3258632975

MS4 Annual Report Cover Page

MCC form for period ending March 9, 2022

SPDES ID: NYR20A192

This cover page must be completed by the report preparer.
Joint reports require only one cover page.

Choose one:

● **This report is being submitted on behalf of an individual MS4.**

Fill in SPDES ID in upper right hand corner.

Name of MS4: RC GENERAL SVCS, FACILITIES

OR

○ **This report is being submitted on behalf of a Single Entity**

(Per Part II.E of GP-0-10-002)

Name of Single Entity:

OR

○ **This is a joint report being submitted on behalf of a coalition.**

Provide SPDES ID of each permitted MS4 included in this report. Use page 2 if needed.

Name of Coalition:

SPDES ID	SPDES ID	SPDES ID
NYR20A	NYR20A	NYR20A
SPDES ID	SPDES ID	SPDES ID
NYR20A	NYR20A	NYR20A
SPDES ID	SPDES ID	SPDES ID
NYR20A	NYR20A	NYR20A
SPDES ID	SPDES ID	SPDES ID
NYR20A	NYR20A	NYR20A
SPDES ID	SPDES ID	SPDES ID
NYR20A	NYR20A	NYR20A
SPDES ID	SPDES ID	SPDES ID
NYR20A	NYR20A	NYR20A

MS4 Annual Report Cover Page

MCC form for period ending March 9, 2022

Provide SPDES ID of each permitted MS4 included in this report.

SPDES ID NYR20A	SPDES ID NYR20A	SPDES ID NYR20A
SPDES ID NYR20A	SPDES ID NYR20A	SPDES ID NYR20A
SPDES ID NYR20A	SPDES ID NYR20A	SPDES ID NYR20A
SPDES ID NYR20A	SPDES ID NYR20A	SPDES ID NYR20A
SPDES ID NYR20A	SPDES ID NYR20A	SPDES ID NYR20A
SPDES ID NYR20A	SPDES ID NYR20A	SPDES ID NYR20A
SPDES ID NYR20A	SPDES ID NYR20A	SPDES ID NYR20A
SPDES ID NYR20A	SPDES ID NYR20A	SPDES ID NYR20A
SPDES ID NYR20A	SPDES ID NYR20A	SPDES ID NYR20A
SPDES ID NYR20A	SPDES ID NYR20A	SPDES ID NYR20A
SPDES ID NYR20A	SPDES ID NYR20A	SPDES ID NYR20A
SPDES ID NYR20A	SPDES ID NYR20A	SPDES ID NYR20A
SPDES ID NYR20A	SPDES ID NYR20A	SPDES ID NYR20A
SPDES ID NYR20A	SPDES ID NYR20A	SPDES ID NYR20A
SPDES ID NYR20A	SPDES ID NYR20A	SPDES ID NYR20A
SPDES ID NYR20A	SPDES ID NYR20A	SPDES ID NYR20A
SPDES ID NYR20A	SPDES ID NYR20A	SPDES ID NYR20A
SPDES ID NYR20A	SPDES ID NYR20A	SPDES ID NYR20A

MS4 Municipal Compliance Certification(MCC) Form

MCC form for period ending March 9, 2022

Name of MS4 COUNTY OF ROCKLAND, DEPT OF GENERAL SVCS., FACILITIES

SPDES ID NYR20A192

Each MS4 must submit an MCC form.

Section 1 - MCC Identification Page

Indicate whether this MCC form is being submitted to certify endorsement or acceptance of:

- ● An Annual Report for a single MS4
- ○ A Single Entity (Per Part II.E of GP-0-10-002)
- ○ A Joint Report

Joint reports may be submitted by permittees with legally binding agreements.

If Joint Report, enter coalition name:

5690581587

MS4 Municipal Compliance Certification(MCC) Form

MCC form for period ending March 9, 2022

Name of MS4: COUNTY OF ROCKLAND, DEPT OF GENERAL SVCS., FACILITIES

SPDES ID: NYR20A192

Section 2 - Contact Information

Important Instructions - Please Read

Contact information must be provided for ***each*** of the following positions as indicated below:

1. Principal Executive Officer, Chief Elected Official or other qualified individual (per GP-0-08-002 Part VI.J).
2. Duly Authorized Representative (Information for this contact must only be submitted if a Duly Authorized Representative is signing this form)
3. The Local Stormwater Public Contact (required per GP-0-08-002 Part VII.A.2.c & Part VIII.A.2.c).
4. The Stormwater Management Program (SWMP) Coordinator (Individual responsible for coordination/implementation of SWMP).
5. Report Preparer (Consultants may provide company name in the space provided).

   A separate sheet must be submitted for each position listed above unless more than one position is filled by the same individual. If one individual fills multiple roles, provide the contact information once and check all positions that apply to that individual.

   If a new Duly Authorized Representative is signing this report, their contact information must be provided and a signature authorization form, signed by the Principal Executive Officer or Chief Elected Official must be attached.

For each contact, select all that apply:

○ Principal Executive Officer/Chief Elected Official

● Duly Authorized Representative

● Local Stormwater Public Contact

● Stormwater Management Program (SWMP) Coordinator

● Report Preparer

First Name: ROBERT | MI: H | Last Name: GRUFFI

Title: DIRECTOR, FACILITIES MGMT.

Address: 50 SANATORIUM ROAD

City: POMONA | State: NY | Zip: 10970-

eMail: GRUFFIR@CO.ROCKLAND.NY.US

Phone: (845) 426-5958 | County: ROCKLAND

MS4 Municipal Compliance Certification (MCC) Form

MCC form for period ending March 9, 2022

Name of MS4: COUNTY OF ROCKLAND, DEPT OF GENERAL SVCS., FACILITIES

SPDES ID: NYR20A192

Section 3 - Partner Information

Did your MS4 work with partners/coalition to complete some or all permit requirements during this reporting period? ○ Yes ● No

If Yes, complete information below.

Submit a separate sheet for each partner. Information provided in other formats will not be accepted. If your MS4 cooperated with a coalition, submit one sheet with the name of the coalition. It is not necessary to include a separate sheet for each MS4 in the coalition.

If No, proceed to Section 4 - Certification Statement.

Partner/Coalition Name

Partner/Coalition Name (con't.)

SPDES Partner ID - If applicable: NYR20

Address

City

State

Zip -

eMail

Phone ( ) -

Legally Binding Agreement in accordance with GP-0-08-002 Part IV.G.? ○ Yes ○ No

What tasks/responsibilities are shared with this partner (e.g. MM1 School Programs or Multiple Tasks)?

○ MM1

○ MM2

○ MM3

○ MM4

○ MM5

○ MM6

Additional tasks/responsibilities

○ *Watershed Improvement Strategy Best Management Practices* required for MS4s in impaired watersheds included in GP-0-08-002 Part IX.

MS4 Municipal Compliance Certification(MCC) Form

MCC form for period ending March 9, 2022

Name of MS4 COUNTY OF ROCKLAND, DEPT OF GENERAL SVCS., FACILITIES

SPDES ID NYR20A192

Section 4 - Certification Statement

"I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."

This form must be signed by either a principal executive officer or ranking elected official, or duly authorized representative of that person as described in GP-0-08-002 Part VI.J.

First Name ROBERT MI H Last Name GRUFFI

Title (Clearly print title of individual signing report) DIRECTOR, FACILITIES MGMT.

Signature Robert H. Gruffi

Date 10/13/2022

The annual report form and any attachments can be sent to the DEC Central Office clicking the Submit Form link below, or by sending it directly to: MS4compliance@dec.ny.gov. All submissions must include the SPDES ID in the title and must be complete before hitting the Submit Form link below:

Submit Form

If unable to submit electronically, hardcopy submissions can be sent to:

Bureau of Water Compliance
Division of Water
4th Floor
625 Broadway
Albany, New York 12233-3505

1100364151

MS4 Annual Report Form

This report is being submitted for the reporting period ending March 9, 2022

If submitting this form as part of a joint report on behalf of a coalition leave SPDES ID blank.

Name of MS4/Coalition: COUNTY OF ROCKLAND, DEPT OF GENERAL SVCS., FACILITIES MGMT

SPDES ID: NYR20A192

Water Quality Trends

The information in this section is being reported (check one):

- ● On behalf of an individual MS4
- ○ On behalf of a coalition

How many MS4s are contributed to this report? 1

1. Has this MS4/Coalition produced any reports documenting water quality trends related to stormwater? If not, answer No and proceed to Minimum Control Measure One.

● Yes ○ No

If Yes, choose one of the following

- ○ Report(s) attached to the annual report
- ● Web Page(s) where report(s) is/are provided below

Please provide specific address of page where report(s) can be accessed - not home page.

URL: http://rocklandgov.com/departm

URL: see attached docs

URL:

URL:

4286299954

MS4 Annual Report Form

This report is being submitted for the reporting period ending March 9, 2022

If submitting this form as part of a joint report on behalf of a coalition leave SPDES ID blank.

Name of MS4/Coalition: COUNTY OF ROCKLAND, DEPT OF GENERAL SVCS.,

SPDES ID: NYR20A192

Minimum Control Measure 1. Public Education and Outreach

The information in this section is being reported (check one):

● On behalf of an individual MS4
○ On behalf of a coalition

How many MS4s contributed to this report? ___

1. Targeted Public Education and Outreach Best Management Practices

Check all topics that were included in Education and Outreach during this reporting period:

○ Construction Sites	○ Pesticide and Fertilizer Application
○ General Stormwater Management Information	○ Pet Waste Management
○ Household Hazardous Waste Disposal	○ Recycling
○ Illicit Discharge Detection and Elimination	● Riparian Corridor Protection/Restoration
○ Infrastructure Maintenance	○ Trash Management
○ Smart Growth	○ Vehicle Washing
● Storm Drain Marking	● Water Conservation
● Green Infrastructure/Better Site Design/Low Impact Development	● Wetland Protection
○ Other:	○ None

Other: _____

2. Specific audiences targeted during this reporting period:

○ Public Employees	○ Contractors
○ Residential	○ Developers
○ Businesses	○ General Public
○ Restaurants	○ Industries
● Other:	○ Agricultural

Other: k-college aged youth programs

MS4 Annual Report Form

This report is being submitted for the reporting period ending March 9, 2022

If submitting this form as part of a joint report on behalf of a coalition leave SPDES ID blank.

Name of MS4/Coalition: COUNTY OF ROCKLAND, DEPT OF GENERAL SVCS., FACILITIES MGMT

SPDES ID: NYR20A192

3. What strategies did your MS4/Coalition use to achieve education and outreach goals during this reporting period? Check all that apply:

○ Construction Site Operators Trained	# Trained	
○ Direct Mailings	# Mailings	
○ Kiosks or Other Displays	# Locations	
● List-Serves	# In List	125
○ Mailing List	# In List	
○ Newspaper Ads or Articles	# Days Run	
● Public Events/Presentations	# Attendees	498
● School Program	# Attendees	498
○ TV Spot/Program	# Days Run	
○ Printed Materials:	Total # Distributed	

Locations (e.g. libraries, town offices, kiosks)

○ Other:

● Web Page: Provide specific web addresses - not home page. Continue on next page if additional space is needed.

URL: https://rocklandgov.com/departme

URL:

MS4 Annual Report Form

This report is being submitted for the reporting period ending March 9, 2022

If submitting this form as part of a joint report on behalf of a coalition leave SPDES ID blank.

Name of MS4/Coalition: COUNTY OF ROCKLAND, DEPT OF GENERAL SVCS., [illegible]

SPDES ID: NYR20A192

3. Web Page con't.: Provide specific web addresses - not home page.

URL

URL

URL

URL

URL

URL

URL

MS4 Annual Report Form

This report is being submitted for the reporting period ending March 9, 2022

If submitting this form as part of a joint report on behalf of a coalition leave SPDES ID blank.

Name of MS4/Coalition: COUNTY OF ROCKLAND, DEPT OF GENERAL SVCS., [illegible]

SPDES ID: NYR20A192

4. Evaluating Progress Toward Measurable Goals MCM 1

Use this page to report on your progress and project plans toward achieving measurable goals identified in your Stormwater Management Program Plan (SWMPP), including requirements in Part III.C.1. Submit additional pages as needed.

A. Briefly summarize the Measurable Goal identified in the SWMPP in this reporting period.

Our professional Stream-Bio-monitoring program is one of only a handful remaining in the State. Our volunteer stream monitoring program has continually increased the number of volunteers for the since 2006. The professional reports on stream quality measured at 20 stream sites throughout the County are used by numerous county, town and village boards in their review of development projects. We also attend several environmental functions throughout the year to advertise our rain barrel and rain garden installations. Additionally, storm drain marker education has increased since

B. Briefly summarize the observations that indicated the overall effectiveness of this Measurable Goal.

We have seen an increase in the number of public inquiries involving our environmental programs. Water quality has improved over recent years across the stream sites that we monitor. The new data for 2018 and beyond will be project focused and provide us with pre-post data on the health of our streams and relate how infrastructure impacts aquatic passability and flooding. A feasibility study was completed in 2019 that identified the top 10 most impaired stream sites along with potential remediation strategies for each site. This data along with the 10 year baseline dataset of BEERS data

C. How many times was this observation measured or evaluated in this reporting period?

5

(ex.: samples/participants/events)

D. Has your MS4 made progress toward this Measurable Goal during this reporting period? ● Yes ○ No

E. Is your MS4 on schedule to meet the deadline set forth in the SWMPP? ● Yes ○ No

F. Briefly summarize the stormwater activities planned to meet the goals of this MCM during the next reporting cycle (including an implementation schedule).

We partner with the Lower Hudson Coalition of Conservation Districts to sponsor a Stormwater Trade Show in October of each year. We participate at Rockland County Government Day in March of each year distributing information on all of our environmental programs. We partner with the NYS DEC HREP in educating K-college in the Day of the Life in the Hudson River. We partner with LDEO/RC Youth Bureau/KRB in educating 11th and 12th graders at annual RPLUS event held in March. We coordinate NYS DEC sponsored American Eel Citizen Science Project from

4961183103

MS4 Annual Report Form

This report is being submitted for the reporting period ending March 9, 2022

If submitting this form as part of a joint report on behalf of a coalition leave SPDES ID blank.

Name of MS4/Coalition: COUNTY OF ROCKLAND, DEPT OF GENERAL SVCS.,

SPDES ID: NYR20A192

Minimum Control Measure 2. Public Involvement/Participation

The information in this section is being reported (check one):

● On behalf of an individual MS4
○ On behalf of a coalition
How many MS4s contributed to this report? 1

1. What opportunities were provided for public participation in implementation, development, evaluation and improvement of the Stormwater Management Program (SWMP) Plan during this reporting period? Check all that apply:

● Cleanup Events — # Events: 1

○ Comments on SWMP Received — # Comments:

○ Community Hotlines — Phone # ( ) -

Phone # ( ) -
Phone # ( ) -
Phone # ( ) -
Phone # ( ) -
Phone # ( ) -
Phone # ( ) -
Phone # ( ) -
Phone # ( ) -
Phone # ( ) -

○ Community Meetings — # Attendees:

○ Plantings — Sq. Ft.:

● Storm Drain Markings — # Drains: 246

● Stakeholder Meetings — # Attendees: 30

● Volunteer Monitoring — # Events: 8

● Other: WAVE

2. Was public notice of availability of this annual report and Stormwater Management Program (SWMP) Plan provided? ● Yes ○ No

○ List-Serve — # In List:

○ Newspaper Advertising — # Days Run:

○ TV/Radio Notices — # Days Run:

○ Other:

○ Web Page URL: Enter URL(s) on the following two pages.

MS4 Annual Report Form

This report is being submitted for the reporting period ending March 9, 2022

If submitting this form as part of a joint report on behalf of a coalition leave SPDES ID blank.

Name of MS4/Coalition: COUNTY OF ROCKLAND, DEPT OF GENERAL SVCS., FACILITIES MGMT

SPDES ID: NYR20A192

2. URL(s) con't.:

Please provide specific address(es) where notice(s) can be accessed - not home page.

URL

URL

URL

URL

URL

URL

URL

MS4 Annual Report Form

This report is being submitted for the reporting period ending March 9, 2022

If submitting this form as part of a joint report on behalf of a coalition leave SPDES ID blank.

Name of MS4/Coalition: COUNTY OF ROCKLAND, DEPT OF GENERAL SVCS.,

SPDES ID: NYR20A192

2. URL(s) con't.:

Please provide specific address(es) where notices can be accessed - not home page.

