

# Port Henry Stream Study

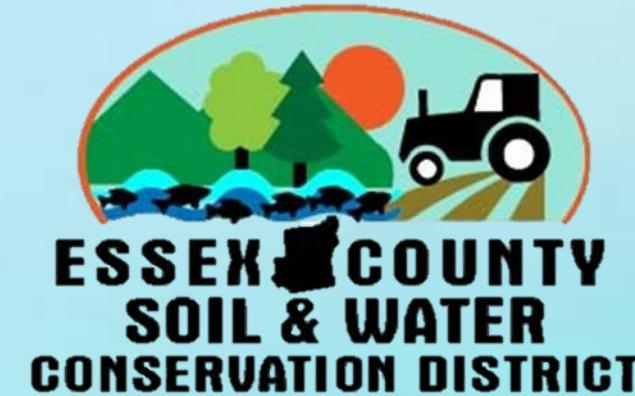
A multi-year investigation of Mill, McKenzie, and Stony Brooks

# Introduction

Alice Halloran - District Manager  
Noah Weber - District Technician  
Daniel Berheide - Senior Technician

*Organization Mission Statement.* Essex County SWCD is dedicated to the preservation of soil and water resources. The District's goal is to work with landowners, municipalities, agricultural producers and the public toward the improvement of water quality, resource protection, and the implementation of best management practices. The District will implement projects and programs to further this goal and to enhance the quality of life in Essex County.

New York State has Soil and Water Conservation Districts in every county





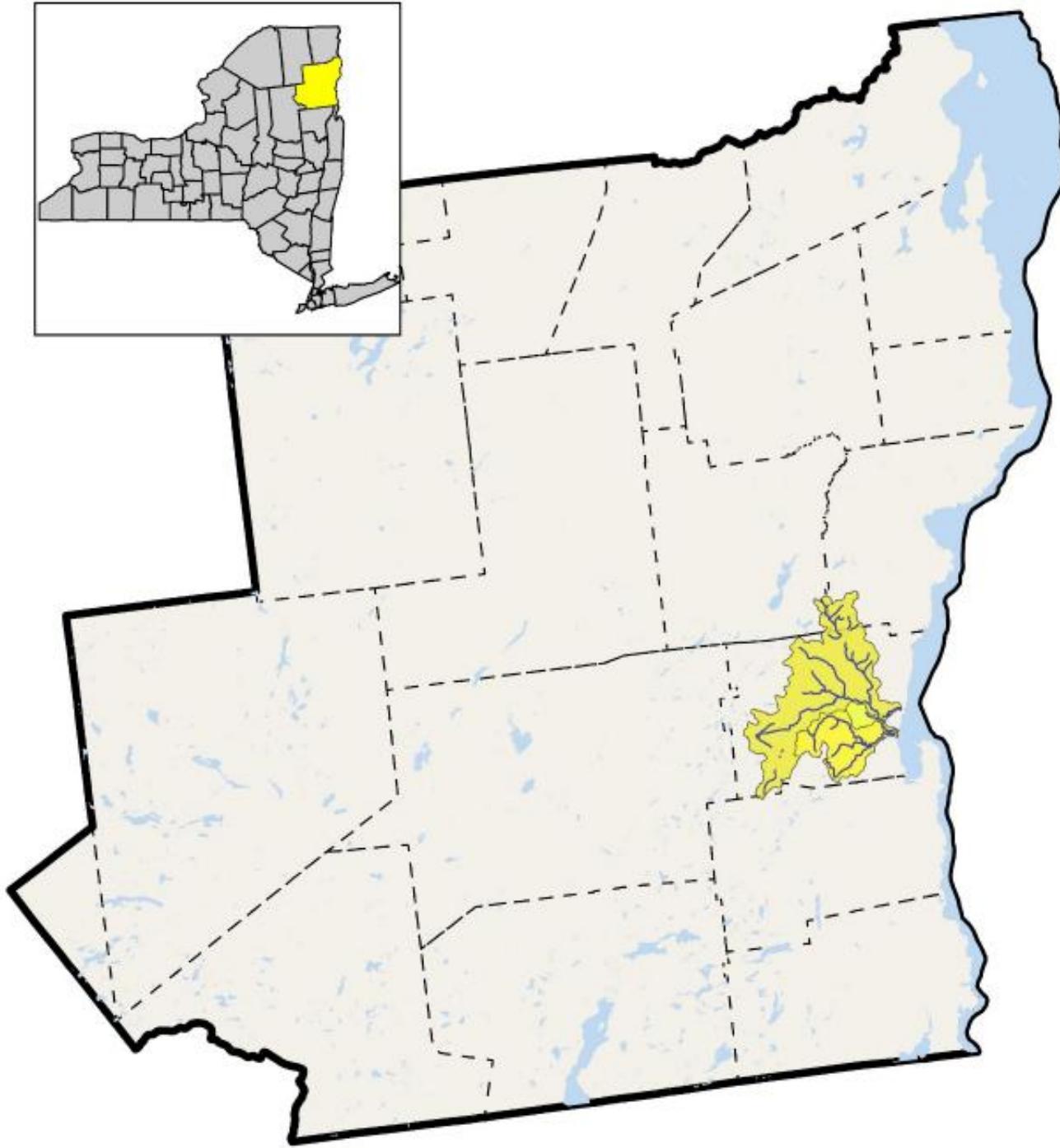
## Reason for study

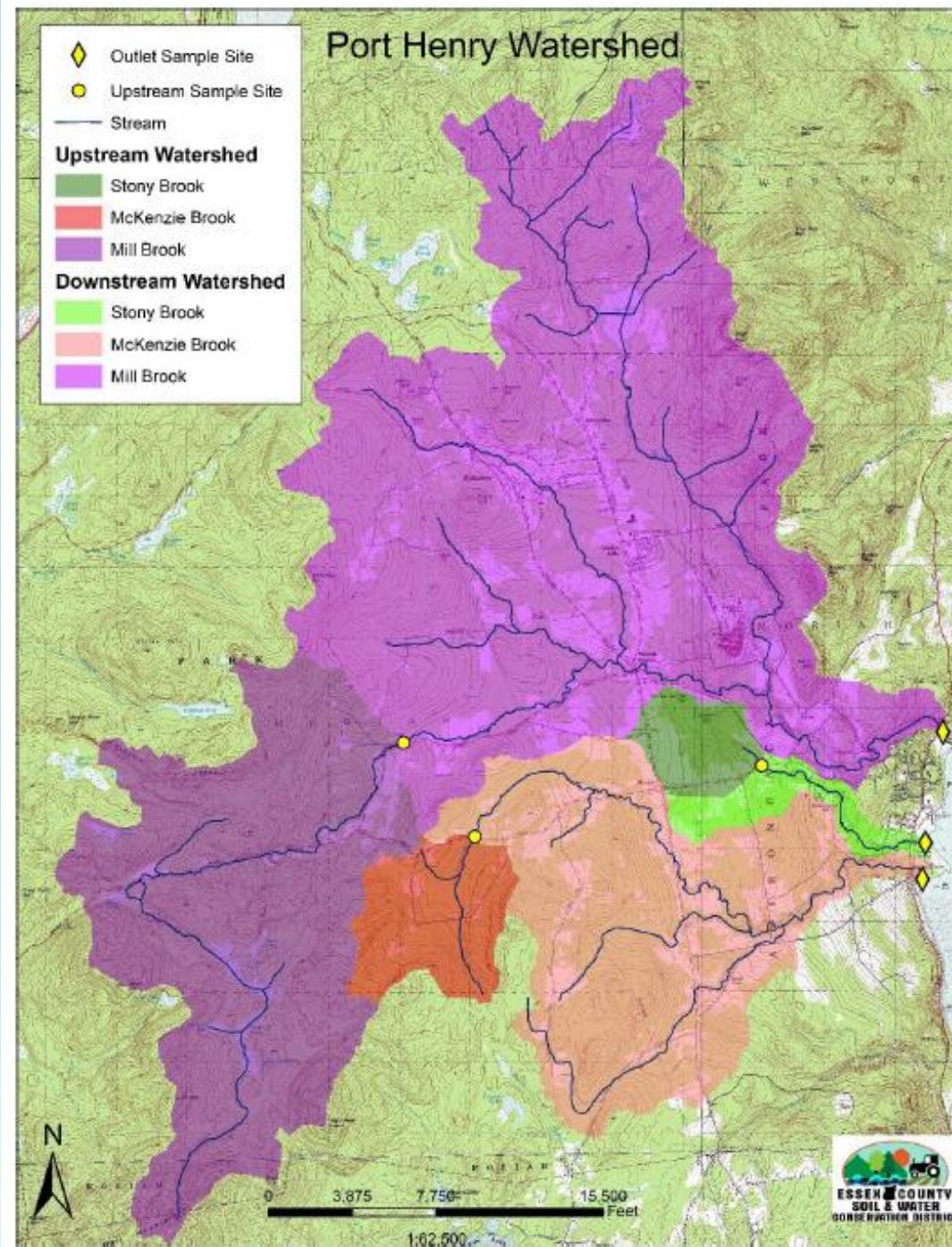
- HABS concerns

## Aims and Objectives

- Water quality
- Sources of problems
- Potential projects and solutions

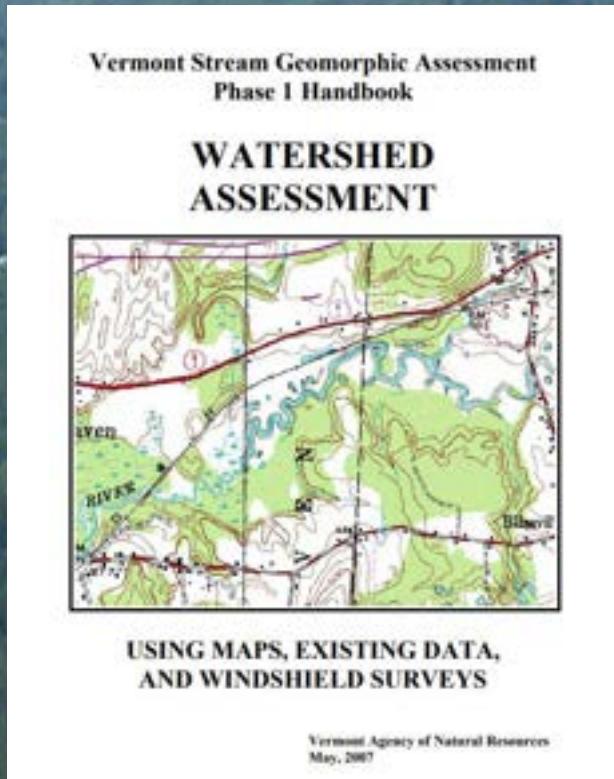
# Port Henry Stream Study Location



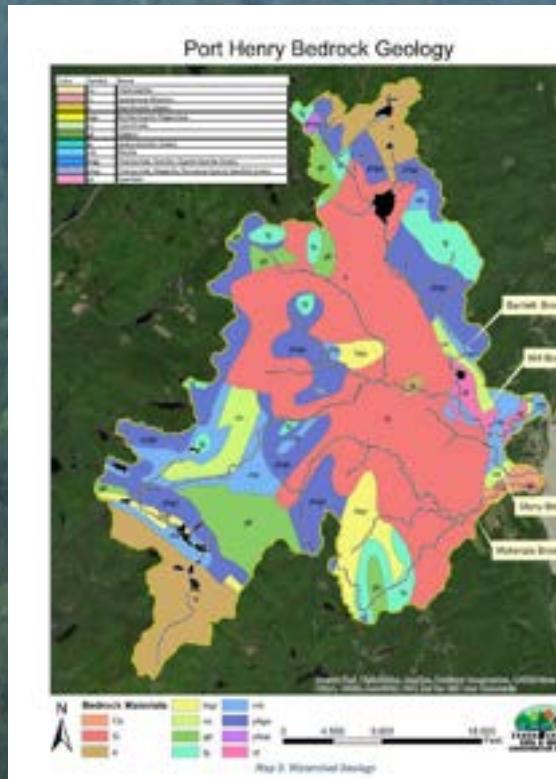


# Phase 1

A wide lens approach to get an overview of the streams utilizing existing information.



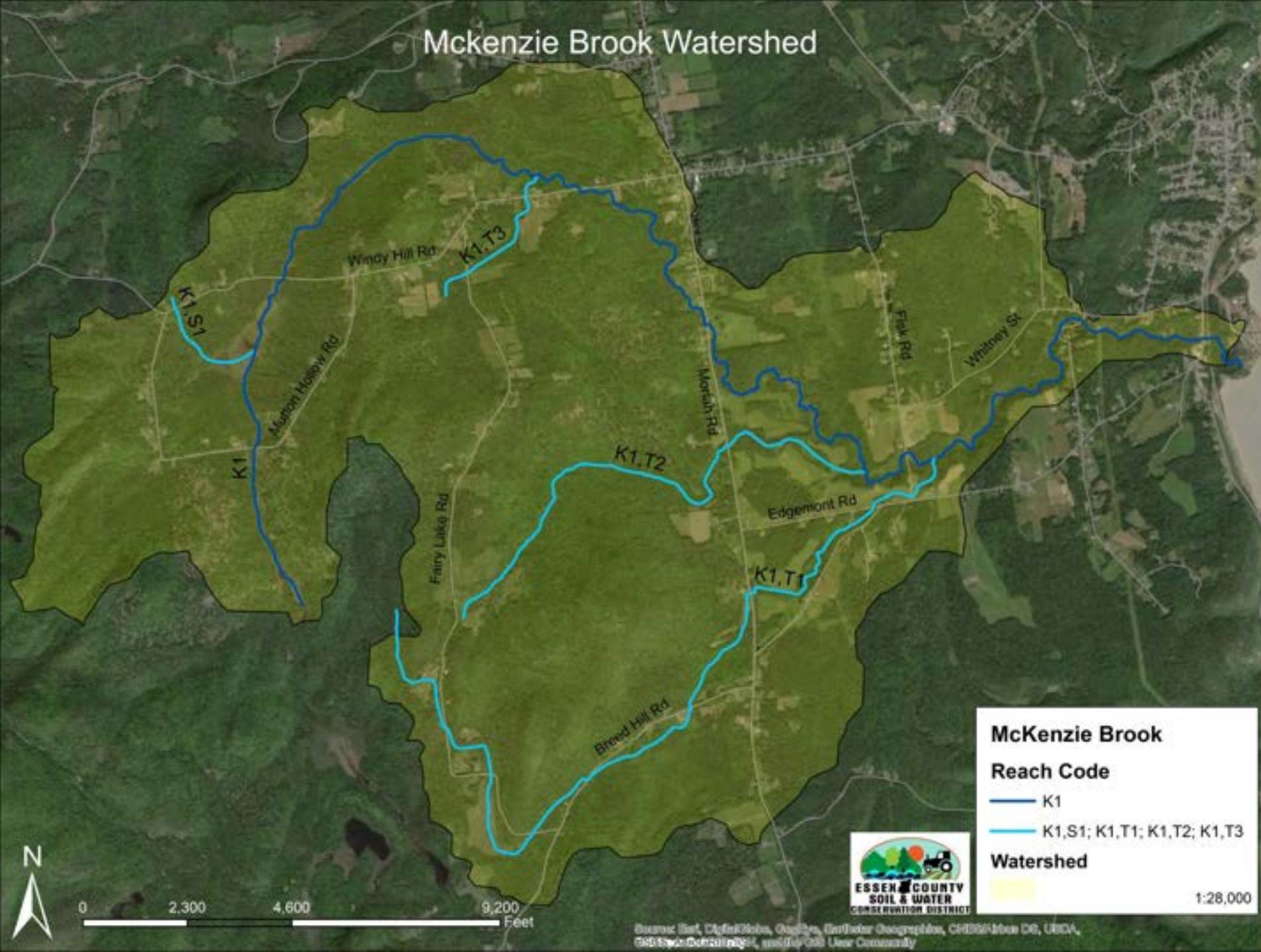
Aerial photographs  
GIS  
Existing maps  
Windshield surveys  
Other plans or studies



# Phase 1

- Vermont Stream Assessment Protocols
- Step 1 – Reach identification using GIS
- Step 2 – Determine stream type
- Step 3 – Investigate geology and soils
- Steps 4-6 –Land cover, reach hydrology, channel & floodplain modifications
- Impact Rating assigned to each reach

# McKenzie Brook Watershed



# Parameters

- Watershed Land Cover/Land Use
- Corridor Land Use
- Riparian Buffer
- Flow Regulation and Water Withdrawals
- Bridges and Culverts
- Channel Straightening
- Berms, Roads, Improved Paths, Railroads



# Scoring Criteria

Each parameter was given it's own rubric to derive an individual impact rating for that category. That rating was converted into a numeric score of 0, 1 or 2.  
Ratings were tallied to find the total impact score.

- Example for Riparian Buffer:

0-2.0% unforested = 0

2.1-10% unforested = 1

10.1-23% unforested = 2

Table 2: Land Use for all streams and reaches

Watershed	Reach	Ag Land	Development	Forest	Open Water	grass/shrub	wetland
McKenzie Brook	K1	9%	5%	79%	0%	1%	6%
	K1, T1	7%	6%	82%	0%	0%	5%
	K1, T2	9%	4%	84%	0%	1%	3%
	K1, T3	12%	7%	80%	0%	0%	1%
	K1, S1	No Data	No Data	No Data	No Data	No Data	No Data
Stony Brook	R1	22%	12%	65%	0%	0%	0%
	R1, S1	6%	7%	74%	0%	7%	6%
Mill Brook	M1	11%	13%	69%	0%	0%	6%
	M2	11%	15%	72%	0%	1%	1%
	M3	3%	3%	87%	1%	2%	5%
	M4	No Data	No Data	No Data	No Data	No Data	No Data
	M5	0%	0%	96%	0%	1%	2%
	M2, T1	4%	17%	74%	0%	2%	2%
	M3, T1	23%	7%	60%	0%	0%	11%
	M3, T2	0%	0%	89%	1%	0%	10%
	M3, T1.1	2%	1%	96%	0%	1%	0%
	M3, T1.2	2%	3%	91%	0%	3%	2%
	M3, S1	No Data	No Data	No Data	No Data	No Data	No Data
	M3, S2	0%	0%	96%	1%	1%	2%
Bartlett Brook	B1	16%	9%	65%	5%	0%	5%
	B2	2%	8%	81%	4%	1%	4%
	B2, T1	0%	0%	97%	0%	0%	3%
	B2, T2	0%	0%	97%	0%	1%	1%
	B2, S1	0%	0%	100%	0%	0%	0%

Table 3: Impact scores and final impact rating for each reach

Watershed	Reach	Land Use Score	IR Corridor LU	Riparian Buffer IR	Flow Reg. IR	Bridge and Culvert IR	Straight IR	Berm and Roads	Reach	Final Impact Rating Score (out of 14 possible)
McKenzie Brook	K1	2	1	1	0	1	1	1	K1	7
	K1, T1	2	2	2	0	2	0	2	K1, T1	10
	K1, T2	2	0	0	1	1	0	0	K1, T2	4
	K1, T3	2	2	2	0	1	0	1	K1, T3	8
	K1, S1	0	0	0	0	1	0	1	K1, S1	2
Stony Brook	R1	2	2	2	0	2	1	1	R1	10
	R1, S1	2	2	2	0	1	2	0	R1, S1	9
Mill Brook	M1	2	2	2	0	1	2	2	M1	11
	M2	2	2	2	0	1	1	1	M2	9
	M3	1	2	2	2	1	1	2	M3	11
	M4	0	0	0	0	2	0	0	M4	2
	M5	0	0	0	0	0	0	0	M5	0
	M2, T1	2	2	2	2	1	0	2	M2, T1	11
	M3, T1	2	1	1	0	0	0	0	M3, T1	4
	M3, T2	0	0	0	0	0	0	0	M3, T2	0
	M3, T1.1	1	1	1	0	0	1	1	M3, T1.1	5
	M3, T1.2	1	1	1	0	0	0	1	M3, T1.2	4
	M3, S1	0	0	0	0	1	2	2	M3, S1	5
	M3, S2	0	0	0	0	0	0	0	M3, S2	0
Bartlett Brook	B1	2	2	2	2	2	0	2	B1	12
	B2	2	2	1	2	1	1	2	B2	11
	B2, T1	0	1	1	0	0	0	1	B2, T1	3
	B2, T2	0	0	0	0	0	0	0	B2, T2	0
	B2, S1	0	0	0	0	0	0	0	B2, S1	0

Stream: McKenzie Brook

Reach: K1

Town: Moriah

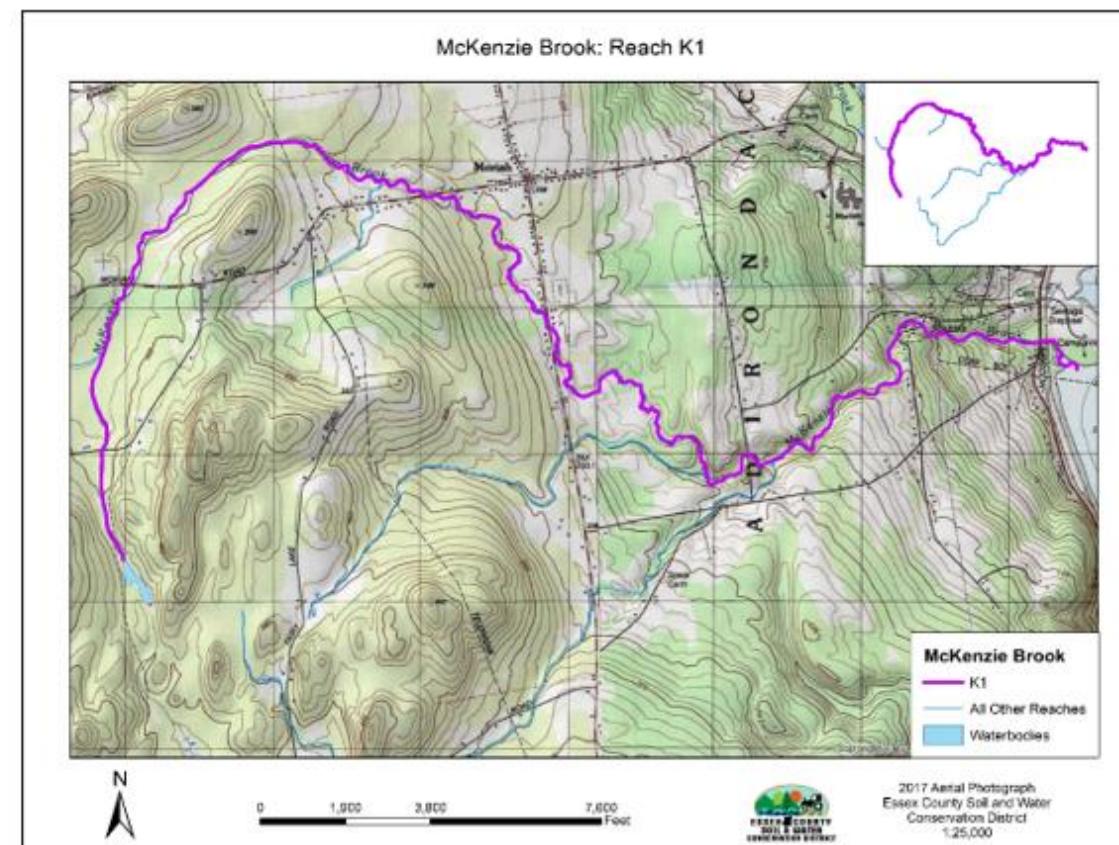
Upstream Start of Reach: -73.458188, 44.03407

Downstream End of Reach: -73.540139, 44.023741

Impact Rating	Score (0-2)
4.1 Watershed Land Cover / Land Use	2
4.2 Corridor Land Cover / Land Use	1
4.3 Riparian Buffer Width	1
5.1 Flow Regulations and Water Withdrawals	0
5.2 Bridges and Culverts	1
5.4 Channel Straightening	1
6.1 Berms and Roads	1
6.2 River Corridor Development	0

Watershed Area (mi <sup>2</sup> )	8.81
Channel Length (ft)	42946.20
Channel Width (ft)	34.12
Channel Slope (%)	.762
Sinuosity	1.174
Valley Type	VB
Reference Stream Type	C or E
Total Impact Rating	7
Priority Level	Medium

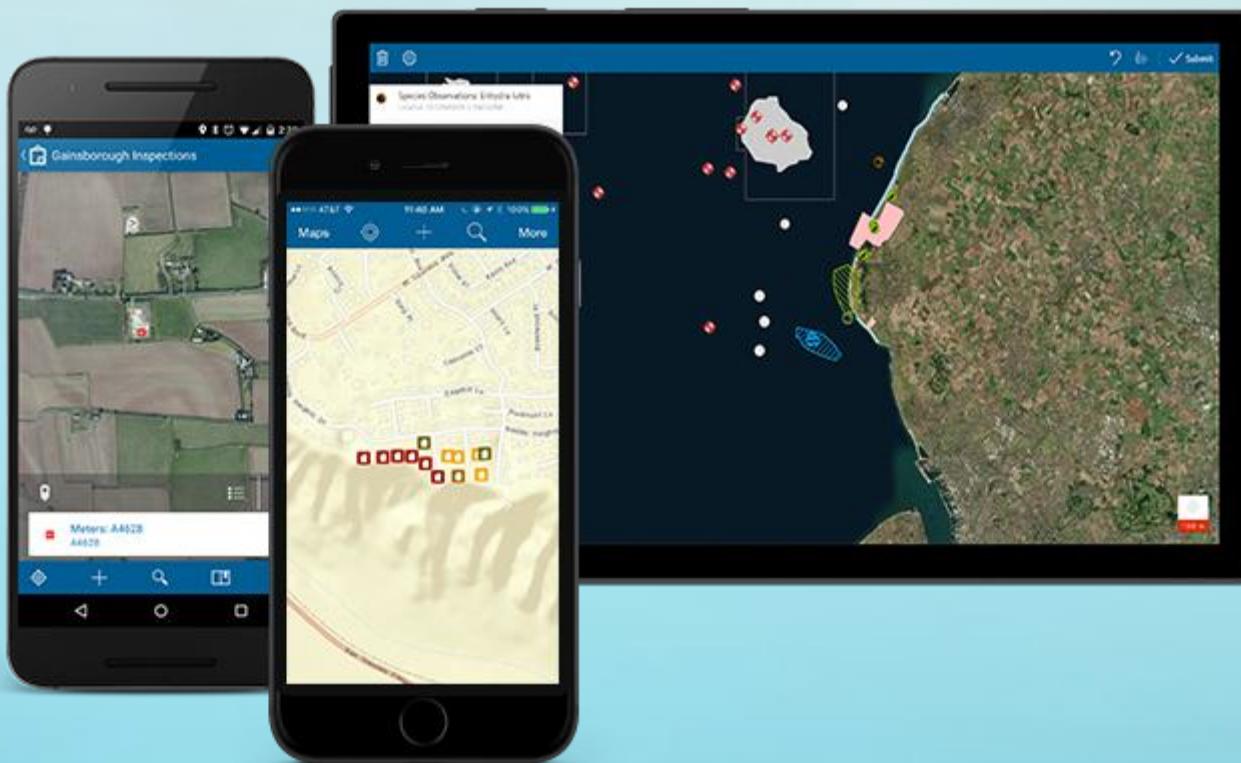
**Reach Highlights:** Longest reach out of McKenzie Brook, the start (upstream) is a wetland created by beavers. As you travel downstream there are two more wetland locations with beaver dams. The stream then runs into Lake Champlain on the south edge south of an RV campground.



# Phase II

Rapid Stream Assessment Results and Corridor Planning

# ArcGIS Collector App



Map showing stream bank conditions, debris jams, grade control structures, and potential water quality concerns across a rural landscape. The map includes labels for roads like Wilberbee Rd, Plank Rd, Switchback Rd, Dogway Rd, and Fisk Rd. It also shows streams like Mill Brook, Bartlett Brook, and Grove Brook. A legend on the left details symbols for stream bank erosion, hard bank armoring, mass failure, multiple armoring, other armoring, rip-rap armoring, debris jams, grade control structures (dam, ledge, waterfall, weir), potential water quality concerns, and seep tributaries.

