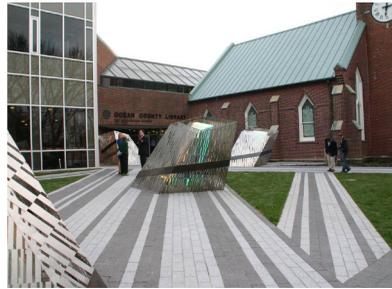


Township

Southampton Township



# GROWING SMART AND WATER WISE

Protecting Water Resources  
in the Growth Areas of the  
New Jersey Pinelands



July 2014

Southampton Township

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# **GROWING SMART AND WATER WISE**

**Protecting Water Resources  
in the Growth Areas of the  
New Jersey Pinelands**



**July 2014**

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# EXECUTIVE SUMMARY



*Colliers Mills Pond (Credit: Pinelands Preservation Alliance)*

**How can we balance growth with nature,** especially in a region that relies upon a porous, sensitive water source like the Kirkwood-Cohansey aquifer? Supported by state and federal legislation, the Pinelands Comprehensive Management Plan (CMP) was adopted in 1980 to protect this major drinking-water supply along with the region’s natural, agricultural, ecological, historical, recreational and scenic resources. In the 34 years that have followed, nearly 300,000 acres of land have been permanently preserved,<sup>1</sup> while growth has been encouraged in designated town centers and regional growth areas. Several state-level regulations play a complementary role by limiting water withdrawals and development of land.

This report asks how well the state and regional growth management framework has served water resources in the New Jersey Pinelands. Simply put, to what extent have the Pinelands water resources been affected by development, especially during the period since the CMP’s regional land-

use controls have been in place? What kinds of pressures can we expect going forward, and what can be done to minimize their negative impacts?

New Jersey Future contracted with Daniel Van Abs Ph.D. of Rutgers University to conduct a comprehensive survey of water indicators in three diverse growth areas of the New Jersey Pinelands, examining water quantity, water quality, watershed integrity and the state of wastewater, stormwater and public drinking water supply systems. Dr. Van Abs and his research team analyzed and synthesized the findings from different water resource studies; collaborated with researchers at the Pinelands Preservation Alliance (PPA) to understand existing conditions; met with representatives from local water and wastewater utilities to assess the capacity and integrity of those systems; and collaborated with New Jersey Future to understand how future growth might exacerbate negative impacts. Dr. Dan Van Abs’ research was published into a

1. Van Abs, Daniel J., Oliver Stringham, Yuling Gao and Tim Evans. 2014. *Effects of Land Development on Water Resources of the Pinelands Region*. Prepared for New Jersey Future. Rutgers-The State University of New Jersey. New Brunswick, NJ.

report, *Effects of Land Development on Water Resources of the Pinelands Region*,<sup>2</sup> June 2014.<sup>3</sup> Among the report's major findings:

- The study areas exhibit significant environmental impacts from development and the accompanying loss of natural lands that filter and absorb stormwater; chemical modifications to soils that foster the growth of non-native landscaping; water quality impairments; and the excessive withdrawal of water.
- Impacts vary across study areas, based on differences in hydrogeology, land-use patterns and water sources, including such factors as the use of water from the Delaware River in Medford and Evesham townships, Hammonton's compact town center and surrounding irrigated agricultural land, and Tuckerton and Little Egg Harbor's development in flood-prone coastal areas.
- Drinking water, wastewater and stormwater infrastructure across the study areas share a need for better asset-management practices and greater investment in upgrades and maintenance. Hammonton faces acute constraints on future growth due to the difficulty of expanding its current drinking water and wastewater capacity.
- Although future projected growth will be slower than in recent decades it will exacerbate impacts on the region's water resources unless carefully located and designed to minimize stormwater runoff and to recharge groundwater, and unless water withdrawals are limited to prevent adverse effects on ecological conditions.

Through consultation with Dr. Van Abs and the Pinelands Preservation Alliance, New Jersey Future shared these findings with New Jersey Department of Environmental Protection (NJDEP), the New Jersey Pinelands Commission, and representatives from of the municipalities targeted in the study: Evesham Township, Hammonton Town, Little Egg Harbor Township, Medford Lakes Borough, Medford Township and Tuckerton Borough. New Jersey Future used this outreach to develop and fine-tune recommendations, and to assess their feasibility and practicality. Following these meetings, New Jersey Future sent revised recommendations to state, regional and municipal representatives for their comment.