URL

URL

URL

URL

URL

URL

URL

MS4 Annual Report Form

This report is being submitted for the reporting period ending March 9, 2022

If submitting this form as part of a joint report on behalf of a coalition leave SPDES ID blank.

Name of MS4/Coalition: COUNTY OF ROCKLAND, DEPT OF GENERAL SVCS., FACILITIES MGMT

SPDES ID: NYR20A192

3. Where can the public access copies of this annual report, Stormwater Management Program SWMP) Plan and submit comments on those documents?

Enter address/contact info and select radio button to indicate which document is available and whether comments may be submitted at that location. Submit additional pages as needed.

● MS4/Coalition Office ● Annual Report ○ SWMP Plan ● Comments

Department: DEPT. OF GEN. SVCS., FACILITIES

Address: 50 SANATORIUM ROAD, BLDG. A

City: POMONA State: NY Zip: 10970-

Phone: (845) 364-2958

○ Library ○ Annual Report ○ SWMP Plan ○ Comments

Address:

City: State: Zip: -

Phone: ( ) -

● Other ● Annual Report ○ SWMP Plan ○ Comments

Address: 50 SANATORIUM ROAD

City: POMONA State: NY Zip: 10970-

Phone: (845) 364-2958

● Web Page URL: ● Annual Report ○ SWMP Plan ○ Comments

HTTP://ROCKLANDGOV.COM/DEPARTMENTS/GENERAL-SERVICES/FACILITIES/MS4-ANNUAL-REPORTS/

Please provide specific address of page where report can be accessed - not home page.

● eMail ○ Comments

GRUFFIR@CO.ROCKLAND.NY.US

MS4 Annual Report Form

This report is being submitted for the reporting period ending March 9, 2022

If submitting this form as part of a joint report on behalf of a coalition leave SPDES ID blank.

Name of MS4/Coalition: COUNTY OF ROCKLAND, DEPT OF GENERAL SVCS.,

SPDES ID: NYR20A192

4.a. If this report was made available on the internet, what date was it posted?
Leave blank if this report was not posted on the internet. 10/13/2022

4.b. For how many days was/will this report be posted? 365

If submitting a report for single MS4, answer 5.a.. If submitting a joint report, answer 5.b..

5.a. Was an Annual Report public meeting held in this reporting period? ○ Yes ● No
If Yes, what was the date of the meeting? __/__/____

If No, is one planned? ○ Yes ● No

5.b. Was an Annual Report public meeting held for all MS4s contributing to this report during this reporting period? ○ Yes ● No

If No, is one planned for each? ○ Yes ● No

6. Were comments received during this reporting period? ○ Yes ● No
If Yes, attach comments, responses and changes made to SWMP in response to comments to this report.

MS4 Annual Report Form

This report is being submitted for the reporting period ending March 9, 2022

If submitting this form as part of a joint report on behalf of a coalition leave SPDES ID blank.

Name of MS4/Coalition: COUNTY OF ROCKLAND, DEPT OF GENERAL SVCS., [redacted]

SPDES ID: NYR20A192

7. Evaluating Progress Toward Measurable Goals MCM 2

Use this page to report on your progress and project plans toward achieving measurable goals identified in your Stormwater Management Program Plan (SWMPP), including requirements in Part III.C.1. Submit additional pages as needed.

A. Briefly summarize the Measurable Goal identified in the SWMPP in this reporting period.

The RC Division of Environmental Resources has partnered with schools (K-12 & universities), citizen groups (Sparkill Creek Alliance) and public agencies (NYSDEC, Soil and Water Conservation Districts, Water Quality Committee, RC Stormwater Coalition) to involve and inform residents on Stormwater Management issues.

B. Briefly summarize the observations that indicated the overall effectiveness of this Measurable Goal.

- Public meetings are well attended, public officials are aware and supportive of measures to reduce stormwater runoff.
- Public inquiries increase as general knowledge and discussion on topic expands.

C. How many times was this observation measured or evaluated in this reporting period?

4

(ex.: samples/participants/events)

D. Has your MS4 made progress toward this measurable goal during this reporting period?

● Yes ○ No

E. Is your MS4 on schedule to meet the deadline set forth in the SWMPP?

● Yes ○ No

F. Briefly summarize the stormwater activities planned to meet the goals of this MCM during the next reporting cycle (including an implementation schedule).

We are are a participating member of the Stormwater Coalition of Rockland, and attend the meetings to provide guidance and input on stormwater management issues. The coalition meets monthly. The SWCD is on the website committee and provides insight and feedback at quarterly meetings to increase materials/content and user views.

MS4 Annual Report Form

This report is being submitted for the reporting period ending March 9, 2022

If submitting this form as part of a joint report on behalf of a coalition leave SPDES ID blank.

Name of MS4/Coalition: COUNTY OF ROCKLAND, DEPT OF GENERAL SVCS.,

SPDES ID: NYR20A192

Minimum Control Measure 3. Illicit Discharge Detection and Elimination

The information in this section is being reported (check one):

- ● On behalf of an individual MS4
- ○ On behalf of a coalition

How many MS4s contributed to this report? 1

1. Enter the number and approx. percent of outfalls mapped: 37 # 100 %

2. How many of these outfalls have been screened for dry weather discharges during this reporting period (outfall reconnaissance inventory)? 20

3.a. What types of generating sites/sewersheds were targeted for inspection during this reporting period?

- ○ Auto Recyclers
- ● Building Maintenance
- ○ Churches
- ○ Commercial Carwashes
- ○ Commercial Laundry/Dry Cleaners
- ○ Construction Vehicle Washouts
- ○ Cross-Connections
- ○ Distribution Centers
- ○ Food Processing Facilities
- ○ Garbage Truck Washouts
- ○ Hospitals
- ○ Improper RV Waste Disposal
- ○ Industrial Process Water
- ○ Landscaping (Irrigation)
- ○ Marinas
- ○ Metal Plateing Operations
- ○ Outdoor Fluid Storage
- ● Parking Lot Maintenance
- ○ Printing
- ○ Residential Carwashing
- ○ Restaurants
- ○ Schools and Universities
- ○ Septic Maintenance
- ○ Swimming Pools
- ● Vehicle Fueling
- ● Vehicle Maint./Repair Shops
- ○ Other:
- ○ None

- ○ Sewersheds:

MS4 Annual Report Form

This report is being submitted for the reporting period ending March 9, 2022

If submitting this form as part of a joint report on behalf of a coalition leave SPDES ID blank.

Name of MS4/Coalition: COUNTY OF ROCKLAND, DEPT OF GENERAL SVCS.,

SPDES ID: NYR20A192

3.b. What types of illicit discharges have been found during this reporting period?

- ○ Broken Lines From Sanitary Sewer
- ○ Cross Connections
- ○ Failing Septic Systems
- ○ Floor Drains Connected To Storm Sewers
- ○ Illegal Dumping
- ○ Other:
- ○ Industrial Connections
- ○ Inflow/Infiltration
- ○ Pump Station Failure
- ○ Sanitary Sewer Overflows
- ○ Straight Pipe Sewer Discharges
- ● None

4. **How many illicit discharges/potential illegal connections have been detected during this reporting period?** 0

5. **How many illicit discharges have been confirmed during this reporting period?** 0

6. **How many illicit discharges/illegal connections have been eliminated during this reporting period?** 0

7. **Has the storm sewershed mapping been completed in this reporting period?** ● Yes ○ No
   If No, approximately what percent was completed in this reporting period? 100 %

8. **Is the above information available in GIS?** ○ Yes ● No
   Is this information available on the web? ○ Yes ● No
   If Yes, provide URL(s):

Please provide specific address of page where map(s) can be accessed - not home page.

URL

URL

MS4 Annual Report Form

This report is being submitted for the reporting period ending March 9, 2022

If submitting this form as part of a joint report on behalf of a coalition leave SPDES ID blank.

Name of MS4/Coalition: COUNTY OF ROCKLAND, DEPT OF GENERAL SVCS., [illegible]

SPDES ID: NYR20A192

8. URL(s) con't.:
Please provide specific address of page where map(s) can be accessed - not home page

URL

URL

URL

URL

URL

9. Has an IDDE law been adopted for each traditional MS4 and/or have IDDE procedures been approved for all non-traditional MS4s contributing to this report? ● Yes ○ No

10. If Yes, has every traditional MS4 contributing to this report certified that this law is equivalent to the NYS Model IDDE Law? ○ Yes ○ No ● NT

11. What percent of staff in relevant positions and departments has received IDDE training?

100 %

MS4 Annual Report Form

This report is being submitted for the reporting period ending March 9, 2022

If submitting this form as part of a joint report on behalf of a coalition leave SPDES ID blank.

Name of MS4/Coalition: COUNTY OF ROCKLAND, DEPT OF GENERAL SVCS.,

SPDES ID: NYR20A192

12. Evaluating Progress Toward Measurable Goals MCM 3

Use this page to report on your progress and project plans toward achieving measurable goals identified in your Stormwater Management Program Plan (SWMPP), including requirements in Part III.C.1. Submit additional pages as needed.

A. Briefly summarize the Measurable Goal identified in the SWMPP in this reporting period.

The measureable goal identified in the SWMPP for this reporting period was the ORI on 50% of the 37 known outfalls.

B. Briefly summarize the observations that indicated the overall effectiveness of this Measurable Goal.

Review of the identified outfalls and their identified locations on the Facilities site map was performed. Staff was trained and informed on their locations and observatory requirements.

C. How many times was this observation measured or evaluated in this reporting period?

1

(ex.: samples/participants/events)

D. Has your MS4 made progress toward this measurable goal during this reporting period?

● Yes ○ No

E. Is your MS4 on schedule to meet the deadline set forth in the SWMPP?

● Yes ○ No

F. Briefly summarize the stormwater activities planned to meet the goals of this MCM during the next reporting cycle (including an implementation schedule).

Planned for this reporting cycle shall be continuation of the ORI Survey for the remaining 50% of the identified outfalls.

5624056356

MS4 Annual Report Form

This report is being submitted for the reporting period ending March 9, 2022

If submitting this form as part of a joint report on behalf of a coalition leave SPDES ID blank.

Name of MS4/Coalition: COUNTY OF ROCKLAND, DEPT OF GENERAL SVCS.,

SPDES ID: NYR20A192

Minimum Control Measures 4 and 5.
Construction Site and Post-Construction Control

The information in this section is being reported (check one):

● On behalf of an individual MS4
○ On behalf of a coalition

How many MS4s contributed to this report? 1

1a. Has each MS4 contributing to this report adopted a law, ordinance or other regulatory mechanism that provides equivalent protection to the NYS SPDES General Permit for Stormwater Discharges from Construction Activities? ● Yes ○ No

1b. Has each Town, City and/or Village contributing to this report documented that the law is equivalent to a NYSDEC Sample Local Law for Stormwater Management and Erosion and Sediment Control through either an attorney cerfification or using the NYSDEC Gap Analysis Workbook? ○ Yes ○ No ● NT

If Yes, Towns, Cities and Villages provide date of equivalent NYS Sample Local Law.
○ 09/2004 ○ 03/2006 ● NT

2. Does your MS4/Coalition have a SWPPP review procedure in place? ● Yes ○ No

3. How many Construction Stormwater Pollution Prevention Plans (SWPPPs) have been reviewed in this reporting period? 0

4. Does your MS4/Coalition have a mechanism for receipt and consideration of public comments related to construction SWPPPs? ○ Yes ○ No ● NT

If Yes, how many public comments were received during this reporting period?

5. Does your MS4/Coalition provide education and training for contractors about the local SWPPP process? ● Yes ○ No

6. Identify which of the following types of enforcement actions you used during the reporting period for construction activities, indicate the number of actions, or note those for which you do not have authority:

○ Notices of Violation	#	0	○ No Authority
○ Stop Work Orders	#	0	○ No Authority
○ Criminal Actions	#		● No Authority
○ Termination of Contracts	#	0	○ No Authority
○ Administrative Fines	#		● No Authority
○ Civil Penalties	#		● No Authority
○ Administrative Orders	#	0	○ No Authority
○ Enforcement Actions or Sanctions	#	0	
○ Other	#		● No Authority

MS4 Annual Report Form

This report is being submitted for the reporting period ending March 9, 2022

If submitting this form as part of a joint report on behalf of a coalition leave SPDES ID blank.

Name of MS4/Coalition: COUNTY OF ROCKLAND, DEPT OF GENERAL SVCS.,

SPDES ID: NYR20A192

Minimum Control Measure 4. Construction Site Stormwater Runoff Control

The information in this section is being reported (check one):

● On behalf of an individual MS4
○ On behalf of a coalition

How many MS4s contributed to this report? 1

1. **How many construction projects have been authorized for disturbances of one acre or more during this reporting period?** 0

2. **How many construction projects disturbing at least one acre were active in your jurisdiction during this reporting period?** 0

3. **What percent of active construction sites were inspected during this reporting period?** ● NT
   %

4. **What percent of active construction sites were inspected more than once?** ● NT
   %

5. **Do all inspectors working on behalf of the MS4s contributing to this report use the NYS Construction Stormwater Inspection Manual?** ● Yes ○ No ○ NT

6. **Does your MS4/Coalition provide public access to Stormwater Pollution Prevention Plans (SWPPPs) of construction projects that are subject to MS4 review and approval?** ● Yes ○ No ○ NT

   If your MS4 is Non-Traditional, are SWPPPs of construction projects made available for public review? ○ Yes ● No

   If Yes, use the following page to identify location(s) where SWPPPs can be accessed.

MS4 Annual Report Form

This report is being submitted for the reporting period ending March 9, 2022

If submitting this form as part of a joint report on behalf of a coalition leave SPDES ID blank.

Name of MS4/Coalition: COUNTY OF ROCKLAND, DEPT OF GENERAL SVCS.,

SPDES ID: NYR20A192

6. con't.:

Submit additional pages as needed.

● MS4/Coalition Office

Department: FACILITIES MANAGEMENT

Address: 50 SANATORIUM ROAD

City: POMONA NY Zip: 10970-

Phone: (845) 364-2958

○ Library

Address:

City: Zip: -

Phone: ( ) -

○ Other

Address:

City: Zip: -

Phone: ( ) -

● Web Page URL(s): Please provide specific address where SWPPPs can be accessed - not home page.

URL: HTPP://ROCKLANDGOV.COM/DEPARTMENTS/GENERAL-SERVICES/FACILITIES/MS4-ANNUAL REPORTS

URL:

MS4 Annual Report Form

This report is being submitted for the reporting period ending March 9, 2022

If submitting this form as part of a joint report on behalf of a coalition leave SPDES ID blank.

Name of MS4/Coalition: COUNTY OF ROCKLAND, DEPT OF GENERAL SVCS., [redacted]

SPDES ID: NYR20A192

7. Evaluating Progress Toward Measurable Goals MCM 4

Use this page to report on your progress and project plans toward achieving measurable goals identified in your Stormwater Management Program Plan (SWMPP), including requirements in Part III.C.1. Submit additional pages as needed.

A. Briefly summarize the Measurable Goal identified in the SWMPP in this reporting period.

Our measurable goal is to review 100% of SWPPP'S develop in house or by outside consultants for construction projects being performed by the County of Rockland, and ensuring they are in complete compliance with DEC regulations, the Design Manual, the Guidelines for Soil and Erosion Control and our local requirements.

B. Briefly summarize the observations that indicated the overall effectiveness of this Measurable Goal.

This Measurable Goal is very effective because all SWPPP's generated or caused to be generated by the Facilities Management Department, are prepared or reviewed by a Licensed Professional Engineer who has special knowledge and experience in this particular area ensuring plans that are sufficient with regard to size and function.

C. How many times was this observation measured or evaluated in this reporting period?

0

(ex.: samples/participants/events)

D. Has your MS4 made progress toward this measurable goal during this reporting period?

● Yes ○ No

E. Is your MS4 on schedule to meet the deadline set forth in the SWMPP?

● Yes ○ No

F. Briefly summarize the stormwater activities planned to meet the goals of this MCM during the next reporting cycle (including an implementation schedule).

In the next reporting period, we intend to continue reviewing all of the SWPPP's that are prepared.

1048119251

MS4 Annual Report Form

This report is being submitted for the reporting period ending March 9, 2022

If submitting this form as part of a joint report on behalf of a coalition leave SPDES ID blank.

