BOROUGH OF RUMSON

ENVIRONMENTAL RESOURCE INVENTORY

Prepared by

Rumson Environmental Commission

2022

Editorial/Mapping Updates
August 2023

by
Kendra Lelie, PP, AICP & Brett Harris, PP, AICP
Kyle McManus Associates

ACKNOWLEDGEMENTS

This report was prepared by the Rumson Environmental Commission using the existing Master Plan and accompanying Plans, Elements, Ordinances, Resolutions as well as additional materials available from partnerships, collaborations, and programs the Borough engaged in as part of its municipal duties. In addition, the Rumson Environmental Commission utilized information from governmental and other public databases, historical accounts, and scholarly articles to create a comprehensive categorization of the natural and environmental features in and around our town.

It is our hope that this Environmental Resource Inventory (ERI) will serve as an index of natural resources and information about the characteristics and environmental features of the Borough and that it will be used as a tool for measuring and evaluating resource protection issues when considering land use planning, zoning regulations, municipal ordinances, land use management techniques and development locations and intensity.

An ERI is an important land use tool and the natural resources identified here should be considered throughout the land use decision-making process. The inventory will serve as the basis for where the community should seek to protect, integrate and/or conserve resources. While making planning decisions, Rumson should consider the resources available and their ability to sustain a population while ensuring clean water and safe living conditions. This report should also serve as an educational tool for the public as it shows our residents and visitors where the environmental resources are located and provides an index of lands of environmental resource importance.. This report is meant to empower citizens, environmental commissions, and planning boards to think about how they can further protect and plan for the sustainability of the municipality's resources.

RUMSON ENVIRONMENTAL COMMISSION MISSION STATEMENT:
Our mission is to work with the community to protect our unique natural resources. We educate our residents on what we can do to maintain and protect our land, water and air; facilitate the adoption of behaviors that will meet those ends; and motivate residents and local businesses to join in the effort. For more information, please visit the Rumson EC website at www.rumsonnj.gov/environmental-commission.

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INTRODUCTION

Originally settled in 1665 and incorporated in 1907, the Borough of Rumson is a compact residential community located in the coastal area of northeastern Monmouth County, New Jersey. The community is bounded by the Navesink River to the north, the Shrewsbury River to the east and south, and the Boroughs of Fair Haven and Little Silver to the west. Because of their exceptional ecological, recreational and fishery significance, both the Shrewsbury and Navesink Rivers are listed by NJDEP as Category-1 streams which are protected from any measurable change to existing water quality. There are a number of unnamed tributaries and ponds throughout the Borough that flow into the two rivers.

The Borough and its surrounds are rich with early American history. Prior to 1665 when the lands that include Rumson were purchased from the Lenape tribe of Native Americans for "two anchors of liquors, foure hundred fathomes of seawon, Nine blankets, nine trading cloathe-coates, nine kettles, nine troopers coates, nine gunns, six howes, six shirts, six pounds of powder and six barrs of lead"[1], the land was prized by Native Americans for its waters abundant with sea life, especially clams and oysters. The Lenape subtribe, the Navesinks settled in the greater Rumson area where evidence shows they established a village in the Black Point section of Rumson. In fact, Rumson Road follows the so called "Indian Trail" that connected Rumson Neck to points west that are the present-day communities of Little Silver, Shrewsbury and Tinton Falls.

In the early days of the 17th and 18th centuries, the Rumson Neck was enjoyed by a small number of families who built large plantations that spanned the two rivers. According to real estate listings of the time, the land, with frontage on two navigable rivers, offered both salt and fresh meadow; had rich soil good for both summer and winter grain as well as crops and orchards; and boasted sections that were well timbered for settlers to build homes, barns and communal buildings. By the time George Washington's army chased the British down Rumson Road in the 1788 Battle of Monmouth, Rumson had roads, churches, hotels, docks and was a proper summer resort destination and ships would bring folks from points north to enjoy the summers at the Jersey Shore.

According to 18th century maps and written accounts, there was once a passage across the Seabright land mass that opened directly to the Atlantic Ocean near the mouth of the Navesink River allowing ocean waves to crash on the eastern shores of Rumson. When the pass closed, a more contained coastal estuary formed around the Rumson peninsula. This type of ecosystem, with its tidal flood plains and salt marshes, is considered one of the most productive natural habitats in the world and supports a rich and diverse selection of wildlife.

[1] Salter, Edwin-"History of Monmouth and Ocean Counties", 1890, p.33 Bayonne, N.J., E. Gardner & son, 1890.

Today, the Two Rivers and its surrounding ecosystem are extremely important to the community's way of life. The waters are teaming with fish and shellfish for fisherman, crabbers and clammers year-round. Recreational sailing, motor boating, paddle boarding, rowing, swimming and birdwatching are just some of the activities that attract residents and visitors especially in the warmer months. The large shade trees lining the streets, historic buildings and generously sized residential lots in the bulk of the town contribute to the beauty and character that makes Rumson one of the most sought-after places to live.

Protecting the unique natural and environmental resources such as the salt marshes and wetlands that make up our floodplain and the lush tree canopy and expansive open space that keep our impervious surface minimized are important to our town's resiliency.. Preserving these resources will help mitigate flood damage during storm events, prevent erosion, help filter pollutants from the air and water, provides habitat that supports a balanced ecosystem and. In the pages that follow, we describe these characteristics in more detail and provide recommendations on ways to preserve them.

CHAPTER 1: WATER RESOURCES

Perhaps the most unique and valuable resources the Borough of Rumson possesses are its water resources. Water resources include any river, stream, lake, pond, aquifer, other underground source, or other water body which may be diverted to a water supply system. Water resources used to provide potable water must be protected to prevent contamination of drinking water supplies and widespread and long-lasting contamination of aquifers. Contamination of water resources can result in costly remediation efforts, including treatment of the water to return it to its previous condition and provision of alternate sources of potable water for the people affected.[2]

Hydrologic Cycle[3]

The hydrologic cycle describes the continuous circulation of water between the oceans, atmosphere, and land. Water is supplied to the atmosphere by evapotranspiration. This includes evaporation from water, vegetation, snow, and transpiration from plants. Water is returned to the land through precipitation. Within the hydrologic cycle, water may be stored by vegetation, snowpacks, land surfaces, water bodies, saturated subsurface zones, and unsaturated subsurface zones/soils. Water may be transported between these storage areas via overland runoff, stream flow, infiltration, groundwater recharge, and groundwater flow, among other processes. People interact with the hydrologic cycle by removing water for agricultural, domestic, and non-residential uses, and returning it as wastewater discharges. Urban development may also interfere with the natural transfers of water between storage components of the hydrologic cycle.

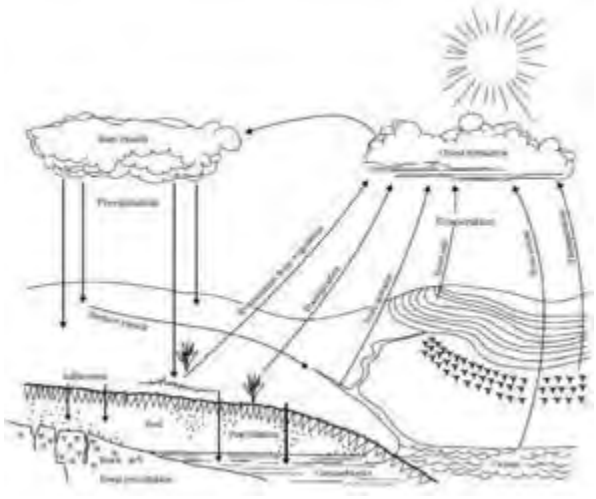


Figure 1 Hydrologic Cycle Diagram 1

Within a watershed, a water balance may be used to describe the hydrological cycle. A water balance provides for an accounting of water transfers across a watershed's boundaries over a period of time. Any difference between inflows to the system and outflows from the system during this time period must be balanced by a change of storage within the system.

[2] NJDEP, Bureau of Release Prevention, Environmentally Sensitive Areas Guidance Document, 2017
[3] 2006 Rumson Stormwater Management Plan, pg 10-11

Changes to the Hydrologic Cycle/Water Balance[4]

An increase in impervious surface area associated with urbanization increases runoff while it decreases infiltration of water into surrounding soils. Urbanization also results in decreased evapotranspiration. Development practices in an urban watershed stream may dramatically change the hydrologic condition of a stream.

Potential impacts include: an increase in the magnitude and frequency of runoff events; an increase in the stream's annual flow as surface storm runoff rather than base flow; and increases in velocity of flow during storms.

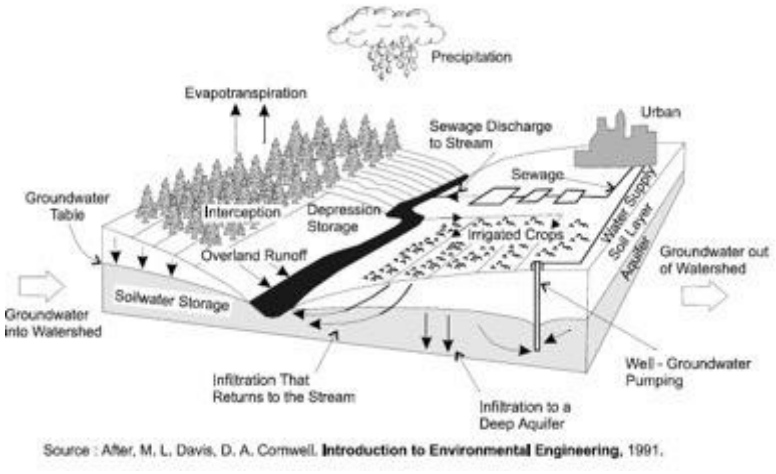


Figure 2 Hydrologic Diagram 2

The National Oceanographic and Atmospheric Administration (NOAA), the agency that develops statistical estimates of rainfall amounts has increased its estimates for many storm events, particularly the larger events.

The following table indicates the old and new 24- hour rainfall amounts in inches for Monmouth County. The decrease in infiltration that occurs with urbanization reduces soil moisture replenishment and groundwater recharge that is the source of stream baseflow, which is important for sustaining aquatic life.

Table 1 24-Hour Rainfall Amounts in Monmouth County

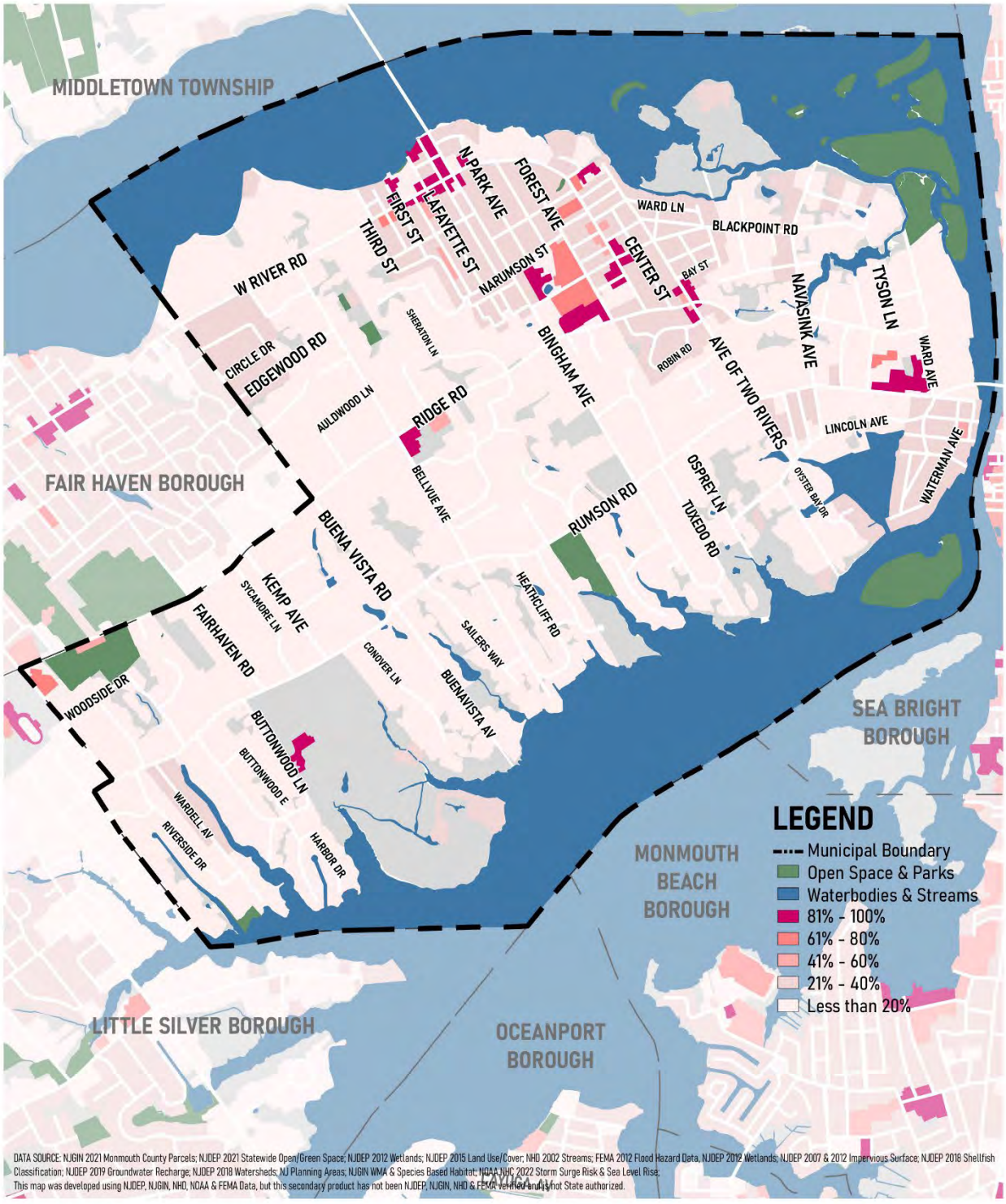
NRCS 24 Hour Design Storm Rainfall Depth (inches)- 2012

	1 year		2 Year		5 Year		10 Year		25 Year		50 Year		100 Year	
	Old	New	Old	New	Old	New	Old	New	Old	New	Old	New	Old	New
Monmouth County	2.8	2.8	3.4	3.4	4.4	4.4	5.3	5.2	6.0	6.5	6.5	7.7	7.5	8.9

[4] NJDEP, Bureau of Release Prevention, Environmentally Sensitive Areas Guidance Document, 2017

Over the years, with continued development in the Borough, impervious surface has increased which puts stress on the natural hydrologic cycle. This increase can be seen visually in the maps below which illustrate the five-year increase between 2007 and 2012. Increased development with accompanying reductions in the tree canopy and natural ground cover impact rainwater interception and increase stormwater runoff. Trees improve the water cycle in urban areas by their ability to intercept or slow the rate that rainfall reaches the ground, increase absorption, and reduce the amount spilling onto paved surfaces and flowing into storm drains and rivers.

The preservation of the natural hydrologic cycle, to the greatest extent practicable, will maintain groundwater recharge and reduce baseflow impacts. It will also reduce the potential for flooding and erosion, and possibly, the size and cost of stormwater infrastructure. Lack of proper stormwater management, reduced baseflow, degradation of water quality, and increased flooding and erosion can lead to reduced diversity of aquatic life, fewer opportunities for human uses of water resources, and loss of property and human life.



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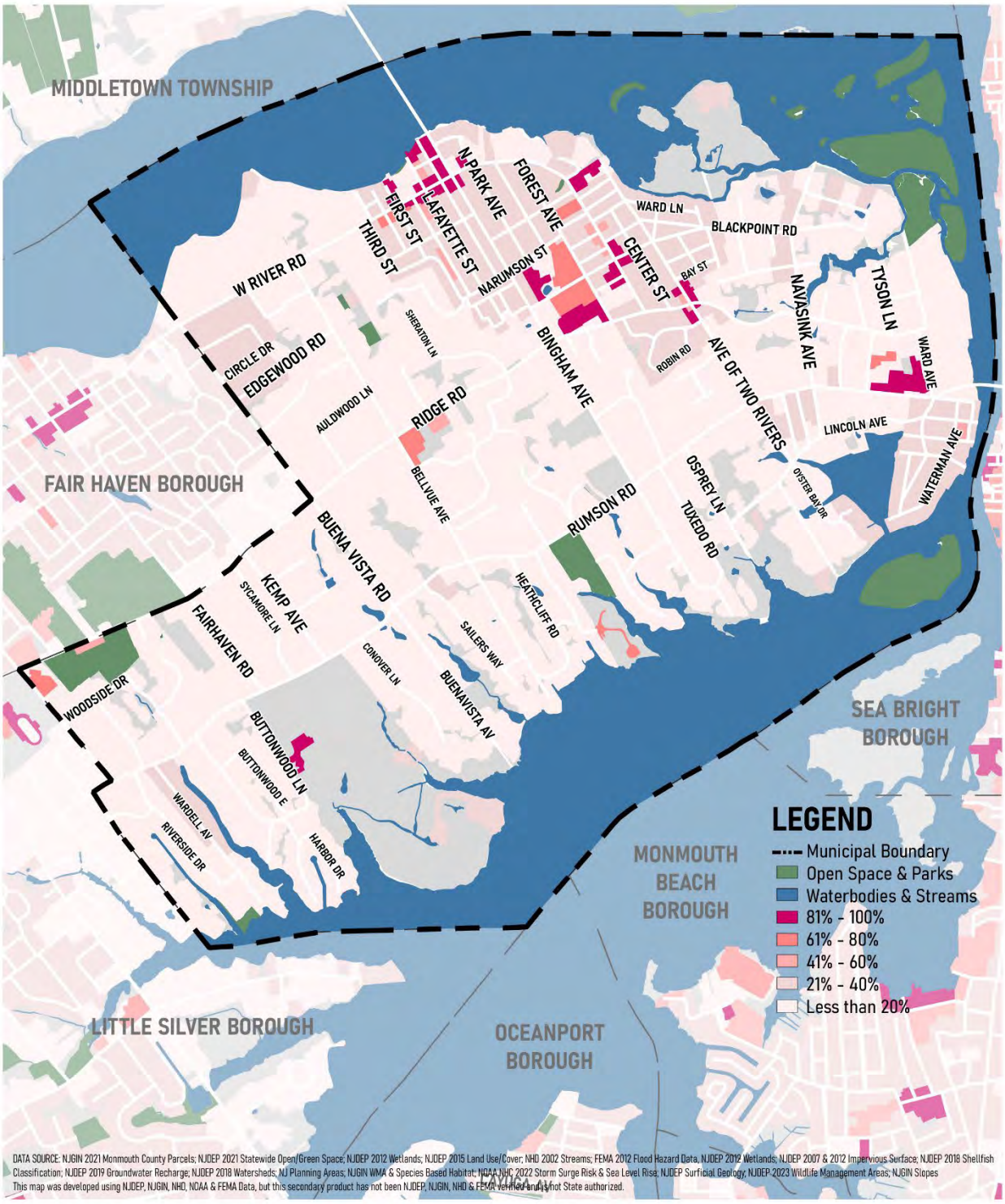
POLICY PLANNING DESIGN

2007 IMPERVIOUS COVERAGE
BOROUGH OF RUMSON

0 1000 2000 3000 feet



DATA SOURCE: NJGIN 2021 Monmouth County Parcels; NJDEP 2021 Statewide Open/Green Space; NJDEP 2012 Wetlands; NJDEP 2015 Land Use/Cover; NHD 2002 Streams; FEMA 2012 Flood Hazard Data, NJDEP 2012 Wetlands; NJDEP 2007 & 2012 Impervious Surface; NJDEP 2018 Shellfish Classification; NJDEP 2019 Groundwater Recharge; NJDEP 2018 Watersheds; NJ Planning Areas; NJGIN WMA & Species Based Habitat; NOAA NHC 2022 Storm Surge Risk & Sea Level Rise; NJDEP Surficial Geology; NJDEP 2023 Wildlife Management Areas; NJGIN Slopes
This map was developed using NJDEP, NJGIN, NHD, NOAA & FEMA Data, but this secondary product has not been NJDEP, NJGIN, NHD & FEMA verified and is not State authorized.

KMA KYLE / MCMANUS ASSOCIATES POLICY PLANNING DESIGN

2012 IMPERVIOUS COVERAGE
BOROUGH OF RUMSON

0 1000 2000 3000 feet

Groundwater & Aquifers

Water located beneath the land surface, that is within the saturation zone below the water table, is *ground water*. *Aquifers* are underground water bearing fractured bedrock or geologic formations where this groundwater is found in usable quantities and are recharged by surface waters. In the case of *confined aquifers,* such as exists beneath Rumson, the recharge area can be located far away, and subsequently impacted by various sources. Alternatively, unconfined aquifers are covered by permeable geologic formations (either solid rock or unconsolidated sediments), and the upper surface where the rock formations are fully saturated is called the water table. These aquifers also are known as water table aquifers. They receive recharge directly from the infiltration of rainfall and surface water.[5] A *water resource* as defined at N.J.A.C. 7:19-1.3 includes any river, stream, lake, pond, aquifer, other underground source, or other water body which may be diverted. These include feeder streams entering a water supply reservoir, reservoirs and buffer zones, and the aquifers utilized by water supply wells with their attendant wellhead protection areas.