From this process, three kinds of recommendations were developed to protect or improve water resources in the Pinelands:

- Recommendations for action by state government and the Pinelands Commission that will strengthen the regulatory

framework for water withdrawals, encourage water conservation in flexible ways, identify more sustainable water sources, and empower municipalities with new tools and resources.

- Municipal best practices that can make existing and future development more sustainable and "water wise" through green infrastructure, water conservation, improved development and redevelopment patterns and asset management for water infrastructure. This section includes technical and financial resources to help jump start implementation.
- Opportunities for near-term municipal action that build on existing projects, such as integrating low-impact design into Little Egg Harbor Township and Tuckerton Borough's rebuilding efforts following Hurricane Sandy.

While the recommendations in this report are geared toward the growth areas of the Pinelands, comprehensive water resource protections must also address the agricultural sector, which was not a focus of the Van Abs Pinelands report but which has a tremendous impact on water resources and ecosystem health.

For a generation, vigilant application of the Pinelands regional planning approach has helped to protect a unique natural and cultural system. The success of this approach serves as a model for other regional planning programs well beyond New Jersey. There is now sufficient evidence of what the CMP has been able to accomplish since its adoption, yet it is important to examine where it is still necessary to improve policy. Concentrating development in specific areas of the Pinelands has served to protect critical habitats elsewhere, but shortcomings in the design of these growth areas has impaired nearby water resources.

Water resources do not respect political boundaries; best management practices in one town will not protect a watershed if a neighboring town sanctions its degradation or fails to act. All levels of government must play a role, even as they grapple with shrinking financial resources. Partnerships will be needed to move forward. Continued management that protects of the Pinelands region and the underlying Kirkwood-Cohansey aquifer while accommodating human settlement in the heart of the Boston-Washington corridor will require New Jersey to update the region's existing growth management framework strategically, with water resources in mind.

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2. To read the Van Abs Pinelands Report, visit: [njfuture.org/pinelands](http://njfuture.org/pinelands)

3. Hereinafter, this report is referred to in the text as the Van Abs Pinelands report.

# UNDERSTANDING WATER RESOURCES IN PINELANDS GROWTH AREAS

## RESEARCH METHODOLOGY

The June 2014 report by Daniel J. Van Abs Ph.D. and his research team at Rutgers University examined three study areas in and adjacent to the Pinelands Management Area and the Pinelands National Reserve, each of which is highly developed and targeted for future growth.

