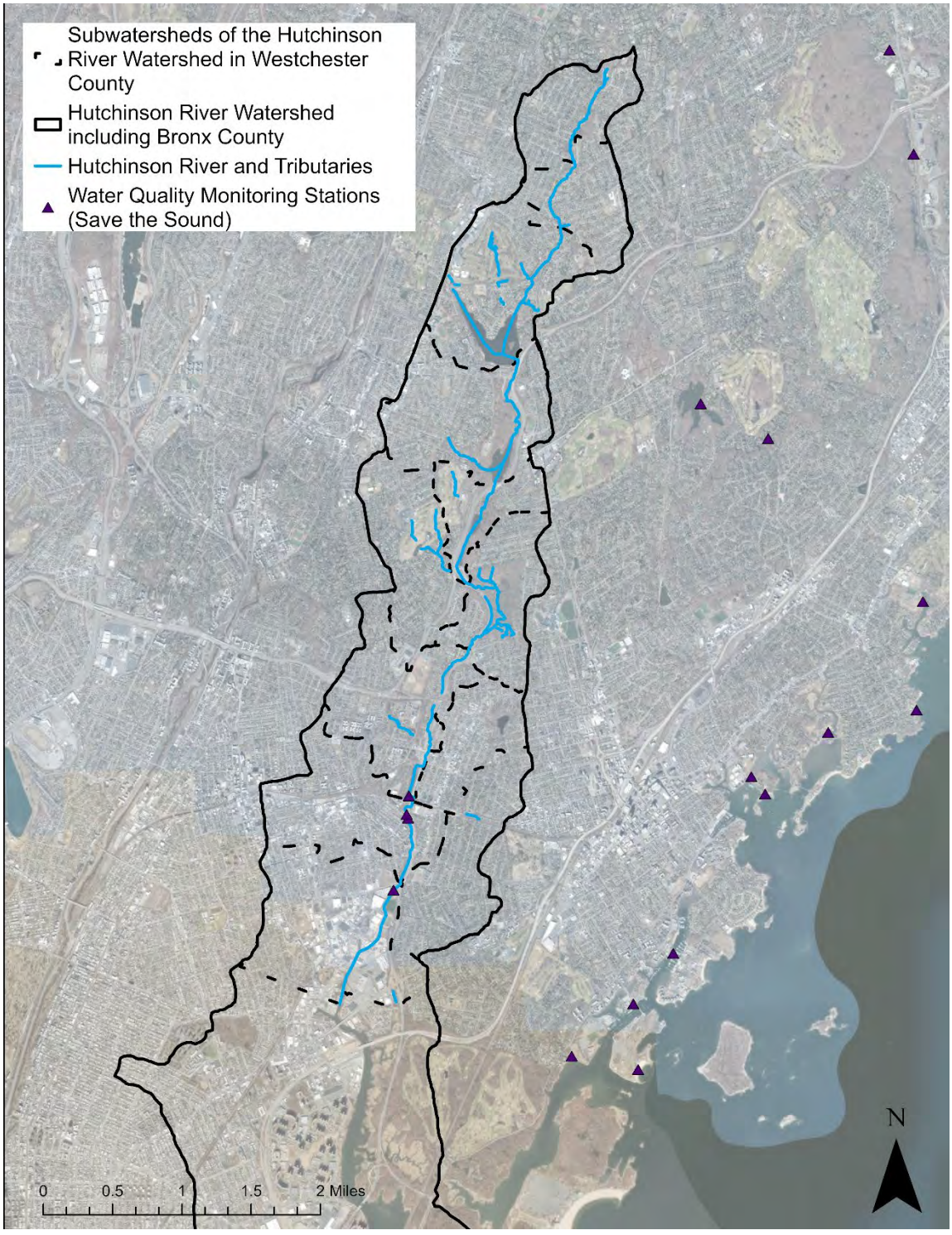
Sufficient DO is important for a healthy aquatic ecosystem as fish and other aerobic organisms rely on certain levels, typically >5 mg/L, for survival. As such, nutrient and suspended solids loading may be used as a metric to evaluate impacts to DO in a waterbody. In addition to contributing to low DO, suspended solids can be detrimental to aquatic life and stream health by increasing turbidity and carrying heavy metals and other contaminants, which further emphasizes the impact of their loading.

Fecal Coliform and Bacteria

As noted above, the New York State 303(d) List identifies fecal coliform as a pollutant causing impairment in the Hutchinson River.

Save the Sound monitors levels of pathogen indicator bacteria at four sampling locations along the Hutchinson River through a yearly monitoring program (Figure 11). Samples are taken weekly from June to September at set locations in the lower portion of the watershed (Pelham Lake at Willson's Woods Park, upstream of Farrell and Beechwood Avenues, an outfall at the Farrell and Beechwood intersection, and Glover Field).

Since 2015, samples collected in the Hutchinson River regularly exceed state water quality standards, and higher levels than of any river monitored by Save the Sound. Since 2019, multiple sampling locations near the border of Westchester County and the Bronx have chronically exceeded the state bacteria criteria for swimming. Oftentimes, this value is at least ten times the state threshold (Save the Sound, 2022). Failing sewer infrastructure has been identified in several of the municipalities located within the Hutchinson River watershed (Save the Sound, 2020). Currently, there are efforts throughout the County to address the aging sewer infrastructure and implement remediation efforts. In 2022, Mount Vernon was awarded $150 million in state funding to improve its sanitary sewer system.



Mapping data sources: NYS DEC 2022; ESRI 2023; Westchester County 2022; Save the Sound 2023

Figure 11. Save the Sound Bacteria Monitoring Locations within Hutchinson River Watershed

Oil and Grease

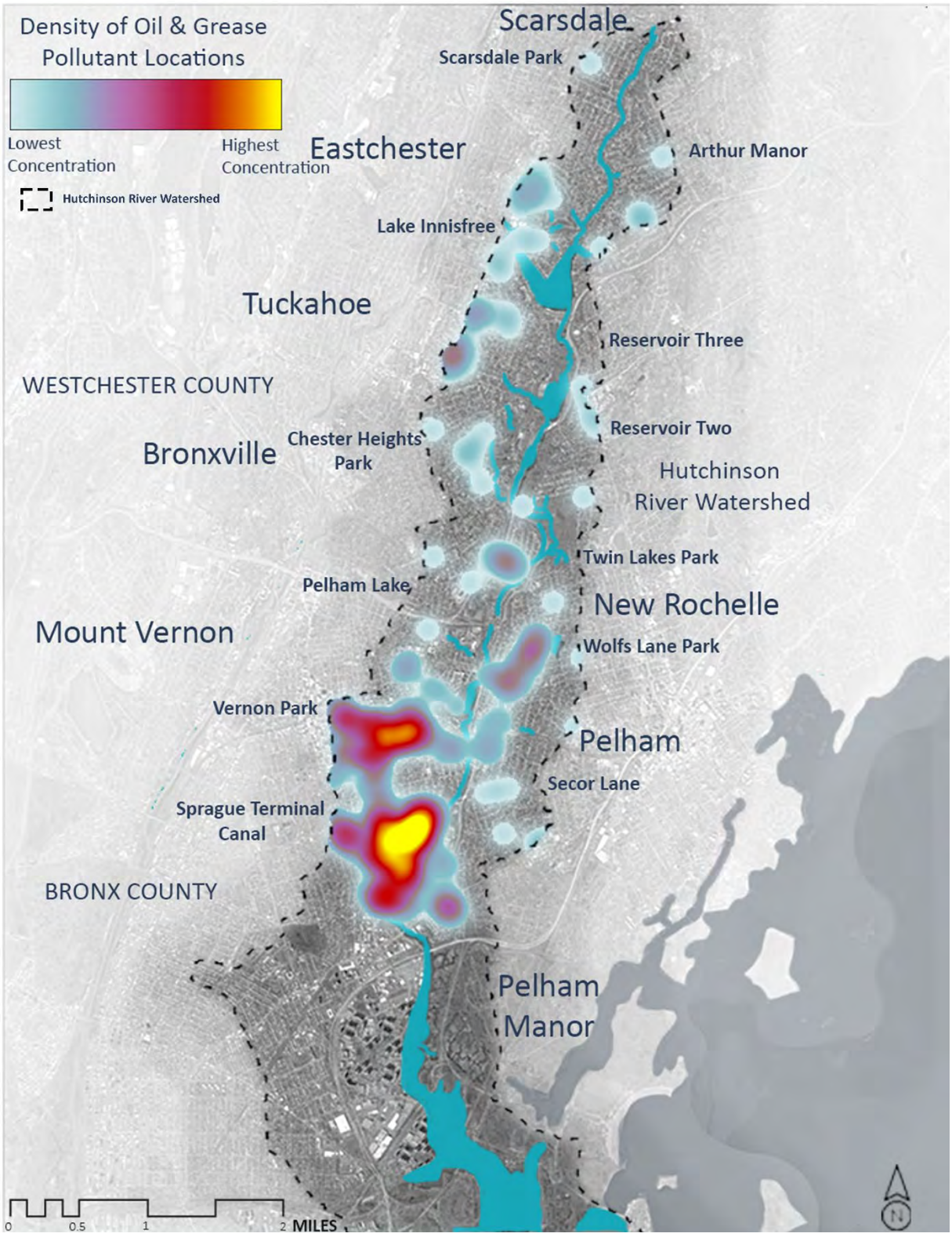
Potential sources of oil and grease throughout the watershed include facilities such as: auto body shops, car washes, manufacturing facilities, gas stations, petroleum storage facilities, trucking terminals as well as restaurants, laundromats, and commercial zones. This list was determined based on business types that have the potential to generate more oil and grease runoff than other land use types. Some, but not all of these businesses require coverage under New York State's Multi-Sector General Permit. A heat map illustrating concentrations of these potential sources is displayed in Figure 12.

Many of these potential sources are concentrated in the lower reaches of the watershed. The areas near Sprague Terminal Canal and Vernon Park include denser development and higher numbers of automobile repair and utility shops. These parts of Pelham, Eastchester, and Mount Vernon have historically been home to auto repair and manufacturing businesses. The higher levels of imperviousness in this portion of the watershed also means that spilled oils are more likely to drain directly to storm drains and to the Hutchinson River without treatment or separation.

The upper reaches of the watershed are more residential, and oil and grease hotspots are more spread out. However, improper handling of oil and grease from everyday activities such as cooking and car maintenance can still be an issue.

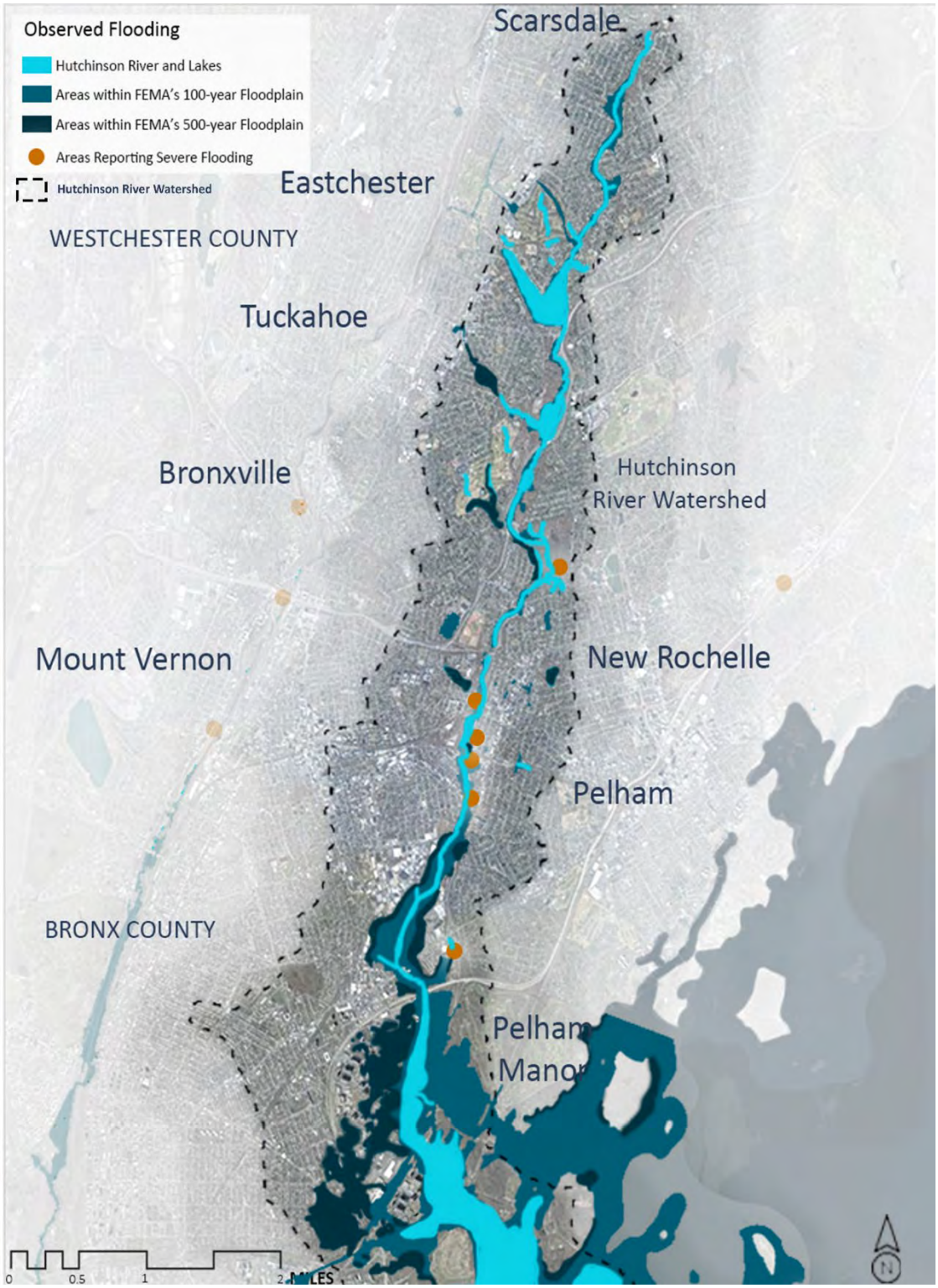
Flooding

The Hutchinson River watershed experiences disruptive flooding in low lying areas, areas where the river backs up due to silt and sediment deposits, areas with undersized road-stream crossings, and areas that were likely once wetlands and part of the river's original floodplain. Additionally, the increasing frequency of larger rain events and thus flash flood events due to climate change results in additional locations of flooding from inundated storm sewer systems. The abundant impervious cover throughout the watershed also results in high volumes of stormwater entering the river at once (Arnold and Gibbons, 1996). Flooding during storms impacts areas along the entire length of the river. Figure 13 shows the flood zones within the Hutchinson River watershed (FEMA, 2007) along with locations where flash floods have previously been reported based on hazard mitigation reports (Westchester County, 2021).



