NJ Department of Environmental Protection
Water Monitoring and Standards
Marine Water Monitoring

Sanitary Survey of Shellfish Growing Area NE2

Navesink River

December 2015

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Navesink River

New Jersey Department of Environmental Protection (NJDEP)

Bureau of Marine Water Monitoring (BMWM)

Robert Schuster, Interim Chief

December 2015

Data from January 1, 2012 – December 22, 2015

Report prepared by:

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Cover Photo – Coopers Bridge (photo by Tracy Fay)

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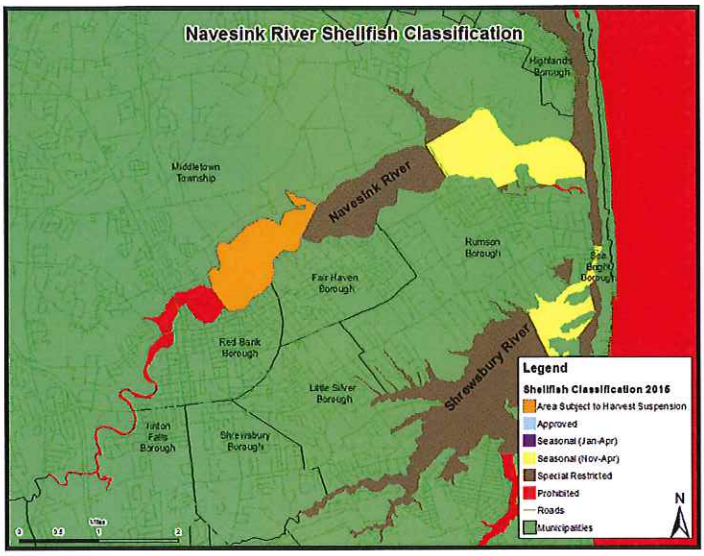
EXECUTIVE SUMMARY

The Navesink River is located in Monmouth County, New Jersey and is part of the Shrewsbury River Basin. The approximate size of this shellfish growing area is about 2,520 acres. The water quality data presented in this Sanitary Survey of the Navesink River was collected between January 1, 2012 and December 22, 2015 using the Systematic Random Sampling (SRS) strategy. Water samples were analyzed according to the National Shellfish Sanitation Program's Guide for the Control of Molluscan Shellfish (NSSP Guide) from 48 sampling stations for fecal coliform.

Due to an annual evaluation of the Navesink River in late 2014, 565.7 acres in the western portion of the Navesink River were suspended in a January 9, 2015 public notice. In accordance with N.J.A.C 7:12-1.5(b), the Department of Environmental Protection (Department) is required to immediately suspend those areas to shellfish harvest. The suspension of harvest affected 565.7 acres of *Special Restricted* waters in the Navesink River; Special *Restricted* waters allow harvest pending further processing under a permit issued by the Department. The suspension closed depuration lots 5C and 6A, therefore, no shellfish harvest is allowed with or without a state issued depuration permit (*N.J.A.C. 7:12-9.7*) in the suspended area.



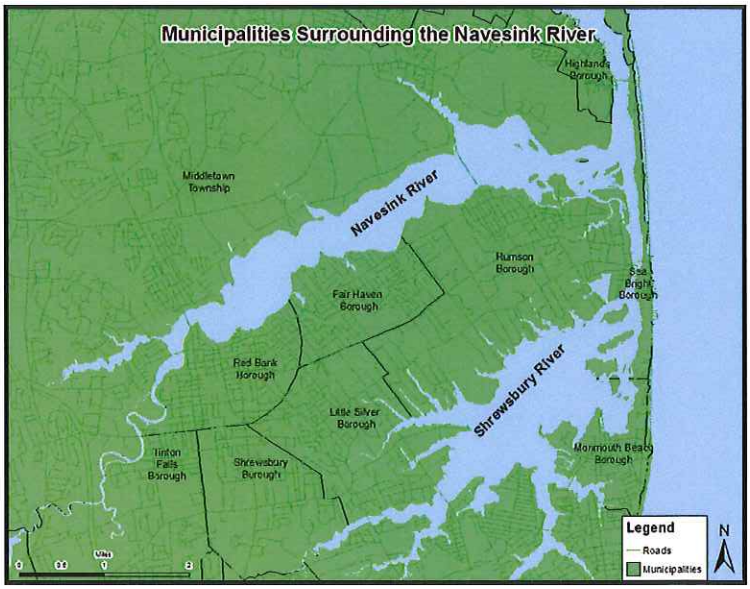
This report recommends the same area for a downgrade from a *Special Restricted* classification to a *Prohibited* classification in the next adoption of *N.J.A.C. 7:12* (see adjacent figure). The suspension and subsequent downgrade are due to fecal coliform levels exceeding the NSSP Guide criteria for *Special Restricted* waters. Six stations in the Navesink River currently exceed the criteria for the shellfish growing area classification of *Special Restricted.* This report also recommends that the Bureau of Marine Water Monitoring (BMWM) continue to monitor the Navesink River fecal coliform levels, perform targeted sampling during storm events to identify potential sources of pollution, and work with the local municipalities to address areas identified during targeted sampling and to take actions or corrective measures to improve the bacterial water quality.

DESCRIPTION OF GROWING AREA

Location & Description

Shellfish growing area, NE2, the Navesink River, is located in Monmouth County and connects to the Sandy Hook Bay via the Shrewsbury River (see following figure). The Navesink River is part of the Shrewsbury River Estuary, but for the purpose of this report, it is examined as a separate growing area. The Navesink River is approximately 8 miles long. There are numerous small creeks off of the Navesink River, including Swimming River, Jumping Brook, McClee's Creek, and Claypit Creek.

Seven municipalities surround the Navesink River; they are Middletown, Tinton Falls, Red Bank, Fair Haven, Rumson, Highlands, and Sea Bright.