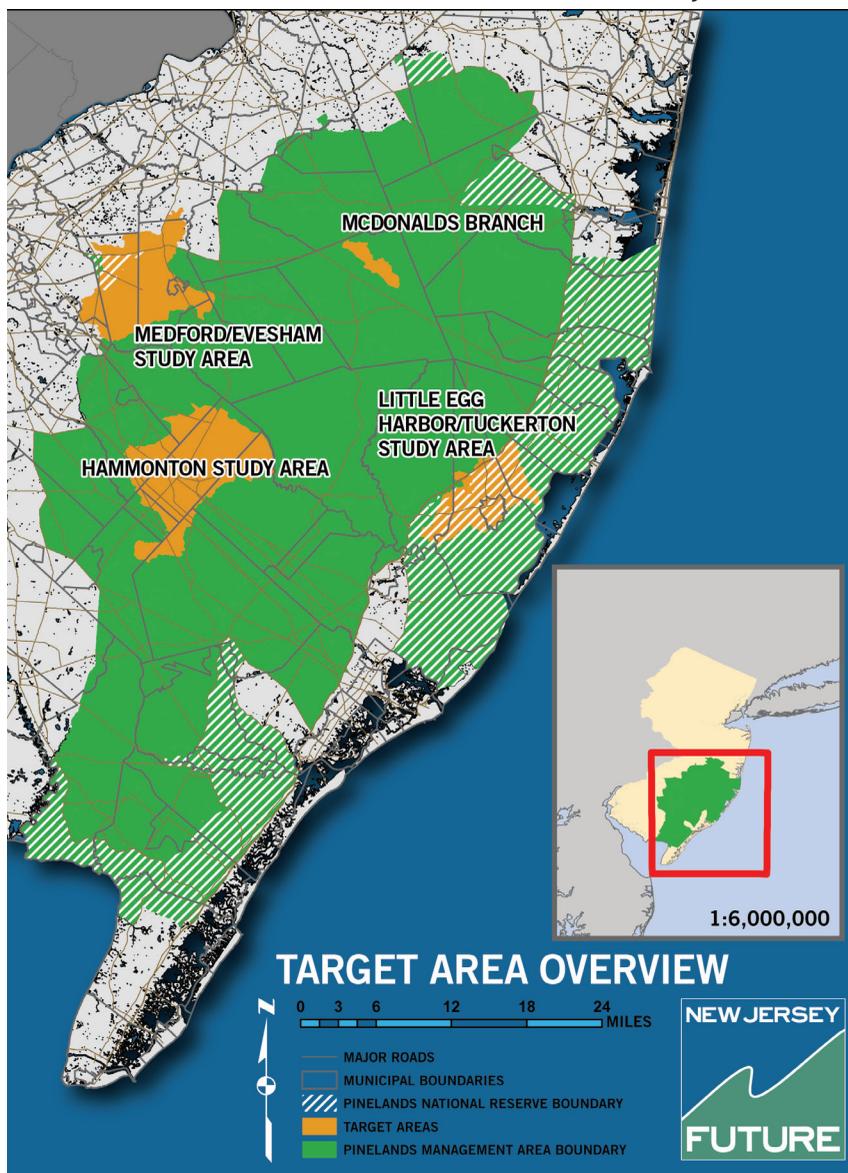
Proximity to Philadelphia has spurred extensive low- to moderate-density suburban development in Evesham and Medford townships, both in and outside of the Pinelands Management Area, while Medford Lakes is a small borough that is largely built out and entirely within the jurisdiction of the Pinelands Management Area. The Hammonton area is characterized by a traditional compact town center surrounded by agricultural lands. The easternmost study area includes Little Egg Harbor Township and Tuckerton Borough, where higher-density growth areas along the coast fall within the Pinelands National Reserve boundary, but outside of the Pinelands Management Area. A fourth area, the undeveloped McDonald Branch subwatershed in the Brendan T. Byrne State Forest, was examined to serve as a control that could be compared to the growth areas.

The research team sought to understand the present condition of water resources and how it has been affected by development, especially since the adoption of the Pinelands Comprehensive Management Plan. The team examined watershed integrity (land-use changes), water availability, water quality, stormwater management, and water and wastewater utilities. They collected and analyzed available data, and met with representatives of the local drinking-water and wastewater utilities. Wherever possible, the team used what is known as the HUC 14 subwatershed as its unit of study.<sup>4</sup>

Researchers relied upon two different tools to understand the impacts of future growth on the study areas: projections for population and employment growth, and a

buildout analysis. The study utilized the long-term municipal population and employment projections developed by each area's metropolitan planning organization (MPO) for the year 2040 as a way to estimate the potential water and wastewater demands on the existing systems.

Study Area Overview



4. The term "HUC 14" refers to the scale of a watershed, which can be determined by its unique identifier, its hydrologic unit code (HUC). Watersheds drain into common outlets, which then combine with more and more watersheds to drain into increasingly larger common outlets. A HUC consists of a series of numbers that describe each of the watersheds that encompass that area. Smaller HUC numbers indicate a much larger scale of measurement, such as the Delaware River Watershed, while larger HUC numbers measure individual components of larger watersheds, going as far as the subwatershed level. It is similar to a phone number: More digits encompass a greater area, such as an area code or even a country code.

## KEY FINDINGS

The Van Abs Pinelands report evaluated water resources in the three study areas using five factors: watershed integrity, water availability, water quality, stormwater management and water utilities. For each factor, a high-level summary of the importance, the evaluation method, and the findings follow below. Readers are encouraged to view the full report at [www.njfuture.org/pinelands](http://www.njfuture.org/pinelands).

