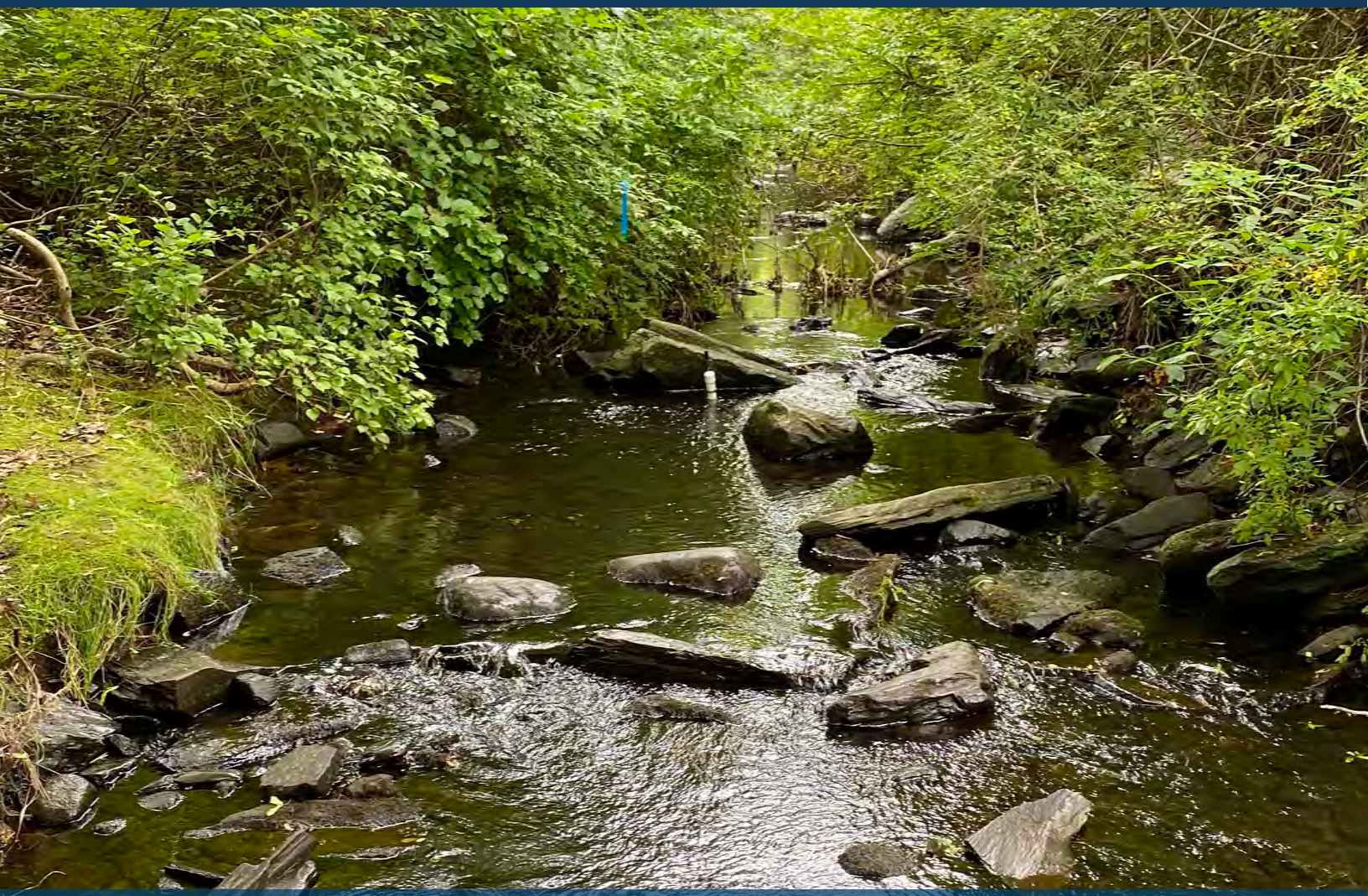

Maidford River Restoration Pilot Project

Baseline Conditions Report
Maidford River

TRC

New England neefc Environmental Finance Center

SNEP NETWORK

September 2023

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APPENDICES

Appendix A 200-Foot Buffer Land Use Figures

The Southeast New England Program Network

The Southeast New England Program (SNEP) Network brings together local environmental organizations, academic institutions, regional planners, and consultants who collaborate to provide municipalities, tribes and organizations in Rhode Island and Southeast Massachusetts access to free training and technical assistance to advance stormwater management, ecological restoration, and sustainable financing goals. The SNEP Network is administered by the New England Environmental Finance Center through cooperative agreement with the US Environmental Protection Agency.

The SNEP Network worked in partnership with the Town of Middletown and Aquidneck Land Trust to advance restoration of the Maidford River - documenting the process to serve as a key resource to demonstrate best practices for improving Southeast New England's water resources. To advance the restoration project, the SNEP Network provided partner services (Elizabeth Scott Consulting and Save the Bay) to support project management, wetlands mapping, funding/financing assistance, communications, and community engagement (including direct outreach to property owners) from Summer 2020 through Winter 2022. The SNEP Network also provided consultant services from its pre-approved consultant pool. Fuss & O'Neill provided support on the design and engineering of the river and floodplain restoration project. TRC Environmental Corporation prepared the Quality Assurance Project Plan, collected the specified watershed condition data and prepared the Maidford River Restoration Project Baseline Monitoring Report and Maidford River Watershed Condition Report.

Find out more about the SNEP Network at www.snepnetwork.org.

Disclaimer

The SNEP Network is administered by the New England Environmental Finance Center at the University of Southern Maine, UMaine System.

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Executive Summary

The Maidford River is a highly-altered, small low-gradient coastal stream located on Aquidneck Island in lower Narragansett Bay. The Maidford River watershed, comprised of approximately 1,821 acres and predominantly composed of agricultural and residential land uses, drains the southeastern corner of the Town of Middletown (Figure 1). SNEP Network partners assisted the Town of Middletown and Aquidneck Land Trust to advance use of nature-based solutions to mitigate flooding along the Maidford River and restore water quality and habitat. The project entailed an initiative to restore the river's riparian buffer along its length, as well as a river and floodplain restoration component in one reach of the river.

What is the goal of the Maidford River Restoration Pilot Project (Pilot Project)? The Pilot Project sought to mitigate flooding of local roads (Berkeley Avenue and Berkeley Avenue Extension) and farm fields, and to improve water quality and both riparian and aquatic habitat.

What is the geographic extent of the Pilot Project? The Maidford River Restoration Pilot Project boundary extends from the river's headwaters to the diversion structure into Nelson Pond on Paradise Avenue, and the river and floodplain restoration project area is bounded upstream by the Berkeley Avenue culvert and downstream by the intersection with Green End Avenue.

What are the expected benefits resulting from implementation of the restoration project?

- Reduced frequency and duration of flooding of Berkeley Avenue and Berkeley Ave Extension
- Reduced flood hazard risk area (identified as A/AE FEMA Flood Zone)
- More stable stream corridor and channel, and reduced bank scour
- Increased area of riparian buffer restored and/or maintained in a more naturally vegetated condition
- Improved aquatic habitat and community composition
- Reduced sediment and nutrient loads discharged to sensitive receiving waters

What is the purpose of this report? This report provides an overview of the Maidford River watershed's baseline conditions as monitored and documented by SNEP Network partners and consultants.

Who was involved in the Maidford River Restoration Pilot Project baseline conditions monitoring? The following organizations played a role in overseeing, advising, or executing the baseline conditions monitoring work.

Why did we monitor? Prior to potential implementation of the Pilot Project, the SNEP Network and project partners monitored to establish baseline conditions in the Maidford River and its watershed. Following the completion of potential restoration work in the future, another round of monitoring could be conducted using similar methodology. These results would be compared to the baseline conditions described in this report to evaluate the success of the Project against key environmental measures.

What was monitored? To establish baseline watershed conditions, the following selected measures were monitored and documented in the time period from Summer 2021 to Winter 2022 (measure specific timing):

- Water Quality, including Annualized Phosphorus, Nitrogen, and Sediment Loads
- Area of Riparian Buffer Habitat
- Annual Number of Road Closures due to Flooding
- Area Designated as A/AE Flood Zone
- Presence/Absence of Species of Concern (Leopard Frog)

What were the key takeaways?

- Water Quality, Including Annualized Phosphorus, Nitrogen, and Sediment Loads
    - The Maidford River is a flashy system where dry channel conditions can be quickly replaced by flooding conditions.
    - The flashiness of the system allowed for extreme temperatures to be experienced in the stream channel.
    - Wet weather flows were responsible for the vast majority of the total phosphorus and TSS loads, even though dry weather flow conditions tend to prevail. Total nitrogen loads were also higher during wet weather but not as extreme.
    - Enterococci levels were elevated during all wet weather sampling events and even some dry weather sampling rounds.
- Area of Riparian Buffer Habitat
    - A combination of both impervious surfaces and residential and/or commercial land, constituted approximately 23% of the buffer area.
    - Natural land uses accounted for approximately 61% of the 200-ft buffer area.
    - The balance of the buffer area consisted primarily of hayfields.
- Annual Number of Road Closures due to Flooding
    - Road-closing flooding on Berkeley Avenue appears to occur at and above flows of 19 cfs.
    - This level of streamflow can be achieved during storm events as small as 0.87 inches.
- Area Designated as A/AE Flood Zone
    - The current area of Zone A/AE within the restoration area is approximately 37 acres.

- Presence/Absence of Species of Concern (Leopard Frog)
    - Leopard frog was not detected in the survey area.
    - At least five other frog species were present in the survey area.

Where can I find more detailed information about the Maidford River Restoration Pilot Project, including the baseline monitoring data and Quality Assurance Project Plan? This information is available online at https://snepnetwork.org/maidford/.



1.0 Introduction

The Maidford River is a highly- altered, small low-gradient coastal stream located on Aquidneck Island in lower Narragansett Bay. The Maidford River watershed, comprised of approximately 1,821 acres and predominantly composed of agricultural and residential land uses, drains the southeastern corner of the Town of Middletown (Figure 1). The river appears insignificant, but it serves as the primary water source for two of Aquidneck Island's public water reservoirs, Nelson Pond and Gardiner Pond. Its intermittently heavy flows flood local roads, farm fields and lawns. Its sediment and nutrient loads contribute to frequent cyanobacteria (also known as blue green algae) blooms in the reservoirs. The polluted waters also negatively affect the downstream coastal saltmarsh that is critical breeding habitat for saltmarsh sparrow and seaside sparrow, two species suffering considerable declines. At its discharge into coastal waters of the Sakonnet River, the river's high bacteria levels threaten recreational and shellfishing uses.

An underlying condition contributing to water resources concerns and affecting the Maidford River's ecological integrity is the channelization, straightening, and culverting that has occurred over decades. These alterations, along with development that has occurred near the river, severely impact natural stream processes. The river experiences both flashy stream flows and periods of de- watering and disconnected flows (in the upper portion). It routinely spills out of the river channel flooding farm fields, lawns and roads within the reach bound by the Berkeley Avenue culvert and Green End Avenue. Flooding of Berkeley Avenue and Berkeley Avenue Extension may occur several times a year during which time the Town of Middletown must close Berkeley Avenue to traffic, diverting public safety vehicles departing from the Fire Station on Wyatt Road from traveling south on Berkeley Avenue, and creating a public safety concern for homes and neighborhoods located in this part of town. This area is identified as A/AE FEMA Flood Zone on the Town's Flood Hazard Map.

The project team worked to advance use of nature-based solutions to mitigate flooding along the Maidford River and restore the river's water quality and habitat. The project entailed a river and floodplain restoration component which proposes moving the river to restore meanders and re-create connection to its floodplain along with replacement of road culverts to mitigate flooding along Berkeley Avenue north of Green End Avenue. The consultant working with the project team evaluated flood mitigation, water quality and habitat benefits of various restoration alternatives, and performed detailed modeling of the selected alternative to document flood mitigation benefits which further informed development of 30% design plans for the selected alternative. Design Plans and project reports are available on the SNEP Network's Maidford River Restoration Project webpage (https://snepnetwork.org/maidford/).