Legend

Stream Banks - Line layer

- Bank Erosion
- Hard Bank (Armoring)
- Mass Failure
- Multiple (Armoring)
- Other (Armoring)
- Rip-rap (Armoring)

Debris Jam

- !

Grade Control

- Dam
- Ledge
- Waterfall
- Weir

Potential Water Quality Concerns

- ?

Seep\_Trib

- 

Basemap

Layers

Tables

Add

Bookmarks

Charts

Save and open

Map properties

Share map

Embed map

Information

Collapse

Search

Print

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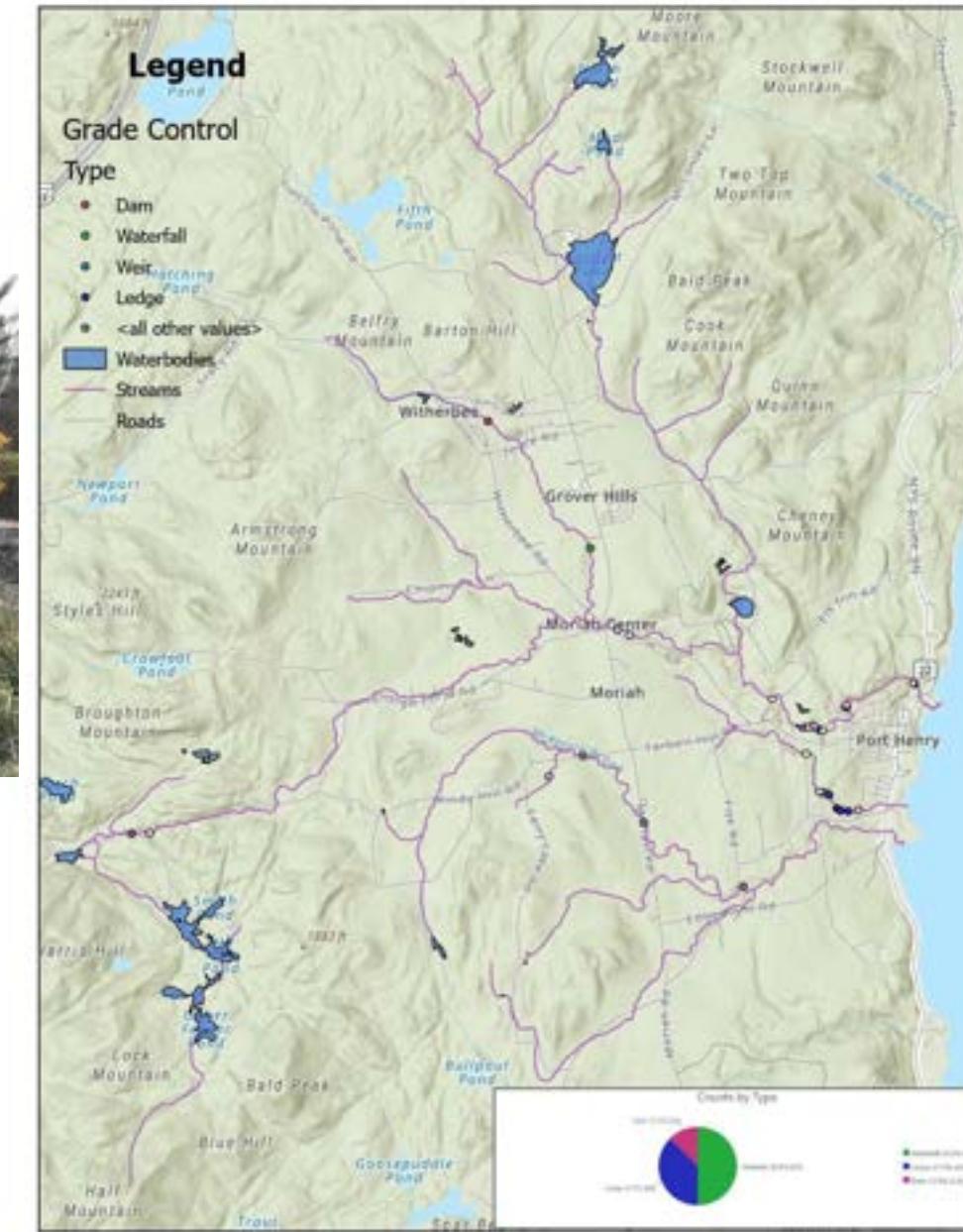
Esri Canada, Esri, HERE, Garmin, INCREMENT P, USGS, METI/NASA, NGA, EPA, USDA

Powered by Esri

# DEBRIS JAMS



# GRADE CONTROLS

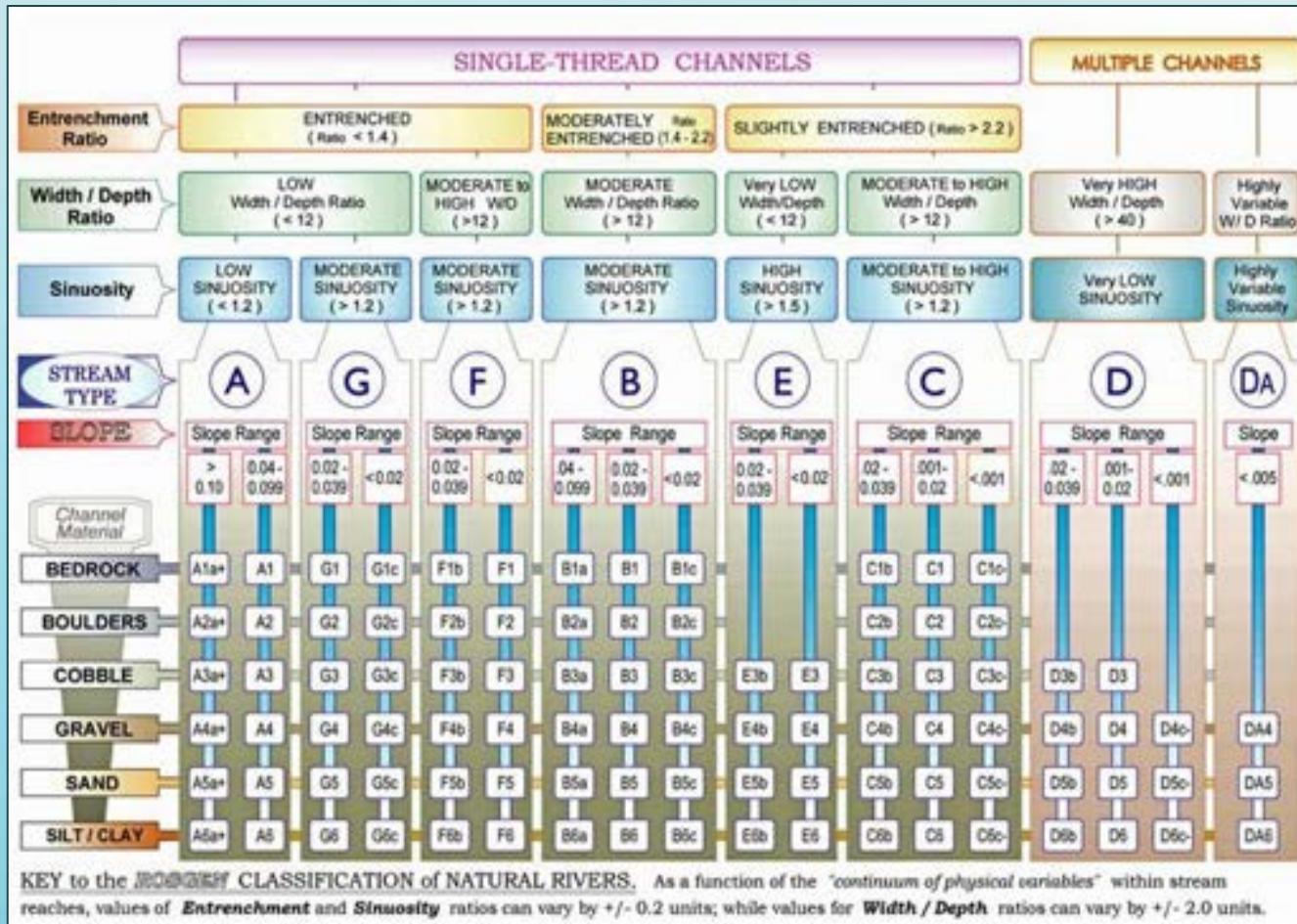


0 0.5 1 2 3 Miles



ESSEX COUNTY  
SOIL & WATER  
CONSERVATION DISTRICT

# Rapid Stream Assessment Field Note Worksheets



Key to the Rosgen Classification of Natural Rivers

Reach	Stream type
M1a	B3c
M1c	B4a
M1d	B3
M1e	F3
M1f	B3
M2a	B2
M2b	A1
M2c	C3b
K1T3	B



## Tally Sheet (page 1)

	Stream Name: <u>Mill Brook</u>																												
	Location: <u>South Orange - Mill Brook</u>																												
Step 2.1 Height of bankfull above water surface																													
	Bankfull Height	Chan. Width																											
Comments (describe indicator)																													
3. Riparian banks, Buffers, and Corridors																													
3.1 Typical Bank Slope																													
<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 15%;">Bank</td> <td style="width: 15%;">Type</td> <td style="width: 15%;">Shallow</td> <td style="width: 15%;">Moderate</td> <td style="width: 15%;">Steep</td> <td style="width: 15%;">Slope</td> <td style="width: 15%;">Comments on the higher of the two banks?</td> </tr> <tr> <td>Lower</td> <td>bedrock/boulders</td> <td>gravel</td> <td>sand</td> <td>silt/clay</td> <td>mix</td> <td>cohesive</td> </tr> <tr> <td>Upper</td> <td>bedrock/boulders</td> <td>gravel</td> <td>sand</td> <td>silt/clay</td> <td>mix</td> <td>cohesive - non-cohesive</td> </tr> </table>			Bank	Type	Shallow	Moderate	Steep	Slope	Comments on the higher of the two banks?	Lower	bedrock/boulders	gravel	sand	silt/clay	mix	cohesive	Upper	bedrock/boulders	gravel	sand	silt/clay	mix	cohesive - non-cohesive						
Bank	Type	Shallow	Moderate	Steep	Slope	Comments on the higher of the two banks?																							
Lower	bedrock/boulders	gravel	sand	silt/clay	mix	cohesive																							
Upper	bedrock/boulders	gravel	sand	silt/clay	mix	cohesive - non-cohesive																							
3.2 Bank Erosion (ft)																													
<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 15%;">Left</td> <td style="width: 15%;">Length:</td> <td style="width: 15%;">ft.</td> <td style="width: 15%;">Bank Revetment Type:</td> <td style="width: 15%;">Length:</td> <td style="width: 15%;">ft.</td> </tr> <tr> <td>Right</td> <td>Length:</td> <td>ft.</td> <td>Bank Revetment Type:</td> <td>Length:</td> <td>ft.</td> </tr> </table>			Left	Length:	ft.	Bank Revetment Type:	Length:	ft.	Right	Length:	ft.	Bank Revetment Type:	Length:	ft.															
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Right	Length:	ft.	Bank Revetment Type:	Length:	ft.																								
3.3 Near Bank Vegetation Type																													
<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 15%;">Tree</td> <td style="width: 15%;">1% cover</td> <td style="width: 15%;">Reserve</td> <td style="width: 15%;">Cover</td> <td style="width: 15%;">Deciduous</td> <td style="width: 15%;">R/S cover</td> <td style="width: 15%;">Reserve</td> <td style="width: 15%;">Cover</td> <td style="width: 15%;">Deciduous</td> </tr> <tr> <td>Shrubs/ Saps.</td> <td>20</td> <td>0</td> <td>10</td> <td>40</td> <td>20</td> <td>0</td> <td>10</td> <td>40</td> </tr> <tr> <td>Herbs</td> <td>10</td> <td>10</td> <td>15</td> <td>75</td> <td>10</td> <td>10</td> <td>15</td> <td>75</td> </tr> </table>			Tree	1% cover	Reserve	Cover	Deciduous	R/S cover	Reserve	Cover	Deciduous	Shrubs/ Saps.	20	0	10	40	20	0	10	40	Herbs	10	10	15	75	10	10	15	75
Tree	1% cover	Reserve	Cover	Deciduous	R/S cover	Reserve	Cover	Deciduous																					
Shrubs/ Saps.	20	0	10	40	20	0	10	40																					
Herbs	10	10	15	75	10	10	15	75																					
3.4 Bank Canopy																													
<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 15%;">Left</td> <td style="width: 15%;">76 - 100%</td> <td style="width: 15%;">51 - 75%</td> <td style="width: 15%;">26 - 50%</td> <td style="width: 15%;">1 - 25%</td> <td style="width: 15%;">0%</td> <td colspan="2" style="width: 30%;">Channel Canopy</td> </tr> <tr> <td>Right</td> <td>76 - 100%</td> <td>51 - 75%</td> <td>26 - 50%</td> <td>1 - 25%</td> <td>0%</td> <td>Open</td> <td>Closed</td> </tr> </table>			Left	76 - 100%	51 - 75%	26 - 50%	1 - 25%	0%	Channel Canopy		Right	76 - 100%	51 - 75%	26 - 50%	1 - 25%	0%	Open	Closed											
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Right	76 - 100%	51 - 75%	26 - 50%	1 - 25%	0%	Open	Closed																						
3.5 Buffer Width (meters) (FTT 4-25.8)																													
<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 15%;">Left</td> <td style="width: 15%;">0 - 25 ft.</td> <td style="width: 15%;">26 - 50 ft.</td> <td style="width: 15%;">51 - 100 ft.</td> <td style="width: 15%;">&gt; 100 ft.</td> <td style="width: 15%;">none (SD)</td> </tr> <tr> <td>Right</td> <td>0 - 25 ft.</td> <td>26 - 50 ft.</td> <td>51 - 100 ft.</td> <td>&gt; 100 ft.</td> <td>none (SD)</td> </tr> </table>			Left	0 - 25 ft.	26 - 50 ft.	51 - 100 ft.	> 100 ft.	none (SD)	Right	0 - 25 ft.	26 - 50 ft.	51 - 100 ft.	> 100 ft.	none (SD)															
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3.6 Buffer Vegetation Type																													
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Shrubs/ Saps.	20	0	10	40	20	0	10	40																					
Herbs	10	10	15	75	10	10	15	75																					
3.7 Riparian Corridor (downstream)																													
<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 15%;">Left</td> <td style="width: 15%;">forest, shrub-scrub, crop/pasture/hay, commercial/industrial, residential, bare, none (SD)</td> </tr> <tr> <td>Right</td> <td>forest, shrub-scrub, crop/pasture/hay, commercial/industrial, residential, bare, none (SD)</td> </tr> </table>			Left	forest, shrub-scrub, crop/pasture/hay, commercial/industrial, residential, bare, none (SD)	Right	forest, shrub-scrub, crop/pasture/hay, commercial/industrial, residential, bare, none (SD)																							
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Right	forest, shrub-scrub, crop/pasture/hay, commercial/industrial, residential, bare, none (SD)																												
4.1 Spring or Seeps: extensive (present) / minimum (absent) / absent																													
4.2 Adjacent Wetlands: extensive / present / minimum / none / absent																													
4.3 Flow status: base / low / high																													
4.4 Current Debris Jams (FTT): #																													
Flood related jam yes/no; If yes = Significant for (all that apply) habitat/channel adjustment / flood damage concerns																													
4.5 Flow Regs. & Withdrawals (FTT): TYPE: withdrawal / bypass / no-e/ators & release / point / tank SIZE: small / large / USE: drinking / irrigation / flood-control / hydro-electric / recreation / other																													
4.6 Upstream/Downstream Flow Regs.: upstream / downstream / both / none																													
4.7 Stormwater Inputs (FTT): tile drain ___ / road ditch ___ / urban stormwater ___ / field ditch ___ / overland flow ___																													
4.8 Constrictions: <input type="checkbox"/> none <input checked="" type="checkbox"/> narrow channel <input checked="" type="checkbox"/> bridge <input checked="" type="checkbox"/> old streambed <input checked="" type="checkbox"/> bedrock outcrop <input type="checkbox"/> other																													
4.9 Beaver Dams (FTT): # <input type="checkbox"/> ft. of the segment affected. <input type="checkbox"/> Bridge & Culvert Assessments																													
5. Channel Bed and Planform Changes (5.0 to 5.3 record on tally sheet)																													
5.4 Stream Ford or Animal Crossing (FTT): Yes / No																													
5.5 Channel Alterations (FTT) (check off that apply): dredging / gravel mining / commercial mining / none Length of Straightening: _____ (With Widening: Yes / No) Alteration from Flood Work Yes / No																													
Flood Berms: material from channel / material pushed out of field / none																													
Comments: _____																													
Phase 2 Stream Geomorphic Assessment																													
June 2012																													
- A29 -																													
Vermont Agency of Natural Resources																													

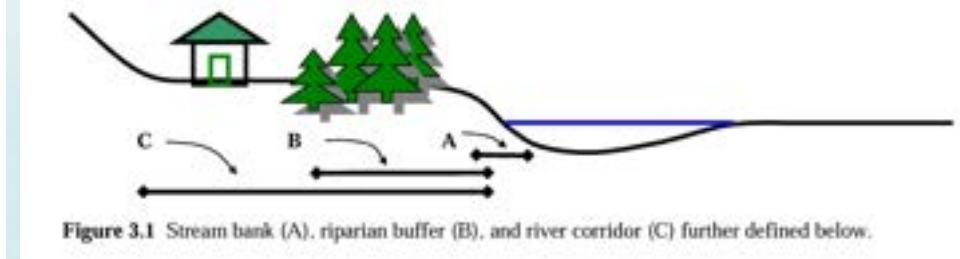


Figure 3.1 Stream bank (A), riparian buffer (B), and river corridor (C) further defined below.

## Step 3, 4, and 5

3. Riparian Banks, Buffers and Corridors
4. Flow Modifiers
5. Channel Bed and Planform Changes

# Step 6

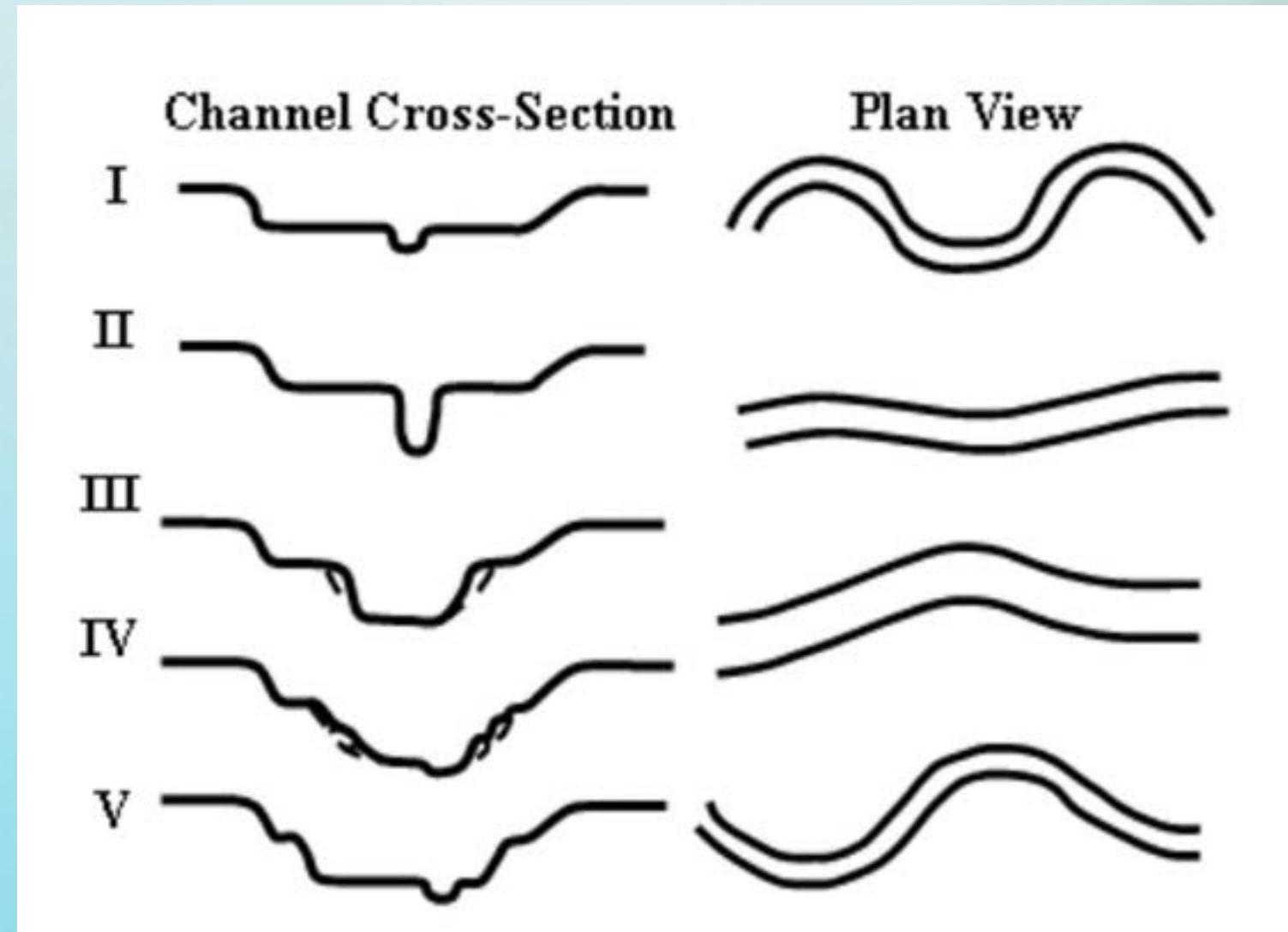
## Rapid Habitat Assessment

# Reach Habitat Assessment

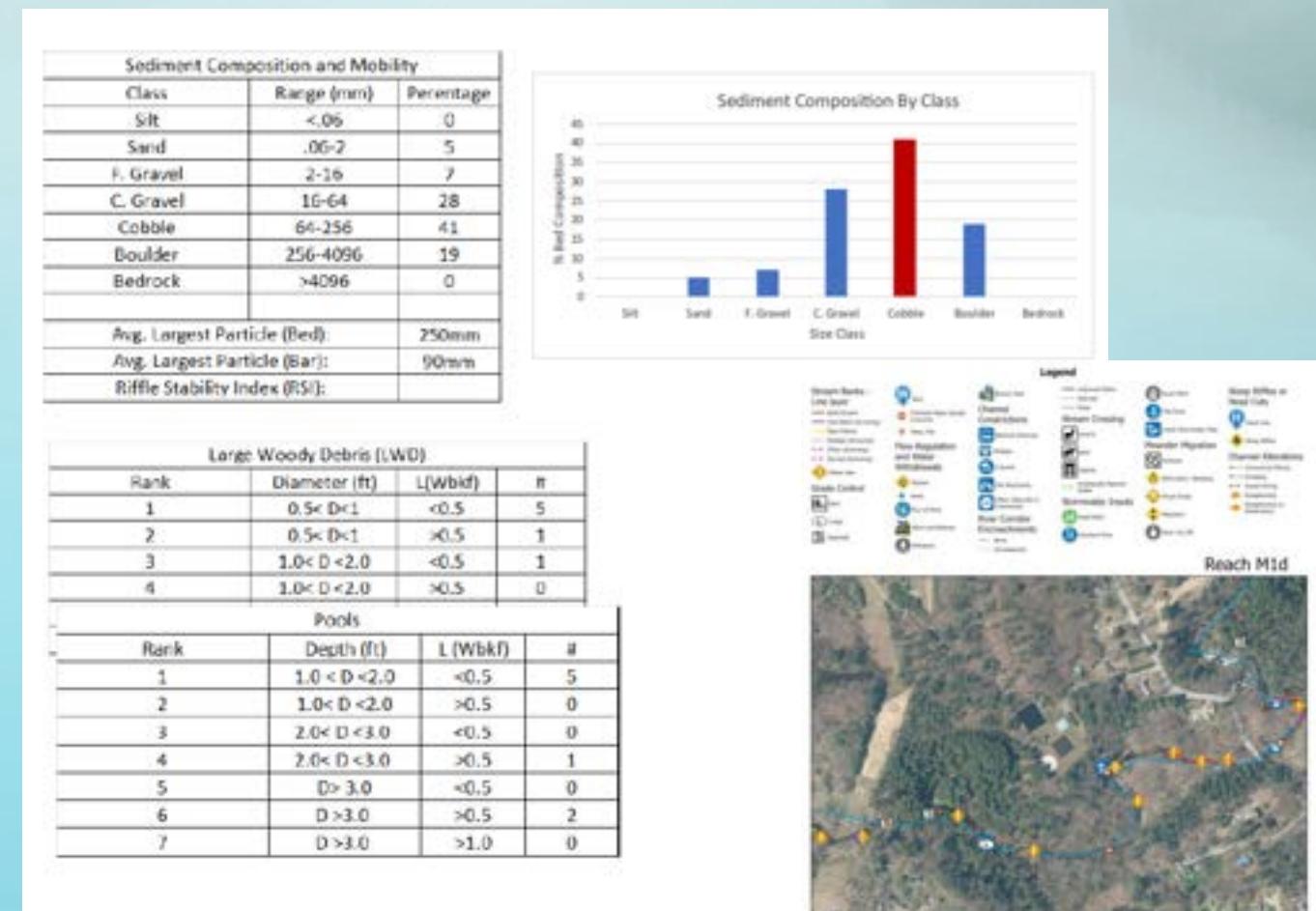
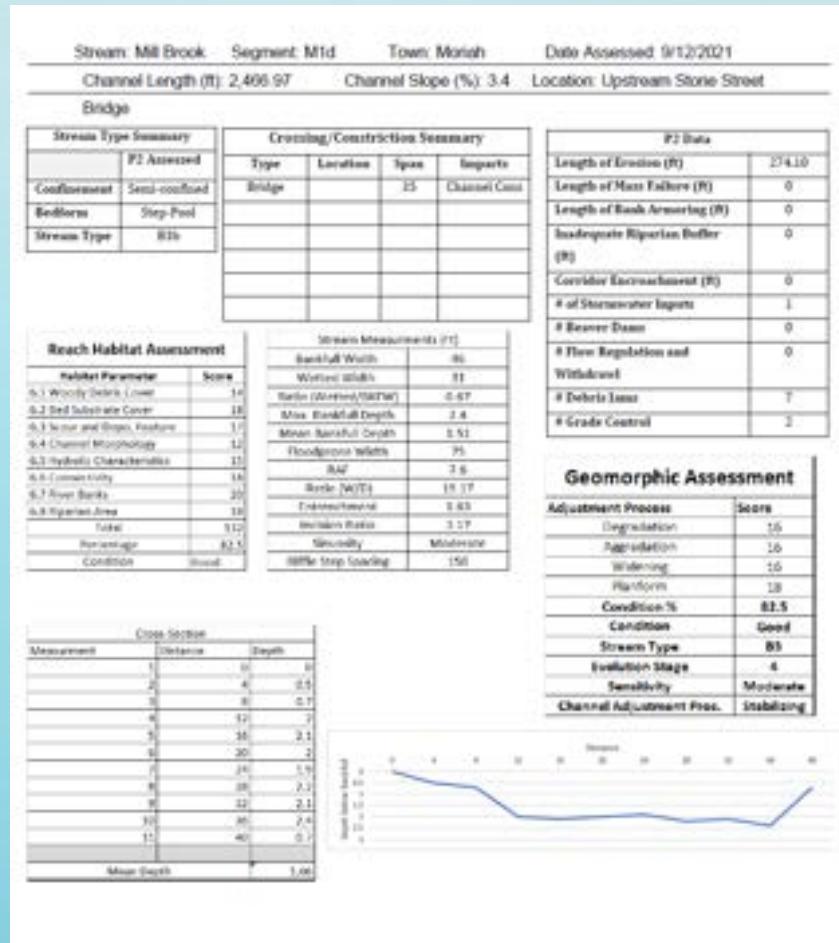
Reach	Score (%)	Condition
M1a	64	Fair
M1c	67	Good
M1d	83	Good
M1e	64	Fair
M1f	72	Good
M2a	81	Good
M2b	79	Good
M2c	78	Good
K1-1	74	Good
K1T3	74	Good