Figure 3 Monmouth County Aquifers Map

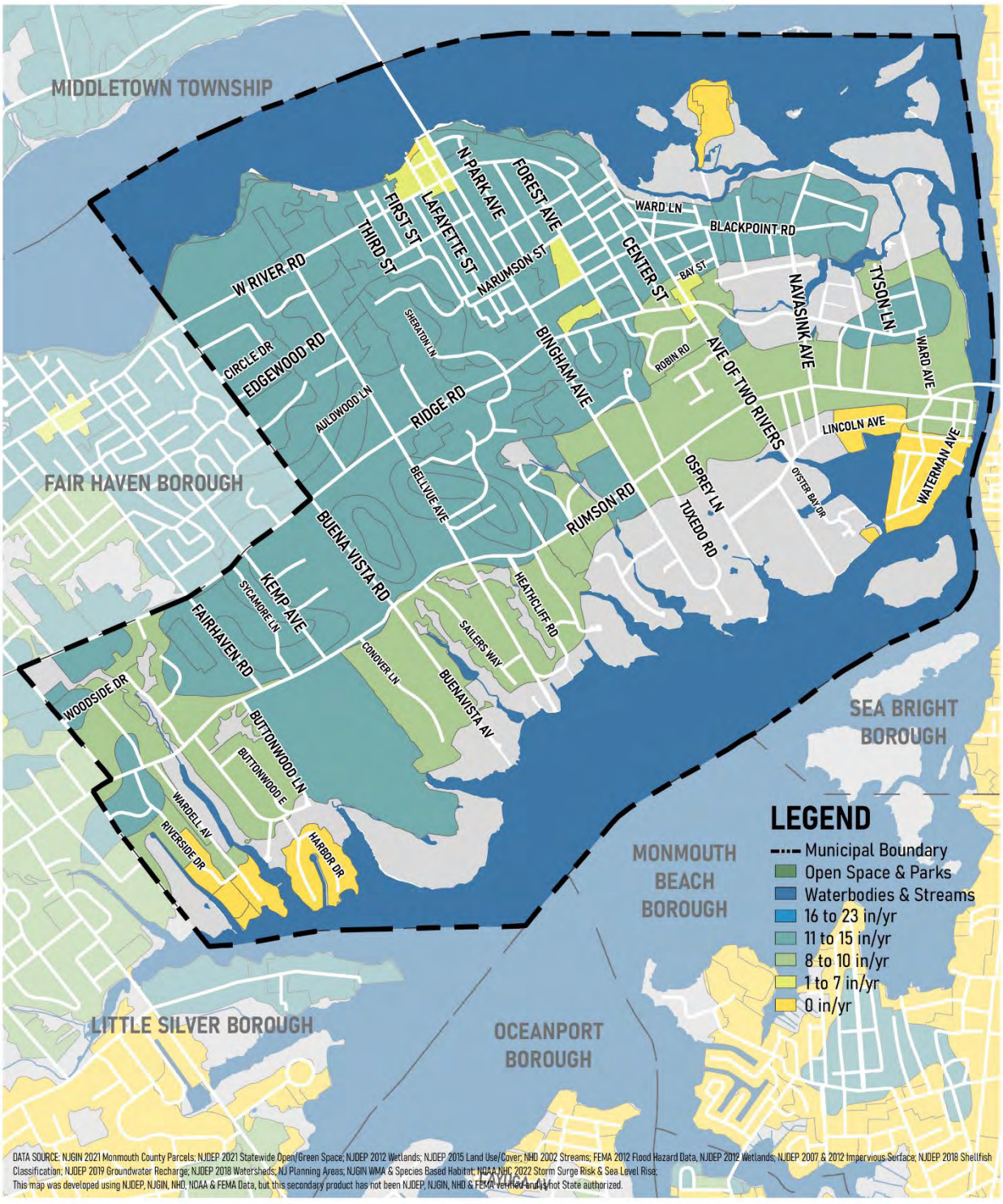
Groundwater generally moves slowly, ranging from about one foot per day to perhaps ½ inch per month. It might take days or centuries for water to travel from the point where it enters the ground to the point of discharge into a stream, depending on the pore size between particles as well as the size and uniformity of the actual particles.

The Composite Confining Unit

The Composite Confining Unit is composed of silt and clay with localized sand lenses. Confining Units include Shark River, Manasquan, Hornerstown and Tinton Formations and the lower part of (Sandy Hook Member) of the Red Bank Formation. Localized Water Table Aquifers composed of massive quartz sand outcrop such as the Vincentown Formation and the upper part (Shrewsbury Member) of the Red Bank Formation grade into confining units southeastward in the subsurface where the quartz sand becomes more glauconitic and silty with well yields ranging from 25 – 500 gallons/minute. The Piney Point Aquifer occurs near the top of the composite unit in the subsurface only. Water in the aquifers is generally good but iron and manganese levels may be locally elevated and require chemical treatment. Typically, calcium- bicarbonate type waters dominate.

[5] National Driller, The ABCs of Acquifers, https://www.nationaldriller.com/articles/85773-the-abcs-of-aquifers

The groundwater recharge Geographic Information System layer created by NJDEP utilizes soil characteristics and existing land use information to determine the likely rate of groundwater recharge. Areas with lower groundwater recharge, such as impervious areas and soils with poor infiltration, may require additional engineering and best practice measures to encourage groundwater recharge. Groundwater quality is monitored by the Department of Environmental Protection for common toxic chemicals. The Rumson Country Club well and a well located nearby in Red Bank have been monitored. No toxic chemicals were detected.



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GROUNDWATER RECHARGE MAP

BOROUGH OF RUMSON

0 1000 2000 3000 feet

Watersheds

A watershed is the land area drained by a set of brooks, streams, and rivers that generally flow in a common direction and terminate at a common destination, usually a large river, lake or the ocean. Rumson is located in two watersheds, the Navesink River/Lower Shrewsbury River Watershed and the Shrewsbury River Watershed.[6]

The Northern section of Rumson is located in the Navesink River Watershed which is 59,200 acres or roughly a 95 square mile tract of northeast Monmouth County containing uplands, bogs, fresh and tidal wetlands, streams, and tidal rivers. Numerous streams and brooks flow through a diverse mix of small farms, tracts of forest, green, and open space, sprawling residential and suburban development, and densely built out urban areas. The Headwaters of the Navesink include Yellow Brook, Big Brook and Mine Brook flowing from western Colts Neck Township. These tributaries flow into the Swimming River Reservoir: a critical potable water source for the area, which then feeds the Swimming River, before opening into the wide, tidally flushed coastal lagoon of the Navesink River.

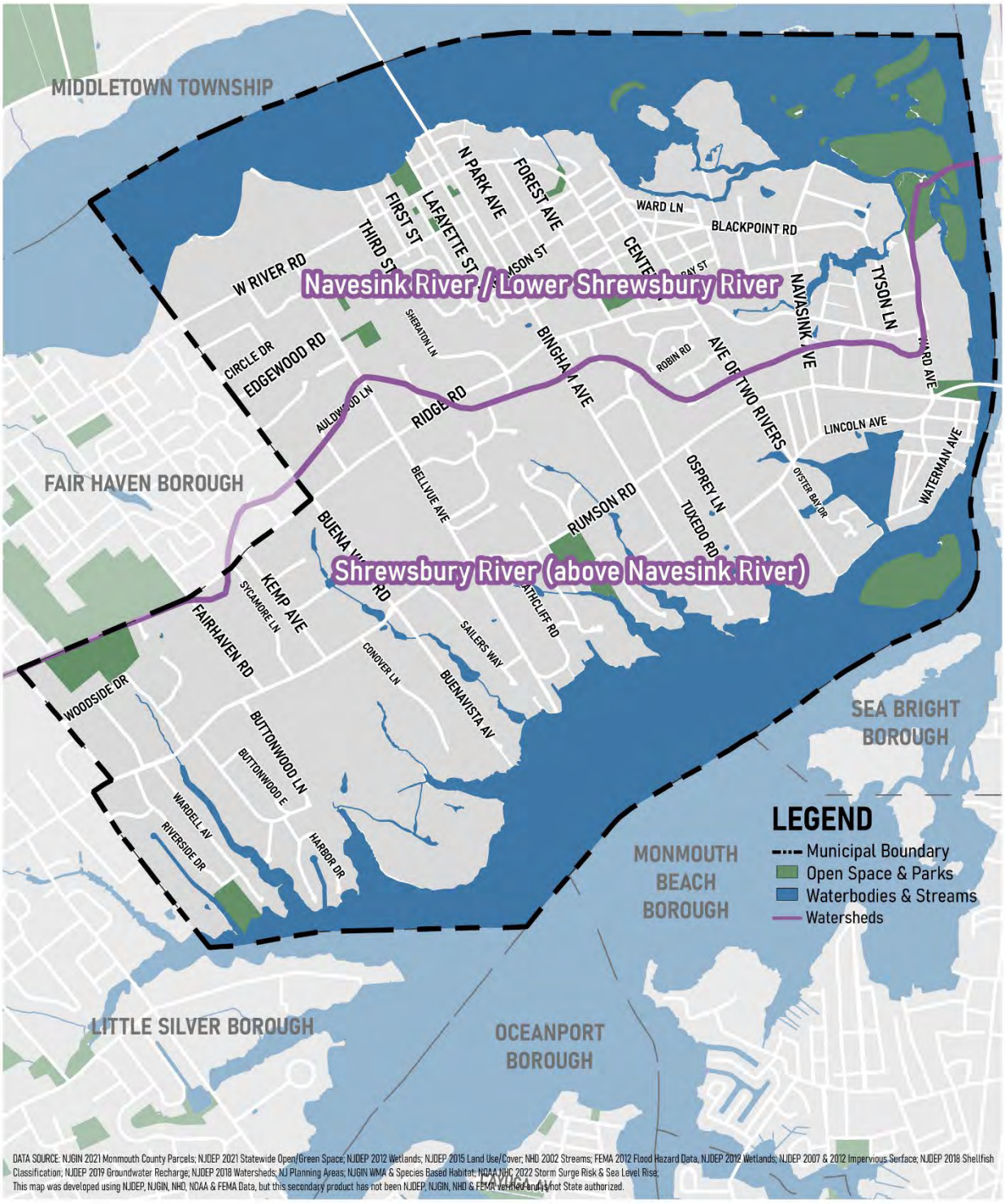
Numerous other tributaries feed the Navesink, including the Hockhockson and Pine Brook Rivers from the southwest, Ramanessin Brook, Willow Brook, and Hop Brook from the hills of Colts Neck and Middletown, Nut Swamp and Jumping Brook which flow into Shadow Lake before reaching the Navesink, and Poricy Brook, McClees Creek and Claypit Navesink from the north.[7] These waters flow through seven municipalities; Colts Neck, Middletown, Tinton Falls, Red Bank, Fair Haven, Rumson, and Sea Bright before the Navesink River meets the Shrewsbury River, Sandy Hook Bay, and the wide angle of the New York New Jersey Harbor.[8]

The southern boundary of Rumson is part of the Shrewsbury Watershed. The Shrewsbury River drains an area of 27 square miles and is similar in topography and physiography to the Navesink watershed. Tributaries to the river include Manhassett Creek, Troutman's Creek, Branchport Creek, Turtle Mill Brook, Parkers Creek, Oceanport Creek, Town Neck Creek, Wardell's Creek and Little Silver Creek. The Shrewsbury Watershed and Navesink Watershed join at the mouth of Navesink River on the Northeastern tip of Rumson where they flow to the Atlantic Ocean via the Sandy Hook Bay.

[6] ~~*NJDEP AmeriCorps Watershed Ambassador*~~ *Program, Freehold Division of Planning.*

[7] Kate Kellen & Jerry Keelen, The Navesink Watershed: A Short History (2003), Swimming River Group, *available at* https://rucore.libraries.rutgers.edu/rutgers-lib/17173/PDF/1/

[8] Zachary Lees, Esq, Pathogen Pollution int the Navesink River (2016), Clean Ovean Action available at https://www.cleanoceanaction.org/fileadmin/editor_group2/Water_Quality/COA_Navesink_Report_FINAL.pdf



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WATERSHED MAP
BOROUGH OF RUMSON

0 1000 2000 3000 feet

Streams & Waterbodies[9]

Rumson is located between the Shrewsbury and Navesink Rivers and there are a number of unnamed tributaries and ponds. Both the Shrewsbury and Navesink Rivers are classified as "Category 1 Streams". As such, the waters are protected from any measurable change in existing water quality because of their exceptional ecological significance, exceptional recreational significance, exceptional water supply significance, or exceptional fisheries resources. Both the Navesink and Shrewsbury Rivers are tidal coastal estuaries that borders Rumson on its northern, eastern and southern shores. Several streams and coves shape the river shore. Four of the prominent Rumson streams flow in a southeasterly direction from a topographic ridge to the Shrewsbury River. Oyster Bay also flows into the Shrewsbury River. Another prominent stream flows in a northeasterly direction from Navesink Avenue, north of Ridge Road, and outlets at the confluence of the two rivers.

These streams provide habitat for a wide variety of wildlife species. A range of turtles breed in the inland streams of Rumson and an array of birds roost and nest nearby in order to hunt and forage in riparian habitat the multitude of streams provide. Several riverine islands are located within the Borough boundaries. Most of these are in the Navesink River or at the confluence of the Navesink and Shrewsbury Rivers. The exception is Gunning Island which is in the Shrewsbury River opposite Oyster Bay. Most of these islands contain wetlands habitat, which are part of global cycles for water, nitrogen and sulfur. Because wetlands store carbon within their plant communities and soil instead of releasing it to the atmosphere as carbon dioxide, they can help to moderate global climate conditions.

These estuaries support substantial hard clam (Mercenaria mercenaria), soft clam (Mya arenaria), and blue crab (Callinectes sapidus Rathbun) populations. The Shrewsbury and Navesink Rivers produce most soft shell clams in the state. The Oceanic Bridge serves as the boundary line where shell-fishing beds are closed to shellfish harvesting.

Impacts from agriculture, horse farms, development and urban runoff are believed to have contributed to non-point sources of pollution in the Shrewsbury and Navesink rivers. These impacts include siltation of rivers, streams and ponds, increased nutrient levels in water bodies and increased bacterial levels. Urban runoff and bacteria specific to wildlife have contaminated many shellfish-harvesting beds in the downstream reaches of the Shrewsbury and Navesink Rivers.

[9] 2006 Rumson Stormwater Management Plan, pg. 16

Within the shellfish-harvesting portions of the Navesink River, the major pollution problem is high

bacterial loadings from non-point sources, with the highest concentration occurring in the segment of the river near Red Bank. According to NJDEP, water quality improves as one proceeds downstream along the Shrewsbury and Navesink rivers. Because of pollution, shellfish harvesting was prohibited for 25 years in the Navesink River. Following the implementation of the Clean Water Act in 1972, significant improvements in water quality in the Navesink River occurred from the reduction of non-point source loading into the river which led to the reopening of shellfish harvesting in the late 1990's. Further improvements were achieved through a collaboration between stakeholders (Rally for the Navesink) in response to a 2016 NJDEP downgrade of 567 square miles of the Navesink to direct shellfish harvesting. The river system ultimately drains into the Raritan Bay and Sandy Hook Bay. Frequent flooding occurs along the Shrewsbury River and tributaries. The flooding is primarily due to high water from storms producing high tides, which flood the extensively developed land areas. Long lasting storms such as northeasters prevent the drainage of floodwaters to Raritan Bay and Sandy Hook Bay.[10]

[10] US Army Corps of Engineers FACT SHEET-Shrewsbury River Basin, Sea Bright, NJ Feasibility Study, 2020, available at: https://www.nan.usace.army.mil/Media/Fact-Sheets/Fact-Sheet-Article-View/Article/487391/fact-sheet-shrewsbury-river-nj/

Floodplains & Flood Hazard

Floodplains are a naturally occurring result of a tidal river front and provide a number of benefits to the surrounding community. As the rivers rise and retreat, they need space to spread out and slow down so sediment can settle keeping water cleaner for local wildlife and recreational uses. Floodplains are a nutrient rich and biologically diverse environment that can support an abundance of plants, birds, fish, and other species on land and in the water. In fact, many of our local marine life rely on different sections of our floodplain to breed and raise young. Importantly, properly managed flood plains can mitigate property damage from flood events by capturing and storing flood waters and gradually recharging ground waters[11]. The entire coast of the Rumson peninsula lies in a flood plain.

The effects and hazards are outlined below.

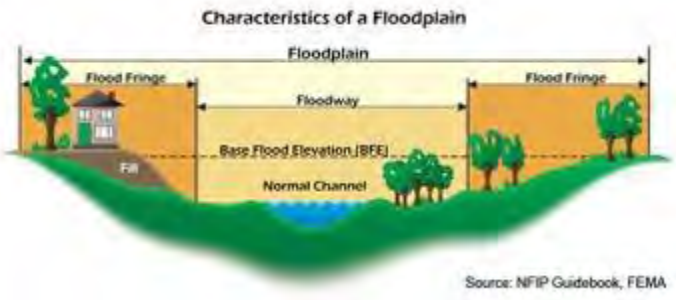

Figure 4 Characteristics of a Floodplain

Description of Known Flood Hazards

All the Borough's boundaries with water bodies are located within the floodplain. Flooding generally occurs in low-lying areas of the Borough along the banks of the Navesink and Shrewsbury Rivers. In particular, the northeastern portion of the Borough near Barley Point Island, the southwestern portion of the Borough along the Shrewsbury River, and southeast corner of the Borough, just south of the Sea Bright Bridge in the West Park neighborhood are highly susceptible to flood events during large storms. Portions of the Borough are also susceptible to flooding on a regular basis from higher-than-normal high tides. These areas include Shrewsbury Drive near Avenue of the Two Rivers, the intersection of Holly Tree Lane and Navesink Avenue, the southern end of Club Way, and the entire West Park neighborhood, including South Ward Avenue, Waterman Avenue, Warren Street, Washington Avenue, Grant Avenue, and River Place. Flooding also occurs from a small stream to the west of Brookside Drive. This stream backs up during heavy rainfalls, causing flooding to the neighboring residential properties and occasionally Rumson Road. Residents typically have a 24-hour warning of severe coastal flooding events. There are no levees or dams located in the Borough that would result in a flood if they failed or were damaged[12]. A total of 503 residential homes and 14 commercial buildings are located within the 100-year floodplain, also known as the Special Flood Hazard Area (SFHA). As can be seen in Table 2, 18% of the structures in the Borough are within the 100-year floodplain and therefore vulnerable to flood damage.

[11] Green Guide, FEMA Community Rating System, Association of State Floodplain Managers, https://www.floodsciencecenter.org/products/crs-community-resilience/green-guide/2/

Item	Borough Total	100-Year Floodplain	500-Year Floodplain[1]	100-Year + 500-Year Floodplain	Percent Located within the 100-Year Floodplain
Structures	3,196	595	191	786	18.6%
Properties	2,677	756	115	871	28.2%
Land Area (acres)[2]	2,975	731	166	897	24.6%

1. This does not include the area within the 100-year floodplain.
2. Land area only includes land parcel areas. Waterways and roads are not included in this area.

Table 2 Structures, Property & Land Area in Floodplain

In addition, some critical facilities are also located within either the 100-year or 500-year floodplain. The Department of Public Works buildings are located within 550 feet of the Navesink River, and a significant portion of the facilities are within the 100-year floodplain. Several sanitary sewer pump stations are also located within the SFHA, many of which were damaged during Superstorm Sandy. The pump stations located at Club Way, Thornton Way, Navesink Avenue, Grant Avenue, Avenue of Two Rivers South, Buena Vista Avenue and Avenue of Two Rivers are all located within the 100-year floodplain. It should also be noted that the pump station on Riverside Drive is located within the 0.2% Annual Flood Hazard Area. In addition, Rumson's Borough Hall and Police Department are located within the 500-year floodplain. Below is a map of community & critical facilities with flood zone overlay. The map also indicates which roads have the potential for flooding during the 100-year flood.

[12] Rumson Flood Plain Management Plan, 2015

A number of homes in this area were substantially damaged during Superstorm Sandy. Early warning and evacuation, as well as making the necessary preparations to protect facilities from flooding, can protect the health and safety of residents and emergency workers and facilitate a rapid response and recovery from future flood events. The Borough is in the process of preparing Emergency Operation and Debris Management Plans that should address these issues and minimize their impacts to the maximum extent practical. Many of the hazards to which Rumson is vulnerable generally occur concurrently with flooding. Areas that are susceptible to flooding will only increase in their vulnerability as impacts due to sea level rise become greater in the future. Homes which are not raised above the base flood elevation are particularly vulnerable to flood related hazards, as are areas prone to flooding but not located within the SFHA. Working with the Federal Emergency Management Agency (FEMA) is recommended to ensure that all flood maps illustrate an accurate portrayal of flood risk within the community.

The 100 year floodplain boundary generally parallels the shoreline but veers inland around and in the stream corridors. The 500 year floodplain area mimics the 100 year floodplain boundary approximately 500 feet further inland and crosses Rumson Road around the stream corridor between Wardell Avenue and Brookside Drive.

Floodplains are managed through the state's Stream Encroachment Permit process and also through the Federal National Flood Insurance Program. State permits are required for projects which involve alterations to stream channels or floodplains within the 100 Year floodplain boundary.

DATA SOURCE: NJGIN 2021 Monmouth County Parcels; NJDEP 2021 Statewide Open/Green Space; NJDEP 2012 Wetlands; NJDEP 2015 Land Use/Cover; NHD 2002 Streams; FEMA 2012 Flood Hazard Data, NJDEP 2012 Wetlands; NJDEP 2007 & 2012 Impervious Surface; NJDEP 2018 Shellfish Classification; NJDEP 2019 Groundwater Recharge; NJDEP 2018 Watersheds; NJ Planning Areas; NJGIN WMA & Species Based Habitat; NOAA NHC 2022 Storm Surge Risk & Sea Level Rise; NJDEP Surficial Geology, & Soils, NJDEP 2023 Wildlife Management Areas; NJGIN Slopes; This map was developed using NJDEP, NJGIN, NHD, NOAA & FEMA Data, but this secondary product has not been NJDEP, NJGIN, NHD & FEMA verified and/or not State authorized.

KMA
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FLOOD HAZARD AREA & CRITICAL FACILITIES
BOROUGH OF RUMSON

0 1000 2000 3000 feet

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POLICY
PLANNING
DESIGN

FLOOD HAZARD AREA & SCHOOLS MAP

BOROUGH OF RUMSON

0 1000 2000 3000 feet

Water Quality: Potential & Known Sources of Contamination

Section 303(d) of the Clean Water Act requires states, territories, and authorized tribes to develop lists of impaired waters. Impaired waters are waters that are too polluted or otherwise degraded to meet the state water quality standards. Federal law requires these jurisdictions to establish priority rankings for polluted waters and develop total maximum daily loads for impaired waters. A total maximum daily load, or TMDL, is a calculation of the maximum amount of a pollutant that a waterbody can receive and still safely meet water quality standards. [13]

According to NJDEP, impairments for total coliform, dissolved oxygen and fecal coliform have been identified along the Shrewsbury River/Navesink River Estuary and the Navesink River has been placed on the "List of Water Quality Limited Waters with Sublist 5 Subparts and Priority Ranking for TMDL Development", which is a water quality assessment ranking list. While a TDML has not currently been established for the portions of the Shrewsbury and Navesink Rivers adjacent to Rumson's political boundary, future testing may lead to the creation of a TDML, which would require a revision to this Plan.

Figure 5 Shellfish Growing Classification Map

The Navesink River supports a diversity of wildlife and marine life and includes many endangered or threatened species. The Navesink River and its surrounding land area hold immense ecological wealth and as described in a 2016 report by Clean Ocean Action, "the area is a key part of the mid-Atlantic flyway, the convergence of many cold and warm water species' habitats, a nursery for many breeding and wintering species, and supports one of the only commercially harvested softshell clam fisheries in the state, as well as substantial, hardshell clam and blue crab populations and critical fish and animal habitat.

[13] NJDEP, Fact Sheet on the New Jersey 2016 Impaired Waters List January 2020.