### Watershed Integrity

Watershed integrity is a holistic measure of water quality that examines such characteristics as the status and health of watershed hydrologic functions, stream channels, riparian areas, forests and wetlands. The research team analyzed the urbanization of natural lands (riparian areas, wetlands, forests, flood-prone areas and recharge areas) using land use/land cover data. The team also identified areas protected from development through conservation easement or fee-simple purchase. They observed that development prior to the 1986 land use/land cover assessment (and likewise before adoption of the Pinelands Comprehensive Management Plan (CMP)) combined with continued urbanization over the past 20 years has led to the loss of natural vegetation and hydrological capacity, stressing ecosystems and degrading water quality, particularly in four subwatersheds.

### Water Availability

Water supplies in the Pinelands depend primarily upon groundwater. Excessive water withdrawal can cause wetlands and ponds to dry out, threatening plant and animal habitat. Excessive water withdrawal also plays a role in ground subsidence and saltwater intrusion, jeopardizing potable water supplies. The Pinelands Preservation Alliance (PPA) applied the hydrogeological modeling methodology used by the USGS Kirkwood-Cohansey study<sup>5</sup> to evaluate the effects on wetlands of water withdrawals. The team also utilized the New Jersey Geological Survey methodology for the “low flow margin”<sup>6</sup> to assess groundwater capacity and groundwater availability. These assessments revealed that some parts of the study areas, particularly Hammonton and parts of Little Egg Harbor/Tuckerton, are experiencing noticeable effects from excessive water withdrawals.

### Water Quality

From an ecological perspective, impaired water quality damages species habitat and fosters introduction of non-native species. Nutrient-based pollutants, such as from leaky septic systems and fertilizer from lawns and farms, introduce pathogens and trigger algal blooms in waterways, threatening businesses that rely upon waterways for tourism, fishing or shellfishing. Other pollutants, such as PCBs and the pesticide DDT, are no longer produced but have accumulated in the tissue of fish. Poor water quality also makes the treatment of drinking water more expensive. Water quality is monitored by several state and federal agencies that test numerous parameters.

The research team examined the following data and reports:

- Surface-water quality of selected water bodies;
- Biological surface-water quality to look at macroinvertebrate<sup>7</sup> quality, species habitat, acidity, dissolved oxygen, water temperature, and presence of non-native fish or amphibians;
- Surface-water quality of all subwatersheds and coastal waters of the state;
- Ground-water quality from monitoring wells;
- New Jersey’s Private Well Testing Act data, including measurement of mercury, volatile organic compounds, nitrate and gross alpha (radioactive) particles;
- Contamination sites recorded by the New Jersey Department of Environmental Protection (NJDEP) Known Contaminated Site List.

The three study areas experience significant water quality problems from a wide variety of sources. Some are caused by soil modification from fertilizers and lime, while others stem from threats ranging from industrial contamination to stormwater runoff that raises levels of bacteria. Most of the region’s subwatersheds have elevated pH levels and fair to poor ratings for macroinvertebrates, indicating impaired conditions for aquatic life.

### Stormwater Management

Management of stormwater is necessary in developed areas where impervious surfaces prohibit the natural infiltration of water into the ground or towards a water body. The approach to treating stormwater has changed over time. Older systems focused on the quick removal of stormwater

5. Unless otherwise noted, references to the “USGS Study” will refer to the USGS Kirkwood-Cohansey Study. The USGS Study can be found here: <http://pubs.usgs.gov/sir/2012/5122/support/sir2012-5122.pdf> and background information on the research can be found here: <http://www.nj.gov/pinelands/science/current/kc/>

6. The “low flow margin” method is a technique for measuring ground water capacity that takes the difference of two stream flow levels: 1) The September median flow, the typical flow during the month that most often has the lowest mean flows; and 2) The 7Q10, which is the seven-day average low flow that has a 10 percent probability of occurring in any year. From this result, a percentage of water is to be allocated for human use, known as the “ground water availability,” while the remainder is left to maintain aquatic and wetland ecosystems during a stressed period. Information on the “low flow margin” can be found here: <http://www.state.nj.us/dep/njgs/pricelst/tmemo/tm13-3.pdf>

7. The reason to measure macroinvertebrates (water bugs) is because their short life cycles make them more sensitive than fish or reptiles to changing conditions, and thus can provide a good indicator of aquatic conditions that are typical for the stream.