Adjustment Process	Condition Category				
	Reference	Good	Fair	Poor	
<b>7.3 Widening Channel</b> • Active widening of bank vegetation on both sides of the channel; may include bank overhangs that have the veg.	<input type="checkbox"/> Low width:depth ratio $\leq 10$ for C or B-type channels <input type="checkbox"/> $\geq 10$ for E-type channels  <input type="checkbox"/> Little to no scour and erosion at the base of both banks	<input type="checkbox"/> Low to moderate W/D ratio $>10 \leq 40$ for C or B channels <input type="checkbox"/> $>10$ for E-type channels  <input type="checkbox"/> Moderate to moderate scour and erosion at the base of both banks	<input type="checkbox"/> Moderate to high W/D ratio $>40 \leq 40$ for C or B channels <input type="checkbox"/> $>40$ for E-type channels  <input type="checkbox"/> Moderate to high scour and erosion at the base of both banks at the riffle section. Many bank overhangs, undercut bases at top of banks, scouring ruts and freshly exposed root zones	<input type="checkbox"/> High width:depth ratio $>40$ for C or B-type channels <input type="checkbox"/> $>40$ for E-type channels  <input type="checkbox"/> Continuous and/or extensive undercut erosion and erosion at the base of both banks at the riffle section. Many bank overhangs, undercut bases at top of banks, scouring ruts and freshly exposed root zones	
<b>VT RAPID GEOMORPHIC ASSESSMENT — UNCONFINED STREAMS</b>					
Stream Name: <u>Mil Creek</u> Location:	Segment ID: <u>M1a</u> Date: <u>10/25/02</u> Town: <u>Putney</u> Elevation: <u>800 ft</u> Weather: <u>Rain</u> Rain Storm within past 7 days: <u>Y/N</u>				
Observer: <u>Barbara Kuylen</u> , <u>Joe Bresser</u> Organization/Agency: <u>SEAC</u> Reference Stream Type: <input type="checkbox"/> Modified <small>(if altered has a naturally modified stream as Standard Reference)</small>					
Adjustment Process	Condition Category				
Reference	Good	Fair	Poor		
<b>7.3 Channel Degradation (Erosion)</b> • Eroded left- or right banks or the erosion bed and exposed bedrock/boulders/bridge footings • New terraces or recently stabilized longitudinal profiles • Bankfull, or instabilities that are 2-3 times steeper than right-of-way • Riffles eroded, vertical banks • Alluvial (fine) sediments that are instabilities (riffles like domes) high on banks • Tributary aggradation, observed through the presence of tributaries at or upstream of the mouth of a tributary • Bars with steep banks, usually occurring as the downstream end of a bar	<input type="checkbox"/> Little evidence of localized slope incision or undercutting  <input type="checkbox"/> Incision Rate $\geq 1.8 \times 1.2$ and Erosion/deposition ratio $>2.0$  <input type="checkbox"/> Riffle banks comprise and composed of coarse sediments (100%). Full complement of expected bed features	<input type="checkbox"/> Minor localized slope incision or undercutting  <input type="checkbox"/> Incision Rate $\geq 1.2 \times 1.4$ and Erosion/deposition ratio $>2.0$  <input type="checkbox"/> Riffle banks mostly rounded, riffle length may appear shorter. Full complement of expected bed features	<input type="checkbox"/> Steep change in slope, head cut present, or new structures representing  <input type="checkbox"/> Incision Rate $\geq 1.4 \times 2.0$ and Erosion/deposition ratio $>2.0$  <input type="checkbox"/> Riffle or dune may appear discontinuous, bed profile dominated by bars	<input type="checkbox"/> Steep change in slope and/or multiple head cuts present. Tributaries representing  <input type="checkbox"/> Incision rate $\geq 2.0$ OR Erosion/deposition ratio $\geq 1.0$  <input type="checkbox"/> Riffle pool or riffle-dune features replaced by plan bed features	<input type="checkbox"/> Multiple unanticipated incision, or diagnostic features present. Major undercutting/breaching at the head of bedrock, leading to steep riffles and flood chutes
Stream Type Departs <input type="checkbox"/> Type of STD: <u>Historic</u>	<input type="checkbox"/> No incised bed discontinuity (i.e. incision in fine or discontinuous in sediment supply)	<input type="checkbox"/> Minor bed discontinuity, some fine sediment and/or reduction of sediment load	<input type="checkbox"/> Major bed discontinuity, greater flow and/or reduction of sediment load	<input type="checkbox"/> Major existing flow discontinuity, greater flow and/or reduction of sediment load	<input type="checkbox"/> Multiple responses of large discontinuities and minor features in the channel length typically occupied by a single riffle pool response. (Nothing but head cut with plan bed)
Source: <input type="checkbox"/> Historic <input type="checkbox"/> Recent	<input type="checkbox"/> Complete riffle banks and deep pools in riffle pool type ** Full complement of expected bed features	<input type="checkbox"/> Identifies complete riffles and/or some filling of pools with fine sediment. (Rocky pool only by degree, sand with rocks)	<input type="checkbox"/> Incisive riffles at dunes and discontinuity by rate. Significant filling of pools with sediment, pools may be planed with some overhangs	<input type="checkbox"/> Riffle pool or riffle-dune features replaced by plan bed features	<input type="checkbox"/> Additional large discontinuities and minor features in the channel length typically occupied by a single riffle pool response. (Nothing but head cut with plan bed)
	<input type="checkbox"/> Minor point or ditch bank present. Minor depositional features typically less than half' bankfull stage in height	<input type="checkbox"/> Riffles in multiple well-channelled or diagnostic bed. Minor depositional features typically less than half' bankfull stage in height	<input type="checkbox"/> Multiple unanticipated and discontinuous or diagnostic bed present. Major undercutting/breaching at the head of bedrock, leading to steep riffles and flood chutes	<input type="checkbox"/> Multiple unanticipated well-channelled or diagnostic bed present splitting or breaking. Some areas under low flow conditions	<input type="checkbox"/> Major disruption of channel planform and width of the floodplain area resulting from major bedrock undercutting, dredging, or channel straightening
	<input type="checkbox"/> No apparent increase in fine gravel/rubble substrate (gravel count)**	<input type="checkbox"/> Some increase in fine gravel/rubble substrate that may comprise over 30% of the sediments	<input type="checkbox"/> Riffles incise at first gravel and sand substrate that may comprise over 70% of the sediments. Sediment bars with undercut	<input type="checkbox"/> Riffle pool or riffle-dune features replaced by plan bed features	<input type="checkbox"/> Major disruption of channel planform and width of the floodplain area resulting from minor and extensive bedrock undercutting, dredging, and/or channel straightening
	<input type="checkbox"/> Low width:depth ratio $\leq 10$ for C or B-type channels <input type="checkbox"/> $\geq 10$ for E-type channels	<input type="checkbox"/> Low to moderate W/D ratio $>10 \leq 40$ for C or B channels <input type="checkbox"/> $>10$ for E-type channels	<input type="checkbox"/> Moderate to high W/D ratio $>40 \leq 40$ for C or B channels <input type="checkbox"/> $>40$ for E-type channels	<input type="checkbox"/> High width:depth ratio $>40$ for C or B-type channels <input type="checkbox"/> $>40$ for E-type channels	<input type="checkbox"/> Human-made constructions significantly smaller than bedrock width, causing extensive up-slope / downstream deposition and flow bifurcation
	<input type="checkbox"/> No human-made construction smaller than bedrock width, causing minor up-slope / downstream deposition	<input type="checkbox"/> Human-made constructions smaller than bedrock width, causing major up-slope / downstream deposition	<input type="checkbox"/> Major existing flow discontinuity, reduction in flow and / or increase in sediment load	<input type="checkbox"/> Human-made constructions significantly smaller than bedrock width, causing extensive up-slope / downstream deposition and flow bifurcation	<input type="checkbox"/> Human-made constructions significantly smaller than bedrock width, causing extensive up-slope / downstream deposition and flow bifurcation
Source: <input type="checkbox"/> Historic <input type="checkbox"/> Recent	<input type="checkbox"/> 20 <input type="checkbox"/> 19 <input type="checkbox"/> 18 <input type="checkbox"/> 17 <input type="checkbox"/> 16 <input type="checkbox"/> 15 <input type="checkbox"/> 14 <input type="checkbox"/> 13 <input type="checkbox"/> 12 <input type="checkbox"/> 11 <input type="checkbox"/> 10 <input type="checkbox"/> 9 <input type="checkbox"/> 8 <input type="checkbox"/> 7 <input type="checkbox"/> 6 <input type="checkbox"/> 5 <input type="checkbox"/> 4 <input type="checkbox"/> 3 <input type="checkbox"/> 2 <input type="checkbox"/> 1	<input type="checkbox"/> 20 <input type="checkbox"/> 19 <input type="checkbox"/> 18 <input type="checkbox"/> 17 <input type="checkbox"/> 16 <input type="checkbox"/> 15 <input type="checkbox"/> 14 <input checked="" type="checkbox"/> 13 <input type="checkbox"/> 12 <input type="checkbox"/> 11 <input type="checkbox"/> 10 <input type="checkbox"/> 9 <input type="checkbox"/> 8 <input type="checkbox"/> 7 <input type="checkbox"/> 6 <input type="checkbox"/> 5 <input type="checkbox"/> 4 <input type="checkbox"/> 3 <input type="checkbox"/> 2 <input type="checkbox"/> 1	<input type="checkbox"/> 20 <input type="checkbox"/> 19 <input type="checkbox"/> 18 <input type="checkbox"/> 17 <input type="checkbox"/> 16 <input type="checkbox"/> 15 <input type="checkbox"/> 14 <input type="checkbox"/> 13 <input type="checkbox"/> 12 <input type="checkbox"/> 11 <input type="checkbox"/> 10 <input type="checkbox"/> 9 <input type="checkbox"/> 8 <input type="checkbox"/> 7 <input type="checkbox"/> 6 <input type="checkbox"/> 5 <input type="checkbox"/> 4 <input type="checkbox"/> 3 <input type="checkbox"/> 2 <input type="checkbox"/> 1	<input type="checkbox"/> 20 <input type="checkbox"/> 19 <input type="checkbox"/> 18 <input type="checkbox"/> 17 <input type="checkbox"/> 16 <input type="checkbox"/> 15 <input type="checkbox"/> 14 <input type="checkbox"/> 13 <input type="checkbox"/> 12 <input type="checkbox"/> 11 <input type="checkbox"/> 10 <input type="checkbox"/> 9 <input type="checkbox"/> 8 <input type="checkbox"/> 7 <input type="checkbox"/> 6 <input type="checkbox"/> 5 <input type="checkbox"/> 4 <input type="checkbox"/> 3 <input type="checkbox"/> 2 <input type="checkbox"/> 1	<input type="checkbox"/> 20 <input type="checkbox"/> 19 <input type="checkbox"/> 18 <input type="checkbox"/> 17 <input type="checkbox"/> 16 <input type="checkbox"/> 15 <input type="checkbox"/> 14 <input type="checkbox"/> 13 <input type="checkbox"/> 12 <input type="checkbox"/> 11 <input type="checkbox"/> 10 <input type="checkbox"/> 9 <input type="checkbox"/> 8 <input type="checkbox"/> 7 <input type="checkbox"/> 6 <input type="checkbox"/> 5 <input type="checkbox"/> 4 <input type="checkbox"/> 3 <input type="checkbox"/> 2 <input type="checkbox"/> 1
	I Evolution Stage				
	STD* <input type="checkbox"/> Historic	Condition Rating: (Total Score / 10) <u>5.7/10 = 71</u>	Channel Evaluation Stage: <u>Cold</u>		
	T & Stream Condition: <u>Cold</u>				
	/ Very High / Extreme				
	I (not able to get accurate channel data) Y/N <input type="checkbox"/> from work in channel after flood: Y/N				
	I (not able to get accurate channel data) Y/N <input type="checkbox"/> from work in channel after flood: Y/N				

# CHANNEL EVOLUTION



# Mill Brook – M1d



A soft, out-of-focus photograph of a natural landscape. In the foreground, there is a body of water, possibly a lake or river, with a small boat visible on the left. The middle ground shows a wide expanse of water. In the background, there are several green, forested hills or mountains under a clear sky.

# Water Quality Monitoring and Data Collection

Results

# Port Henry Watershed

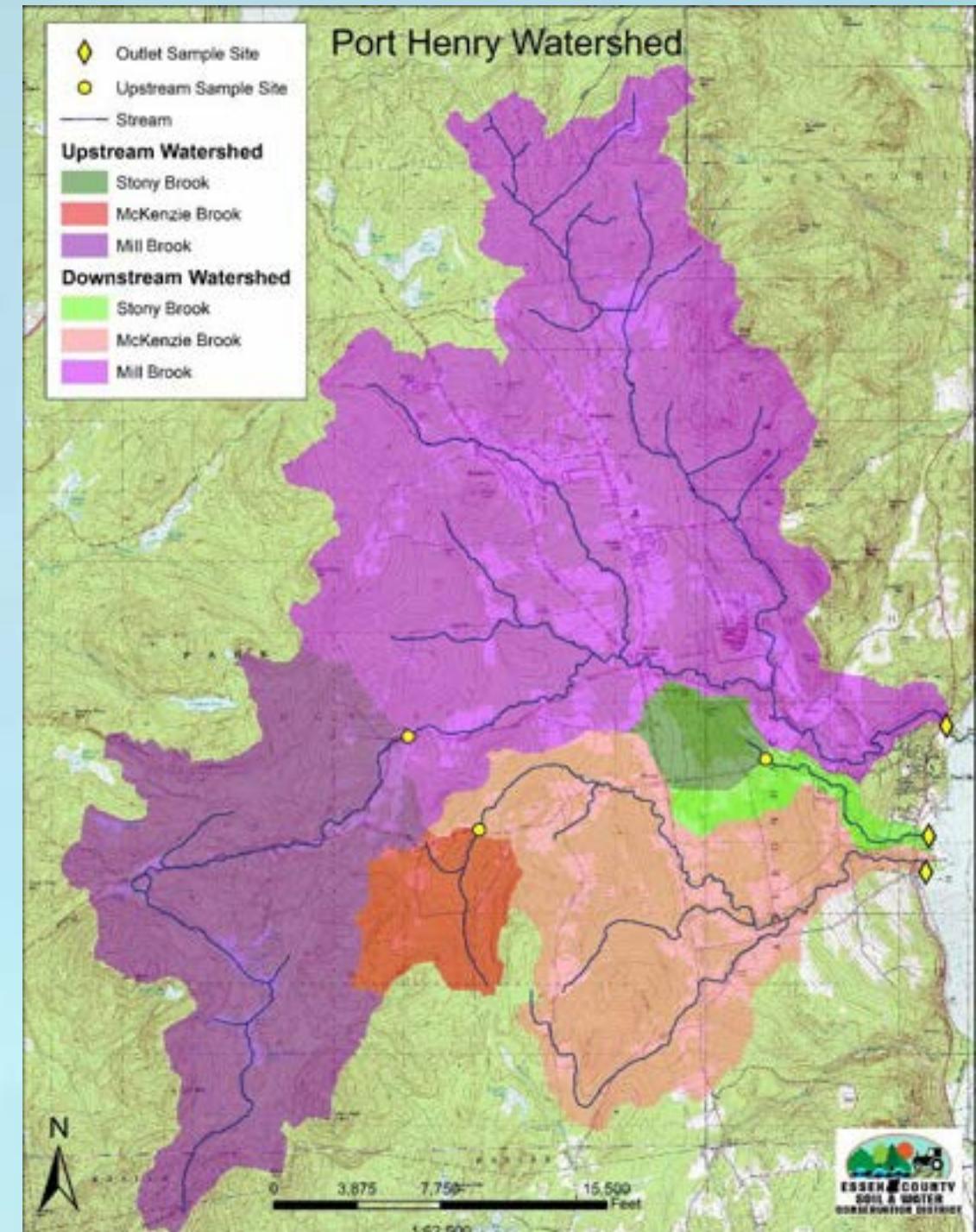
Water quality analysis of 3 tributaries of Lake Champlain:

- Mill Brook
- Stony Brook
- McKenzie Brook

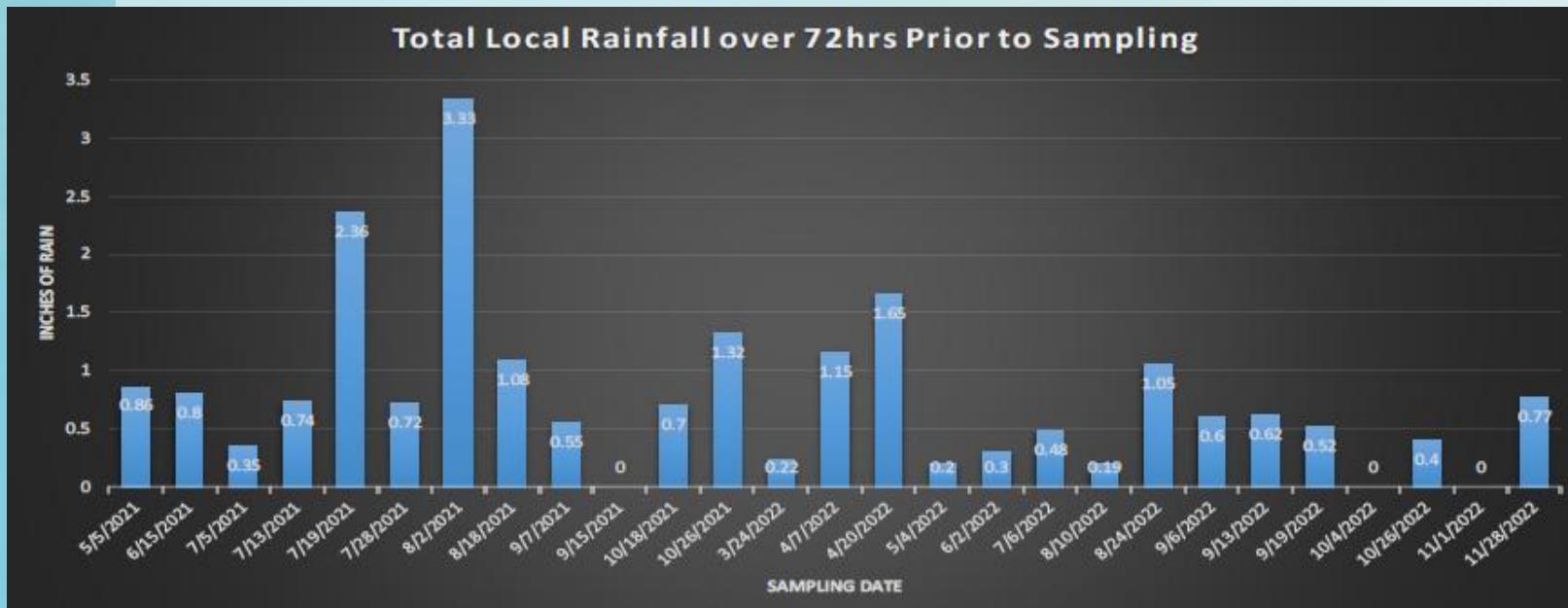
Total of 6 sites, with an upstream and downstream site on each stream

27 field days sampling water

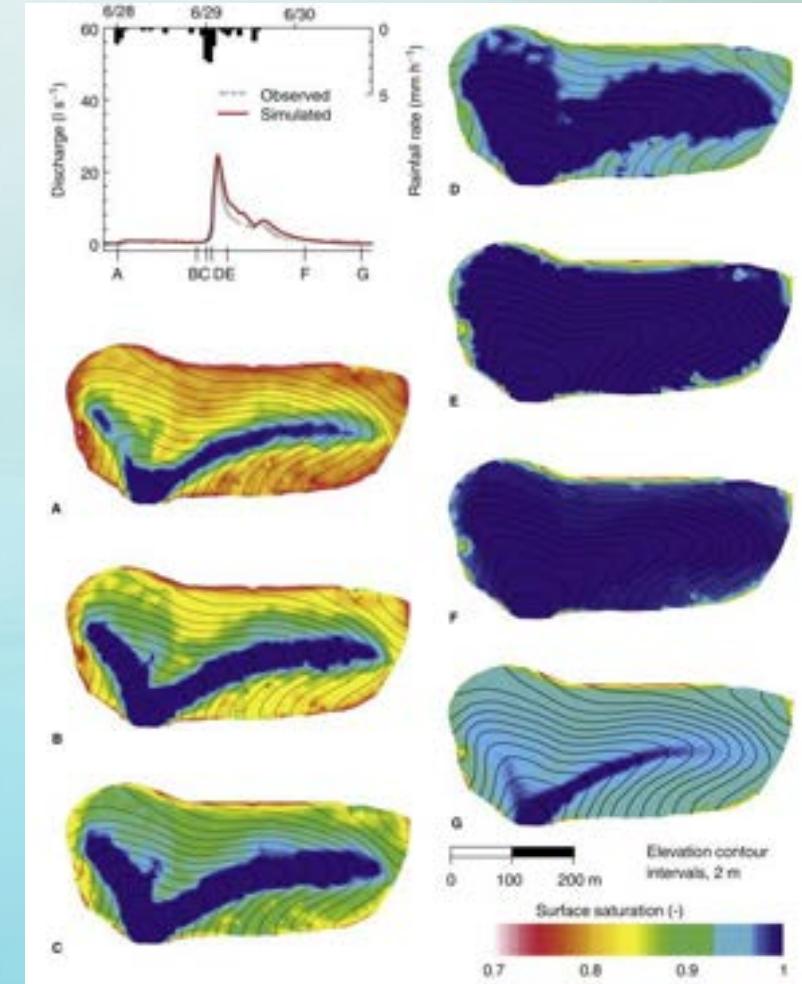
- Goal was to conduct at least half of the sampling days after a rain event...



# Achieved!



- 24 of the 27 collection days occurred within 72 hours of a rain event



## Example of post-rain event time of concentration saturation within a watershed

# Monitoring Locations



# Post Rain Event Sedimentation and Turbidity

Mill Brook →

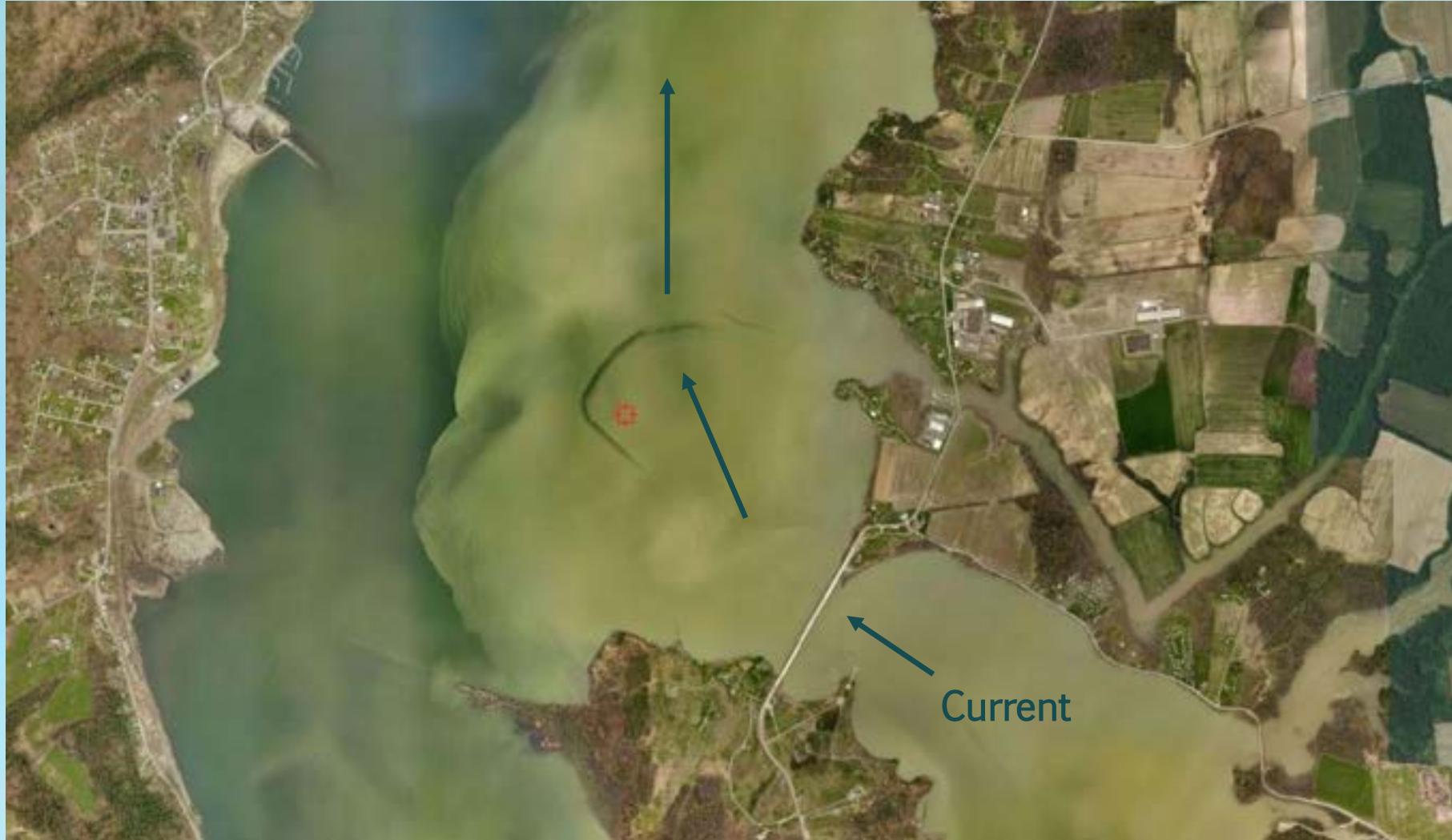
Stony Brook →

McKenzie Brook →

← Hospital Creek

← Wards Creek

Current



- These pictures were taken on the same day, 4 miles apart after a rain event
- Some streams are affected more than others by runoff
- Land use, riparian buffers, and marsh filtration make a difference



- What is in that water?