The Navesink also supports a robust recreation-based economy comprised of paddling sports, boating, crabbing, angling and clamming, sailing, birdwatching, and swimming.[14] According to, Clean Ocean Action, "the struggle to improve and maintain the water quality of the Navesink has been a tale that has unfolded in fits and starts throughout the last several decades. The popularization of the Jersey Shore as a vacation destination and expansion of railways to the shore throughout the 19th century led to increases in population and development pressures. These pressures culminated with a post WWII boom in development, habitat loss, industrial and wastewater discharge, spills, and dumping throughout the NY/NJ Harbor Estuary and New York Bight. By the 1950's, the commercial shell fishing industry and much of the surrounding ecosystem collapsed due to pollution, disease, and habitat loss. Substantial improvements were not made until the mid- 1970's following the passage of the Clean Water Act and modern environmental regulations, and investment in improved wastewater treatment technology. For a time, improvements in water quality allowed the reopening of shellfish harvesting in the downstream most section of the Navesink in the late 1990's, which had been previously closed for over twenty-five years."[15]

The Shrewsbury and Navesink Rivers produce most softshell clams in the state with approximately 2,520 acres of clamming sites[16], however, due to increased pollution levels, the NJDEP restricted an additional 567 acres of the Navesink River from direct harvesting of shellfish in 2015. Although the approved portions of the Shrewsbury and Navesink Rivers still produce the majority of softshell clams in the state, the recent downgrade of these additional acres serve as stark warning.

Presently, the Oceanic Bridge serves as the boundary line where shell-fishing beds are closed to shellfish harvesting. Many non-point sources of pollution from agriculture, horse farms, development and urban runoff have contributed to pollution in the Shrewsbury and Navesink rivers and threaten this industry as well as recreational use of the rivers. The resulting siltation of rivers, streams and ponds, increased nutrient and bacterial levels in waters and reduced dissolved oxygen have impacted the marine and land life in and around the rivers. Urban runoff and bacteria specific to wildlife have contaminated many shellfish-harvesting beds in the downstream reaches of the Shrewsbury and Navesink Rivers.

Within the shellfish-harvesting portions of the Navesink River, the major pollution problem is high bacterial loadings from non- point sources, with the highest concentration occurring in the segment of the river near Red Bank. Both the Navesink River and the Shrewsbury River estuary exceed the state's criteria for the above-mentioned pollutants and are classified as impaired waterways upstream of Rumson. According to NJDEP, water quality improves as one proceeds downstream along the Shrewsbury and Navesink rivers. As can be seen from the map, the only areas presently approved for direct shellfish harvesting in the Shrewsbury and Navesink rivers are east of the Oceanic Bridge.

[14] Zachary Lees, Esq, Pathogen Pollution int the Navesink River (2016), Clean Ocean Action, available at: https://www.cleanoceanaction.org/fileadmin/editor_group2/Water_Quality/COA_Navesink_Report_FINAL.pdf

[15] Zachary Lees, Esq, Pathogen Pollution int the Navesink River (2016), Clean Ocean Action, available at: https://www.cleanoceanaction.org/fileadmin/editor_group2/Water_Quality/COA_Navesink_Report_FINAL.pdf

[16] NJ Department of Environmental protection, Division of Water Monitoring & Standards

Surface water quality of the Navesink River is tested nearby in Red Bank. Total coliform and fecal coliform levels were occasionally noted above the standard maximum safe levels of 200 ml fecal coliform and 2400 ml total coliform. High levels of fecal coliform, an indicator of human and animal waste, limit the safe harvesting of shellfish in the Navesink. Although, the Navesink is condemned to shellfishing west of the Borough, the Navesink River in Rumson is designated as a special restricted area. The Shrewsbury River also received this designation. Harvesting is allowed in these areas only by special permit which can be obtained from the New Jersey Department of Environmental Protection.

Water quality is managed through the Monmouth County 208 Water Quality Management Program. Public agencies and private corporations which discharge effluent, industrial wastewater, or wash water, into surface waters are required to obtain permits in accordance with the Federal Water Pollution Control Act (PL 92-500). These permits are obtained under the National Pollutant Discharge Elimination Process.

In addition, permits are required under the New Jersey Water Pollution Control Act (NJSA 58:lOA-l et seq.) for discharge into surface or groundwater. This program is administered by the N J Department of Environmental Protection, Division of Water Resources, Water Quality Management Element. The United States Army Corps of Engineers, New York District, regulates the dredging or filling of navigable waters and their floodplains through the Clean Water Act (33 USC 1344). Waterfront development adjacent to tidal or navigable waterways is also regulated by the New Jersey Department of Environmental Protection of Coastal Enforcement under N.J.S.A. 12:5-3.

Alteration of a stream channel or the installation of permanent fill or structures is regulated by the New Jersey Department of Environmental Protection, Division of Water Resources, stream Encroachment Section under the Flood Hazard Area Control Act (N.J.S.A. 58:16A-50).

The 2021 Rumson Stormwater Management and Control ordinance requires flood control, groundwater recharge, and pollutant reduction measures to be achieved through the use of stormwater management measures including green infrastructure Best Management Practices (GI BMPs) and nonstructural stormwater management strategies. These measures include rain gardens, bioswales, filter strips, native planting, converted lawn or pervious surfaces with ground cover and other plantings and the use of rain barrels to name a few.

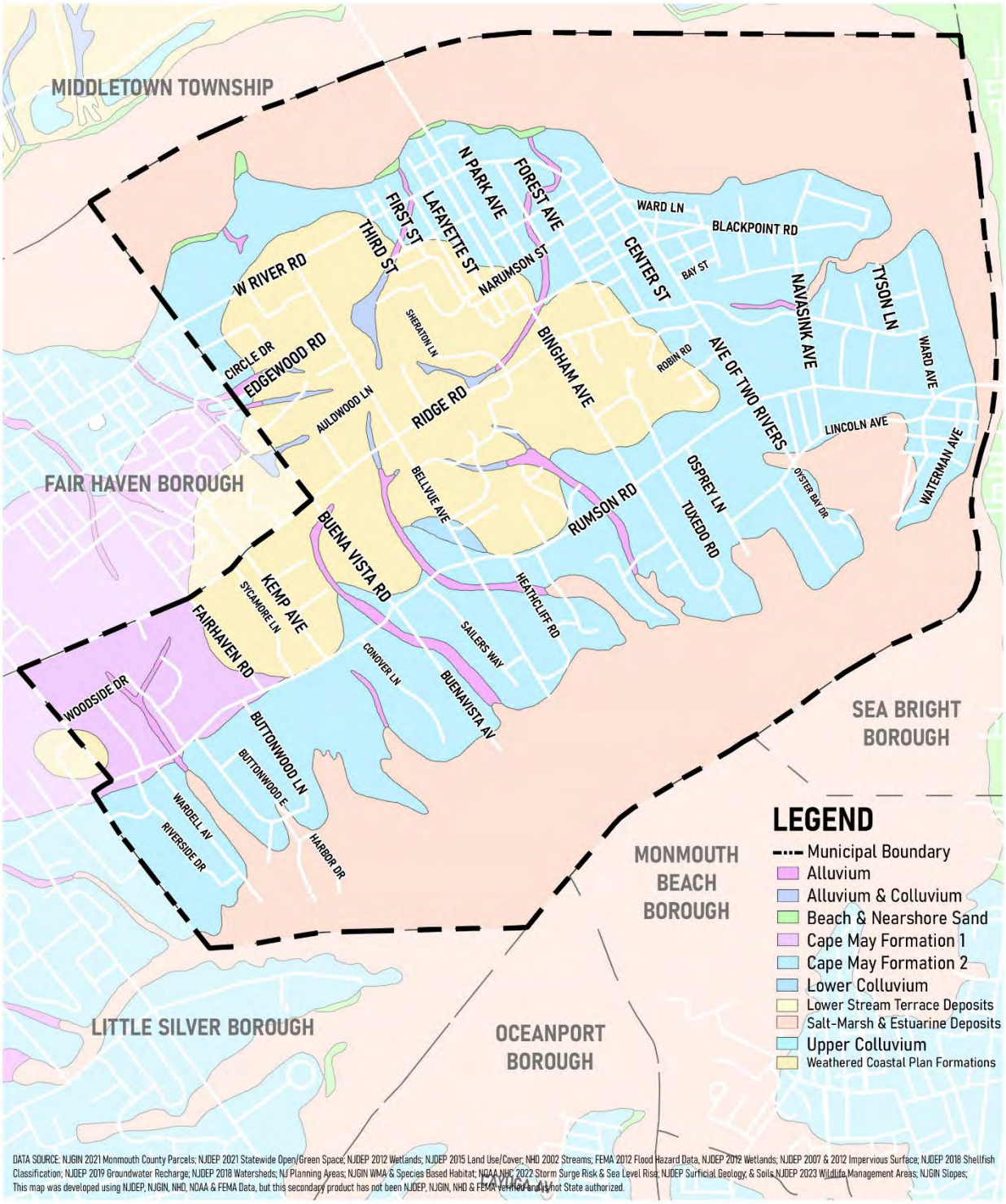
CHAPTER 2: NATURAL FEATURES

New Jersey is divided into five physiographic provinces: Ridge and Valley, Highlands, Piedmont, Inner Coastal Plain and an outer Coastal Plain. The approximate boundary between the Inner and Outer Coastal Plain stretches from the Sandy Hook Bayshore Area of Monmouth County, southwest to the Delaware River shore of Salem County. All lands east of this boundary, including the Borough of Rumson, fall within the Outer Coastal Plain. This province consists of gently sloping and relatively low-lying areas formed on unconsolidated and semi-consolidated marine alluvial sediments. These sediments include clay, silt, sand and gravel which were deposited over 70 million years ago as sea levels rose and fell during the end of the Cretaceous Period of the Mesozoic Era.

Bedrock & Surficial Geology

The underlying formations in Monmouth County are generally sand and clay compositions which contain varying amounts of gravel, marl or glauconite. The Borough of Rumson is located entirely within the Red Bank sand formation outcrop. This reddish sand was deposited during the Upper Cretaceous Epoch of the Cretaceous Period. This sand formation consists of two members; upper and lower. The upper phase is slightly clayey, with medium to coarse grain quartz sand and minor amounts of mica and glauconite. The lower phase is a composition of medium to fine grained Micaceous sand.

The Shrewsbury and the Navesink Rivers, which surround Rumson, once flowed directly into the Ocean, leaving Rumson Neck a headland peninsula. Sandy Hook, and the barrier beach which contains the Boroughs of Sea Bright and Monmouth Beach, were formed from sand carried northward by the dominant offshore current. As these sediments were deposited, the eastern end of the Rumson Neck became protected from the coastal erosion it had previously experienced. Gradually the barrier grew, sealing the Navesink and Shrewsbury River Inlets. These inlets have opened and closed several times during recorded history.



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SURFICIAL GEOLOGY MAP
BOROUGH OF RUMSON

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Soils[17]

The United States Department of Agriculture Soil Conservation Service has delineated agronomic soils series on a County-wide basis. The Soil Survey of Monmouth County delineated nine soil series within the Borough: Freehold, Holmdel, Shrewsbury, Evesboro, Klej, Atsion, Tidal Marsh Urban Land and filled land.

Most of the Borough overlays the Freehold Series Soils and are deep, well-drained mixes of sand and loam. The Freehold Series is found in the upland areas along the ridge, encompassing the knolls. West of the Oceanic Bridge, these soils extend from the Navesink River to an area north of Rumson Road. A large area of Freehold Urban Complex soil surrounds River Road, Ridge Road and Bingham Avenue. The Urban Complex designation refers to soil coverage by impervious surfaces which ranges between 40 and 80 percent.

Areas mapped as Urban Land soil are at least 80 percent covered by roads, buildings, parking lots and other impervious surfaces. The Filled Land designation refers to areas which were previously low lying, including former wetlands which have been filled in. This designation has been given several small areas around Barley Point and a large area which encompasses the land between the east side of Oyster Bay and the Shrewsbury River.

The Shrewsbury soils are poorly drained and exhibit a shallow depth to the seasonal high-water table. These soils occupy most of the gently sloping low-lands adjacent to the Shrewsbury River, between the Borough boundary with Fair Haven and Oyster Bay. Another large area of this series was delineated around the intersection of Navesink Avenue and Ridge Road, surrounding the upper reaches of the stream.

Evesboro and Atsion Soils are generally dry, sandy, and well drained. Evesboro Soil Series was mapped in a narrow band, east of the Oceanic Bridge and adjacent to the Navesink River. Near Black Point Road, this narrow band widens, encompassing lands between the River and an area south and east of the intersection of Black Point Road and Navesink Avenue. Another significant pocket of Evesboro Soils surrounds Hartshorne Lane. The Atsion Soils are in a narrow band which parallels and encompasses Meadow Lane. Klej Soils are a mixture of sand and loam which overlay a clay substratum. These soils exhibit a shallow depth to the seasonal high-water table and are poorly drained. A small pocket of Klej Series was delineated surrounding the eastern end of Black Point Horseshoe. The soil series occupying tidal marshes are known as Sulfaquets and Sulfihemists. Tidal marshes were delineated as narrow bands along both the Navesink and Shrewsbury Rivers. Many offshore islands were also designated with this series. The largest area delineated is located southwest of the confluence of the two rivers.

In addition to their authorities under the Chapter 251 Soil Erosion and Sediment Control Program, the Soil Conservation Districts also administer the NJPDES Stormwater Phase II program in

[17] Borough of Rumson 1988 Master Plan, Natural Resource and Environmental Features, T&M Associates

conjunction with the NJDEP Division of Water Quality (www.nj.gov/dep/dwq). The Stormwater Discharge Permit Program requires construction activities including clearing, grading and excavation that disturb one acre or more obtain authorization of a construction general permit (5G3). This permit must be acquired in addition to Soil Erosion and Sediment Control Plan certification through the local Soil Conservation District.

Slopes

Topography in Rumson is gently undulating, with an east-west ridge dividing drainage between the two rivers. Ridge Road takes its name from this landform, on which it is located. While much of the town is low-lying, Rumson contains several knolls with elevations of 100 feet above sea level. One such knoll is located on the south side of Ridge Road, east of Fair Haven Road. The other high elevation areas are clustered around Bellevue Avenue between Ridge and River Roads. Several lower knolls are also located within the central portion of the Borough. The topography gradually evens out, gently sloping towards the rivers. The lowest elevations within the Borough are located along the River shores. The Navesink shoreline is somewhat steeper than that of the Shrewsbury River. There is a small area of steep slopes in the northwestern portion of the Borough. This area has the potential for increased rates of erosion, especially during storm events.

CHAPTER 3: CLIMATE

New Jersey is one of the smallest states but has five distinct climate regions. The climate is primarily influenced by topography, the Atlantic Ocean, and prevailing atmospheric flow patterns, such as the principal movement of weather systems from west to east, known as the prevailing westerlies. The result is highly variable weather in the state's five climate zones, which are the Northern, Central, Pine Barrens, Southwest and Coastal. Rumson is located within the Coastal Climate zone, where the weather is influenced by both land and the ocean. The Borough of Rumson has a moderate climate with hot, humid summers, cold winters and averages 40 inches of annual precipitation.

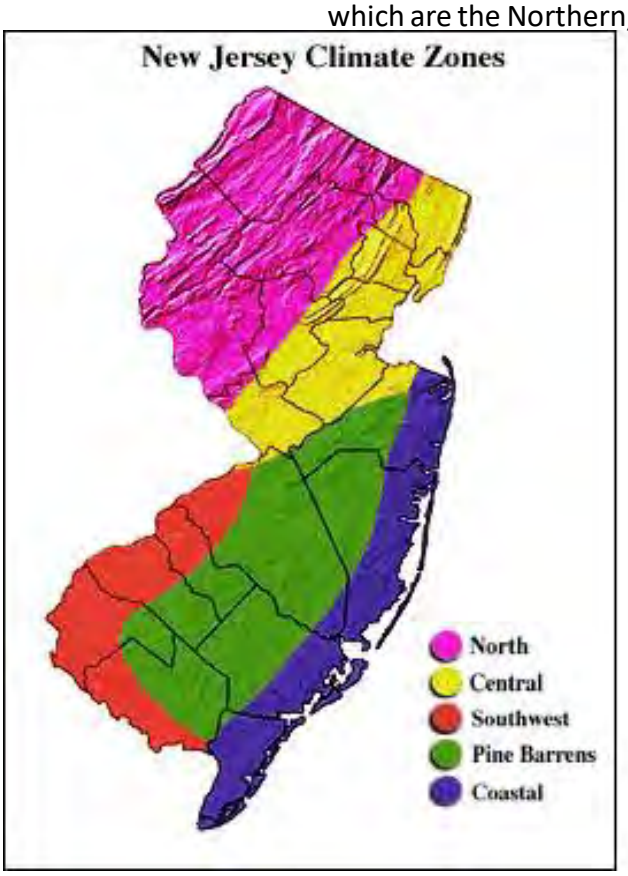


Figure 6 New Jersey Climate Zones

Unlike inland municipalities, coastal towns like Rumson have seasonal temperature fluctuations that are more gradual and less prone to extremes. This is due to the high heat capacity aspect of water, which surrounds the peninsula of Rumson in the Shrewsbury and Navesink Rivers, as well as in the nearby Atlantic Ocean. Having a high heat capacity means there is less temperature fluctuation and more temperature stability. Thus, in the autumn, the rivers and ocean remain warmer than the land surface, resulting in a more temperate and extended fall. However, once the water does cool down in the winter, it subsequently takes longer to warm up again in the spring, remaining cool into April and May, and causing a more delayed springtime than in the interior areas.

Sea breezes also affect the Rumson climate. In the spring as the sun's heat becomes stronger, the air mass over the land warms more quickly than that over the ocean. As a result, the warmer (lighter) air is replaced by the cooler (heavier) air from the ocean. These "sea breezes" can spread 5 to 10 miles inland and play a major role in the climate from about March through October. Besides causing a delayed spring and an extended autumn, sea breezes also moderate hot summer temperatures, keeping coastal areas cooler.

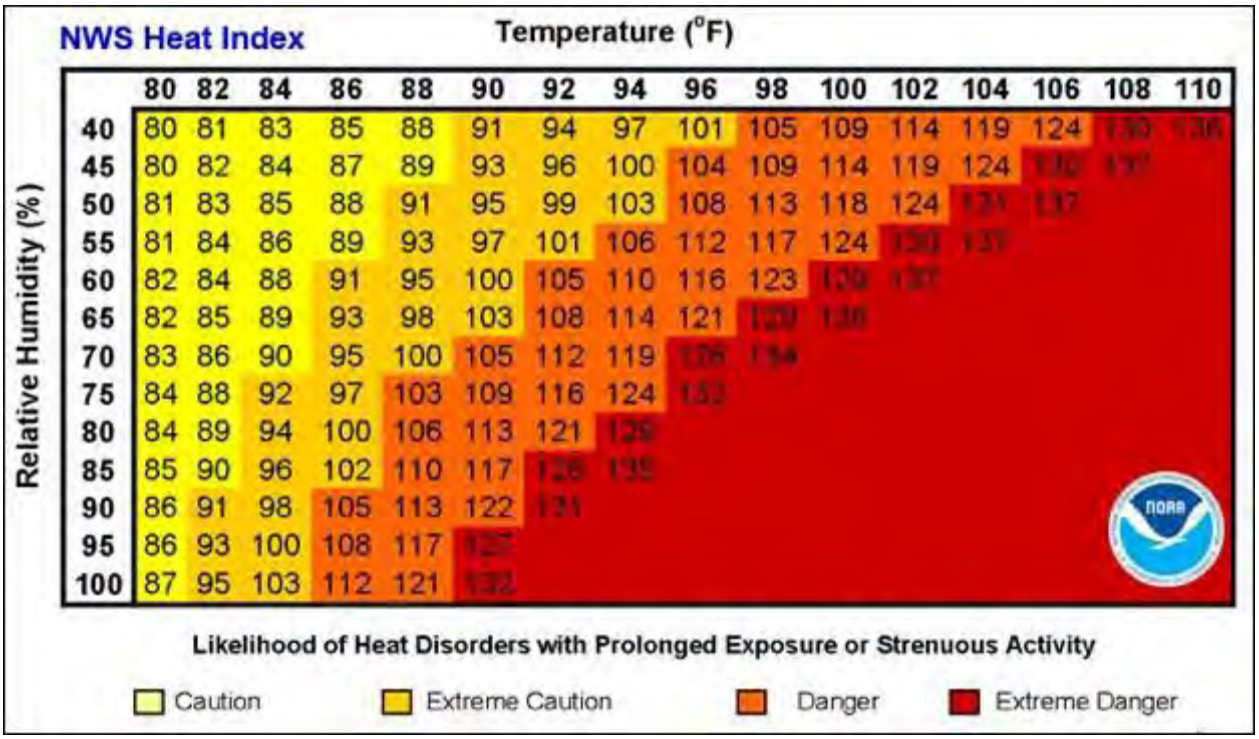
Hurricanes, tropical storms, and nor'easters are storm events which consist of a number of damaging hazards including heavy precipitation, high winds, wave action, storm surge, coastal

flooding, and coastal erosion. All of New Jersey, including the Borough of Rumson, falls within the Hurricane Susceptible Region, and there is an 18% to 24% chance of experiencing a tropical storm or hurricane event between June and November of any given year in Monmouth County. Since 1850, thirty-six (36) Hurricane or Tropical Storm tracks have passed within 75 miles of Monmouth County. Nor'easters generally occur during the winter months and are named after the wind direction of the storm. They tend to last for more than one tidal cycle, often generating flooding events.

Extreme Temperatures[18]

Rumson is highly susceptible to both extreme heat and extreme cold events. Long periods of extreme temperatures can overstress power supply systems, resulting in brownouts or blackouts and leaving residents without heat or air conditioning. Generally, the impact on humans of extreme temperature events is minimal, with the exception of the very young and elderly populations, who are more susceptible to the health impacts of extreme temperatures. If the population of Rumson ages over time, the vulnerability to extreme temperature events will increase. Improved weather forecasting, community warnings, and community preparedness can help to reduce the risks of extreme temperature events, as well as other hazard events such as flooding, to vulnerable populations. Extreme cold events often accompany a winter storm or occur soon after. Prolonged exposure to the cold can cause frostbite or hypothermia. Rumson is more likely to experience extreme heat than extreme cold events. Extreme heat events occur during the summertime when the weather in Rumson is substantially hotter and/or more humid than the Borough average for that time of year. It is not uncommon for summer temperatures to soar into the nineties and, as can be seen in Table 3 below, depending on humidity, dangerous conditions can occur in the low nineties.

Table 3 National Weather Service Heat Disorder Chart



Air Quality: Potential & Known Sources of Contamination

The 1970 federal Clean Air Act set standards for six criteria pollutants: nitrogen dioxide, lead, sulfur dioxide, ozone, carbon monoxide, and particulate matter. Concentrations of these National Ambient Air Quality Standards (NAAQS) are measured regionally as well as at point sources like factories and power plants. New Jersey does not exceed the NAAQS for nitrogen dioxide, lead, or sulfur dioxide. Rumson is in the attainment area for carbon monoxide, meaning it doesn't exceed the standard.

Ground-level ozone results when volatile organic compounds (VOCs) and nitrogen oxides (NOx) combine with sunlight and high temperatures to cause environmental and health impacts. Power plants, industrial facilities, and motor vehicles contribute the VOCs and nitrogen oxides; these sources are located both within and outside of NJ borders, resulting in regional effects. Summertime, with its bright sunlight and heat, often contributes to high ozone levels. The US Environmental Protection Agency has classified northern NJ as "moderate" for non-attainment of the 8-hour NAAQS ozone standard; southern NJ is classified as "marginal." Substantial improvements in attainment will require VOC and NOx reductions regionally.[19] (USEPA, May 3, 2013; USEPA, January 31, 2019; NJDEP Bureau of Air Monitoring, 2015.)