Commonly Encountered Water Quality Pollutants	
pH	A measure of acidity; lower pH indicates greater acidity. Pure water has a pH of 7. In the Pinelands, water is naturally more acidic, with pH values closer to 5. Species native to the Pinelands are specially adapted to this environment, giving them a competitive advantage over species that require less acidic conditions. Soil modification is required, such as through the introduction of lime, which lowers acidity, to make Pinelands soil conditions hospitable to Kentucky bluegrass and other common plantings. This chemical alteration can enter waterways and harm native species by making their habitat more accommodating to outside species, and rendering native species increasingly unable to compete.
Nitrates	Anthropogenic sources of nitrates occur as a result of runoff from fertilizers as well as from septic system leaching and/or sewage. High concentrations of nitrates are poisonous to fish and other aquatic species. Nitrate concentrations in water bodies can also trigger rapid growth of algae, known as eutrophication, which can reduce dissolved oxygen content available for other species.
E Coli/ Fecal Coliform	<i>Escherichia coli</i> , a bacterium commonly known as <i>e. coli</i> , is found in the intestinal systems of humans and animals, but can cause health problems if ingested. As a result, inadequately treated or untreated waste can allow this bacterium to enter waterways and threaten human health. Fecal coliform refers to a group of different intestinal bacteria that includes <i>e. coli</i> . The presence of fecal coliform serves as an indicator that <i>e. coli</i> might be present.
Salts	Salts can enter water supplies through the treatment of roads during winter weather. In coastal communities, excessive water withdrawal can cause seawater to enter the aquifer, a process known as saltwater intrusion. In addition to their corrosive properties, high salt concentrations can harm freshwater species damage terrestrial plants if used for irrigation, and be expensive to remove from water.

from developed areas to surface waters, and were followed by systems that included detention basins to help remove litter and sediment. Newer regulations require systems that can control the rate and velocity of discharges, filter sediments and discharges, and maintain ground-water recharge. Such stormwater treatment systems do not focus on non-sediment-based pollutants, nor do they typically have the capacity to accommodate the largest storms. Maintenance is typically limited unless there is a system failure. To understand the types of stormwater management systems employed in each municipality, the research team estimated the approximate age and location of nearby development, operating under the assumption that changes in stormwater regulations over the years have mandated different systems. The researchers examined increases in developed area over time, in addition to the acreage of stormwater basins from 1995 to 2007, to obtain a rough estimate of the type of management systems used. Findings were limited by the availability of data; however, each of the study areas saw a dramatic rise in the number

of stormwater basins from 1995 to 2007; areas with earlier development likely have older systems that do not control for sediments.

### Water and Wastewater Utilities

Understanding the quality and integrity of water and wastewater systems is critical so that municipalities can plan for future maintenance and upgrades. Higher density development relies upon community-supplied water and sewer systems. The capacity of drinking water and wastewater systems to serve residential and non-residential development depends upon several factors including regulatory allowances to withdraw water for drinking and to discharge treated effluent, as well as the size of the treatment plants and pipes. The integrity of these systems affects the environment (such as when pipes leak). Making matters worse, poor service and breaks will require future rate increases to address the deferred maintenance. The research team met with staff at the drinking and wastewater departments and utilities to assess the state of the infrastructure systems, including understanding the service areas, capacity and allocation limits, vulnerability to pollution, asset management, and needs for investment. They compared the available capacity with projected future demands. Each of the municipalities differed in terms of its available water and wastewater capacity. Presently, Hammonton has neither water nor wastewater capacity. Growth projections indicate that some of the other municipalities may need to expand capacity to meet future demand. Little Egg Harbor is the only municipality that was found to have an asset management system in place, although other municipalities were considering starting some form of asset management.