Name of MS4/Coalition: COUNTY OF ROCKLAND, DEPT OF GENERAL SVCS.,

SPDES ID: NYR20A192

Minimum Control Measure 5. Post-Construction Stormwater Management

The information in this section is being reported (check one):

● On behalf of an individual MS4
○ On behalf of a coalition

How many MS4s contributed to this report? 1

1. How many and what type of post-construction stormwater management practices has your MS4/Coalition inventoried, inspected and maintained in this reporting period?

	# Inventoried	# Inspections	# Times Maintained
○ Alternative Practices			
○ Filter Systems			
● Infiltration Basins	3	6	2
○ Open Channels			
○ Ponds			
○ Wetlands			
○ Other			

2. Do you use an electronic tool (e.g. GIS, database, spreadsheet) to track post-construction BMPs, inspections and maintanance? ○ Yes ● No

3. What types of non-structural practices have been used to implement Low Impact Development/Better Site Design/Green Infrastructure principles?

● Building Codes
● Municipal Comprehensive Plans
○ Overlay Districts
● Open Space Preservation Program
○ Zoning
○ Local Law or Ordinance
○ None
○ Land Use Regulation/Zoning
○ Watershed Plans
○ Other Comprehensive Plan
○ Other:

MS4 Annual Report Form

This report is being submitted for the reporting period ending March 9, 2022

If submitting this form as part of a joint report on behalf of a coalition leave SPDES ID blank.

Name of MS4/Coalition: COUNTY OF ROCKLAND, DEPT OF GENERAL SVCS.,

SPDES ID: NYR20A192

4a. Are the MS4s contributing to this report involved in a regional/watershed wide planning effort?

○ Yes ● No

4b. Does the MS4 have a banking and credit system for stormwater management practices?

○ Yes ● No

4c. Do the SWMP Plans for each MS4 contributing to this report include a protocol for evaluation and approval of banking and credit of alternative siting of a stormwater management practice?

○ Yes ● No

4d. How many stormwater management practices have been implemented as part of this system in this reporting period?

0

5. What percent of municipal officials/MS4 staff responsible for program implementation attended training on Low Impace Development (LID), Better Site Design (BSD) and other Green Infrastructure principles in this reporting period?

5 %

MS4 Annual Report Form

This report is being submitted for the reporting period ending March 9, 2022

If submitting this form as part of a joint report on behalf of a coalition leave SPDES ID blank.

Name of MS4/Coalition: COUNTY OF ROCKLAND, DEPT OF GENERAL SVCS., [redacted]

SPDES ID: NYR20A192

6. Evaluating Progress Toward Measurable Goals MCM 5

Use this page to report on your progress and project plans toward achieving measurable goals identified in your Stormwater Management Program Plan (SWMPP), including requirements in Part III.C.1. Submit additional pages as needed.

A. Briefly summarize the Measurable Goal identified in the SWMPP in this reporting period.

The goal of the Facilities Management Department is to inspect all Post-Construction Storm Water Management Practices including Infiltration Basins, Catch Basins, Piping and Outfall structures at least once per year to ensure proper maintenance and operations. If inservice maintenance work is required, this work will be performed as needed or, if possible, accumulated so that work can be done as part of a Capital Improvement Project.

B. Briefly summarize the observations that indicated the overall effectiveness of this Measurable Goal.

All Post-Construction Storm Water Management Practices were inspected this reporting period as necessary.

C. How many times was this observation measured or evaluated in this reporting period?

30

(ex.: samples/participants/events)

D. Has your MS4 made progress toward this measurable goal during this reporting period?

● Yes ○ No

E. Is your MS4 on schedule to meet the deadline set forth in the SWMPP?

● Yes ○ No

F. Briefly summarize the stormwater activities planned to meet the goals of this MCM during the next reporting cycle (including an implementation schedule).

It is the intention of the County of Rockland to continue inspection and maintenance of all the post construction storm water management devices, to ensure discharge of storm water of a quality and quantity that is acceptable.

MS4 Annual Report Form

This report is being submitted for the reporting period ending March 9, 2022

If submitting this form as part of a joint report on behalf of a coalition leave SPDES ID blank.

Name of MS4/Coalition: COUNTY OF ROCKLAND, DEPT OF GENERAL SVCS.,

SPDES ID: NYR20A192

Minimum Control Measure 6. Stormwater Management for Municipal Operations

The information in this section is being reported (check one):

● On behalf of an individual MS4
○ On behalf of a coalition

How many MS4s contributed to this report? 1

1. Choose/list each municipal operation/facility that contributes or may potentially contribute Pollutants of Concern to the MS4 system. For each operation/facility indicate whether the operation/facility has been addressed in the MS4's/Coalition's Stormwater Management Program(SWMP) Plan and whether a self-assessment has been performed during the reporting period. A self-assessment is performed to: 1) determine the sources of pollutants potentially generated by the permittee's operations and facilities; 2) evaluate the effectiveness of existing programs and 3) identify the municipal operations and facilities that will be addressed by the pollution prevention and good housekeeping program, if it's not done already.

Operation/Activity/Facility	Addressed in SWMP?		Self-Assessment Operation/Activity/Facility performed within the past 3 years?	
Street Maintenance	● Yes	○ No	● Yes	○ No
Bridge Maintenance	○ Yes	● No	○ Yes	● No
Winter Road Maintenance	● Yes	○ No	● Yes	○ No
Salt Storage	● Yes	○ No	● Yes	○ No
Solid Waste Management	● Yes	○ No	● Yes	○ No
New Municipal Construction and Land Disturbance	● Yes	○ No	● Yes	○ No
Right of Way Maintenance	○ Yes	● No	○ Yes	● No
Marine Operations	○ Yes	● No	○ Yes	● No
Hydrologic Habitat Modification	○ Yes	● No	○ Yes	● No
Parks and Open Space	● Yes	○ No	● Yes	○ No
Municipal Building	● Yes	○ No	● Yes	○ No
Stormwater System Maintenance	● Yes	○ No	● Yes	○ No
Vehicle and Fleet Maintenance	● Yes	○ No	● Yes	○ No
Other	○ Yes	● No	○ Yes	● No

MS4 Annual Report Form

This report is being submitted for the reporting period ending March 9, 2022

If submitting this form as part of a joint report on behalf of a coalition leave SPDES ID blank.

Name of MS4/Coalition: COUNTY OF ROCKLAND, DEPT OF GENERAL SVCS., FACILITIES MGMT

SPDES ID: NYR20A192

2. Provide the following information about municipal operations good housekeeping programs:

● Parking Lots Swept (Number of acres X Number of times swept)	# Acres	12
○ Streets Swept (Number of miles X Number of times swept)	# Miles	
● Catch Basins Inspected and Cleaned Where Necessary	#	110
● Post Construction Control Stormwater Management Practices Inspected and Cleaned Where Necessary	#	1
● Phosphorus Applied In Chemical Fertilizer	# Lbs.	0
● Nitrogen Applied In Chemical Fertilizer	# Lbs.	0
● Pesticide/Herbicide Applied (Number of acres to which pesticide/herbicide was applied X Number of times applied to the nearest tenth.)	# Acres	0.00.0

3. How many stormwater management trainings have been provided to municipal employees during this reporting period? 1

4. What was the date of the last training? 07 / 08 / 2021

5. How many municipal employees have been trained in this reporting period? 10

6. What percent of municipal employees in relevant positions and departments receive stormwater management training? 100 %

MS4 Annual Report Form

This report is being submitted for the reporting period ending March 9, 2022

If submitting this form as part of a joint report on behalf of a coalition leave SPDES ID blank.

Name of MS4/Coalition: COUNTY OF ROCKLAND, DEPT OF GENERAL SVCS., [redacted]

SPDES ID: NYR20A192

7. Evaluating Progress Toward Measurable Goals MCM 6

Use this page to report on your progress and project plans toward achieving measurable goals identified in your Stormwater Management Program Plan (SWMPP), including requirements in Part III.C.1. Submit additional pages as needed.

A. Briefly summarize the Measurable Goal identified in the SWMPP in this reporting period.

Pollution Prevention/Good Housekeeping for Municipal Operations is an ongoing process for the County of Rockland. All methodology indicated in the SWPPP continues on an ongoing basis.

B. Briefly summarize the observations that indicated the overall effectiveness of this Measurable Goal.

These goals are being met based upon Facilities Management observations.

C. How many times was this observation measured or evaluated in this reporting period?

1

(ex.: samples/participants/events)

D. Has your MS4 made progress toward this measurable goal during this reporting period?

● Yes ○ No

E. Is your MS4 on schedule to meet the deadline set forth in the SWMPP?

● Yes ○ No

F. Briefly summarize the stormwater activities planned to meet the goals of this MCM during the next reporting cycle (including an implementation schedule).

All of the Pollution Prevention/Good Housekeeping practices presently being utilized by the County of Rockland shall continue to be performed.

MS4 Annual Report Form

This report is being submitted for the reporting period ending March 9, 2022

If submitting this form as part of a joint report on behalf of a coalition leave SPDES ID blank.

Name of MS4/Coalition: COUNTY OF ROCKLAND, DEPT OF GENERAL SVCS.,

SPDES ID: NYR20A192

Additional Watershed Improvement Strategy Best Management Practices

The information in this section is being reported (check one):

● On behalf of an individual MS4
○ On behalf of a coalition

How many MS4s contributed to this report? 1

MS4s must answer the questions or check NA as indicated in the table below.

MS4 Description	Answer	Check NA	(POC)
NYC EOH Watershed	-	-	-
Traditional Land Use	1,2,3,4,5,6,7a-d,8a,8b,9	10,11,12	Phosphorus
Traditional Non-Land Use	1,2,3,4,7a-d,8a,8b,9	5,10,11,12	Phosphorus
Non-Traditional	1,2,77a-d,8a,8b,9	3,4,5,10,11,12	Phosphorus
Onondaga Lake Watershed	-	-	-
Traditional Land Use	1,6,7a-d,8a,9	2,3,4,5,8b,10,11,12	Phosphorus
Traditional Non-Land Use	1,6,7a-d,8a,9	2,3,4,5,8b,10,11,12	Phosphorus
Non-Traditional	1,6,7a-d,8a,9	2,3,4,5,8b,10,11,12	Phosphorus
Greenwood Lake Watershed	-	-	-
Traditional Land Use	1,4,6,7a-d,8a,9	2,3,5,8b,10,11,12	Phosphorus
Traditional Non-Land Use	1,4,6,7a-d,8a,9	2,3,5,8b,10,11,12	Phosphorus
Non-Traditional	1,4,6,7a-d,8a,9	2,3,5,8b,10,11,12	Phosphorus
Oyster Bay	-	-	-
Traditional Land Use	1,4,7a-d,9,10,11,12	2,3,5,6,8a,8b	Pathogens
Traditional Non-Land Use	1,4,7a-d,9,10,11,12	2,3,5,6,8a,8b	Pathogens
Non-Traditional	1,4,7a-d,9	2,3,4,5,8a,8b,10,11,12	Pathogens
Peconic Estuary	-	-	-
Traditional Land Use	1,4,7a-d,8a,9,10,11,12	2,3,5,6,8b	Pathogens and Nitrogen
Traditional Non-Land Use	1,4,7a-d,8a,9,10,11,12	2,3,5,6,8b	Pathogens and Nitrogen
Non-Traditional	1,4,7a-d,8a,9	2,3,4,5,8b,10,11,12	Pathogens and Nitrogen
Oscawana Lake Watershed	-	-	-
Traditional Land Use	1,4,6,7a-d,8a,9	2,3,5,8b,10,11,12	Phosphorus
Traditional Non-Land Use	1,4,6,7a-d,8a,9	2,3,5,8b,10,11,12	Phosphorus
Non-Traditional	1,4,6,7a-d,8a,9	2,3,5,8b,10,11,12	Phosphorus
LI 27 Embayments	-	-	-
Traditional Land Use	1,2,3,4,7a-d,9,10,11,12	5,6,8a,8b	Pathogens
Traditional Non-Land Use	1,2,3,4,7a-d,9,10,11,12	5,6,8a,8b	Pathogens
Non-Traditional	1,2,3,4,7a-d,9	5,6,8a,8b,10,11,12	Pathogens

1. **Does your MS4/Coalition have an education program addressing impacts of phosphorus/nitrogen/pathogens on waterbodies?** ○ Yes ○ No ● N/A

2. **Has 100% of the MS4/Coalition conveyance system been mapped in GIS?** ○ Yes ○ No ● N/A

   If N/A, go to question 3.

   If No, estimate what percentage of the conveyance system has been mapped so far. 0 %

   Estimate what percentage was mapped in this reporting period. 0 %

MS4 Annual Report Form

This report is being submitted for the reporting period ending March 9, 2022

If submitting this form as part of a joint report on behalf of a coalition leave SPDES ID blank.

Name of MS4/Coalition: COUNTY OF ROCKLAND, DEPT OF GENERAL SVCS., FACILITIES MGMT

SPDES ID: NYR20A192

3. **Does your MS4/Coalition have a Stormwater Conveyance System (infrastructure) Inspection and Maintenance Plan Program?** ○ Yes ○ No ● N/A

4. **Estimate the percentage of on-site wastewater treatment systems that have been inspected and maintained or rehabilitated as necessary in this reporting period?** 0 %

5. **Has your MS4/Coalition developed a program that provides protection equivalent to the NYSDEC SPDES General Permit for Stormwater Discharges from Construction Activities (GP-0-08-001) to reduce pollutants in stormwater runoff from construction activities that disturb five thousand square feet or more?** ○ Yes ○ No ● N/A

6. **Has your MS4/Coalition developed a program to address post-construction stormwater runoff from new development and redevelopment projects that disturb greater than or equal to one acre that provides equivalent protection to the NYS DEC SPDES General Permit for Stormwater Discharges from Construction Activities (GP-0-08-001), including the New York State Stormwater Design Manual Enhanced Phosphorus Removal Standards?** ○ Yes ○ No ● N/A

7a. **Does your MS4/Coalition have a retrofitting program to reduce erosion or phosphorus/nitrogen/pathogen loading?** ○ Yes ○ No ● N/A

7b. **How many projects have been sited in this reporting period?** 0

7c. **What percent of the projects included in 7b have been completed in this reporting period?** 0 %

7d. **What percent of projects planned in previous years have been completed?** 0 %

● No Projects Planned

8a. **Has your MS4/Coalition developed and implemented a turf management practices and procedures policy that addresses proper fertilizer application on municipally owned lands?** ○ Yes ○ No ● N/A

8b. **Has your MS4/Coalition developed and implemented a turf management practices and procedures policy that addresses proper disposal of grass clippings and leaves from municipally owned lands?** ○ Yes ○ No ● N/A

MS4 Annual Report Form

This report is being submitted for the reporting period ending March 9, 2022

If submitting this form as part of a joint report on behalf of a coalition leave SPDES ID blank.

Name of MS4/Coalition: COUNTY OF ROCKLAND, DEPT OF GENERAL SVCS., FACILITIES MGMT

SPDES ID: NYR20A192

9. Has your MS4/Coalition developed and implemented a program of native planting?
● Yes ○ No ○ N/A

10. Has your MS4/Coalition enacted a local law prohibiting pet waste on municipal properties and prohibiting goose feeding?
○ Yes ○ No ● N/A

11. Does your MS4/Coalition have a pet waste bag program?
● Yes ○ No ○ N/A

12. Does your MS4/Coalition have a program to manage goose populations?
● Yes ○ No ○ N/A

Microbial Source Tracking in Sparkill Creek: Increasing evidence supporting contributions of human sewage contamination beyond background levels of fecal indicators in Sparkill Creek.

Study Conducted by: Lawrence Vail, James Elling and Gregory O'Mullan

Summary

This project continues a preliminary Molecular Source Tracking (MST) study completed in 2020 that found evidence of human fecal contamination in multiple areas of the Sparkill watershed particularly after wet weather. Tests include a cultivation based fecal indicator bacteria (FIB) determination commonly-used to screen for contamination and a genetic based MST test that is specific for bacterial contamination related to human sources. The main objectives for the 2021 project are: 1) *to examine the contaminant level in* ***stormwater runoff*** *from road surfaces into the creek and,* 2) *to look more closely at an area in the* ***upper watershed*** where human fecal contamination was found in 2020***.*** Despite the elevated levels of fecal indicators, stormwater samples collected at street level during wet weather did not have detectable levels of human specific fecal bacteria. Five wet weather samples were collected between the Marsico Court site, where previous high human signal was detected, and the upstream reservoir outlet that previously had no human signal. The area mostly had high FIB values and increasing MST readings for samples collected further downstream. However, on one sample date human contamination was detected even at the most upstream reservoir site - complicating the interpretation of these results. Other exploratory work was done on the Blauvelt Arm and some of its stormwater sources. Taken as a whole the data strongly supports the presence of human fecal waste as a component of the FIB signal near Marsico Ct. Examination of possible septic contamination or malfunctioning of sewer lines near the pump station are possible next steps along with additional MST testing.