[19] USEPA, May 3, 2013; USEPA, January 31, 2019; NJDEP Bureau of Air Monitoring, 2015.

Climate Change Projections-Sea Level Rise

Climate Change is anticipated to impact the Borough of Rumson by increasing sea levels along the banks of the Navesink and Shrewsbury River. An increase in average sea levels will change the baseline for flooding from coastal storms, and therefore their impacts. Additionally, climate change may alter the characteristics of storm systems, making them more powerful and damaging. In 2019, The New Jersey Department of Environmental Protection released a study highlighting the disproportionate effect climate change has had on New Jersey. As can be seen in Figure 7, the state's sea- level rise projections are more than twice the global average. According to the report, "sea-level in New Jersey could rise from 2000 levels by up to 1.1 feet by 2030, 2.1 feet by 2050, and 6.3 feet by 2100".[20]

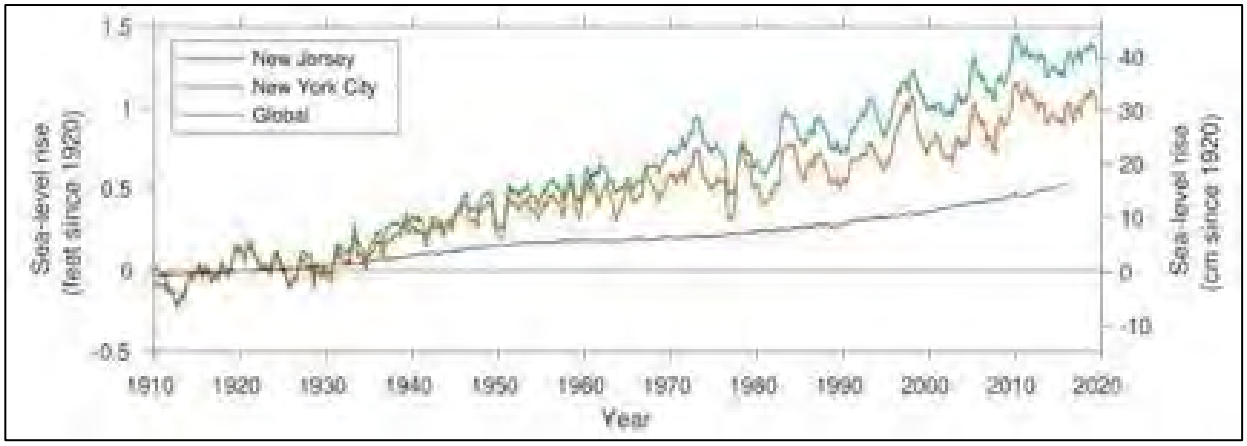


Figure 7 Historic Sea Level Rise Chart

As outlined in the 2015 Rumson Floodplain Management Plan and specified in the 2019 Regional Resilience Adaptation Action Plan[21], the effects of sea level rise will be more pronounced in low-lying areas of the Borough, such as the West Park neighborhood and the neighborhoods along the banks of the Shrewsbury River.

According to the studies, with a one-foot increase in sea level, some of the small islands in the eastern portion of the Navesink River and low-lying regions of the Borough along the Shrewsbury River would be underwater. Much of the tidal marsh will remain, however in these areas there would be slight uninhibited marsh retreat, as well as the loss of some land area from the island portions of the Borough.

[20] Kopp, R.E., C. Andrews, A. Broccoli, A. Garner, D. Kreeger, R. Leichenko, N. Lin, C. Little, J.A. Miller, J.K. Miller, K.G. Miller, R. Moss, P. Orton, A. Parris, D. Robinson, W. Sweet, J. Walker, C.P. Weaver, K. White, M. Campo, M. Kaplan, J. Herb, and L. Auermuller. New Jersey's Rising Seas and Changing Coastal Storms: Report of the 2019 Science and Technical Advisory Panel. Rutgers, The State University of New Jersey. Prepared for the New Jersey Department of Environmental Protection. Trenton, New Jersey.

[21] NJ FRAMES planning team (Coastal Management Program; Louis Berger, A WSP Company; Perkins Eastman; Binera Inc.; Rutgers Climate Institute; the Jacques Cousteau National Estuarine Research Reserve); Two Rivers, One Future: Regional Resilience Action Plan;2019

With two feet of sea level rise (predicted by 2050), water will encroach on the land area of Rumson along all of the water boundaries.. Many islands within the boundaries of Rumson will be completely underwater. Much of the tidal marsh will remain; however, there will be some areas of uninhibited marsh retreat in the more upland areas of the Shrewsbury River. Additionally, in small areas along the Navesink River and the offshore islands, marsh will convert to open water. Three feet of sea level rise will encroach on all shorelines within the Borough. Many of the properties along the Shrewsbury River will be underwater, as will most of the offshore islands. Much of the tidal marsh will continue to remain; however, areas of uninhibited marsh retreat in the more upland areas of the Shrewsbury River and along the present-day land boundaries will convert to unconsolidated shoreline. Additionally, in small areas along the Navesink River and the offshore islands, marsh will convert to open water. The full complement of sea level rise maps and marsh retreat maps can be found in Appendix B.

Even without Seal Level Rise, the storm surge associated with storm events (such as Superstorm Sandy) can cause extreme damage to property and environmental features. To assess how climate change will affect storm surge, the Borough worked with the Jacques Cousteau National Estuarine Research Reserve (JCNERR) to create SLOSH models that estimate storm surge heights and wind resulting from historical, hypothetical, or predicted hurricanes. SLOSH is a computer model developed by the National Weather Service (NWS) an stands for Sea, Lake, and Overland Surge from Hurricanes. It is important to note that the SLOSH model does not include rainfall amounts, river flow, or wind-driven waves and accuracy is generally within 20% (NOAA). Category 1, 2, & 3 SLOSH models for the Borough of Rumson are included as Appendix C.

The modeling showed that during a Category 1 storm event storm surge would be above ground level along the banks of the Shrewsbury and on all of the islands in the Navesink River. During a Category 2 storm event, storm surge would further inundate the Borough along the banks of the Shrewsbury River. Storm surge would also inundate the northeastern portion of the Borough along the Navesink River. In a Category 3 storm event, the entire width of the Borough along Navesink Avenue would become flooded and would experience storm surge along all of the Borough's shoreline, within inundation reaching further inland along the Shrewsbury River. Additionally, the eastern portion of the Borough would be inundated with storm surge, except for a small portion of land just north of the Sea Bright Bridge. This modeling does not take into account any increase in Sea Level Rise (SLR) resulting from climate change.

DATA SOURCE: NJGIN 2021 Monmouth County Parcels; NJDEP 2021 Statewide Open/Green Space; NJDEP 2012 Wetlands; NJDEP 2015 Land Use/Cover; NHD 2002 Streams; FEMA 2012 Flood Hazard Data, NJDEP 2012 Wetlands; NJDEP 2007 & 2012 Impervious Surface; NJDEP 2018 Shellfish Classification; NJDEP 2019 Groundwater Recharge; NJDEP 2018 Watersheds; NJ Planning Areas; NJGIN WMA & Species Based Habitat; NOAA NHC 2022 Storm Surge Risk & Sea Level Rise;
This map was developed using NJDEP, NJGIN, NHD, NOAA & FEMA Data, but this secondary product has not been NJDEP, NJGIN, NHD & FEMA verified and is not State authorized.

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2 FOOT SEA LEVEL RISE MAP
BOROUGH OF RUMSON

0 1000 2000 3000 feet

CHAPTER 4: WILDLIFE & HABITATS

New Jersey is one of the most biologically diverse states in the country, and home to over 1,000 different species of animal wildlife. To thrive, wildlife needs unspoiled spaces where it can access food, water, cover and places to raise young. Rumson is surrounded on three sides by what is known as *The Two Rivers;* (the Navesink and the Shrewsbury rivers) and protected from the ocean by the land mass that is Sea Bright. Along with these rivers come an incredible ecological system that supports fish, fowl and a plethora of diverse wildlife. According to Rumson Improvement Association's 1965 update to the *History of Rumson*, "an outstanding feature of our rivers is their many islands. These islands are of two types: spoils, or man-made islands from dredging; and marshy, low-lying islands. The coast itself has changed over the years. One of the earliest maps, dated December 1778, shows Sandy Hook detached from the Highlands of the Navesink. This same map shows an inlet from the ocean directly into the juncture of the Navesink and Shrewsbury Rivers at a point a little north of the present Rumson-Sea Bright Bridge. Hills' Engineer Map, published in 1781, shows these openings still in existence. However, by 1879 both inlets were filled"[22] as they remain today.

Figure 8 Tidal Wetlands in the Rumson Section of the Navesink River

Because Rumson is nestled between two rivers, surrounded by marshland, it provides a unique habitat for a diverse variety of wildlife. The Navesink & Shrewsbury Rivers are part of the *Atlantic Flyway* where migratory birds travel searching for food sources, breeding grounds, or overwintering sites and is visited by a huge variety of birds, including songbirds, wading birds, and raptors such as hawks, osprey and bald eagles.

[22] History of Rumson, 1665-1965, Rumson Improvement Association, pg 223

Food sources are abundant, and the open water and riparian habitats attract many ornithologically significant species to our area including several federal and state threatened and endangered species such as the symbol of our nation, the state-endangered Bald Eagle and the state-threatened Osprey. Our waters are especially significant for thousands of winter waterfowl including Mallards, Buffleheads, American Black Ducks, Canvasbacks, Greater Scaup and Brant. An estimated 360 species have been recorded here and most can be seen in or around our community. Fish populations are healthy, and the river is visited by sea turtles, dolphins and occasionally seals.

Wetlands

Wetlands are areas where water covers soil all or part of the time and play a key role in the ecosystem. They protect and improve water quality, provide fish and wildlife habitats, store floodwaters and maintain surface water flow during dry periods. The complex, dynamic

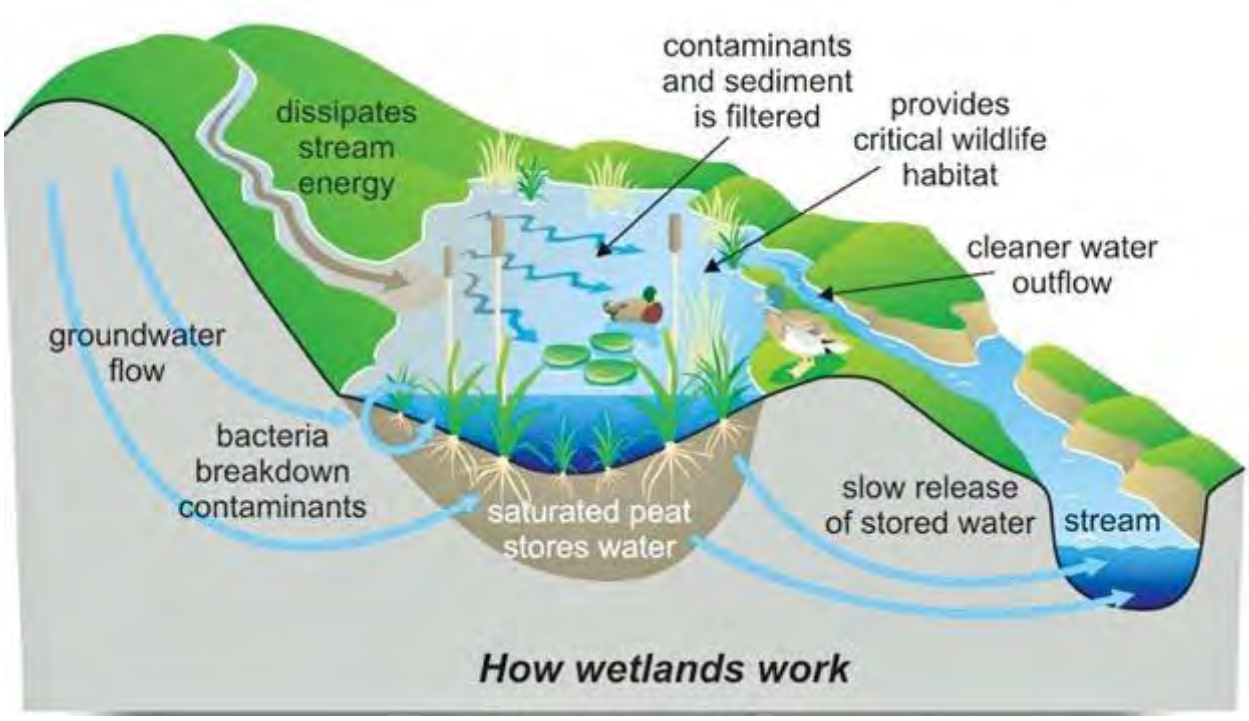

Figure 9 How Wetlands Work, source: Public Employees for Environmental Responsibility

relationships among the organisms inhabiting the wetland environment are called food webs and they provide great volumes of food that attract many animal species. These animals use wetlands for part of or all of their life cycle. Dead plant leaves and stems break down in the water to form small particles of organic material called "detritus."

This enriched material feeds many small aquatic insects, shellfish and small fish that are food for larger predatory fish, reptiles, amphibians, birds and mammals. The combination of shallow water, high levels of nutrients and primary productivity is ideal for the development of organisms that

form the base of the food web and support many species of fish, amphibians, shellfish and insects. Many species of birds and mammals rely on wetlands for food, water and shelter, especially during migration and breeding.

There are many areas throughout the Borough that contain wetlands. There are many deciduous wetlands throughout the low-lying neighborhoods on the southern side of the Borough. Additionally, there are vegetated dunes and salt marsh in the northeastern portion of the Borough, particularly near Barley Point Island and the eastern tip of the peninsula.

Wetlands in the Borough are classified as deciduous wetlands, disturbed wetlands, herbaceous wetlands, managed wetlands, phragmites dominant wetlands, vegetated dunes and salt marshes. These wetlands, especially those adjacent to the Navesink and Shrewsbury Rivers, provide the Borough a vital asset during storms and floods. Not only do wetlands provide a natural buffer between buildings and the rivers, but they also slow the speed of surging floodwaters and provide an area for retention and recharge. State regulations through the NJDEP freshwater and coastal wetland permit programs limit development in these areas. Additionally, the Borough owns two bird sanctuaries along the banks of the Shrewsbury River, one on Rumson Road near Widgeon Road, and the other off of Buena Vista Avenue. Both of these areas contain wetlands. The parks and bird sanctuaries along the riverfronts can act as natural buffers.

DATA SOURCE: NJGIN 2021 Monmouth County Parcels; NJDEP 2021 Statewide Open/Green Space; NJDEP 2012 Wetlands; NJDEP 2015 Land Use/Cover; NHD 2002 Streams; FEMA 2012 Flood Hazard Data, NJDEP 2012 Wetlands; NJDEP 2007 & 2012 Impervious Surface; NJDEP 2018 Shellfish Classification; NJDEP 2019 Groundwater Recharge; NJDEP 2018 Watersheds; NJ Planning Areas; NJGIN WMA & Species Based Habitat; NOAA NHC 2022 Storm Surge Risk & Sea Level Rise.
This map was developed using NJDEP, NJGIN, NHD, NOAA & FEMA Data, but this secondary product has not been NJDEP, NJGIN, NHD & FEMA verified and/or not State authorized.

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WETLANDS MAP
BOROUGH OF RUMSON

0 1000 2000 3000 feet

Salt Marsh[23]

Salt marshes are among the most productive ecosystems on earth and provide a healthy balanced ecosystem for the diverse wildlife in our area. The confluence of underwater and a tidal network provide a nursery area for fish, crustacea, and insects and a rich food web that supports a wide variety of wildlife. Research increasingly points to aquatic wildlife as the main recipient of marsh production. Little vegetation is consumed directly but is broken down by bacteria and small insects. The decaying plants and microbes are eaten by larger crustaceans, insects, fish, and mussels that reside in the marsh soils, ditches, and pools where they are protected from predators. Salt marshes serve as a buffer between our land and our rivers, filtering nutrients, run- off, and pollutants, even shielding coastal areas from storm surge, flood, and erosion. They provide protection against wave action, storm surge and sea level rise. Because salt marshes trap nutrients and sediment, and build organic matter to form peat, they are able to grow and keep pace with the rising ocean. Current forecasts call for the sea level to rise at least another foot in this century. If preserved, salt marshes could keep pace with this rise providing important protections. In places where marshes have been destroyed, winter storms are more damaging. Additionally, restoring marshes can dramatically increase fish populations that control mosquitoes.

There are two designated Coastal Barrier Resources System areas within the boundaries of Rumson; one in the Navesink River to the northeast of the Borough and the other in the Shrewsbury River to the southeast of the Borough. Both are secondary barriers, maintained primarily by internally generated wind and waves and formed on unconsolidated sediments. A Coastal Barrier Resources System (CBRS) is a unique landform that provides protection for aquatic habitats and serves as the mainland's first line of defense against erosion and severe coastal storms. Development is restricted on CBRS's by the Coastal Barrier Resources Act (CBRA) of 1982 to protect the barrier system and prevent future flood damage.

Vernal Habitat[24]

Rumson has two areas of potential Vernal Habitat. Vernal Habitat provide tremendous value to wildlife habitat. The unique environment of vernal pools provides habitat for numerous rare plants and animals that can survive and thrive in these harsh conditions. Many of these plants and animals spend the dry season as seeds, eggs, or cysts, and then grow and reproduce when the ponds are again filled with water. In addition, birds such as egrets, ducks, and hawks use vernal pools as a seasonal source of food and water.

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[23] Function & Value of Salt Marsh,2004 New Hampshire Department of Environmental protection, can be found at https://www.des.nh.gov/organization/commissioner/pip/factsheets/cp/documents/cp -07.pdf

[24] USEPA, Wetlands Protection & Restoration, https://www.epa.gov/wetlands/vernal-pools

Vernal pools are seasonal depressional wetlands. They are covered by shallow water for variable periods from winter to spring but may be completely dry for most of the summer and fall. These wetlands range in size from small puddles to shallow lakes and are usually found in a gently sloping plain of grassland. Sometimes connected to each other by small drainages known as vernal swales, these systems form valuable complexes.

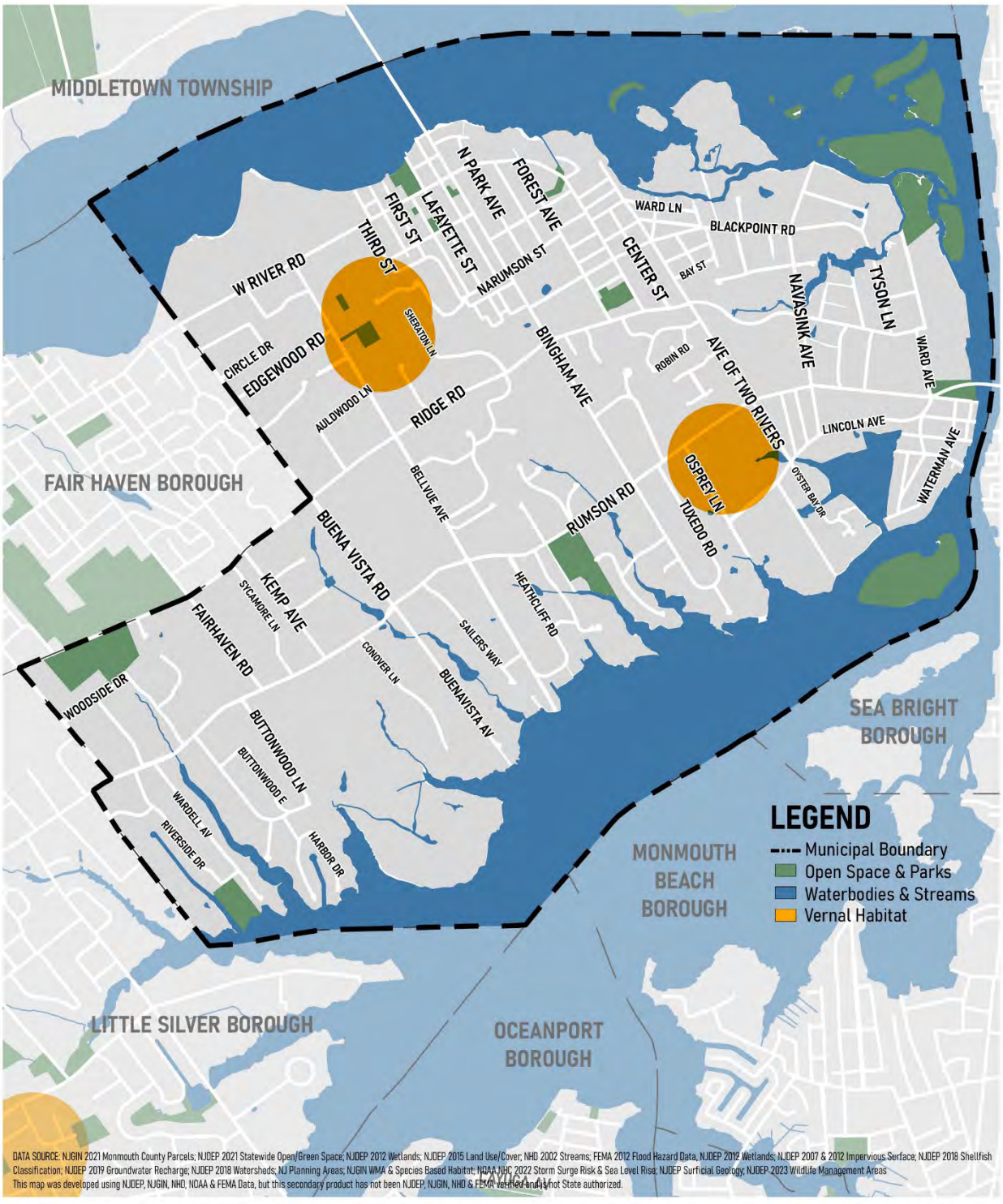
Climatic changes associated with each season cause dramatic changes in their appearance. The pools collect water during winter and spring rains, changing in volume in response to varying weather patterns. During a single season, pools may fill and dry several times. In years of drought, some pools may not fill at all. In the spring, wildflowers often bloom in brilliant circles of color that follow the receding shoreline of the pools. By early summer, the water has evaporated, and the clay pools appear brown, barren, and cracked.

Vernal pools are a valuable and increasingly threatened ecosystem. It is recommended that vernal pools be protected in the Borough, as their disappearance marks the loss of rare and important habitat and some of the associated plant and animal species as well.

Species Based Habitat Status

According to the NJDEP both the Shrewsbury and Navesink Rivers are Federally Listed as Category 1 Streams. Category One (C1) is a type of antidegradation designation that provides additional protection to specific waterbodies. C1 waters are protected from any measurable change in existing water quality because of their exceptional ecological significance, exceptional recreational significance, exceptional water supply significance, or exceptional fisheries. The NJ Department of Fish and Wildlife designates the two rivers and accompanying floodplain as in need of habitat specific protections.