The project also included an initiative, led by Save the Bay, to re-establish naturally vegetated and protected buffers (aka riparian buffers) along the river's length. The riparian buffer initiative delivered direct assistance to property owners and informed development of the SNEP Network's Buffer Restoration Guide (https://bufferrestorationguide.org/).

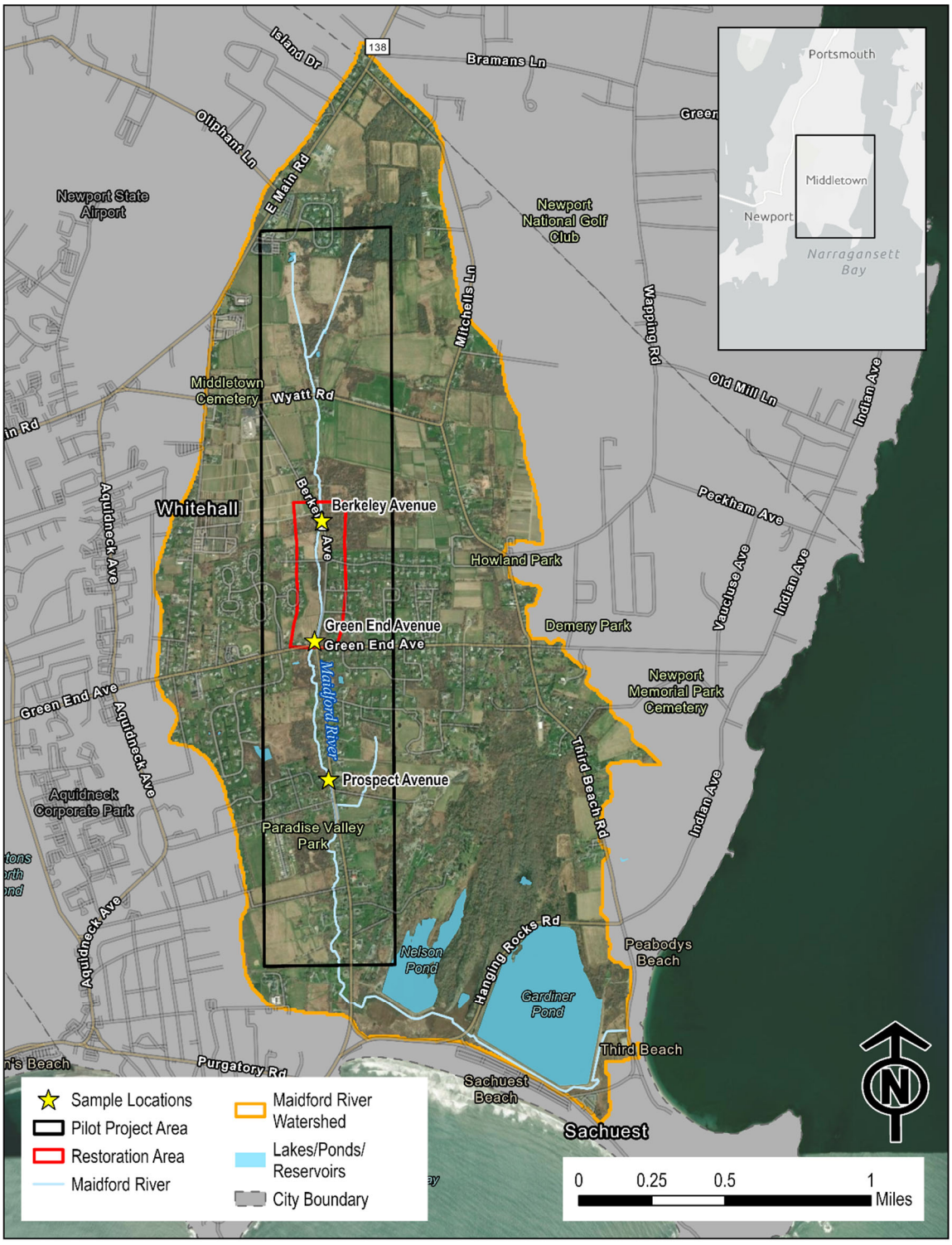


Figure 1. Maidford River Watershed and Associated Project and Restoration Area.

The Maidford River Restoration Project baseline monitoring initiative was undertaken to document pre-implementation watershed conditions as another means to demonstrate best practices. Following the completion of potential restoration work in the future, another round of monitoring could be conducted using similar methodology to evaluate the success of the Project against key environmental measures. This report documents baseline watershed conditions as assessed by TRC Environmental Corporation and others in accordance with the EPA-approved Quality Assurance Project Plan. Detailed results of the streamflow, water quality, and other data collected by TRC Environmental Corporation can be found in the Maidford River Restoration Project Baseline Monitoring Data Report available on the SNEP Network's Maidford River webpage: https://snepnetwork.org/baseline-monitoring-maidford/.

2.0 Water Quality, Including Annualized Phosphorus, Nitrogen, and Sediment Loads

The Maidford River has experienced issues with degraded water quality, which also impacts key receiving waters, including the City of Newport's water supply reservoir system and Third Beach in Middletown (RIDEM 2017 and 2021).

To document current conditions, TRC collected water quality and stream discharge data during wet and dry weather flow events at each of the three Pilot Project monitoring locations (Berkeley Avenue, Green End Avenue, and Prospect Avenue) (Figure 1). Wet weather events were defined as events during a storm that produced at least 0.25" of precipitation.

A variety of field measurements and laboratory analyses were completed over the Summer 2021 to Winter 2022 period. Key laboratory analytes included total phosphorus, total nitrogen, total suspended solids (TSS), and enterococci. Five rounds of discrete water quality sampling were completed by TRC, including two dry weather rounds and three wet weather rounds. Data loggers were also deployed at each monitoring point to measure discharge rates and temperature of the river. Detailed information on each of the parameters monitored by TRC is provided as part of a separate report (TRC 2022).

The Rhode Island Department of Environmental Management (RIDEM) also collected similar water quality field measurements and laboratory analytical data from each location. The Prospect Avenue location was sampled under dry weather conditions as part of the state's Ambient River Monitoring Program while the Berkeley Avenue and Green End Avenue monitoring locations were sampled during wet weather. During the primary Summer 2021 to Winter 2022 baseline monitoring period, RIDEM completed three full rounds of dry weather sampling (i.e., not including enterococci-only rounds) and two rounds of wet weather sampling at these locations.

2.1 Stream Discharge, Water Temperature, and Precipitation

Continuous instream water level and temperature data were collected at each of the three stream monitoring stations (Berkeley Avenue, Green End Avenue, and Prospect Avenue). Based on manual instream measurements documenting the relationship between water level and stream flow, TRC developed the calculated river discharge (streamflow) series. The calculated discharge, recorded data logger temperature, and precipitation records obtained from the nearby Newport State Airport, are presented for each station in Figures 2 through 4. The figures are depicted in order from upstream (Berkeley Avenue) to downstream (Prospect Avenue).

The discharge series for each location demonstrates the flashiness of the Maidford River system during precipitation events with runoff-driven peak flows towering over the minimal base (dry weather) flows observed. Large daily swings in recorded temperature, a sign of datalogger exposure, serve as an indication of a dry stream channel. In some cases, logger temperatures exceeded 100°F when exposed by receding streamflows. The Berkeley Avenue monitoring location sustained the longest period without flow in the monitored portion of the Maidford River system, with dry channel conditions from mid-July to early September 2022 (Figure 2). Green End Avenue and Prospect Avenue temperature records suggest some exposure of the datalogger, although for shorter periods, primarily in August 2022 (Figures 3 and 4).

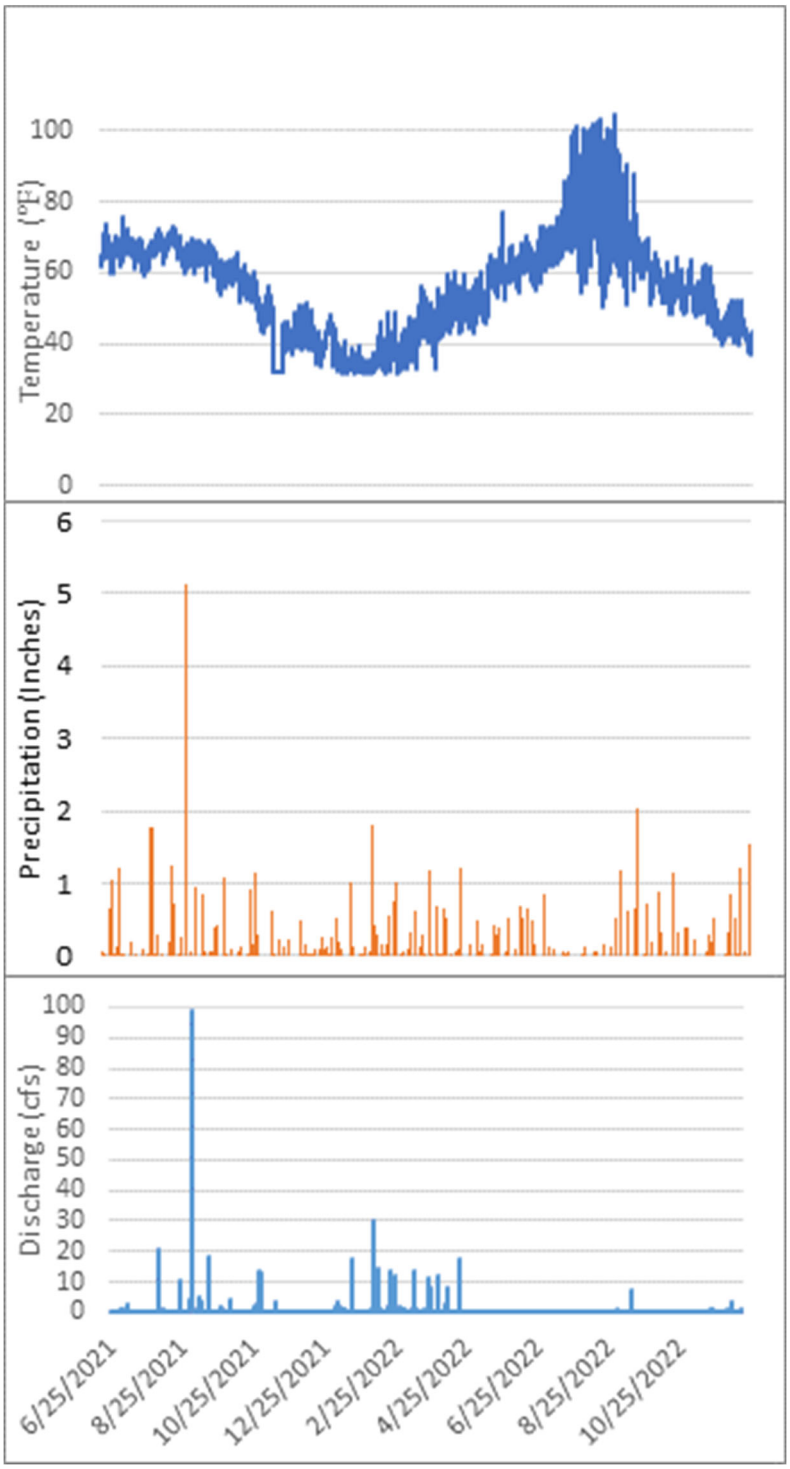


Figure 2. Discharge, Precipitation, and Temperature Graphs at Berkeley Avenue.