# Water Quality Sampling



Field data collection:

1. YSI Pro 1030 Probe
2. Water samples to Endyne
3. Endyne data then sent to LaBella Labs for analysis



# Data! Now what?

Date	Location	WQ Dataset #	Time	Bottle	Water Level	pH	Conductivity	Specific Conductance	Temperature (C)	(F)
5/5/2021	Upstream Mill Brook	1	8:45 AM	6	5.4	7.62	50.3	71.2	9.5	49.3
5/5/2021	Upstream Mill Brook	7	8:42 AM	2	6	7.79	84.7	205.5	14.6	58.28
5/5/2021	Upstream Mill Brook	13	9:05 AM	3	6	7.81	109	128.7	17	62.6
5/5/2021	Upstream Mill Brook	20	11:00 AM	5	5.7	7.69	110.2	131	18.7	61.66
5/5/2021	Upstream Mill Brook	26	10:00 AM	5	4.5	7.76	40.8	46.7	18.4	65.12
5/5/2021	Upstream Mill Brook	32	9:32 AM	3	5.6	7.94	75.9	90.4	16.6	60.89
5/5/2021	Upstream Mill Brook	41	8:55 AM	6	5.6	7.64	76.1	94.7	14.7	58.46
5/5/2021	Upstream Mill Brook	42	11:32 AM	3	5.6	7.73	202.8	120.3	17.2	62.59
5/5/2021	Upstream Mill Brook	7	9:25 AM	3	5.6	7.49	78.2	98.5	14.2	57.58
5/5/2021	Upstream Mill Brook	12	10:50 AM	5	5.9	7.09	88.1	104.9	16.6	61.88
5/5/2021	Upstream Mill Brook	19	9:23 AM	3	5.7	6.9	56.6	78	10.6	51.08
5/5/2021	Upstream Mill Brook	25	9:05 AM	5	5.4	6.79	55.7	79.9	8.9	48.07
5/5/2021	Upstream Mill Brook	32	9:10 AM	3	5.2	6.68	58.7	77.2	1.6	34.88
5/5/2021	Upstream Mill Brook	39	9:05 AM	3	5.7	6.96	43.1	87.9	5.9	49.62
5/5/2021	Upstream Mill Brook	46	10:10 AM	3	5.2	5.08	37	62.5	4.1	39.38
5/5/2021	Upstream Mill Brook	5	9:30 AM	3	5.7	8.85	58.5	75.7	9.6	49.28
5/5/2021	Upstream Mill Brook	9	9:23 AM	3	5.8	8.88	70	85.9	10.5	51.9
5/5/2021	Upstream Mill Brook	15	9:54 AM	3	5.1	9.97	99.6	121.7	15.5	59.9
5/5/2021	Upstream Mill Brook	20	9:57 AM	5	6.2	6.7	115.8	133.2	17.9	64.12
5/5/2021	Upstream Mill Brook	25	9:54 AM	5	6.1	5.58	129.7	136.3	21.9	75.42
5/5/2021	Upstream Mill Brook	31	9:55 AM	5	6.1	5.58	139.7	145.7	24.9	76.44
5/5/2021	Upstream Mill Brook	38	10:13 AM	2	5.9	6.52	96.8	118.3	15.4	59.72
5/5/2021	Upstream Mill Brook	44	9:50 AM	3	6.1	7.2	114.4	134.2	17.2	62.95
5/5/2021	Upstream Mill Brook	50	9:50 AM	3	6.1	7.2	114.4	134.2	17.2	62.95
5/5/2021	Upstream Mill Brook	56	9:53 AM	3	6.2	7.1	105.7	121	18.7	64.58
5/5/2021	Upstream Mill Brook	61	11:06 AM	3	6.1	6.71	91.4	105.4	8	46.4
5/5/2021	Upstream Mill Brook	67	10:34 AM	3	5.9	7.5	90.8	103.5	10.2	53.95
5/5/2021	Upstream Mill Brook	73	9:58 AM	3	5.8	6.47	77.6	105.7	7.7	49.86
5/5/2021	Upstream Mill Brook	79	9:50 AM	12	5.5	7.78	150.8	188.1	1.9	33.42
5/5/2021	Downstream Mill Brook	6	11:30 AM	4	5.6	7.85	100.1	139	10.6	51.08
5/5/2021	Downstream Mill Brook	10	10:00 AM	5	5.7	8.11	200.7	240.8	16.1	60.98
5/5/2021	Downstream Mill Brook	16	10:16 AM	4/7	6.3	8.15	209.5	237.3	18.9	64.57
5/5/2021	Downstream Mill Brook	25	1:30 PM	6	6.1	8.15	206.8	234.5	18.7	65.88
5/5/2021	Downstream Mill Brook	31	11:40 AM	6	5.3	7.93	86	97.4	18.8	55.84
5/5/2021	Downstream Mill Brook	37	10:40 AM	6	5.6	8.11	151.8	173.9	18.2	64.79
5/5/2021	Downstream Mill Brook	46	10:15 AM	3	5.1	7.99	126.1	135.6	16.2	63.39
5/5/2021	Downstream Mill Brook	56	12:43 PM	6	6.1	8.15	205.2	205.8	18.8	65.84
5/5/2021	Downstream Mill Brook	62	10:42 AM	6	6.4	7.94	171.4	205.8	16.2	63.16
5/5/2021	Downstream Mill Brook	68	12:15 PM	6	5.4	8.37	212.8	245.2	18.8	64.4
5/5/2021	Downstream Mill Brook	74	10:01 AM	6	6.6	7.91	131.8	179.8	10.9	53.67
5/5/2021	Downstream Mill Brook	30	10:27 AM	6	6.2	7.99	111.8	159.8	9.8	48.39
5/5/2021	Downstream Mill Brook	37	11:04 AM	6	5.5	7.35	62.9	108.8	2.9	37.22
5/5/2021	Downstream Mill Brook	44	10:55 AM	6	5.1	7.41	90.1	139.8	6.4	43.52
5/5/2021	Downstream Mill Brook	51	11:31 AM	6	2.1	7.64	76.2	122.8		
5/5/2021	Downstream Mill Brook	6	11:04 AM	6/7	2.1	7.64	114	142.6		
5/5/2021	Downstream Mill Brook	20	10:08 AM	6	6.2	7.82	195.9	236.5		
5/5/2021	Downstream Mill Brook	21	10:08 AM	6	4.9	7.93	264.5	264.5		
5/5/2021	Downstream Mill Brook	24	9:52 AM	6	4.4	8.03	247.4	276.6		
5/5/2021	Downstream Mill Brook	29	11:58 AM	6	4.6	8.13	275.2	301.3		
5/5/2021	Downstream Mill Brook	49	11:58 AM	7	6.4	7.95	201.9	239		
5/5/2021	Downstream Mill Brook	4	10:54 AM	6	5.7	8.06	240	298.6		
5/5/2021	Downstream Mill Brook	57	11:00 AM	6	6.7	8.07	232.9	288.1		
5/5/2021	Downstream Mill Brook	64	12:13 PM	6	6.1	8.33	209.2	280.0		
5/5/2021	Downstream Mill Brook	32	11:57 AM	6	6.2	7.97	204	287		
5/5/2021	Downstream Mill Brook	27	10:30 AM	7	6.3	8.04	182.5	245.3		
5/5/2021	Downstream Mill Brook	39	11:00 AM	3	5.7	7.85	98.4	142.9		

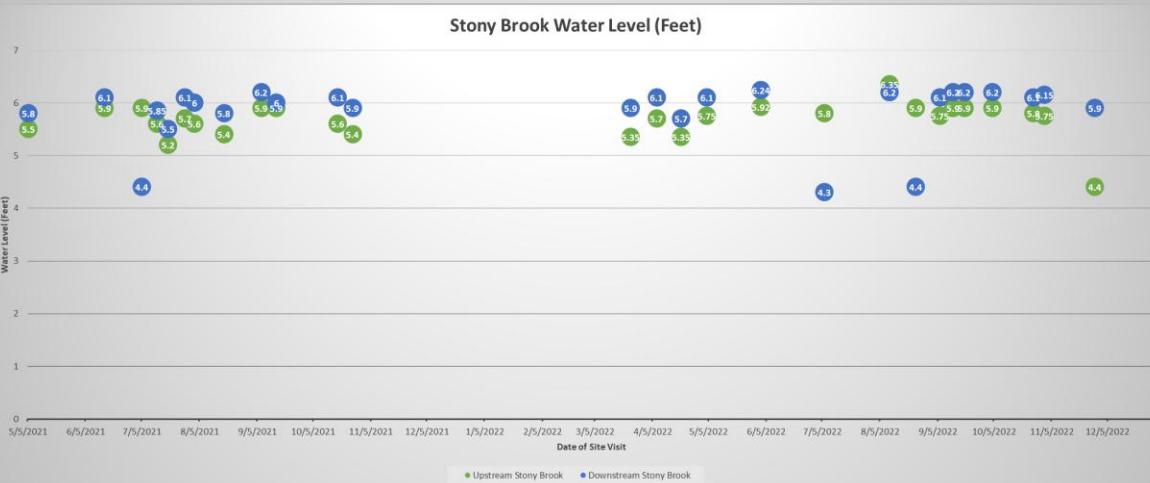
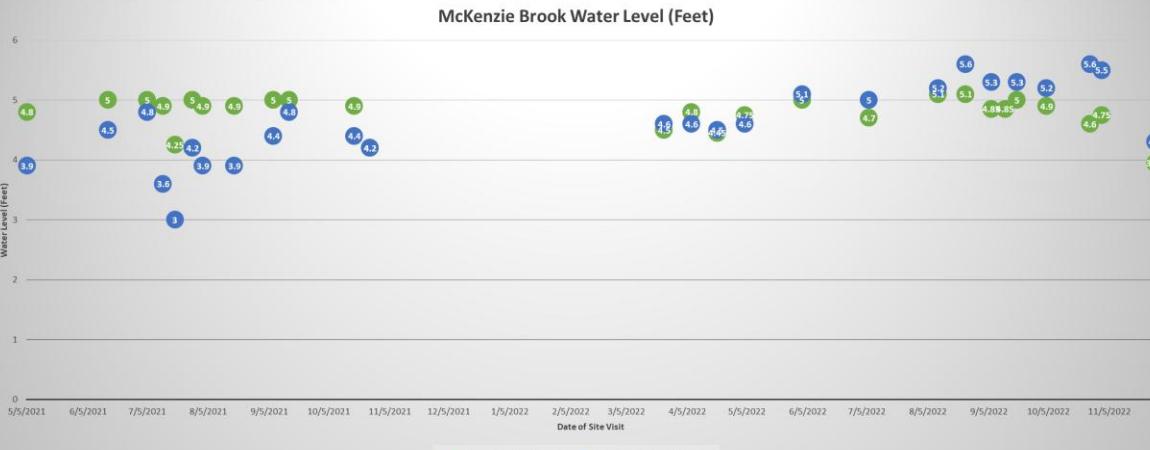
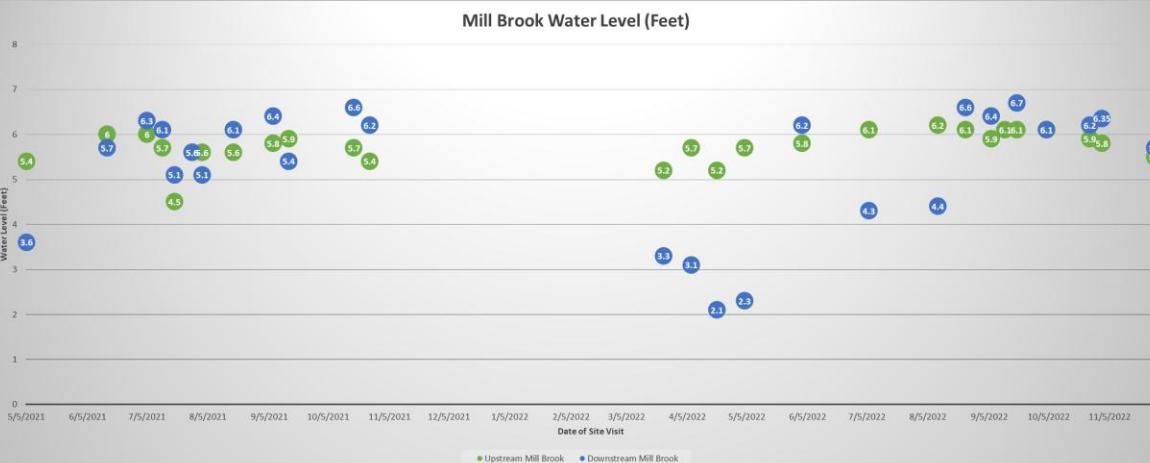


Stadia Rod measurements of water depth

Date	Location	WQ Dataset #	Time	Bottle	Water Level	pH	Conductivity	Specific Conductance	Temperature (C)	(F)
5/5/2021	Upstream Stony Brook	3	9:45 AM	2	5.5	7.65	64.9	272.8	21.1	69.3
5/5/2021	Upstream Stony Brook	9	9:47 AM	6	5.9	7.92	270.5	290.1	17.5	61.78
5/5/2021	Upstream Stony Brook	15	9:51 AM	3	5.9	7.62	257.8	270.1	19.2	66.56
5/5/2021	Upstream Stony Brook	21	11:45 AM	3	5.9	7.73	257.3	277.3	20	68.68
5/5/2021	Upstream Stony Brook	28	10:40 AM	3	5.2	7.64	182.7	218.4	17.5	60.5
5/5/2021	Upstream Stony Brook	34	10:08 AM	3	5.7	7.73	272.8	311.8	16.8	60.12
5/5/2021	Upstream Stony Brook	40	10:40 AM	3	5.6	7.62	270.8	290.8	16.8	60.88
5/5/2021	Upstream Stony Brook	46	10:40 AM	3	5.2	7.66	174.4	204.4	15.4	59.74
5/5/2021	Upstream Stony Brook	52	9:55 AM	3	5.9	7.48	255.3	266.8	16.8	60.48
5/5/2021	Upstream Stony Brook	58	10:21 AM	3	5.9	7.48	241.8	267.6	16.8	60.58
5/5/2021	Upstream Stony Brook	64	10:50 AM	3	5.9	7.32	234.0	241.5	15.0	57.88
5/5/2021	Upstream Stony Brook	70	10:50 AM	3	5.9	7.32	234.0	241.5	15.0	57.88
5/5/2021	Upstream Stony Brook	76	10:50 AM	3	5.9	7.32	234.0	241.5	15.0	57.88
5/5/2021	Upstream Stony Brook	82	10:50 AM	3	5.9	7.32	234.0	241.5	15.0	57.88
5/5/2021	Upstream Stony Brook	88	10:50 AM	3	5.9	7.32	234.0	241.5	15.0	57.88
5/5/2021	Upstream Stony Brook	94	10:50 AM	3	5.9	7.32	234.0	241.5	15.0	57.88
5/5/2021	Upstream Stony Brook	100	10:50 AM	3	5.9	7.32	234.0	241.5	15.0	57.88
5/5/2021	Upstream Stony Brook	106	10:50 AM	3	5.9	7.32	234.0	241.5	15.0	57.88
5/5/2021	Upstream Stony Brook	112	10:50 AM	3	5.9	7.32	234.0	241.5	15.0	57.88
5/5/2021	Upstream Stony Brook	118	10:50 AM	3	5.9	7.32	234.0	241.5	15.0	57.88
5/5/2021	Upstream Stony Brook	124	10:50 AM	3	5.9	7.32	234.0	241.5	15.0	57.88
5/5/2021	Upstream Stony Brook	130	10:50 AM	3	5.9	7.32	234.0	241.5	15.0	57.88
5/5/2021	Upstream Stony Brook	136	10:50 AM	3	5.9	7.32	234.0	241.5	15.0	57.88
5/5/2021	Upstream Stony Brook	142	10:50 AM	3	5.9	7.32	234.0	241.5	15.0	57.88
5/5/2021	Upstream Stony Brook	148	10:50 AM	3	5.9	7.32	234.0	241.5	15.0	57.88
5/5/2021	Upstream Stony Brook	154	10:50 AM	3	5.9	7.32	234.0	241.5	15.0	57.88
5/5/2021	Upstream Stony Brook	160	10:50 AM	3	5.9	7.32	234.0	241.5	15.0	57.88
5/5/2021	Upstream Stony Brook	166	10:50 AM	3	5.9	7.32	234.0	241.5	15.0	57.88
5/5/2021	Upstream Stony Brook	172	10:50 AM	3	5.9	7.32	234.0	241.5	15.0	57.88
5/5/2021	Upstream Stony Brook	178	10:50 AM	3	5.9	7.32	234.0	241.5	15.0	57.88
5/5/2021	Upstream Stony Brook	184	10:50 AM	3	5.9	7.32	234.0	241.5	15.0	57.88
5/5/2021	Upstream Stony Brook	190	10:50 AM	3	5.9	7.32	234.0	241.5	15.0	57.88
5/5/2021	Upstream Stony Brook	196	10:50 AM	3	5.9	7.32	234.0	241.5	15.0	57.88
5/5/2021	Upstream Stony Brook	202	10:50 AM	3	5.9	7.32	234.0	241.5	15.0	57.88
5/5/2021	Upstream Stony Brook	208	10:50 AM	3	5.9	7.32	234.0	241.5	15.0	57.88
5/5/2021	Upstream Stony Brook	214	10:50 AM	3	5.9	7.32	234.0	241.5	15.0	57.88
5/5/2021	Upstream Stony Brook	220	10:50 AM	3	5.9	7.32	234.0	241.5	15.0	57.88
5/5/2021	Upstream Stony Brook	226	10:50 AM	3	5.9	7.32	234.0	241.5	15.0	57.88
5/5/2021	Upstream Stony Brook	232	10:50 AM	3	5.9	7.32	234.0	241.5	15.0	57.88
5/5/2021	Upstream Stony Brook	238	10:50 AM	3	5.9	7.32	234.0	241.5	15.0	57.88
5/5/2021	Upstream Stony Brook	244	10:50 AM	3	5.9	7.32	234.0	241.5	15.0	57.88
5/5/2021	Upstream Stony Brook	250	10:50 AM	3	5.9	7.32	234.0	241.5		

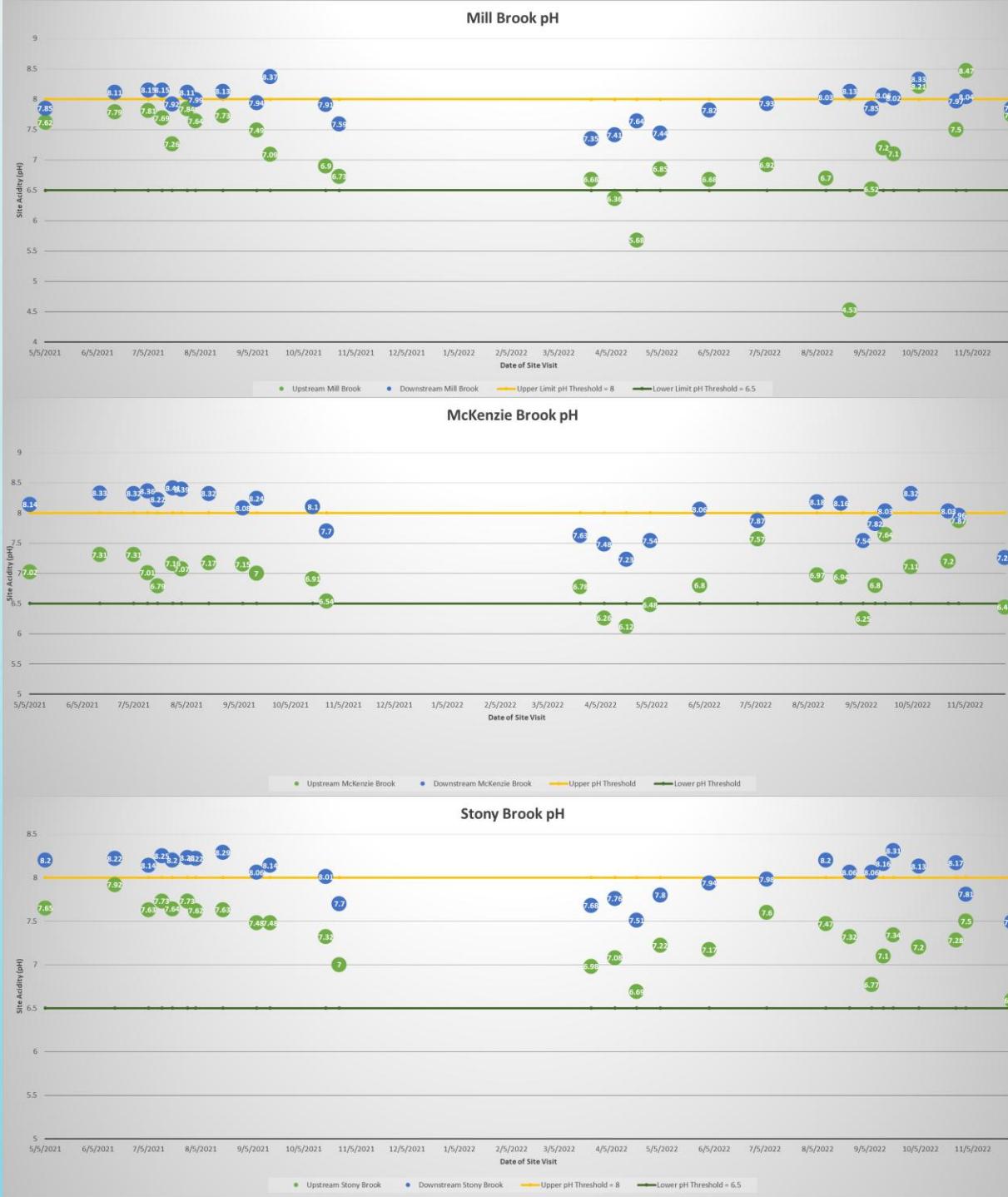
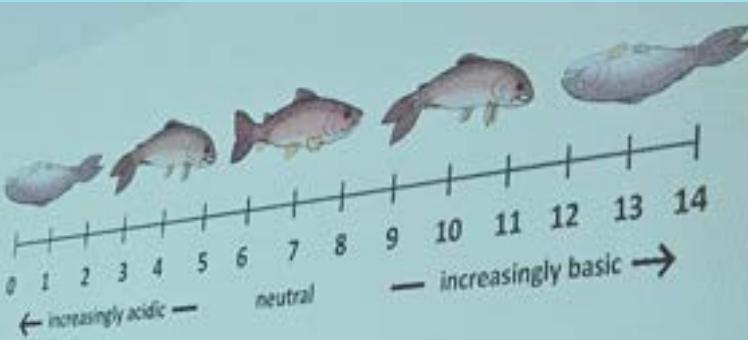
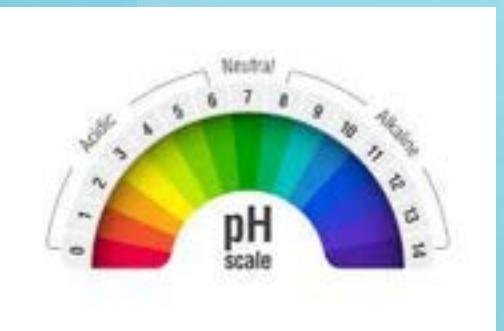
# Water Level

- Lower water levels
  - Concentrate pollutants
  - Summer = hotter water
  - Winter = potential for complete freeze
- Higher water levels
  - Greater velocity
  - Increased erosion, turbidity and sedimentation



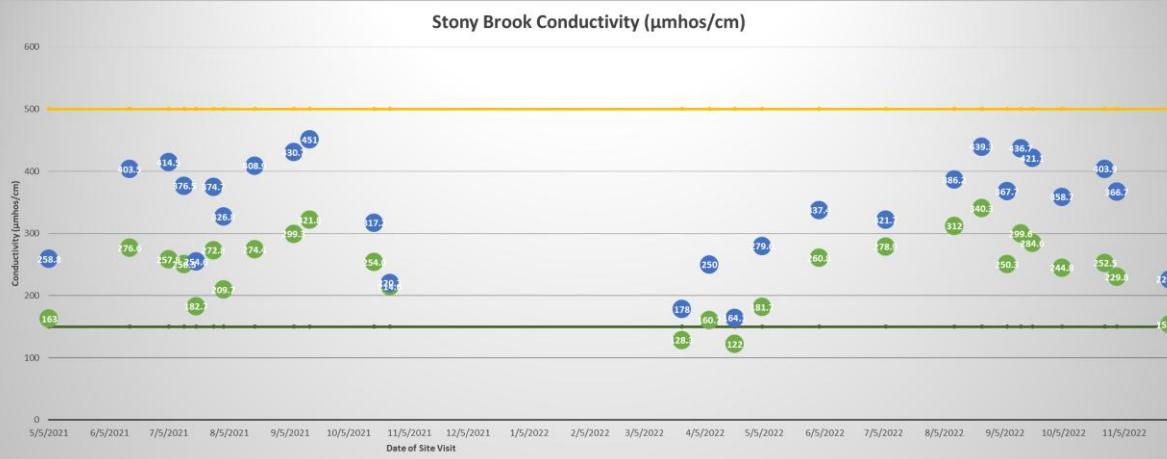
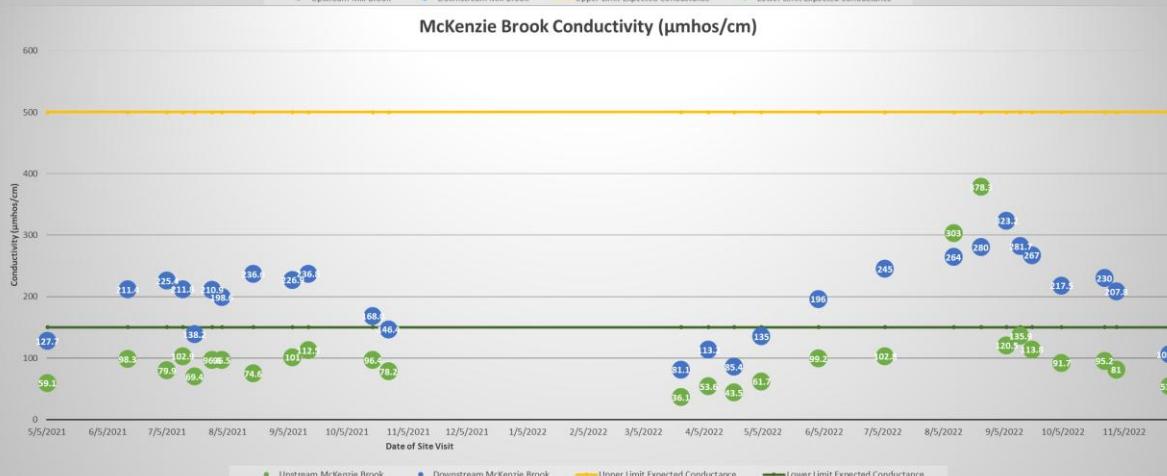
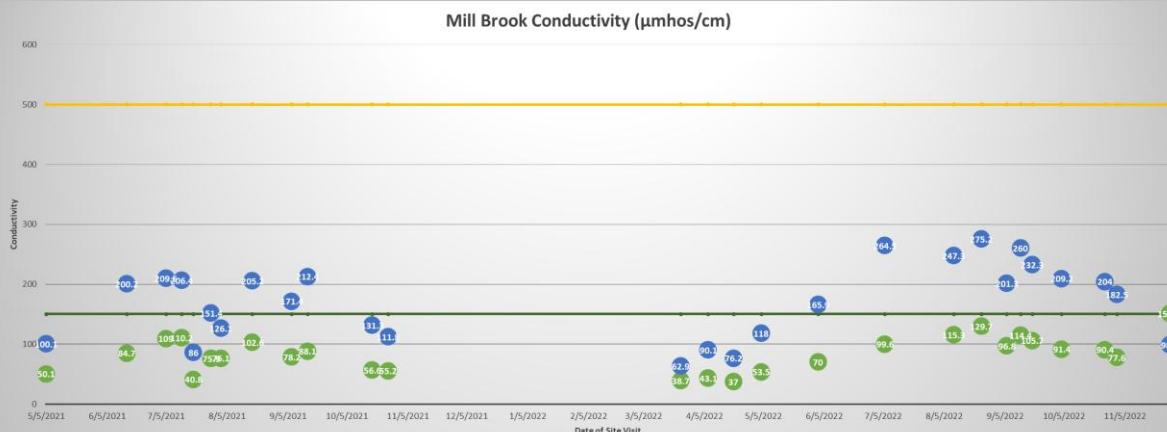
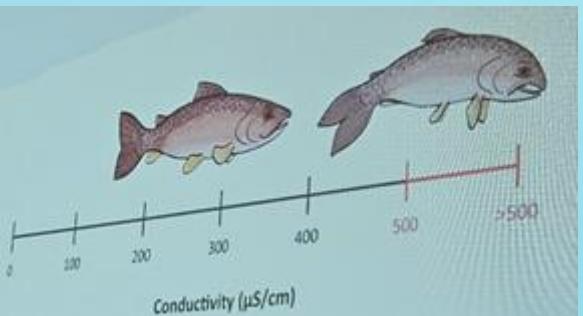
# pH

- Optimal pH for aquatic organisms between 6.5 and 8.0
  - Streams are buffered by geology
  - Maintain equilibrium unless impacted by external sources
  - Most pollutants increase acidity and drop the pH
    - Agricultural nutrients, mining byproducts, stormwater runoff from developed lands
  - A few do the opposite
    - Oils, agricultural lime, limestone gravel leachate