Mapping data sources: NYS DEC 2022; Westchester County 2022; ESRI 2023

Figure 12. Potential Oil and Grease Pollutant Hotspots in the Hutchinson River Watershed Based on Business Type



Mapping data sources: NYS DEC 2022; ESRI 2023; FEMA 2007; Westchester County Office of Emergency Management 2021

Figure 13. FEMA 100 and 500-year Floodplain and Reported Flooding from the Westchester County Hazard Mitigation Plan in the Hutchinson River Watershed

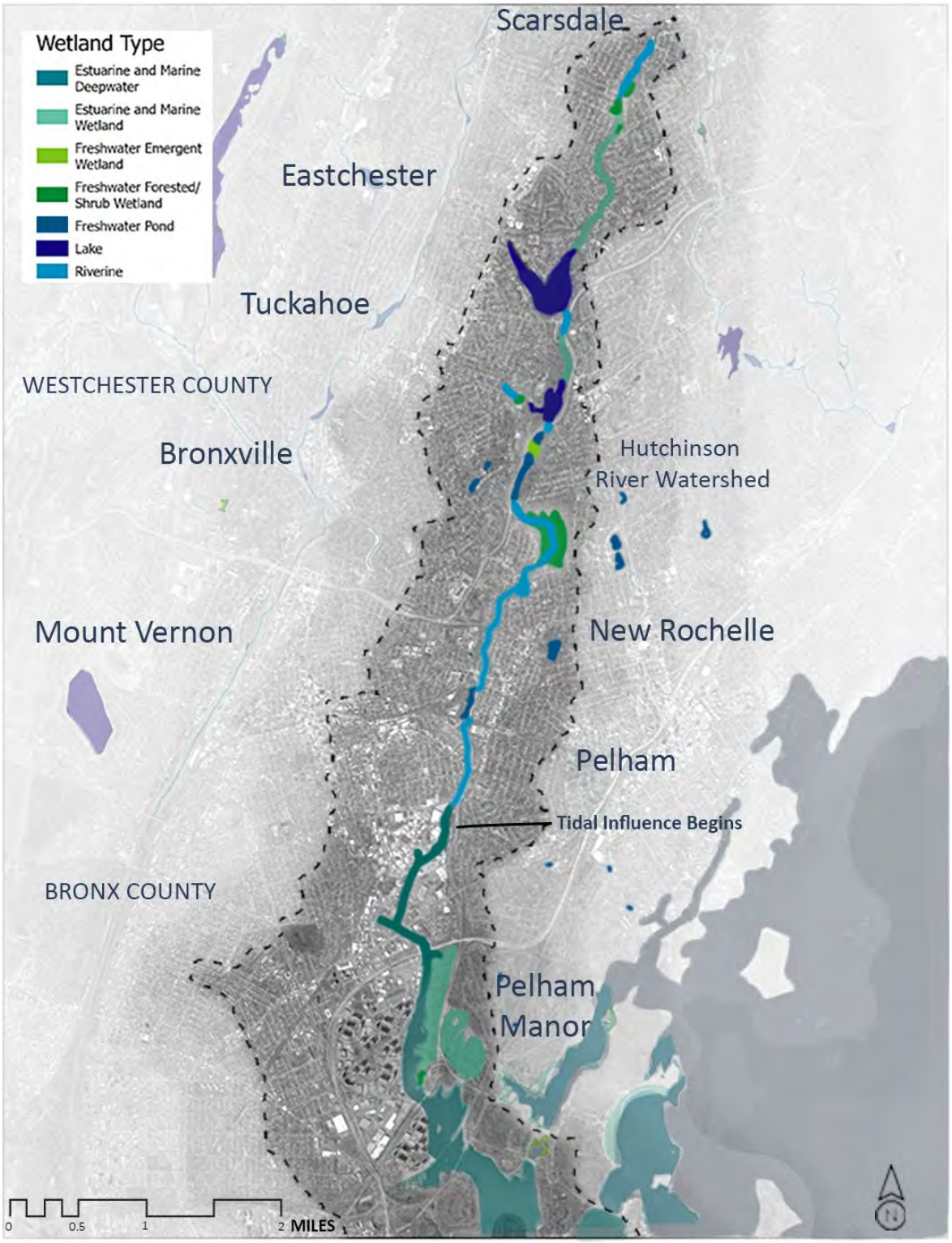
2.5. Ecological Conditions

Prior to development, the Hutchinson River was a freshwater river whose freshwater marshes, wetlands, and floodplain ecosystems provided refuge for fish, migratory birds, and a diverse plethora of aquatic plants. Today, the habitats along the Hutchinson River are fragmented due to the region's heavy development; most suitable habitats that could exist in the Hutchinson River are impacted by poor water quality related to urbanization such as, discharges, and development along the river (Sun and Caldwell, 2015; Liu, He, and Wu, 2016). Yet, wetlands and habitats still dot the landscape and provide critical ecosystem services and habitat diversity in the urbanized watershed. Twin Lakes County Park, Nature Study Woods, and Willson's Woods Park are all identified as Critical Environmental Areas by Westchester County. Figure 14 shows the location of wetlands and aquatic resources in the Hutchinson River watershed.

Aquatic Habitat

From its headwaters, the Hutchinson River is a freshwater stream, becoming tidally influenced as it approaches Eastchester Bay. It is commonly used for fishing, and species that have been reported include crappies, bluegills, pumpkinseed, largemouth bass, and channel catfish (iNaturalist). These species are all largely pollutant tolerant (Karr, 1981).

One concern to the health of aquatic wildlife is the dams that block the river and restrict migratory fish species from historic spawning locations. Dams and road-stream crossings may also degrade water quality and disrupt core ecosystem services such as sediment and nutrient transport. In 2020, fish traps were placed below the Pelham Lake dam to determine the presence of migratory fish and explore the feasibility of fish passage. In addition to multiple carp, alewife and perch have been recorded in the Hutchinson River for the first time since the 19th century (Waldman, 1981 and Long Island Sound Study, 2020). These results suggest that the river still has the capacity to support migratory fish species and possibly recover its original biodiversity.



Mapping data sources: NYS DEC 2019; ESRI 2023; US Fish & Wildlife Service 2021

Figure 14. Wetland and Other Aquatic Resources in the Hutchinson River Watershed

Wetlands

Wetlands provide critical ecosystem services such as pollutant filtration, wildlife habitat, and flood control. They originally encompassed a significant amount of land in the Hutchinson River watershed and greater New York City region (National Wetlands Inventory, USFWS 2022). Much of the land was drained, filled, or compacted to be suitable for development. Most of the wetlands in the Hutchinson River Basin are palustrine wetlands, meaning they contain less than 0.5 ppt of ocean-derived salts, are less than 20 acres, and are typically dominated by trees, shrubs, and emergent vegetation. Wetlands were also mapped and are scattered across the watershed (USGS Communications and Publishing, 2021).

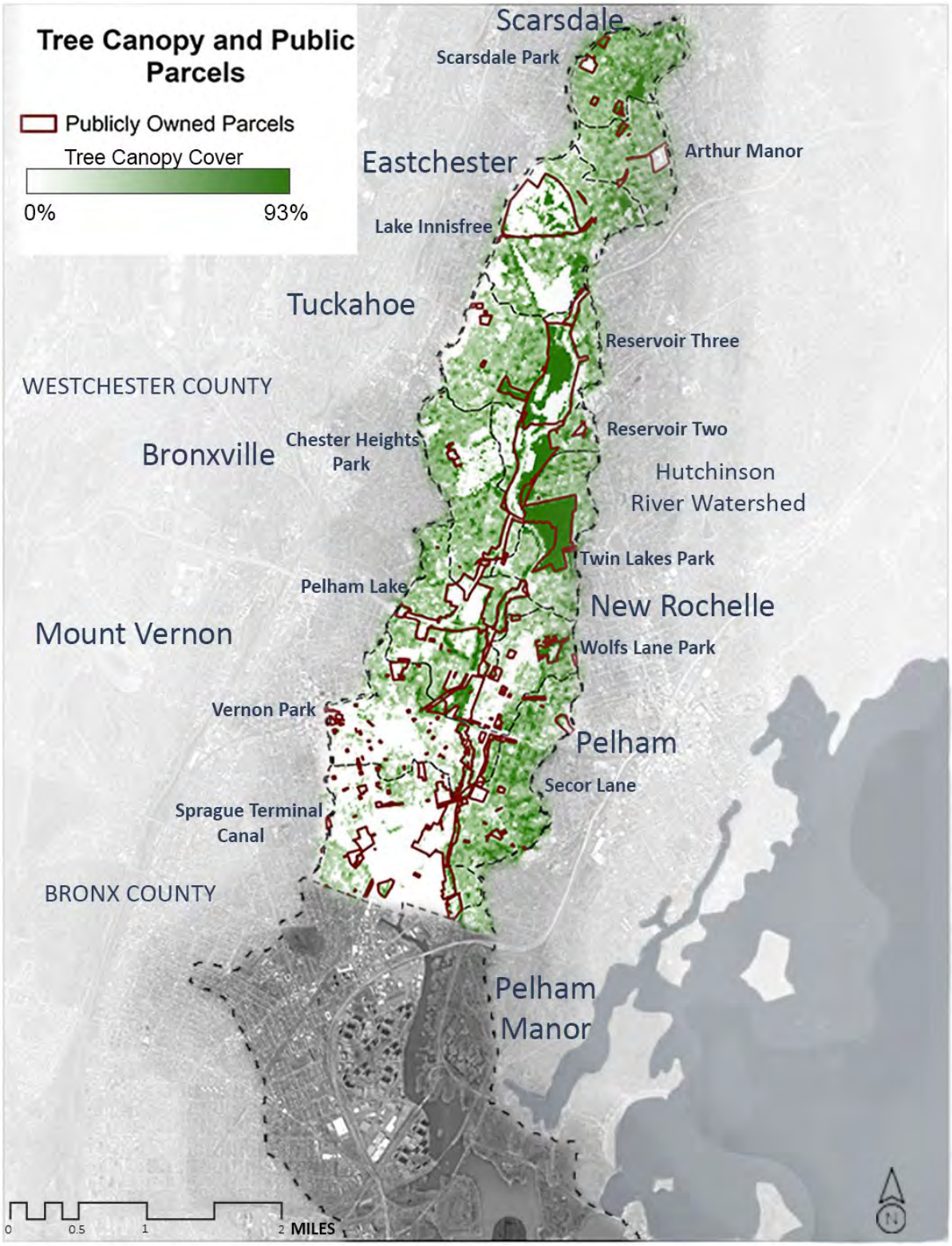
The Eastchester Creek Channel, Pelham Lake, and Reservoirs No. 3 and 2. Are all included in the National Wetlands Inventory as estuarine/marine deep water (Eastchester Creek Channel) and freshwater ponds (Pelham Lake and Reservoirs No. 3 and No. 2) (National Wetlands Inventory, USFWS 2022). Wading birds such as great blue herons and great egrets are commonly spotted along the Hutchinson River. Painted turtles and spotted salamanders have also been sighted (iNaturalist).

The Nature Study Woods in New Rochelle is the most significant and largest wetland in the Hutchinson River watershed that is considered “forested;” its vegetation is primarily broad-leafed deciduous trees such as American beeches or red maples. It is considered a freshwater forested/shrub wetland and is regulated by New York State (National Wetlands Inventory, USFWS 2022).

Although Pelham Bay Park is not within Westchester County, it is directly downstream of the Hutchinson River and significant for its great assemblage of habitats and biodiversity. It is the largest park in New York City and contains nearly 200 acres of salt marsh. The Hutchinson River is one of three waterways that feed these marshes, creating a system of mud flats, intertidal marsh, and salt meadow near the Thomas Pell Wildlife Refuge. These marshes are dominated by native saltmarsh cordgrass, which can tolerate the brackish waters but are threatened by invasive species such as common reed that exist along the edges (Pelham Bay Park- Salt Marshes in New York City Parks, NYC Parks).

Upland Habitats

Relatively few wooded areas remain near the Hutchinson River because of heavy urbanization. Twin Lakes County Park in Eastchester and Nature Study Woods in New Rochelle are among the largest parcels of forests and parkland in the watershed. The National Land Cover Database provides percent tree canopy cover throughout the United States at 30-meter spatial resolution (USDA, 2021). This tree canopy data is overlaid with publicly-owned lands provided by Westchester County and is portrayed in Figure 15. Areas of low tree canopy in publicly-owned lands may present an opportunity for reforestation.



Mapping data sources: Westchester County Department of Planning 2022; ESRI. US Forest Service 2016

Figure 15. Publicly Owned Land and Tree Canopy Cover in the Hutchinson River Watershed

Common tree species identified within the floodplain canopy include northern red oaks, American beeches, and flowering dogwoods. Shaded, wet areas are optimal habitats for ferns, skunk cabbage, and many native and ornamental flowers such a violets, tickseed, daffodils, and jewelweed. Invasive species commonly reported in the area include Japanese stiltgrass and porcelainberry (iNaturalist). Since most of the land in the watershed is suburban, there are many native and ornamental trees across the neighborhoods.

Despite the development in the area, many animals have adapted to the urban and suburban landscapes. Lawns make up the most groundcover in the watershed, but still the river is closely bordered by trees in the northern reaches. White-tailed deer, coyotes, and raccoon can make the most of this patchwork of habitats and abundance of food provided by human presence. Birds typically seen in suburban neighborhoods include common backyard birds such as northern cardinals and house sparrows, as well as great horned and barred owls (iNaturalist).

2.6. Ecological Challenges

Ecosystems within the Hutchinson River watershed face many challenges to maintaining their survival and health. Industrial and commercial land use impacts water quality from point source pollution, atmospheric deposition, and heat. Development changes the landscape, altering the water flow through the system and human activity introduces non-native and invasive species. These physical changes impact the ecological communities that once thrived along the Hutchinson River and into the Long Island Sound. Understanding the ecological challenges that the ecological communities experience today is a critical component to providing recommendations for future restoration.

Invasive Species

Water chestnut, an invasive plant that forms large mats of vegetation on top of slow-moving bodies of water, has been observed in the Hutchinson River along Pelham Lake (iMapInvasives). Water chestnut hinders the growth of native submerged aquatic vegetation (SAVs) by blocking sunlight and can contribute to eutrophication from its decay. Additionally, like much of the East Coast, the common reed (*Phragmites australis*) is outcompeting native reeds and grasses such as cattails and wetland grasses in wetlands across the region. *Common reed* grow aggressively and decrease the biodiversity of wetlands and diversity of habitat available for wildlife.