6/25/2021 through 12/16/2022

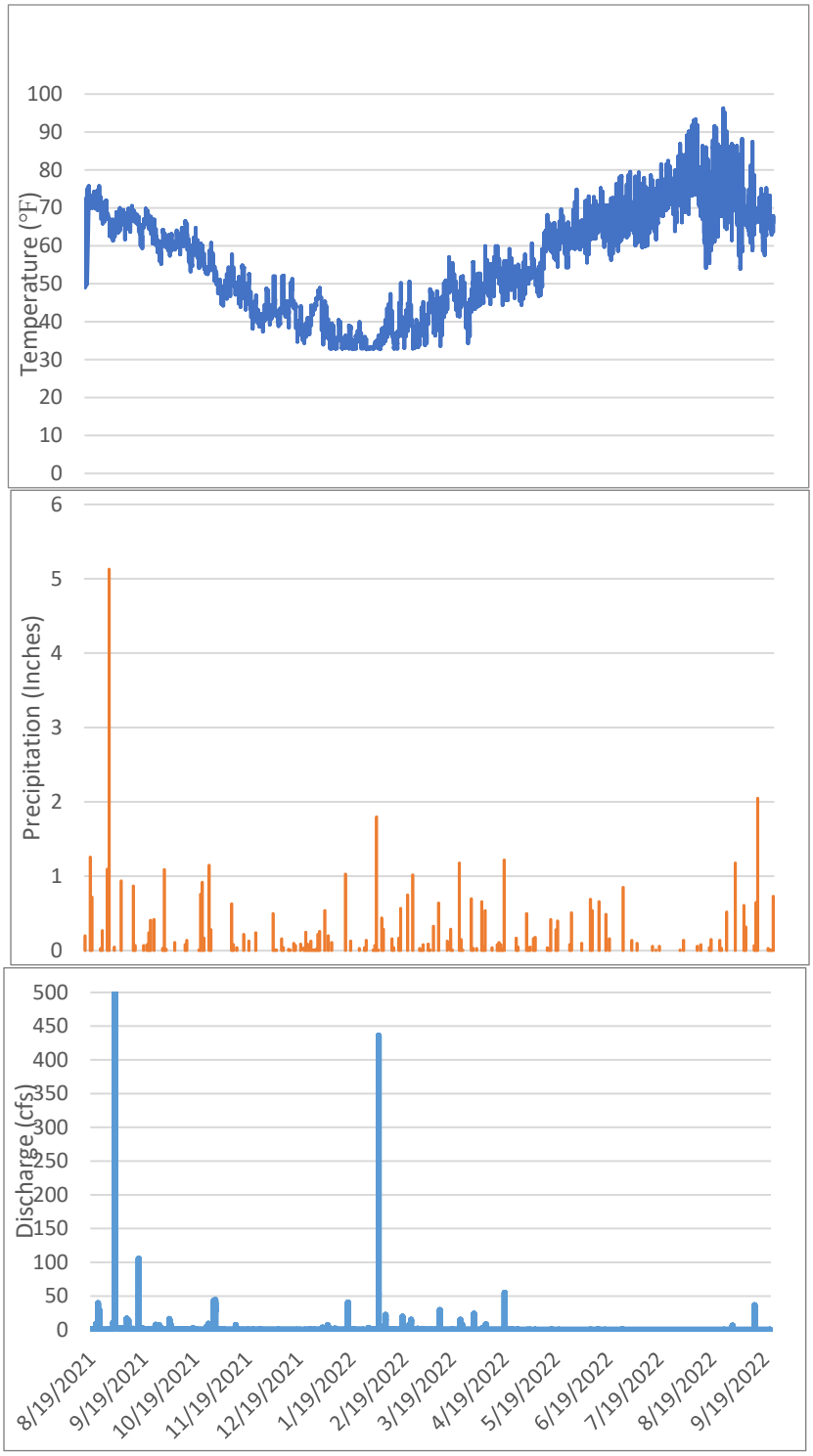


Figure 3. Discharge, Precipitation, and Temperature Graphs at Green End.

8/19/2021 through 9/22/2022

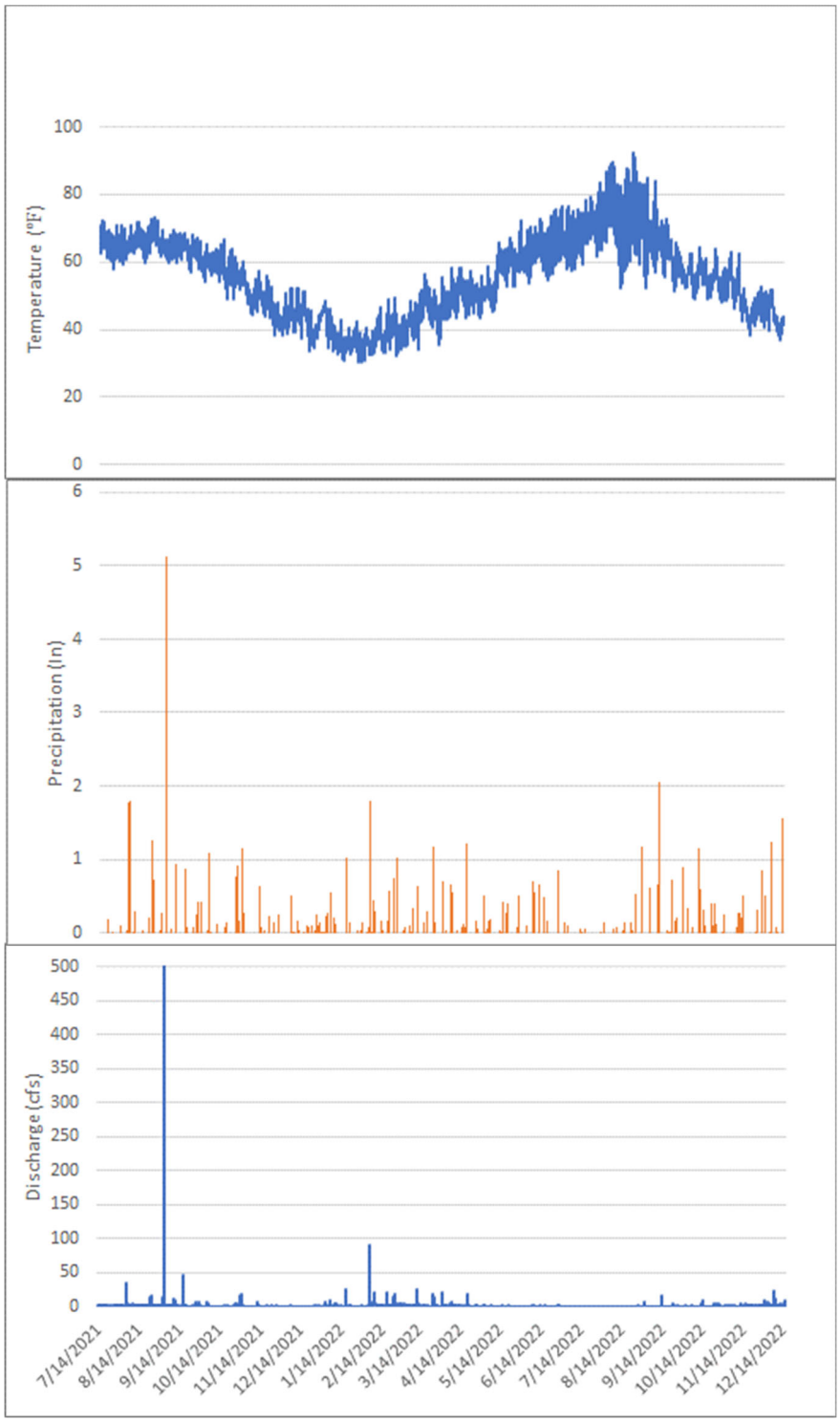


Figure 4. Discharge, Precipitation, and Temperature Graphs at Prospect Avenue.

7/14/2021 through 12/16/2022

Flow statistics for each location, including mean, low, and peak flows are presented in Table 1. Each statistic is also broken out by dry and wet weather conditions. As expected, most flow statistics increased from upstream to downstream, although of note, all three flow monitoring locations experienced cessation of flow (dry channel conditions) at some point over the course of the study (see "Low Flow" in Table 1). Extreme variances of precipitation patterns and temperatures as a result of climate change will only further exacerbate the fluctuations between dry and wet weather measured flow rates, and will likely increase extreme outlier events, such as those observed on September 2, 2021 and February 4, 2022. **An increase in frequency of extreme weather events only highlight the importance of river restoration to manage water quality, habitat, and flooding potential.**

Table 1. Key Flow Statistics

Statistic	Upstream → Downstream					
	Berkeley		Green End		Prospect	
	Dry	Wet	Dry	Wet	Dry	Wet
Low Flow (cfs)	0.000	0.000	0.000	0.000	0.000	0.000
Mean Flow (cfs)	0.174	1.200	0.233	1.671	0.467	3.048
Peak Flow (cfs)	1.661	98.9	2.660	105	5.372	594

2.2 Total Phosphorus, Total Nitrogen and TSS Annualized Loads

The total phosphorus, total nitrogen, and TSS concentration results for each monitoring location are presented in Figure 5 and Figure 6. The primary form of nitrogen detected was nitrate-nitrogen, which was particularly elevated during dry weather and tended to increase in the downstream direction (Figure 6). This suggests that nitrate-nitrogen is entering the Maidford River in the Pilot Project Area via groundwater inputs. Although it was beyond the scope of this study to identify specific sources, fertilizer applications and septic systems in the watershed could both potentially contribute nitrate-nitrogen in this way.

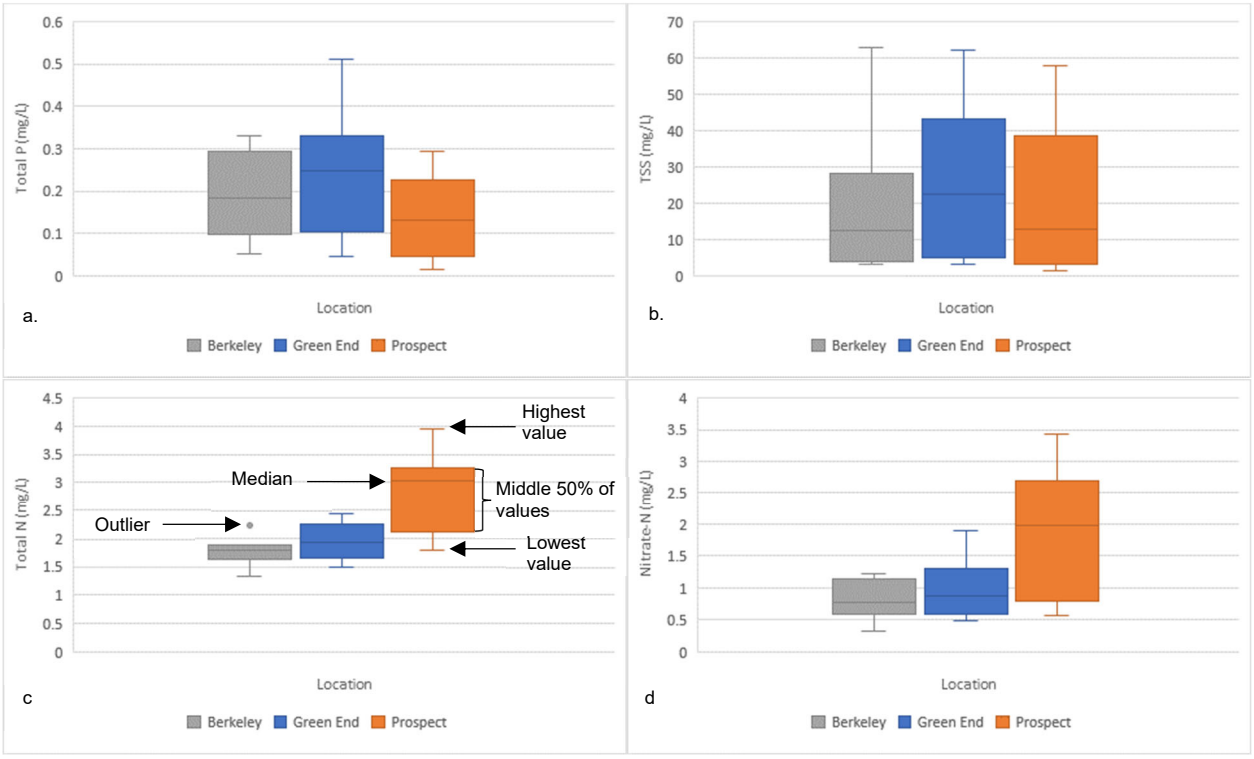


Figure 5. Total Phosphorus, TSS, Total Nitrogen, and Nitrate-Nitrogen Concentrations – All Events.