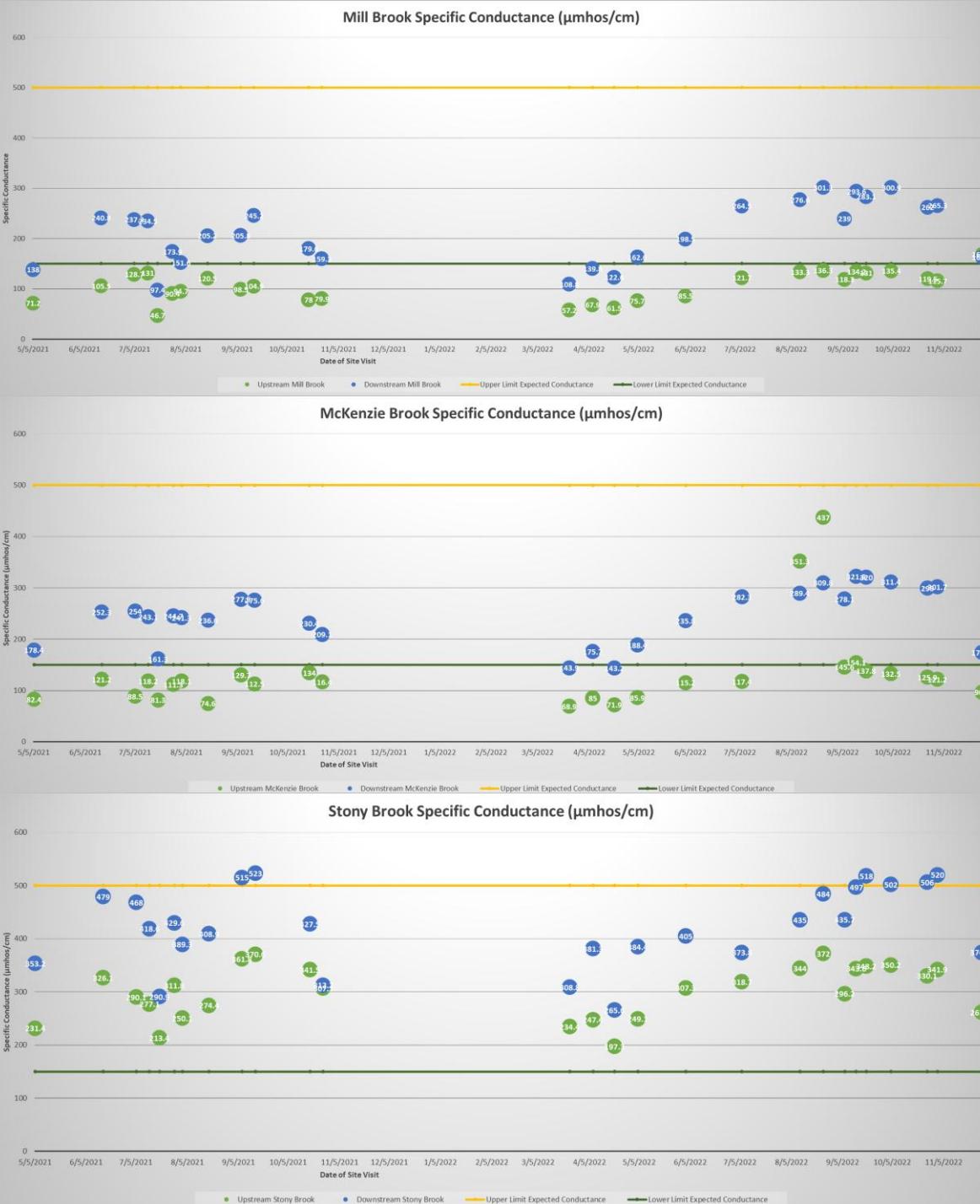
# Conductivity

- A measure of how easily a water body can conduct an electrical current (indirect measure of salinity/salt)
  - Also, how fish sense their environment



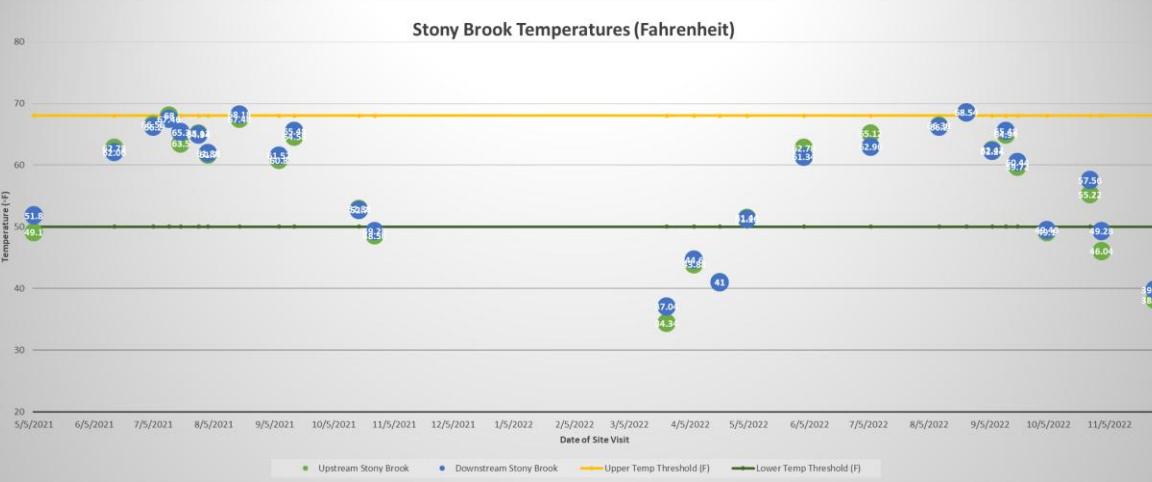
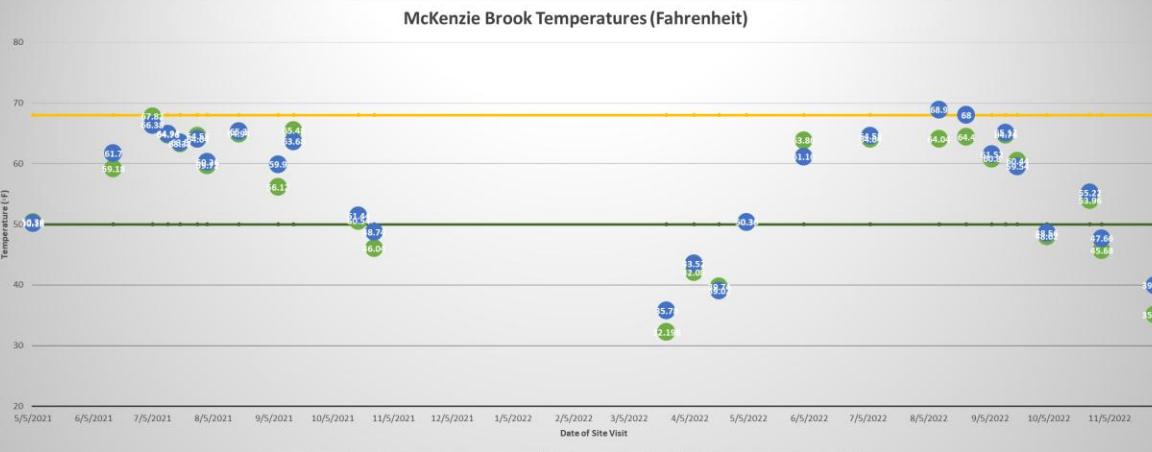
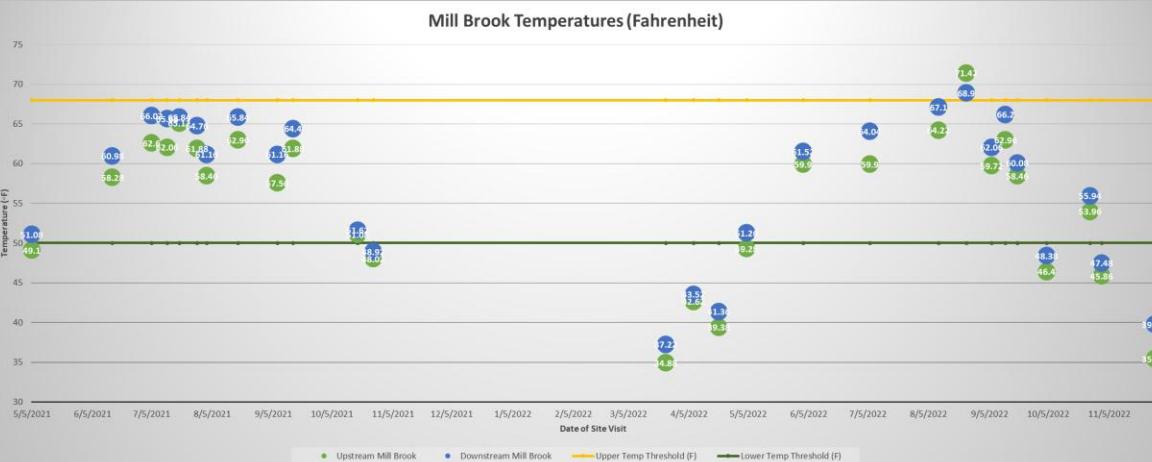
# Specific Conductance

- The calculated conductivity of the river at a standardized temperature of 25°C (77°F)
- This calculation is necessary to allow comparison of one or more bodies of water as temperatures fluctuate throughout the day, season, or year
- Temperature changes can resemble pollutant discharge if not disassociated in the data



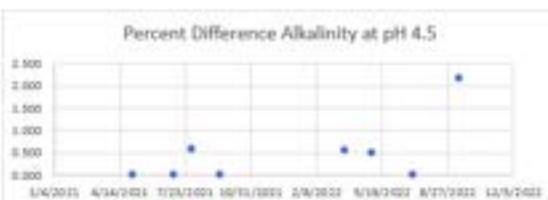
# Temperature

- Rising temperatures yield:
  - Decrease in dissolved oxygen
  - Increase in
    - Photosynthesis
    - Chemical reactivity
    - Total dissolved solids
    - Conductance
    - Geologic dissolution
    - HABs

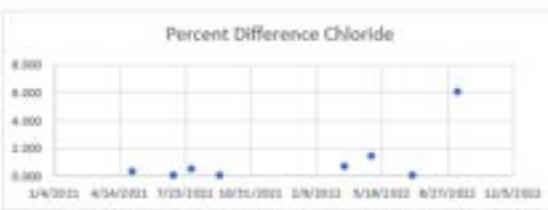


# Quality Analysis

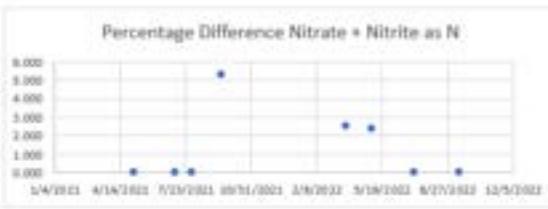
	Alkalinity at pH4.5	Control bottle	% Difference
5/5/2023 Lower MK	74	74	0.000
7/6/2023 Lower Mill	71	71	0.000
8/2/2023 Upper MK	42	43	0.588
9/15/2023 Upper Stony	150	150	0.000
3/24/2022 Lower Stony	90	92	0.549
5/4/2022 Lower Mill	50	49	0.505
7/6/2022 Upper MK	62	62	0.000
9/13/2022 Upper MK	55	60	8.174



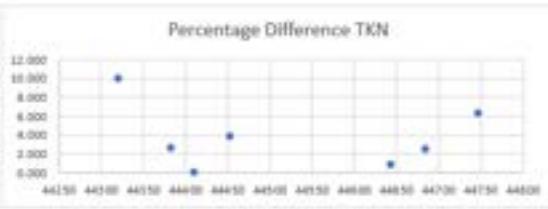
	Chloride	Control bottle	% Difference
5/5/2023 Lower MK	9.9	10	0.251
7/6/2023 Lower Mill	22	22	0.000
8/2/2023 Upper MK	4.9	5	0.505
9/15/2023 Upper Stony	25	25	0.000
3/24/2022 Lower Stony	38	39	0.649
5/4/2022 Lower Mill	17	18	1.429
7/6/2022 Upper MK	<2.5	<2.5	0.000
9/13/2022 Upper MK	3.7	2.9	6.061



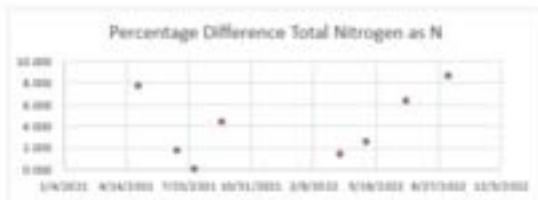
	Nitrate + Nitrite as N	Control bottle	% Difference
5/5/2023 Lower MK	<0.1	<0.1	0.000
7/6/2023 Lower Mill	0.14	0.14	0.000
8/2/2023 Upper MK	<0.05	<0.05	0.000
9/15/2023 Upper Stony	0.078	0.063	5.319
3/24/2022 Lower Stony	0.19	0.21	2.500
5/4/2022 Lower Mill	0.1	0.11	2.381
7/6/2022 Upper MK	<0.05	<0.05	0.000
9/13/2022 Upper MK	<0.05	<0.05	0.000



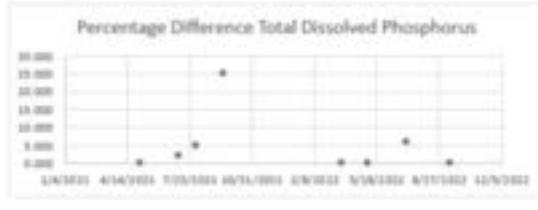
	TKN	Control bottle	% Difference
5/5/2023 Lower MK	0.39	0.26	10.000
7/6/2023 Lower Mill	0.27	0.3	2.652
8/2/2023 Upper MK	0.53	0.53	0.000
9/15/2023 Upper Stony	0.42	0.36	3.846
3/24/2022 Lower Stony	0.32	0.33	0.769
5/4/2022 Lower Mill	0.38	0.42	2.500
7/6/2022 Upper MK	0.89	0.69	6.529
9/13/2022 Upper MK	0.7	0.99	8.580



	Total Nitrogen as N	Control bottle	% Difference
5/5/2023 Lower MK	0.49	0.38	7.847
7/6/2023 Lower Mill	0.41	0.44	7.455
8/2/2023 Upper MK	0.58	0.58	0.000
9/15/2023 Upper Stony	0.5	0.42	4.348
3/24/2022 Lower Stony	0.53	0.54	1.429
5/4/2022 Lower Mill	0.48	0.53	2.475
7/6/2022 Upper MK	0.89	0.69	6.529
9/13/2022 Upper MK	0.7	0.99	8.580



	Total Dissolved Phosphorus	Control bottle	% Difference
5/5/2021 Lower MK	<0.01	<0.01	0.000
7/6/2021 Lower Mill	0.012	0.011	2.374
8/2/2023 Upper MK	0.0084	0.0069	4.902
9/15/2023 Upper Stony	0.01	0.01	0.000
3/24/2022 Lower Stony	<0.012	<0.012	0.000
5/4/2022 Lower Mill	<0.013	<0.012	0.000
7/6/2022 Upper MK	0.023	0.028	6.000
9/13/2022 Upper MK	0.01	0.01	0.000



	Total Phosphorus	Control bottle	% Difference
5/5/2021 Lower MK	0.0077	0.011	8.824
7/6/2021 Lower Mill	0.013	0.015	13.571
8/2/2023 Upper MK	0.012	0.013	2.000
9/15/2023 Upper Stony	0.01	0.02	16.667
3/24/2022 Lower Stony	0.021	0.022	1.183
5/4/2022 Lower Mill	0.028	0.043	17.688
7/6/2022 Upper MK	0.067	0.049	7.719
9/13/2022 Upper MK	0.01	0.06	16.467



	Total Suspended Solids	Control bottle	% Difference
5/5/2021 Lower MK	4.1	3.9	1.250
7/6/2021 Lower Mill	1.2	1.5	5.556
8/2/2023 Upper MK	1.2	1.3	2.000
9/15/2023 Upper Stony	9	5	12.500
3/24/2022 Lower Stony	12	12.2	0.413
5/4/2022 Lower Mill	22.6	20.3	2.681
7/6/2022 Upper MK	19.4	15.4	5.747
9/13/2022 Upper MK	1	29.4	29.400



>20% difference

# Endyne Labs

- Water bottle analysis results

Table 1.3a: Mean concentration and range of surface grab chemical parameters of **McKenzie Brook** upstream and downstream from May 2021 - November 2022.

Parameter (mg/L)	Upstream Mean	Downstream Mean	Upstream Range	Downstream Range
Alkalinity at pH 4.5 (CaCO <sub>3</sub> )	53.77	109.56	28 - 150	60 - 150
Chloride (Cl <sup>-</sup> )	5.51	11.43	<2.5 - 39	6.1 - 22
Nitrate + Nitrite as N	0.06	0.14	<0.05 - <0.1	<0.05 - 0.34
TKN	0.57	0.34	0.27 - 0.99	0.21 - 0.62
Total Nitrogen as N	0.59	0.44	0.27 - 0.99	0.26 - 0.67
Total Dissolved Phosphorus	0.02	0.02	0.0069 - 0.028	0.005 - 0.063
Total Phosphorus	0.03	0.02	0.01 - 0.067	0.0077 - 0.034
Total Suspended Solids	7.18	6.75	1 - 24	<1 - 28.8
Total Calcium (Ca <sup>2+</sup> )	16.83	34.40	8.5 - 36	20 - 47
Total Magnesium (Mg <sup>2+</sup> )	3.12	6.81	1.70 - 3.70	3.5 - 12
Total Potassium (K <sup>+</sup> )	0.74	0.92	0.52 - 0.99	<0.50 - 1.5
Total Sodium (Na <sup>+</sup> )	4.52	7.79	2.50 - 4.6	5.2 - 11

Table 1.3b: Mean concentration and range of surface grab chemical parameters of **Stony Brook** upstream and downstream from May 2021 - November 2022.

Parameter (mg/L)	Upstream Mean	Downstream Mean	Upstream Range	Downstream Range
Alkalinity at pH 4.5 (CaCO <sub>3</sub> )	121.16	137.44	64 - 160	30 - 180
Chloride (Cl <sup>-</sup> )	21.48	48.36	15 - 30	27 - 65
Nitrate + Nitrite as N	0.09	0.16	<0.05 - 0.14	0.07 - 0.34
TKN	0.45	0.38	0.25 - 0.80	0.24 - 0.69
Total Nitrogen as N	0.50	0.65	0.25 - 0.80	0.24 - 4.10
Total Dissolved Phosphorus	0.02	0.02	0.0071 - 0.03	0.0075 - 0.02
Total Phosphorus	0.03	0.05	<0.01 - 0.13	<0.01 - 0.088
Total Suspended Solids	13.12	15.89	<1 - 44.80	<1 - 67.30
Total Calcium (Ca <sup>2+</sup> )	38.32	47.48	19 - 50	30 - 58
Total Magnesium (Mg <sup>2+</sup> )	7.92	8.95	3.90 - 10	5.40 - 12
Total Potassium (K <sup>+</sup> )	1.03	1.44	<0.50 - 2.20	0.77 - 3.10
Total Sodium (Na <sup>+</sup> )	11.87	27.52	9.10 - 14	16 - 36

Table 1.3c: Mean concentration and range of surface grab chemical parameters of **Mill Brook** upstream and downstream from May 2021 - November 2022.

Parameter (mg/L)	Upstream Mean	Downstream Mean	Upstream Range	Downstream Range
Alkalinity at pH 4.5 (CaCO <sub>3</sub> )	41.58	67.52	22 - 56	30 - 140
Chloride (Cl <sup>-</sup> )	5.94	22.45	3 - 9.60	7.60 - 35
Nitrate + Nitrite as N	0.06	0.13	<0.05 - 0.16	0.014 - 0.25
TKN	0.33	0.34	0.20 - 0.63	0.20 - 0.63
Total Nitrogen as N	0.39	0.47	0.25 - 0.68	0.31 - 0.78
Total Dissolved Phosphorus	0.01	0.01	0.0052 - 0.02	0.005 - 0.021
Total Phosphorus	0.02	0.07	0.0087 - 0.039	<0.01 - 0.53
Total Suspended Solids	5.09	15.88	<1 - 33.20	<1 - 69.30
Total Calcium (Ca <sup>2+</sup> )	13.40	23.31	6.50 - 23	11 - 43
Total Magnesium (Mg <sup>2+</sup> )	2.26	4.68	1.1 - 3.9	2.20 - 9.30
Total Potassium (K <sup>+</sup> )	0.58	0.86	<0.50 - 0.77	<0.50 - 1.80
Total Sodium (Na <sup>+</sup> )	4.28	13.83	1.90 - 6.80	5.70 - 22

# LaBella Associates

- Took raw data from Endyne and prepared water quality graphs to show change over time to be able to infer or draw conclusions from

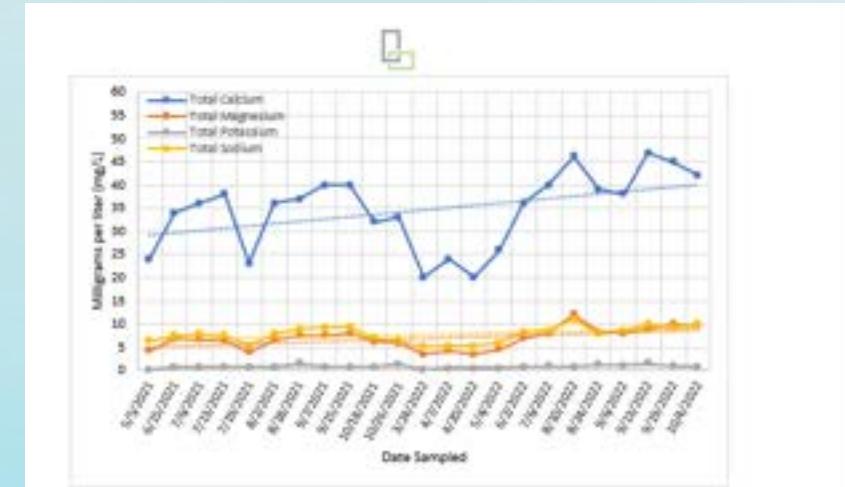


Figure 1.3.1h: Total calcium, total magnesium, total potassium, and total sodium milligrams per liter (mg/L) concentrations from seasonal water quality sampling dates for McKenzie Brook downstream.

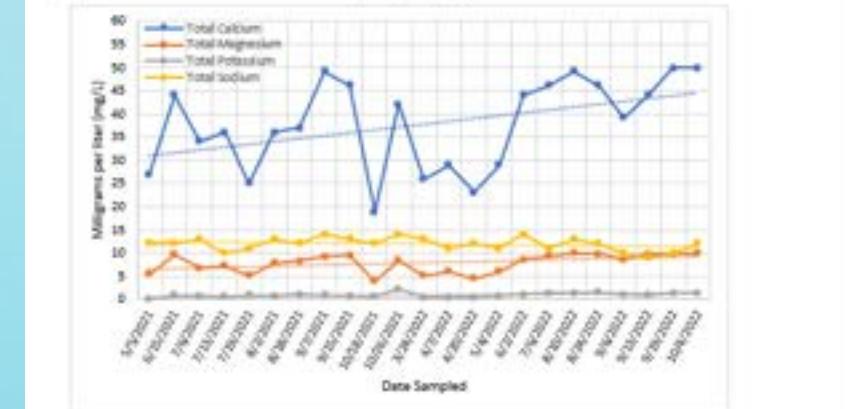


Figure 1.3.1i: Total calcium, total magnesium, total potassium, and total sodium milligrams per liter (mg/L) concentrations from seasonal water quality sampling dates for Stony Brook upstream.

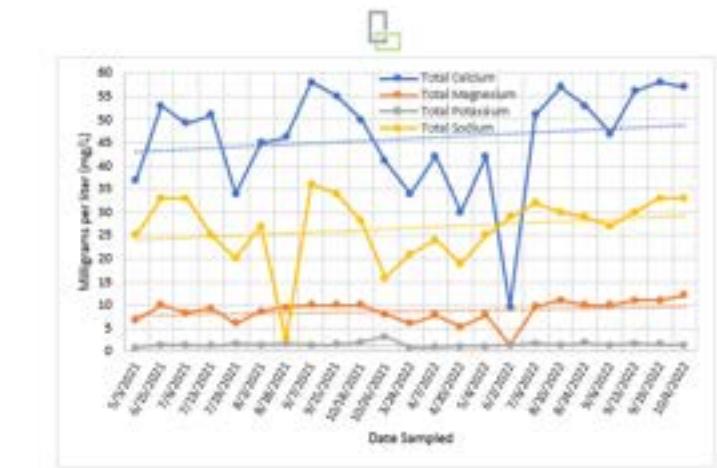


Figure 1.3.1j: Total calcium, total magnesium, total potassium, and total sodium milligrams per liter (mg/L) concentrations from seasonal water quality sampling dates for Stony Brook downstream.

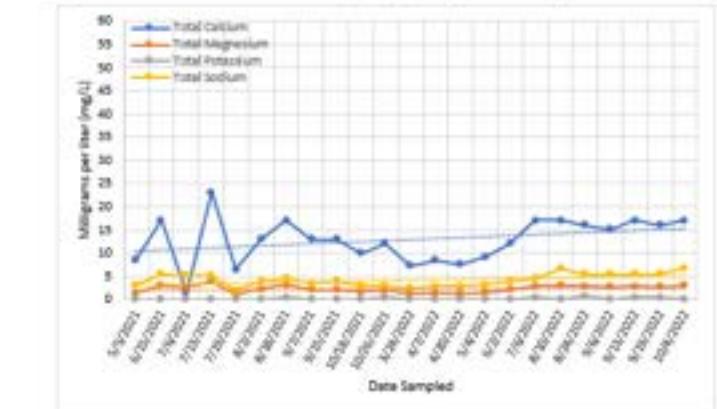


Figure 1.3.1k: Total calcium, total magnesium, total potassium, and total sodium milligrams per liter (mg/L) concentrations from seasonal water quality sampling dates for Mill Brook upstream.

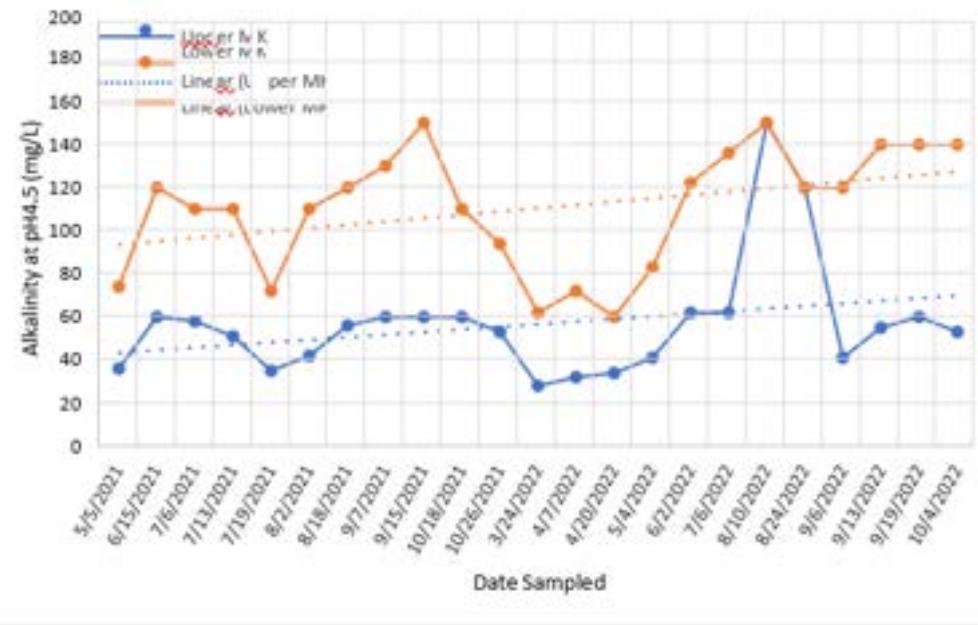


Figure 1.3.1a: Alkalinity at pH 4.5 (mg/L) concentrations from seasonal water quality sampling dates for McKenzie Brook.