In the remaining forests within the watershed, Japanese stiltgrass, garlic mustard, and mugwort among others have been observed taking over the groundcover. Non-native trees such as Norwegian maples, tree of heaven, and Bradford pears are interspersed with native species. In terms of non-native wildlife, mute swans have been sighted on the Hutchinson River and spotted lanternflies and emerald ash borers exist in the area.

Although, other invasive species have not been officially recorded within the watershed, that does not necessarily mean they do not exist. Zebra mussels and Chinese mitten

crabs have been a problem in the greater Hudson River basin, and Hydrilla, another invasive aquatic plant, has been identified elsewhere in Westchester County. Although these species may not currently exist, there is potential for them to inhabit the Hutchinson River watershed in the future.

Ecological Harm

Numerous avian, mammal, plant, reptile, and amphibian species listed by Federal, State or County jurisdictions as threatened or endangered are expected to occur in Westchester County based on habitat, though their occurrence in the Hutchinson River watershed has not been confirmed.

Within the Hutchinson River basin, the only endangered or threatened species listed by the U.S. Fish and Wildlife Service (USFWS) are the piping plover and monarch butterfly (candidate species[10]). Both have been impacted primarily by habitat loss. Migratory songbirds and shorebirds pass through the area including the bald eagle, black skimmer, and wood thrush. (IpaC, USFWS).

It is important to note the role that the Hutchinson River basin plays as an interconnecting node of regional natural systems. However, that once healthy habitat corridor is now fragmented. The river itself is blocked by four dams, cutting off the upstream reaches from downstream habitats and the Atlantic Ocean. On land, the remaining forests are sparse and loosely connected. Roads crisscross the watershed and prevent safe passage for wildlife. This fragmentation not only limits the available habitat but may increase inbreeding among populations (Yu et al., 2020).

The impacts from loss of habitat, invasion by non-native species, and degradation of ecological health as identified above emphasize the need to address these problems and create a safer, healthier environment for all the Hutchinson River watershed's inhabitants.

2.7. Social Vulnerability

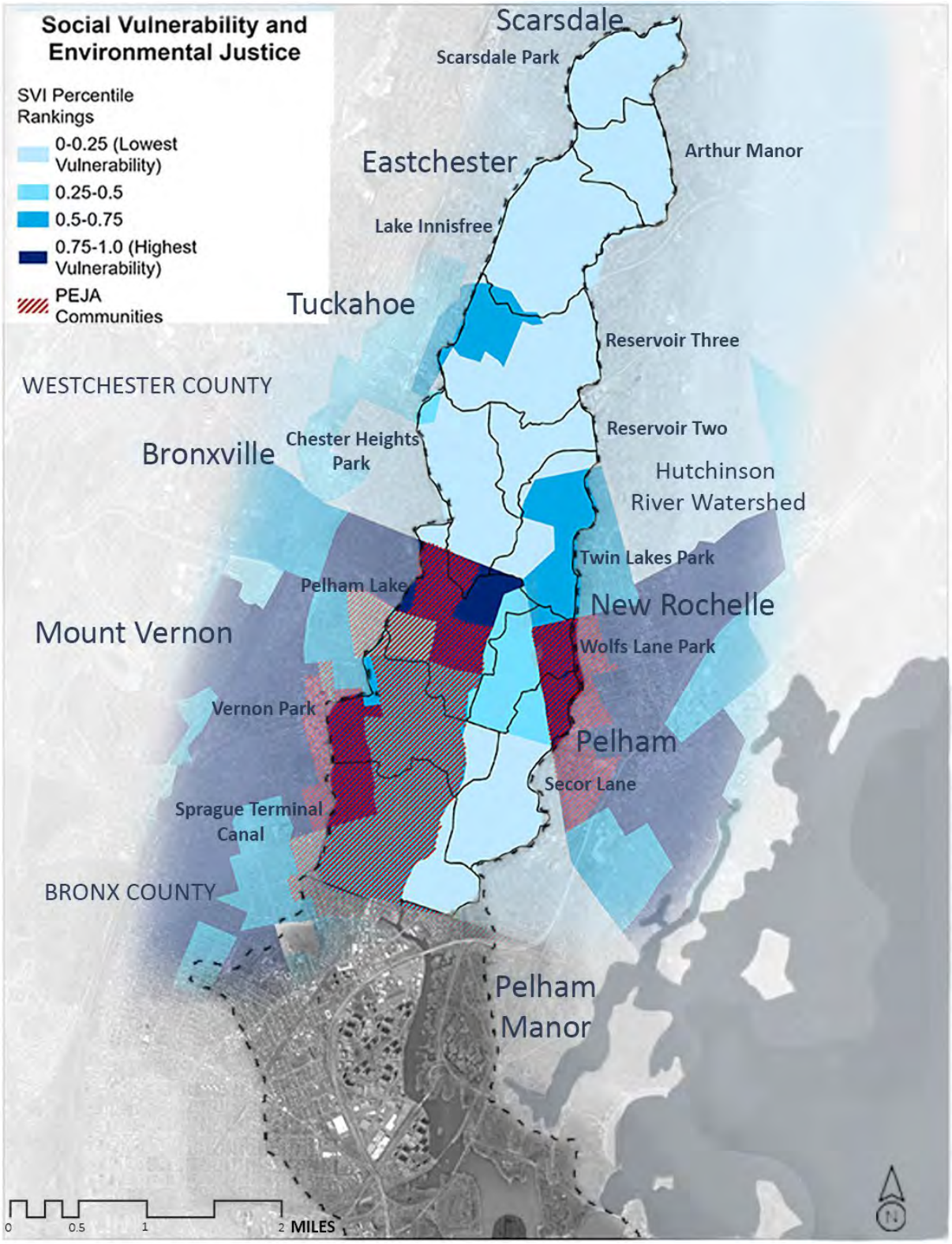
While a demographic analysis is not readily available at the watershed scale and is outside of the scope of this watershed study, it is still important to understand local patterns of social vulnerability. The 2020 Social Vulnerability Index (SVI) score was overlaid with the New York State produced Potential Environmental Justice Areas (PEJAs) and the subwatershed boundaries in Figure 16 to understand where these vulnerabilities exist within the watershed.

The SVI score is computed based on US census data and looks at the community's ability to adapt to changes and respond to disasters such as flooding and hurricanes. Scoring is based on 16 social factors such as income, education, housing, language,

[10] Candidate species are plants and animals for which the U.S. Fish and Wildlife Service (FWS) has sufficient information on their biological status and threats to propose them as endangered or threatened under the Endangered Species Act (ESA), but for which development of a proposed listing regulation is precluded by other higher priority listing activities.

ethnicity, and vehicle access (CDC/ATSDR, 2020). PEJAs also utilizes US Census blocks and considers % minority populations and % household incomes below the federal poverty level (NYS DEC, 2021).

Areas with the highest vulnerability are concentrated in subwatersheds located in the lower half of the watershed. Two of the subwatersheds selected for detailed field assessments were selected, in part, due to the concentration of high vulnerability communities in these areas. Care should be taken to ensure that recommendations and restoration opportunities are not disproportionately implemented in low vulnerability areas and instead consider an equitable distribution of resources for watershed implementation. This is also in keeping with the spirit of Westchester County's Equity in Environmental Legislation Act which is intended to ensure that all communities are treated fairly when the County is considering any new law in an effort to combat historical cases of violation of environmental justice.



Mapping data sources: NYS DEC 2019; Center for Disease Control and Prevention 2020; ESRI 2023

Figure 16. SVI and PEJA Classifications in the Hutchinson River Watershed

2.8. Comparative Subwatershed Analysis

The Comparative Subwatershed Analysis (CSA) is a framework for screening subwatersheds within a watershed to identify the ones with the greatest restoration potential (Zielinski, 2001). The CSA consists of a simple desktop analysis that screens subwatersheds within a watershed to identify the subwatersheds with the greatest restoration potential based on "metrics." Metrics are single numeric values that characterize the relative restoration potential of a subwatershed. A summary of the subwatershed screening and associated metrics is provided briefly below. Greater detail on this analysis can be found in Appendix B.

Subwatersheds with the highest aggregate score were prioritized for field assessments as discussed in Section 5. Metrics were grouped into three categories:

- Restoration Potential Metrics – indicate greater restoration potential; this included metrics indicating that there may be space and opportunity to implement restoration opportunities such as low tree canopy and high percentage of publicly owned land.
- Pollution Potential Metrics – indicate increased risk of pollution; this included subwatersheds with high impervious cover, high percentage of industrial land and high number of hotspots per acre.
- Flooding Potential Metrics – indicate greater potential for flooding; metrics included high numbers of buildings in the flood zone and flood prone road crossings.

As part of the comparative subwatershed analysis, the subwatersheds were also grouped into four categories based on similar conditions (e.g., land use, development patterns, drainage patterns, etc.):

- Subwatersheds with a large percent of land use dominated by waterbodies and/or parkland
- Subwatersheds dominated by medium density residential areas
- Subwatersheds with steep topography and dense residential areas
- Subwatersheds in heavily industrialized areas

This categorization is displayed in Table 6. Subwatersheds with similar characteristics will also have comparable restoration strategies and recommendations. Based on the similarities throughout the Hutchinson River watershed, it is possible to select subwatersheds for detailed assessment and then apply subwatershed-wide recommendations to subwatersheds in the same grouping. Additional details on subwatershed categorization and outcomes can be found in Appendix B.

Table 6. Subwatershed Categorization and Comparative Subwatershed Analysis

Subwatershed Group Characterization	Subwatershed	Restoration Potential	Pollution Potential	Flooding Potential
Subwatersheds with significant waterbodies and/or parkland	Pelham Lake	Medium-High	Medium-High	Medium-High
	Lake Innisfree	Medium-High	Medium	Medium-Low
	Reservoir Three	High	Medium	Medium
	Reservoir Two	Low	Medium-Low	Low
	Twin Lakes Park	Medium-Low	Low	Medium
Subwatersheds dominated by medium density residential areas	Arthur Manor	High	Medium Low	Medium-High
	Chester Heights Park	Medium-High	Medium	Low
	Scarsdale Park	Medium-Low	Medium-Low	Medium-Low
Subwatersheds with steep topography and dense residential areas	Secor Lane	Medium-Low	Medium	Medium-High
	Wolfs Lane Park	Medium	Medium-High	Medium-Low
Subwatersheds in heavily industrialized areas	Sprague Terminal Canal	Medium	High	High
	Vernon Park	Medium	High	Medium-High

3. Watershed Goals

Goals for the Hutchinson River Watershed Management Plan were developed over the course of the watershed planning process, with input from the Project Steering Committee and other watershed stakeholders.

3.1. Water Quality

Improve the water quality of the Hutchinson River for the ecosystems and communities in and along the river. Address bacteria and other pollutants of concerns (dissolved oxygen, oil and grease) to meet water quality standards for recreation.

To estimate the annual loads of these pollutants, Biohabitats used the Watershed Treatment Model (WTM), developed by the Center for Watershed Protection. The WTM is a screening level tool that is used to estimate pollutant loads under current watershed conditions and may be used to estimate the effects of proposed management practices (Caraco, 2002). The model has two components: Pollutant Sources and Treatment Options. Biohabitats used the Pollutant Sources component to estimate annual pollutant loads from primary land uses and impervious cover. Additional information on the baseline assessment and the WTM can be found in Section 7 and Appendices B and I.

The WTM estimated the annual loading rates of total nitrogen (TN), total phosphorus (TP), and total suspended solids (TSS) for the Westchester County portion of the Hutchinson River Watershed. Higher values of TN, TP, and TSS loading represent a greater contribution to the low DO levels in the Hutchinson River. The WTM provides both total annual pollutant load (lbs per year) and a loading rate (lbs per acre per year). A more detailed discussion of the WTM set up and inputs can be found in Appendix I.

The following should be considered when interpreting the results of the WTM for the Westchester County portion of the Hutchinson River Watershed:

- Due to the limited available data, Biohabitats did not incorporate Secondary Sources (e.g., septic systems, illicit connections, sanitary sewer overflows) or existing treatment measures that may be in place.
- Pollutant concentrations were taken from the WTM Manual (Caraco, 2002) and are not specific to the Westchester County portion of the Hutchinson River Watershed.

The results from the pollutant load estimates for the Hutchinson River watershed are provided in Table 7.

Table 7. Estimated Pollutant Loads for the Hutchinson River Watershed

Land Use	Area (Acres)	TN (lbs/yr)	TP (lbs/yr)	TSS (lbs/yr)	Bacteria (billion/yr)
Residential	2,628	18,732	3,406	851,471	978,980,411
Commercial	471	2,690	430	100,889	195,726
Roadway	1,104	31,856	5,309	1,567,341	968,340
Industrial	179	3,709	593	169,021	126,766
Parks	716	1,432	143	71,600	8,592
Open Water	117	1,498	59	18,135	--
TOTAL	**5,217**	**59,917**	**9,940**	**2,778,457**	**980,279,835**

In the absence of a substantial water quality monitoring data set (limited data available via the NYSDEC Division of Water (DOW) Bureau of Water Assessment and Management. Water Quality Portal) or an established Total Maximum Daily Load (TMDL)[11], load reductions were estimated based on assigned Wasteload Allocations (WLAs) in established TMDLs, including the TMDL developed for Long Island Sound (NYS DEC and CT DEP 2000). Load reduction targets are as follows:

Dissolved Oxygen: Reduce 30% of Total Nitrogen from Stormwater Loads

Total Nitrogen was selected as a proxy for dissolved oxygen as nitrogen contributes to algal growth that leads to low dissolved oxygen levels and subsequent loss of designated uses.

Fecal Coliform: Reduce 10% of Bacteria from Stormwater Loads

Reductions apply to wet weather runoff and do not apply to dry weather discharges.

Oil and Grease: No Residue or Visible Oil Film Attributable to Stormwater Runoff.

Oil and grease water quality standards are established by NYS DEC in a narrative form (vs. numeric) and state that there should be, “No residue…no visible oil film.” As there is no numeric standard, a load reduction target is not appropriate or feasible. Instead, it is assumed that the reduction of stormwater runoff will also work towards reducing oil and grease.

3.2. Habitat and Ecology

Improve ecological function and health of the river and the watershed’s landscapes. Provide refuge and connectivity for the organisms that live in and along the river. This includes managing invasive species, planting native species, removing aquatic barriers,

[11] A TMDL is the maximum amount of a pollutant allowed to enter a waterbody so that the waterbody can meet water quality standards for that particular pollutant. A TMDL determines a pollutant reduction target and allocates load reductions necessary to the source(s) of the pollutant.

and protecting and restoring forested areas and tree canopy within the watershed to promote biodiversity and ecosystem health.