See explanation of individual boxplot features in Figure 5c. Outliers are extreme values located more than 1.5 times the interquartile range (i.e., middle 50% of values) from either end.

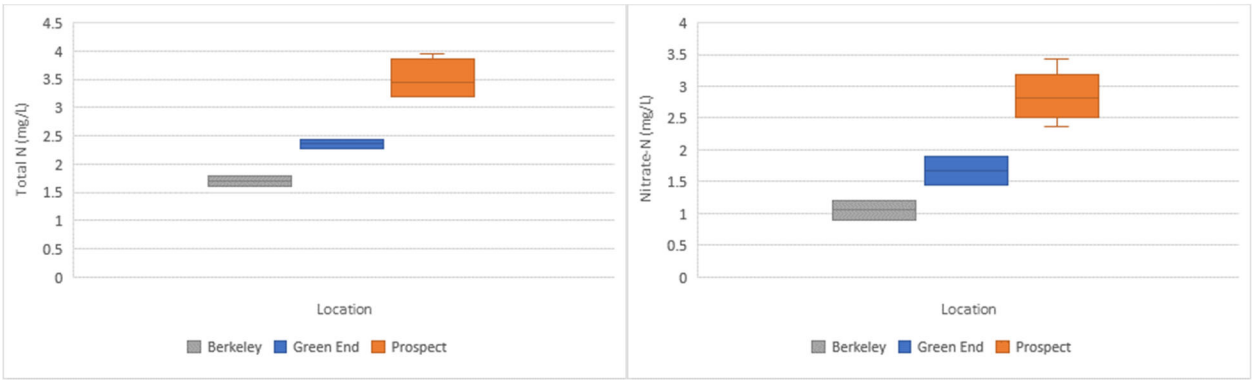


Figure 5. Total Nitrogen and Nitrate-Nitrogen Concentrations – Dry Weather Events Only.

See explanation of individual boxplot features in Figure 5c. Outliers are extreme values located more than 1.5 times the interquartile range (i.e., middle 50% of values) from either end.

The average concentrations of total phosphorus, total nitrogen, and TSS from lab-analyzed samples were used in combination with the measured mean flows to calculate loading estimates for each parameter over an annualized basis (Figure 7).

One thing that is clear from the results is that wet weather conditions drive the bulk of total phosphorus and TSS loading, by far. On an annual basis, wet weather flow contributes 8 to 15 times the total phosphorus and 18 to 26 times the TSS as dry weather flow (Figure 7), even though dry weather flow conditions occur more often (nearly 75% of the time). Wet weather also produces the majority of total nitrogen loading, although the difference between dry and wet weather loading totals is less substantial than it is for total phosphorus and TSS (generally 1.8 to 2.5 times higher). **Overall, these observations demonstrate the significance of stormwater runoff on water quality conditions in the Maidford River and its receiving waters.**

Loading of all three parameters also broadly increases in the downstream direction, meaning that the Maidford River delivers larger amounts of nutrients (phosphorus and nitrogen) and sediments (TSS) as the watershed area draining to the river increases. The rate at which loading increases also tends to accelerate in the downstream direction for all three measures during dry weather (Figure 7). This pattern also holds for total nitrogen during wet weather. However the rate at which loading increases decelerates in the downstream direction for total phosphorus and TSS. Overall, this suggests that wet weather runoff is particularly rich in total phosphorus and TSS from sources located above the Berkeley Avenue sampling location.

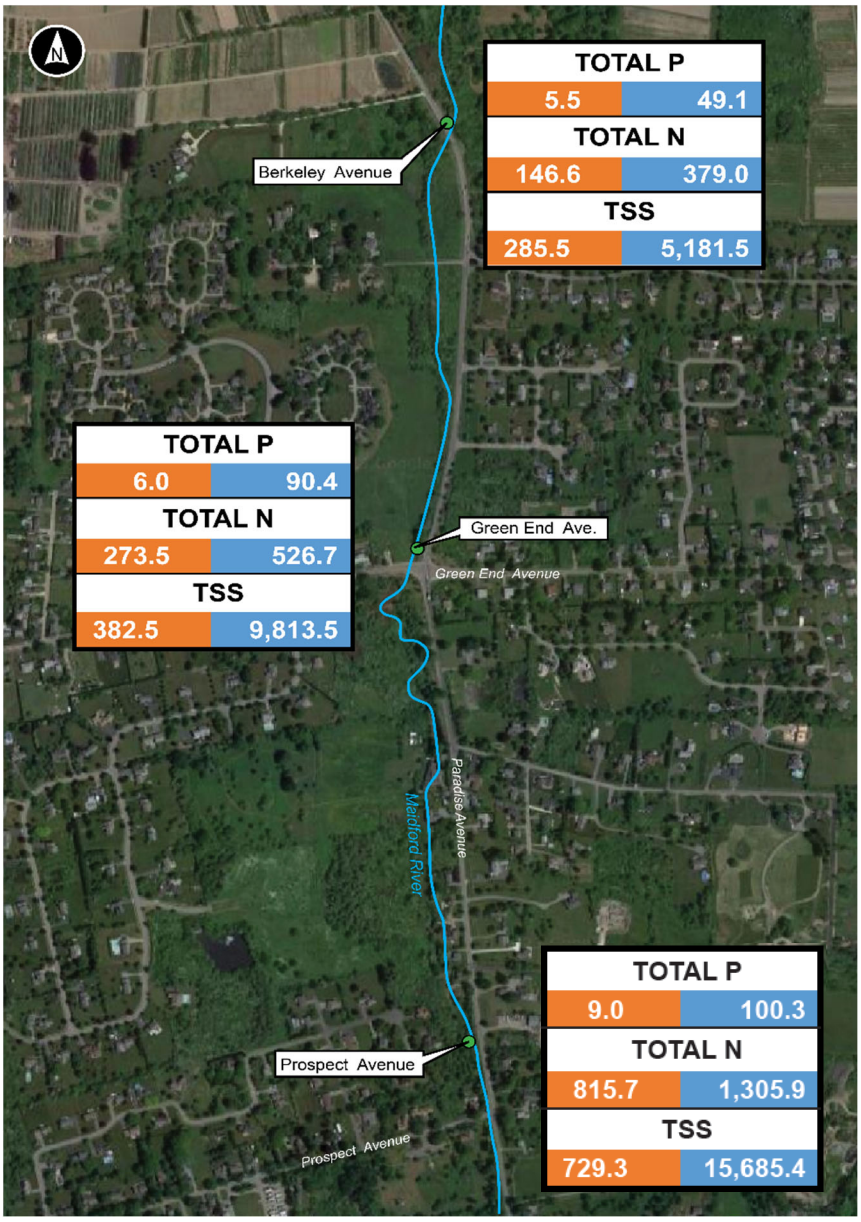


Figure 7. Annual Load Estimates for Total Phosphorus, Total Nitrogen, and TSS in Kilograms at Monitoring Locations.
Dry (orange) and Wet (blue) Conditions.

2.3 Enterococci

Enterococci, occur in the digestive tracts of humans and other animals. Although these bacteria may not always directly cause illness, they serve as indicators of fecal contamination and possible pathogens. Enterococci are salt-tolerant organisms, as compared to *E. coli*, and are therefore usually preferred for monitoring bacteria levels in brackish or salt water (Byappanahalli *et al.* 2012).

The Rhode Island enterococci numeric criteria are applicable for primary contact recreation and swimming. Although the Maidford River is not used for primary recreation, high levels of bacterial indicators are still undesirable, especially since some flow is diverted to the City of Newport's water supply reservoir system and the rest is discharged at Third Beach, a saltwater swimming beach. The single sample maximum is 61 colonies/100 mL for freshwater and 104 colonies/100mL for saltwater.

Enterococci results for dry weather (Figure 8, orange outlined points) showed a higher concentration of enterococci at Green End Avenue on May 24, 2022 compared to Prospect Avenue, which may be a result of a localized increase of bacteria levels within that area under near-stagnant flow conditions. However, enterococci results from this study otherwise indicated increasing levels downstream during wet weather conditions (Figure 8, blue outlined points). Additionally, wet weather enterococci levels tended to be higher than dry weather levels. Some dry weather and all wet weather samples exceeded the state numerical criteria. Six of the nine wet weather samples collected at Prospect Avenue were too high to quantify (>2,400 MPN).

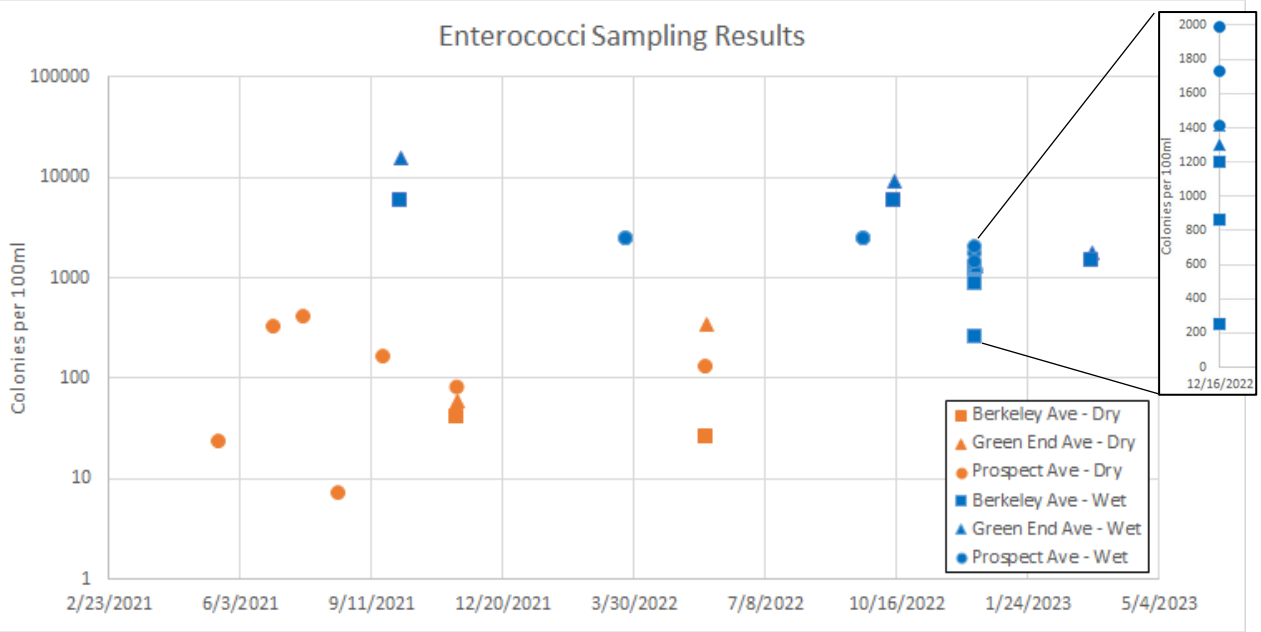


Figure 8. Enterococci Sample Results for Monitoring Stations in Dry and Wet Weather Conditions.

Inset show detail of December 16, 2022 sampling results.

RIDEM collected dry weather data at Prospect Ave on May 18, June 29, July 22, August 17, and September 21, 2021. Additionally RIDEM collected wet weather data at Berkeley Ave and Green End Ave on October 4, 2021, October 14, 2022, and March 14, 2023. All other data collected by TRC.