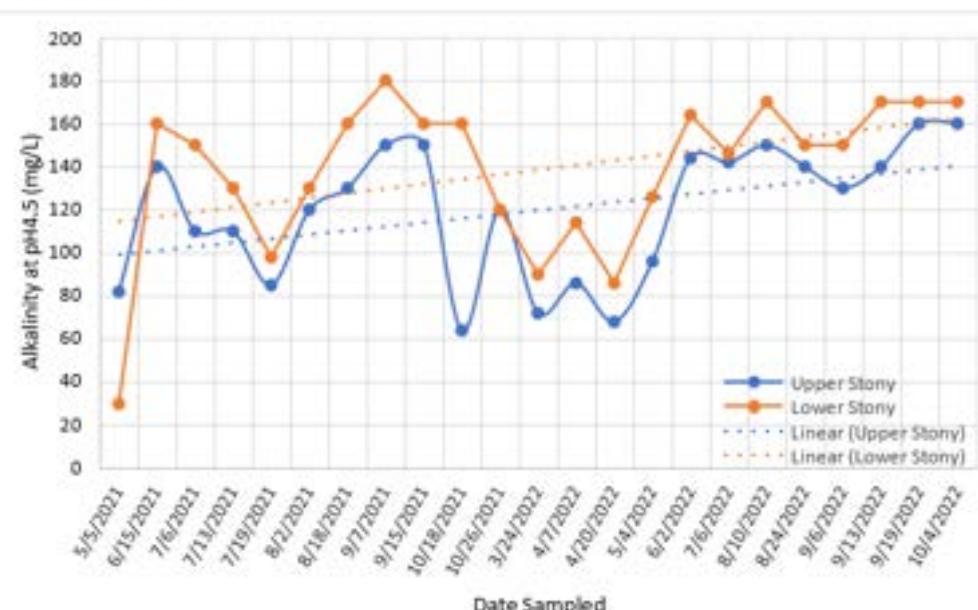


Figure 1.3.1b: Alkalinity at pH 4.5 (mg/L) concentrations from seasonal water quality sampling dates for Stony Brook.

# Alkalinity

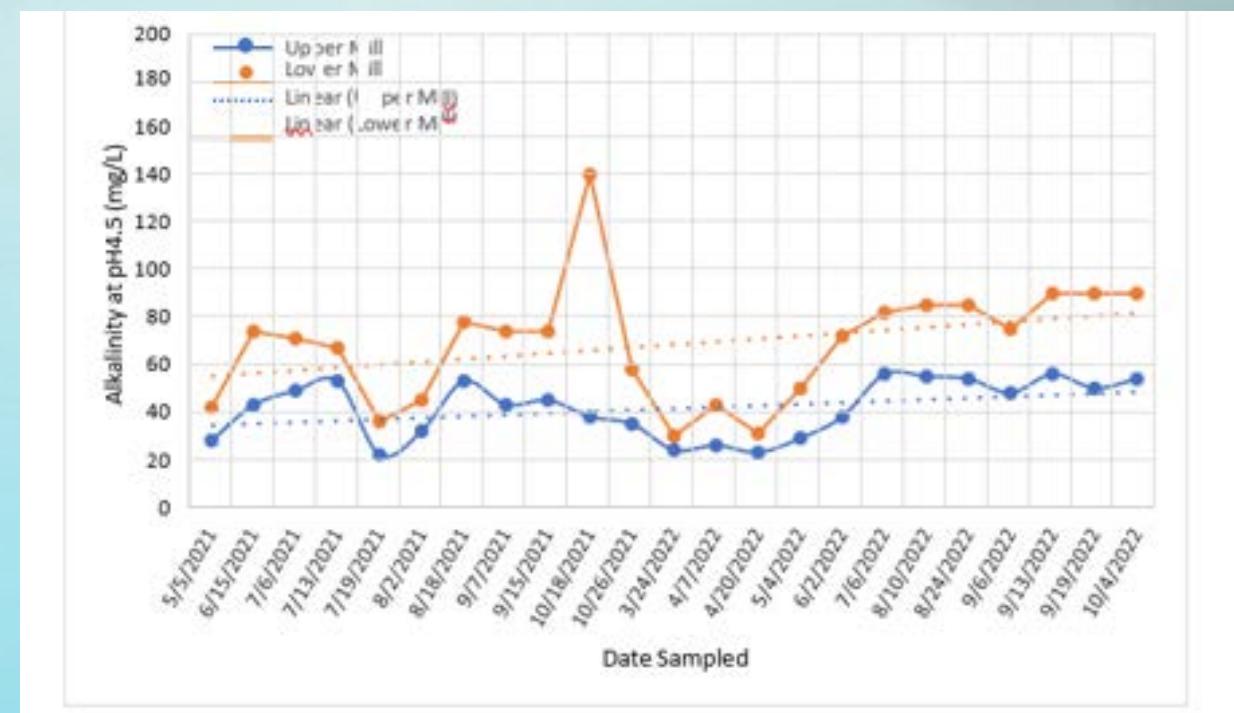


Figure 1.3.1c: Alkalinity at pH 4.5 (mg/L) concentrations from seasonal water quality sampling dates for Mill Brook.

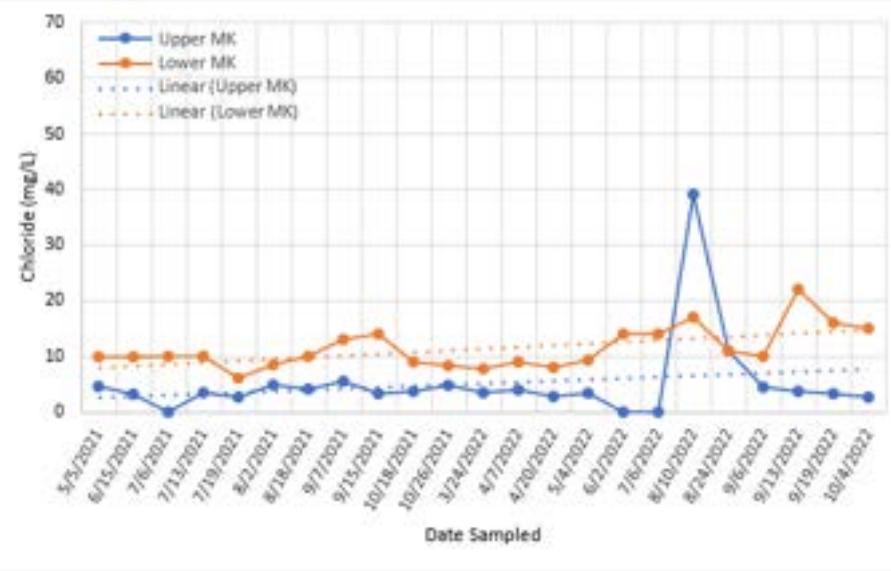


Figure 1.3.1d: Chloride (mg/L) concentrations from seasonal water quality sampling dates for McKenzie Brook.

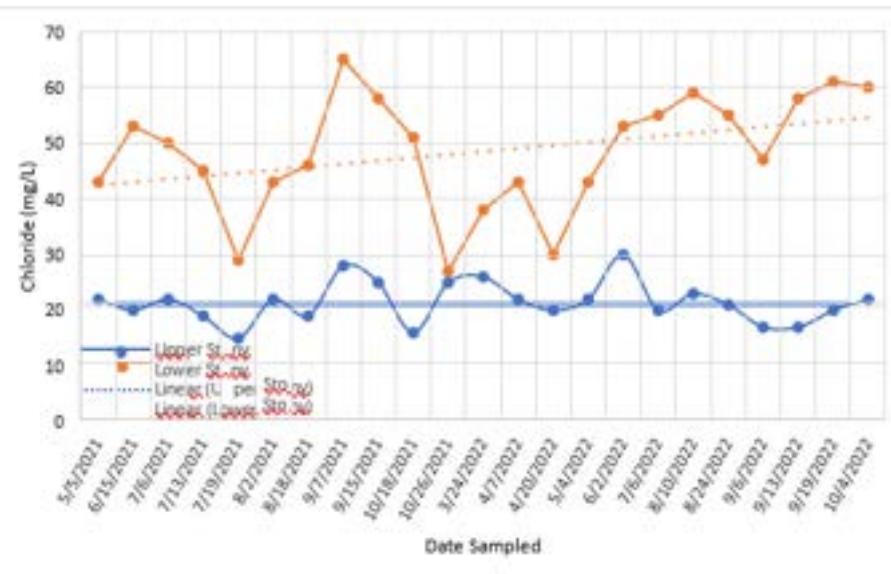


Figure 1.3.1e: Chloride (mg/L) concentrations from seasonal water quality sampling dates for Stony Brook.

# Chloride

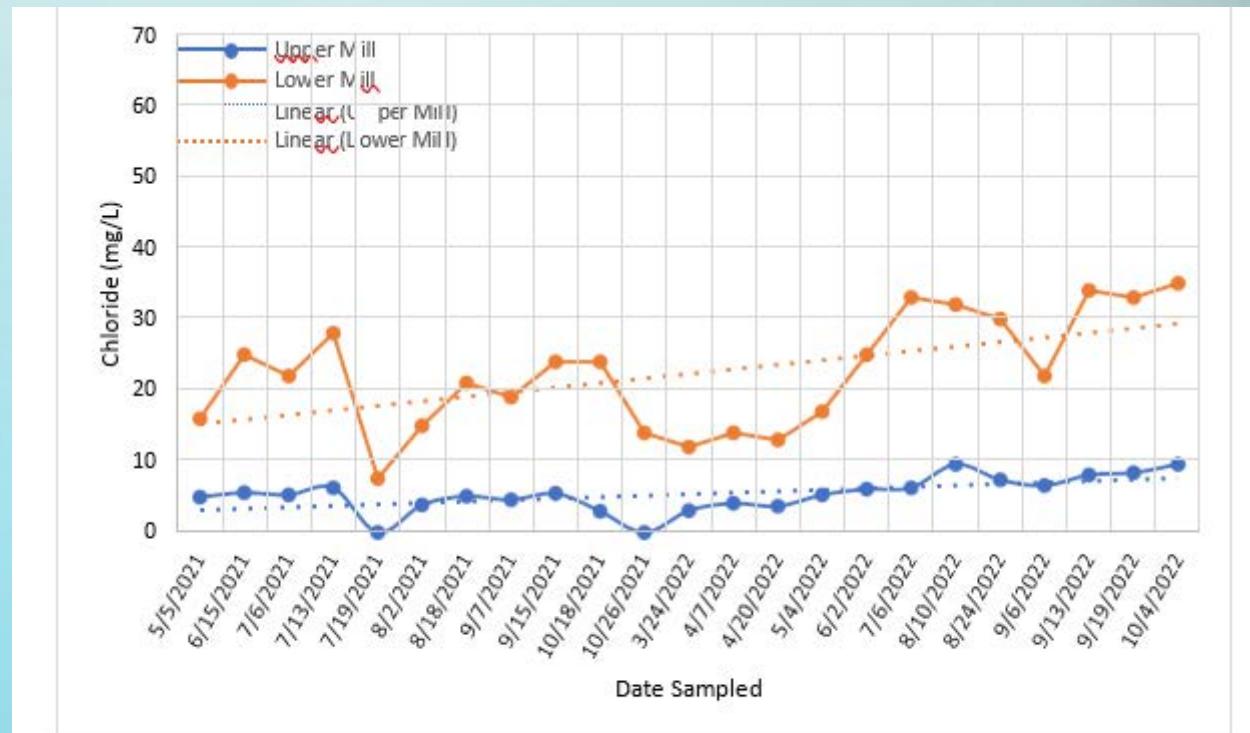
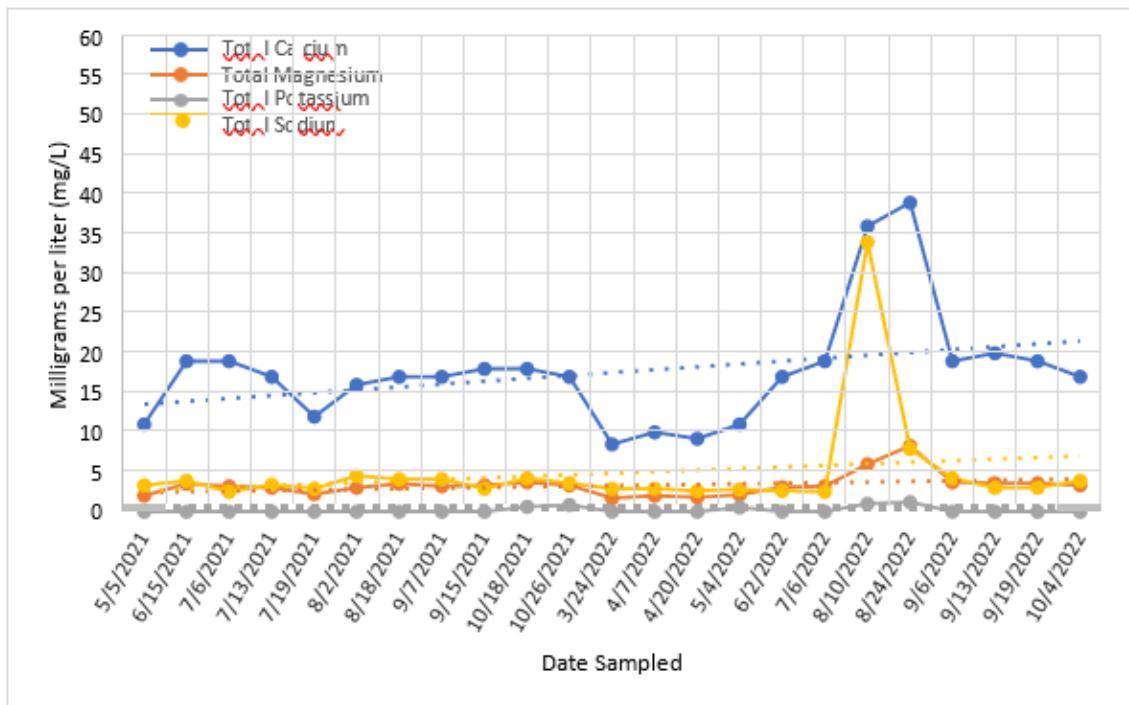
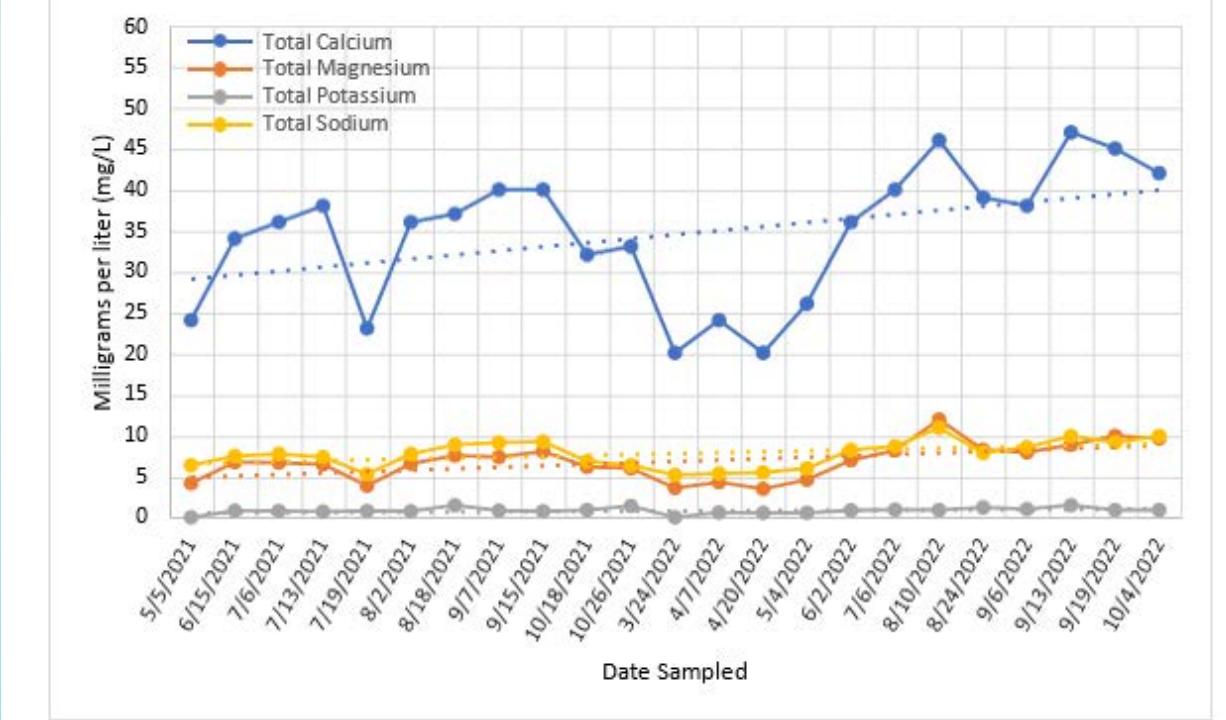


Figure 1.3.1f: Chloride (mg/L) concentrations from seasonal water quality sampling dates for Mill Brook.

# McKenzie Brook: Total Calcium, Magnesium, Potassium and Sodium



McKenzie Brook Upstream



McKenzie Brook Downstream

# Stony Brook: Total Calcium, Magnesium, Potassium and Sodium

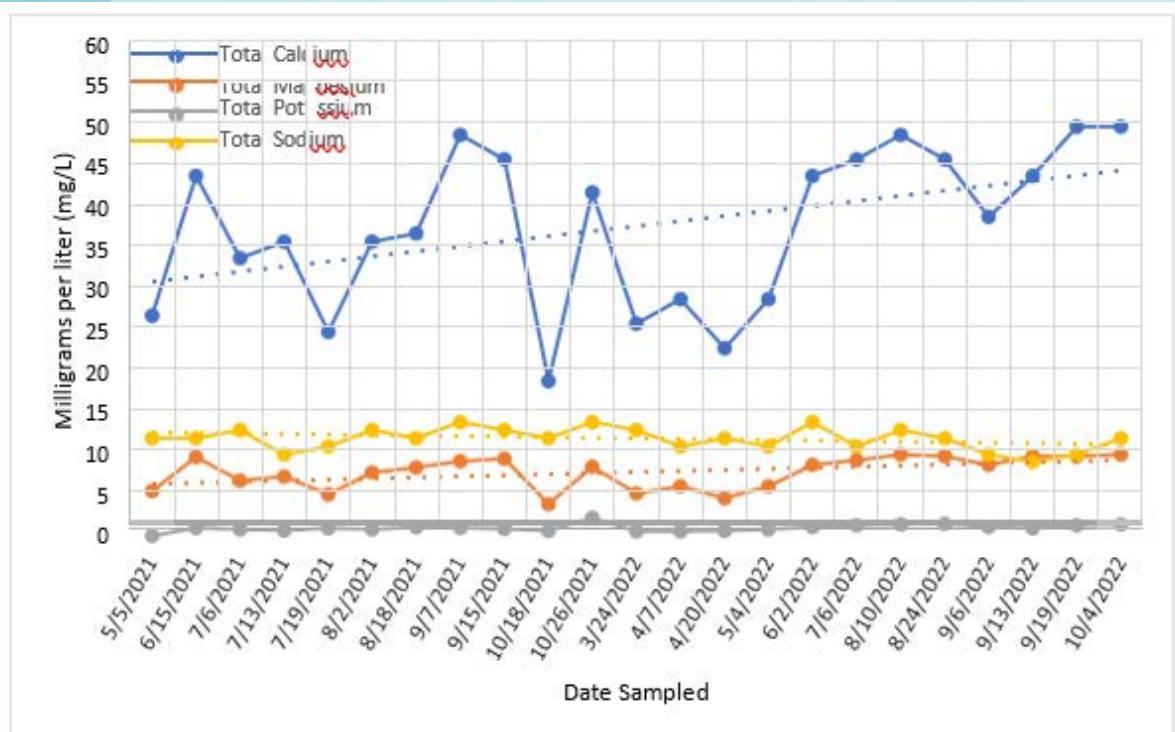


Figure 1.3.1i: Total calcium, total magnesium, total potassium, and total sodium milligrams per liter (mg/L) concentrations from seasonal water quality sampling dates for Stony Brook upstream.

Stony Brook Upstream

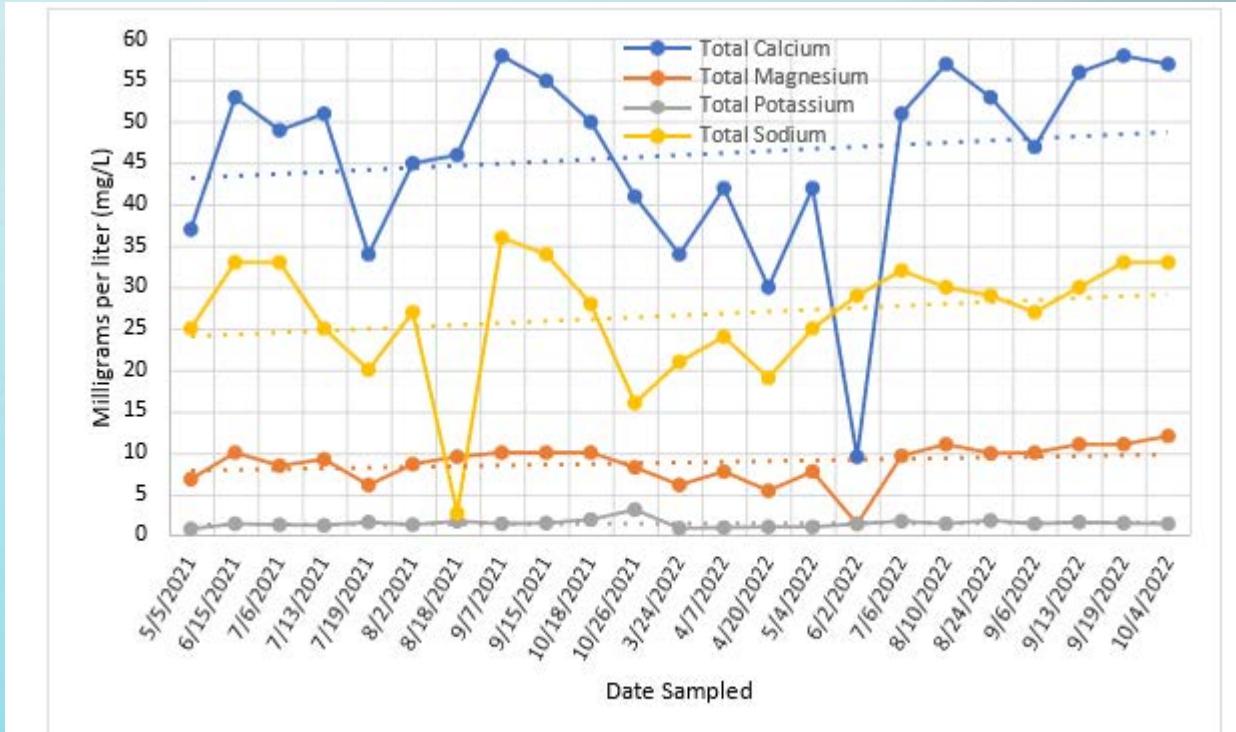


Figure 1.3.1j: Total calcium, total magnesium, total potassium, and total sodium milligrams per liter (mg/L) concentrations from seasonal water quality sampling dates for Stony Brook downstream.

Stony Brook Downstream

# Mill Brook: Total Calcium, Magnesium, Potassium and Sodium

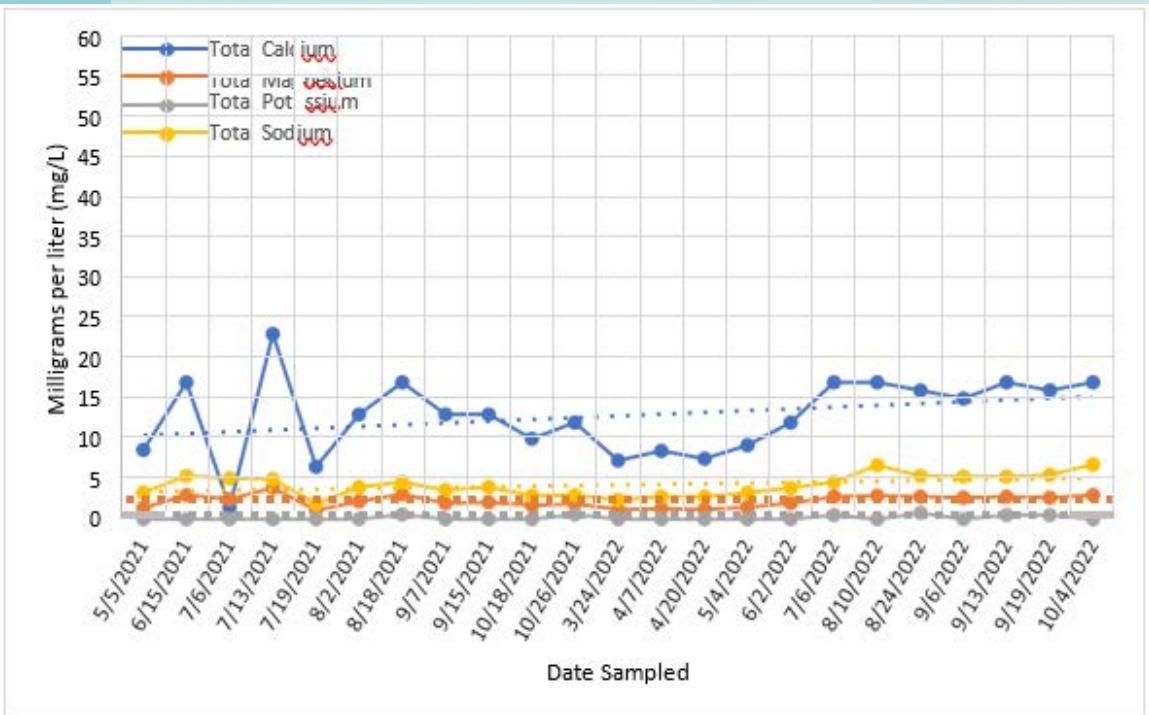


Figure 1.3.1k: Total calcium, total magnesium, total potassium, and total sodium milligrams per liter (mg/L) concentrations from seasonal water quality sampling dates for Mill Brook upstream.