Introduction

Over the last decade, community scientist monitoring has demonstrated widespread fecal contamination in Sparkill Creek using EPA approved cultivation-based enumeration of the Fecal Indicator Bacteria (FIB), enterococci. These cultivation methods do not differentiate human from animal sources of contamination, making the optimization of management/mitigation efforts to reduce contamination difficult. In 2020, a preliminary Molecular Source Tracking (MST) study was conducted to validate the use of human specific MST methods in this system and to determine if there was any evidence from MST approaches for human contributions within the broader fecal contamination signal established using traditional cultivation based monitoring in the creek. The 2020 data provided general validation for two MST assays with both detecting high levels of human signal in positive control samples (human sewage samples from Orangetown) and no detection in negative control (sterile water) samples. The 2020 data also provided evidence of relatively widespread human contamination (detection, at least once, at 5 of 6 sites tested) within the creek and increasing range (greater number of sites with human detection) and increasing concentration of human fecal detection in wet weather compared to

dry weather conditions. Although fecal indicators were found at all sites, human detection did not occur at some sites (e.g. Tackamack South Park) even during wet weather. It must be noted that these data do not suggest that other sources or fecal contamination are absent or that human signals are primarily responsible for the broader fecal indicator signal, only that human contamination appears to be present as a component of the larger fecal signal at some sites in the creek.

The 2021 Project:

To build upon this prior effort, we selected one (HF183, the method with higher detection levels) of the two MST assays used in 2020 to conduct a follow up study in 2021. In 2021, we had two main objectives: 1) *to examine the level of human signal in **stormwater runoff** from road surfaces into the creek as a possible non-point source contribution of fecal contamination* and; 2) *to confirm a sub-set of areas where human sewage signal was detected in the **upper watershed** with an intent to constrain possible inputs that could be targets for management follow up*. The concept was that the upper watershed may have source patterns that were easier to differentiate due to less development and less opportunity for transport from upstream sources and from a confluence of tributaries with mixed sources. Data from 2021 demonstrate that while stormwater runoff from road and parking lot surfaces do contain high levels of traditional fecal indicators, there were not detectable levels of human fecal contamination in the tested stormwater. Stormwater runoff does significantly contribute to the broader, non-human, background signal of fecal indicators found in prior monitoring data but these MST data suggest that the human fecal signal in the creek is likely occurring primarily from subsurface sources or specific point (pipe) sources rather than being widespread in stormwater runoff. The 2021 data also provide evidence for a common human fecal signal in the upper watershed near Marsico Court following rain events and identifies an area that would benefit from additional management attention to search for subsurface inputs of fecal contamination to the creek, including the possibility of septic influence in a region where municipal sewer lines are now available. These data did not clearly identify a point source but do provide an area of interest worthy of management follow up.

Results and Discusson:

FIB in stormwater runoff-

Four samples, three in June and one in October, of street-water were collected during rainfall from runoff moving across impervious surfaces in the watershed before the water had the chance to enter a storm drain or runoff directly into the nearby creek. These samples represent recent rainfall that interacts with possible contaminants that have accumulated on the impervious surface or were carried from adjacent vegetated areas by the rainwater. This type of stormwater contributes to the extra volume in the creek following rainfall and is one, widely distributed, pathway for contaminants, including fecal contamination, to enter the creek. While it might seem unlikely that this type of stormwater input could the carry significant fecal waste, prior studies in similar environments have demonstrated that the levels of fecal indicators can be quite high in the stormwater from suburban, urban and agricultural areas (Montero and O'Mullan, 2018; Sidhu et al 2012; Parker et al 2010). This pattern of elevated FIB was also found in the

subset of stormwater samples examined in this study with enterococci values ranging from 474 to >24,196/100ml. This confirms that stormwater can carry significant levels of FIB into the creek and is one mechanism accounting for the elevated indicator levels found in the creek after rainfall.

Despite the elevated levels of fecal indicators, these samples did not have detectable levels of human specific fecal bacteria (Table 1). These FIB may come from animal sources (e.g. bird droppings) or from background levels of the indicator that have become naturalized on street surfaces or adjacent vegetated areas and are mobilized in stormwater following rain. These data are important to understanding patterns of FIB in the creek and confirm that not all sources of FIB to the creek are an indication of human fecal waste contamination. Although prior data (MST data from 2020) indicate that levels of human specific fecal waste increase in the creek following rainfall, there are also sources of FIB (including stormwater) that do not appear to be linked to human waste and contribute the overall elevated levels of FIB in the creek found following rain. These data, together with the lack of human detection at many sites during dry weather (in MST data from the 2020 study) despite detectable FIB in these same samples, indicate that the FIB signal from prior monitoring data include widespread FIB from a non-human origin. When combined with the elevated human signal detected following rainfall at some sites (MST data from 2020), these data suggest that FIB levels in the watershed come from a complex mixture of human and non-human sources. Therefore, caution must be used in interpreting the traditional FIB data to understand that not all FIB signal is an indication of human fecal input. In fact, half of the stormwater samples had FIB levels at the maximum detection level (at the assay dilution level most commonly used in prior monitoring), suggesting that even the highest detections of FIB are not an indication, by itself, of a human contribution to the monitoring data signal. Although animal sources, common in stormwater, are thought to have a lower health risk than waters containing human fecal contamination (Soller et al 2010; Soller et al 2015), even animal sources may require management action. These data also reinforce the importance of including MST information when sources are of FIB are not easy to determine.

Table 1: Stormwater runoff fecal bacteria sampling in the Sparkill Creek watershed.

Sample site	Sample type	Latitude/ Longitude	Date sampled	ENT / 100ml	HF183 gene copies/100ml
Stop & Shop parking lot	Street water	41.040375°, -73.946616°	6/4/21	474	Not detected
Stop & Shop parking lot	Street water ?	41.040375°, -73.946616	10/26/21	1500	Not detected
South Greenbush Road	Street water	41.052192° -73.944697°	6/4/21	>24,196	Not detected
Marsico Ct/ Valenza Ln intersection	Street water	41.0658°, -73.9400°	6/4/21	>24,196	Not detected

MST confirmation of human-specific fecal waste in the upper watershed-

In 2020, no human fecal signal was detected at our site in Tackamack South Park under any of the conditions sampled (3 samples combining wet and dry conditions) despite the consistent, although often low, presence of traditional FIB. This suggests that locations with very limited human development at the site or above the site are likely to be free of human signal but not entirely free of FIB. In contrast, the 2020 data provided evidence, after rainfall, of human contamination in the Creek adjacent to Marsico Court, an area of the upper watershed where the creek pass through a few residential yards and where there is a nearby sewer pumping station. Over the period of 2012-2019 routine monitoring at this site had an enterococci geometric mean of 552 colony forming units/100ml, more than 5 times the federal guideline for safe recreational contact. Although most sites lower in the watershed had higher geometric means, these long term data indicate that the creek adjacent to Marsico Court is worthy of additional management attention. Therefore this site had both long term elevated FIB levels and recent preliminary evidence (2020) of human contamination after rainfall. This area became a focus in 2021 sampling to confirm detection of a human fecal signal and to attempt to constrain the area where it may be most concentrated or entering the creek. To be clear, this is not expected to be the most concentrated human signal in the watershed. This area was targeted for sampling because of its location in the upper watershed where fewer human sources are likely (and therefore they may be easier to identify and correct; a useful place to begin more concentrated MST sampling) and the creek just above this area passes through mostly undeveloped forested land where human signal would not be expected (similar to Tackamack South Park).

Eleven new samples, on three sampling dates in 2021, were analyzed in the upper watershed near Marsico Court (Table 2; Figure 1). All 2021 sampling was conducted following significant precipitation because that was the condition in which the highest detection occurred in 2020 sampling. The first sampling for 2021 occurred on 6/4/21 and included samples at the routine monitoring site adjacent to Marsico Court and upstream where a nearby reservoir feeds the creek and was expected to be above most likely sources of human contamination or at least just upstream of currently occupied residential neighborhoods. On this sampling date (6/4/21, light green in Table 2) there was a quantifiable human signal detected at the creek site adjacent to Marsico Court, but no human signal detected upstream where the reservoir feeds into the creek. This result matched expectations based on 2020 MST sampling. The enterococci levels on this date were typical for a wet weather day at the routine Marsico monitoring site and decreased upstream near the reservoir. Site 1 has a series of small input pipes, thought to be stormwater, entering the creek that might contribute to the human signal. There is a nearby sewer pump station and there are houses bordering the creek between sites 1 and 5. To follow up on this initial 2021 sampling, additional sites were added between sites 1 and 5 for the next sampling (8/19/21, light blue in table 2) in an attempt to determine if the human signal could be detected above the routine monitoring site, and in an attempt to constrain the spatial location of possible inputs. August 19 received heavy rainfall (4" or more overnight in Tappan) and the creek was unusually turbid on this day. The enterococci FIB signal on 8/19 was much higher than on the prior (6/4) event, reaching maximum FIB levels (>24,196/100ml) for the dilution used at all four locations. In contrast to the prior wet weather sampling events, human signal was not detected

at the routine Marsico sampling site and was only detected (but not quantifiable) just upstream (site 3).

A final wet weather sampling event was conducted on 10/26/21 (light aqua in table 2) in an effort to better constrain the potential human inputs to this area. Five sites were sampled during another major rain event (at least 5/8" prior to and continuing through sampling), in this case including substantial roadway and backyard flooding. FIB levels were again near maximum detection and in human signal was detectable at all five locations (quantifiable at sites 1 and 3). Unlike the prior sampling events, human contamination was detected even at the most upstream site - complicating the interpretation of these results. It is possible that the extreme precipitation and surface flooding may have altered flow paths creating detectable human signal even at the most upstream location, but it is also possible that some rarely detected human source enters the creek near the reservoir. In combination the 2020 and 2021 sampling demonstrate a strong case for human fecal inputs near Marsico Court despite the relatively low density of development. This signal is most common between sites 1 and 3. Additional management attention to consider the possible presence of septic connections or influence from the nearby pumping station seem appropriate in this area, as the number of possible sources would seem to be quite limited.

Figure 1: Aerial view of Marsico Court Sampling Area

From 2016 Google Earth image. GPS locations determined from Google Earth.

Table 2: Upper watershed MST 2021 sampling near Marsico Court.

Table is shaded to highlight the three 2021 wet weather sampling events (6/4.21 in light green; 8/20/21 in light blue; 10/26/21 in light aqua). The Marsico Area Site 1 being most downstream and 5 most upstream) correspond to the sites in Figure 1. MST data is color coded as: red = human signal detected and quantified; orange = detected but not quantifiable; and green = not detected.

Sample site	Marsico Area Site #	Sample type	Latitude/ longitude	Date sampled	ENT / 100ml	Human specific MST: HF183 gene copies/100ml
Marsico Ct, routine monitoring site	1	Creek	41.066412°, -73.940717°	6/4/21	1334	8.18×10^2
Creek flowing from Reservoir upstream of Marsico Ct	5	Creek	41.067359°, -73.938527°	6/4/21	146	Not detected
Marsico Ct, routine monitoring site	1	Creek	41.066412°, -73.940717°°	8/19/21	>24,196	Not detected
Behind Valenza Property 1, near Chicken Coop	3	Creek	41.066557°, -73.940185°	8/19/21	>24,196	Detected, Not Quantified
Behind Valenza, between property 1 and 2	4	Creek	41.066582°, -73.940029°	8/19/21	>24,196	Not detected
Creek flowing from Reservoir upstream of Marsico Ct	5	Creek	41.067359°, -73.938527°	8/19/21	>24,196	Not detected
Marsico Ct, routine monitoring site	1	Creek	41.066412°, -73.940717°°	10/26/21	24,196	7.78×10^2
Marsico Ct, just above routine monitoring site- above stormwater pipes	2	Creek	41.066515°, -73.940613°	10/26/21	15,531	Detected, Not Quantified
Behind Valenza Property 1, near Chicken Coop	3	Creek	41.066557°, -73.940185°	10/26/21	14136	9.11×10^2
Behind Valenza, between property 1 & 2	4	Creek	41.066582°, -73.940029°	10/26/21	24,196	Detected, Not Quantified
Creek flowing from Reservoir upstream of Marsico Ct	5	Creek	41.067359°, -73.938527°	10/26/21	19,863	Detected, Not Quantified

Results from other 2021 sampling sites-

In 2020, most sites sampled in the lower watershed following precipitation were found to have detectable human signal, including the Clausland Arm between South Greenbush Road and and NY Rte 303. In 2021, on 8/19 following heavy precipitation, both the Clausland and Blauvelt arms of the Sparkill Creek were tested just upstream of their confluence. FIB were near maximum detection in both samples and human fecal signal was detected, but not quantified, consistent with human sources upstream in each arm of the creek. An exploratory sample was collected upstream at one of the sources of the Blauvelt Arm from a pipe entering a drainage culvert near the Blauvelt Library. This pipe had an FIB signal at maximum detection but no human MST signal was detected in this sample. These limited data are consistent with 2020 data, showing widespread human signal in the creek lower in the watershed following wet weather.

Table 3: Other 2021 MST samples collected in the Sparkill Creek watershed.

Sample site	Sample type	Latitude/ Longitude	Date sampled	ENT / 100ml	HF183 gene copies/100ml
Clausland Arm	Creek	41.05433, -73.94515	8/19/21	>24,196	Detected, Not Quantified
Blauvelt Arm	Creek	41.05440, -73.945136	8/19/21	19,863	Detected, Not Quantified
Blauvelt Library Culvert pipe	Pipe input to culvert	41.059118° -73.956451°	8/19/21	>24,196	Not detected

Summary Conclusions and Management Relevance:

These data suggest that stormwater input, likely without human fecal contributions in most locations, contributes to the widespread FIB signal in the creek. This high background level of FIB makes it difficult to use FIB data alone to identify possible human fecal sources. However, the MST sampling does suggest that human fecal waste contributes to the FIB signal at many locations in the watershed. Locations in the upper watershed, such as the creek near Marsico Court and Valenza Lane, where human signal is generally lacking at upstream sites and where there are fewer possible sources of human input provide a more constrained location to begin management efforts. Our data strongly support the presence of human fecal waste as a component of the FIB signal near Marsico Ct. It is expected that this human signal occurs as a component of a broader non-human FIB signal and therefore even if management actions remove the human waste inputs, it is not expected that traditional FIB monitoring data will drop to acceptable geometric mean levels. However, examination of possible septic contamination or malfunctioning of sewer lines near the pump station are possible next steps now that a human contribution has been clearly indicated.

In the lower watershed there appear to be widespread human inputs for example in both the Clausland and Blauvelt Arms before their confluence. Although MST data will be useful to test individual inputs, it is anticipated sampling in the creek will be more difficult to interpret due to a high likelihood of multiple upstream human inputs. As the concentration of human-specific

fecal waste is expected to vary considerably across sampling events due to variable dilution, and human signal will be present at most sites lower in the watershed, MST sampling would likely require a high level of sampling from single events to allow interpretation of MST concentration data as a source identification tool. MST sampling of individual pipe inputs would still have management value and regional investigations of sewer leakage may be useful next steps given the widespread human signal in the watershed.

Sediment is known to contain high levels of FIB throughout the region in fecal impacted waterways (O'Mullan et al 2019) and in small volume systems like Sparkill Creek there is extensive water and sediment interaction that has the potential to influence FIB dynamics in the creek water. As another future step, MST approaches could be used to examine whether human fecal signal is retained in the sediment, which could then act as a reservoir (potentially resuspended during the higher flow following rainfall). Other components of the system, such as groundwater could also be tested to better understand the routes of contaminant delivery to Sparkill Creek.