Surface waters, which include all types of open water, such as rivers, streams, ponds, lakes, bays, canals, and estuaries must be protected to prevent birds, animals, and fish from being adversely affected by a discharge. Adverse effects may be seasonal in nature, due to the life cycles and migratory habits of the birds, animals and fish that utilize a given area of surface water. Freshwater waterways serving as passages to and from spawning areas are important for the survival of numerous varieties of fish. Open water areas are wintering points for birds, such as the Canada Goose and other waterfowl, and breeding.



KMA KYLE | MCMANUS ASSOCIATES POLICY PLANNING DESIGN

VERNAL HABITAT
BOROUGH OF RUMSON

0 1000 2000 3000 feet

Birds

At least 40 bird species are considered year-round residents of Monmouth County. These include the Northern Cardinal, Tufted Titmouse, Carolina Chickadee, Carolina Wren, American Crow, Blue Jay, Red-bellied Woodpecker, Downy Woodpecker, Cedar Waxwing and New Jersey's state bird, the American Goldfinch. [25] Rumson is part of the migratory path known as the Atlantic Flyway and many birds visit or nest in the area. Birds which can be expected to visit or nest within the Borough include common members of the Larus (gulls); Sterna (terns); Anas and Aythya (ducks); Buteo, circus, Accipter (hawks); Telmatodytes and Troglondytes (wrens); Catharus (thrush); Vireo; Vermivora and Dendroica (warblers); Passerculus, Passerella, Ammospiza, Spizella, Melospizo and Zonotrichia (sparrows); Bonasa (grouse); Phasianus (pheasant); Parus (chicadee); Citta (nuthatch); Spinus and Carpodacus (finch); Dendrocopus (woodpecker); and Otus and Asio (owls). In Appendix D is a list of some of the specific birds that can be found in and around the Rumson area throughout the year.

Figure 10 American Gold Finch: NJ State Bird

Fish

Many Species of fish and shellfish are attracted to the Navesink and Shrewsbury Rivers as habitat or breeding sites. Commonly found are species of Anchoa (anchovy), Alosa (alewife, hickory shad and herring), Raja (slate), Acipenser (sturgeon), and Merone (perch). Fisherman come to the local waters for Striped bass, bluefish, weakfish and summer flounder. The Navesink estuary supports substantial hard clam (Mercenaria mercenaria), soft clam (Mya arenaria), and blue crab (Callinectes sapidus Rathbun) populations. As stated earlier, the Shrewsbury and Navesink Rivers produce the majority of soft clams in the state with approximately 2,520 acres of clamming sites[26], the recent downgrade of these additional acres serve as stark warning. According to NOAA National Marine Fisheries Service, NJ leads the nation with an annual $159 million in revenues from shellfisheries.[2]

Animals

Mammals typically found within the Borough include those associated with forest, wet forest, marsh, old fields, forest fringe, and those which can be found in proximity to developed lands. Several species can be found in conjunction with a variety of habitats. Small mammals and rodents such as mice, voles, moles, rabbits, opossum, racoon, skunk, groundhog, squirrel and chipmunk provide food for birds of prey and larger mammals such as the red fox and eastern coyote. White tailed deer are extremely prevalent in the area. Nocturnal bats can be seen at night feeding on mosquitos.

25 https://www.friendsofmonmouthcountyparks.com/docume nts/127/birds_oct_13.pdf

26 NJDEP, Division of Water Monitoring & Standards

27 NJDEP, Water Monitoring Standards, Sanitary Survey of Shellfish Growing Area NE2, Navesink River, 2015

Threatened and Endangered Species

The New Jersey Department of Environmental Protection maintains lists of threatened and endangered wildlife species, and their habitats and ranges. Endangered species are those whose prospects for survival within the state are in immediate danger. A species is classified as threatened if the continued loss of or change in habitat, exploitation, predation, disease or competition would cause that species to become endangered. Hunting, predators, human disturbance, habitat loss and change, and climate change all threaten these animals' survival. There are numerous species of endangered or threatened birds that live or migrate in the Rumson area including the iconic bald eagle, osprey, herons and egrets who depend on healthy rivers for hunting and wooded areas for nesting. There are five types of endangered or threatened turtle. The threatened and endangered species associated with this area of Monmouth County, and which could find suitable habitat in and around the Borough are listed in Appendix E.

Tree Canopy[28]

Trees contribute both environmental and economic benefits that far exceed the costs of planting and care over their lifetime. Trees provide environmental benefits such as stormwater runoff reduction, cleaner air, better water quality, and wildlife habitat that supports biodiversity. Trees also provide economic benefits such as energy savings and higher property values that are an average of three times greater than tree care costs. To protect its trees, Rumson maintains a five-member Shade Tree Commission whose mission is to maintain and promote a healthy, safe and sustainable shade tree resource that will physically, economically and aesthetically benefit the Rumson community and its residents in the most cost-effective manner possible. Since its creation, Rumson has been a strategic riverside community with most of its original tree resources contained in native oak and beech forests. Today, the borough is over 90% developed, and the majority of the tree resources lie on private property. As for the public tree resource, it mainly consists of 12 different tree species along roadways between the curb and sidewalk, or just inside of the sidewalk in a traditional tree lawn. The Shade Tree Commission has provided the Borough with a list of recommended trees for the Borough which can be found on their website at http://www.rumsonnj.gov/stc/downloads/RSTC-Brochure-Final.pdf).

Trees improve air quality by absorbing gaseous pollutants (via leaves), intercepting particulates (dust, smoke, dirt), releasing oxygen (photosynthesis) and reducing ozone levels (through transpiration). By intercepting rainfall and slowing down runoff, increasing infiltration capacity of soil and improving water quality by reducing soil erosion and removing pollutants, trees protect watersheds by reducing stormwater runoff.

[28] USDA Forest Service, Trees pay US Back pamphlet, found at https://www.dec.ny.gov/docs/lands_forests_pdf/treespayusback.pdf

One hundred trees remove 53 tons of carbon dioxide per year and 430 pounds of other air pollutants per year. One hundred mature trees capture about 139,000 gallons of rainwater per year. Because trees reduce ambient temperatures and transpiration uses solar energy that would otherwise heat the air, strategically placed trees save up to 56% on annual air-conditioning costs and evergreens that block winter winds can save 30% on heating. In tree-lined commercial districts, shoppers report more frequent shopping, longer shopping trips and tend to spend up to 12% more for goods.

Each large front yard tree adds 1% to the house sales price and a large specimen trees can add 10% to property value.

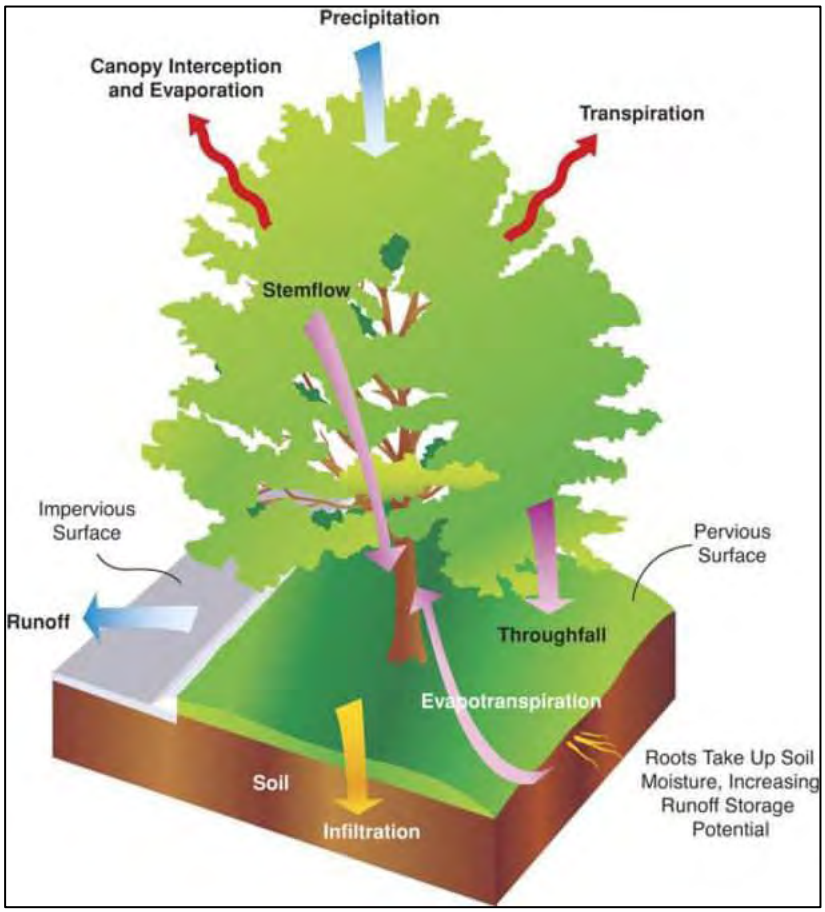


Figure 10 How Trees Reduce Stormwater Runoff

Importantly, trees provide food, shelter and a place to raise young for wildlife in the Borough. A balanced ecosystem is critically important for the health and happiness of our residents. Trees encourage beneficial insects which improve the gardens and landscape of our town and provide food for many types of birds and amphibians. The mature and native trees support several threatened and endangered species of bird such as the Bald Eagle, Peregrine Falcon, Red-shouldered Falcon, Short-eared Owl, Golden-winged Warbler, Osprey, and the red-headed Woodpecker.

Rumson has many mature and significant trees within its borders. In 2016, Rumson became one of only 35 municipalities in New Jersey to be recognized as a Tree City USA member for more than 25 years. In 2019, the NJDEP Heritage Tree Program identified a 200-year-old Gingko Biloba measuring 216 inches in circumference located on a private property in the Borough and classified it as a “Champion Tree”. Although non-native, the Ginkgo is the world's oldest living tree species and can be traced back 250 million years to when dinosaurs roamed the earth. In 2020, a native Atlantic White Cedar was named the second state champion tree identified on a private property in the Borough.

Tree Protection

The Rumson Shade Tree Commission was formally established in 1962. This advisory board strives to help Rumson become more proactive in its approach to tree care issues. It is a goal of the Shade Tree Commission and this management plan to foster a cooperative environment between the various agencies in the Borough for the betterment of Rumson's tree resource and therefore its residents and visitors. Rumson has a tree protection ordinance and has a designated Tree Ordinance Officer to administer the tree protection program. The purpose of the ordinance is to prevent the clear cutting of trees and to restrict the removal of other trees, thereby maintaining the beauty and character, preventing erosion, controlling actions that will substantially change drainage patterns and restricting any action that could create a hazard to persons or property.

Native Plants

Native plants are uniquely adapted to a specific region's climate, soil type, and growing conditions which provide multiple benefits to our environment. They help maintain healthy soil, cleaner water and support more resilient landscapes. These plants have evolved to survive in the local conditions and are more disease resistant, cold-hardy, drought-tolerant and are often naturally deer resistant. The hardiness of native plants mean that they require less intervention to maintain; less fertilizer, less pesticides, less water, less maintenance and they protect against erosion. The reduction in necessary chemicals means less pollutants enter our waterways keeping our rivers and oceans cleaner. Moreover, native plants are actually better at filtering the stormwater that flows over the surface into our rivers and oceans and recharges our aquifers with cleaner water.

The root structure of a native plants can be anywhere from three to five times deeper than their non-native cousins. Unlike the less robust root structure of turf or many non-natives, these deep roots not only out-compete weeds and invasives, but they actually filter the water as it moves through the soil removing pollutants before they enter groundwater sources. Because deeper roots help bind the vulnerable topsoil and subsoil together, a strong root structure is more effective in preventing erosion.

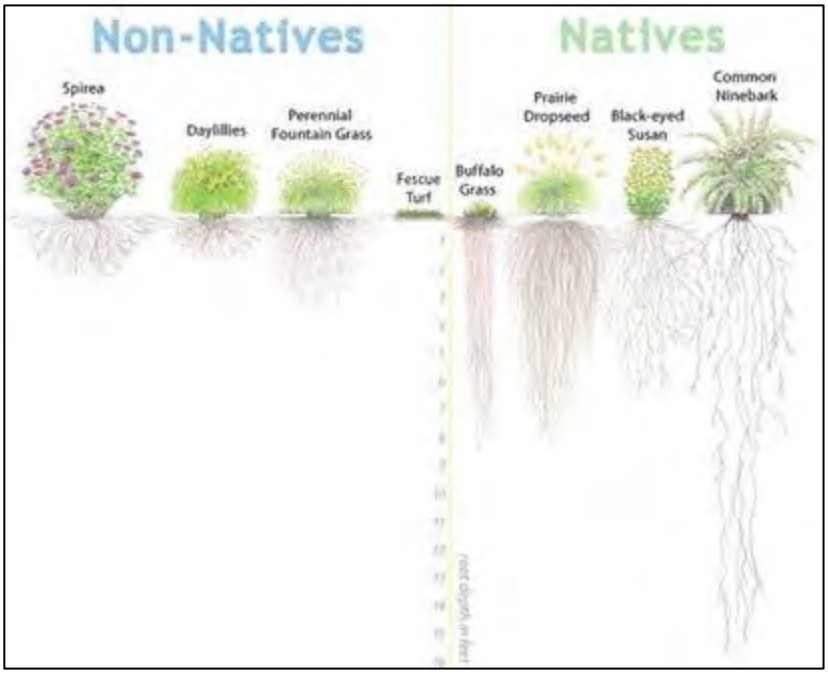


Figure 11 Native vs. Non-native Root Structure (source: Alliance for the Bay)

Local wildlife depends on native plants. They are the ecological basis upon which life depends, including birds and people. Without them and the insects that co-evolved with them, local wildlife cannot thrive. For example, research by the entomologist Doug Tallamy has shown that native oak trees support over 500 species of caterpillars whereas ginkgo, a commonly planted landscape tree from Asia, host only five species of caterpillars. When it takes over 6,000 caterpillars to raise one brood of chickadees, that is a significant difference.[29].

Figure 12 Ruby Throated Humming Bird Feeding on Native Cardinal Flower

When development removes native groundcover, shrubs and trees and replaces them with non-native species and turf, the health and balance of our ecosystem is severely undermined. Exotic plants and non- natives may offer a nectar source, but in many cases their leaves, fruits, pollen and nectar do not provide adequate nutrition, cover or breeding grounds necessary for local wildlife to thrive. Gardens that mostly feature non-native species of plants are often of little benefit to wildlife. The lack of proper habitat and food sources for native birds and insects is one factor in the decline of many of these species in the United States.

A list of native trees, shrubs and perennials can be found on the Rumson Environmental Commission website at http://rumsonnj.gov/env/native-plants.html.

[29] Audubon Society, https://www.audubon.org/content/why-native-plants-matter

CHAPTER 5: OPEN SPACE AND HISTORIC RESOURCES

Rumson is a mature community of approximately 5.1 square miles. The Borough has an established development pattern consisting of compact, pedestrian-scale business areas surrounded by residential streets. According to the 2018 U.S. Census Borough estimate, the Borough has a population of approximately 6,792. Rumson has been significantly influenced by its proximity to the New York Metropolitan Region. New York City is located approximately 40 miles north of Rumson and is easily accessible by ferry from Highlands, Atlantic Highlands or Belford and by train from the New Jersey Transit North Jersey Coast Line, which has stops locally in Red Bank and Little Silver. Additionally, the Garden State Parkway is located approximately 4 miles west of Rumson and is accessible by exit 109. County Route 520 provides access from the Borough to the Parkway. Other major roads near Rumson include State Highway Routes 35 and 36. The Oceanic Bridge crosses the Navesink River and provides connections from Rumson to Middletown and the greater Bayshore region via Navesink River Road. The Rumson-Sea Bright Bridge provides access from Rumson Road (County Route 520) to State Highway 36 in Sea Bright over the Shrewsbury River.

Open Space

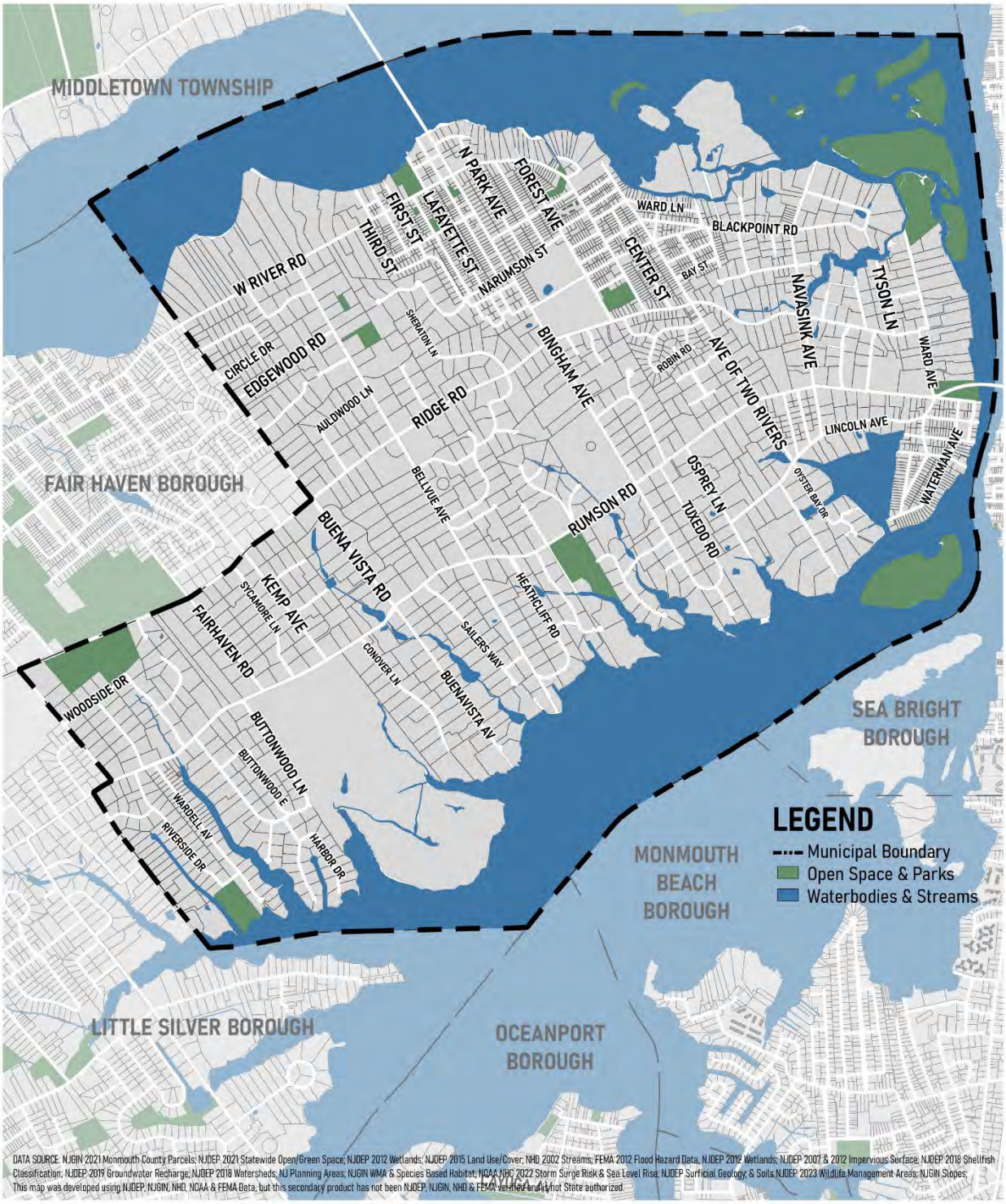
Rumson is a predominately built-out community. However, there are a number of parks scattered throughout the Borough that provide recreational opportunities and aid in the natural filtering of stormwater. Victory Park is 3.55 acres located along the Navesink River and contains a small beach, playgrounds and grassed open space. Additionally, there is a
0.52-acre crew facility adjacent to Victory Park along the waterfront. West Park consists of 2.87 acres, located on either side of the Sea Bright Bridge along the Shrewsbury River and contains a playground, as well as grassed open space. The Borough also has 9 acres of multi-use fields at Riverside Park, located at the end of Riverside Drive, along the Little Silver Creek tributary of the Shrewsbury River. The Meadow Ridge Park, located on Ridge Road near the border with Fair Haven, consists of 23.4 acres of multi-use fields, playgrounds, and natural open space. Rodgers Park and Piping Rock Park in the Borough also contain playgrounds and fields.

The Borough of Rumson has a total of 71.55 acres of open space, including a number of small islands in the Navesink and Shrewsbury River, as well as small areas on East River Road, Ward Ave, and Allen Street. Mercer Field on Rumson Road is the largest parcel of open space, consisting of over 15 acres. There is also a 4.5 wetland area on Buena Vista Avenue. Additionally, the Borough owns two bird sanctuaries along the banks of the Shrewsbury River, one on Rumson Road near Widgeon Road, and the other off Buena Vista Avenue. Both areas contain wetlands. The parks and bird sanctuaries along the riverfronts can act as natural buffers and absorb storm surge without any harm to buildings. The small islands in the Navesink and Shrewsbury Rivers, along with the Boroughs of Sea Bright and Monmouth Beach across the rivers, create a natural buffer around Rumson.

The private Rumson County Club, along the Shrewsbury River, is not considered open space; however, it consists of a golf course along Rumson Road and lands in a natural state closer to the river. This also acts as a natural buffer and sponge, protecting the more developed properties around it. However, since the Country Club is privately owned and is not deed restricted, there is no guarantee this property will remain in its natural state in perpetuity.

Open Space Preservation[32]

The opportunity for additional open space preservation in Rumson is small because it is largely built-out and the high value of land within the community. However, there are numerous existing parks and areas of preserved open space scattered throughout the community. Many of the islands located in the Shrewsbury and Navesink Rivers are also owned by the State or Borough for conservation. While the opportunity for future open space preservation within the Borough is low, if the opportunity arises to gain additional open space resources, it is recommended that the opportunity should be explored to aid in storm resiliency, provide additional recreational space and wildlife habitat.



DATA SOURCE: NJGIN 2021 Monmouth County Parcels; NJDEP 2021 Statewide Open/Green Space; NJDEP 2012 Wetlands; NJDEP 2015 Land Use/Cover; NHD 2002 Streams; FEMA 2012 Flood Hazard Data; NJDEP 2012 Wetlands; NJDEP 2007 & 2012 Impervious Surface; NJDEP 2018 Shellfish Classification; NJDEP 2019 Groundwater Recharge; NJDEP 2018 Watersheds; NJ Planning Areas; NJGIN WMA & Species Based Habitat; NOAA NHC 2022 Storm Surge Risk & Sea Level Rise; NJDEP Surficial Geology; & Soils NJDEP 2023 Wildlife Management Areas; NJGIN Slopes; This map was developed using NJDEP, NJGIN, NHD, NOAA & FEMA Data, but this secondary product has not been NJDEP, NJGIN, NHD & FEMA verified and is not State authorized.