3.0 Area of Riparian Buffer Habitat

Aquidneck Land Trust (ALT) used Spring 2021 high resolution aerial imagery and ground-checking to assess the condition of a 200-foot buffer around Maidford River. The study area begins at the headwaters at the river's northernmost points and extends downstream 2.5 miles to the Newton Pond diversion structure just west of Paradise Avenue. The 200-foot buffer was assessed on either side of the stream bed and totaled an area of approximately 159 acres. Land cover was categorized as the following sets of categories:

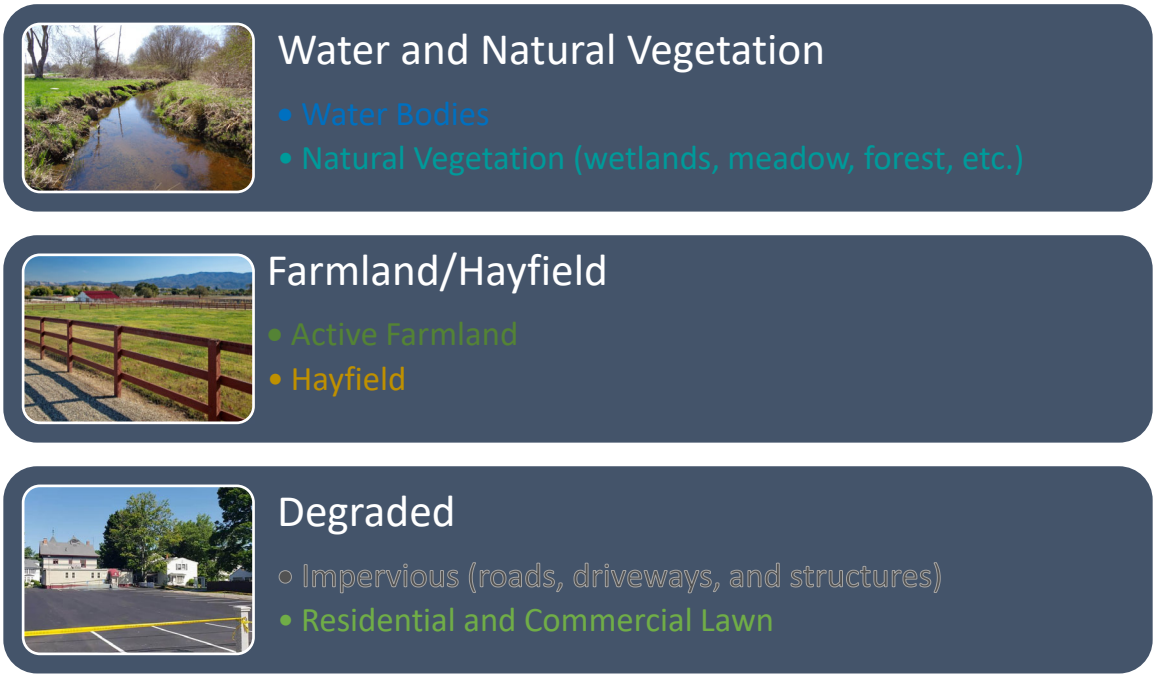


Figure 9 (as well as Attachment A) portrays the different landcovers within the 200-foot buffer. ALT's analysis of the buffer showed that natural vegetation and water bodies together comprised approximately 98 acres, or 61% of the buffer with water bodies making up less than 1 acre. Notably, the natural vegetation category includes a mix of meadow areas, scrub-shrub, and forested lands. Residential and/or commercial lawn/landscaping and hayfields each comprised approximately 25 acres or 16% of the buffer. Impervious surfaces comprised approximately 11 acres or 7% of the buffer, and active farmland comprised approximately 0.7 acres of 0.4% of the buffer (Figure 10). Degraded land use, a combination of both impervious surfaces and residential and/or commercial land, constituted approximately 23% of the buffer.

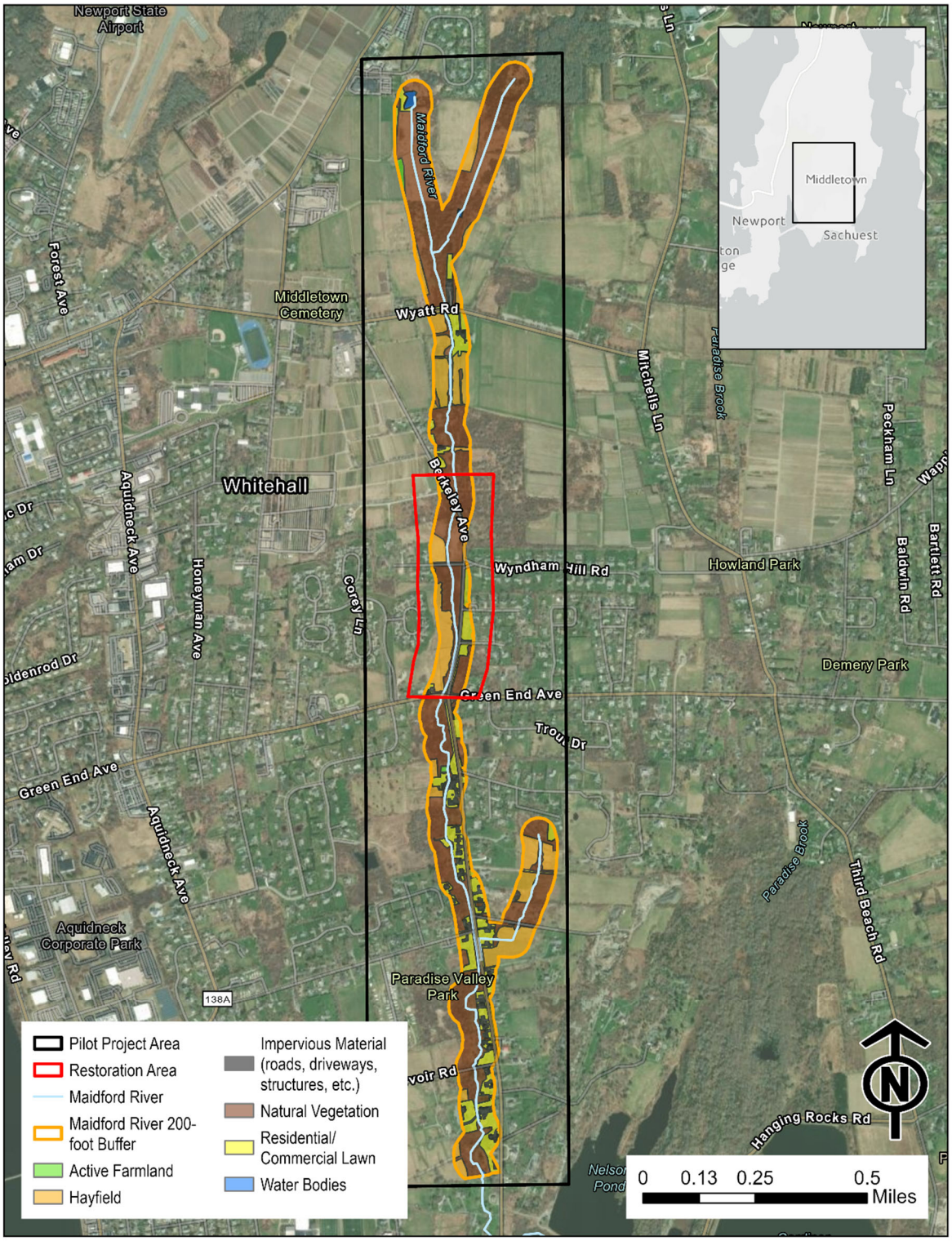


Figure 9. Land Use within the Maidford River 200-Foot Buffer (Spring 2021).

Land use source data from Aquidneck Land Trust.

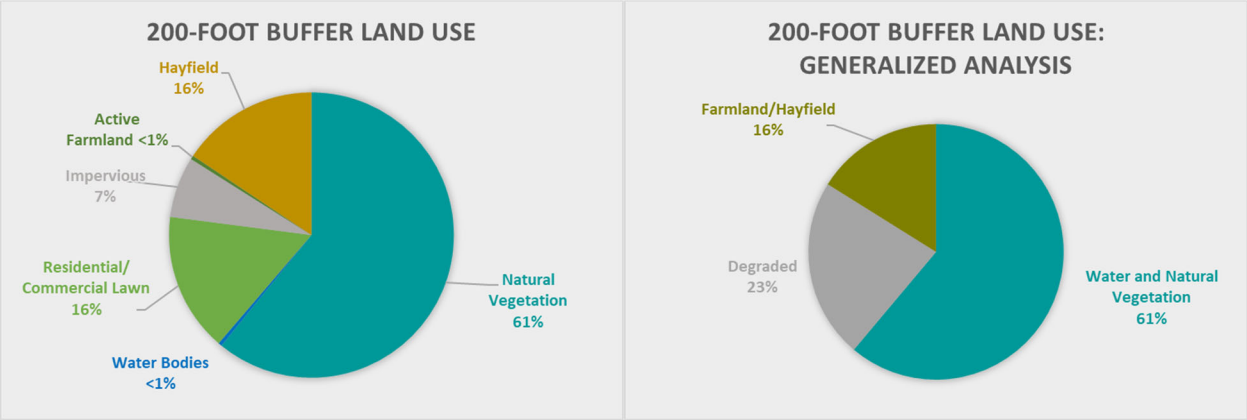


Figure 10. Land Use Percentages within the 200-foot Buffer.

Though natural vegetation comprises the predominant land cover in the Maidford River's buffer area, close to a quarter of the land cover within the critically important buffer area is either lawn, impervious surfaces (buildings or driveways) or active agricultural uses. Converting these uses to a more naturally vegetated condition where possible will lead to improvements in the river's water and habitat quality. Notably, conversion to forested lands will have the most significant positive impact on water quality. Additionally, investigation of management practices on natural land uses in the buffer and making recommendations that increase the structural complexity of the buffer in those areas can help improve stormwater flow and nutrient uptake by plants in the buffer. A naturally vegetated buffer area helps protect rivers in many ways by slowing down runoff, trapping sediments and other pollutants, filtering shallow groundwater before it reaches the river, preventing erosion, and stabilizing river banks. Habitat quality is also improved because wildlife use natural vegetative cover for feeding, resting, nesting, and as migration stopover sites. Trees and shrubs that overhang the riverbank shade the water and provide microhabitats for aquatic organisms.

4.0 Annual Number of Road Closures Due to Flooding

Flooding of the Maidford River periodically causes road closures to occur at Berkeley Avenue and Berkeley Avenue Extension (Figure 11).

Not only do these road closures make it difficult for travel, but closures can also create safety issues as they restrict access for emergency vehicles. The Town of Middletown documented road closures throughout the study period (August 2021 through January 2023) for Berkeley Avenue and Berkeley Avenue Extension (Figure 12).

Berkeley Avenue was observed to be closed five times during the study period (Table 2). No road closures were observed at Berkeley Avenue Extension, per se, though entrance to the private road is made inaccessible when Berkeley Avenue is flooded.



Figure 11. Flooding of Berkeley Avenue at Culvert Location.

Source: SNEP Network Restoring the Maidford River Watershed Story Map (https://storymaps.arcgis.com/stories/9677a4d4f6a941968668efc53234460d)

Road closure events were caused by precipitation events that totaled 0.87 to 6.23 inches over a 48-hour period. The rain event on September 2, 2021, resulting in a total 6.23 inches of rain, diverted emergency vehicles from using Berkeley Avenue. Of the recorded events, minor road cleanup was needed after one of the storm events on September 16, 2021. When compared to the discharge rates at Berkeley Avenue, road closure events appeared to be most likely when discharge at Berkeley Avenue reached approximately 18.6 cfs or greater (Figure 13).