Brief Description of Sampling and Analytical Methods:

Sampling and analytical methods are briefly described below. More complete methods are provided in the 2020 report. The Sparkill Creek watershed is located in southeastern Rockland County, NY and a small portion of Bergen County, NJ. The creek flows through a twelve square mile watershed of parkland, suburban and low density industrial/commercial landscapes before entering the Hudson River via a tidal wetland at Piermont NY. The creek is listed on the New York State Priority Waterbody List of stressed streams (NYS-DEC, 2013; USEPA 2020). Riverkeeper and SCWA have monitored enterococci concentrations, utilizing EPA approved IDEXX Enterolert cultivation-based methods, at twelve to sixteen sites since 2011 (Vail, 2015; Riverkeeper 2019). This MST study collected samples using gloved hand or sampling pole, into autoclave sterilized 250 or 1000 ml polyproplene bottles, triple rinsed with creek water before final sample collection, and immediately placed into an opaque ice filled cooler until processing. FIB negative control samples were included for each sampling date and consisted of an autoclaved sterile water sample that was transferred into a sample bottle in the field and handled in parallel to creek water samples. MST positive and negative control samples were included with the 2020 samples. FIB enumeration and filtration for MST occurred within six hours of collection for all samples. Enterococci were enumerated using the IDEXX Enterolert variant of EPA method 1600 (US-EPA, 2009), including a 1/10 dilution in sterile water of each creek sample and a negative (sterile water only) control with each sampling date, as previously described in Young et al (2013). The MST samples (60-200ml) were vacuum filtered onto sterile 0.45 um polycarbonate membranes, using sterile technique to handle samples, filtration funnels and membranes, and immediately following filtration membranes were transferred into 2ml sterile cryotubes and frozen before overnight shipping for DNA extraction and qPCR analysis.

DNA extraction and MST qPCR were performed at Source Molecular Corp (Miami Lakes, FL) in 2020 and at LuminUltra (which acquired Source Molecular) in 2021, an ISO 17025 accredited testing laboratory, using assays based on EPA Method 1696 (HF183; EPA, 2019). For each sample, DNA was extracted from filters using the Generite DNA-EZ ST1 extraction kit (GeneRite, NJ),

eluted in 100µl of sterile water. MST qPCR assays were run on duplicate reactions using 2µl of extract as template. An Applied Biosystems StepOnePlus real time thermocycler (Applied Biosystems, Foster City, CA) was used for qPCR assays with a final reaction volume of 20µl. For each batch of qPCR results assay controls including negative (no template), positive (positive control plasmid added), and a dilution series of calibration curve samples (to determine limits of detection and amplification efficiency) were included. For the purposes of this 2021 MST data set, samples with none, or only one, of the replicates positive (positive meaning fluorescence signal above background in the qPCR assay) are reported as "*No Detection" (ND)*; samples with both replicates positive but outside the range of quantification (generally meaning a quantitative cycle (Cq) above 34) are reported as "*Detected, Not Quantified" (DNQ)*; while samples with both non-diluted and replicates positive within the range of quantification (generally a Cq below 34) are reported as "*Detected and Quantified" (DQ)* and the number of gene copies per 100ml of creek water is reported based on extrapolation from the calibration curve. Samples in the "detected, not quantified" categories are considered to be low level detection near the minimum detection level of the assay.

Acknowledgements:

The authors would like to thank the Rockland County Soil and Water Conservation District for providing funds to conduct this study.

References:

Montero, A. and G. O'Mullan. 2018. Street Runoff as a Source of Fecal Indicator Bacteria to Urban Embayments. Section VIII: 1-38 pp. In S.H. Fernald, D.J. Yozzo and H. Andreyko (eds.), Final Reports of the Tibor T. Polgar Fellowship Program, 2017. Hudson River Foundation.

O'Mullan, G.D., Dueker, M.E. and Juhl, A.R. 2017 Challenges to managing microbial fecal pollution in coastal environments: Extra-enteric ecology and microbial exchange among water, sediment, and air. *Current Pollution Reports*, 3(1), 1-16.

O'Mullan, G.D., A. Juhl, R. Reichert, E. Schneider, and N. Martinez. (2019) Patterns of sediment-associated fecal indicator bacteria in an urban estuary: benthic-pelagic coupling and implications for shoreline water quality. Science of the Total Environment 656:1168-1177.

Parker, J.K., D. Mcintyre, and R.T. Noble. 2010. Characterizing fecal contamination in stormwater runoff in coastal North Carolina, USA. Water Research 44:4186-4184.

Riverkeeper, 2019. Sparkill Creek Community Water Quality Monitoring Results 2012-2019. Available at: https://www.riverkeeper.org/wp-content/uploads/2020/05/2019-SPARKILL-Entero-Report-RIVERKEEPER.pdf

Sidhu, J.P.S., L. Hodgers, W. Ahmed, M.N. Chong, and S. Toze. 2012. Prevalence of human pathogens and indicators in stormwater runoff in Brisbane, Australia. Water Research 46: 6652–6660.

Soller, J.A., M.E. Schoen, T. Bartrand, J.E. Ravenscroft, and N. Ashbolt. 2010. Estimating human health risks from exposure to recreational waters impacted by human and non-human sources of faecal contamination. Water Research 44: 4674-4691.

Soller, J.A., T. Bartand, J. Ravenscroft, M. Molina, G. Whelan, M. Schoen, and N. Ashbolt. 2015. Estimated human health risks from recreational exposures to stormwater runoff containing animal faecal material. Environmental Modelling and Software 72:21-32.

U.S. Environmental Protection Agency 2019A. Method 1696: Characterization of Human Fecal Pollution in Water by HF183/BacR287 Taqman Quantitative Polymerase Chain Reaction (qPCR) Assay. Environmental Protection Agency Office of Water 821-R-19-002.

U.S. Environmental Protection Agency 2020. National Summary of Impaired Waters and TMDL Information, available online at:
https://iaspub.epa.gov/waters10/attains_nation_cy.control?p_report_type=T#causes_303d

Vail, L. 2015. Sparkill Creek- Citizen Science Pathogen Indicator Project
https://www.hudsonriver.org/wp-content/uploads/2017/12/SCWA_CS_FinalReport.pdf

A Feasibility Survey of Ten Adversely Impacted Streams in Rockland County

Based on benthic macroinvertebrate sample analysis

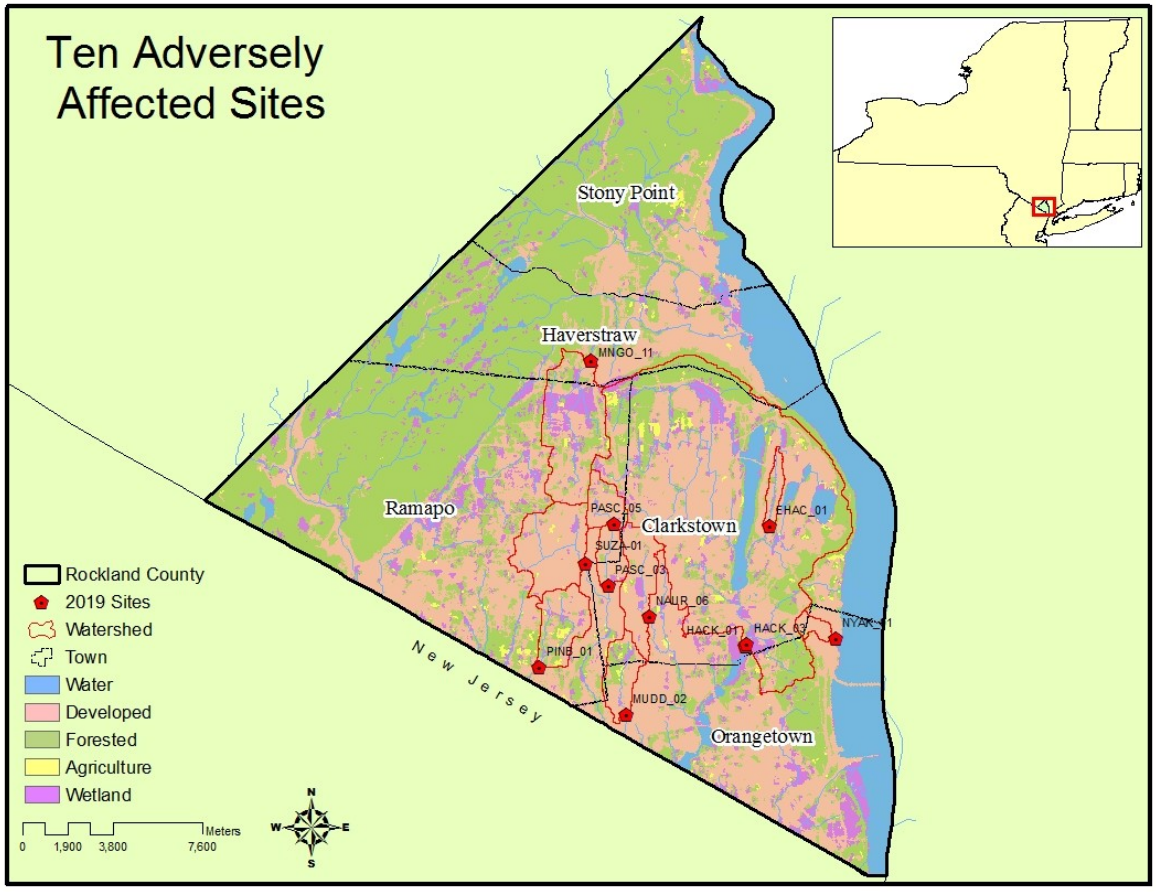
Prepared by

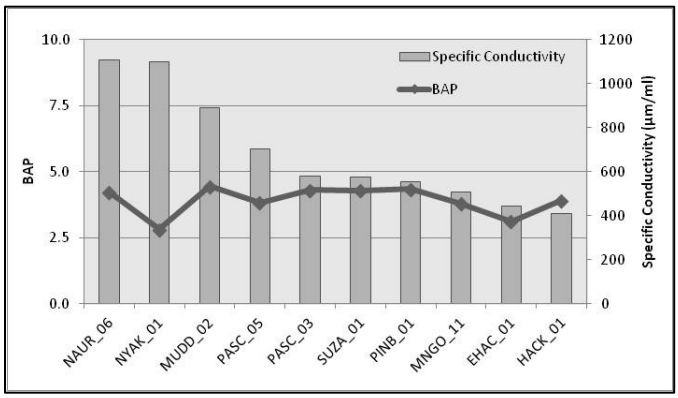
Watershed Assessment Associates
Environmental Services / Biomonitoring / Invertebrate Taxonomy / Professional Training

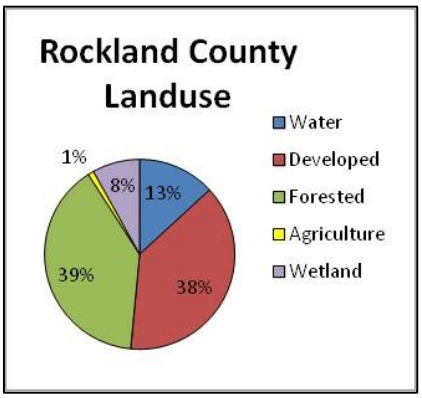
November 2019

Contents

Overview of Rockland County







Impacts to Rockland County Streams

General Development

Although only 38 percent of Rockland County is developed, an average of 72 percent of the study sites were within developed land. Developed land typically consists of residential, commercial and industrial areas that are altered from their natural state. Impermeable surfaces that prevent water from

infiltrating the ground (buildings, paved ground) cover a large proportion of developed land. This results in uncontrolled runoff into streams. Under natural conditions, most rain permeates the ground replenishing ground water, and some of it runs into streams, but in a watershed with significant impermeable surface area runoff can increase 2 to 16 times the natural rate (Schueler, 1995). Not only does increased surface runoff lead to flooding and erosion, but it also carries pollutants into streams, all of which directly and negatively affect the biota and overall health of streams.

Dams

There are numerous dams in the county, which can impact the quality of streams by changing the natural variable flow patterns some biota require. This results in an abundance of organisms that prefer calm, pooled water. In natural systems, biota shifts may occur over time, but human alterations result in changes that occur to streams so fast that the ecosystem doesn't have time to acclimate and stabilize, increasing the chance of harmful algae blooms (HAB) in ponded areas.

Pesticides/Herbicides/Fertilizers

Heavy use of these chemicals pollutes waterways, especially when in conjunction with increased runoff caused by impermeable surfaces.

Discharge pipes including SPDES

Discharge pipes, including state pollutant discharge elimination systems (SPDES), often deposit pollutants into waterways and adversely affect stream flows.

Mining/Quarries

There are at least three quarries in Rockland County. In general, quarries result in loss of vegetation, increased soil disturbance and erosion, altered hydrology, increased runoff and introduction of contaminants to streams.

Golf Courses

There are nearly a dozen golf courses in Rockland County. Golf courses use large quantities of fertilizer, pesticides and herbicides to maintain fairways and greens, resulting in increased chemicals in runoff, and divert water for irrigation. Golf courses also result in reduced vegetation and soil compaction.

Channelization

In developed areas, stream riparian zones are often reduced or completely obliterated (e.g. mowing/farming/grazing or building structures/paving surfaces up to water's edge), resulting in increased flows during rain events, decreased flood containment and increased runoff. The increased flow eventually channelizes streams, resulting in changes in the in-stream substrate and penetration of sunlight, thereby altering the stream's ecosystem.

Invasive Plants

Monocultures of invasive plants (Japanese knotweed and Phragmites) create impenetrable thickets along stream corridors, often altering light penetration into the streams. Invasive plants also out-compete native species, contributing to a lack of biodiversity.

Mowing and Yard Waste

Some areas of the stream bank are mowed right up to the water. This increases soil erosion and sedimentation.

Litter and Yard Waste

Litter is discarded onto streambanks or directly into streams by dropping trash, dumping appliances and other household goods, and disposing of yard waste. Litter is also carried into streams through run-off. Litter impacts the ecosystem when it alters habitat, is accidentally ingested by or entraps wildlife, or introduces pollutants. Additionally, some litter remains in a stream or riparian area indefinitely, diminishing the esthetics and health of a waterbody for human use.

Individual Stream Assessments

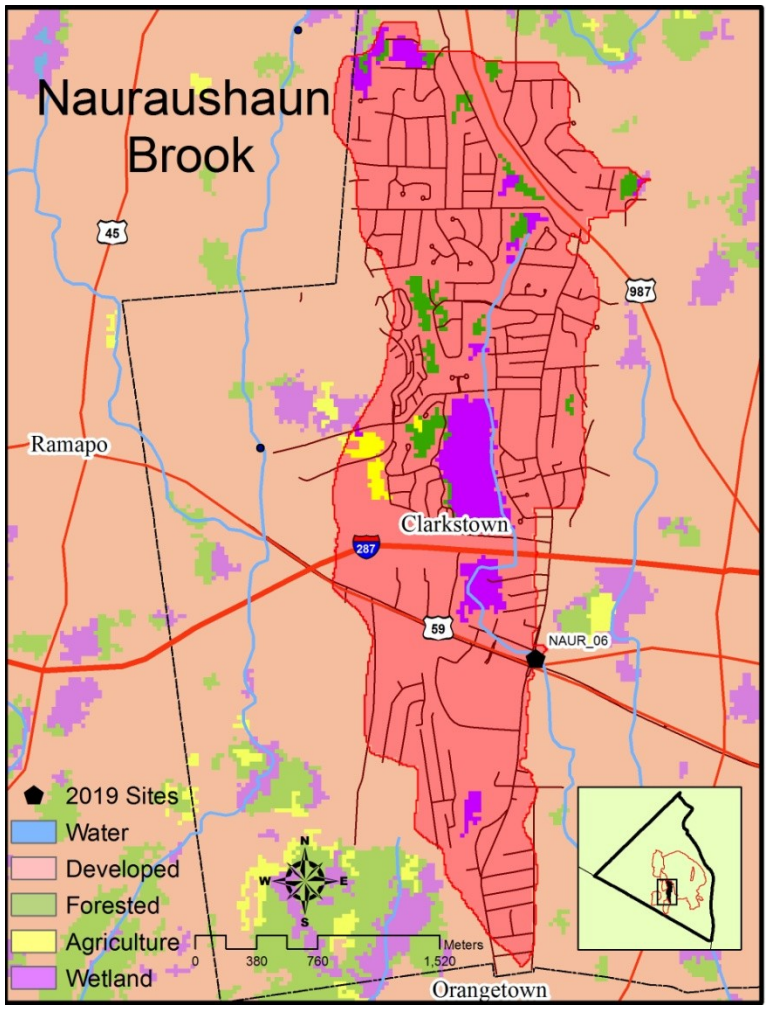
Watershed Assessment Associates (WAA) identified ten streams in Rockland County with low averaged Biological Assessment Profile (BAP) scores based on assessments performed since 2006: (http://rocklandgov.com/departments/environmental-resources/protecting-our-streams-and-waterways/. The BAP, created by the Stream Biomonitoring Unit of the NYS Department of Environmental Conservation: https://www.dec.ny.gov/chemical/23847.html, is a four-tiered system of impact categorization based on macroinvertebrate communities. (More information is available at: https://www.dec.ny.gov/docs/water_pdf/bapnarrative18.pdf) All streams included in this study are classified as second tier, moderately impacted (BAP score of 2.5-5.0), which correlates to poor water quality that is often limiting to fish, shellfish and wildlife propagation.