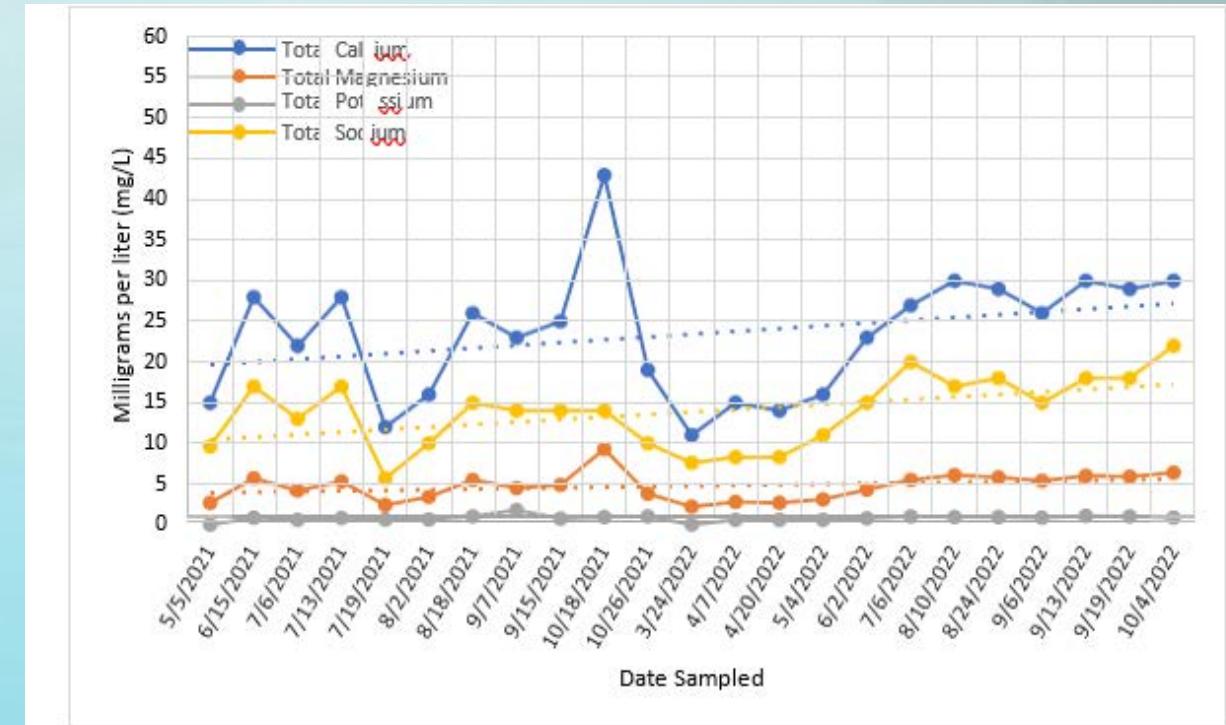
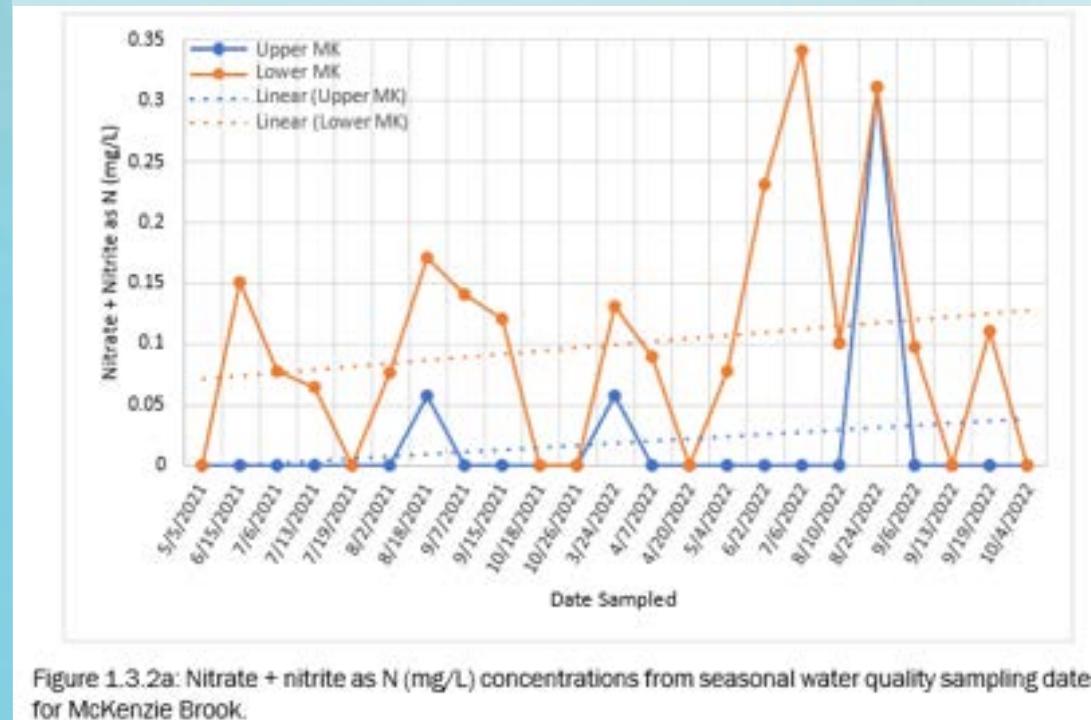
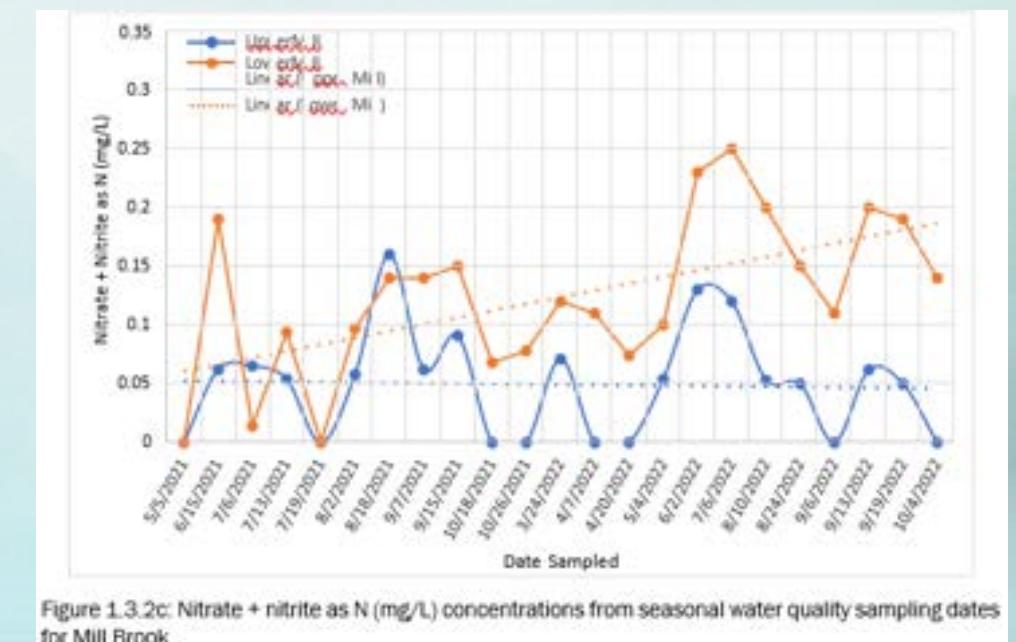


Figure 1.3.1l: Total calcium, total magnesium, total potassium, and total sodium milligrams per liter (mg/L) concentrations from seasonal water quality sampling dates for Mill Brook downstream.

# Nitrate/Nitrite



McKenzie Brook



Mill Brook



Stony Brook

# Mean TKN

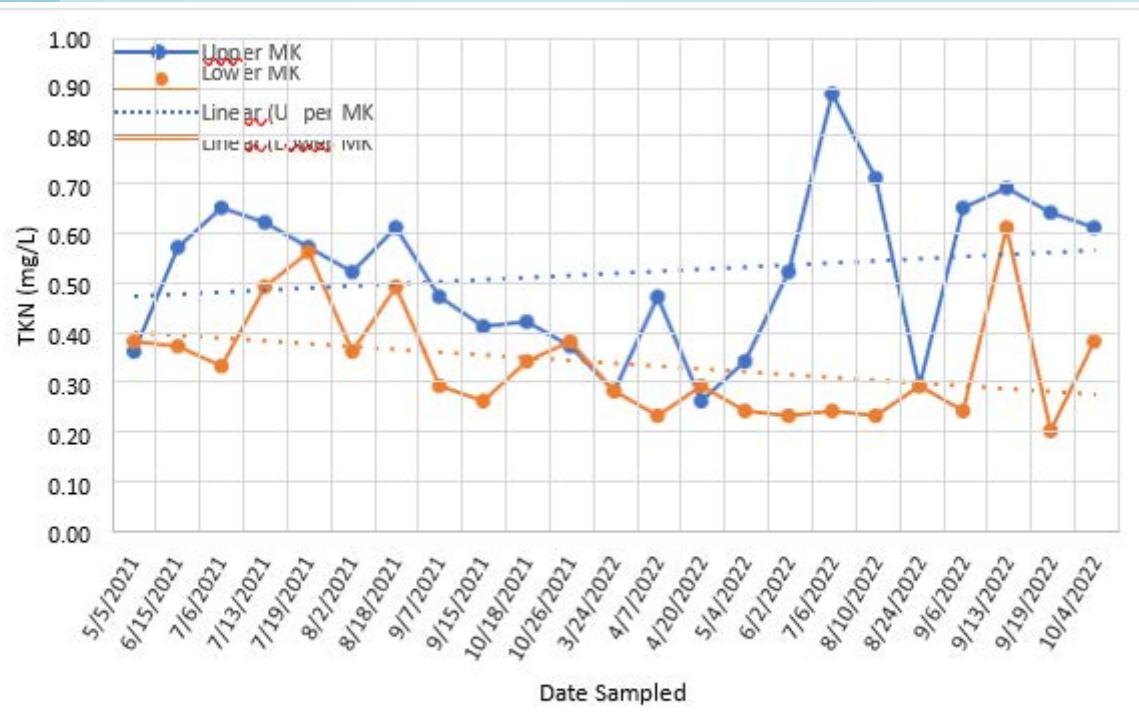


Figure 1.3.2d: TKN (mg/L) concentrations from seasonal water quality sampling dates for McKenzie Brook.

McKenzie Brook

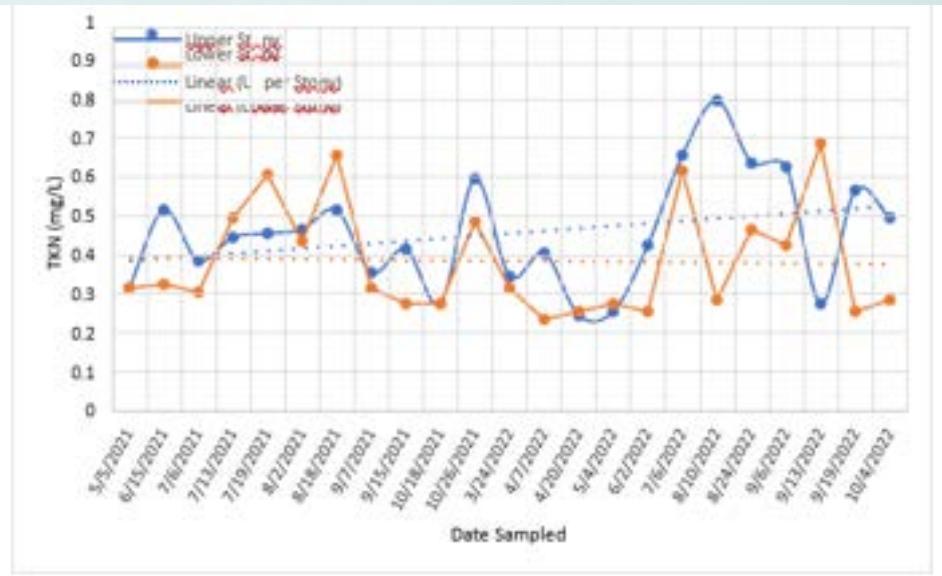


Figure 1.3.2e: Total Kjeldahl nitrogen (mg/L) concentrations from seasonal water quality sampling dates for Stony Brook.

Stony Brook

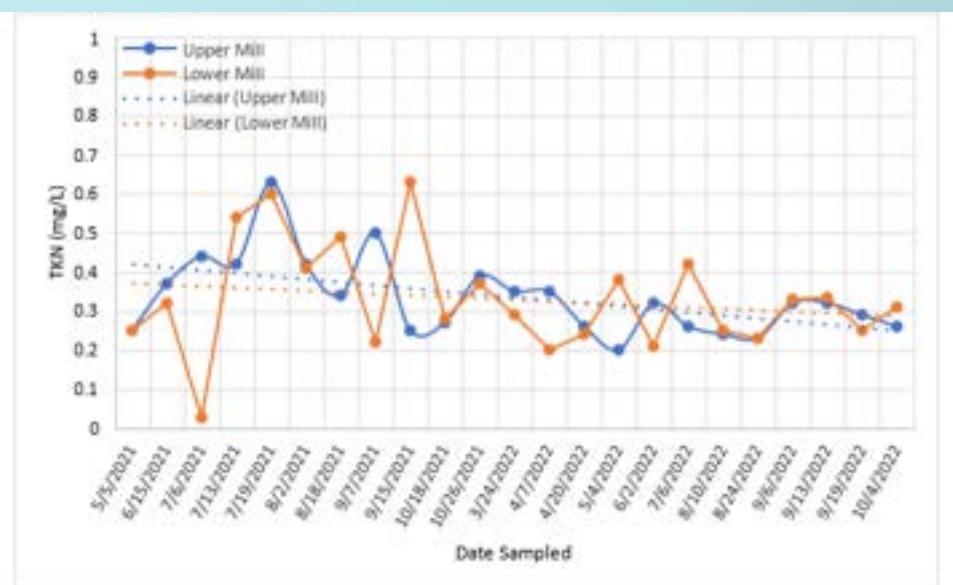


Figure 1.3.2f: Total Kjeldahl nitrogen (mg/L) concentrations from seasonal water quality sampling dates for Mill Brook.

Mill Brook

# Total Nitrogen

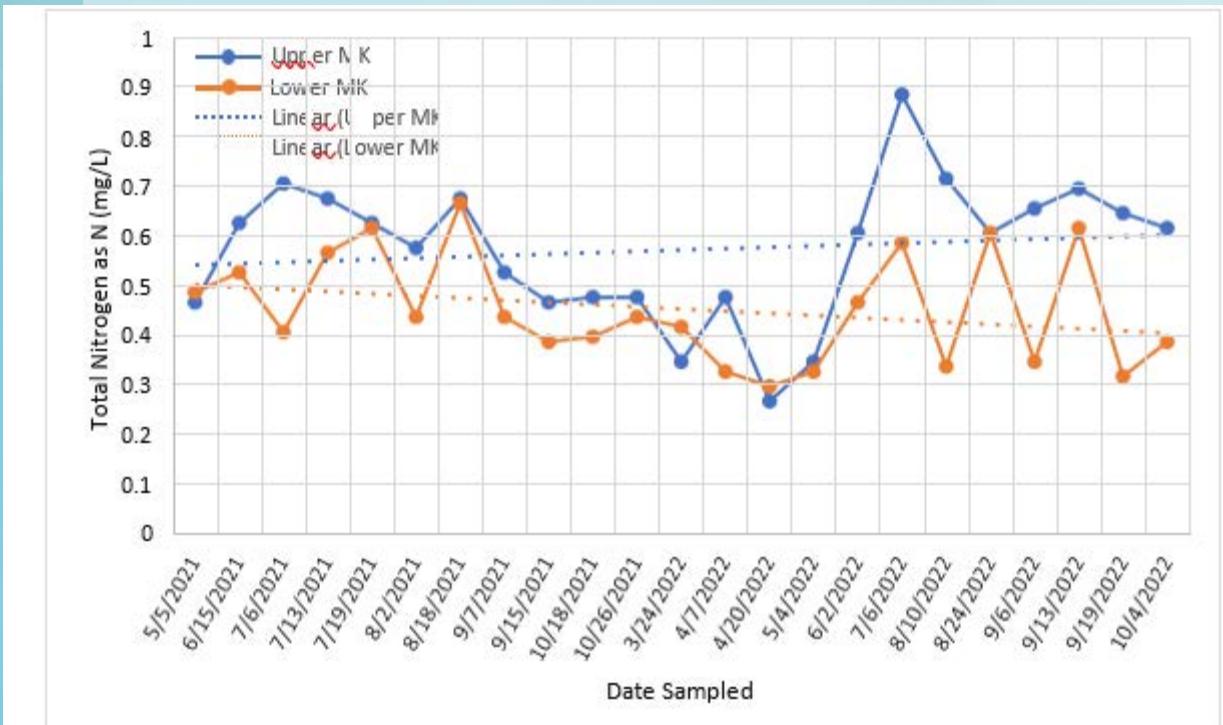


Figure 1.3.2g: Total nitrogen (mg/L) concentrations from seasonal water quality sampling dates for McKenzie Brook.

McKenzie Brook

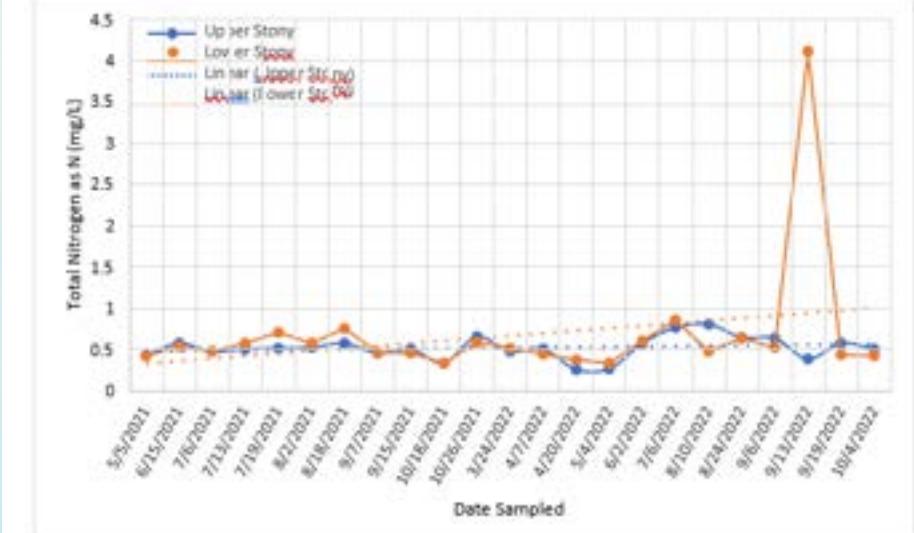


Figure 1.3.2h: Total nitrogen (mg/L) concentrations from seasonal water quality sampling dates for Stony Brook.

Stony Brook

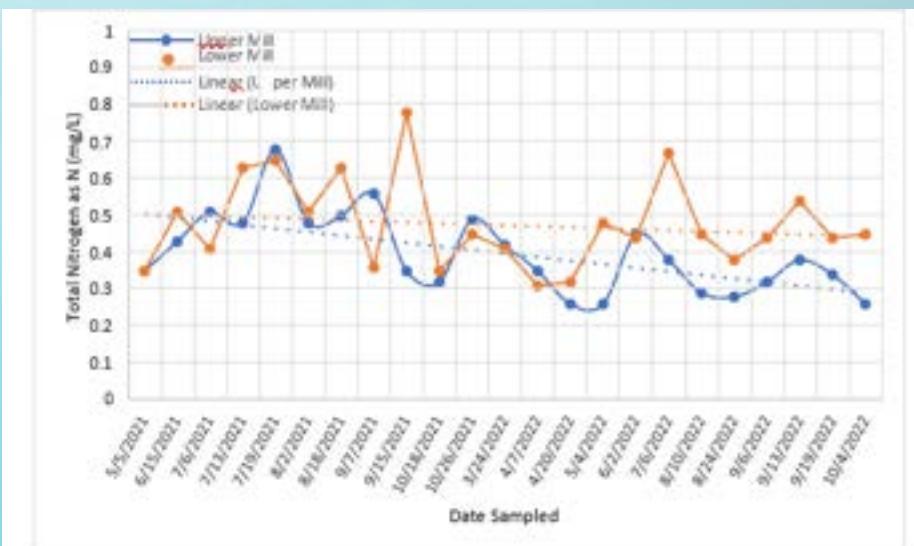
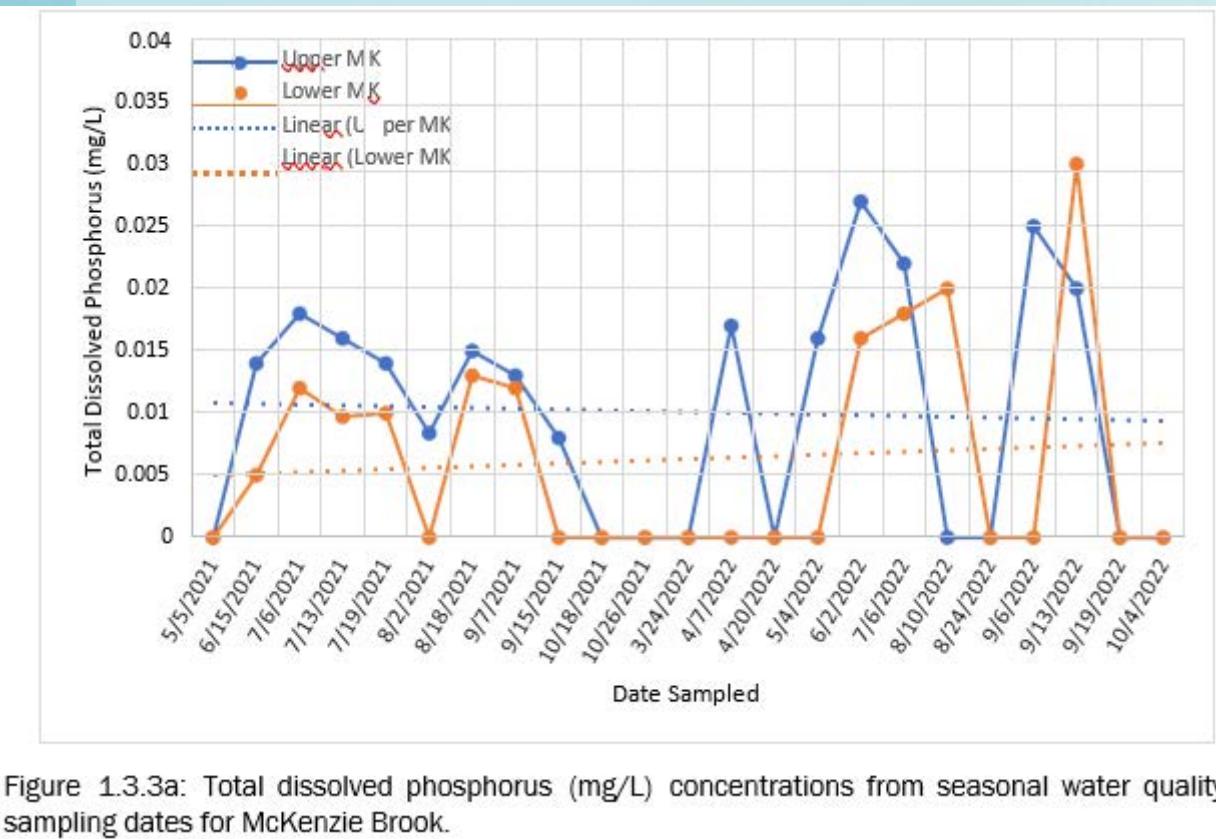


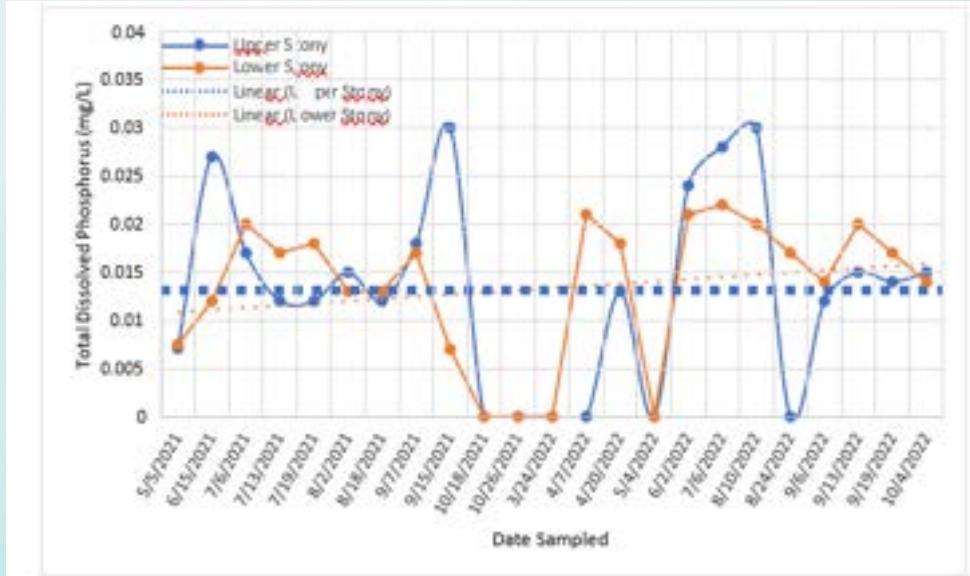
Figure 1.3.2i: Total nitrogen (mg/L) concentrations from seasonal water quality sampling dates for Mill Brook.

Mill Brook

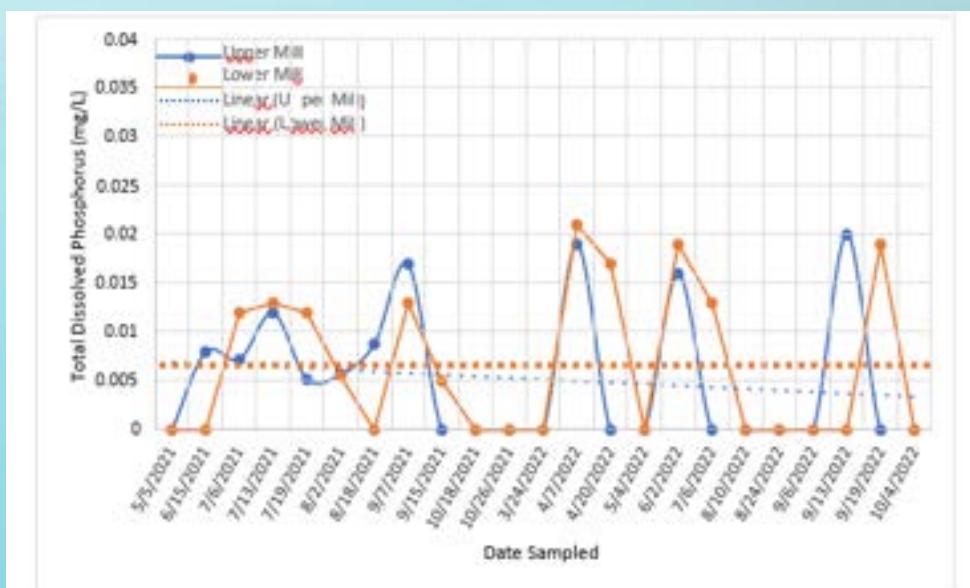
# Total Dissolved Phosphorus



McKenzie Brook

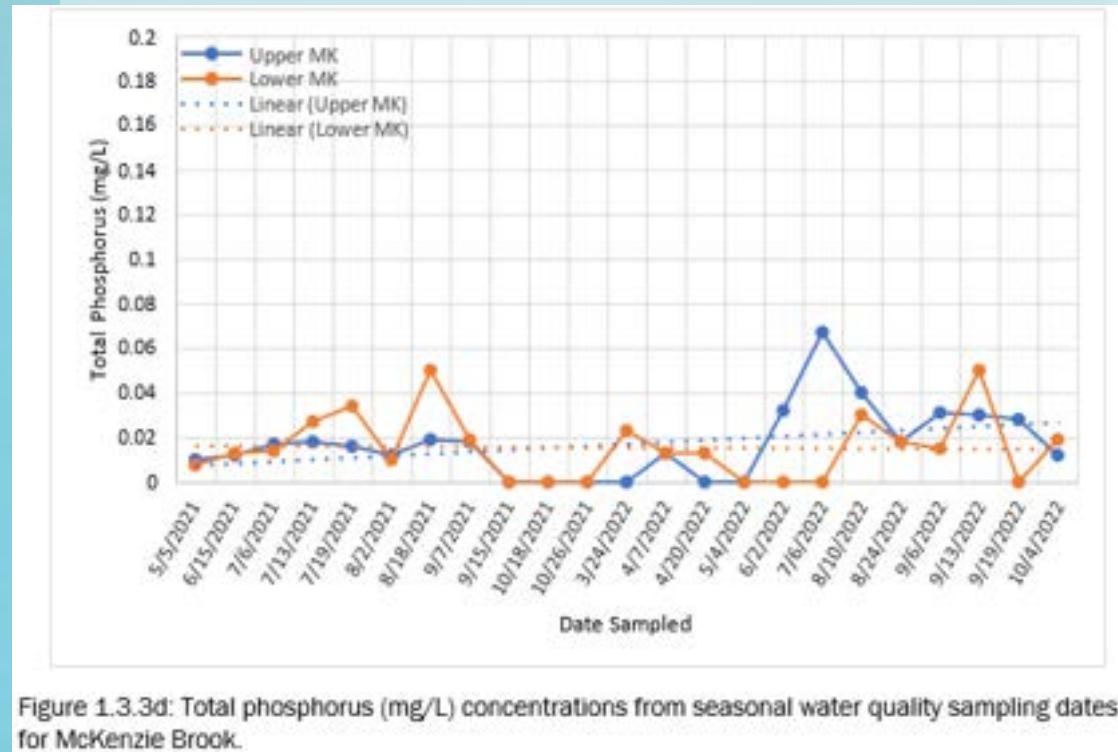


Stony Brook



Mill Brook

# Total Phosphorus



# Total Suspended Solids

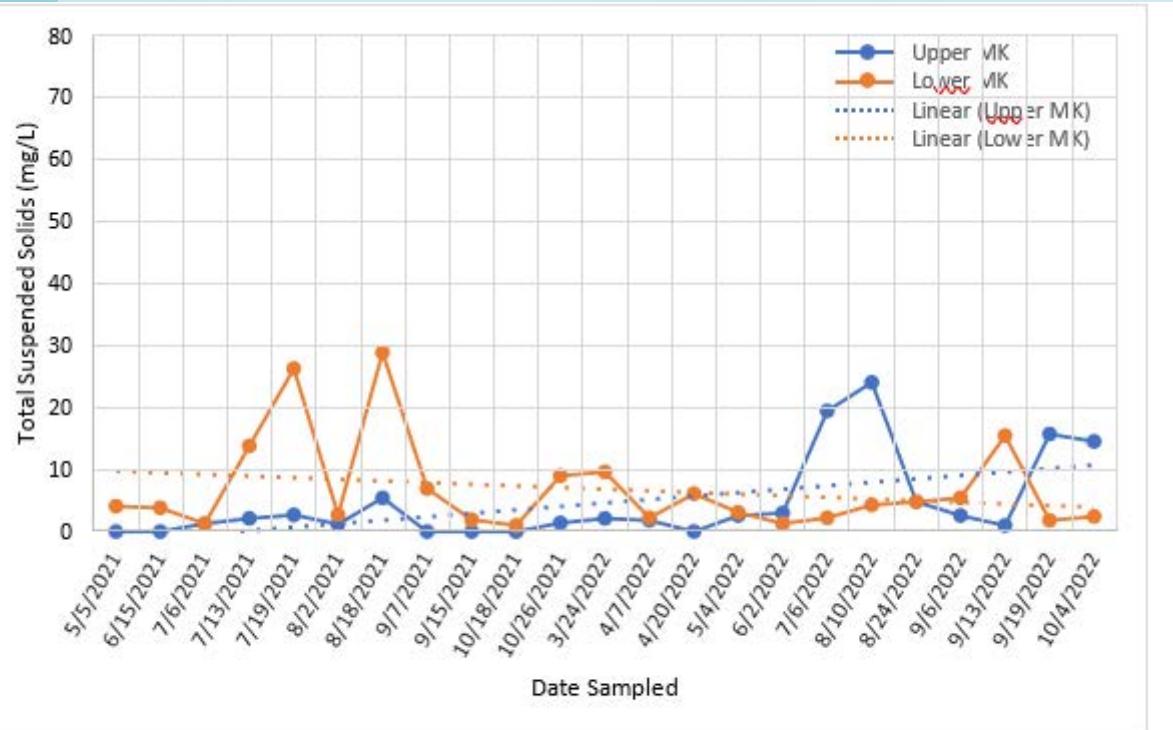


Figure 1.3.4a: Total suspended solids (mg/L) concentrations from seasonal water quality sampling dates for McKenzie Brook.