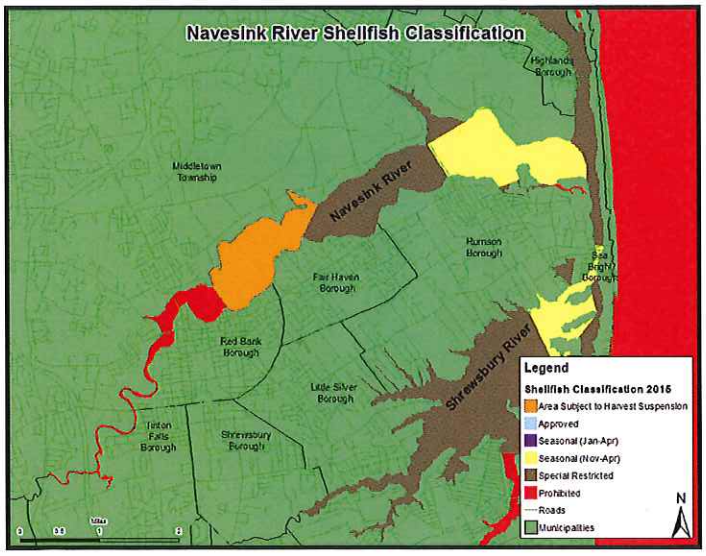


Growing Area Classification Summary

The approximate size of this shellfish growing area is 2,520 acres. Shellfish classifications in this growing area include *Seasonal (November-April), Special Restricted,* and *Prohibited* waters (see below figure). There are no *Approved* waters in this growing area. There are currently about 677 acres of *Seasonal (November-April)* waters, 1,568 acres of *Special Restricted* waters, and 275 acres of *Prohibited* waters in the Navesink River. However, 565.7 acres of the *Special Restricted* portion of the Navesink River are currently suspended. Suspended means waters where the harvest of shellfish is suspended pending the establishment by rulemaking of the appropriate classification. This report is recommending the currently suspended area be downgraded to *Prohibited* in the adoption of *N.J.A.C. 7:12*, Shellfish Growing Water Classification, please see the 'Conclusions' and 'Recommendations' section of this report for further detail.

The *Seasonal (November-April)* waters can be found on the eastern end of the Navesink River, starting from the Oceanic Bridge and extending northward to Locust Point, then eastward toward Lower Rocky Point, excluding waters within Claypit Creek (see N.J.A.C. 7:12 for official boundaries).

The majority of waters in this shellfish growing area are classified as *Special Restricted.* The *Special Restricted* classification means that it is prohibited to harvest shellfish from these waters for direct market; a special permit must be issued to be in compliance with N.J.A.C. 7:12. Recreational harvest of shellfish is not permitted from *Special Restricted* waters. Currently, the *Special Restricted* waters are located in the western section of the Navesink River, starting from the Oceanic Bridge extending westward until the area subject to harvest suspension. Other *Special Restricted* areas include Claypit Creek, Shrewsbury River, and some unnamed waterways in the lower Navesink (see N.J.A.C. 7:12 for official boundaries). On January 9, 2015 a public notice suspended harvest of 565.7 acres of *Special Restricted* waters of the Navesink River. Specifically the suspended area includes, all waters west of a line beginning at latitude 40 degrees 22 minutes 3.4 seconds N., longitude 74 degrees 2 minutes 48.2 seconds W. and heading in a north-east direction to latitude 40 degrees 22 minutes 25.0 seconds N., longitude 74 degrees 2



minutes 34.1 seconds W., to the existing Prohibited waters west of Highway 35 Bridge (Cooper's Bridge) in Red Bank, including all of Swimming River, Shadow Lake, McClee's Creek, and other tributaries. These 565.7 acres are being recommended to be classified as *Prohibited* on the next rule promulgation of N.J.A.C. 7:12. Please see the 'Conclusions' and 'Recommendations' section of this report for further detail.

Prohibited waters can be found in the upper Navesink River and in some unnamed waterways.

This area is displayed in the current State of New Jersey Shellfish Growing Water Classification Chart (NJDEP) or on the Bureau of Marine Water Monitoring's (BMWM) website at http://www.state.nj.us/dep/bmw/; the official classification descriptions can be found at *N.J.A.C. 7:12*, Shellfish Growing Water Classifications.

Evaluation of Biological Resources

Commercially important shellfish native to New Jersey include hard clams (*Mercenaria mercenaria*), soft-shell clams (*Mya arenaria*), blue mussels (*Mytilus edulis*), eastern oysters (*Crassostrea virginica*), ocean quahogs (*Arctica islandica*), surf clams (*Spisula solidissima*), sea scallops (*Placopecten magellanicus*), and bay scallops (*Aequipectin irradians*). New Jersey is considered as one of the U.S. major ports for commercial fishery landings. The five major fishing ports in New Jersey are Belford, Point Pleasant, Barnegat Light, Atlantic City, and Cape May. Four of these ports are ranked among the top 50 ports in the nation based on harvest value. According to the State of New Jersey 2014 Hazard Mitigation Plan, the New Jersey fishing industry contributes an estimated $4.5 billion annually from commercial fisheries, aquaculture, and recreational fishing. Based on data from "New Jersey's Commercial Fishing Industry" collected by the Garden State Seafood Association in 2011, New Jersey's most valuable fisheries were dominated by shellfish including sea scallops ($142 million), surf clams/ocean quahogs ($19 million), squid ($13 million), blue crabs ($9 million), hard shell clams ($6 million), oysters ($3 million), and lobsters ($3 million). According to NOAA National Marine Fisheries Service, in 2012, "Shellfish landings revenue was dominated by New Jersey ($159 million), followed by Virginia ($114 million), and Maryland ($63 million)."

In 2015, NJDEP Bureau of Shellfisheries conducted a hard clam (*Mercenaria mercenaria*) stock assessment of the Navesink River; the report is not yet available. Factors that contribute to having a viable resource include salinity, dissolved oxygen levels, bottom conditions, and predation.