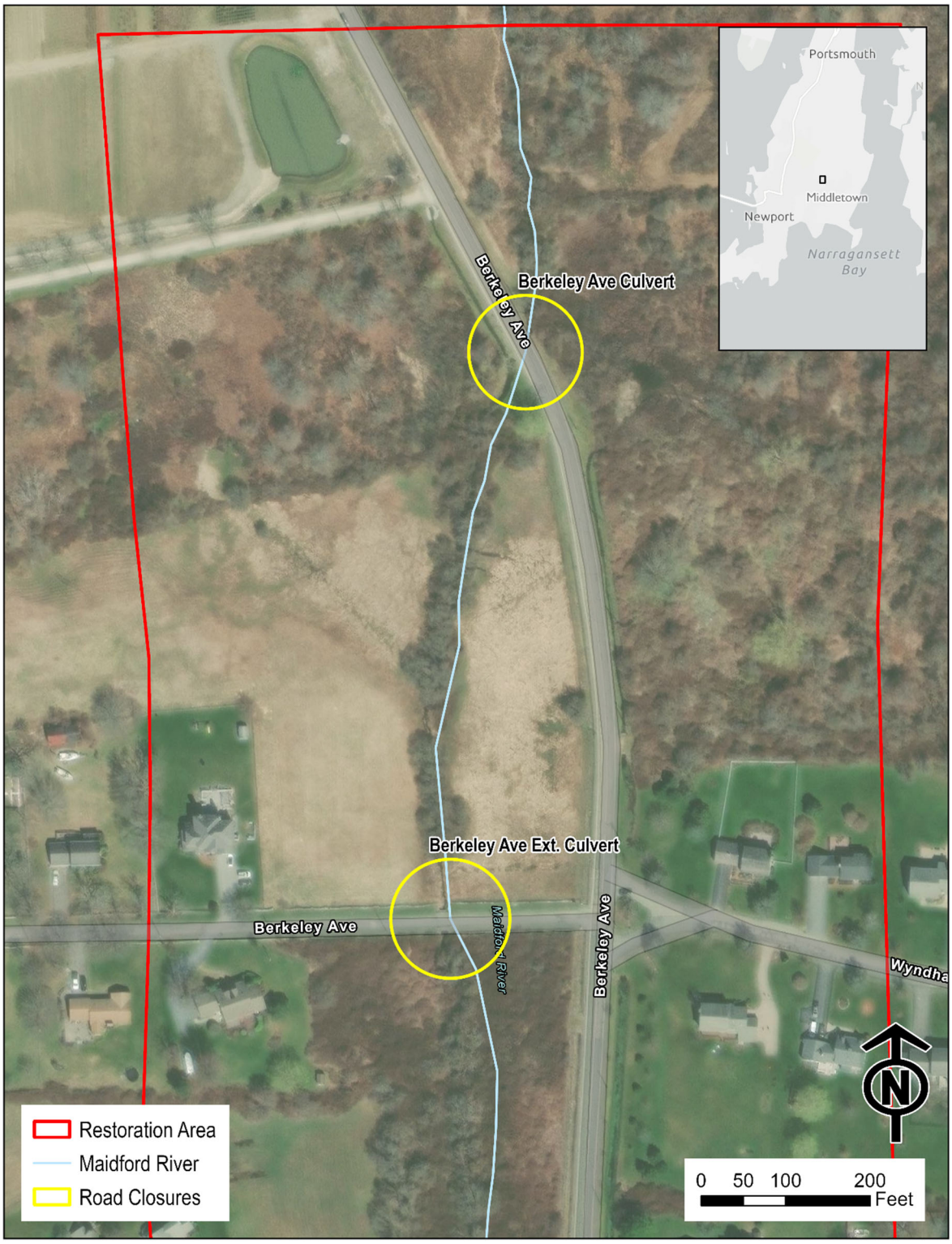
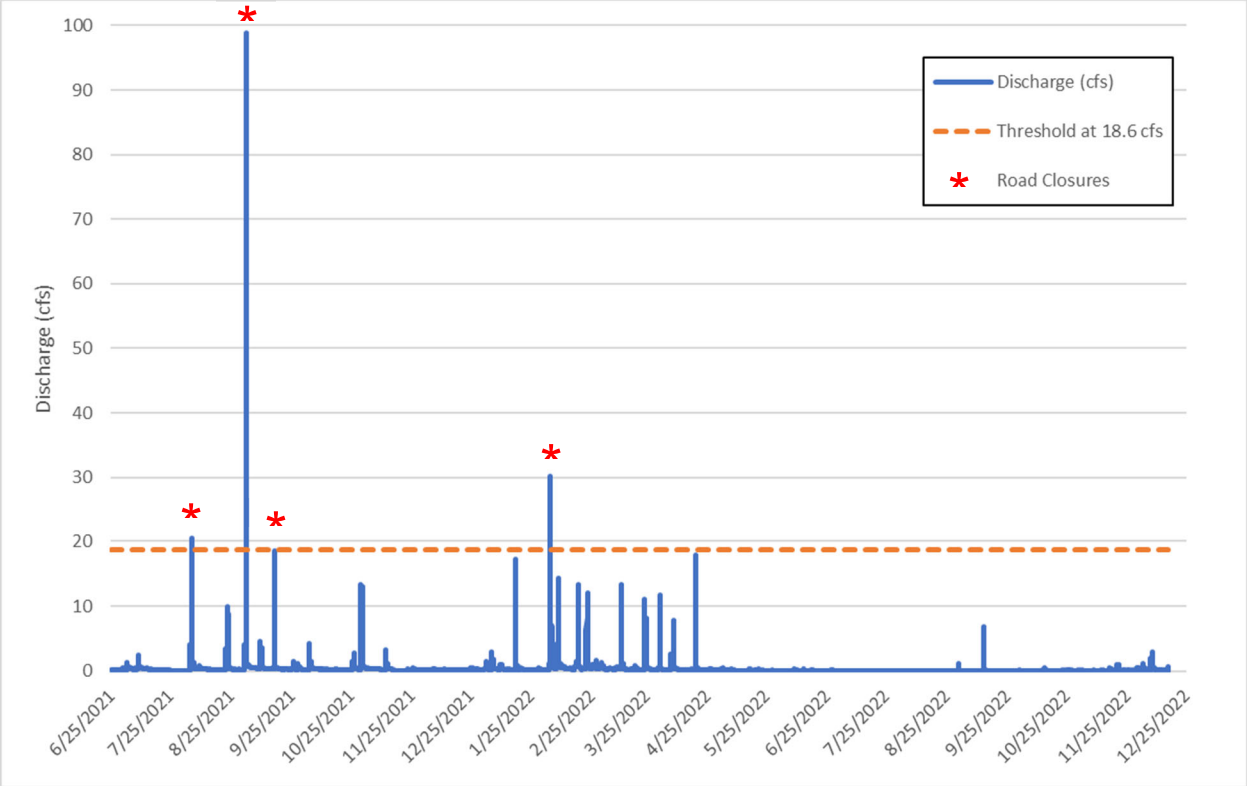


Figure 12. Locations of the Culvert Crossings at Berkeley Avenue and Berkeley Avenue Extension.

Table 2. Road Closures at Berkeley Avenue

Date	Duration of Closure (Hours)	Emergency Vehicles Diverted from using Berkeley Avenue?	Did the Town deploy equipment to clear road of sediment or other debris post-storm?	Rainfall Amount from Newport State Airport over 48 hour-Period (Inches)
8/5/2021	1.5	No	No	3.56
9/2/2021	10	Yes	No	6.23
9/16/2021	1.5	No	Yes**	0.87
2/4/2022	N/A*	No	N/A*	2.87
1/23/2023	3.5	No	No	1.50

* Value not provided
** Cleanup from small amounts of stone washed away from an upstream driveway.



Note: Discharge at Berkeley Avenue was measured from 6/25/2021 to 12/16/2022. Discharge during the 1/23/2023 road closure event was not calculated and therefore not shown on this figure.

Figure 13. Discharge at Berkeley Ave. in Relation to Road Closures Events.

5.0 Area Designated as A/AE Flood Zone

FEMA's National Flood Hazard Zones A/AE represent Special Flood Hazard Areas. Zones A/AE were mapped within the restoration area bounded upstream by the Berkeley Avenue culvert and downstream by the intersection with Green End Avenue (Figure 14). The calculated area of Zone AE within the restoration area was approximately 37 acres.

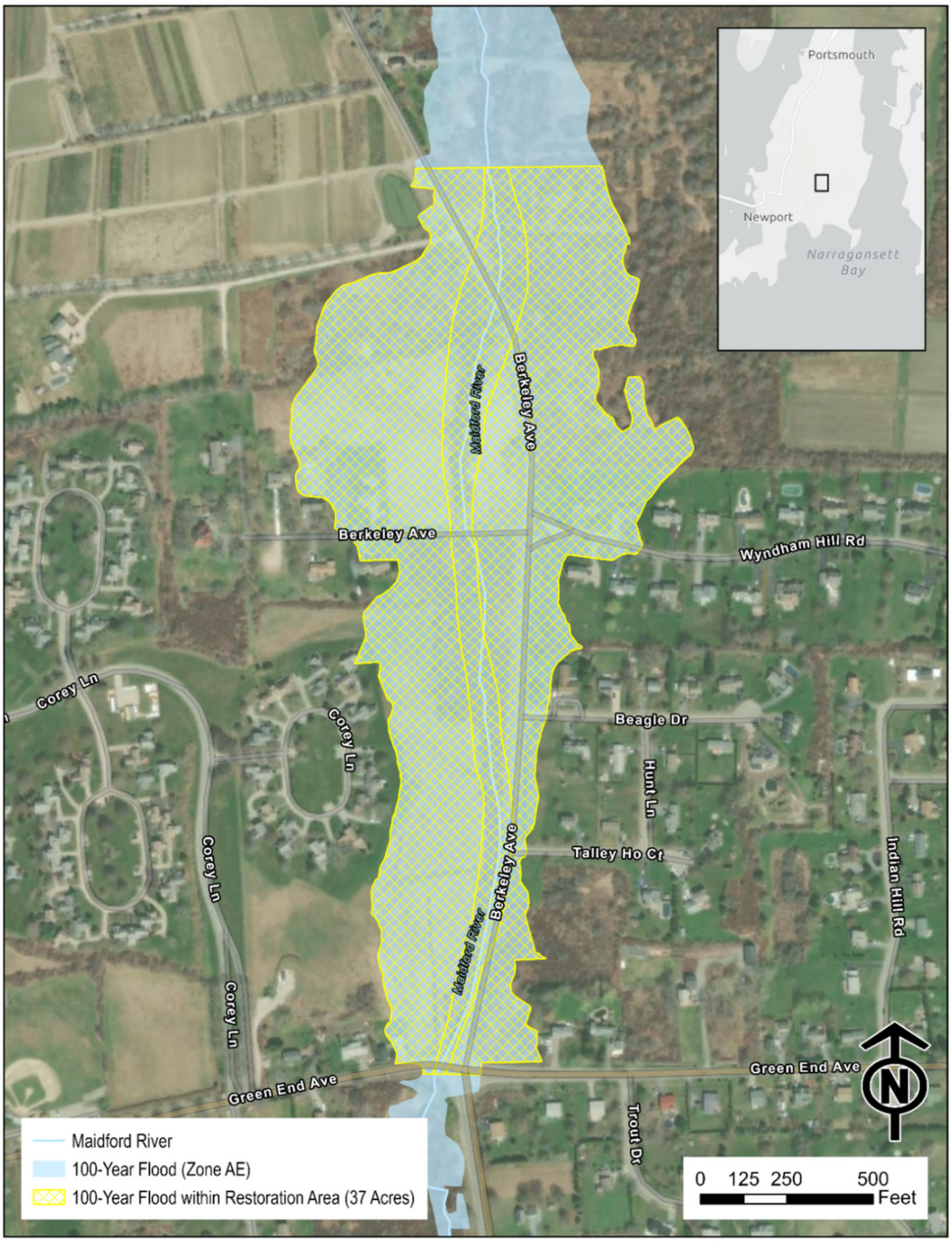


Figure 14. FEMA Flood A/AE Zone Areas within the Restoration Area.