3.3. River Access

Increase public access to the Hutchinson River and connectivity of waterbodies and open space to improve public use, safety, appreciation, and stewardship. Opportunities should be explored to expand greenways and trails and promote on-water recreation such as canoeing and kayaking. Engage communities that have historically been disconnected from the river by generating opportunities for them to experience it. Hold feedback sessions to gather public input regarding the type and accessibility of river use and guide future implementation.

3.4. Educational Opportunities

Promote stewardship of the watershed through education and outreach, improved access to the Hutchinson River and its tributaries, and citizen involvement in science, conservation, and restoration activities. This includes conducting education and outreach to business and industrial communities on pollution prevention; engaging municipalities and school districts to implement restoration opportunities; and increasing signage in targeted areas.

4. Community Involvement

Public participation and outreach were conducted as part of the watershed planning process to increase public understanding of issues affecting the watershed, gather valuable on-the-ground knowledge about watershed-related concerns and opportunities, and to build support for implementation of the plan. Community involvement activities that occurred as part of the watershed planning process are summarized below. A list of participants from public events is provided in Appendix C.

4.1. Project Steering Committee

A Project Steering Committee (the Steering Committee) was formed to guide development of the Plan. The Steering Committee consisted of representatives from the watershed municipalities, government organizations, educational institutions, non-profit organizations, and others who live and work within the watershed. A series of meetings were held with the Steering Committee and other invited stakeholders to discuss issues of concern in the watershed and to identify watershed planning goals and objectives that would form the basis of the plan recommendations. The Steering Committee and other stakeholders also provided review of draft deliverables, guidance on selecting subwatersheds for targeted field assessments, and assisted in prioritization of selected recommendations. The watershed plan reflects the combined efforts of Save the Sound, Westchester County Department of Planning and Soil & Water Conservation District, the Biohabitats project team and members of the Project Steering Committee and other individuals involved in the plan development process. These parties are listed in the Acknowledgments section at the beginning of this document.

4.2. Public Input

Public input and participation were solicited using a variety of formats to maximize input from the local community. This included virtual meetings were held in the evenings to accommodate work schedules. Presentations from the public meetings are available on the Save the Sound's Hutchinson River Watershed Plan website: https://www.savethesound.org/hutchplan/.

Meeting recordings and presentations were circulated to all stakeholders following the meeting and input tools remained accessible for one week following each meeting. Emails and social media posts were issued prior to each public meeting that included information on how to access the meeting. The final draft watershed plan was also made available to stakeholders with copies of the plan shared with the main branch of local libraries within the watershed and at the Westchester County Office. Comments received and responses are also included in Appendix C.

Public Meetings

Kick-off Meeting (September 21, 2022): A public kick-off meeting was held virtually to introduce watershed planning concepts, introduce the watershed plan, and solicit input on watershed priorities via small group discussion utilizing JAMBOARD™, a digital

interactive whiteboard intended to help facilitate online collaboration. Participants were asked to respond to several questions:

- What is important to you in the Hutchinson River Watershed?
- What would you like to see change?
- What do you want to see in the Hutchinson River Watershed Plan?
- What information already exists?
- Who should be involved in the planning process?
- What are effective outreach strategies?

Responses were discussed by the group and used to guide the development of the watershed goals and plan.

A screenshot of one of the JAMBOARD™ pages generated at the meeting is provided in Figure 17. More than 35 people participated in the meeting.

Public Meeting #2 (February 21, 2023): A second public meeting was held virtually to review the results of the Watershed Baseline Assessment; obtain feedback from stakeholders on draft watershed goals; and solicit input from stakeholders on current initiatives underway, planned or desired within the watershed. Approximately 60 people participated in the meeting.

Public Meeting #3 (*Date): Place holder for summary of February meeting*

Stream Walk

A stream walk was held on August 23, 2023, and had 11 participants from Save the Sound, Westchester County, Hutchinson River Restoration Project, steering committee members, local media reporters, and Bronx Borough representatives. Due to high water levels throughout the summer, the stream walk focused on a short reach of the river adjacent to Glover Field in Mt. Vernon. The purpose of the stream walk was to provide community members and other stakeholders interaction with the river and see first-hand some of the impairments and examples of potential restoration projects. This walk also provided details on the 9E watershed planning process.

Public Input Map

A public map was created and posted on Save the Sound's website to help gather local information and knowledge from residents and users of the lands and waterways within the Hutchinson River watershed. This information helped to inform baseline conditions and identify opportunities.

Project Webpage

A project webpage was developed and hosted on the Save the Sound Website https://www.savethesound.org/hutchplan/. The webpage was used to share information and documents available throughout the watershed planning process and provide access to the Public Input Map. Westchester County planning, Long Island Sound

watershed program also provided a link to the Save the Sound webpage and references the Hutchinson River as WAC6.

Figure 17. Public Meeting Input on Watershed Priorities

5. Identifying Restoration Opportunities

Upland field assessments for the Westchester County portion of the Hutchinson River watershed were conducted to identify water quality improvement and habitat enhancement opportunities in Spring 2023. Due to the large size of the watershed, field efforts primarily targeted four of the twelve subwatersheds identified based on the results of the Comparative Subwatershed Analysis (see Section 2 for additional details) and input from Save the Sound, Westchester County, and the Steering Committee.

Subwatersheds were selected that were representative of the subwatershed categories identified in the Comparative Subwatershed Analysis. The subwatersheds of focus for the field assessment included:

- **Reservoir Three** (representing subwatersheds with significant waterbodies and/or parkland; high restoration potential and high-medium flooding potential)
- **Pelham Lake** (representing subwatersheds with significant waterbodies and/or parkland; high restoration and medium flooding potential; high to medium high social vulnerability)
- **Sprague Terminal** (representing subwatersheds in heavily industrialized areas; high pollution and flooding potential)
- **Vernon Park** (representing subwatersheds in heavily industrialized areas; high pollution and flooding potential)

While field assessments were largely concentrated in these four subwatersheds, additional field assessments were conducted as time allowed by Save the Sound staff in Arthur Manor, Vernon Park and Wolfs Lane Park. Results from this additional effort were combined with those from within the four subwatersheds listed above.

Recommendations for these representative subwatersheds have application and relevance to subwatersheds in the same category (i.e., recommendations for Sprague Terminal may be applicable to other subwatersheds in heavily industrialized areas).

All assessments were conducted on or from publicly accessible spaces such as commercial parking lots or rights-of-way. Privately-owned sites were assessed from roadways or the right-of-way. Additionally, beyond desktop analysis, a full assessment of school properties was not conducted due to privacy and safety. School properties in close proximity to other sites were assessed from the right-of-way only. Municipalities should collaborate with local school boards to identify and evaluate additional restoration opportunities on school campuses. Streams were not assessed due to the small amount of contiguous daylighted stream reaches located on publicly accessible land.

Three types of assessments were conducted to facilitate evaluation of a broad range of restoration interventions: Hotspots, Stormwater Retrofits, and Reforestation. Descriptions of each assessment type are provided below. Types of field assessments were selected based on subwatershed conditions and identifying restoration opportunities with the greatest potential for improving water quality and meeting additional watershed goals. For example, the Hotspot Assessment was selected in

Sprague Terminal and Vernon Park due to the high amount of industrial land use in these subwatersheds.

A summary of field assessment findings is provided in Table 8. The location and type of opportunities identified during the field assessments are provided in Figure 24.

Hotspot Assessment: targeted locations that may be contributing large amounts of debris, eroding pavement, bulk storage of materials, chemicals, or oil and grease into the watershed. These locations can contribute to the watershed's pollutants of concern including low dissolved oxygen and oil and grease.

Figure 18. Hutchinson River Watershed Hotspot: Overflowing and Undermaintained Oil and Grease Disposal Container (Eastchester)

Figure 19. Hotspot Location in the Hutchinson River Watershed: Overflowing Bulk Material Storage and Sediment Accumulation (Mount Vernon)

Stormwater Retrofit Assessment: targeted large areas of untreated impervious cover and examined opportunities to provide water quality treatment and runoff reduction through opportunities like green stormwater infrastructure. For stormwater retrofit opportunities, climate resiliency considerations included larger stormwater opportunity footprints and sizing to account for larger storm events. Selected solutions leaned towards cost-effective practices known to be effective at volume management and that include an overflow system (e.g., bioretention areas and submerged gravel wetlands).

Figures 20 and 21. Stormwater Retrofit Opportunity Locations in the Hutchinson River Watershed (Left photo: Bioretention area proposed to provide treatment for untreated impervious area (Mount Vernon); Right photo: bioretention area is proposed to treat untreated impervious and compacted pervious areas (Mount Vernon)

Reforestation Assessment: targeted areas with the potential to increase tree canopy cover and remove impervious cover. These sites also had the potential to provide co-benefits such as heat island mitigation and habitat corridors, enhance community aesthetics, provide erosion control, and remove non-native invasive species.

Figure 2222. Reforestation Opportunities in the Hutchinson River Watershed: Conservation Landscaping Proposed on an Open, Unused Lot (Mount Vernon)

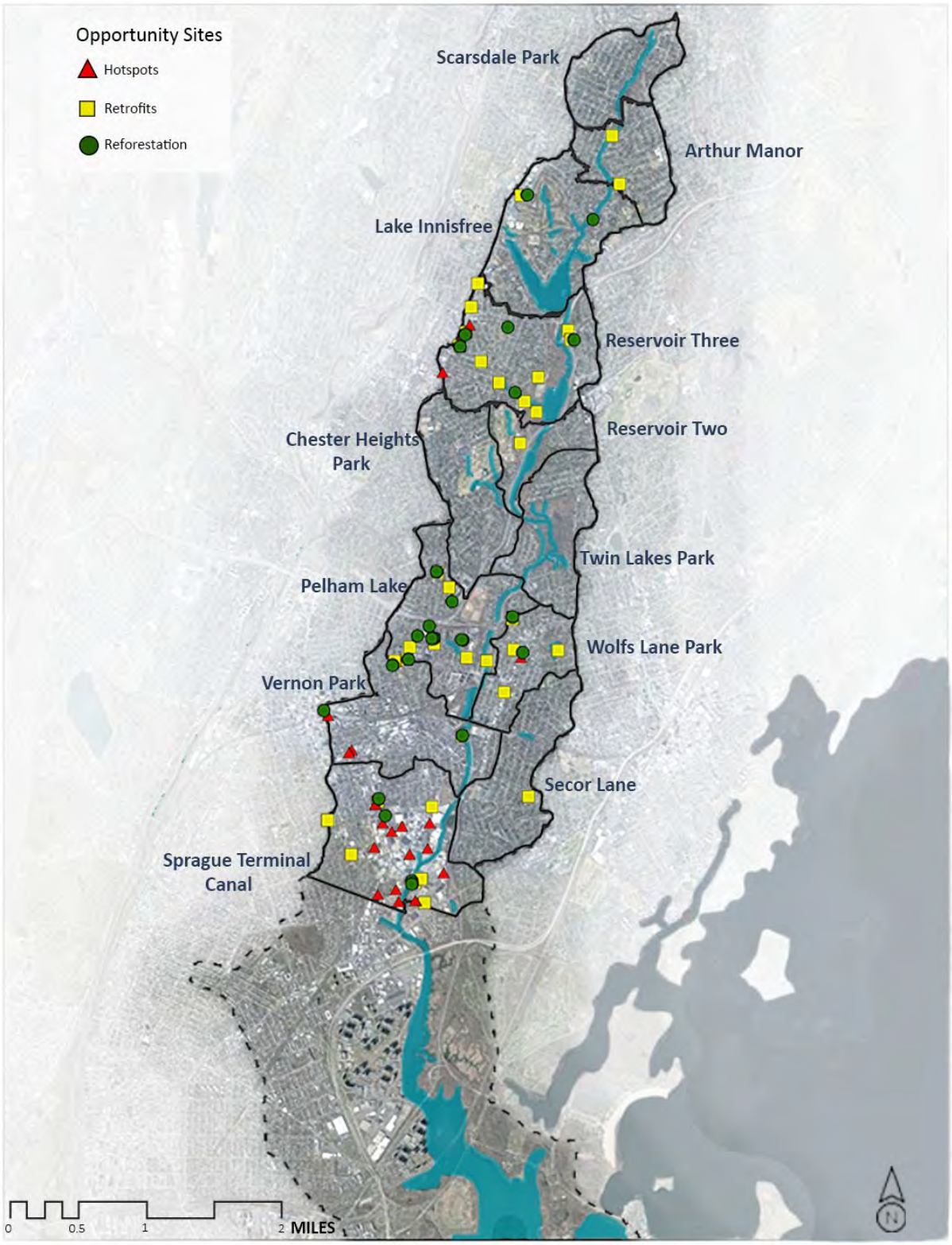
Figure 23. Reforestation Opportunities in the Hutchinson River Watershed: Invasives Species Management and Conservation Landscaping Proposed within a Community Park (Eastchester)

Table 8. Summary of Field Assessment Findings

Assessment	General Findings

Hotspot	• Twenty hotspot sites investigated
	• Assessed areas from road or right-of-way
	• Types of businesses assessed included:
	  o Auto body shops
	  o Shopping centers
	  o Scrap metal
	  o Stockpiling areas
	  o Asphalt production
	• Common recommendations included street sweeping, dumpster replacement, future education, follow up meetings, bulk material management, oil and grease separator installation, and pavement replacement

Stormwater Retrofit	• Thirty-seven potential stormwater retrofit sites investigated • Focused on water quality, nuisance flooding, and impervious area treatment • Assessed primarily large parking lots, schools, playgrounds, and land owned by institutions (i.e., religious centers, universities) • Types of stormwater retrofits included bioretention, regenerative stormwater conveyance, and wetlands
Reforestation	• Twenty-five potential reforestation sites investigated • Focused on impervious areas and forest/grasses in poor condition • Noted presence of non-native and invasive species for control and management recommendations • Types of recommendations included reforestation, conservation landscaping, and street tree planting



Mapping data sources: Biohabitats 2023; ESRI 2023; NYS DEC 2019.