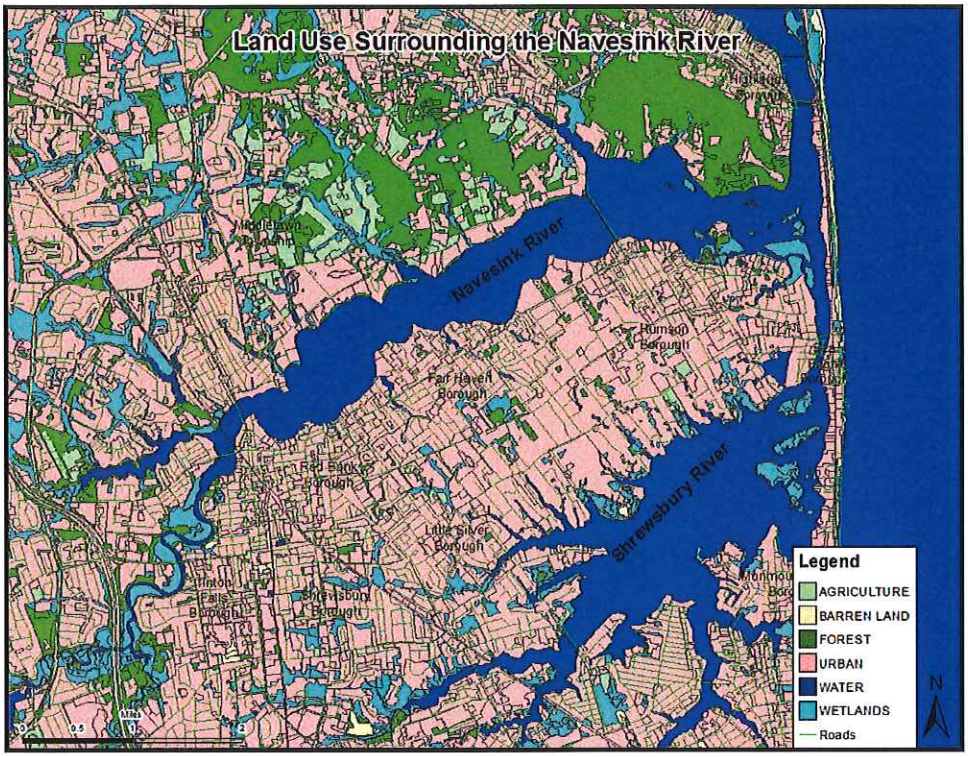
SHORELINE SURVEY: EVALUATION OF POTENTIAL POLLUTION SOURCES

Shoreline surveys or site-specific tours of areas nearby or abutting shellfish growing waters can provide insight as to the location and nature of land use, surface water discharges, marinas, unpermitted discharges, and stormwater inputs. The following sections detail information derived collectively from recent shoreline surveys.

Land Use

The current land use surrounding the Navesink River is predominately urban and residential (see adjacent figure). However, there are sections of forest, barren lands, wetlands, and agricultural areas. Most

residential development is single family homes; however, there are some higher density cluster developments in the area, primarily in Sea Bright Borough.



The Monmouth County Park System manages several parks in the Navesink watershed, including Hartshorne Woods Park, Thompson Park, Huber Woods Park, Dorbrook Recreation Area, Holmdel Park, Tatum Park and the newly acquired Swimming River Park (previously Chris's Landing Marina). Small horse farms and other agricultural farms can be found in Middletown Township and in the upper watershed. The Swimming River Reservoir, upstream of the shellfish growing waters, is managed by New Jersey American Water Company and provides drinking water for residents of Monmouth County. Navesink County Club borders the Navesink River in Middletown and operates a private golf course. Barley Point Island is a private community of about 50 homes on the 38 acre island; the community association maintains the pump station and sewer lines to the mainland.

As the demand for more urban land has increases, more forest, wetland, and agriculture are being redeveloped to urban areas, putting stress on the surrounding ecosystem. The displacement of cropland, grassland, and forested areas by impervious surfaces and buildings greatly intensifies stormwater runoff, diminishes groundwater recharge, and promotes urban heat formation. These factors were identified by the Environmental Protection Agency as being the most significant threat to water resources. The toxic and pathogenic pollutants transported from impervious surfaces to watersheds in the form of non-point source pollution have been shown to substantially degrade streams, rivers, and lakes (EPA).

This area was heavily influenced by Superstorm Sandy in October of 2012. Since Superstorm Sandy there has been a lot of construction on condominiums and residential homes and rebuilding of docks, bulkheads and other structures at residential homes and commercial marinas; areas are still undergoing repairs or have not been repaired.

Vegetation is an essential part of the marine ecosystem, offering habitat and nursery grounds for numerous species. In the Navesink River, the submerged aquatic vegetation (SAV) is prevalent in shallow areas. Some of the most common species of SAV include widgeon grass (*Ruppia maritima*), sago pondweed (*Potamogeton pectinatus*), horned pondweed (*Zannichellia palustris*) and eelgrass (*Zostera marina*).

Waterfowl are known to inhabit this area, especially during winter months. Herons, ducks, geese, and egrets are common sights. The area is a well-known tourist spot on the New Jersey shore and entertains an influx of population in the summer months.

Surface and Ground Water Discharges

A surface water discharge involves the release of treated effluent from various municipal and industrial facilities directly into a river, stream, or the ocean. The discharge of pollutants from a point source is authorized under New Jersey Pollutant Elimination System (NJPDES), and the regulations are found at N.J.A.C. 7:14A. The main purpose of the NJPDES program is to ensure proper treatment and discharges of wastewater. By doing so, the permits limit the amount or concentration of pollutants that can be discharged into ground water, streams, rivers, and the ocean.

There are no direct discharges into the waters of the Navesink River. However, there are two domestic treatment facilities in the general vicinity. The Two River Water Reclamation Authority (TRWRA), and the Township of Middletown Sewage Authority (TOMSA); both discharge treated wastewater into the Atlantic Ocean.

The Two River Water Reclamation Authority has six member towns: Monmouth Beach, Fair Haven, Little Silver, Shrewsbury Borough, Oceanport, and West Long Branch. It also has six customer towns: Sea Bright, Rumson, Red Bank, Eatontown, Shrewsbury Township and part of Tinton Falls. TRWRA handles average flows of 13.83 million gallons of sanitary sewer per day (TRWRA, 2015).

The Township of Middletown Sewage Authority (TOMSA) is located in Belford section of the Township of Middletown and is designed to treat 10.8 million gallons of sanitary sewer per day (TOMSA, 2015). Middletown, Atlantic Highlands, and Highlands use the facility and the effluents are discharged to the Atlantic Ocean via the Monmouth County Bayshore Outfall Authority (MCBOA).

Marinas

Marina facilities have the potential to affect the suitability of shellfish growing areas for the harvest of shellfish. The biological and chemical contamination associated with marina facilities may be of public health significance. The discharge of sewage from vessels into the waterways can contribute to the degradation of the marine environment by introducing disease-causing microorganisms (pathogens), such as bacteria, protozoan, and viruses, into the marine environment. Chemical compounds, such as oil and gasoline resulting from spills, leaks, and pressure washing from vessels can poison fish and other marine organisms. Research has shown that by-products from the biological breakdown of petroleum products can harm fish and wildlife, and pose threats to human health if ingested (NOAA). For this reason, waters within the marina basin are restricted to shellfish harvesting.

There are 22 marinas in the Navesink River (see adjacent figure). The waters enclosed by the marina (the marina basin) are classified as *Prohibited.* Depending on the size of the marina and the water quality, water immediately adjacent to each marina may be classified as *Prohibited, Special Restricted, Seasonal (November – April), or Seasonal (January – April).* Marina buffer zones were calculated using the

Virginia Model or the marina buffer equation, depending on the location. Additional information on the marina equations used for buffer generation can be found in the NJDEP *Shellfish Growing Area Report Guidance Document* (2012).