KMA
KYLE · MCMANUS ASSOCIATES
POLICY PLANNING DESIGN

OPEN SPACE MAP
BOROUGH OF RUMSON

0 1000 2000 3000 feet

Historic Preservation

In 1655, early settlers began to make their way to the fertile and beautiful land between the Navesink and Shrewsbury rivers known then as "Rumson Neck". Many of the names in the early deeds (Hance, Corlies, Conover, Hartshorne, Borden, Wardell, Bingham, McCarter) are memorialized on street signs, pond names, and tombstones in the Old Quaker Cemetery on Conover Avenue. The first settlers established homes referred to as plantations with hundreds of acres, salt and fresh meadow, grain crops, orchards, and barns for milking cows[33]. They were self-sufficient estates where the early settlers could spend the warm summers along the Jersey Shore. In fact, in the 1600s, the land mass known as Seabright was just beginning to emerge from a tidal sandbar and waves from the Atlantic Ocean crashed directly on the eastern shore of the peninsula. More and more families flocked to Rumson in the following centuries as larger estates sold off smaller parcels to be used as summer residences. In 1907 the Borough of Rumson was incorporated separately from the Township of Shrewsbury and the governing body we know today was formed.

In addition to the historic Old Quaker Cemetery located on the corner of Rumson Road and Conover Lane, there are numerous properties in Rumson with historical significance. For example, the clubhouse and grounds of the Seabright Lawn Tennis & Cricket Club were designed by New York City firm of James Renwick, who had also designed the Smithsonian Institution in Washington, DC and St. Patrick's Cathedral. The privately owned Sheep's Run property (pictured) was once part of a larger property owned by John Hance, who was one of the original settlers who negotiated the purchase of Rumson from the Navesink Indians of the Lenni Lenape Tribe. Rumson's Historic Preservation Commission maintains a robust website www.rumsonnj.gov/rhpc with detailed information on existing historic homes, architectural styles represented, virtual tours and historical context of some of the more significant homes.

Figure 13 Historic Sheep's Run Estate in Rumson Borough

The searchable database includes over 416 homes that were built in or before 1918, remain standing, and have not undergone significant renovations to facades. These properties are part of the community's assets and may be threatened by flood hazard areas. The mapping presented in Appendix F depicts the Borough's historic preservation properties in relation to flood hazard areas. Of the 416 properties included in the inventory, ninety-nine are located in the AE zone (with a one percent chance of annual flooding), and seventeen are located within the VE velocity flood zone (also with a one percent chance of annual flooding).

[32] 2015 Rumson Borough Floodplain management plan, pg. 41
[33] History of Rumson 1665-1965, The Rumson Improvement Association, 1965

CHAPTER 6: REGIONAL RELATIONSHIPS

The Two Rivers Regional Resilience Adaptation Action Plan (FRAMES Regional Action Plan)

FRAMES is the result of a 3-year risk assessment, outreach, and scenario planning process for the New Jersey Fostering Regional Adaptation through Municipal Economic Scenarios project. The project is based in the Two Rivers region of Monmouth County, New Jersey, and comprises 15 communities along the Shrewsbury and Navesink Rivers, as well as communities on the Sandy Hook Bayshore and Atlantic Ocean coastline. The project is funded by the National Oceanic and Atmospheric Administration (NOAA) Regional Resilience Grant Program, and its approach and key principles are based on the framework laid out in NOAA's 'What Will Adaptation Cost? An Economic Framework for Coastal Community Infrastructure.'

As one of the final products of the project, this Regional Action Plan presents six strategies for achieving regional resilience, as well as one potential path for implementation of the strategies, called the conceptual scenario.

The Regional Action Plan is intended to serve as a guiding document for the communities located in the Two Rivers region to inform their planning and future development efforts. The regional planning strategies listed below have been developed in response to a comprehensive risk analysis that considered the impacts of coastal storms and sea-level rise on the region, responds to the regional risk of total water levels (accumulation of floodwater above the mean higher high-water mark) and permanent inundation due to sea-level rise, and reflect the environmental, social, and economic principles that are the basis of the regional resilience goals, set forth in the project.

- New Coastal Protection Infrastructure
- Protect Critical Facilities
- Harden and Plan for Future of Water Dependent Assets
- Neighborhood-level Adaptation Measures
- Long-term Vision and Master Planning for Permanent Inundation
- The Monmouth County Coastal Resilience Committee

The strategies have been iteratively updated based on extensive outreach with the public, stakeholders, steering committee members, and technical and constituent advisors who served on the project advisory committees. While many of these strategies can be championed and integrated individually into the planning and development of the region, together these strategies provide a viable, approach to mitigate risk of loss from storm surge and permanent inundation.

The first strategy suggests a wide range of ecological (green) and structural solutions that can be

applied across the region to protect from the flooding impacts caused from storm surge, and permanent inundation caused from sea-level rise. The second strategy focuses on critical facilities, promoting approaches to protect, adapt, and relocate important assets that are at risk. The third strategy creates a plan for the future of water-dependent assets that are economically and culturally important for the region. The fourth strategy proposes measures that adapt current infrastructure and development to provide near- and-long term protection, while the fifth strategy provides a long-term vision and master planning approach to promote a sustainable region and develop land use opportunities in light of permanent inundation. Finally, the sixth strategy proposes to initiate a regional planning forum, the Monmouth County Coastal Resilience Committee, to focus on regional approaches to resilience, including the promotion of strategies presented in this Regional Action Plan.

The Regional Action Plan is designed to guide current and future planning and development and does not provide a singular approach to reducing the risk of flooding to the region. To help visualize how these strategies might direct future projects and policies, the planning team created a conceptual scenario that applies the strategies to future planning years. The conceptual scenario has been developed based on stakeholder feedback and is just one future pathway of many that the strategies can help guide.

Navesink River Municipalities Committee

The Navesink River Municipalities Committee (NRMC) is a longstanding advisory body that meets monthly to address issues concerning the preservation of the Navesink River. The Committee members include two representatives from Tinton Falls, Red Bank, Fair Haven, Rumson, and Middletown, plus a council member from each town that borders the Navesink River. The NMRC has partnered with the NJ Department of Environmental Protection and trained volunteers to monitor the water in dozens of locations for bacteria contamination and to determine the source.

Monmouth University

Monmouth University and the Borough of Rumson collaborate on several programs. They have entered a partnership to develop a new Monmouth Marine and Environmental Field Station on municipal property located on the banks of the Navesink River. The facility will provide unique opportunities for scientific research and educational collaboration between the professionals and students of the university and local schools. The Monmouth University School of Science and the Borough of Rumson host a Two River Seminar Series centered on the environment and wildlife of the Navesink and Shrewsbury rivers. These educational discussions led by experts from the university's Marine and Environmental Biology and Policy Program and Urban Coast Institute are open to members of the public of all ages. The University has established a marine biology program in the Rumson School District to educate students on the fragile ecosystem.

Clean Ocean Action

Clean Ocean Action (COA) is a broad-based coalition of 135 active boating, business, community, conservation, diving, environmental, fishing, religious, service, student, surfing, and women's groups. The mission is to improve the degraded water quality of the marine waters off the New Jersey/New York coast. The coalition identifies sources of pollution and mounts attacks on each source by using research, public education, and citizen action to empower people and convince our public officials to clean up and protect our ocean. The Rumson Environmental Commission partners with COA on various projects including Rally the Navesink which aims to identify and correct causes of pollution in the Navesink and Shrewsbury rivers; the annual Rally for the Rivers Eco-fest, which provides a venue for local stakeholders to educate the public on ways they can help protect our local waterways; and Movie Nights for the Waterways, which uses environmental messages in children's movies to educate school-aged children on various environmental issues.

American Littoral Society

The American Littoral Society (ALS) promotes the study and conservation of marine life and habitat and empowers people to care for the coast through advocacy, conservation, and education. In a partnership with the Rumson School District, ALS brought environmental education and advocacy into the school's curriculum through its Operation Oyster program. The one-day program each fall teaches students the importance of the oyster history in the Navesink and Shrewsbury rivers, their importance to the culture and economy, as well as the area's ecology. Students participated in projects and listened to lectures in their math, science and history classes and they contributed writing assignments for English classes. The kids learn how to construct an oyster reef, which provides a home for the shellfish and their contribution to help clean the waterways. In math classes, students calculate the species' survivability. A writing assignment had students composing letters to the Rumson Mayor, asking for support from the local government for the environmental group and school's efforts. As part of their social studies classes, the kids learn the history of the region from educators wearing colonial period costumes. In another partnership with the Rumson Environmental Commission, ALS brings educational movie nights that screen documentaries that teach about issues related to preserving our coastline and waterways.

CHAPTER 7: NATURAL RESOURCES AND PLANNING

The Borough is fortunate to have many incredible natural resources that add to the unique character of the Borough and are recognized to be of significant public value. These resources are protected through federal and state environmental legislation and local zoning and land development regulations. In this section, listed are a number of special designations and critical areas of significant environmental benefit and recommendations for protecting them.

According to the 2002 Rumson Land Use Element, the town wishes to conform to the principals set forth in the 1988 Master Plan. Master Plan principles and objectives include maintaining Rumson's character as a residential community; encouraging the most appropriate use of land consistent with neighborhood character and establishing appropriate population densities and limiting the intensity of development to both preserve the natural environment and to ensure neighborhood, community, and regional well-being.

NJ State Planning Areas (State Development and Redevelopment Plan)

The New Jersey State Development and Redevelopment Plan (SDRP) identifies areas along the Navesink River, north of River Road, Black Point Road and Black Point Horseshoe as Planning Area 5 (PA-5). The State has designated PA-5 areas as being environmentally sensitive. This designation describes large contiguous land areas with valuable eco-systems, geological features and wildlife habitats. The PA-5 designated area in Rumson consists of coastal wetlands and sedge islands that are part of a larger environmentally sensitive area which includes the Navesink Highlands on the north shore of the river and the Mcclees Creek Basin. PA-5 emphasizes maintaining large contiguous areas of undisturbed habitat to protect sensitive natural resources and wildlife. The PA-5 also includes the islands in the Navesink and Shrewsbury Rivers. A Map of Rumson Borough Planning Areas can be found in Appendix G.

In addition to the PA-5 designation, the State Plan identifies several critical environmental/historic sites (CEHS) within Rumson. This designation applies the conservation objectives of Planning Area 5 to smaller locations that are less than one square mile in area. In Rumson, the historic Oceanic Village, the southern shoreline of Rumson along the Shrewsbury River (inclusive of the Rumson Country Club holdings) and the sedge islands in the Shrewsbury River are recognized as critical environmental/historic sites. The plan also recognizes Monmouth County's scenic corridor along Rumson Road as a CEHS.

Coastal Area Facility Review Act (CAFRA)

The Coastal Area Facility Review Act (CAFRA) authorizes the NJDEP to regulate a wide variety of residential, commercial, public or industrial development such as construction, relocation, and enlargement of buildings and structures; and associated work such as excavation, grading, site preparation and the installation of shore protection structures within the CAFRA area. The CAFRA area begins where the Cheesequake Creek enters Raritan Bay in Old Bridge, Middlesex County. It extends south along the coast around Cape May, and then north along the Delaware Bay ending at Kilcohook National Wildlife Refuge in Salem County. The inland limit of the CAFRA area is an irregular line that follows public roads, railroad tracks, and other features. The width of the CAFRA area varies from a few thousand feet to 24 miles. The CAFRA area is divided into zones with different regulatory thresholds for each zone. The entire borough of Rumson is within the CAFRA zone and as such is subject to Coastal Area Facility Review Act, N.J.S.A. 13:19-1 et seq. (CAFRA permits).

Wildlife Management Area

In order to protect wetland habitats of various marine animals and preserve a diversity of fish and wildlife habitat, the NJDEP Division of Fish and Wildlife established a 67-acre Wildlife Management Area of salt marsh and vegetated dunes off the northeastern tip of the Rumson peninsula. The area cannot be developed and is set aside for conservation of habitat and recreation.

Figure 14 Wildlife Management Areas

Coastal Barrier Resource Systems (CBRS)

The Coastal Barrier Resource Act of 1982 encourages the conservation of hurricane prone, biologically rich coastal barriers by restricting federal expenditures that encourage development, such as federal flood insurance. Areas within the CBRS can be developed provided that private developers or other non-federal parties bear the full cost.[35]

There are two designated Coastal Barrier Resources System areas within the boundaries of Rumson; one in the Navesink River to the northeast of the Borough and the other in the Shrewsbury River to the southeast of the Borough. Both are secondary barriers, maintained primarily by internally generated wind waves and formed on unconsolidated sediments. A Coastal Barrier Resources System (CBRS) is a unique landform that provides protection for aquatic habitats and serves as the mainland's first line of defense again erosion and severe coastal storms. Development is restricted on CBRS's by the Coastal Barrier Resources Act (CBRA) of 1982 to protect the barrier system and prevent future flood damage.

[35] US Fish & Wildlife Service, Coastal Barrier Resource System Overview. Information can be found at https://www.fws.gov/CBRA/

CHAPTER 8: CONSIDERATIONS & RECOMMENDATIONS

This ERI is an important land use tool as the natural resources identified herein should be taken into account throughout the land use decision-making process. This inventory should serve as the basis for where we as a community should seek to protect, integrate and/or conserve resources. Planning should be done with the resources available and their ability to sustain a population while ensuring clean water and safe living conditions.

This ERI should be used as follows:

- As a factual basis for municipal land use planning
- As a resource in the preparation of the land use element of the municipal Master Plan
- As a comprehensive guide in the Site Plan review process
- As a basic tool in determining zoning regulations, municipal ordinances, or other land use management techniques
- As a basis for a land capability analysis and for determining the intensity and location of development
- As an indicator of sensitive areas and areas suitable for certain kinds of development
- As a tool to increase understanding of natural systems, and their limitations and opportunities for use
- As a long-term planning tool to identify potential land use and natural resource problems
- As an educational tool for residents to learn more about their community and its environment
- As a way to save dollars by avoiding future problems and mitigation costs
- As a tool for making decisions about the placement of infrastructure, roads, sewers, schools, etc.

Below is a list of existing policy recommendations and land use measures related to the preservation and conversation of Borough environmental resources provided for in the Borough's Master Plan. This Environmental Resources Inventory endorses these goals.

Recommendations from the 2006 Rumson Stormwater Management Plan

The 2006 Stormwater Management Plan provides a strategy for the borough to plan for and manage increased runoff associated with future development and land use changes and is designed to provide a municipal-wide approach to stormwater management planning. The Plan makes recommendations to better regulate stormwater management and addresses groundwater recharge, stormwater quantity, and stormwater quality impacts by including stormwater design and performance standards for new development and redevelopment. The Plan specifically recommends the maximum practical use of the following nonstructural strategies for all major developments in accordance with Subchapter 5 of the DEP Best Management Practices manual:

- Protect areas that provide water quality benefits or areas particularly susceptible to erosion and sediment loss.
- Minimize impervious surfaces and break up or disconnect the flow of runoff over impervious surfaces.
- Maximize the protection of natural drainage features and vegetation.
- Minimize the decrease in the pre-construction "time of concentration."
- Minimize land disturbance including clearing and grading.
- Minimize soil compaction.
- Provide vegetated open-channel conveyance systems discharge into and through stable vegetated areas.
- Provide preventative source controls. For certain development not subject to RSIS (i.e., commercial development or development not meeting the major development threshold but meeting the stormwater management thresholds tailored to the Borough), this Plan also recommends the use of the above nonstructural strategies to the maximum extent feasible.

In addition, Subchapter 5 further requires an applicant seeking approval for a major development to specifically identify which and how these nonstructural strategies have been incorporated into the development's design. Finally, for each of those nonstructural strategies that could not be incorporated into the development's design due to engineering, environmental, or safety reasons, the applicant must provide an acceptable rationale for this contention. Below is a list of recommended measures from the Plan.

Erosion and Sediment Control.

The Standards for Soil Erosion and Sediment Control in New Jersey are regulated by the New Jersey Department of Agriculture and locally enforced through the Freehold Soil Conservation District. The Borough should continue to support and enforce these standards for all applicable development.

Water Quality Improvement.

The Borough of Rumson currently enforces the NJDEP Best Management Practices for stormwater runoff quality and reduction of total suspended solids. Green infrastructure techniques should also be used to promote resiliency in the Borough and improve the water quality entering the Navesink and Shrewsbury Rivers. Green infrastructure uses permeable surfaces, landscape formations, and plant material to intercept stormwater runoff before it enters storm drains by promoting infiltration and filtration. Their use can promote resiliency by mitigating flooding and helping the Borough to quickly recover from storms. Additionally, green infrastructure captures runoff pollution and prevents it from entering waterways.

Vegetated Filter Strips

Vegetated filter strips are engineered stormwater conveyance systems that treat small drainage areas. Generally, a vegetated filter strip consists of a level spreader and planted vegetation. The level spreader ensures uniform flow over the vegetation that filters out pollutants and promotes infiltration of the stormwater. Vegetated filter strips are best utilized adjacent to a buffer strip, watercourse or drainage swale since the discharge will be in the form of sheet flow, making it difficult to convey the stormwater downstream in a normal conveyance system (swale or pipe).

Figure 15 Vegetated Filter Strip

Stream and Valley Corridor Buffer Strips

Buffer strips are undisturbed areas between development and the receiving waters. There are two management objectives associated with stream and valley corridor buffer strips: 1) To provide buffer protection along a stream and valley corridor to protect existing ecological form and functions; and 2) To minimize the impact of development on the stream itself (filter pollutants, provide shade and bank stability, reduce the velocity of overland flow). Buffers only provide limited benefits in terms of stormwater management; however, they are an integral part of a system of best management practices.

The Stabilization of Banks, Shoreline and Slopes

The root systems of trees, shrubs and plants effectively bind soils to resist erosion. Increasing the amount of required plant material for new and redeveloped residential and non-residential sites should be encouraged throughout the Borough. Planting schemes should be designed by a certified landscape architect to combine plant species that have complementary rooting characteristics to provide long-term stability.

Pond Configuration

In Rumson, many estate homes create ponds for aesthetic purposes. In some cases, these ponds are part of interconnected systems. Many of these ponds are shallow and suffer from eutrophic conditions. This leads to a large amount of weed and algae growth that depletes the amount of dissolved oxygen in the water. Through proper design, increases in water temperature during summer months can be minimized.

The configuration of a pond will affect its temperature. The length-to-width ratio should be maximized to prevent the occurrence of large open areas of water that cannot be shaded by vegetation. The positioning of deciduous and coniferous trees along the edges of a pond, channel, or wetland can assist in mitigating undesirable increases in water temperature and contribute to the maintenance of dissolved oxygen levels by inhibiting the growth of algae. It is desirable that ponds should have at least one deep area over 4 to 6 feet in depth to keep the pond waters cool and to maintain an area to sustain a fish population.

Pond Maintenance

In the Design and Performance Standards Section of the Plan, the narrative indicates that the maintenance of stormwater management systems, including ponds, with outfalls discharging to Borough streams and waterways, is the responsibility of private property owners. To date, this has not been an effective way of maintaining ponds. The Borough is exploring new options to determine whether there are viable alternatives to manage this resource. The Borough anticipates including educational materials regarding the impacts of poor pond maintenance in a direct mailing to all residents. The continuing exploration of this issue may change the Borough's policy regarding pond maintenance in the future. The requirement for any new or rehabilitated pond should be consistent with the Category -1 stream requirements.

Deterrence of Geese

Maintaining or planting dense woody vegetation around the perimeter of a pond or wetland is the most effective means of deterring geese from taking over and contaminating local lakes and ponds. Minimizing the amount of land that is mowed will limit the preferred habitat for geese. However, if these actions are not sufficient, the Borough will investigate other actions.

Fertilizers

The use of fertilizers to create the "perfect lawn" is an increasingly common problem in many residential areas. Fertilizer run-off increases the level of nutrients in water bodies and can accelerate eutrophication in the lakes and rivers and continue on to the coastal areas. The excessive use of fertilizer causes nitrate contamination of groundwater. Good fertilizer maintenance practices can help in reducing the amount of nitrates in the soil and thereby lower its content in the water. Initially, the Borough should work with the NJDEP to educate homeowners of the impacts of the overuse of fertilizers. This discussion should include other techniques to create a "green lawn" without over fertilizing. Almost as important as the use of fertilizer is the combination of over fertilizing and over watering lawns. In many cases, this leads to nutrient rich runoff, which ultimately may discharge into a nearby stream, lake or other water body. If fertilizer is applied correctly, the natural characteristics of the underlying soils will absorb or filter out the nutrients in the fertilizer.

Unpaved Roads

While there are no unpaved public roads in the Borough, there are a few privately maintained unpaved roads or lands serving more than one lot. There is a need to manage the runoff from these roadways. Poorly maintained unpaved roads may contribute to water quality problems and erosion from unpaved roads may increase nonpoint source pollution. This Plan recommends utilizing best management practices (BMP's) to properly manage existing unpaved roads.

Recommendations from 2015 Floodplain Management Plan[36]

Wetlands Protection

There are many areas throughout the Borough that contain wetlands. The wetlands are classified as deciduous wetlands, disturbed wetlands, herbaceous wetlands, managed wetlands, phragmites dominant wetlands and salt marshes. These wetlands, especially those adjacent to the Navesink and Shrewsbury Rivers, provide the Borough a vital asset during storms and floods. Not only do wetlands provide a natural buffer between buildings and the rivers, but they also slow the speed of surging floodwaters and provide an area for retention and recharge. State regulations through the NJDEP freshwater and coastal wetland permit programs are currently in place to limit development in these areas. The Borough should continue to support and enforce these programs. The Borough should also consider further investigation of living shorelines to augment these areas and provide additional shoreline stabilization.

Erosion and Sediment Control

The Standards for Soil Erosion and Sediment Control in New Jersey are regulated by the New Jersey Department of Agriculture and locally enforced through the Freehold Soil Conservation District. The Borough should continue to support and enforce these standards for all applicable development.

Water Quality Improvement

The Borough of Rumson currently enforces the NJDEP Best Management Practices for stormwater runoff quality and reduction of total suspended solids. Green infrastructure techniques should also be used to promote resiliency in the Borough and improve the water quality entering the Navesink and Shrewsbury Rivers. Green infrastructure uses permeable surfaces, landscape formations, and plant material to intercept stormwater runoff before it enters storm drains by promoting infiltration and filtration. Their use can promote resiliency by mitigating flooding and helping the Borough to quickly recover from storms. Additionally, green infrastructure captures runoff pollution and prevents it from entering waterways.

[36] 2015 Rumson Floodplain Management Plan, pg. 44-45

Coastal Barrier Protection

Rumson is protected from the Atlantic Ocean by the Borough of Sea Bright. Additionally, there are a number of uninhabited islands located throughout the rivers that act as natural buffers. A number of these islands are identified on the Preliminary FIRM map as Coastal Barrier Resource System Areas. The Borough should continue to maintain these islands as undeveloped open space.