6.0 Presence/Absence of Species of Concern (Leopard Frog)



Pickerel frog was present in the survey area, although its calls were not detected.

Frog call count surveys were completed to monitor for the presence of state-listed northern leopard frogs (*Lithobates pipiens*) as well as the frog community at-large. Surveys were conducted once every two weeks from April 1 to June 23, 2022 (total of seven surveys). Observers visited five stations, spaced at least 570 feet apart, and listened for frog calls for five minutes at each station (Figure 15). For each species heard, the observer recorded the maximum calling index during one-minute intervals. The calling index ranged from 0 (no calls heard) to 3 (individuals too numerous to count, chorus is constant and overlapping).

The primary target species of the surveys – northern leopard frog (*Lithobates pipiens*) – was not observed at any point over the course of the survey period. However, four other species of frogs were identified calling during the survey period: spring peeper (*Pseudacris crucifer*), American toad (*Anaxyrus americanus*), green frog



Figure 15. Frog Call Count Monitoring Locations

(*Lithobates clamitans*), and gray treefrog (*Dryophytes versicolor*). Additionally, pickerel frog (*Lithobates palustris*) was visually observed near the Maidford River but not detected by call. Most calls heard throughout the survey were made by spring peepers, though no spring peepers were heard calling in June (Figure 16). Fewer calls were detected overall in June than in April or May, as calling activity transitioned from spring peeper and American toad to green frog and gray treefrog.

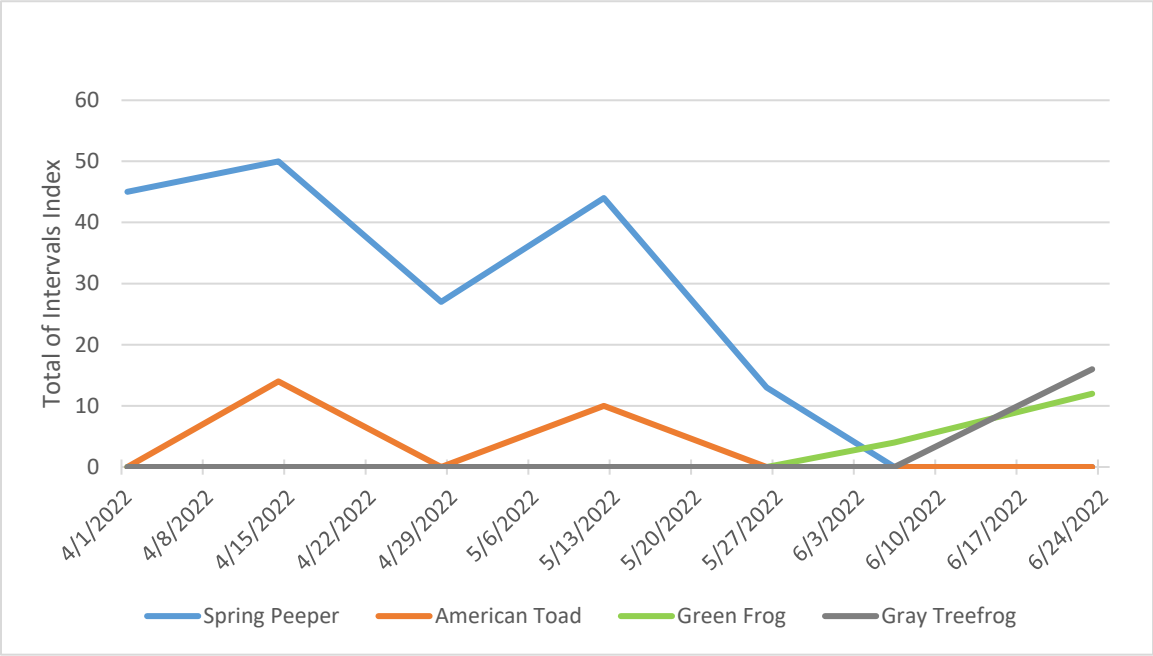


Figure 16. Biweekly Frog Call Survey Totals by Species

7.0 Summary

Maidford River is an altered coastal stream that has been prone to flooding and water quality impacts from watershed pollutants. In advance of a pilot project to restore the river and floodplain and mitigate flooding of roads and farm fields, SNEP Network partners and consultants collected data on baseline conditions of the Maidford River and its watershed.

Data collected from targeted portions of the Maidford River included stream flow (discharge rates), pollutant concentrations and loading, quantification of riparian buffer habitat area, road closures due to flooding, areal extent of the FEMA designated flood zones, and presence/absence of state-listed northern leopard frog). Each of these serve as measures of baseline conditions that can be compared to post-restoration conditions to help evaluate the success of the Maidford River Restoration Pilot Project.

Key takeaways from each measure of baseline conditions include the following:

- Water Quality, Including Annualized Phosphorus, Nitrogen, and Sediment Loads
    - The Maidford River is a flashy system where dry channel conditions can be quickly replaced by flooding conditions.
    - The flashiness of the system allowed for extreme temperatures to be experienced in the stream channel.
    - Wet weather flows were responsible for the vast majority of the total phosphorus and TSS loads, even though dry weather flow conditions tend to prevail. Total nitrogen loads were also higher during wet weather but not as extreme.
    - Enterococci levels were elevated during all wet weather sampling events and even some dry weather sampling rounds.
- Area of Riparian Buffer Habitat
    - A combination of both impervious surfaces and residential and/or commercial land, constituted approximately 23% of the 200-ft buffer area.
    - Natural land uses accounted for approximately 61% of the buffer area.
    - The balance of the buffer area consisted primarily of hayfields.
- Annual Number of Road Closures due to Flooding
    - Road-closing flooding on Berkeley Avenue appears to occur at and above flows of 19 cfs.
    - This level of streamflow can be achieved during storm events as small as 0.87 inches.
- Area Designated as A/AE Flood Zone
    - The current area of Zone A/AE within the restoration area is approximately 37 acres.
- Presence/Absence of Species of Concern (Leopard Frog)
    - Leopard frog was not detected in the survey area.
    - At least five other frog species were present in the survey area.

8.0 References

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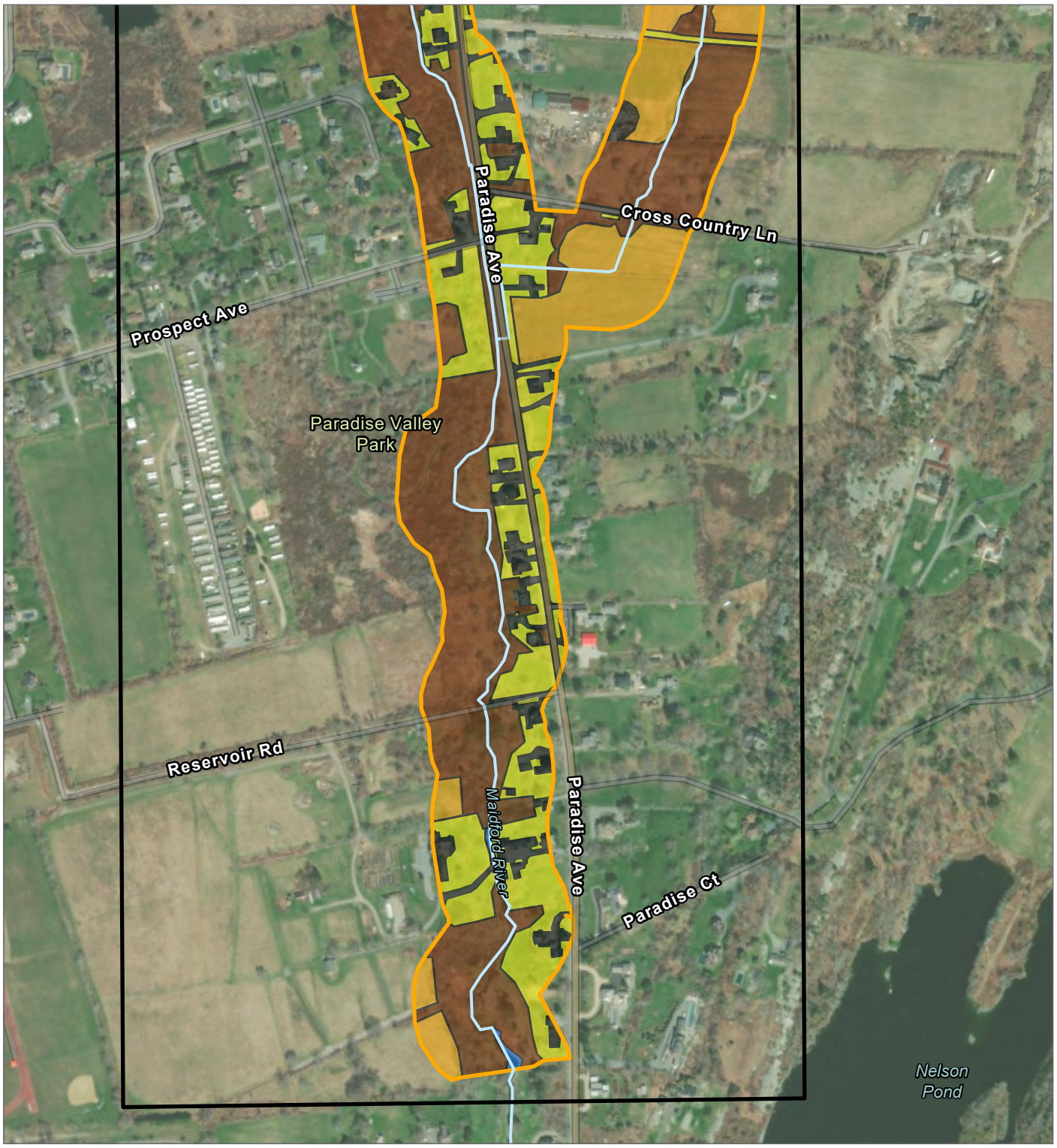
Appendix A: 200-Foot Buffer Land Use Figures



- PILOT PROJECT AREA
- RESTORATION AREA
- MAIDFORD RIVER
- MAIDFORD RIVER 200-FOOT BUFFER
- ACTIVE FARMLAND
- HAYFIELD
- IMPERVIOUS MATERIAL (ROADS, DRIVEWAYS, STRUCTURES, ETC.)
- NATURAL VEGETATION
- RESIDENTIAL/COMMERCIAL LAWN
- WATER BODIES

BASE MAP: ESRI, WORLD IMAGERY, 2021
DATA SOURCES: TRC, AQIDNECK LAND TRUST

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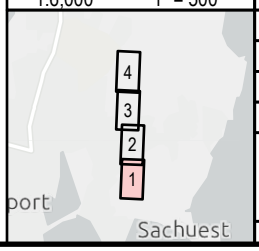