Spills, Unpermitted Discharges, and Closures

Spills reported to the DEP hotline (1-877-WARN-DEP) are passed on to the BMWM when shellfish waters are involved. Since there is a direct relationship between the pollution of shellfish growing areas and the transmission of diseases to humans, BMWM must carefully assess each spill occurrence. If the spill is determined to be detrimental to the shellfish beds, then a closure is made in the impacted area to protect public health. The closure is not lifted until the source of the problem is fixed/eliminated and all samples in that area fit within the appropriate classification criteria.

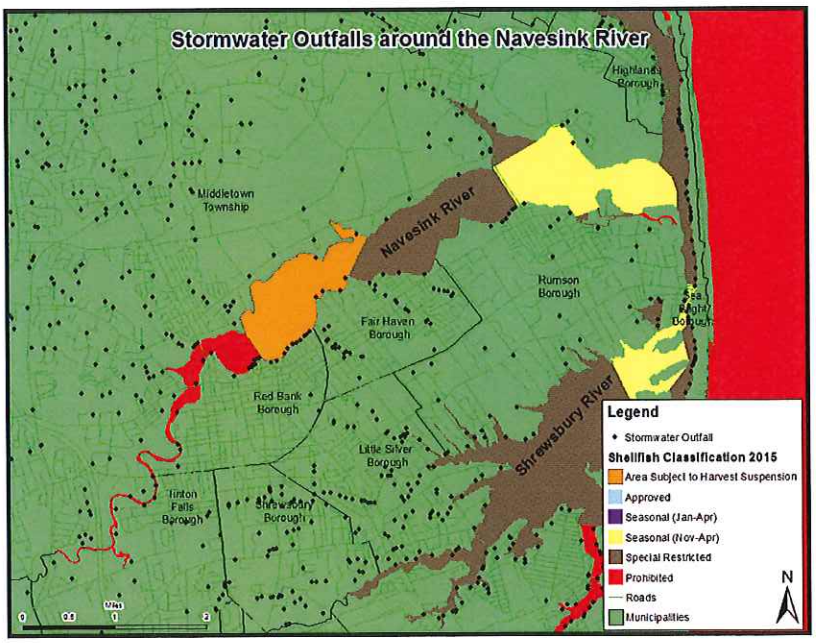
All state waters in New Jersey were closed for shellfish harvest in preparation for Hurricane Irene in 2011 and Superstorm Sandy in 2012. In both instances the shellfish growing waters of the state remained closed until water and, in some cases, tissue tests showed that the shellfish were safe for human consumption.

There were no other significant spills or unpermitted discharges requiring closures in the Navesink River since the last report on the area. However, there is a suspension of harvest in the upper portion of the river and this report recommends the same area for a downgrade, please see the 'Conclusions' and 'Recommendations' section of this report for further detail. Closures prior to 2011 are discussed in the prior reports on this area, see www.nj.us.gov/dep/bmw for more information.

The process of dredging can impair water quality and contaminate shellfish beds that are near dredging and disposal sites. BMWM is given the opportunity to review such project through CAFRA submission and will deny a project if the proposed dredging or disposal site can potentially contaminate shellfish beds or impair water quality. BMWM's comments are taken into consideration by the NJDEP, Division of Land Use Regulations (DLUR) when approving or denying a permit.

Stormwater Discharges

Environmental pressures on shellfish beds in New Jersey can originate in materials that enter growing waters via stormwater discharges. Runoff is a term for the surface water that moves from land to the ocean. During this transition the water picks up both nutrients (helpful and harmful) and pollutants. While some of this runoff provides nutrients for plants and animals, it also carries pollutants that can potentially contaminate the waters. Some pollutants include bird waste, agricultural pesticides, animal waste, and bacteria from faulty septic systems and failing



municipal infrastructure. Storm drains along roads collect the runoff and transmit it to stormwater outfalls. The outfalls discharge the runoff into streams, bays, oceans, and other bodies of water. They are often found in urban areas, and are especially common within lagoon communities. The first flush after a rain event often carries the most pollutants.

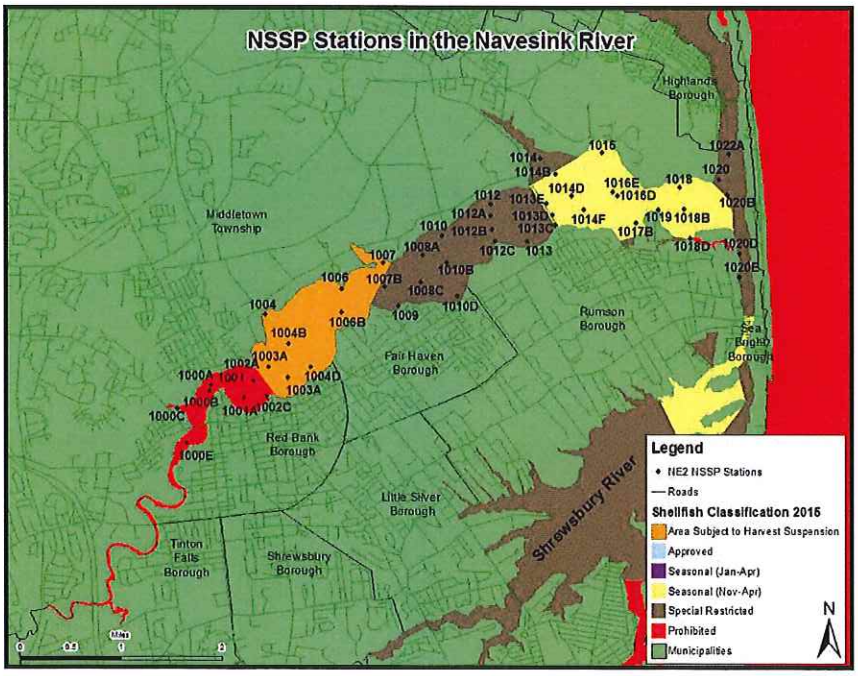
BMWM conducts stormwater projects to help lessen the effect of stormwater runoff. Water samples are taken during a storm event and the preceding days in order to determine the effect of runoff. Once a possible source of the problem is identified, the appropriate people (usually the municipality/county) are notified to remedy the situation.

There are numerous storm water inputs into the Navesink River and its tributaries (see above figure). These numerous storm water inputs have the potential to negatively impact the water quality within this growing area. Stormwater outfalls are one of the most significant non-point sources of pollution in this shellfish growing area. Considering the substantial amount of outfalls in this area, it is crucial to understand the importance of their regulation, in order to prevent pollution. BMWM is currently performing targeted sampling during storm events in the Navesink River to identify potential sources of pollution, and working with the local municipalities to address areas identified during targeted sampling and to take actions or corrective measures to improve the bacterial water quality. Information and results gathered will be included in a separate report or the next reappraisal report on the Navesink River.