Figure 24. Restoration Opportunity Sites Identified as a Result of Field Assessments (Biohabitats)

5.1. Restoration Opportunity Prioritization

Based on data collected through the field assessments, an inventory of restoration opportunities was developed, and a schema formulated to prioritize and rank restoration opportunities. While the individual metrics vary by type of opportunity, the overall prioritization framework for all three (Hotspots, Stormwater Retrofits, and Reforestation) was organized into the following categories:

- **Environmental Impact:** covers metrics that are focused on the opportunity's environmental impact. Water quality is a large focus of this category. Additional metrics are included depending on the project type.
- **Ability to Address:** considers the feasibility or ease of implementing the proposed opportunity, including ownership and physical parameters such as available space, slope, and soil type.
- **Ancillary Benefits**: considers additional benefits that may result from the project's implementation.

Restoration opportunities were scored within each of the three categories to determine a total score that is translated into either high, medium, or low priority within each restoration opportunity type. A detailed methodology of opportunity prioritization can be found in Appendix D. Refer to Section 6 and Appendices E and F for detailed information on restoration opportunities.

6. Management Measures

This section describes recommended actions to meet the watershed management goals identified in Section 3. The recommendations are categorized as watershed-wide and site specific:

Watershed-wide Recommendations are recommendations are non-location specific that can be implemented throughout the Hutchinson River watershed or can be implemented at the neighborhood, municipal or regional scale.

Site Specific Recommendations include site-specific projects and/or actions intended to address specific issues identified at that location.

Due to the large size of the Hutchinson River watershed and limited field assessment scope of the watershed planning process, site-specific recommendations are intended to serve as demonstration projects and further field assessments are recommended to identify additional restoration projects. This plan is not meant to be a complete list of projects but is a living document that will be adapted to include new projects and priorities as they are identified.

6.1. Watershed-Wide Recommendations

Recommendations that apply across the watershed or across subwatersheds with similar characteristics are outlined below.

Establish a Lead Entity for Watershed Plan Implementation

Save the Sound, Westchester County Department of Planning and Soil & Water Conservation District, and the Project Steering Committee have been leaders throughout the watershed planning process. To see the plan through to implementation and post-construction maintenance, a lead entity should be tasked with leading watershed based plan implementation and post-construction activities such as:

- Continuing to engage and leverage involvement from the Steering Committee, including the municipalities
- Identifying funding sources, as well as pursuing grant funding for projects
- Reviewing and updating action items in the plan
- Developing annual project management, maintenance and/or work plans
- Coordinating and leading public outreach activities
- Hosting public meetings to celebrate accomplishments and solicit feedback on plan updates and next steps.

Improve Stream and River Accessibility

Due to the high level of development along the river, access to many portions of the Hutchinson River is limited. Improved access to the Hutchinson River and its tributaries is needed to restore access to communities that have been historically separated from the river; enhance recreational opportunities as well as public appreciation; and increase stewardship of the river. Opportunities for trails and paddle craft launching

points should be explored within publicly owned land such as the Twin Lakes County Park, Nature Study Woods, Wilson Woods Park, and Migui Park. The Glover Athletic Fields are also located adjacent to the Hutchinson River. Recently, a walking path was developed starting in Pelham, following the Hutchinson River until reaching Wilson Woods Park.

Trash Monitoring

Save the Sound and other community groups should undertake an effort to establish a baseline understanding of the types, amounts, and potential sources of trash in the Hutchinson River watershed. General field observations noted high levels of trash in the Vernon Park and Sprague Canal Terminal Canal subwatersheds. These findings should inform recommendations for trash management which could include more frequent trash pickup days for certain areas/neighborhoods, outreach and education, and implementation of in-stream trash traps in strategic locations throughout the watershed.

Barrier Removal and Aquatic Organism Passage

Save the Sound, Westchester County, and the Steering Committee should continue to work with groups to identify, study, and evaluate opportunities to improve aquatic connectivity of the Hutchinson River. These efforts should focus on monitoring the presence of alewife and other migratory species to identify the most significant barriers and collaborating with owners to develop recommendations for passage or removal.

Future efforts can build on existing projects on Pelham Lake Dam and Reservoir #2 to improve connectivity. It is recommended that interested parties conduct a road-stream crossing (culvert and bridge) assessment of the Hutchinson River watershed for anadromous and resident fish species to identify and prioritize barriers to fish passage and opportunities for restoring fish passage. Potential resources include the North Atlantic Aquatic Connectivity Collaborative (NAACC) and funding may be available through NYS DEC's Water Quality Improvement Project Program (WQIP) Program.

Community Involvement

The Steering Committee and other responsible parties should continue to pursue opportunities to engage the community in the improvement of the health of the Hutchinson River watershed. Opportunities for engagement should include:

- Leveraging crowdsourcing to identify significant contributors to stormwater pollution. A smart phone app (e.g., SeeClickFix) could be set up and utilized to report watershed issues such as deteriorating dumpsters, excessive sediment runoff from a construction site, etc.
- Engaging Schools: The field assessments conducted as part of this watershed plan did not include a thorough assessment of school properties. Municipalities should work with schools to identify onsite stormwater retrofit and reforestation opportunities. Restoration projects on school properties also provide an education and engagement opportunity for teachers and students to learn about

the health of the Hutchinson River, ways that humans can improve water quality, provide avenues for on-site research needed for some AP or IB courses, and ways to help maintain onsite restoration projects.

Advocate for TMDL Development

The Lead Entity and Project Steering Committee should identify the process for New York State to establish TMDLs for the Hutchinson River watershed. There are three pollutants on the 303d list (oil and grease, oxygen demand, and fecal coliform) for the Hutchinson River. The next regulatory step towards improving water quality and meeting water quality standards is to establish a TMDL. A TMDL is the maximum amount of a pollutant allowed to enter a waterbody so that the waterbody can meet water quality standards for that particular pollutant. A TMDL determines a pollutant reduction target and allocates load reductions necessary to the source(s) of the pollutant.

Establish More Robust Water Quality Monitoring Throughout the Watershed

Consider monitoring for nutrients, dissolved oxygen, bacteria, and additional pollutants from the industries along the river such as mineral and chemical runoff. Incorporate citizen science as appropriate as well.

Review Parking Lot Standards

Development regulations that specify the layout and design of parking lots should be reviewed and modified to impact the development of parking lots associated with new development and redevelopment. Field observations throughout the watershed identified opportunities to reduce the amount of impervious cover generated by parking lots, increase tree canopy, and reduce urban heat island effects.

Encourage Golf Course Environmental Stewardship

Work with golf courses to develop environmentally sound strategies including water conservation, fertilizer management, and reforestation. The New York Golf Course Foundation, Golf Course Superintendents Association of America, and Cornell partnered to develop a manual detailing best management practices for New York state golf courses.

Continue to Implement an Illicit Discharge Detection and Elimination Program

Illicit discharges are non-stormwater flows that discharge into the stormwater drainage system or directly into surface waters. Wastewater connections to the storm drain system, sanitary sewer overflows, and illegal dumping are among the types of illicit discharges that may exist in sewered residential and commercial areas within the watershed. Identifying and eliminating these discharges is an important means of pollution source control for the watershed.

Municipalities are required to implement an Illicit Discharge Detection and Elimination Program as part of the MS4 Permit. An Illicit Discharge Detection and Elimination program should include the following elements:

- Map outfalls

- Obtain legal authority to prohibit illicit discharges
- Screen all outfalls at least once every five years
- Educate employees, businesses, and the public on illegal discharges
- Address non-stormwater discharges

Successful implementation of this program is critical to reducing bacterial levels within the watershed.

Retrofit Public Land

Work with public landowners to provide stormwater treatment on currently untreated developed public land. For the purposes of the pollutant load reduction estimates in Section 7, it was assumed that approximately 30% of developed public land, including schools, would be retrofitted with stormwater management practices such as bioretention areas.

Increase Tree Canopy Coverage

Work with public landowners to increase tree canopy, particularly street and parking lot trees that provide coverage over existing impervious surfaces, which has the benefit of reducing heat island effects and stormwater runoff. For the purposes of the pollutant load reduction estimate in Section 7, it was also assumed that approximately 20% of school parking lots and 5% of non-highway roadways would have tree canopy coverage.

Increase Street Sweeping to Improve Water Quality Benefits

Municipalities currently conduct street sweeping as part of their MS4 Permit requirements. Street sweeping curbed streets and parking lots with vacuum and/or regenerative air sweepers is a viable and cost-effective stormwater management practice, when combined with structural stormwater management practices, such as bioretention areas (Tetra Tech, 2020). Municipalities should work towards optimizing street sweeping for water quality benefits. For the purposes of the pollutant load reduction estimate in Section 7, it was assumed that street sweeping with vacuum assisted sweepers would occur weekly.

New Development and Redevelopment Water Quality Treatment

Work with municipalities to ensure that stormwater regulations provide treatment for stormwater in new and redeveloped properties and improve stormwater regulations where needed. For the purposes of the pollutant reduction estimate in Section 7, it was assumed that 10% of the watershed would redevelop and receive treatment from stormwater management practices such as bioretention areas.

Recommendations for Subwatersheds in Heavily Industrialized Areas

Based on field observations in Vernon Park and Sprague Terminal Canal subwatershed, the following actions are recommended for subwatersheds identified as having heavily industrialized areas (see Table 6 in Section 2):

- Dumpster replacement and outreach program: A dumpster replacement and management outreach program should be implemented to replace leaking dumpsters and increase awareness of good dumpster practices such as siting away from storm drains and keeping lids closed.
- Street sweeping: Increased street sweeping should be considered for industries with high potential for migrating materials such as the asphalt production companies located in Sprague Terminal Canal subwatershed.
- Catch basin cleaning: Increased catch basin cleaning should be implemented by municipalities in locations with high levels of trash and debris generation. Storm drain inlets trash debris screens may also be an option for high trash generation areas where frequent maintenance is also possible to prevent clogging. This recommendation should be aligned with recommendations that result from the trash monitoring effort.
- Oil/grit separators: Look for additional opportunities to stormwater retrofit industrial sites with oil/grit separators or other stormwater management practices with high removal rates for oil and grease.

Subwatersheds Dominated by Medium Density Residential

Subwatersheds dominated by medium density residential (as identified in Table 6 in Section 2) should consider the following recommendations:

- Green streets: Develop and implement plans within rights-of-way that reduce stormwater runoff, increase the number and acreage of green spaces in urban areas, improve water quality, and enhance quality of life and community livability. Green street practices include bioretention bumpouts and street trees.
- Greening vacant lots: Repurpose vacant lots as low-cost green stormwater infrastructure. Pursue state and federal grants to undertake a demolition program to remove and discard dilapidated buildings. The vacant lots left after the demolition program present an opportunity to provide ecological benefits such as green space and treatment of stormwater runoff.
- Lawn management education and outreach: Implement a residential stewardship program. The purpose of this outreach program would be to minimize nutrient runoff from lawn care practices in residential areas by generating residential watershed awareness and active stewardship (including awareness of the New York State Nutrient Runoff Law). In addition to residents, the campaign should also encourage golf courses and lawn care companies to use alternative products or application procedures to reduce the use of fertilizers and herbicides/pesticides. This campaign can also serve to increase awareness of Westchester County's recently passed Neighbor Notification Law which requires notification when pesticides are sold or applied.
- Pet waste management: A residential education and outreach campaign should also encourage residents to pick up and properly dispose of pet waste. Actions should include:
    - Media campaign on the water quality impacts of dog waste

- Pet waste stations in high dog walking areas including parks, greenways and common areas
- Educational signs in same areas

Subwatersheds with High to Medium-High Restoration Potential

Due to the large size of the Hutchinson River watershed and limited field assessment scope of the watershed planning process, additional field assessments are recommended to identify additional site-specific restoration projects. In particular, the reforestation and stormwater retrofit assessments should be conducted within high to medium-high restoration potential subwatersheds where field assessments were not previously conducted (Lake Innisfree, Arthur Manor, and Chester Heights subwatersheds).

6.2. Site Specific Recommendations

Tables 9 – 11 outline high priority site-specific recommendations identified during the field assessments conducted specifically for the Hutchinson River Watershed Management Plan. Tables are organized by the type of assessment/restoration opportunity: hotspot, stormwater retrofit, and reforestation.

Additional details on restoration opportunities can be found in Appendix E. High priority restoration opportunities are further highlighted in Figure 25 and summary sheets on each are available in Appendix F.

Table 9. Summary of High Priority Hotspot Opportunities

ID	Type of Site	Subwatershed	Prioritization	Recommendations
HtSpt_04	East Third Street Businesses	Vernon Park	High	Outreach; Dumpster Replacement; Bulk Material Perimeter Control; Resurface Parking Lot
HtSpt_05	Scrap Metal Service	Sprague Terminal Canal	High	Outreach; Bulk Material Perimeter Control; Oil/Grit Separator
HtSpt_06	Pavement Facility	Sprague Terminal Canal	High	Outreach; Resurface Parking Lot; Oil/Grit Separator
HtSpt_07	Asphalt Production 2[12]	Sprague Terminal Canal	High	Resurface Parking Lot; Oil/Grit Separator
HtSpt_08	Recycling Center	Sprague Terminal Canal	High	Outreach; Dumpster Replacement; Resurface Parking Lot; Street Sweeping; Oil/Grit Separator
HtSpt_09	Asphalt Production 1	Sprague Terminal Canal	High	Outreach; Resurface Parking Lot; Street Sweeping; Oil/Grit Separator
HtSpt_10	Shopping Center Dumpster Area	Reservoir Three	High	Outreach; Dumpster Replacement; Oil/Grit Separator
HtSpt_13	Concrete Production	Sprague Terminal Canal	High	Outreach; Bulk Material Perimeter Control; Resurface Parking Lot; Street Sweeping; Oil/Grit Separator
HtSpt_20	Auto Service Shop	Wolfs Lane Park	High	Outreach; Resurface Parking Lot; Oil/Grit Separator

[12] Sites of the same name that are numbered are categorized as the same type of hotspot with similar characteristics.