Figure 16 Sunset over Navesink River wetlands

Recommendations from 2021 Update to the Stormwater Management and Control Ordinance

Green Infrastructure

Flood control, groundwater recharge, and pollutant reduction shall be achieved through the use of stormwater management measures, including green infrastructure Best Management Practices (GI BMPs) and nonstructural stormwater management strategies. GI BMPs and low impact development (LID) should be utilized to meet the goal of maintaining natural hydrology to reduce stormwater runoff volume, reduce erosion, encourage infiltration and groundwater recharge, and reduce pollution. GI BMPs and LID should be developed based upon physical site conditions and the origin, nature and the anticipated quantity, or amount, of potential pollutants. Multiple stormwater management BMPs may be necessary to achieve the established performance standards for water quality, quantity, and groundwater recharge.

Recommended Green Building Infrastructure Techniques from 2015 Land Use Element[37]

Given the experience of Hurricane Sandy and the potential for future storms, there is a compelling need to build resiliency in the Borough of Rumson. The Borough's development regulations should be designed to protect and promote resiliency throughout the Borough. This should be done through the promotion of green building and infrastructure techniques. The Land Use Plan Element overviews green building and infrastructure techniques and is meant to inform the future development of municipal development regulations.

Green building and infrastructure techniques are an important tool for promoting resiliency in the Borough of Rumson. They use permeable surfaces (e.g., porous concrete, gravel, mulch, etc.), landscape formations (e.g., channels, depressions), plant material, or other technologies to reduce stormwater runoff by promoting natural infiltration. Their use can promote resiliency by mitigating flooding (i.e., reducing the risk and impacts of flooding) and helping the Borough to quickly recover from storms. In addition, they provide numerous co-benefits, not the least of which are: reducing long-term maintenance and operation costs of stormwater infrastructure; and, capturing runoff pollution (e.g., particulate matter, heavy metals) and preventing their entry into sensitive terrestrial waterways. The Land Use Plan Element recommends the incorporation of green building and infrastructure techniques in the Borough's development regulations. Recommended green building and infrastructure techniques are described in the following subsections.

Downspout Disconnection

Downspout disconnection refers to the rerouting of rooftop drainage pipes to specialized containment devices (e.g., rain barrels, cisterns) and permeable areas, instead of traditional stormwater drainage systems. This allows stormwater runoff from building roofs not only to infiltrate soil, but also to be collected for later use (e.g., watering lawns and gardens), which reduces demand on public water supplies.

[37] 2015 Rumson Land Use Element, pg. 38-42

Rain Gardens

Rain gardens are shallow, vegetated basins that absorb stormwater runoff from impervious surfaces (e.g., rooftops, sidewalks, and streets). Runoff is channeled into rain gardens, and is then used by plants, infiltrated into the ground, and evaporated. They may be installed in a variety of locations and can be an attractive element of site design. In addition, it is important to note that rain gardens can be installed in a variety of locations. Indeed, they may be installed in any properly graded unpaved space, and in parking lots and paved areas through the construction of specialized planter boxes that collect and absorb runoff.

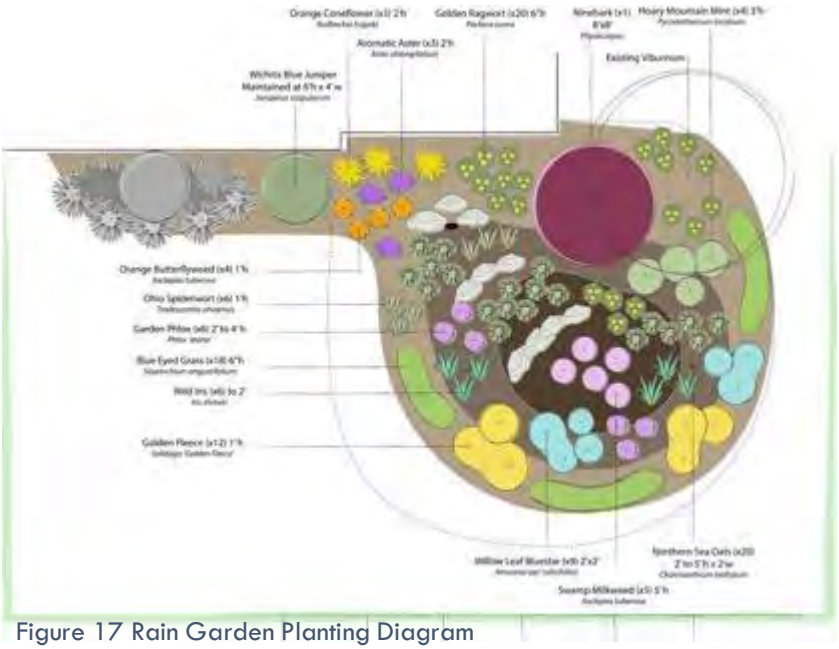


Figure 17 Rain Garden Planting Diagram

Bioswales

Bioswales are open, linear channels with vegetation, mulching, or xeriscaping that slow stormwater runoff and attenuate flooding potential while conveying stormwater runoff away from critical infrastructure. While they convey stormwater runoff away from critical infrastructure, their permeable surface permits the natural infiltration of stormwater. They are often used as an alternative to, or enhancement of, traditional stormwater drainage systems.

Figure 18 Curbside Bioswale

Permeable Pavements

Permeable pavements help to reduce stormwater runoff, which helps to improve the quality of terrestrial waters and mitigate flooding. With traditional (i.e., impervious) pavement, stormwater runs into drains and inlets, which places a burden on such infrastructure, and may result in the discharge of pollutants (e.g., sediment, oil residue, etc.) into terrestrial waters. Permeable pavements, however, infiltrate, treat, or store rainwater where it falls. Key examples of permeable pavements include pervious concrete, porous asphalt, and permeable interlocking pavers.

Green Roofs

Figure 19 Green Roof

Green roofs are roofs that are covered with substrate and vegetation that enable the infiltration of rainwater. This not only minimizes stormwater runoff but leads to reduced building operating costs and energy consumption by providing improved insulation of the roof surface and absorbing less heat on the roof surface (i.e., increasing the roof surface albedo over traditional roof surfaces). Flat and low-pitched roofs are most suited to green roof development and retrofitting therewith.

Tree Cover

Increased tree cover in developed areas is an important example of green infrastructure. Trees reduce and slow stormwater by intercepting precipitation in their leaves and branches. In addition, their root systems help to aerate soil, which facilitates natural infiltration of stormwater and reduces runoff. Trees also purify the air and can help to cool developed areas by providing shade, and through evaporative cooling and increased latent heat flux (i.e., the dissipation of sensible heat).

Living Shorelines

Living shorelines are an approach to shoreline stabilization that uses wetland plants, submerged aquatic plants, oyster reefs, coir fiber logs, sand fill, and stone to provide shoreline protection and maintain important habitat areas. They offer numerous benefits over hardened structures (e.g., bulkheads and concrete walls), including protection of the riparian and intertidal environments, improvement of water quality via filtration of upland runoff; and creation of habitat for aquatic and terrestrial species.

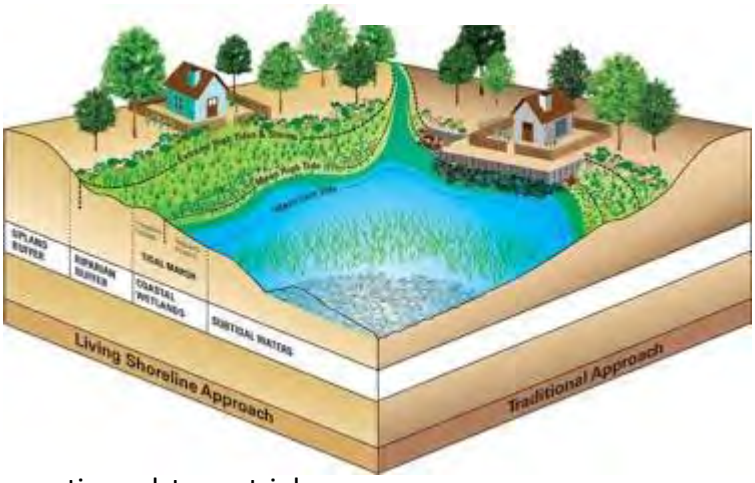


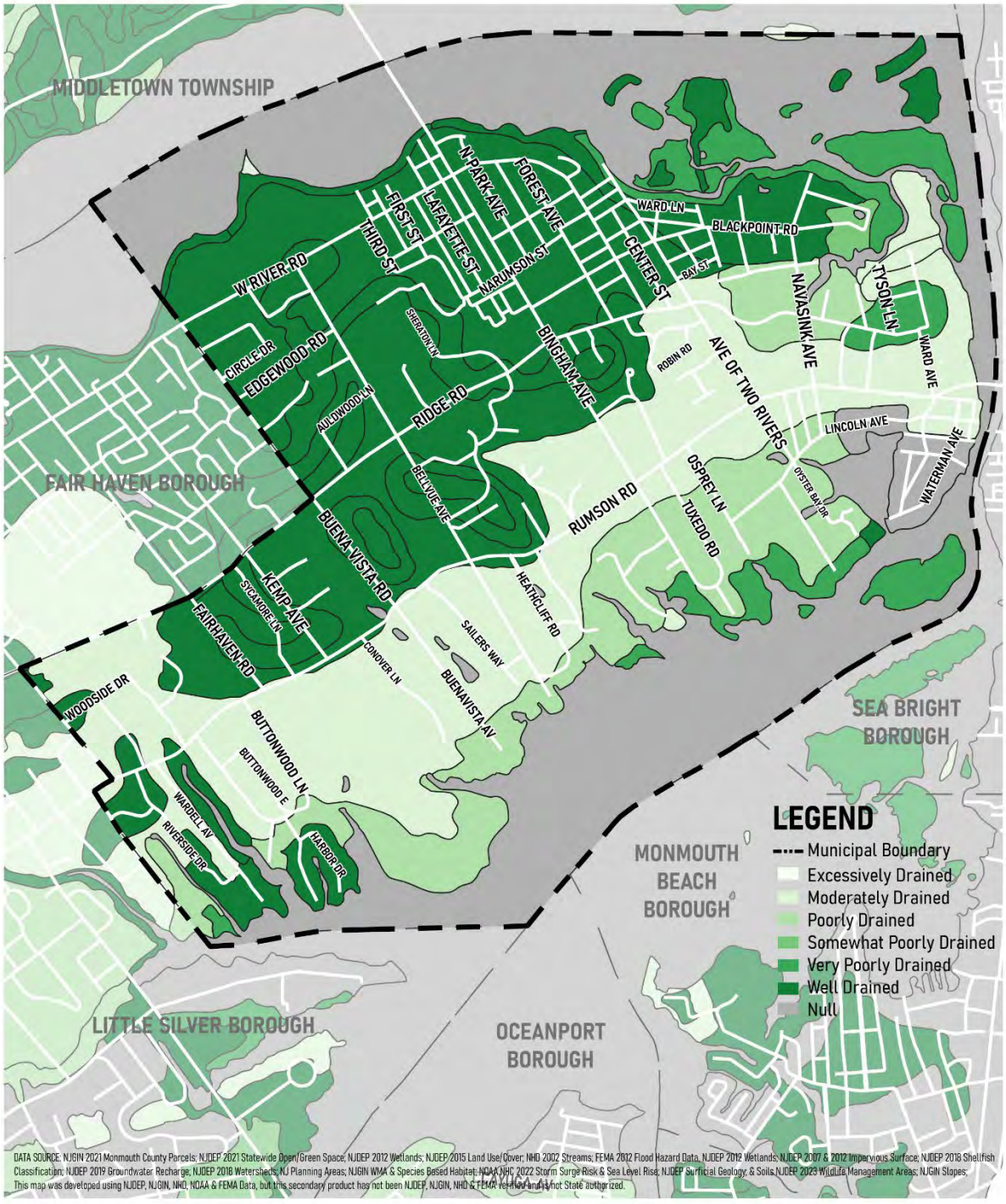
Figure 20 Living Shoreline Approach

Open Space Preservation

Preservation of open space areas within and adjacent to developed areas can help to mitigate the water quality and flooding impacts of stormwater. Indeed, natural open space areas promote increased groundwater recharge, lower stormwater runoff, and reduced levels of nutrients and sediment in terrestrial waters. They also help to cool developed areas through evaporative cooling and increased latent heat flux. The use of building coverage and impervious surface limits, tree-save requirements, and noncontiguous clustering are key ways to promote open space preservation through development regulation.

APPENDIX

Appendix A. BOROUGH OF RUMSON SOILS MAP



Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres In AOI	Percent of AOI
AptAv	AppoquinlmInk-Trensqueking-Mispillion complex, 0 to 1 percent slopes, very frequently flooded	170.3	3.5%
N.sA	N.sion sand, 0 to 2 percent slopes, Northern Coastal Plain	8.3	0.2%
BEAOV	Beaches, 0 to 15 percent slopes, very frequently ftooded	98.2	2.0%
EveB	Evesboro sand. 0 to 5 percent slopes	173.9	3.6%
FrkB	Freehold sandy loam, 2 to 5 percent slopes	496.8	10.2%
FrkC	Freehold sandy loam, 5 to 10 percent slopes	300.7	6.2%
FrkE2	Freehold sandy loam. 15 to 25 percent slopes, eroded	5.9	0.1%
FrrC	Freehoi Urban land complex. 0 to 10 percent slopes	557.0	11.5%
HocA	Holmdel sandy loam, 0 to 2 percent slopes	979.5	20.2".4
Kl<gB	Klej loamy sand, 0 to 5 percent slopes	15.1	0.3%
PhbE	Phalanx loamy sand. 10 to 25 percent slopes	0.1	0.0%
ShrA	Shrewsbury sandy loam. 0 to 2 percent slopes	437.6	9.0%
UdaB	Udorthents, 0 to 8 percent slopes	105.0	2.2%
USBROA	Urban lan Brockelonorton complex, 0 to 2 percent slopes, occasionally flooded	133.7	2.8%
USKLEA	Urban len Klej complex, 0 to 2 percent slopes	55.1	1.1%
WATER	Water	1,290.9	26.6%
Totals for Area of Interest		4,859.5	100.0%

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

Appendix B. SEA LEVEL RISE MAPS

1 Foot of Sea Level Rise
Rumson Borough

Legend

- Municipality
- Schools
- Fire Stations
- Law Enforcement
- Assisted Living
- Hospitals
- Evacuation Routes
- 1ftSLR

Year 2010 Population: 7122

According to Keru th G. Atillrr d. al. in tl1e2013 orud) •A G<ological Perspective en SeaLevel Rise and its acu AIC1'8the U.S. Mid·Atlantir Coast" a probable tlm t i•the 1 ft,.. lovel rise condition that could be ecperted by 2050. This map depicts that sea level rise as well as lhe proceeding proje<licns thereafter and is: c-entered on tqctrn.midpalities.

0 0.3 0.6 1.2 Miles

Map Author: Rachael Sacatelli and Bryan Serino
Rutgers, New Brunswick
Center for Remote Sensing
and Spatial Analysis

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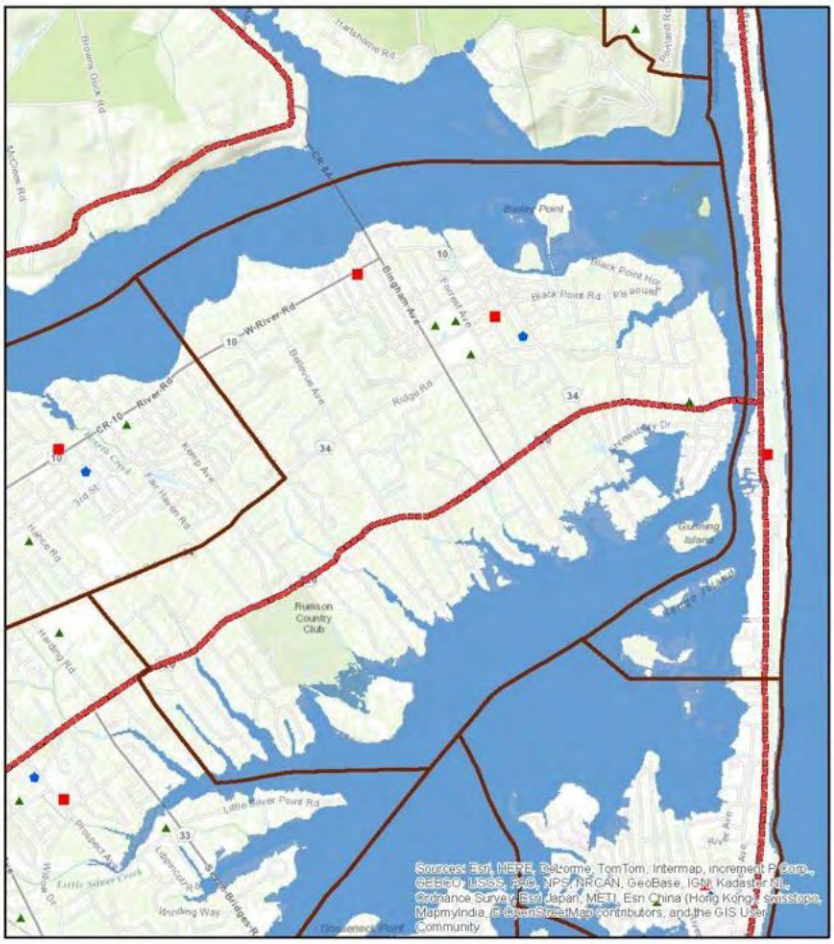


2 Feet of Sea Level Rise
Rumson Borough

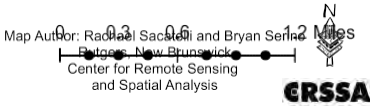
Legend

- Municipality
- Schools
- Fire Stations
- Law Enforcement
- Assisted Living
- Hospitals
- 2ft SLR
- Evacuation Routes

7122

Year 2010 Population:

According to Kenneth G. Miller et al. in the 2013 study "A Geological Perspective on Sea-Level Rise and its Impacts Along the U.S. Mid-Atlantic Coast" a probable threat is the 1ft sea level rise condition that could be expected by 2050. This map depicts that sea level rise as well as the proceeding projections thereafter and is centered on target municipalities.



Map Author: Rachael Sacatelli and Bryan Serino
Rutgers, New Brunswick
Center for Remote Sensing
and Spatial Analysis
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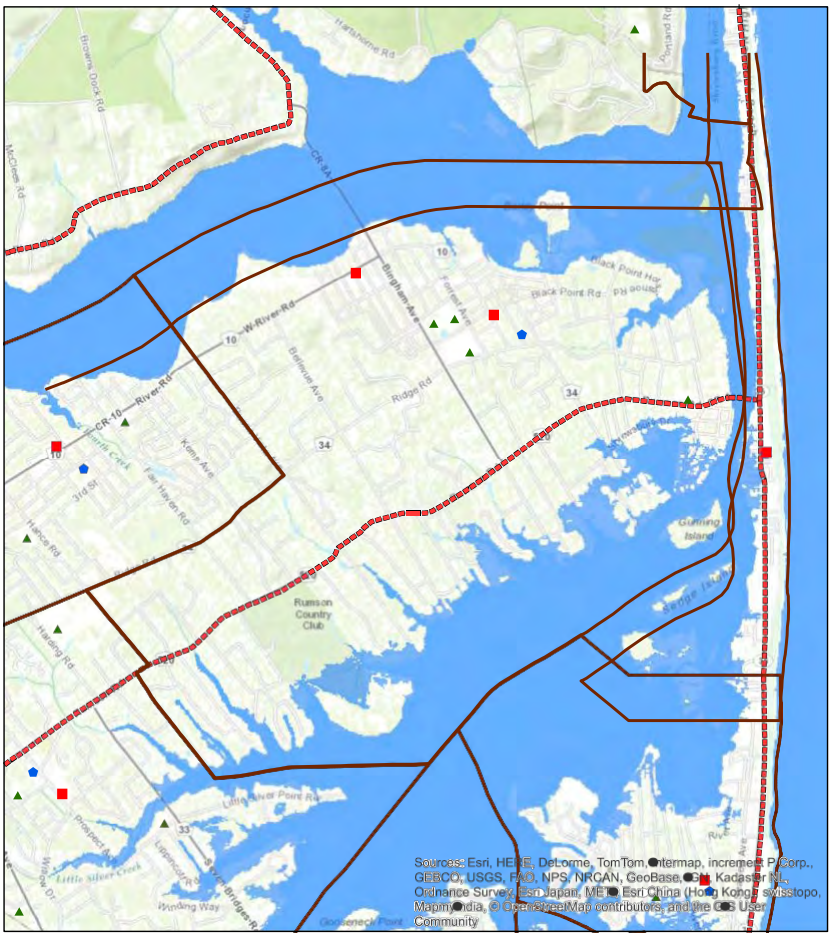

3 Feet of Sea Level Rise
Rumson Borough

Legend

- Municipality
- Schools
- Fire Stations
- Law Enforcement
- Assisted Living
- Hospitals
- 3ft SLR
- Evacuation Routes

7122

Year 2010 Population:

According to Kenneth G. Miller et al. in the 2013 study "A Geological Perspective on Sea-Level Rise and its Impacts Along the U.S. Mid-Atlantic Coast" a probable threat is the 1ft sea level rise condition that could be expected by 2050. This map depicts that sea level rise as well as the proceeding projections thereafter and is centered on target municipalities.