WATER QUALITY STUDIES

Sampling Strategy

The National Shellfish Sanitation Programs' Guide for the Control of Molluscan Shellfish (NSSP Guide, 2013) gives the State Shellfish Control Authority the option of choosing one of two water monitoring sampling strategies for each growing area. For additional information on the types of sampling strategies see the NJDEP Shellfish Growing Area Report Guidance Document (2012). This shellfish growing area is not impacted by discharges from sewage treatment facilities or combined sewer overflows; therefore, it is sampled under the Systematic Random Sampling Strategy (SRS).



New Jersey bases its growing water classifications on the fecal coliform criterion. The classification criterion is composed of a measure of the statistical 'central tendency' (geometric mean) and the relative variability of the data set. The criteria were developed by the NSSP to ensure that shellfish harvested from designated waters would safe for human consumption (NSSP, 2013). For the Systematic Random Sampling Strategy, variability is expressed as the

Estimated 90th percentile.

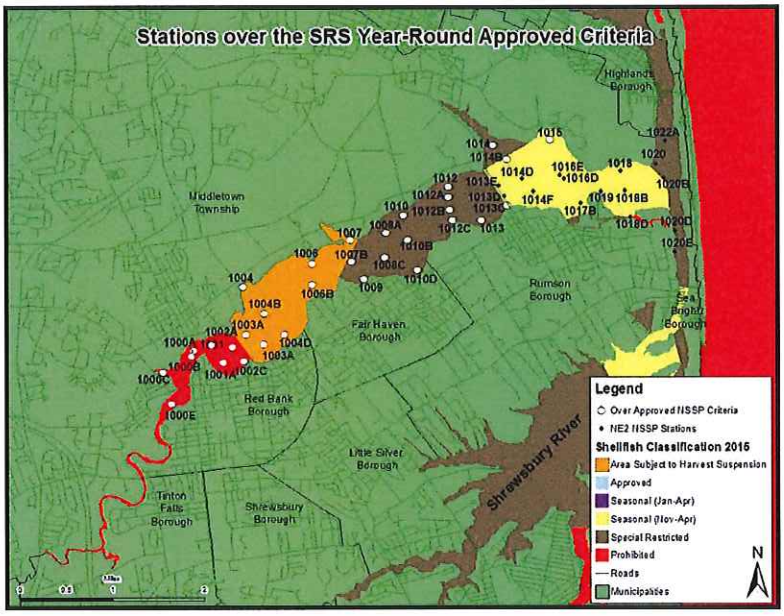
Water sampling was performed in accordance with the Field Procedures Manual (NJDEP, 2005). Water quality sampling, shoreline, and watershed surveys were conducted in accordance with the NSSP *Guide for the Control of Molluscan Shellfish,* 2013 Revision. Data management and analysis were accomplished using database applications developed for the Bureau of Marine Water Monitoring. Mapping of data was performed with Geographic Information System software (GIS: ArcMap).

Bacteriological Quality

Approximately 1900 water samples were collected from this shellfish growing area for fecal coliform testing from January 1, 2012 through December 22, 2015. Nearly 1,600 stations are monitored each year for coliform levels throughout the state; 48 stations are located in Navesink River (see previous figure).

Compliance with NSSP Criteria

According to the NSSP Guide, the water quality of each growing area must be evaluated before an area can be classified as *Approved, Seasonal (November - April or January - April), Special Restricted,* or *Prohibited.* A *Seasonal* area must be sampled and meet the *Approved* criterion during the time of the year that it is open for harvest. The summer season runs from May through October, and the winter season runs from November through April.

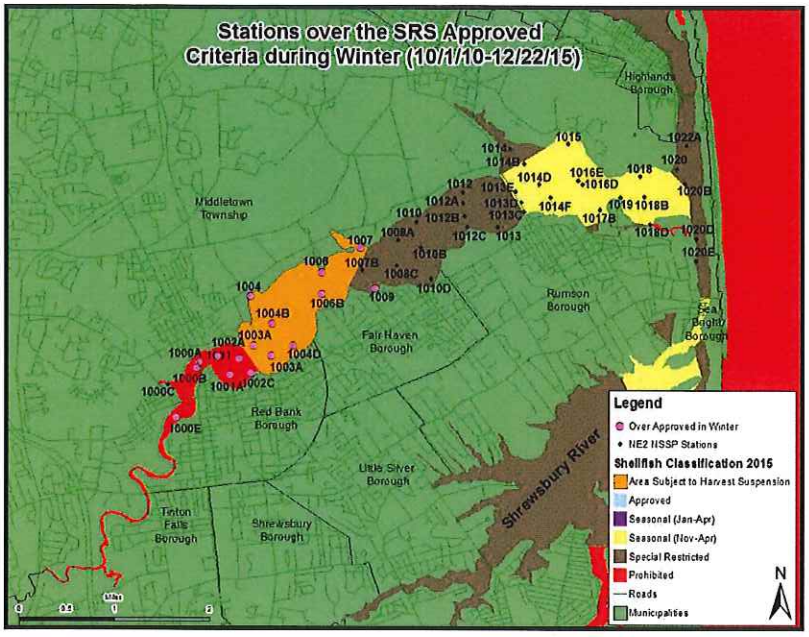


There is one assignment run for the Navesink River. This report examined the data from the assignment runs done in-between January 1, 2012 and December 22, 2015. The assignment runs during this timeframe provided sufficient samples for evaluation, bearing in mind the sample size must be at least 30 for each station according to the Systematic Random Sampling (SRS) strategy.

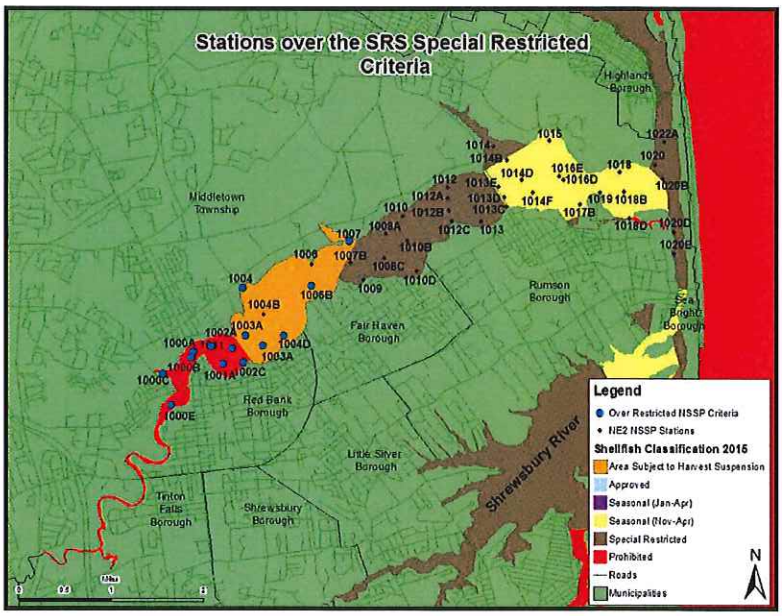
The NSSP Guide establishes the guidelines for classification. In order for waters to be classified as *Approved* the Geometric Mean must be below 14 CFUs/100mL. For waters to be classified as *Special Restricted* the Geometric Mean must be below 88 CFUs/100mL. The Estimated 90th Percentiles must also fit within NSSP Guide criteria.