PROJECT: **MAIDFORD RIVER RESTORATION PILOT PROJECT**
RHODE ISLAND

TITLE: **LAND USE DETAIL**

DRAWN BY:	K. BACHAND	PROJ. NO.:	016318
CHECKED BY:	S. DEHAINAUT		
APPROVED BY:	M. O'BRIEN		
DATE:	SEPTEMBER 2023		

FIGURE 1
SHEET 1 OF 4

TRC
10 HEMINGWAY DRIVE
2ND FLOOR
EAST PROVIDENCE, RI 02915
PHONE: 401.330.1236

FILE: MAIDFORD_RIVER_RESTO_PROJECT

COORDINATE SYSTEM: NAD 1983 STATEPLANE RHODE ISLAND FIPS 3800 FEET; MAP ROTATION: 0
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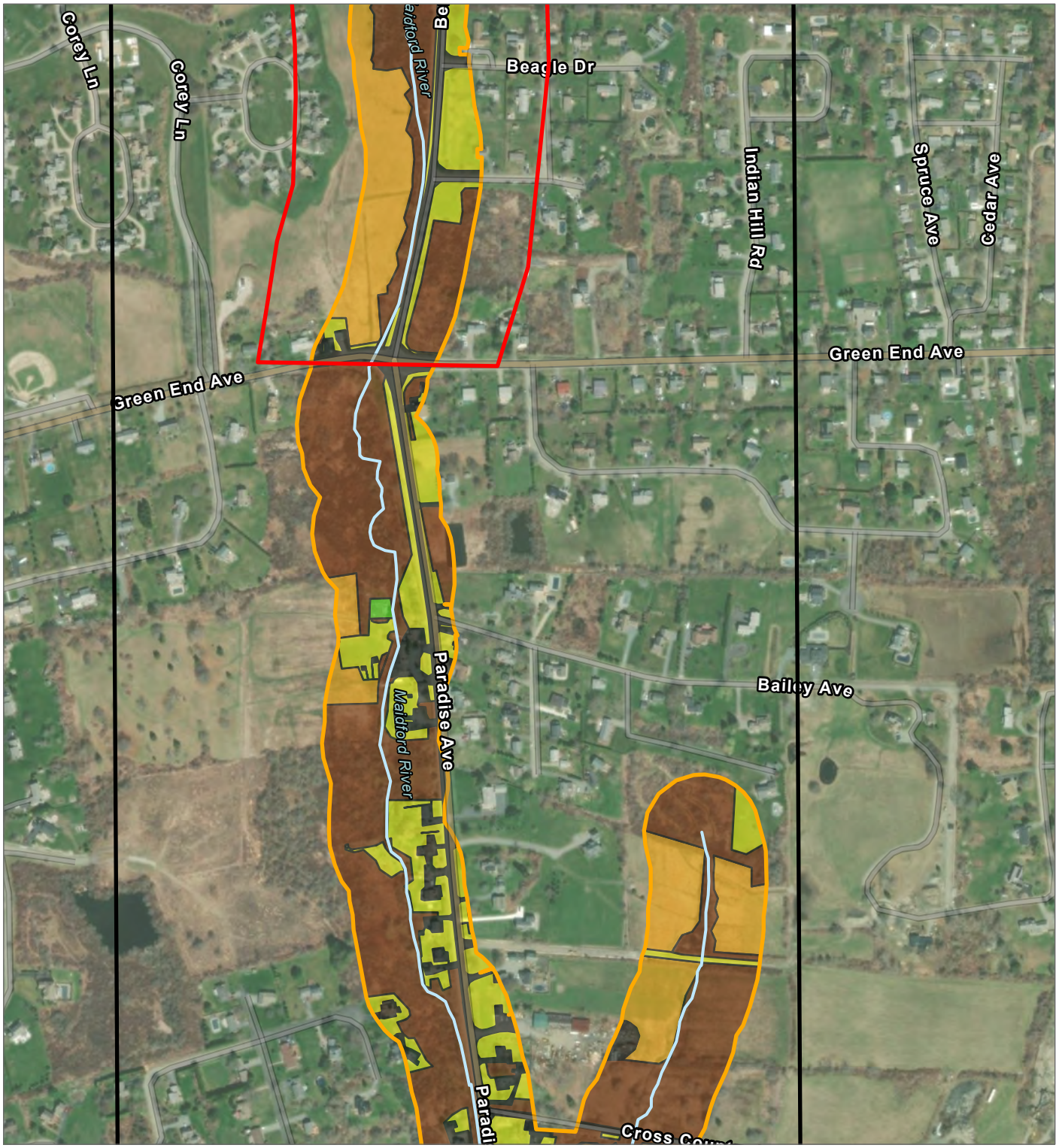

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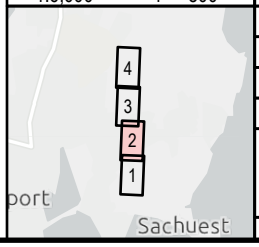

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FIGURE 1
SHEET 2 OF 4

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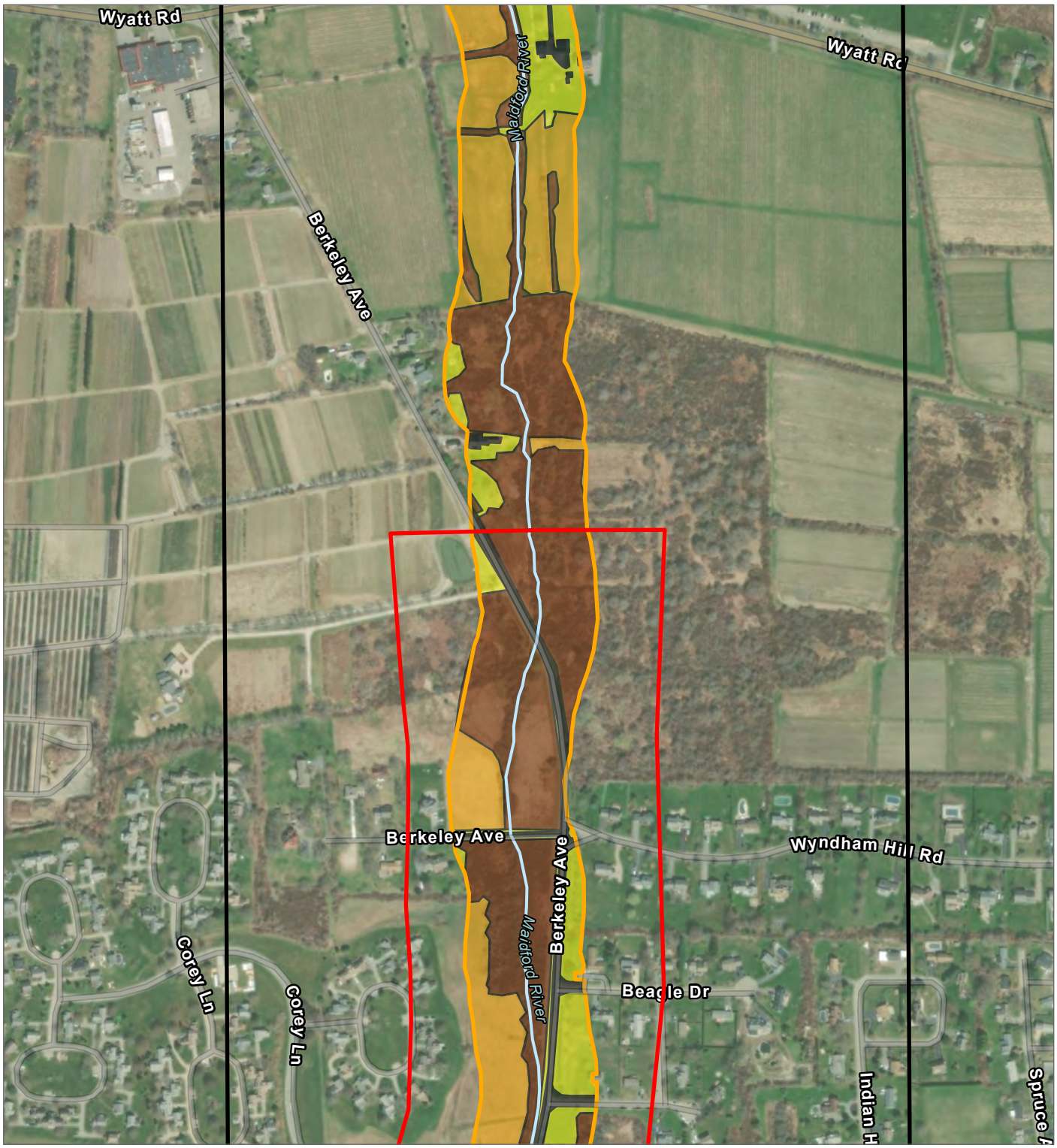

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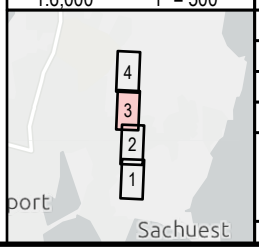

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FIGURE 1
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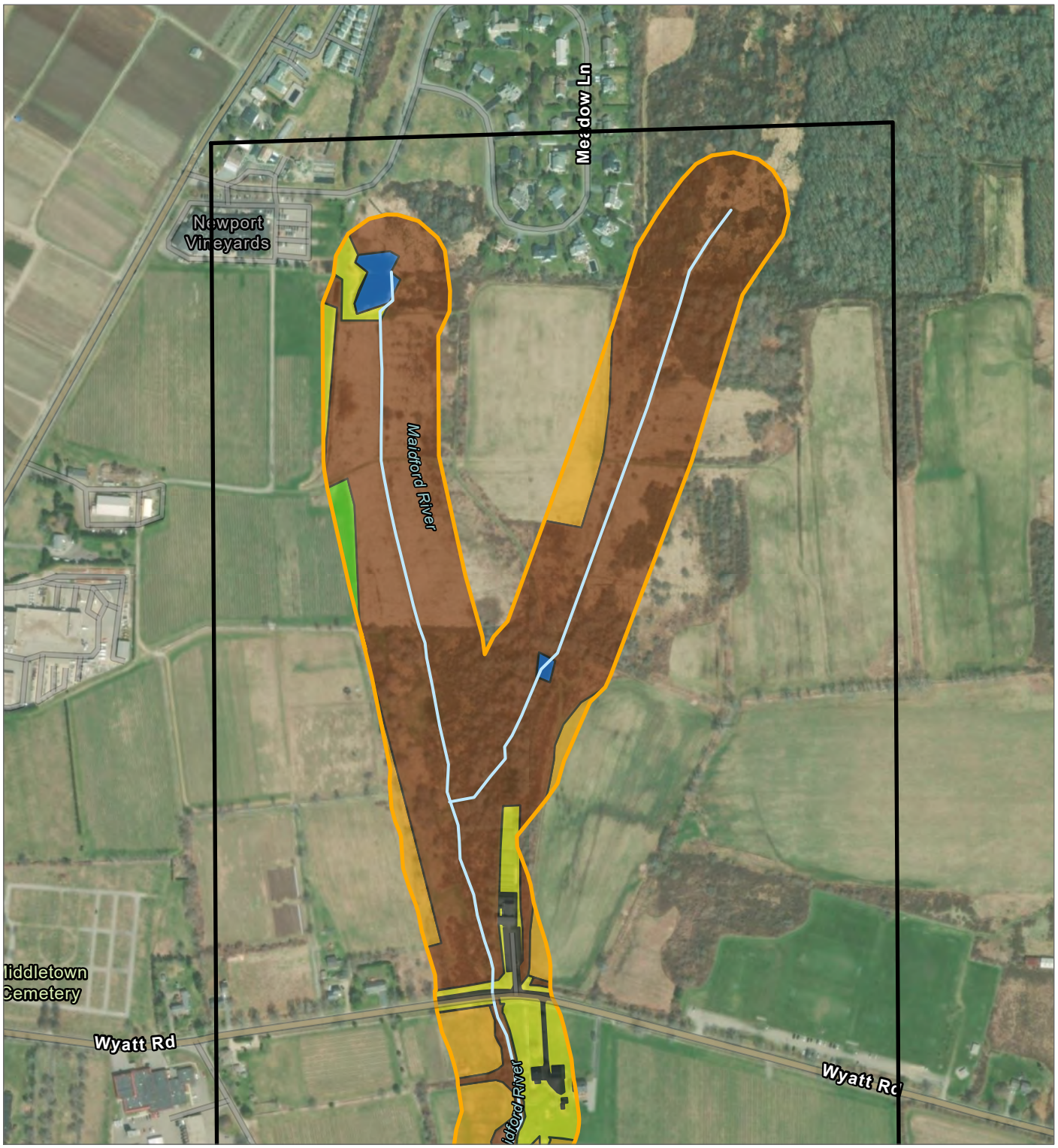

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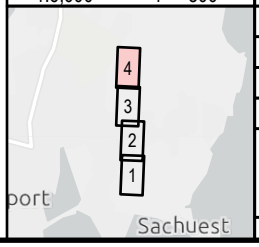

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