0 0.3 0.6 1.2 Miles

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Map Author: Rachael Sacatelli and Bryan Serine
Rutgers, New Brunswick
Center for Remote Sensing
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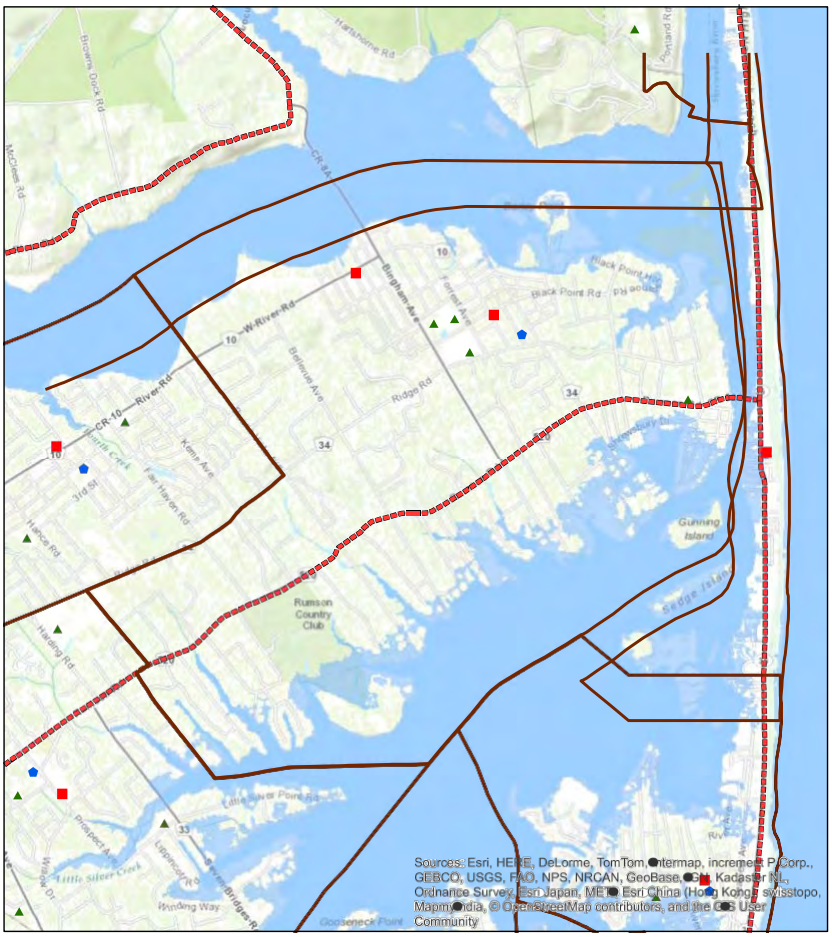

Appendix C. SLOSH MODELS

Category 3 SLOSH Model
Rumson Borough

Legend

CJ Municipality
Schools
Fire Stations
Law Enforcement
Assisted Living
Hospitals
Evacuation Routes

Category 3 SLOSH
0 - 3 Feet Above Ground Level
3-6
6-9
>9

Year 2010 Population: 7122

This map depicts dt< SLOSH model <Xl<nu provided by NOAA. The dqllhs are ranged from *0-9 or* greater f«t of inundation abovt ground IC'V◁ ••d ▬▬ categoriztd in th< legend obovt-

0 0.25 0.5 1 Miles

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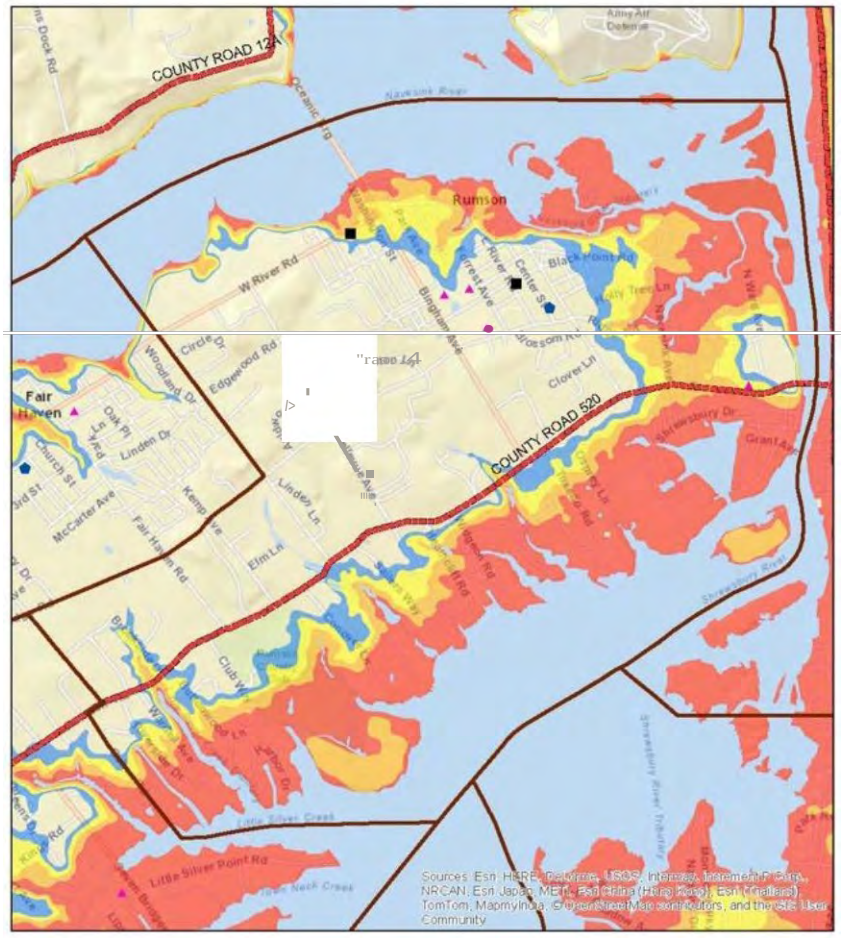

Category 2 SLOSH Model
Rumson Borough

Legend

- Municipality
- Schools
- Fire Stations
- Law Enforcement
- Assisted Living
- Hospitals
- Evacuation Routes

Category 2 SLOSH

- 0- 3 Feet Above Ground Level
- 3-6
- 6-9

Year 2010 Population: 7122

This map depicts the SLOSH model extents provided by NOAA. The depths are ranged from 0-9 or gr,.tcr **feet of inundation aboveground level and are categcrized in the legend above,**

0 0.25 0.5 1 Miles

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Map Author: Rachael Sacate and Bryan Serino
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and Spatial Analysis

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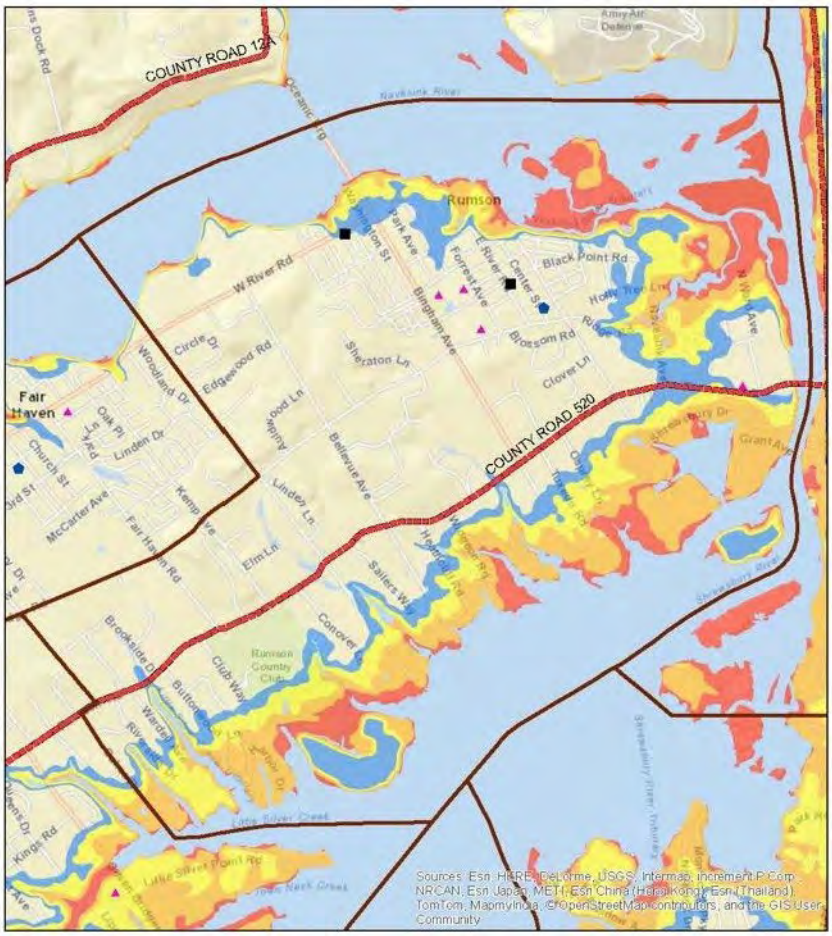

Category 1 SLOSH Model
Rumson Borough

Legend

C::J Municipality

" Schools

● Fire Stations

● Law Enforcement

● Assisted Uving

o Hospitals

— — Evacuation Routes

Category 1 SLOSH

0 - 3 Feet Above Ground Level

3-6

6-9

>9

Year 2010 Population: 7122

This map depicts the SLOSH model extenu provided by NOAA. The dqllhs are ranged from O·9 or grealer feet of uwndatian aboveground level and ... eat<gorized in UJ0 legend above.

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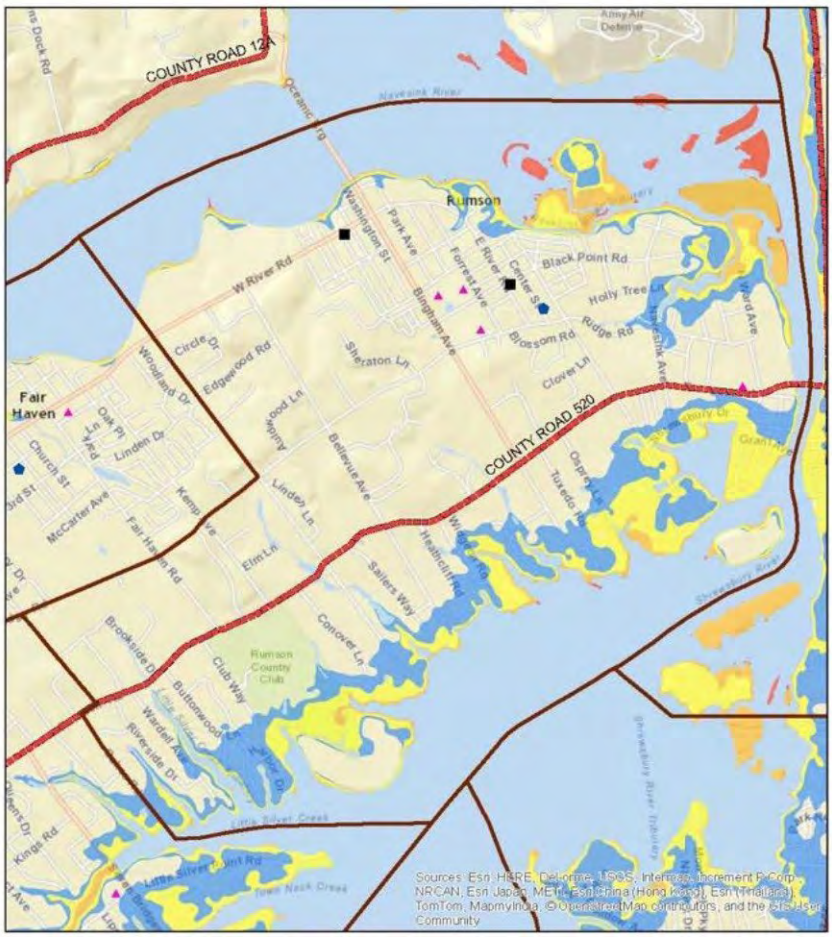


Appendix D. BIRDS OF RUMSON

BIRDS FOUND IN AND AROUND RUMSON			
common name	scientific name	common name	scientific name
American Crow	Corvus brachyrhynchos	Greater scaup	Aythya marila
American Goldfinch	Spinus tristis	Hairy Woodpecker	Leuconotopicus villosus
American Robin	Turdus migratorius	Hermit Thrush	Catharus guttatus
American Wigeon	Anas Americana	Herring Gull	Larus argentatus
Bald Eagle	Haliaeetus leucocephalus	House Sparrow	Passer domesticus
Barred Owl	Strix varia	House Wren	Troglodytes aedon
Black Duck	Anas rubripes	Laughing Gull	Larus atricilla
Black-capped/Carolina Chickadee	Parus carolinensis	Lesser Scaup	Aythya affinis
Blue Jay	cyanocitta cristata	Loggerhead Shrike	Lanius ludovicianus
Bobwhite	Colinus virginianus	Mallard	Anas platyrhynchos
Brown-headed Cowbird	Molothrus ater	Mockingbird	Mimus pioyglottos
Canadian Goose	Branta canadensis	Mourning Dove	Zenaida macroura
Canvasback	Aythya valisineria	Northern Flicker	Colaptes auratus
Cardinal	Cardinalis cardinalis	Osprey	Pandion haliaetus
Carolina Wren	Thryothorus ludovicianus	Red Shouldered Hawk	Buteo lineatus
Cedar Waxwing	Bombycilla cedrorum	Red Tailed hawk	Buteo jamaicensis
Chipping Sparrow	Spizella passerina	Red-bellied Woodpecker	Melanerpes carolinus
Common Grackle	Quiscalus quiscula	Redwinged Blackbird	Agelaius phoeniceus
Common Merganser	Mergus merganser	Ruby-throated Hummingbird	Archilochus colubris
Common Tern	Sterna hirundo	Savannah Sparrow	Ammodramus savannarum
Cooper's Hawk	Accipiter cooperii	Seaside Sparrow	Ammospiza maritima
Dark-eyed Junco	Junco hyemalis	Sharp-shinned Hawk	Accipiter striatus
Downy Woodpecker	Picoides pubescens	Sharp-tailed Sparrow	Ammospiza caudacuta
Eastern Bluebird	Sialia sialis	Song Sparrow	Melospiza melodia
European Starling	Sturnus vulgaris	Swainson's Thrush	catharus ustulatus
Field Sparrow	Spizella pusilla	Swamp Sparrow	Melospiza georgiana
Gray Catbird	Dumetella carolinensis	Tufted Titmouse	Baeolophus bicolor
Gray-cheeked Thrush	Catharus minimus	Turkey Vulture	Cathartes aura
Great Black-backed Gull	Larus minnus	White-breasted Nuthatch	Sitta carolinensis
Great Blue Heron	*Ardea herodias*	White-throated Sparrow	Zonotrichia albicollis
Great Horned Owl	Bubo virginianis	Yellow-bellied Sapsucker	Sphyrapicus varius

Appendix E. THREATENED AND ENDANGERED SPECIES

BIRDS			
Endangered		**Threatened**	
Bittern, American BR	*Botaurus lentiginosos* BR	Bobolink BR	*Dolichonyx oryzivorus* BR
Eagle, bald BR	*Haliaeetus leucocephalus* BR	Eagle, bald NB	*Haliaeetus leucocephalus* NB
Falcon, peregrine BR	*Falco peregrinus* BR	Egret, cattle BR	*Bubulcus ibis* BR
Goshawk, northern BR	*Accipiter gentilis* BR	Kestrel, American	*Falco sparverius*
Grebe, pied-billed BR	*Podilymbus podiceps* BR	Lark, horned BR	*Eremophila alpestris* BR
Harrier, northern BR	*Circus cyaneus* BR	Night-heron, black-crowned BR	*Nycticorax nycticorax* BR
Hawk, red-shouldered BR	*Buteo lineatus* BR	Night-heron, yellow-crowned	*Nyctanassa violacea*
Knot, red NB	*Calidris canutus* NB	Osprey BR	*Pandion haliaetus* BR
Owl, short-eared BR	*Asio flammeus* BR	Owl, barred	*Strix varia*
Plover, piping**	*Charadrius melodus***	Owl, long-eared	*Asio otus*
Rail, black BR	*Laterallus jamaicensis* BR	Rail, black NB	*Laterallus jamaicensis* NB
Sandpiper, upland	*Batramia longicauda*	Sparrow, grasshopper BR	*Ammodramus savannarum* BR
Shrike, loggerhead NB	*Lanius ludovicianus* NB	Sparrow, Savannah BR	*Passerculus sandwichensis* BR
Skimmer, black	*Rynchops niger*	Woodpecker, red-headed	*Melanerpes erythrocephalus*
Sparrow, Henslow's	*Ammodramus henslowii*		
Sparrow, vesper BR	*Pooecetes gramineus* BR		
Tern, least	*Sternula antillarum*		
Tern, roseate**	*Sterna dougallii***		
Warbler, golden-winged BR	*Vermivora chrysoptera* BR		
Wren, sedge	*Cistothorus platensis*		
**Federally endangered or threatened			

FISH	
Endangered	
Sturgeon, Atlantic**	*Acipenser oxyrinchus oxyrinchus***
Sturgeon, shortnose**	*Acipenser brevirostrum***
**Federally Endangered	

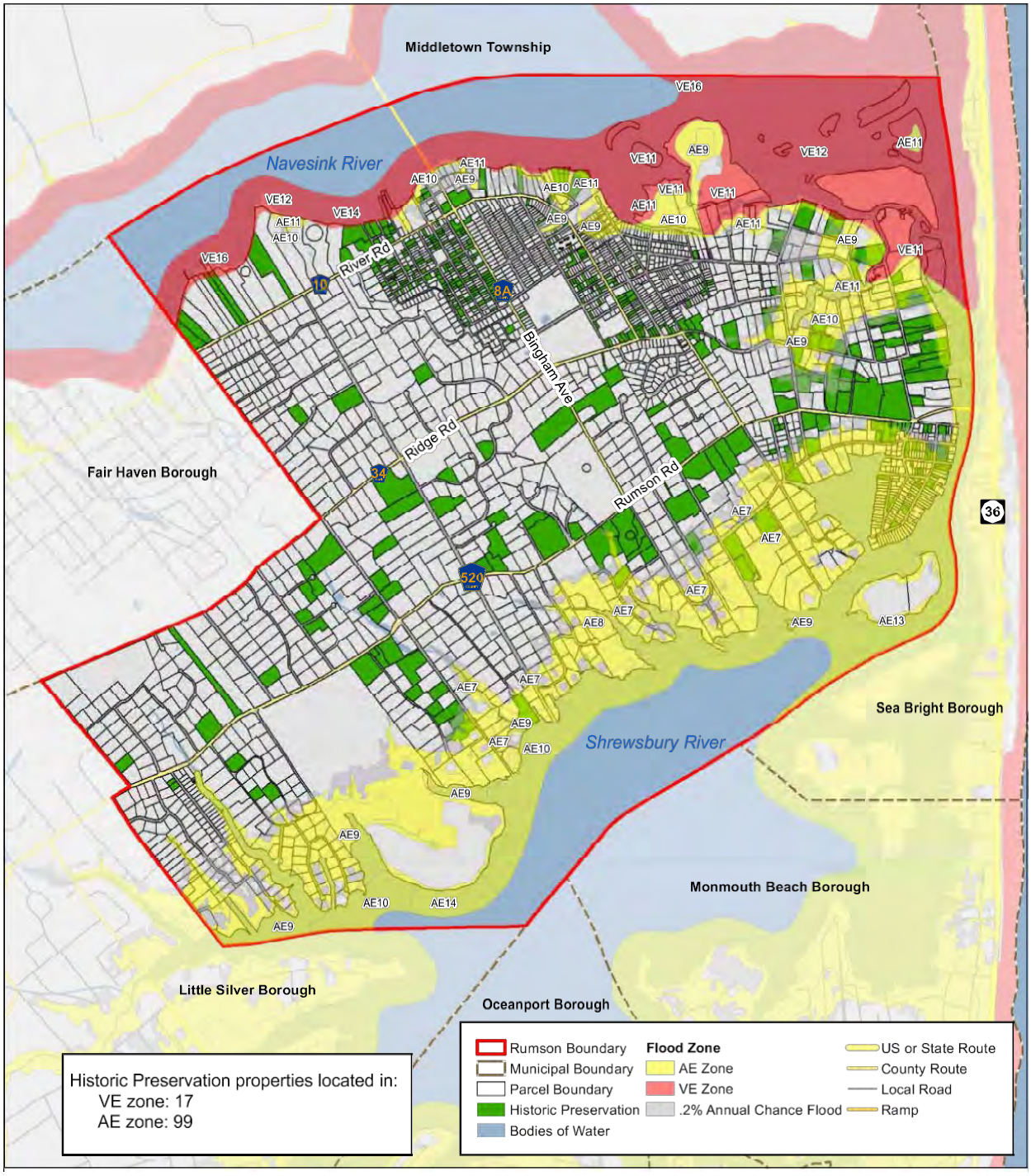
AMPHIBIANS			
Endangered		**Threatened**	
Salamander, blue-spotted	*Ambystoma laterale*	Salamander, eastern mud	*Pseudotriton montanus*
Salamander, eastern tiger	*Ambystoma tigrinum*	Salamander, long-tailed	*Eurycea longicauda*
Treefrog, southern gray	*Hyla chrysoscelis*	Treefrog, pine barrens	*Hyla andersonii*

INVERTEBRATES			
Endangered		**Threatened**	
Beetle, American burying**	*Nicrophorus americanus***	Baskettail, robust(dragonfly)	*Epitheca spinosa*
Beetle, northeastern beach tiger**	*Cincindela d. dorsalis***	Clubtail, banner (dragonfly)	*Gomphus apomyius*
Copper, bronze	*Lycaena hyllus*	Clubtail, harpoon (dragonfly)	*Gomphus descriptus*
Floater, brook (mussel)	*Alasmidonta varicosa*	Elfin, frosted (butterfly)	*Callophrys irus*
Floater, green (mussel)	*Lasmigona subviridis*	Emerald, Kennedy's (dragonfly)	*Somatochlora kennedyi*
Petaltail, gray (dragonfly)	*Tachopteryx thoreyi*	Floater, triangle (mussel)	*Alasmidonta undulata*
Satyr, Mitchell's (butterfly)**	*Neonympha m. mitchellii***	Fritillary, silver-bordered (butterfly)	*Bolaria selene myrina*
Skipper, arogos (butterfly)	*Atrytone arogos arogos*	Jewelwing, superb (dragonfly)	*Calopteryx amata*
Skipper, Appalachian grizzled (butterfly)	*Pyrgus wyandot*	Lampmussel, eastern (mussel)	*Lampsilis radiata*
Wedgemussel, dwarf**	*Alasmidonta heterodon***	Lampmussel, yellow (mussel)	*Lampsilis cariosa*
		Mucket, tidewater (mussel)	*Leptodea ochracea*
		Pondmussel, eastern (mussel)	*Ligumia nasuta*
		Snaketail, brook, (dragonfly)	*Ophiogomphus asperses*
		White, checkered (butterfly)	*Pontia protodice*
**Federally endangered or threatened			

MAMMALS	
Endangered	
Bat, Indiana**	*Myotis sodalis***
Bobcat	*Lynx rufus*
Whale, North Atlantic right**	*Eubalaena glacialis***
Whale, blue**	*Balaenoptera musculus***
Whale, fin**	*Balaenoptera physalus***
Whale, humpback**	*Megaptera novaeangliae***
Whale, sei**	*Balaenoptera borealis***
Whale,sperm**	*Physeter macrocephalus***
Woodrat, Allegheny	*Neotoma magister*
**Federally Endangered	

REPTILES			
Endangered		**Threatened**	
Rattlesnake, timber	*Crotalus h. horridus*	Snake, northern pine	*Pituophis m. melanoleucus*
Snake, corn	*Elaphe g. guttata*	Turtle, Atlantic green**	*Chelonia mydas***
Snake, queen	*Regina septemvittata*	Turtle, wood	*Glyptemys insculpta*
Turtle, bog**	*Glyptemys muhlenbergii***		
Hawksbill, Atlantic**	*Eretmochelys imbricata***		
Leatherback, Atlantic **	*Dermochelys coriacea***		
Loggerhead, Atlantic **	*Caretta caretta***		
Ridley, Atlantic **	*Lepidochelys kempii***		
**Federally endangered or threatened			

Appendix F. HISTORIC PRESERVATION PROPERTIES LOCATED IN THE FLOOD ZONES



Appendix G. RUMSON BOROUGH LAND USE LAND COVER