Twenty-three (23) stations within the Navesink River did not meet the year-round SRS *Approved* criteria. There are no *Approved* waters within this shellfish growing area. All 23 stations are located in *Seasonal (November - April), Special Restricted,* or *Prohibited* waters.

Three of the twenty-three stations are in *Seasonal (November – April)* waters; stations 1013C, 1014B, and 1015 (see previous figure). Harvesting of shellfish in this *Seasonal* area is permitted from November through April (winter). In order to fully evaluate if these waters are correctly classified, the timeframe was extended to capture a sample size of 30 for the winter 'season'. When the time frame was extended back to October 1, 2010 in order to get the 30 SRS samples for winter, there are 16 stations over the SRS criteria for *Approved* waters during the winter, (see adjacent figure). However, none of these stations are in the *Seasonal (November – April)* waters. This means that when the sample size is extended to fit NSSP Guide guidelines the *Seasonal (November - April)* waters are still in compliance.



For waters to be classified as *Special Restricted,* the Geometric Mean must be below 88 CFUs/100mL and the appropriate Estimated 90th Percentile criteria for that station. Fourteen stations sampled exceeded the SRS year round criteria for *Special Restricted* waters; eight of these stations are located in the upper *Prohibited* portion of the river, but six stations are in the *Special Restricted*, 1003A, 1003B, 1004, 1004D, 1006B, and 1007, exceed the Estimated 90th Percentile *Special Restricted* criteria of 163 CFUs/100mL (see adjacent figure). The six stations are currently in the suspended portion of the river, therefore, the area currently suspended is being recommended for a downgrade, please see the 'Conclusions' and 'Recommendations' section of this report for further detail.

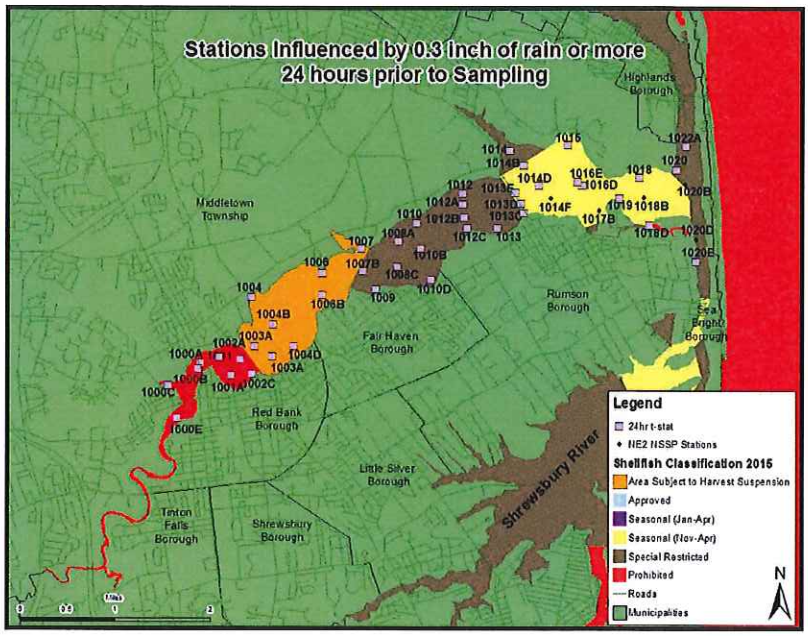


Rainfall Effects

Precipitation patterns in the coastal areas of New Jersey are typical of the Mid-Atlantic coastal region. Summer storms are localized and often associated with thunder and lightning activity. Winter storms are frequently associated with northeasters. Hurricanes can occur during the summer and early fall.

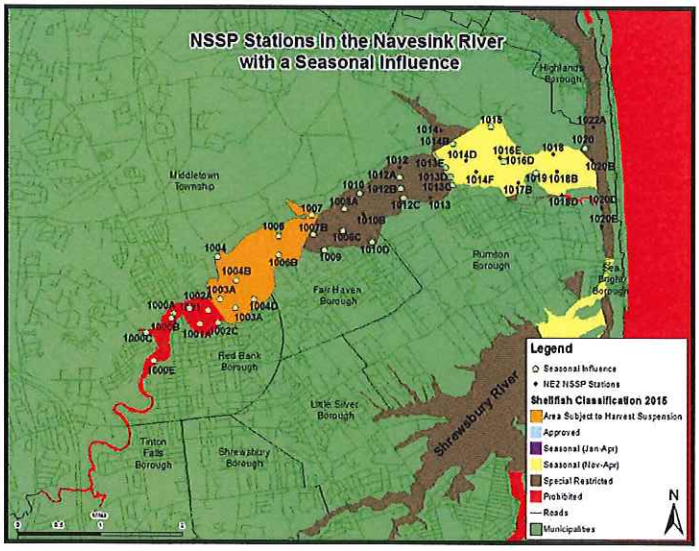
The National Weather Service (NWS) provides 24 hour estimated precipitation based on Multi-Sensor Precipitation Estimation (MPE) calculations using data collected from NWS' NEXRAD radar, together with rain gage observations and recordings. Rainfall amounts are based on the closest established NWS station; each assignment run is assigned to a weather station to accurately reflect the rainfall at the sampling stations; this shellfish growing area uses rainfall station RA003.

To determine whether rain can influence water quality, WM&S/BMWM uses the t-test method to assess rainfall effects. This method compares the fecal coliform MPN values from samples collected during dry weather to samples collected during wet weather and identifies areas where runoffs can potentially affect water quality. The *t*-statistical probability must be less than or equal to 0.05 for a station to be rainfall impacted. There is also a wet/dry cutoff for each growing area that dictates what data is considered 'wet' and what data is considered 'dry'. The scenario used for this growing area was based on a wet/dry cutoff of 0.3 inch.