County regulated and unregulated stream sites identified as moderately impacted:

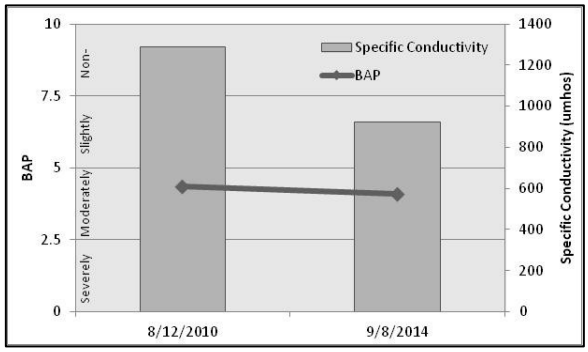
Stream Name	Station	Latitude	Longitude	Municipality	County Regulated Stream
Nyack Brook	NYAK_01	41.08770	-73.91760	Nyack	No
E. Branch Hackensack R.	EHAC_01	41.13114	-73.95028	Valley Cottage	No
S.B. Minisceongo Cr.	MNGO_11	41.19490	-74.03918	Pomona	Yes
Pascack Brook	PASC_05	41.1325	-74.02846	Spring Valley	Yes
Hackensack River	HACK_01	41.08542	-73.96308	West Nyack	Yes
Nauraushaun Brook	NAUR_06	41.09728	-74.01141	Orangetown	No
Pascack Brook	PASC_03	41.10920	-74.03160	Nanuet	Yes
Pine Brook	PINB_01	41.07839	-74.06716	Chestnut Ridge	No
Muddy Creek	MUDD_02	41.06003	-74.02350	Orangetown	Yes
Unnamed tributary	SUZA_01	41.11757	-74.04356	Spring Valley	Yes

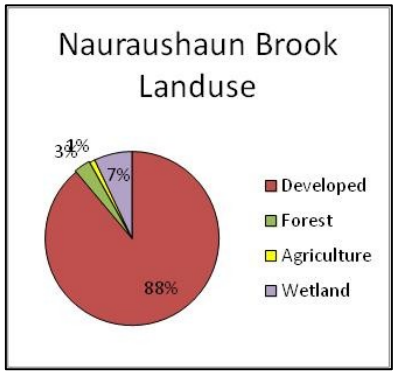
The watersheds were delineated starting from each of the ten station locations to provide a general survey area. This included the site and all the land that drained to that point. Areas downstream of the sites were not considered, as downstream inputs would have little to no effect on upstream areas. For streams with multiple sites, the most downstream site was the used as the point of delineation.

Prior to performing a field observations, WAA conducted basic computer-based reconnaissance to identify dams, large areas of development or industry, SPDES discharge locations, golf courses and quarries. Random field visitation within the watersheds was also performed by the field team and documented through GPS identification of potential problems areas, photo and video clips, and narrative descriptions.



Nauraushaun Brook





Watershed Description

The Nauraushaun Brook study area is 2.46 square miles. In the northern part of the watershed there are large residential developments. The lawns appear to be typically maintained with fertilizers and pesticides/herbicides. The headwater, on a dead end road above I-287, is choked with knotweed and Phragmites and appeared to be dry. South of the interstate, the brook exits a wetland of mostly invasive knotweed and Phragmites and there is a growth of orange colored scum on the rocks just before it enters a tunnel going under the parking lot of Rockland Plaza. Rockland Plaza and The Shops at Nanuet both contribute a large amount of surface runoff to this portion of the stream. Where the stream exits the tunnel (NAUR-06) there is no longer evidence of the orange scum. In this area, there is an existing grass swale for storm water management on a property adjacent to the stream.

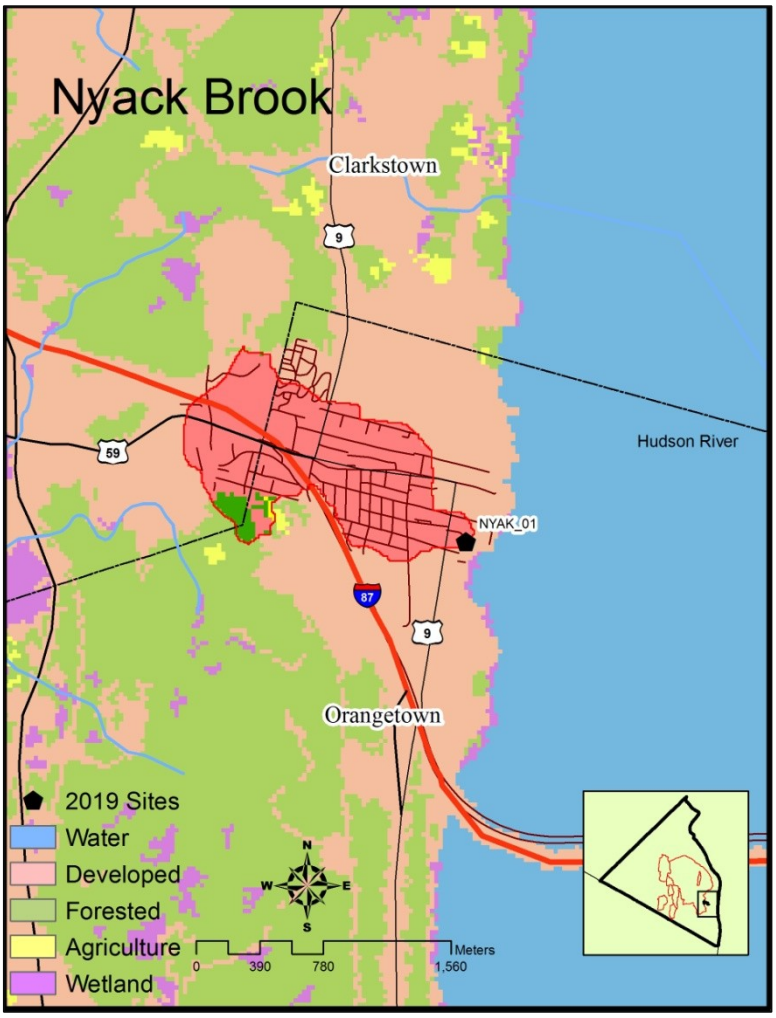
Field Observations

The Tennyson Park site was free of invasive plants and notable for a diverse biota. Because of this, it may be an appropriate “reference” site in further studies. The Smith Road site observation was similar to that of Tennyson Park; it was notable for cattail reeds and other native plants. At the Alice Drive site the stream flow is more sluggish due to topographical changes. It traverses through a wooded wetland

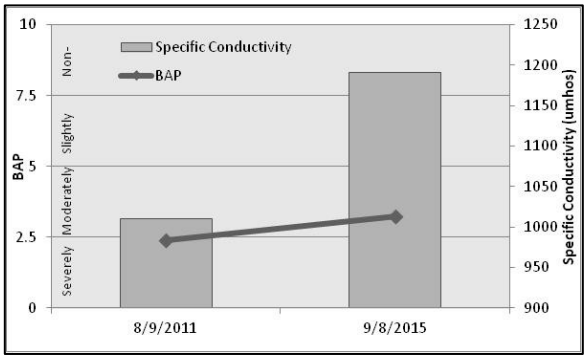
area surrounded by residential housing, close to a secondary road. No gross human impact was visualized at this stretch of the stream. The Rockland Plaza site, where the stream enters the Rockland Plaza area, was notable for invasive Phragmites and Japanese Knotweed; orange scum was seen on rock surfaces here. North Middleton Road S3 is located where the Nauraushaun Brook exits the plaza and is potentially impacted by runoff of large swaths of imperious paved surfaces.

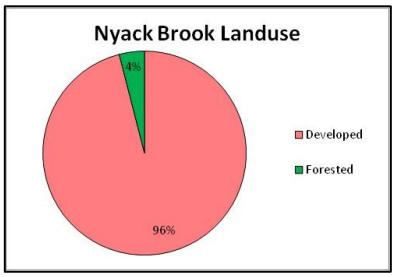
A separate tributary to the brook included the Palmer site, located in a residential area and without any gross visual impacts. Downstream from Palmer, two abandoned 55 gallon barrels of used cooking oil were present at N. Middleton Road S1. Further downstream, the Middleton Road S2 site was notable for an oily sheen on the water and soil surface. The riparian area here was flooded, most likely due to an inadequately sized downstream culvert, and the trees in this area are at risk for drowning. Several of these trees have been tagged for an unknown reason. The site was also notable for abundant litter, including an entire case of Styrofoam food trays.

Past the confluence of the tributary with Nauraushaun Brook, the E. Rte 56 & N. Middletown Road site is in a small park with good riparian habitat and no gross litter or debris.



Nyack Brook





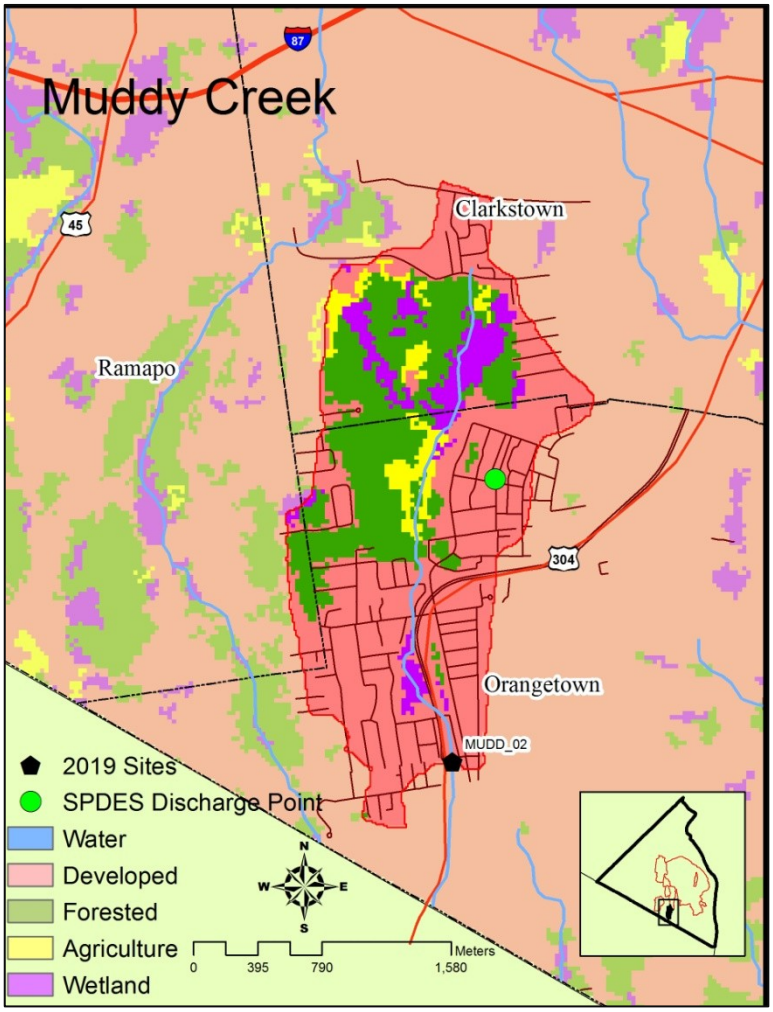
Watershed Description

Nyack Brook is a small watershed of less than half a square mile. Because the watershed is small, even minor impacts can significantly alter the health of the brook. The watershed is 96 percent developed, resulting in considerable runoff. Most of the stream runs through a tunnel underneath Nyack.

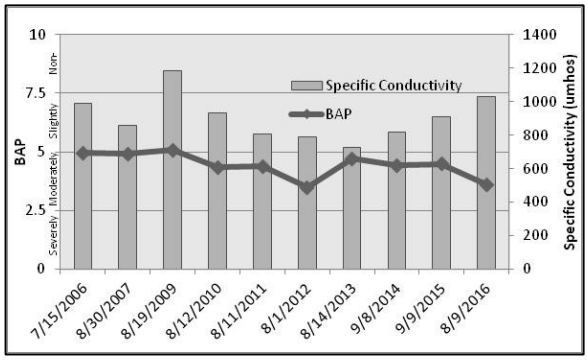
Field Observations

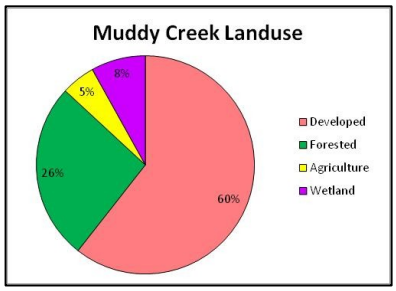
The most notable observation at this site is that most of the stream runs underground, affording little sunlight to penetrate the stream, which negatively impacts a waterway. Additionally, the brook is in a highly developed area, with an abundance of paved surfaces leading to runoff into the stream (including through pipes entering the underground portion of the stream). The brook emerges from its underground stretch at a park near the confluence with the Hudson River. Although there are swaths of mowed grass that abut the stream, there are also sections of good riparian habitat and canopy cover here.

The tunnel that Nyack Brook runs exists from underneath the city. There are drains directly from storm runoff that enter through the ceiling of this tunnel.



Muddy Creek



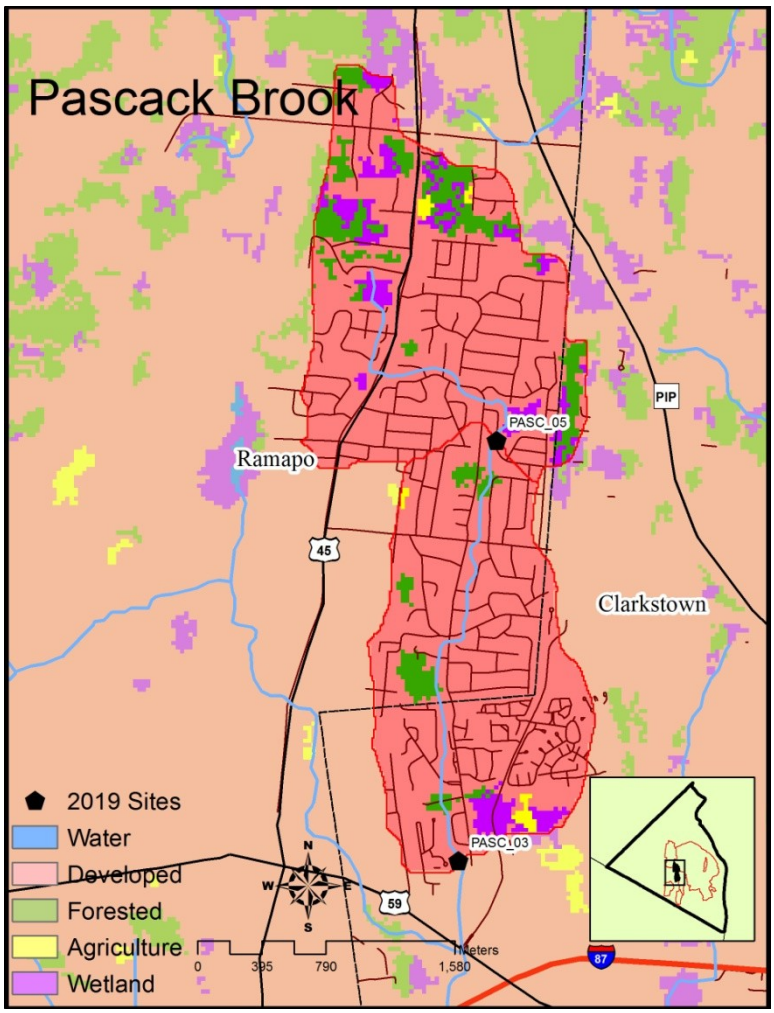


Watershed Description

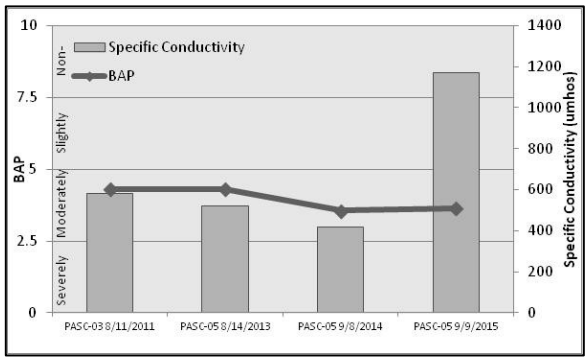
The Muddy Creek Watershed, located upstream from the observation site, is fairly small at 1.62 square miles in area. Sixty percent of the watershed is developed and 26 percent is forested. In the developed areas there is a proliferation of invasive Japanese knotweed. There is an SPDES discharge point within the watershed.