Table 10. Summary of High Priority Hotspot Opportunities

ID	Site Name	Subwatershed	Prioritization	Recommended Stormwater Management Practice
RtFt_04	Eastchester Public Library	Reservoir Three	High	Bioretention
RtFt_06	Holy Trinity Greek Orthodox Church Side Lawn	Reservoir Three	High	Wetland
RtFt_11	Dave and Busters Parking Lot	Sprague Terminal Canal	High	Bioretention
RtFt_19	Cecil E Parker Elementary School	Sprague Terminal Canal	High	Bioretention
RtFt_21	Presbyterian Church and Holmes School Shared Lot	Pelham Lake	High	Bioretention
RtFt_24	Mt Vernon High School	Pelham Lake	High	Wetland
RtFt_25	Sheridan Ave Park	Pelham Lake	High	Bioretention
RtFt_26	Sheridan Ave Street Median	Pelham Lake	High	Bioretention
RtFt_27	Rebecca Turner Elementary School	Sprague Terminal Canal	High	Bioretention
RtFt_28	Colonial Ave Shoulder	Secor Lane	High	Bioretention
RtFt_47	Beechwood Ave	Vernon Park	High	Bioretention

Table 11. Summary of High Priority Reforestation Opportunities

ID	Site Name	Subwatershed	Prioritization	Recommendations
ReFrst_06	Anne Hutchinson Elementary School	Reservoir Three	High	Conservation Landscaping
ReFrst_28	Beechwood Ave Grassy Curb	Vernon Park	High	Conservation Landscaping
ReFrst_30	Chester Park	Wolfs Lane Park	High	Conservation Landscaping
ReFrst_08	Eastchester Park	Reservoir Three	High	Conservation Landscaping
ReFrst_17	Holmes Elementary School	Vernon Park	High	Conservation Landscaping
ReFrst_16	Mt Vernon East Train Station	Vernon Park	High	Conservation Landscaping
ReFrst_09	Mt Vernon High School	Pelham Lake	High	Conservation Landscaping
ReFrst_03	Vernon Hills Shopping Center	Lake Innisfree	High	Reforestation

Mapping data sources: Biohabitats 2023; ESRI 2023; NYS DEC 2019

Figure 25. High Priority Restoration Opportunities as a Result of Prioritization

6.3. Additional Restoration Projects

Additional efforts, outside of the scope of this watershed planning process, are being undertaken by municipalities and other groups to improve the health of the Hutchinson River watershed. Notable projects either in the planning, design or implementation stages include:

Pelham Manor Native Planting: NY State Department of Transportation's (NYSDOT) and the Environmental Coalition of the Pelhams launched a pilot program which resulted in the planting of more than 250 seedlings at the Pelham Manor Hutchinson River Parkway Northbound Exit 4. This effort provides wildlife and pollinator habitat and enhances local aesthetics.

7. Current Pollutant Loads and Future Pollutant Load Reductions

The Watershed Treatment Model (WTM) was used to estimate existing pollutant loads and reductions that would be expected if the recommendations identified within this Plan were implemented.

7.1. Existing Pollutant Loads

Existing pollutant loads were calculated from primary land uses and impervious cover. The primary data source for land use and ownership was taken from the Westchester County online tax parcel viewer, a compilation of data provided by local tax assessors, and is available from the County for general information and planning purposes only. This data was determined to be adequate for the scale and scope of this study but should not be used for other purposes or considered a representation of local tax assessors' records. Based on this data, Biohabitats established six land use categories as input to the WTM: Commercial, Industrial, Open Water, Parks, Residential, and Roadways.

An annual precipitation value of 49.77 inches per year was used based on data from the Westchester County Airport in Harrison, NY. Historical rainfall data was reviewed to determine if there were any changes due to climate change. The data indicated that while intensity of rainfall events has been increasing, the total amount of rainfall has remained the same.

Running the WTM for the existing watershed conditions provided an estimate of current annual pollutant loads for total nitrogen (which influence dissolved oxygen levels in the River); total phosphorus; fecal coliform; and total suspended solids (Table 12). Additional detail on calculating existing pollutant loads can be found in Appendix B and a detailed technical assessment methodology for the WTM is provided in Appendix I.

The following should be considered when interpreting the results of the WTM for the Westchester County portion of the Hutchinson River watershed:

- Some sources of pollutants, such as sewage leaks or illicit sewage connections (Illicit Discharges), were not estimated in the absence of reliable monitoring data to characterize their potential load contribution. No wastewater treatment plants exist within the Westchester County portion of the watershed. There are no known septic systems within the watershed.
- Pollutant concentrations were taken from the WTM Manual (Caraco, 2002) and are not specific to the Westchester County portion of the Hutchinson River watershed.

It is noteworthy that the Hutchinson River watershed is built-out and that most of this development occurred prior to the implementation of the MS4 regulations. Therefore, there are little to no known bioretention practices or similarly performing stormwater management practices currently in place. This results in high levels of pollutant loads from existing conditions and creates very challenging conditions for meeting load reduction targets.

Table 12. Pollutant Loading for the Hutchinson River Watershed

Land Use	Area (Acres)	TN (lbs/yr)	TP (lbs/yr)	TSS (lbs/yr)	Bacteria (billion/yr)
Residential	2,628	19,143	3,480	870,115	979,152,411
Commercial	471	5,644	903	211,645	257,220
Roadway	1,104	31,856	5,309	1,592,801	967,897
Industrial	179	288	46	13,805	10,486
Parks	716	1,433	143	71,629	8,592
Open Water	117	1,498	59	18,135	--
TOTAL	**5,217**	**59,860**	**9,941**	**2,778,122**	**980,396,610**

7.2. Estimated Pollutant Load Reductions

Achieving load reduction targets presented within this plan will take many years and rounds of adaptive management to achieve and will require collaboration with multiple stakeholder groups. The recommendations presented within this plan represent a first round of ambitious recommendations. As progress is made, additional recommendations should be added and added to the Implementation Plan presented in Section 8.

The types of recommendations selected for the Hutchinson River Watershed Plan were selected as they are known pollutant removal performers and can be readily implemented within the known physical conditions of each site. A summary of pollutant removal performance is provided in Table 13. As previously discussed, nutrients (total nitrogen) will serve as a surrogate for dissolved oxygen. Oil and grease water quality standards are established by NYS DEC in a narrative form (vs. numeric) and state that there should be “No residue…no visible oil film”. As there is no numeric standard, a load reduction target is not appropriate or feasible.

Table 13. Pollutant Removal Efficiency by Recommendation Type

Recommendation Type	% Removal			
	TN	TP	TSS	Bacteria
Stormwater Wetland[13]	30%	40%	80%	35%
Bioretention[13]	30%	40%	80%	70%
Regenerative Stormwater Conveyance[13]	30%	40%	80%	70%
Street Sweeping (Vacuum Assisted)[14]	62%	62%	78%	0%

Reforestation pollutant load reductions were accounted for using the WTM's methodology for "land reclamation" which is the conversion of land from one use to another with a lower loading potential. The WTM accounts for land reclamation by moving land from one use to another. The reduction is simply the difference between the load from the old land use and the load from the new land use. For the purposes of this Plan, reforestation encompasses three types of reforestation efforts (reforestation, conservation landscaping, and street tree planting). The same pollutant load reduction methodology was used for all three types.

Site-Specific Recommendations Pollutant Load Reductions

All site-specific reforestation and stormwater retrofit opportunities (high, medium, and low priority) were incorporated into the WTM (Table 14 and Table 15). A detailed description of pollutant load reduction calculations for the site-specific recommendations can be found as part of the Watershed Opportunities Technical Memorandum in Appendix D. In addition to the site-specific recommendations, quantifiable watershed-wide recommendations were incorporated as well (Table 16).

Table 14. Estimated Pollutant Load Reductions from Stormwater Retrofits

ID	Recommended Stormwater Management Practice	Subwatershed	TN Removed (lbs/yr)	TP Removed (lbs/yr)	TSS Removed (lbs/yr)	Bacteria Removed (billion/yr)
RtFt_01	Wetland	Reservoir Three	2.07	0.46	256	69,896
RtFt_02	Wetland	Reservoir Three	35.62	7.88	4,405	1,204,626
RtFt_03	Bioretention	Lake Innisfree	21.45	4.75	2,652	725,417

[13] NYS DEC, 2022
[14] Caraco, 2002

ID	Recommended Stormwater Management Practice	Subwatershed	TN Removed (lbs/yr)	TP Removed (lbs/yr)	TSS Removed (lbs/yr)	Bacteria Removed (billion/yr)
RtFt_04	Regenerative Stormwater Conveyance	Reservoir Three	27.31	6.04	3,377	923,542
RtFt_05	Regenerative Stormwater Conveyance	Reservoir Three	19.33	4.28	2,390	653,617
RtFt_06	Bioretention	Reservoir Three	6.37	1.41	788	215,564
RtFt_07	Bioretention	Reservoir Three	6.15	1.36	761	208,086
RtFt_08	Bioretention	Reservoir Three	1.69	0.37	208	57,003
RtFt_09	Bioretention	Reservoir Three	3.08	0.68	381	104,118
RtFt_11	Bioretention	Sprague Terminal Canal	11.96	2.65	1,479	404,536
RtFt_12	Wetland	Sprague Terminal Canal	4.80	1.06	594	162,322
RtFt_14	Bioretention	Sprague Terminal Canal	6.13	1.36	758	207,340
RtFt_16	Bioretention	Sprague Terminal Canal	0.62	0.14	76	20,919
RtFt_18	Bioretention	Pelham Lake	5.08	1.12	628	171,760
RtFt_19	Bioretention	Sprague Terminal Canal	2.67	0.59	330	90,299
RtFt_21	Bioretention	Pelham Lake	5.31	1.17	656	179,510
RtFt_25	Bioretention	Pelham Lake	0.57	0.13	71	19,409
RtFt_26	Bioretention	Pelham Lake	2.07	0.46	256	70,106
RtFt_27	Bioretention	Sprague Terminal Canal	2.65	0.59	328	89,686
RtFt_28	Bioretention	Secor Lane	2.83	0.63	350	95,773
RtFt_30	Bioretention	Reservoir Three	4.73	1.05	585	160,062
RtFt_31	Bioretention	Wolfs Lane Park	1.60	0.36	198	54,268

ID	Recommended Stormwater Management Practice	Subwatershed	TN Removed (lbs/yr)	TP Removed (lbs/yr)	TSS Removed (lbs/yr)	Bacteria Removed (billion/yr)
RtFt_32	Bioretention	Wolfs Lane Park	3.53	0.78	437	119,402
RtFt_35	Bioretention	Reservoir Three	7.72	1.71	954	260,952
RtFt_37	Wetland	Sprague Terminal Canal	3.42	0.76	422	115,522
RtFt_42	Wetland	Reservoir Three	1.60	0.35	198	54,095
RtFt_43	Bioretention	Reservoir Three	5.53	1.22	684	187,010
RtFt_44	Bioretention	Wolfs Lane Park	0.27	0.06	33	9,119
RtFt_45	Bioretention	Wolfs Lane Park	0.67	0.15	83	22,733
RtFt_46	Wetland	Wolfs Lane Park	11.11	2.46	1,374	375,748
RtFt_47	Bioretention	Vernon Park	14.52	3.21	1,795	490,841
RtFt_48	Wetland	Pelham Lake	7.92	1.75	980	267,981
RtFt_49	Bioretention	Arthur Manor	2.70	0.60	333	91,209
TOTAL			**233.08**	**51.59**	**28,821**	**7,882,471**

Table 15. Estimated Pollutant Load Reductions from Reforestation

ID	Reforestation Type	Subwatershed	TN Removed (lbs/yr)	TP Removed (lbs/yr)	TSS Removed (lbs/yr)	Bacteria Removed (billion/yr)
ReFst_03	Reforestation	Lake Innisfree	0.06	0.03	0.00	44.76
ReFst_04	Reforestation	Reservoir Three	0.01	0.01	0.09	152.18
ReFst_05	Reforestation	Reservoir Three	0.01	0.00	0.00	4.37
ReFst_06	Conservation Landscaping	Reservoir Three	0.11	0.05	0.00	76.15
ReFst_07	Reforestation	Reservoir Three	0.21	0.05	9.48	15,253.89

ID	Reforestation Type	Subwatershed	TN Removed (lbs/yr)	TP Removed (lbs/yr)	TSS Removed (lbs/yr)	Bacteria Removed (billion/yr)
ReFst_08	Conservation Landscaping	Reservoir Three	1.95	0.34	99.40	64.01
ReFst_09	Conservation Landscaping	Pelham Lake	0.11	0.05	0.00	75.06
ReFst_10	Reforestation	Sprague Terminal Canal	0.02	0.01	0.00	13.66
ReFst_11	Conservation Landscaping	Pelham Lake	0.04	0.01	1.28	2,070.06
ReFst_12	Conservation Landscaping	Sprague Terminal Canal	0.03	0.01	0.00	18.34
ReFst_13	Conservation Landscaping	Pelham Lake	2.46	0.58	118.87	191,159.00
ReFst_15	Conservation Landscaping	Sprague Terminal Canal	1.80	0.41	87.56	127,488.00
ReFst_16	Conservation Landscaping	Vernon Park	9.22	1.61	469.93	303.05
ReFst_17	Conservation Landscaping	Vernon Park	0.06	0.02	0.00	39.12
ReFst_18	Conservation Landscaping	Pelham Lake	0.01	0.01	0.00	9.55
ReFst_19	Reforestation	Pelham Lake	0.80	0.15	38.28	354.30
ReFst_20	Conservation Landscaping	Pelham Lake	0.06	0.02	0.00	39.15
ReFst_21	Conservation Landscaping	Pelham Lake	0.00	0.00	0.01	10.87
ReFst_22	Conservation Landscaping	Pelham Lake	0.00	0.00	0.00	0.00
ReFst_23	Street Trees	Wolfs Lane Park	0.24	0.04	12.34	210.22
ReFst_24	Street Trees	Pelham Lake	0.02	0.00	0.83	1,334
ReFst_25	Street Trees	Sprague Terminal Canal	0.01	0.00	0.00	6.49
ReFst_26	Reforestation	Lake Innisfree	0.66	0.11	33.41	21.51
ReFst_28	Conservation Landscaping	Vernon Park	0.13	0.02	6.68	4.30
ReFst_30	Conservation Landscaping	Wolfs Lane Park	1.72	0.30	87.55	56.38
TOTAL			**19.74**	**3.83**	**965.71**	**338,809.42**

Watershed-Wide Recommendations Pollutant Load Reductions

An overview of the assumptions associated with the pollutant load reductions from quantifiable watershed-wide recommendations are summarized below. Estimates are provided in Table 16.

Retrofit Public Land: In addition to the site-specific opportunities identified via field assessments, to attempt to meet load reduction targets proposed within this plan, it was also assumed that 30% of publicly owned impervious cover, including schools, would be retrofitted with bioretention areas (or similarly performing stormwater management practices).

Account for Redevelopment: As development within the watershed turns over and redevelops, stormwater treatment will be provided for previously untreated impervious surfaces. For the purposes of this plan, it was assumed that 10% of existing residential, commercial, and institutional private development will be treated by bioretention areas (or similarly performing stormwater management practices). Transportation and industrial land uses were excluded. For Watershed Treatment Model accounting purposes, redevelopment was accounted for as a stormwater retrofit.

Weekly Street Sweeping: For the purposes of the WTM re-run, it was assumed that the street sweeping currently occurs monthly and would be increased to optimize water quality benefits (weekly sweeping using a vacuum assisted street sweeper conducted by trained operators) for all non-highway roads within the watershed.