The effects of the 'first flush' should be captured by the '24 hours prior to sampling' t-statistical probability. Results are also determined for the 'cumulative 48 hours prior to sampling' and the 'cumulative 72 hours prior to sampling'. These *t*-statistical probabilities help to determine if there is a delayed impact on the waterbody.

Stations that are impacted by rain tend to have a higher geometric mean during wet condition. In some areas, there are substantial differences in the wet and dry geometric means. The 'first flush' after 0.3 inch of rainfall impacts almost the entire river (see above figure). Rainfall appears to be a significant factor for the stations located in this growing area; especially within 24-48 hours of a rain event. This is not unusual since this area is urban and is abundant in impervious surfaces. In addition, many of the Navesink shorelines are sloped, allowing for runoff to reach the river.



Seasonal Effects

Seasonal variations in temperature, precipitation, wind, and circulation of the atmosphere affect marine environments. Seasonal variation may also be the result of a variety of conditions, including specific agricultural land-use practices, biological activity and/or stream flow. BMWM uses a t-test

method to determine which areas may be influenced by seasonal variation by comparing the summer and winter total coliform values. The *t*-statistical probability must be less than 0.05 for a seasonal difference at that station to be considered significant. Statistically significant seasonal impacts were observed at thirty-three of the stations in the Navesink River, the fifteen stations that were not impacted by season are located in the eastern portion of the river, mostly in the *Seasonal* classification. Summer geometric means were higher than winter geometric mean for all stations. Summer includes the months of May through October and winter includes November through April. Summertime pressures are usually more likely to impact these waters because of such things as heavy boat travel and higher summer temperatures. The water quality also has the potential to be affected by other non-point sources from increased summer population and/or increased use of recreational water activities.

RELATED STUDIES

Water Monitoring and Standard's (WM&S) Bureau of Marine Water Monitoring (BMWM) also monitors New Jersey waters for levels of nutrients (estuarine monitoring), phytoplankton, and bathing beach standards.

Nutrients

Nutrient stations are sampled monthly on a biennial basis. The 82 nutrient stations are spread throughout the State's back-bay waters and tidally impacted rivers. At these nutrient monitoring sites, various parameters are measured including water temperature, biogenic silica, chlorophyll a, pH, salinity, secchi depth, total suspended solids, dissolved oxygen, ammonia, nitrate and nitrite, orthophosphate, total nitrogen and total phosphorus. BMWM compiles the results of nutrient levels from such stations and then prepares a separate report. For full nutrient assessment, see www.nj.gov/dep/bmw.

Phytoplankton

Phytoplankton are photosynthetic algae that play a critical role at the base of aquatic food webs. The Bureau of Marine Water conducts routine sampling year-round at 45 static stations (up to 10 times a year) throughout New Jersey marine waters to detect the occurrence of species of marine phytoplankton that could produce biotoxins. BMWM, in accordance with the NSSP requirements, also analyzes the data and annually updates its Marine Biotoxin Contingency Plan. For more information on the BMWM phytoplankton program visit the BMWM website, www.nj.gov/dep/bmw.

Cooperative Coastal Monitoring Program (Bathing Beaches)

The WM&S group cooperatively works with the New Jersey Department of Health and local health agencies to monitor the bathing beaches in New Jersey. Together, these agencies implement the Cooperative Coastal Monitoring Program (CCMP). With this program, the coastal and estuarine waters that are open to the public for recreational bathing are surveyed and regularly monitored for the concentration of bacteria.

Typically, bathing beach samples are taken once a week, usually on Monday, for the entire summer. These samples are tested for Enterococci as a fecal coliform indicator. Ocean and bay recreational beaches are subject to opening and closing procedures of the State Sanitary Code. Local health agencies and law enforcement issue an advisory and may close a bathing beach if the results exceed the State Sanitary Code of 104 Enterococci per 100mL. Stations must be re-sampled when bacteria concentrations exceed the

primary contact standard of 104 Enterococci per 100 mL of sample. Consecutive samples that exceed the standard require the closing of the beach until a sample is obtained that is within the standard. Environmental stations are not bathing beaches and do not require re-sampling. Beaches can also be closed at any time if health or enforcement agencies believe it is in the interest of public health. BMWM utilizes these data as adjunct information; the closure of shellfish waters does not correspond with these results. Please see http://www.njbeaches.org/ for further information.

The CCMP, in conjunction with US Army Corps of Engineers, also carries out the NY/NJ Harbor Estuary Program's Floatables Action Plan that utilizes aerial surveillance to detect floating solid waste and debris. Flights are schedules for six days a week, weather permitting, during the summer months.

Toxic Monitoring

Toxic chemicals such as heavy metals, pesticides, polychlorinated biphenyls (PCBs), and polycyclic aromatic hydrocarbons (PAHs) are dangerous chemicals that can be found in the environment. These substances can be released into the environment by storm drains, runoff, sewage treatment facilities, and atmospheric deposition. Bottom dwelling organisms are most vulnerable to these chemicals and may pose a risk to human health if consumed.

USEPA National Coastal Condition Assessment Program (NCCA)

USEPA National Coastal Condition Assessment (NCCA) and its partners began sampling in the coastal and estuarine waters of the United States in 1990. Data collected includes water column parameters, sediment chemistry & toxicity, benthic communities, and tissue contaminants. NCCA data is used as an indication of areas that need to be investigated further concerning human and/or ecosystem health issues. Please see http://www2.epa.gov/national-aquatic-resource-surveys/national-coastal-condition-assessment for further the 2010 report and the most recent data.

National Oceanic and Atmospheric Administration (NOAA) Mussel Watch

The National Oceanic and Atmospheric Administration (NOAA) Mussel Watch Program monitors the levels of toxins and metals in shellfish. The blue mussel, *Mytilus edulis*, occurs worldwide and effectively takes up toxins and metals from seawater and sediments. The toxins and metals then become concentrated in the mussel's living tissues. Assays from the living tissues of this shellfish can be made easily and cheaply. The Mussel Watch Program monitors metals such as mercury, lead, zinc, nickel, cadmium, copper, chromium, aluminum, silicon, manganese, iron, arsenic, selenium, tin, antimony, thallium, and silver. The program also monitors toxins such as the synthetic organic compounds that are widely used in pesticides, solvents, flame-retardants, and other products. There is no mussel watch station in the Navesink River. Please see http://coastalscience.noaa.gov/about/centers/ccma for further information and the most recent data.