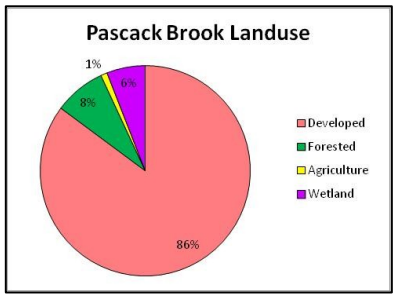
Field Observations

The Convent Road site is a wetland headwater notable for an abundance of invasive Phragmites. The Pasteur Road site is located at the Pfizer Pharmaceutical Offices, which holds an SPEDES permit. The site could not be accessed; if this location is included in future evaluations, approval by Pfizer to access the area prior to the day of the evaluation will be required. Margaret Keahon Drive is located below the SPEDES permit area. Yard waste dumped into the stream was readily visible here. At Crooked Hill Road, good stream habitat conditions with adequate riparian zones and canopy cover and no gross human impact were observed. The Walter Street Site was notable for the storage of an outdoor drum with no containment system. At the W. Washington Avenue site, there are business downspouts that divert water into the parking lot, then directly into the creek.



Pascack Brook





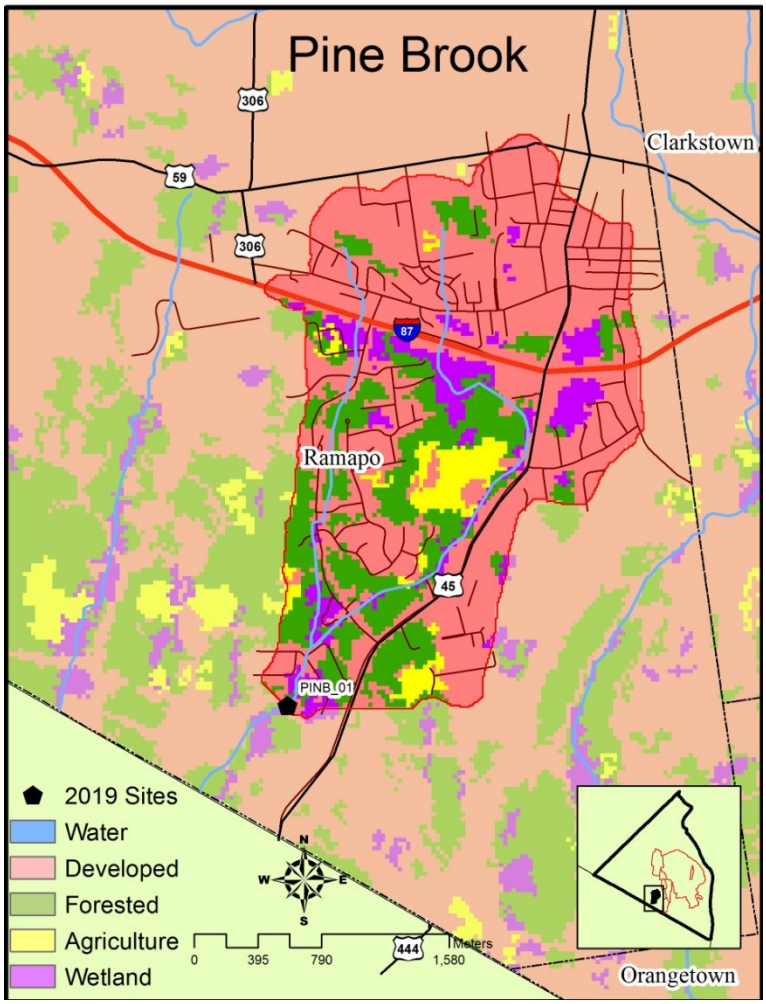
Watershed Description

Pascack Brook watershed is 3.33 square miles in area north of the bottom most site, PASC-03. PASC-05 is about halfway between PASC-03 and the northernmost part of the watershed. 86% of the land use is developed, and the majority of that is residential. The stream is artificially straightened, or channelized, through most of these neighborhoods. There is very little riparian area, with a few trees but mostly mowed grass right up to the stream bank. The loss of the riparian buffer and channelization of the stream is contributing to erosion. In several spots there are storm water discharge points which can increase flows and contribute to pollution.

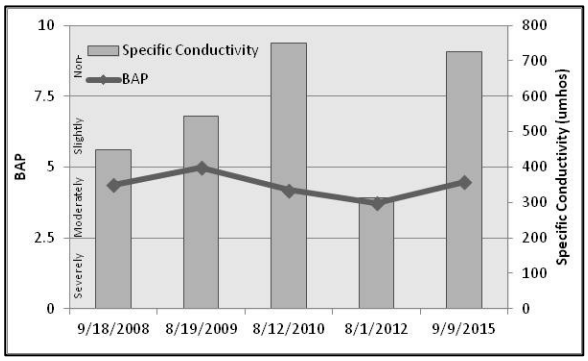
Field Observations

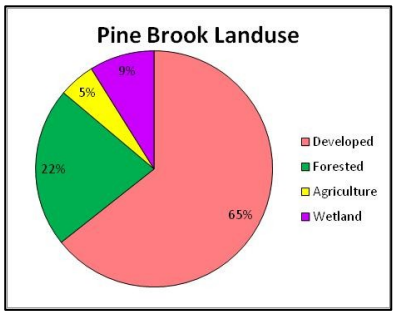
Greenridge Way is in a residential area, but there are no obvious human impacts at this stretch of the brook. At Bristol Lane the stream is underground and homes are located directly above the culvert; diminished sun exposure at this stretch has the potential to affect stream biota. The site off N. Main Street is notable for lack of canopy cover over the stream and a retention pond. The Innington Court

site is located in a residential area notable for well-manicured monoculture lawns, indicating the use of herbicides and pesticides that can contaminate runoff. Additionally, there is litter and yard waste being dumped onto the stream banks. At the Dwight Avenue site the brook has been channelized and enters the yards of a residential neighborhood. A “no dumping” sign had been erected at the Inwood Drive site; nevertheless, yard waste is being disposed of here. The brook is turbid at the Mirror Lake Road site and there was an abundance of litter here. There were several storage drums with no containment system at the site just off North Pascack Road. Water at the North Pascack Road site is turbid; there are areas of runoff upstream from the site.



Pine Brook





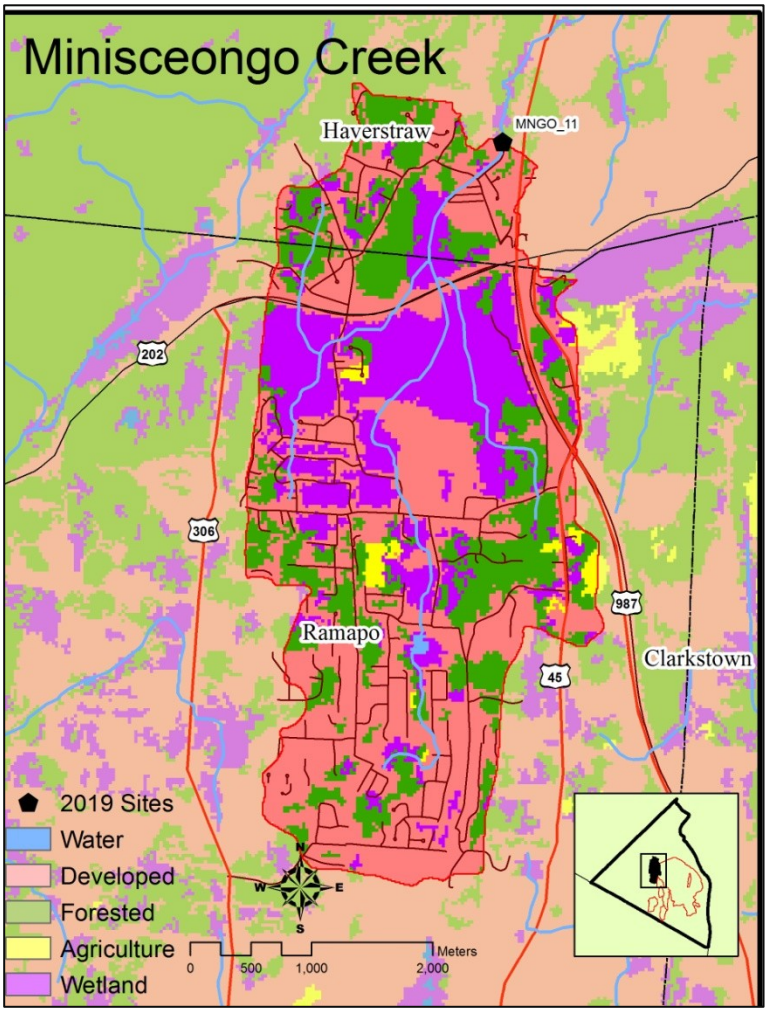
Watershed Description

The watershed to this brook is 2.23 square miles in area. The headwaters are near a large sports field that is most likely treated with fertilizer and herbicides. The headwater of the western branch of the brook contains an old small dam at Jon Leif Lane that is choked with litter and debris. The brook mostly traverses a residential area with mowed lawns, some to the bank of the stream. There is at least one large dam on the main branch of the brook.

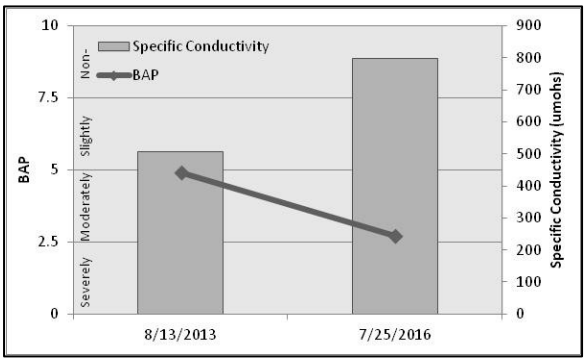
Field Observations

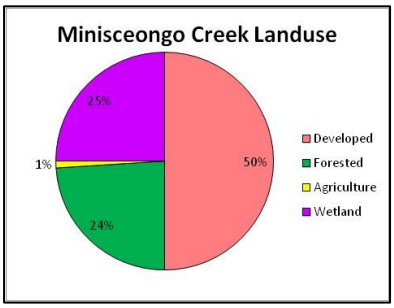
At Dykstras Wey E. the area is strewn with litter, including along the stream banks, and the storm drains are clogged with both litter and debris. At Jon Leif Lane there is an old dam that empties into a culvert. Water behind the dam is stagnant and has breached the stream banks, resulting in a large wooded area of water and mud. It is littered with debris that probably originates from the upstream community. The dam drains through a small pipe into a culvert which itself may be too small to hold the upstream water during times of high flow. The Fellowship Community Park site abuts a parking lot that appears to drain

its runoff directly into the stream through a pipe. The stream runs through a swale of mowed grass with no riparian cover. The Hungry Hollow site is on a branch tributary to the stream that runs past a day camp with swimming area. Past the confluence of this tributary with Pine Brook, the Capricorn Lane site is notable for generalized litter and a sinkhole in the road next to a culvert. The Capital Park site is notable for litter and yard waste.



Minisceongo Creek





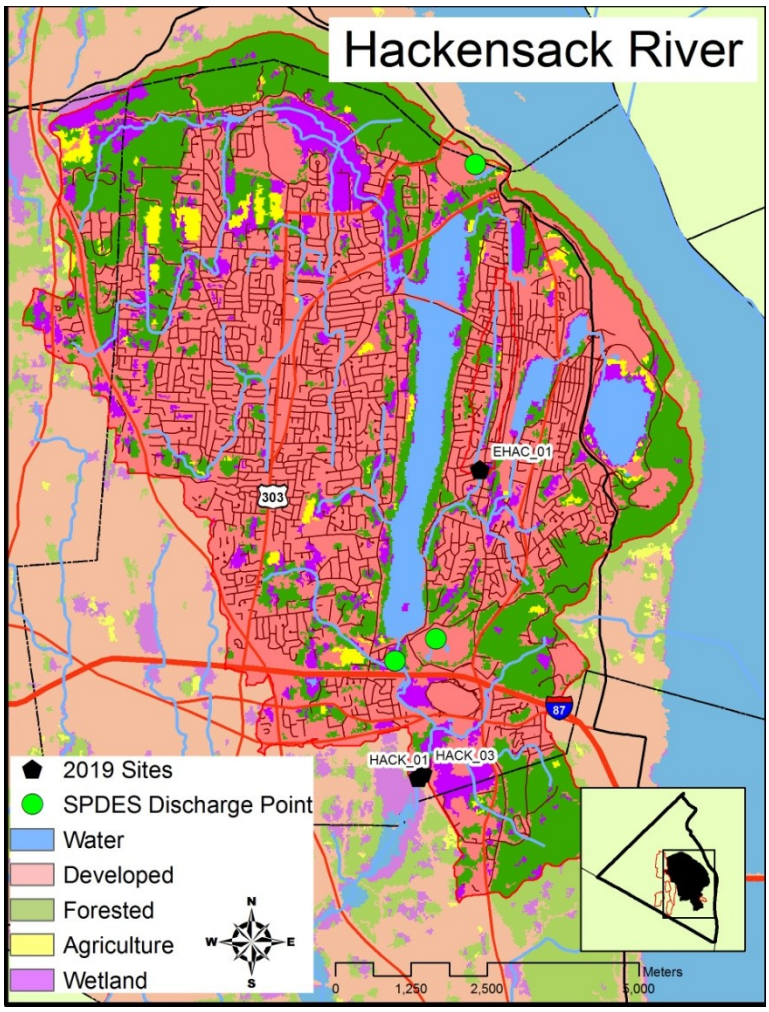
Watershed Description

Of the 5.26 square miles of watershed upstream of MNGO-11, half is developed, 49% is split between forest and wetland, and 1% percent is agricultural. The watershed contains two golf courses, including one with a ponded area created by construction of a dam along the stream. In several neighborhood locations, there is channelization of the creek.

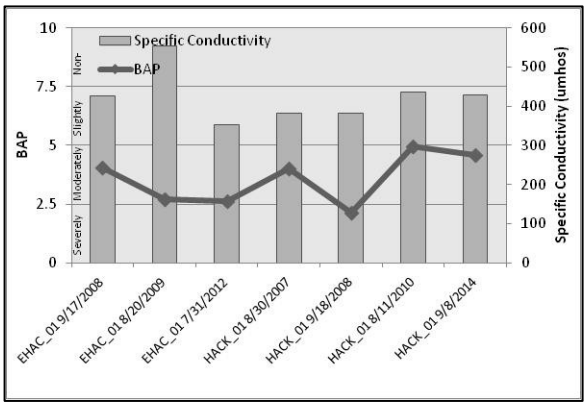
Field Observations

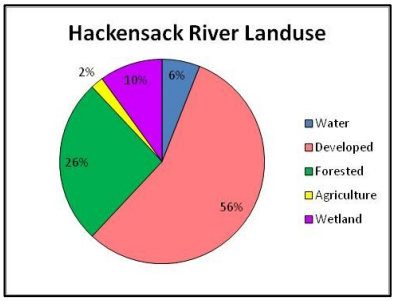
At Sandy Brook Town Park there is a heavily silted pond with no riparian cover. There is an aeration system in the pond at Pomona Road, but heavy algae growth is also present, indicating high levels of nutrients in the water body. A good riffle habitat is present along the stretch at Camp Hill Road. At Route 202 Plaza, a parking lot abuts the brook, there is no adjoining retention basin to curtail runoff and there is very little riparian cover. The Quaker Road Mobile Home Park site is notable for an abundance of litter and yard waste. Across the stream at this location there is a tree service that has deposited logs within a couple of meters from the stream. The Woodfield Road site is notable for an abundance of

Japanese knotweed and lawn clippings. The Burgess Meredith Park site is notable for good habitat and riparian cover.