Increase Tree Canopy Coverage: It was also assumed that street trees would be planted to provide canopy coverage over 5% of all non-highway roadways and 20% of school parking lots in addition to the site-specific opportunities identified via field assessments. This was added as a scenario to attempt to meet load reduction targets proposed within this plan.

Table 16. Estimated Pollutant Load Reductions from Watershed-Wide Recommendations

Watershed-Wide Recommendation	TN Removed (lbs/yr)	TP Removed (lbs/yr)	TSS Removed (lbs/yr)	Bacteria Removed (billion/yr)
Retrofit Public Land (30% of Publicly-Owned Impervious Cover)	446	98	55,189	17,057,038
Account for Redevelopment Water Quality Treatment (10% of Watershed will Redevelop with Stormwater Management)	669	148	82,856	26,600,022
Weekly Street Sweeping for Non-Highway Roads	5,381	1,345	506,040	0

Watershed-Wide Recommendation	TN Removed (lbs/yr)	TP Removed (lbs/yr)	TSS Removed (lbs/yr)	Bacteria Removed (billion/yr)
Increase Tree Canopy Coverage (5% Canopy Coverage over Non-Highway Roads; 20% of School Parking)	722	125.8	36,731	23,658
TOTAL	**7,218**	**1,716.8**	**680,816**	**43,680,718**

Pollutant Load Results

Table 17 provides the results from the WTM and the impact of the recommendations on pollutant loads within the watershed.

Table 17. Comparison of Existing and Estimated Future Loads with both watershed wide and site specific recommendations Implemented

WTM Scenario	Load Type	TN	TP	TSS	Bacteria
		lbs/year	lbs/year	lbs/year	billion/year
Existing Conditions	**Total**	**59,917**	**9,941**	**2,778,457**	**980,396,610**
	Storm	57,646	9,839	2,752,832	980,396,610
	Non-Storm	2,271	102	25,625	--
With Recommendations Implemented	**Total**	**46,949**	**6,810**	**1,557,326**	**929,232,035**
	Storm	44,736	6,751	1,539,199	929,232,035
	Non-Storm	2,213	59	18,127	--

Table 18 compares the estimated load reductions that can be achieved from implementing the proposed recommendations in comparison to the load reduction targets. As illustrated in this table, despite incorporating ambitious recommendations (i.e., retrofit 30% of developed public land) into this plan, there is still a significant amount remaining to meet target load reductions.

As previously mentioned, based on current land use and development patterns achieving load reduction targets presented within this plan will take many years and rounds of adaptive management to achieve and will require collaboration with multiple stakeholder groups. The watershed is already heavily developed with little to no existing stormwater quality treatment. As progress is made, additional recommendations should be added to the Implementation Plan presented in Section 8.

Table 18. Load Reductions Compared to Load Reduction Targets

Load Reduction Target	Existing Load (Table 17 Storm Load)	Reductions Needed to Meet Target	Estimated Load Reductions from Recommendations (Tables 14 - 16)	Remaining Load Reduction Needed
30% TN	57,646	17,294	7,471	9,823
10% Bacteria	980,396,610	98,039,661	51,901,997	46,137,664

8. Implementation Plan

8.1. Funding

Funding for project implementation may be available from a variety of federal, State and local grant programs, as well as private foundations. NYS DEC maintains database of Nonpoint Source Funding Programs as part of the Water Quality Management, NPS program: https://www.dec.ny.gov/chemical/109983.html. The database includes eligibility criteria and links to each specific program, including:

FEMA Grant Programs: FEMA supports a variety of programs that may support watershed plan recommendations from Dam Safety to Hazard Mitigation Assistance Programs that includes the Building Resilient Infrastructure and Communities (BRIC) program.

National Fish and Wildlife Foundation, Long Island Sound Futures Fund: supports efforts to test innovative approaches to conservation that advance Clean Waters and Healthy Watersheds; Thriving Habitats and Abundant Wildlife; and Sustainable and Resilient Communities.

Environmental Justice Community Impact Grant Program (NYS DEC): offers competitive grants to support and empower communities as they develop and implement solutions that significantly address environmental issues, harms, and health hazards, build community consensus, set priorities, and improve public outreach and education.

Water Quality Improvement Project (WQIP) Program (NYS DEC): is a competitive, reimbursement grant program that funds projects that directly improve water quality or aquatic habitat, promote flood risk reduction, restoration, and enhanced flood and climate resiliency, or protect a drinking water source.

New York State Sea Grant and the Long Island Sound Study websites, both provide updates on funding opportunities as they become available and the US EPA also maintains a database of potential “Funding Resources for Watershed Protection” https://www.epa.gov/nps/funding-resources-watershed-protection-and-restoration.

This is by no means a complete list of available programs and other opportunities may emerge following completion this plan.

Table 19. Watershed-Wide Recommendations Implementation Plan

Recommendation	Watershed Goals Addressed	Suggested Lead Organization(s)	Timeframe[1]	Estimated Cost[2]	Potential Funding Sources
Establish a Plan Implementation Committee or Watershed Group	All	Community Organizations	Short	$ -$$	Conservation Alliance Confluence Program, US Department of Agriculture Forest Service
Improve Stream and River Accessibility	River Access & Educational Opportunities	Municipalities/ County/Community Organizations	Medium	$$-$$$	NYSDOS Local Waterfront Revitalization Program (LWRP), Long Island Sound Futures Fund (LISFF)
Trash Monitoring	Water Quality & Habitat and Ecology	Community Organizations	Short	$	NYSDEC Environmental Justice Community Impact Grant (NYSDEC EJ), US EPA / NEIWPCC
Barrier Removal	Habitat and Ecology & Water Quality	Municipalities/ County/Community Organizations	Short	$$$	NYSDEC Water Quality Improvement Project (WQIP), NYSDEC Tributary Restoration and Resiliency Grant, NYSDEC Climate Smart Communities Grant (CSC) NYSDOT Consolidated Local Street and Highway Improvement Program (CHIPS), NOAA Coastal Habitat Restoration and Resilience Grants for Underserved Communities
Community Involvement	Educational Opportunities	Municipalities/County/Community Organizations	Short	$	Long Island Sound Study Stewardship Fund, LISFF, NOAA Coastal Habitat

					Restoration and Resilience Grants for Underserved Communities, Conservation Alliance Confluence Program, NOAA Planet Stewards, EPA Pollution Prevention (P2), NYSDEC EJ
Advocate for TMDL Development	Water Quality	Community Organizations	Short	$	NEIWPCC, NYSDEC WQIP
Parking Lot Standards	Water Quality	Municipalities/ County	Medium	$	Municipal funds, NYS EFC GIGP
Encourage Golf Course Environmental Stewardship	Water Quality, Habitat and Ecology & Educational Opportunities	Municipalities/ County	Short	$-$$	NYS EFC GIGP, NYSDEC WQIP, NYSDEC CSC
Continue to Implement an Illicit Discharge Detection and Elimination Program	Water Quality	Municipalities/ County	Short	$$	NYSDEC WQIP
Retrofit Public Land	Water Quality	Municipalities/County	Medium	$$$	NYSDEC WQIP
Increase Tree Canopy Coverage	Water Quality, Habitat and Ecology	Municipalities/County/Community Organizations	Short	$-$$$	NYSDEC CSC, NYSDEC EJ, NYSDEC WQIP
Increase Street Sweeping to Improve Water Quality Benefits	Water Quality	Municipalities	Short	$$	NYSDEC WQIP
New Development and Redevelopment Water Quality Treatment	Water Quality	Municipalities/County	Short	$$-$$$	NYS EFC GIGP, NYSDEC WQIP
Heavy Industrialized Subwatersheds					

Dumpster replacement and outreach program	Water Quality & Educational Opportunities	Municipalities	Medium	$-$$	NYSDEC WQIP
Street sweeping	Water Quality	Municipalities	Short	$	NYSDEC WQIP
Catch basin cleaning	Water Quality	Municipalities	Short	$	NYSDEC WQIP
Oil/grit separators	Water Quality	Municipalities/County	Long	$$	NYSDEC WQIP
Medium Density Residential Subwatersheds					
Green streets	Water Quality	Municipalities/ County	Long	$-$$	NYSDEC WQIP, NYS EFC GIGP, LISFF, NYSDEC CSC
Greening vacant lots	Water Quality & Habitat and Ecology	Municipalities/ County/Community Organizations	Medium	$$-$$$	NYS EFC GIGP, NYSDEC WQIP, LISFF, NYSDEC CSC, NYSDEC Environmental Justice Community Impact Grant
Lawn management	Water Quality, Habitat and Ecology & Educational Opportunities	Municipalities/ County/Community Organizations	Short	$	NYSDEC WQIP
Pet waste management	Water Quality & Educational Opportunities	Municipalities/ County/Community Organizations	Short	$	NYSDEC WQIP
High to Medium High Restoration Potential Subwatersheds					
Conduct Field Assessment to Identify additional opportunities	Water Quality, Habitat and Ecology, River Access & Educational Opportunities	Community Organizations	Long	$$	Long Island Sound Stewardship Fund, LISFF, NYSDEC Environmental Justice Community Impact Grant

1: Short: implemented within the first five years; Medium: five to seven years; Long: seven to ten years

2: $: $-$10,000 $$: $11,000-$50,000 $$$: Greater than $51,000

Table 20. Hotspot Opportunities Implementation Plan

ID	Type of Site	Municipality	Watershed Goals Addressed	Suggested Lead Organization(s)	Timeframe[1]	Estimated Cost[2]	Potential Funding Sources
HtSpt_04	East Third Street Businesses	City of Mount Vernon	Water Quality	Private property owner/NGO or Municipality	Medium	$$	NYS Environmental Facilities Corporation (EFC) Green Innovation Grant Program (GIGP), NYSDEC Water Quality Improvement Project (WQIP), US EPA Pollution Prevention (P2)
HtSpt_05	Scrap Metal Service	City of Mount Vernon	Water Quality	Private property owner/NGO or Municipality	Medium	$	NYS EFC GIGP, NYSDEC WQIP, US EPA P2
HtSpt_06	Pavement Facility	City of Mount Vernon	Water Quality	Private property owner/NGO or Municipality	Medium	$$	NYS EFC GIGP, NYSDEC WQIP, US EPA P2
HtSpt_07	Asphalt Production 2	City of Mount Vernon	Water Quality	Private property owner/NGO or Municipality	Medium	$$	NYS EFC GIGP, NYSDEC WQIP, US EPA P2
HtSpt_08	Recycling Center	City of Mount Vernon	Water Quality	Private property owner/NGO or Municipality	Medium	$$$	NYS EFC GIGP, NYSDEC WQIP, US EPA P2
HtSpt_09	Asphalt Production 1	City of Mount Vernon	Water Quality	Private property owner/NGO or Municipality	Medium	$$$	NYS EFC GIGP, NYSDEC WQIP, US EPA P2
HtSpt_10	Shopping Center Dumpster Area	Town of Eastchester	Water Quality	Private property owner/NGO or Municipality	Medium	$	NYS EFC GIGP, NYSDEC WQIP, US EPA P2
HtSpt_13	Concrete Production	City of Mount Vernon	Water Quality	Private property owner/NGO or Municipality	Medium	$$	NYS EFC GIGP, NYSDEC WQIP, US EPA P2

HtSpt_20	Auto Service Shop	Village of Pelham	Water Quality	Private property owner/NGO or Municipality	Medium	$$$	NYS EFC GIGP, NYSDEC WQIP, US EPA P2

1: Short: implemented within the first five years; Medium: five to seven years; Long: seven to ten years

2: $: $-$10,000 $$: $11,000-$50,000 $$$: Greater than $51,000

Table 21. Stormwater Retrofit Opportunities Implementation Plan

ID	Type of Site	Municipality	Watershed Goals Addressed	Suggested Lead Organization(s)	Timeframe[1]	Estimated Cost[2]	Potential Funding Sources
RtFt_04	Eastchester Public Library	Town of Eastchester	Water Quality & Educational Opportunities	Municipality / NGO	Medium	$	NYSDEC Water Quality Improvement Project (WQIP), NYS Environmental Facilities Corporation (EFC) Green Innovation Grant Program (GIGP), Long Island Sound Futures Fund (LISFF), NYSDEC Climate Smart Communities (CSC)
RtFt_06	Holy Trinity Greek Orthodox Church Side Lawn	City of New Rochelle	Water Quality & Educational Opportunities	Institutional property owner/NGO	Long	$$$	NYSDEC WQIP, NYS EFC GIGP, LISFF, NYSDEC CSC
RtFt_11	Dave and Busters Parking Lot	Village of Pelham Manor	Water Quality	Private property owner/NGO	Medium	$$$	NYSDEC WQIP, NYS EFC GIGIP, LISFF, NYSDEC CSC
RtFt_19	Cecil E Parker Elementary School	City of Mount Vernon	Water Quality & Educational Opportunities	School District/NGO	Short	$$	NYSDEC WQIP, NYS EFC GIGIP, LISFF
RtFt_21	Presbyterian Church and Holmes	City of Mount Vernon	Water Quality & Educational Opportunities	Institutional property owner/NGO	Medium	$$$	NYSDEC WQIP, NYS EFC GIGIP, LISFF

	School Shared Lot						
RtFt_24	Mt Vernon High School	City of Mount Vernon	Water Quality, Habitat and Ecology, Educational Opportunities	School District/NGO	Short	$$$	NYSDEC WQIP, NYS EFC GIGIP, LISFF, NYSDEC CSC
RtFt_25	Sheridan Ave Park	City of Mount Vernon	Water Quality & Educational Opportunities	Municipality	Long	$	NYSDEC WQIP, NYS EFC GIGIP, LISFF
RtFt_26	Sheridan Ave Street Median	City of Mount Vernon	Water Quality	Municipality	Medium	$	NYSDEC WQIP, NYS EFC GIGIP, LISFF
RtFt_27	Rebecca Turner Elementary School	City of Mount Vernon	Water Quality & Educational Opportunities	School District/NGO	Short	$$	NYSDEC WQIP, NYS EFC GIGIP, LISFF
RtFt_28	Colonial Ave Shoulder	Village of Pelham Manor	Water Quality	Municipality	Long	$	NYSDEC WQIP, NYS EFC GIGIP, LISFF
RtFt_47	Beechwood Ave	City of Mount Vernon	Water Quality & Educational Opportunities	NGO	Short	$$	NYSDEC WQIP, NYS EFC GIGIP, LISFF

1: Short: implemented within the first five years; Medium: five to seven years; Long: seven to ten years