## McKenzie Brook

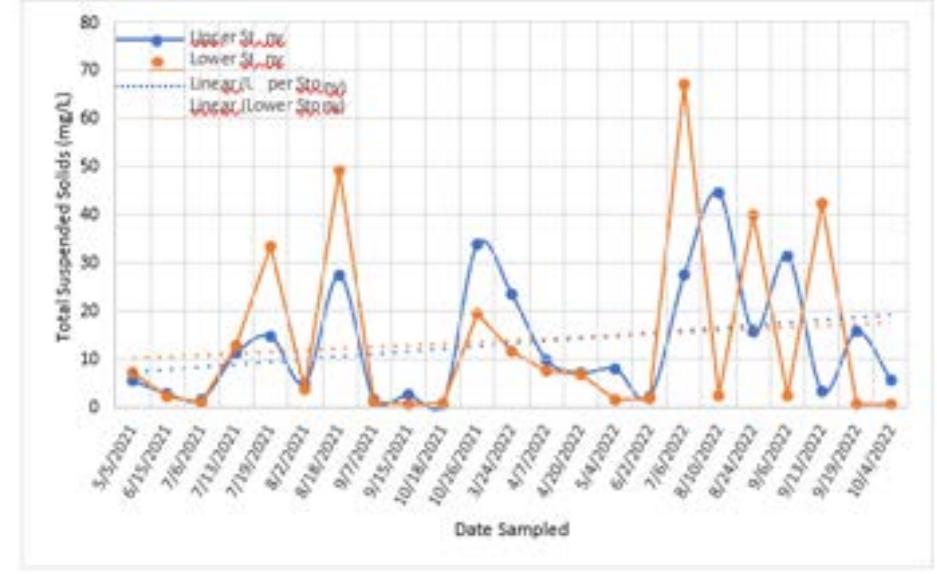


Figure 1.3.4b: Total suspended solids (mg/L) concentrations from seasonal water quality sampling dates for Stony Brook.

## Stony Brook

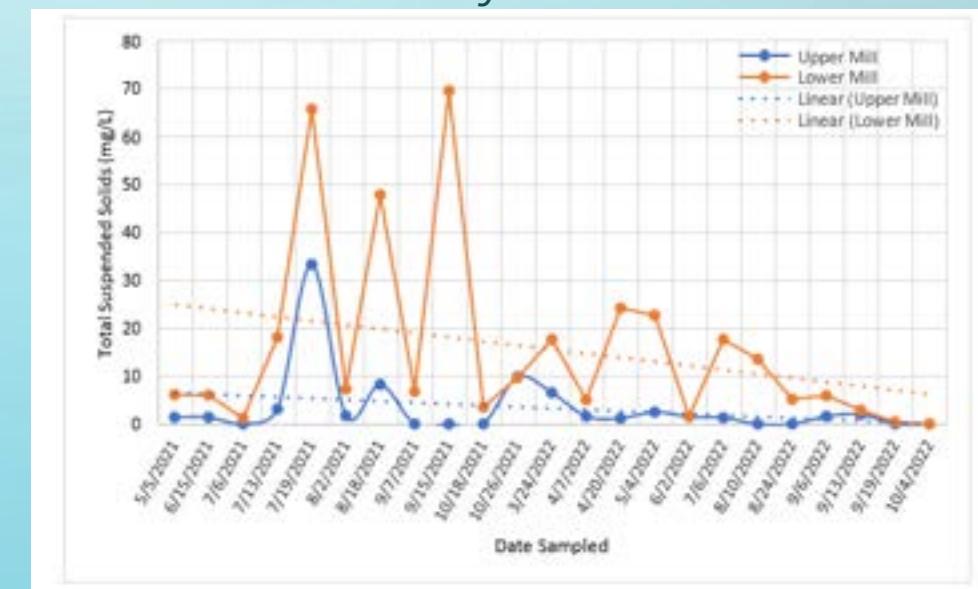


Figure 1.3.4c: Total suspended solids (mg/L) concentrations from seasonal water quality sampling dates for Mill Brook.

## Mill Brook

# Mean Concentration Ranking Of Streams

Parameter (mg/L)	Highest Concentration	Intermediate Concentration	Lowest Concentration
Alkalinity at pH 4.5	Stony Brook	McKenzie Brook	Mill Brook
Chloride	Stony Brook	Mill Brook	McKenzie Brook
Nitrate + Nitrite as N	Stony Brook	Mill Brook	McKenzie Brook
TKN	McKenzie Brook	Stony Brook	Mill Brook
Total Nitrogen as N	McKenzie Brook	Stony Brook	Mill Brook
Total Dissolved Phosphorus	Stony Brook	McKenzie Brook	Mill Brook
Total Phosphorus	Mill Brook	Stony Brook	McKenzie Brook
Total Suspended Solids	Stony Brook	Mill Brook	McKenzie Brook
Total Calcium	Stony Brook	McKenzie Brook	Mill Brook
Total Magnesium	Stony Brook	McKenzie Brook	Mill Brook
Total Potassium	Stony Brook	McKenzie Brook	Mill Brook
Total Sodium	Stony Brook	Mill Brook	McKenzie Brook

# How Can We Assist Our Municipalities?

- Identify and create a prioritized replacement list of culverts and bridges
- Help with grant-funded upgrades to crossings
- Get nuisance crossings into County Hazard Mitigation Plan
  - Will enable faster response and greater likelihood of FEMA assistance for future destructive events



# Aquatic Crossings

- How is our aging infrastructure faring?
- Are the crossings that were built 100 years ago still doing their intended job? Have we learned anything that we can change as we repair and replace structures
- As flood events impact the county with greater frequency, are we keeping up with the changing needs for these structures?
  - When a culvert is replaced, are we making it easier for aquatic organisms to pass by and continue up/downstream?
    - If we replace our manmade barriers with better ones, the Brook Trout and Atlantic Salmon have a greater chance of returning



# How do we know?

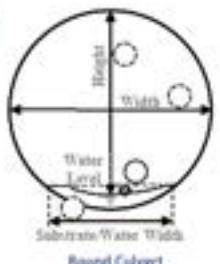
## Structure Shape & Dimensions

- 1) Select the Structure Shape number from the diagrams below and record it on the form for Inlet and Outlet Shape.
- 2) Record on the form in the appropriate blanks dimensions A, B, C and D as shown in the diagrams; C captures the width of water or substrate, whichever is wider; for dry culverts without substrate, C = 0. D is the depth of water – be sure to measure inside the structure; for dry culverts, D = 0.
- 3) Record Structure Length (L). (Record abutment height (E) only for Type 7 Structures.)
- 4) For multiple culverts, also record the Inlet and Outlet shape and dimensions for each additional culvert.

NOTE: Culverts 1, 2 & 4 may or may not have substrate in them, so height measurements (B) are taken from the level of the "stream bed", whether that bed is composed of substrate or just the inside bottom surface of a culvert (grey arrows below show measuring to bottom; black arrows show measuring to substrate).

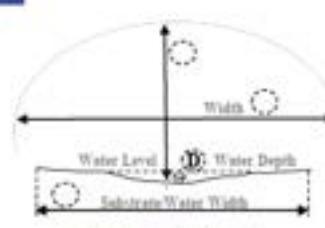
culvert (grey arrows below them measuring to bottom; black arrows show measuring to substrate).

1



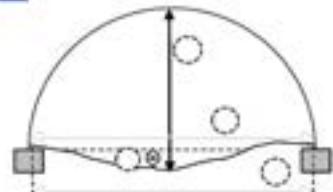
Round Culvert

2



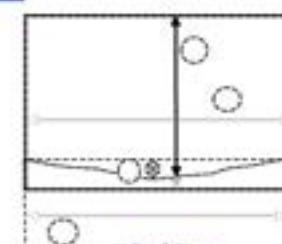
Pipe Arch/Elliptical Culvert

3



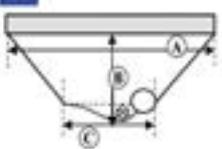
Open Bottom Arch Bridge/Culvert

4



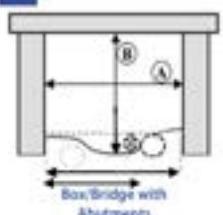
Box Culvert

5



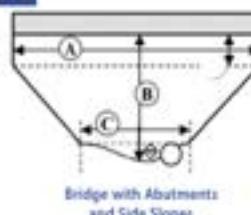
Bridge with Side Slopes

6



Box/Bridge with Abutments

7



Bridge with Abutments and Side Slopes

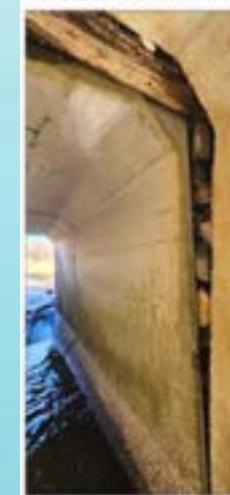
Stream:	NAACC Crossing #:	Structure Type:	Priority Rank:	Priority Points:
McKenzie Brook #11	xy4403007373541475	Multi-Culvert	1	12



Concern:	Crossing Score:
Structural	3 – deformed and inappropriate sizing
AOP	3 – severe limitation for AOP
Catchment	3 – high risk
Flood	3 – high risk

Specifics: McKenzie crossing #11 is a dual-culvert which is undersized and deformed, fails to provide AOP, is a catchment risk for debris, and lies within a flood-prone section of river. While this site has a low risk to the community if it were to fail, it is expected that this crossing would be a lower cost replacement and should be prioritized for future replacement.

Stream:	NAACC Crossing #:	Structure Type:	Priority Rank:	Priority Points:
McKenzie Brook #7	xy4403630773502655	Box Culvert	2	11



Concern:	Crossing Score:
Structural	3 – deformed and fill beginning to fall through gap in structure
AOP	2 – limited AOP
Catchment	3 – debris clearly an issue as removal was necessary to take measurements
Flood	3 – flooded entrance to farm preventing access for days according to farmer

Specifics: McKenzie crossing #7 is a private entrance to a farm. This box culvert was washed away and replaced in July of 2024. The very same box culvert was recovered and reused by the landowner once the flooding subsided. It is expected that this culvert will create issues again, as its replacement already shows signs of structural failure. AOP is reduced and could be improved with an open bottom culvert or bridge. Failure of this structure would prevent access to the farm. It is recommended that this structure be upgraded and replaced.

signs of structural failure. AOP is reduced and could be improved with an open bottom culvert or bridge. Failure of this structure would prevent access to the farm. It is recommended that this structure be upgraded and replaced.

# What Did We Find?

Crossing Number	River	NAACC Crossing Code	Crossing Type	NAACC Evaluation	Road	NAACC Culvert ID	Structure Length (ft)	Structure Height (ft)	Structure Width (ft)	NAACC Priority of Crossing Replacement Score	Aquatic Passability	Constriction Severity	Crossing Condition	Last Checked	Structural Need	AOP	Flood Risk	Catchment risk for debris falls	Community Threat - Consequences for community	Difficulty of replacement (access and expenses)	priority points	rank	
1	McKenzie Brook	xy4403564473461340	Bridge	Minor barrier	Railroad	71415	10.2	4.4	43.5	Low	0.8	none	OK	2019	med	low	high	dangerous	extreme	prohibitively expensive	7	6	
2	McKenzie Brook	xy4403564873461887	Bridge	No barrier	9N	49561	32	6.5	50	Low	0.97	none	OK	2024	low	low	iv. low	low	high--main	high	4	9	
3	McKenzie Brook	xy4403632773471356	Bridge	No barrier	unknown	104942	100	23	34	Low	0.91	minor	OK	2024	OK	low	low	low	old	no need until	4	10	
4	McKenzie Brook	xy4403685773471960	Bridge	Insignificant	Lakeview Rd	37014	30	11.1	14.5	Low	0.87	none	OK	2017	low	low	med	low	low	low	5	8	
5	McKenzie Brook	xy4403593073474091	Bridge	Insignificant	Lakeview Rd	1053366	23	23	34	Low	0.92	none	OK	2024	low	low	low	low	no need until	4	11		
6	McKenzie Brook	xy4402903273486893	Culvert	Severe barrier	Fisk rd	37017	48.5	8.7	14.2	Med	0.09	none	OK	2016	high	high	med	med	med	med	10	7	
7	McKenzie Brook	xy4403630773502655	Box Culvert	Moderate barrier	Sprague dr	105611	23.5	6.5	4.5	High	0.44	severe	poor	2024	high	med	high	high	low	med	13	2	
8	McKenzie Brook	xy4403704373503395	Culvert	Insignificant	S. Moriah rd	37015	29	7	12	Med	0.87	none	OK	2016	low	low	med	low	med	med	5	7	
9	McKenzie Brook	xy4404534773513842	Bridge	Severe barrier	Windy Hill Rd	48268	31.2	4.9	9.1	Med	0	none	OK	2017	med	high	low	med	med	med	8	5	
10	McKenzie Brook	xy4404031373538787	Culvert	Moderate barrier	Windy Hill Rd	37022	29	5.2	8.8	Low	0.52	none	OK	2016	med	med	high	high	low	med	10	6	
11	McKenzie Brook	xy4403007373541475	Multi-Culv	Severe barrier	Mutton hole	37021	35	2	2	High	0.19	minor	OK	2016	high	high	high	high	low	low	12	1	
1	Mill Brook	xy4405131773452480	Bridge	Insignificant	Dock Ln	37016	25.5	4.8	10.7	Low	0.94	none	OK	2016	low	low	med	med	low	med	8	10	
2	Mill Brook	xy4405176673455522	Bridge	Insignificant	Railroad	71320	16	9	41.5	High	0.94	none	OK	2019	low	low	med	high	dangerous	extreme	6	8	
3	Mill Brook	xy4405246673455702	Bridge	No barrier	Dock St	49563	25	5	30	Low	0.95	minor	OK	2024	low	low	med	med	low	med	5	9	
4	Mill Brook	xy4405387973456526	Bridge	No barrier	N Main St	49562	40	33	150	Low	0.87	none	OK	2024	none	low	none	none	high--main	extreme	4	18	
5	Mill Brook	xy4404948373467952	Bridge	No barrier	Stone St	49564	25	12	30	Low	0.99	none	OK	2024	low	low	med	low	med	med	5	11	
6	Mill Brook	xy4404862773475349	Bridge	old dam cross	Petro's RV	71321	16.5	23.5	85	High - i	0.94	minor	poor	2024	dangerous	low	low	low	med	med	dangerous	public danger	10
7	Mill Brook	xy4405104473478883	Culvert	Insignificant	Private (For	70322	13	10.3	30.1	Low	0.87	none	OK	2019	med	low	med	high	low	med	5	5	
8	Mill Brook	xy4405267573479558	Bridge	No barrier	Forge Holl	49360	18	12	18	Low	0.83	none	OK	2024	low	med	high	med	med	high	8	6	
9	Mill Brook	xy4406152973507947	Bridge	No barrier	Titus Rd	47296	30	16.5	70	Low	0.96	none	new	2024	low	low	low	high	main	high	4	15	
10	Mill Brook	xy4406142373510011	Bridge	No barrier	Witherbee	47295	40	13.6	32	Low	0.91	none	OK	2024	low	low	low	high	main	high	4	14	
11	Mill Brook	xy4405698873527925	Bridge	Insignificant	before furn	105257	16.2	7.5	14	Low	0.9	minor	OK	2024	med	low	med	med	low	med	7	2	
12	Mill Brook	xy4405341573539193	Bridge	Insignificant	Driveaway -	62314	13	7.5	21	High	0.97	none	OK	2018	high	med	high	high	low	low	11	4	
13	Mill Brook	xy4405291973542738	Bridge	Minor barrier	old overgro	105246	12	4	13.5	High	0.62	severe	poor	2024	med	high	high	high	low	med	11	1	
14	Mill Brook	xy4405274673550602	Bridge	Insignificant	Crowfoot rd	36892	31	6.8	25.5	Low	0.95	none	OK	2015	low	low	low	low	low	high	4	16	
15	Mill Brook	xy4405007073556133	Bridge	Minor barrier	Unknown	105255	14.2	5	23	Low	0.96	none	new	2024	low	low	med	low	low	med	5	12	
16	Mill Brook	xy4403967673566439	Bridge	Insignificant	Ensign Pond	105247	30	14.5	56.5	Med	0.95	none	new, thou	2024	low	low	low	high	main	high	4	17	
17	Mill Brook	xy4403890873573004	Multi-Culv	Minor barrier	Ensign pond	36893	60	5.6	5.6	High	0.72	none	poor	2016	high	med	high	high	low	low	11	6	
18	Mill Brook	xy4403709873586892	Bridge	Insignificant	unnamed	105256	12	6.7	11	Low	0.89	none	new	2024	low	low	med	low	low	med	5	13	
19	Mill Brook	xy4403568173597615	Culvert	Minor barrier	Ensign Pond	105248	40	5.6	12	High	0.58	severe	poor	2024	high	med	high	high	med	med	11	2	
1	Stony Brook	xy4403886873460453	Culvert	Minor barrier	Harbour Ln	48609	250	5	6	Med	0.73	moderate	OK	2017	high	med	high	high	med	med	11	4	
2	Stony Brook	xy4403892073461390	Bridge	Insignificant	Railroad	71414	10	5	11	High	0.94	none	OK	2019	med	med	med	high	dangerous	extreme	9	12	
3	Stony Brook	xy4403891973461782	Bridge	Insignificant	Main st	37011	44	6	8	High	0.95	none	OK	2016	high	med	med	high	low	med	10	20	
4	Stony Brook	xy4403831173466611	Culvert	Severe barrier	Bridge st	37018	40	6.6	9.3	High	0.09	none	OK	2016	dangerous	med	high	med	high	med	dangerous	10	1
5	Stony Brook	xy4403830073469778	Bridge	Insignificant	Unnamed rd	51492	6.5	9.2	13.1	Med	0.91	moderate	poor	2024	dangerous	med	low	high	low	med	dangerous	10	1
6	Stony Brook	xy4404518673474307	Culvert	Insignificant	Golf course	105258	14	2.6	3.2	High	0.85	none	poor	2024	high	med	high	high	low	low	11	6	
7	Stony Brook	xy4404435673473875	Culvert	Moderate barrier	Golf course	105250	23.4	3.1	2.9	High	0.42	severe	deformation	2024	high	med	high	high	low	low	11	8	
8	Stony Brook	xy4404309673474126	Culvert	Minor barrier	Golf course	105260	12	3.1	3	High	0.6	none	poor	2024	high	med	high	high	low	low	11	5	
9	Stony Brook	xy4404189473474140	Culvert	Moderate barrier	Golf course	105261	39.6	4	4	High	0.41	none	poor	2024	high	med	high	high	low	low	11	2	
10	Stony Brook	xy4404240173474016	Culvert	Minor barrier	Golf course	105262	14	2.8	2.9	High	0.62	none	poor	2024	high	med	high	high	low	low	11	1	
11	Stony Brook	xy4404538473475399	Culvert	Severe barrier	Golf Course	48596	176	8	7.9	low	0.45	severe	moderate	2024	low	high	high	high	extreme	extreme	10	11	
12	Stony Brook	xy4404685473479540	Culvert	Moderate barrier	Viking Ln	104941	242	6.1	5	low...fl	0.48	severe	new	2024	high	high	high	high	extreme	extreme	13	1	
13	Stony Brook	xy4404886273487578	Culvert	Severe barrier	Tarbell hill	37013	80	6	5.8	High	0.01	none	OK	2016	high	high	high	high	med	low	13	1	
prohibitively expensive																							
danger to public																							
top priority																							
medium priority																							
low priority																							

Crossing Number	River	NAACC Crossing Code	Crossing Type	Points in ranking	Priority Rank
11	McKenzie Brook	xy4403007373541475	Multi-Culvert	12	1
7	McKenzie Brook	xy4403630773502655	Box Culvert	11	2
6	McKenzie Brook	xy4402903273486893	Culvert	10	3
10	McKenzie Brook	xy4404031373538787	Culvert	10	4
9	McKenzie Brook	xy4404534773513842	Bridge	8	5
4*	McKenzie Brook	xy4403685773471960	Bridge	5	6
8	McKenzie Brook	xy4403704373503395	Culvert	5	7
1	McKenzie Brook	xy4403564473461340	Railroad Bridge	7	8
2	McKenzie Brook	xy4403564873461887	Bridge	4	9
3	McKenzie Brook	xy4403632773471356	Bridge	4	10
5	McKenzie Brook	xy4403593073474091	Bridge	4	11
6	Mill Brook	xy4404862773475349	Bridge	danger (6)	public danger
13	Mill Brook	xy4405291973542738	Bridge	11	3
17*	Mill Brook	xy4403890873573004	Multi-Culvert	11	2
19	Mill Brook	xy4403568173597615	Culvert	11	3
12	Mill Brook	xy4405341573539193	Bridge	11	4
7	Mill Brook	xy4405104473478881	Culvert	8	5
8	Mill Brook	xy4405267573479558	Bridge	8	6
11	Mill Brook	xy4405698873527925	Bridge	7	7
2	Mill Brook	xy4405176673455522	Railroad Bridge	6	8
3	Mill Brook	xy4405246673455702	Bridge	6	9
1	Mill Brook	xy4405131773452480	Bridge	6	10
5	Mill Brook	xy4404948373467952	Bridge	5	11
15	Mill Brook	xy4405007073556133	Bridge	5	12
18	Mill Brook	xy4403709873586892	Bridge	5	13
10	Mill Brook	xy4406142373510011	Bridge	4	14
9	Mill Brook	xy4406152973507947	Bridge	4	15
14	Mill Brook	xy4405274673550602	Bridge	4	16
16	Mill Brook	xy4403967673566439	Bridge	4	17
4	Mill Brook	xy4405387973456526	Bridge	4	18
5	Stony Brook	xy4403830073469778	Bridge	danger (3)	public danger
12	Stony Brook	xy4404685473479540	Culvert	12	1
13	Stony Brook	xy4404886273487578	Culvert	12	2
9	Stony Brook	xy4404189473474140	Culvert	11	3
10	Stony Brook	xy4404240173474016	Culvert	11	4
8	Stony Brook	xy4404309673474126	Culvert	11	5
7	Stony Brook	xy4404435673473875	Culvert	11	6
6	Stony Brook	xy4404518673474307	Culvert	11	7
4	Stony Brook	xy4403831173466611	Culvert	11	8
1	Stony Brook	xy4403886873460453	Culvert	11	9
3	Stony Brook	xy4403891973461782	Bridge	10	10
11	Stony Brook	xy4404538473475399	Culvert	10	11
2	Stony Brook	xy4403892073461390	Railroad Bridge	9	12

**LEGEND**

Culverts were replaced in 2024 after surveyed\*

- Low
- Moderate
- High
- Danger
- Expensive

# Prioritization of Crossing Replacements



# Quality Assurance

- QAPP – Quality Assurance Project Plan
- ELAP – Environmental Laboratory Approval Program (Endyne)
- VT Stream Protocols
- Technical Advisory Committee



# Potential Projects Identified by Staff

- Implement more permeable surfaces in and around Moriah to reduce surface water runoff
- Remove impermeable structures from the streams where feasible ex: concrete, old metal pipes
- Improve riparian buffers in the more developed sections of the watershed
- Along streams/beaches in the watershed post signage showing what common invasive species look like and how to ID them compared to native species
- Continue to support boat washing/boat inspection initiatives in the ADK Park
- Remove invasive/non-native species along stream banks, start a yearly program to identify, monitor and remove dense beds of invasive vegetation
- Plant more native species along stream banks
- Educate and place signage along Mill and McKenzie Brook next to the campground to encourage people not to pollute the lake/stream
- Educate Town officials and landowners along the streams in this study on ecological benefits of not mowing right up to the stream/brook
- Restoration and protection of wetlands inside the PHSS watershed area
- Address and potentially replace any undersized culverts
- Promote cover crop and soil health practices to the farmers located within the watersheds to reduce erosion and soil run off from farms down to the streams and lake
- Implement best management practices in roadside drainage maintenance to prevent sediment loading into waterways and Lake Champlain.
- Continue long-term water quality monitoring across the watershed
- Completion of Certified Nutrient Management Plans (CNMP) for farms located within the watershed and implement best management practices identified in the those plans.
- Install catch basins to remove debris and sediment around railroad bridges
- Create and complete a hamlet stormwater assessment and management plan for the Town of Moriah in the Port Henry area
- As part of a NYS Local Waterfront Revitalization Program grant, develop a watershed wide green infrastructure plan to address open space protection, also advocate for low impact development going forward
- Continue to coordinate conservation and cleanup efforts between the Town/public and private landowners
- Restore spawning fish habitat where possible in Lake Champlain's tributaries
- Work to protect and secure vernal pools that exist in the transitional areas between the wetlands and wooded areas
- Where feasible, maintain consistent water levels during peak freshwater bird nesting season
- Promote the use of the "NY iMapInvasives" app to the public for mapping and identifying potential invasive species. Also educate the public on how the app works and how to use it properly
- Set up a flow monitoring gage at the downstream sample locations to track changes in water level and water flow
- The Town could consider local standards for stormwater management

# Programs

- Obstruction Investigation and Removal
- Riparian Buffer Program
- Invasive Species Management
- Education and Outreach
- Disadvantaged Community Engagement



Thank you

QUESTIONS?