Hackensack River





Watershed Description

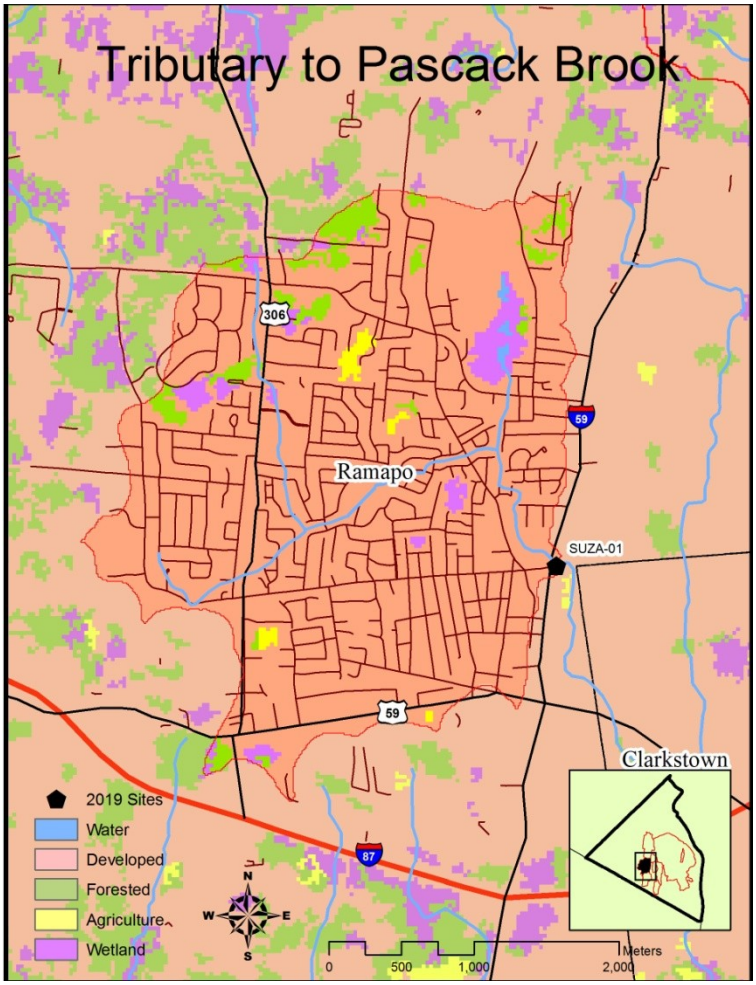
At 34.61 square miles, this was the largest watershed in the study, and included two of the most impacted sites (HACK-01 and EHAC-01). A dammed portion of the Hackensack creates Lake DeForest Lake, a reservoir for local residents. Other land use includes: 56% developed, 26% forest, 10% wetland and 2% agriculture. The watershed comprises golf courses, dams (both large and small backyard dams), quarries and parks, and three SPDES discharge sites, including two at quarries or rock processing facilities and the one at the outlet of Lake DeForest.

Field Observations

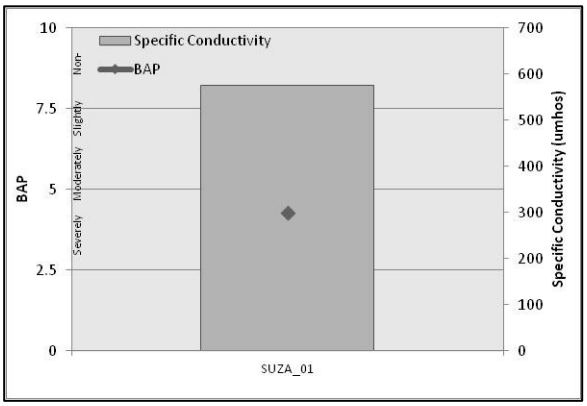
At Reginald Drive there is an aerated pond notable for heavy siltation. There are also ponds at Parkside Drive and Bluebird Drive that are not aerated. A weir at Bluebird Drive appears unnecessary, resulting in a flood area rife with invasive flora. Asphalt and concrete has been dumped at 5 Oaks Lane, and the streambed is littered with bags of yard waste. There is limited stream habitat (lack of larger boulders) at

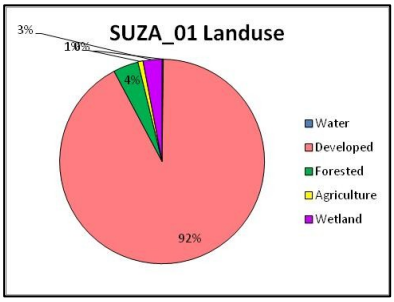
Gilchrest Road and the banks are littered with yard brush. Svahn Drive is notable for a thin strip of riparian habitat, and the storm drains have been stenciled to educate against dumping of trash.

There is a large dam at Old Mill Road that is part of DeForest Lake. Past the lake and a quarry, in a mixed residential and commercial area, there is a retaining pond adjacent to the stream at Louis Drive that contains a water pump. Downstream from this site at Western Highway W, the streambank is strewn with litter, there is a lack of riparian habitat, the stream is turbid and sluggish and there is an abundance of algae and invasive species.



Tributary to Pascack Brook (SUZA_01)





Watershed Description

This 3.66 square mile watershed is 92% developed, mostly with homes and community centers; there are also numerous new construction projects. The watershed includes Suzanne Lake, which is a catch basin for construction sediment runoff and litter from the surrounding community.

Field Observations

At Lenore Avenue, in a residential area, there is piled dirt and gravel near the stream bank on a lot sited for construction. Good flow, fair stream habitat and adequate riparian cover is present at Suzanne Drive and Francis Place. Further along Suzanne Drive, there is a pond with heavy siltation and turbidity; the pond is strewn with litter. Of note is that we observed the Town of Ramapo Litter Patrol truck in this area; workers advised us that they are unable to keep up with removal of the litter here. At Suzanne Pond dam there was an abundance of litter and food waste. Francis Place and Morris Road were notable for construction debris in the stream and lack of silt fences. The SUSA tributary retention basin at Francis Place is heavily silted and it's unclear whether the basin is functioning correctly. The W. Eckerson Road site, an upper SUSA headwater tributary is just below a golf course (with potential

runoff), and was notable for litter on the stream banks and within the stream. There was abundant litter at Main Street and Columbus Avenue.

General Watershed Solutions

General Development

Permeable pavements that simulate natural ground conditions reduce runoff, trap pollutants and return water to aquifers. Permeable pavements are more expensive, rougher and weaker than conventional pavement, but allow flow rates of up to 18 gallons per minute. These surfaces are most appropriate for low volume drives, sidewalks and parking lots, particularly near streambeds. Residents can also be encouraged to consider them for home driveways, walkways and patios.

Buffer zones of native plants (after eradicating invasive species, where necessary) and grass swales diminish runoff in areas where pavement doesn't encroach the water, and provide a protective barrier between livestock refuse and freshwater systems. Mowing up to a stream bank should be discouraged. New construction should leave for a protective riparian zone between the structure and freshwater systems.

Individual landowners and businesses should be encouraged to consider installation of rain gardens and landscaping that encourages seepage and discourages runoff, and green roofs that reduce runoff, reduce urban temperatures and improve water quality.

Remediation of streams buried under city structures is a more complicated and expensive project to consider, but the following links provide information about how other communities have opened previously buried stream beds:

- https://www.nationalgeographic.com/news/2014/11/141125-dc-daylighting-broad-branch-stream-restoration-science/
- https://www.citylab.com/equity/2015/08/the-hidden-health-dangers-of-buried-urban-rivers/400442/
- https://www.npr.org/2014/01/21/264399931/more-cities-bring-buried-streams-back-to-life
- https://www.theguardian.com/cities/2017/aug/29/river-runs-global-movement-daylight-urban-rivers

Dams

Dams that have been built simply for esthetic purpose serve no vital function (e.g. power generation or water supply for a population), are detrimental to stream health and should be

removed. In areas where a dam is to remain intact, fish ladders should be considered to facilitate natural fish migration.

Pesticides/Herbicides/Fertilizers

A plan to reduce the use of these chemicals and diminish the impact of them on stream systems (diminish runoff) should be formulated and implemented. Public education is instrumental to this goal. Education includes awareness of the health and environmental hazards of most chemical treatments, potential safer alternative treatments or practices, and changed perceptions of property esthetics (e.g. consideration of mixed or non-grass lawns).

Discharge pipers, including SPDES

All discharge pipes and SPDES sites should be identified, mapped and monitored to ensure that the systems are well-maintained and the discharges are legal. As always, public education helps to ensure that best management practices are familiar to the general public, and irregularities are reported.

Mining/quarries

Stream inputs from quarries and mines should be monitored and stream restoration by private mining companies compelled, as needed.

Golf courses

Golf courses are a particular challenge due to the alteration of a large amount of land that is then maintained by significant use of pesticides and fertilizers and copious amounts of water. Additionally, native plants are often replaced with alternative vegetation. Such alterations change the local ecosystem and can contribute to significant runoff.

As these facilities contribute to tourism, local economy and recreational activities for residents and visitors, the best solution is to encourage best management practices at golf courses:

- Encourage the use of native plants suitable to the local environment that increase habitat, require less care and water, and add to the food web
- Install bird houses that encourage the natural control of numerous pests
- Construct appropriate riparian zones to buffer the amount of runoff that these facilities generate
- Use untouched native areas as golf hazards
- Eliminate invasive species
- Prevent grass clippings and other organic material from washing into streams

- Encourage the use of knowledge gained from established environmentally friendly courses (http://www.usga.org/articles/2017/04/golf-courses-benefiting-from-environmentally-friendly-approach-t.html)

Channelization

Following EPA guidelines, areas of channelization should be remediated, when possible, and both instream habitat and native riparian buffer zones restored. If channelization is unavoidable, EPA best management practices should be followed when designing the channels. Reintroduction of channel sinuosity should be attempted, when possible. Further information is available at:

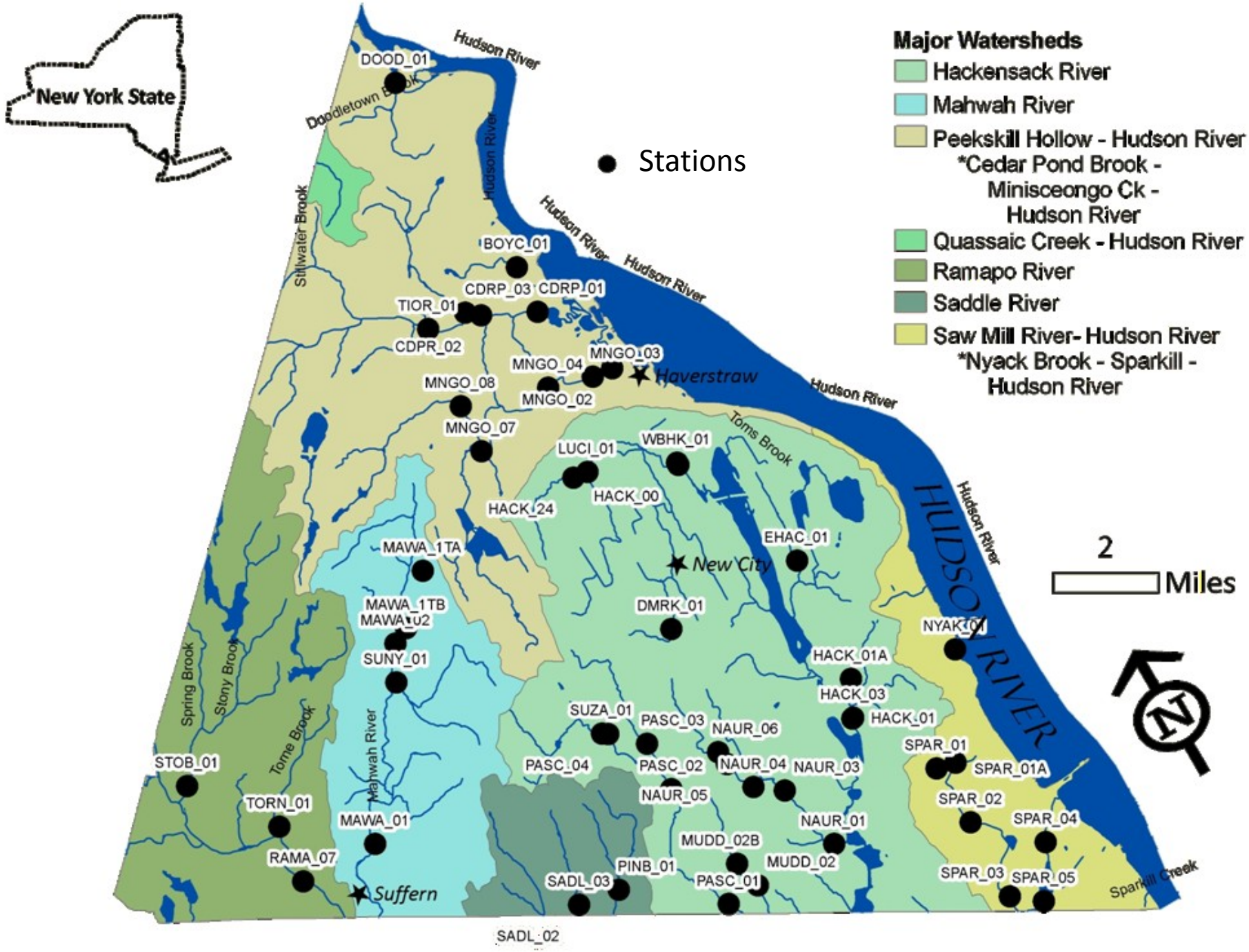
https://www.epa.gov/sites/production/files/2015-09/documents/chapter_3_channelization_web.pdf

Invasive Plants

Removing invasive plants without negatively impacting the area or unintentionally spreading the invasives requires an experienced removal company. Once invasive species are removed, a riparian buffer zone of native plants should be planted.

Litter

This is a particularly pervasive in some areas of the county, where both litter deposition and runoff into streams is problematic. Campaigns to educate the public and change community practices must be part of the solution, and might include “stick and carrot” incentives for detrimental or cooperative action by community members. Simplifying beneficial practices by providing easy access to waste and recycling receptacles/centers, sponsoring school education and initiative programs, instituting public service announcements and social media campaigns and organizing community cleanup days might help to bolster community support for best management practices.


New York State
Major Watersheds
Hackensack River
Mahwah River
Peekskill Hollow - Hudson River
*Cedar Pond Brook - Minisceongo Ck - Hudson River
Quassaic Creek - Hudson River
Ramapo River
Saddle River
Saw Mill River- Hudson River
*Nyack Brook - Sparkill - Hudson River
Stations
Hudson River
HUDSON RIVER
Doodletown Brook
Stillwater Brook
Toms Brook
Spring Brook
Stony Brook
Torne Brook
Mahwah River
Sparkill Creek
Haverstraw
New City
Suffern
DOOD_01
BOYC_01
CDRP_03
CDRP_01
TIOR_01
CDPR_02
MNGO_03
MNGO_04
MNGO_08
MNGO_02
MNGO_07
LUCI_01
WBHK_01
HACK_00
HACK_24
EHAC_01
MAWA_1TA
MAWA_1TB
MAWA_02
SUNY_01
DMRK_01
NYAK_01
HACK_01A
HACK_03
HACK_01
SUZA_01
PASC_03
NAUR_06
SPAR_01
SPAR_01A
STOB_01
PASC_04
PASC_02
NAUR_04
NAUR_03
NAUR_05
SPAR_02
SPAR_04
TORN_01
MAWA_01
NAUR_01
MUDD_02B
RAMA_07
PINB_01
MUDD_02
SPAR_03
SPAR_05
SADL_03
PASC_01
SADL_02
2
Miles
N