CONCLUSIONS

The appendix lists the water quality data obtained from the sampling period of January 1, 2012 to December 22, 2015. Systematic Random Sampling strategy was used to collect the samples, laboratory tests were run for fecal coliform, and a thorough analysis of the data was assembled for this report. Analyses of the Navesink River shellfish growing area samples indicate that all but 6 stations fecal coliform Estimated 90th percentile levels meet the standards of the NSSP Guide. The bacteriological data for six stations do not support the *Special Restricted* criteria for the *Special Restricted* classification under

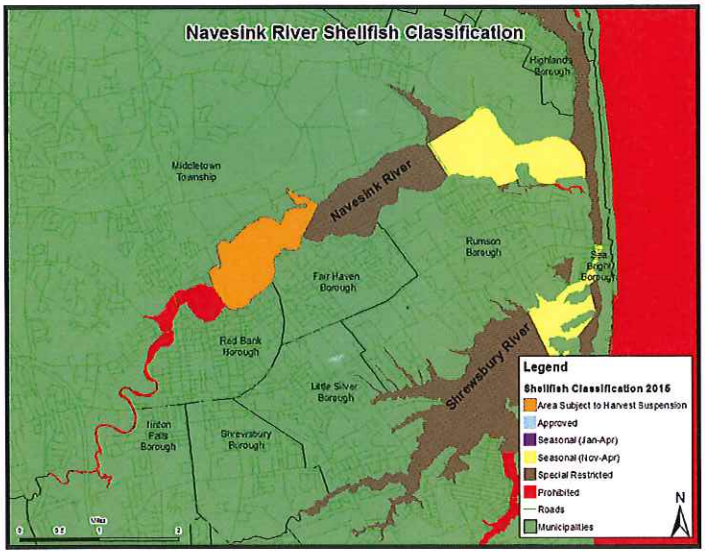
the fecal coliform standard. Based on the fecal coliform data, the area that was subject to a harvest suspension in the January 9, 2015 public notice continues to be of concern and is being recommended for a downgrade in the next rule promulgation. Historical data indicates higher levels of bacteria in the upper portion of the river, making the area *Prohibited.* Potential sources of pollution in this area include high urban land use, marinas, and old infrastructure.

There were thirty-three stations with a seasonal component. Overall, summer geometric mean tends to be higher than winter geometric mean, which is likely due to summer related, marinas, and wildlife activities that occur more frequently during the summer season. It was found that almost the entire Navesink River is impacted by rainfall accumulations above 0.3 inch, particularly 24-48 hours after a rain event.

The lower portion of the river is sufficiently classified as *Seasonal (November - April),* although stations 1013C, 1014B, and 1015 will be monitored closely during the winter months, due to higher year-round values. The Navesink River is not appropriately classified, as indicated by the fecal coliform levels sampled from January 1, 2012 to December 22, 2015 and changes are recommended below.

RECOMMENDATIONS

A downgrade is being recommended for the Navesink River in this sanitary survey report. The area being recommended for a downgrade is currently suspended by a public notice signed on January 9, 2015, due to findings in the 2014 annual evaluation of the growing area. The public notice is available online at, www.nj.gov/dep/wms//bmw/publicnotice/10915.pdf. As noted in the public notice, the suspension of harvest took place immediately (January 9, 2015) and continues pending the establishment of the appropriate classification and boundaries of the waters so classified, or until further determination by the Department that the particular area of water subject to the suspension meets the standards for its current classification. The suspension and recommended downgrade is in the western section, approximately 565.7 acres, bordering the current *Prohibited* area. The downgrade is recommended due to fecal coliform water quality results discussed in the Conclusions section of this report.



The pending downgrade of 565.7 acres of *Special Restricted* waters to *Prohibited* waters will likely be adopted into regulation in 2016. The area is currently suspended and no depuration harvest is allowed out of lots 6A and 5C.

The recommendation for further analysis is for intensive sampling and shoreline surveys in the Navesink River, particularly in the western section, around the hospital and McClees Creek. BMWM will also continue a special pollution source track-down study in the area the Navesink River. Information and results gathered will be included in a separate report or the next reappraisal report on the Navesink River.

Stations *1013C, 1014B, and 1015* will be monitored closely in the annual evaluations of the Navesink River; these stations exceed year-round NSSP criteria for *Approved* waters, but since they are located in *Seasonal (November - April)* waters the timeframe was extended so that there are 30 samples during the winter months (when the waters are open for harvesting). These three stations are not above criteria during the extended timeframe, therefore, no classification changes are recommended at this time.

Recommended Regulation Change

Current (2008) Regulations:

7:12-2.1(a)3.vii.

All waters west of the Highway 35 Bridge (Cooper's Bridge) in Red Bank, including all of Swimming River, Shadow Lake and tributaries.

7:12-3.2(a)3.

All waters of the Navesink River and tributaries west of the Oceanic Bridge and ending at the Highway 35 Bridge (Cooper's Bridge) in Red Bank.

Proposed Regulatory Change (pending adoption in 2016)

7:12-2.1 (a)3.vii.

All waters west of a line starting from the southern shore of the Navesink River at coordinates latitude 40 degrees 22 minutes 3.4 seconds N., longitude 74 degrees 2 minutes 48.2 seconds W., and then heading in a northeasterly direction to the northern shore of the Navesink River at coordinates latitude 40 degrees 22 minutes 25.0 seconds N., longitude 74 degrees 2 minutes 34.1 seconds W., including all of Swimming River, Shadow Lake, McClee's Creek, and other tributaries; and…

7:12-3.1(a)3.

i. All waters of the Navesink River and tributaries west of the Oceanic Bridge starting from the southern base of the Oceanic Bridge, then following the shoreline in a southwesterly direction to a line starting from the southern shore of the Navesink River at coordinates latitude 40 degrees 22 minutes 3.4 seconds N., longitude 74 degrees 2 minutes 48.2 seconds W., and then bearing approximately 26 degrees T in a northeast direction to the northern shore of the Navesink River at coordinates latitude 40 degrees 22 minutes 25.0 seconds N., longitude 74 degrees 2 minutes 34.1 seconds W., then following the shoreline in a northeasterly direction to the northern base of the Oceanic Bridge at Locust Point, then along a line crossing the Oceanic Bridge and terminating at its southern base.

ii. All waters of Claypit Creek north of a line starting at the northern base of the Oceanic Bridge at Locust Point, then bearing 60 degrees T to a Department maintained marker at the south easternmost point of land at the mouth of Claypit Creek and terminating.

iii. All waters of Black Point Creek.

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APPENDICES

A. Statistical Summary

B. Seasonal Evaluation

C. Precipitation

- Rainfall Amount
- Wet/Dry Statistics

D. Data Listing: January 1, 2012 to December 22, 2015