2: $: $-$10,000 $$: $11,000-$50,000 $$$: Greater than $51,000

Table 22. Reforestation Opportunities Implementation Plan

ID	Type of Site	Municipality	Watershed Goals Addressed	Suggested Lead Organization(s)	Timeframe[1]	Estimated Cost[2]	Potential Funding Sources
ReFrst_06	Anne Hutchinson Elementary School	Town of Eastchester	Habitat and Ecology, Educational Opportunities	School District/NGO	Short	$$$	NYSDEC Water Quality Improvement Project (WQIP), NYS Environmental Facilities Corporation (EFC) Green Innovation Grant Program (GIGP), Long Island Sound Futures Fund (LISFF), NYSDEC Climate Smart Communities Program (CSC), NYSDEC Environmental Justice Community Impact Grant (EJ)
ReFrst_28	Beechwood Ave Grassy Curb	City of Mount Vernon	Habitat and Ecology, River Access, Educational Opportunities	NGO	Short	$	NYSDEC WQIP, NYS EFC GIGP, LISFF, NYSDEC CSC, NYSDEC EJ
ReFrst_30	Chester Park	Village of Pelham	Habitat and Ecology, Educational Opportunities	Municipality	Long	$$	NYSDEC WQIP, NYS EFC GIGP, LISFF, NYSDEC CSC, NYSDEC EJ
ReFrst_08	Eastchester Park	Town of Eastchester	Habitat and Ecology, River Access	Municipality	Medium	$$$	NYSDEC WQIP, NYS EFC GIGP, LISFF, NYSDEC CSC, NYSDEC EJ
ReFrst_17	Holmes Elementary School	City of Mount Vernon	Habitat and Ecology, Educational Opportunities	School District/NGO	Medium	$$	NYSDEC WQIP, NYS EFC GIGP, LISFF, NYSDEC CSC, NYSDEC EJ

ReFrst_16	Mt Vernon East Train Station	City of Mount Vernon	Habitat and Ecology, Educational Opportunities	MetroNorth/Municipality	Medium	$$$	NYSDEC WQIP, NYS EFC GIGP, LISFF, NYSDEC CSC, NYSDEC EJ
ReFrst_09	Mt Vernon High School	City of Mount Vernon	Habitat and Ecology, Educational Opportunities	School District/NGO	Short	$$$	NYSDEC WQIP, NYS EFC GIGP, LISFF, NYSDEC CSC, NYSDEC EJ
ReFrst_03	Vernon Hills Shopping Center	Town of Eastchester	Habitat and Ecology	Private property owner	Long	$$$	NYSDEC WQIP, NYS EFC GIGP, LISFF, NYSDEC CSC, NYSDEC EJ

1: Short: implemented within the first five years; Medium: five to seven years; Long: seven to ten years

2: $: $-$10,000 $$: $11,000-$50,000 $$$: Greater than $51,000

9. Monitoring Plan

A monitoring program allows stakeholders to evaluate the effectiveness of recommended actions and assess progress towards meeting the watershed goals. Although NYS DEC has identified the Hutchinson River as impaired for oil/grease, low dissolved oxygen, and fecal coliform, the state has not set load reduction targets or developed TMDL for the River. This makes regular monitoring efforts all the more important in tracking progress, effectiveness and the need for adaptive management in this watershed.

Limited monitoring data currently exists for the Westchester County portion of the Hutchinson River. Since 2015, Save the Sound has regularly sampled at three locations in the lower reaches of the watershed (between Wilson Woods Park and Glover Field). Each sample is tested for the fecal indicator bacteria *Enterococcus* in brackish water and *E. coli* in freshwater.

The NYS DEC also maintains a data portal to provide access to historical monitoring data from the NYS DEC Division of Water, Bureau of Water Assessment and Management. The portal includes 4 sample locations in the in the middle and upper reaches of the Hutchinson River as well as Lake Innisfree, Reservoir 3, and Pelham Lake. Water Quality Monitoring is also conducted privately in Lake Innisfree by the Townhouses of Lake Isle as part of their short and long term lake management efforts.

Save the Sound also coordinates regular monitoring in the tidal reaches of the river, located in the Bronx portion of the watershed as part of the Unified Water Study (UWS). The UWS is a water quality program designed to collect standardized data in Long Island Sound and its embayments. Save the Sound developed the monitoring protocol and partnered with local groups to launch the program in 2017 in selected embayments in New York and Connecticut. Nine stations were established in the lower reaches of the Hutchinson River and Eastchester Bay. The stations have been sampled annually since 2017 for UWS Tier I parameters: dissolved oxygen, water clarity, temperature, salinity, and chlorophyll-a and beginning in 2019 for UWS Tier II for Quantitative Macrophytes, Continuous Dissolved Oxygen, and Nutrients. Tier II data added percent coverage of bare embayment bottom, macrophytes, and eelgrass to the data collected. All data are collected following an EPA-approved Quality Assurance Project Plan or QAPP. EPA-approved QAPPs and monitoring protocols are publicly available at www.savethesound.org/water-monitoring-ecological-health.

A USGS stream gauge is also installed in the Hutchinson River in Pelham, NY. The gauge was active from 1943 to 1989, and then reactivated in June 2009 and discontinued again in April 2013. Parameters beyond flow were intermittently collected while the gauge was active.

There are multiple levels of monitoring that will be required to assess the progress and effectiveness of this Plan; along with more substantial monitoring and modeling or

establishing a TMDL. Additional efforts and programs to monitor instream water quality parameters and BMP efficacy post-construction, specifically related to the identified impairments will be necessary to effectively measure the progress, success and need for adaptive management related to recommendations included in this plan.

10. References

American Society of Civil Engineers. "Infrastructure Report Card for New York State. 2022. https://infrastructurereportcard.org/wp-content/uploads/2017/01/IRC_Brochure-NY2022.pdf

Arnold, Chester L., Gibbons, James. "Impervious Surface Coverage: The Emergence of a Key Environmental Indicator. Journal of the American Planning Association, 62:2, 243-258. 1996.

Cadwell, Donald H. "Surficial Geologic Map of New York." *New York State Geological Survey*, The State Education Department, 1989.

Caraco, Deb. "The Watershed Treatment Model." Center for Watershed Protection, Elliot City, MD, 2002.

Centers for Disease Control and Prevention/ Agency for Toxic Substances and Disease Registry/ Geospatial Research, Analysis, and Services Program (CDC/ATSDR). CDC/ATSDR Social Vulnerability 2020 Database Maryland. 2020

Davis, Barbara, and Teresa Kump-Leghorn. "New Rochelle: A Celebration of 325 Years." *Our History*, New Rochelle, NY, 2013, https://www.newrochelleny.com/1138/Our-History.

Department of Public Service. "Electric and Gas Utility Service Territory by County." Oct. 2020, New York. https://dps.ny.gov/system/files/documents/2022/10/nys-electric-and-gas-utilities-by-county.pdf

Edwards, Jeff. "Hutchinson River Parkway Granted Historic Place Designation." *Patch, New York.* 24 May, 2023. https://patch.com/new-york/pelham astchesten-river-parkway-granted-historic-place-designation

"Fact Sheet- Eastchester Creek, New York." *U.S Army Corps of Engineers, New York District*, U.S. ARMY CORPS OF ENGINEERS, 28 Jan. 2022, https://www.nan.usace.army.mil/Media/Fact-Sheets/Fact-Sheet-Article-View/Article/487367/fact-sheet-eastchester-creek-new-york/

Field, John and Fowler, George. *Bronx River Corridor Study and Management Plan for Westchester County, NY – Volume II.* Westchester County Soil and Water Conservation District and Westchester County Department of Planning, May 2020, New York.

"First Alewife Spotted on the Hutchinson River since the 19th Century." *Long Island Sound Study*, 21 May 2020, https://longislandsoundstudy.net

Federal Emergency Management Agency (FEMA). 100 and 500-year floodplain mapping. 2007.

"Hutchinson River Parkway: NYC Parks." *NYC Parks*, https://www.nycgovparks.org/parks astchesten-river-parkway

iNaturalist. "Westchester County Biodiversity Project." Westchester County, New York. iNaturalist. 2023, https://www.inaturalist.org/projects/westchester-county-biodiversity-project.

Jacobs Civil Consultants, Inc. (Jacobs). *Pelham Lake Rehabilitation–- Sediment Loading Analysis*. 2020.

Karr, J.R. "Assessment of biotic integrity using fish communities." Fisheries 1981. 66:21-27.

Koch, George. National Dam Safety Program. New Rochelle Reservoir Number 1 Dam (Inventory Number NY 20), Hutchinson River Basin, Westchester County, New

York. Phase I Inspection Report. *New York State Department of Environmental Conservation Albany*, 1979a.

Koch, George. National Dam Safety Program. New Rochelle Reservoir Number 3 Dam, Hutchinson River Basin, Westchester County, New York. Phase 1 Inspection Report. *New York State Department of Environmental Conservation Albany*, 1979b.

Lederer, Richard M. *The Place Names of Westchester County, New York*. Harbor Hill Books, 1978.

Liu, Zhifeng; Chunyang He, and Jianguo Wu. "The Relationship between Habitat Loss and Fragmentation during Urbanization: An Empirical Evaluation from 16 World Cities." PLoS ONE. 2016. 11(4).

"Local History–- Interesting Facts, Famous Names & Places." *Town of Eastchester*, 2017, https://www.eastchester.org

Open Sewer Atlas NYC, Shapefile: Combined/Separate Sewer System. New York City Department of Environmental Protection. December 20, 2014. https://www.arcgis.com/home/item.html?id=be88972b0e374879adc6173e67236365

Natural Cooperative Soil Survey, Shapefile: Web Soil Survey. USDA – Natural Resources Conservation Services, 2019.New York State Department of Environmental Conservation (NYS DEC). "Climate Change Effects and Impacts." 2023. https://www.dec.ny.gov/energy/94702.html#Precipitation

New York State Department of Energy & Environment, Shapefile: Combined Sewer Overflows (CSOs): Beginning 2013. NY Open Data. November 10, 2020. https://data.ny.gov/Energy-Environment/Combined-Sewer-Overflows-CSOs-Map/i8hd-rmbi/data

New York State Department of Environmental Conservation (NYS DEC), Connecticut Department of Environmental Protection (CTDEP). A Total Maximum Daily Load Analysis to Achieve Water Quality Standards for Dissolved Oxygen in Long Island Sound. Albany, New York, 2000.

New York State Department of Environmental Conservation (NYS DEC), Shapefile: Waterbody Classifications for Rivers/Streams. Albany, New York: Environmental Resource Mapper, 2022.

New York State Department of Environmental Conservation (NYS DEC). Shapefile: Potential Environmental Justice Areas. Albany, New York: Maps & Geospatial Information System (GIS) Tools for Environmental Justice, 2021.

New York State Department of Environmental Conservation (NYS DEC) Division of Water (DOW) Bureau of Water Assessment and Management, Water Quality Data Portal. Albany, New York: 2023. https://nysdec.maps.arcgis.com/apps/webappviewer/index.html?id=692b72ae03f14508a0de97488e142ae1

New York State Department of Environmental Conservation (NYS DEC). "NYS Section 303(d) List of Impaired/TMDL Waters, 2022. https://www.dec.ny.gov/chemical/31290.html

New York State Department of Environmental Conservation (NYS DEC). New York State Stormwater Management Design Manual 2022 Draft. Albany, New York.

2022. https://dec.ny.gov/news/environmental-notice-bulletin/2022-10-19/new-york-state-stormwater-management-design-manual

"Pelham Bay Park - Salt Marshes in New York City Parks." *NYC Parks*, https://www.nycgovparks.org

Rao, Sahana. "Historic NY Funding to Tackle Mount Vernon Sewage Crisis." *NRDC*, 26 Apr. 2022, https://www.nrdc.org/experts/sahana-rao/historic-ny-funding-tackle-mount-vernon-sewage-crisis

Save the Sound. "164 Sewage Spills in Westchester and counting…" 2020. https://www.savethesound.org/2020/11/10/164-sewage-spills-in-westchester-and-counting/

Save the Sound. Unified Water Study. Unified Water Study: Long Island Sound Embayment Research (UWS). 2023 https://www.savethesound.org/water-monitoring-ecological-health

Schueler, Thomas. "Controlling urban runoff: a practical manual for planning and designing urban BMPs." *Metropolitan Washington Council of Governments. Washington, DC. 1987*.

Sun, Ge and Peter Caldwell. "Impacts of Urbanization on Stream Water Quantity and Quality in the United States." Water Resources IMPACT. 2015. Vol. 17, No. 1.

Tetra Tech. "Street Sweeping Pollutant Reductions and Crediting." 2021. Prepared by E. Cira and M. Voorhees.

"Tribal History." *Tribal Council of the Siwanoy Nation*, https://www.siwanoynation.org/tribal-history

U.S. Department of Agriculture (USDA). Urban Soils. US Department of Agriculture, Washington, D.C. May, 2019. https://www.nrcs.usda.gov/sites/default/files/2022-11/Urban-Soils-Fact-Sheet.pdf

U.S. Department of Agriculture (USDA). USFS Tree Canopy Cover Datasets. US Department of Agriculture, Washington, D.C. 2021. https://data.fs.usda.gov/geodata/rastergateway/treecanopycover/

U.S. Fish and Wildlife Service (USFWS). National Wetlands Inventory (NWI) website. U.S. Department of the Interior, Fish and Wildlife Service, Washington, D.C. 2022.

U.S. Fish and Wildlife Service. Information for Planning and Consultation (IPAC). U.S. Department of the Interior, Fish and Wildlife Service, Washington, D.C. https://ipac.ecosphere.fws.gov/

USGS Communications and Publishing. "Science Snippet. Wetland World: Hydric Soil." United States Geological Survey, May 7, 2021. https://www.usgs.gov/news/science-snippet/wetland-word-hydric-soil

Waldman, J.R. 1981. White Perch on the Run. Underwater Naturalist 13(2):22--23. "

Westchester County. 2021 Westchester County Hazard Mitigation Plan. Westchester County Office of Emergency Management. 2021.

WaterWorld. "N.Y ASCE Grades State's Water Infrastructure." 25, July 2022. https://www.waterworld.com/drinking-water/press-release/14280156/ny-asce-grades-states-water-infrastructure

Williams, David. *The Iron Age*, The Week, Oct. 10, 1895, p. 745. New York, NY.

Yu, W., Wu, B., Wang, X. *et al.* Scale-dependent effects of habitat fragmentation on the genetic diversity of *Actinidia chinensis* populations in China. *Hortic Res* **7**, 172 (2020). https://doi.org/10.1038/s41438-020-00401-1

11. Appendices