### Future Growth

Growth projections suggest that most of the study-area municipalities will continue to grow as part of the New York and Philadelphia metropolitan areas and that this growth will occur increasingly as redevelopment or reuse of existing developed sites. The buildout analysis examined existing land uses and municipal zoning ordinances to estimate the growth potential in the communities, based on the assumption that the remaining vacant and underdeveloped land would be developed at the highest density permitted. These projections were then used to understand potential future range of demand: from the MPO population estimates of where people will choose to live in New Jersey between 2010 and 2040, to the development potential made possible by local zoning codes. (It is important to note that municipal officials have emphasized that future development is unlikely to mirror the results of the buildout, for several reasons: 1) the slowing of demand for development far from urban centers; 2) land preservation efforts; 3) market and political preferences for low-density single-family residential development; 4) infrastructure limitations; and 5) heightened awareness of the risk of coastal flooding.)

## RECOMMENDATION DEVELOPMENT AND FEASIBILITY ANALYSIS

Pinelands water resources have been impaired by land development. If we fail to address these impacts today, future development and redevelopment will ensure further degradation. Based on the research findings and discussions with stakeholders, New Jersey Future has identified several actions steps that state, regional and local governments can take that can help accommodate future growth in a sustainable, “water wise” fashion.

New Jersey Future met with representatives from New Jersey Department of Environmental Protection (NJDEP), New Jersey Pinelands Commission staff, and local officials and stakeholders from each of the three study areas to present the findings of the Van Abs Pinelands report (SEE APPENDIX A). Participants discussed the report findings and brainstormed potential approaches to address water-resource issues.

Solutions were divided into three categories:

- actions that would need to be taken by the Pinelands Commission and/or the state of New Jersey;

- best management practices that could be implemented at the local level;
- location-specific opportunities for near-term action.

Recommendations for the NJDEP and Pinelands Commission were reviewed with representatives from those agencies to identify obstacles and assess feasibility. Meetings with municipal officials provided insights into local interests and concerns as a way to identify place-based actions that could be taken to address problems with water resources. The outcomes from these meetings allowed New Jersey Future to develop municipally-specific tailored “opportunities for action” that offer municipalities achievable near-term objectives to advance the conversation on improving local water resources, but also address commonly encountered water-resource concerns through general recommendations for municipal best practices and a resource guide. As with the state and regional recommendations, follow-up review with local stakeholders helped to refine the recommendations.

# REGIONAL AND STATEWIDE RECOMMENDATIONS

## OVERVIEW

The Van Abs Pinelands report demonstrates that watershed boundaries transcend municipal boundaries. In these instances, municipal action can only go so far; a municipality that manages its water resources responsibly can unfortunately provide a neighbor that shares its watershed with the perverse incentive to take no action, or they may lack the statutory authority, capacity, or prerogative to take action. Recommendations for action by state government and the Pinelands Commission address the regulatory and policy obstacles that presently inhibit water resource protection. These include strengthening existing regulations, improving municipal access to technical and financial resources, and removing the regulatory hurdles that prohibit municipal action.

## WATER SUPPLY PROTECTION

The Kirkwood-Cohansey aquifer is an important source of water in southern New Jersey and the Pinelands region. Protection of this water supply was one of the primary reasons for the legislation that designated the Pinelands National Reserve and New Jersey Pinelands Area. The New Jersey Department of Environmental Protection (NJDEP) and the Pinelands Commission are both charged with protecting the aquifer.

The Van Abs Pinelands report explains that the Pinelands program is successfully preserving land by directing growth to designated growth areas. But the report cautions that the Pinelands Commission and NJDEP regulations do not and perhaps cannot fully address issues of water quality and water supply in the more developed watersheds that are designated for future growth. Past growth, including that which preceded the Pinelands Comprehensive Management Plan (CMP), has already degraded watersheds and water resources and future growth will exacerbate these impacts, making it critical that the Pinelands Commission and the NJDEP refine their policies to

protect water resources. The recently completed USGS study and Pinelands Commission ecological reports<sup>8</sup> provide a basis for significant improvements to water allocation policy for the Kirkwood-Cohansey aquifer, both in and around the Pinelands Area.

It is also important to note that the agricultural sector has a major impact on Pinelands water quality and availability and Pinelands ecosystems. While this report focuses on the impacts of land development on water resources, ultimately any long-term, comprehensive approach to water resources must address ways to optimize the viability of agriculture as an industry without compromising ecological resources.

### 1. Strengthen Regulatory and Planning Thresholds for Water System Allocations

The Pinelands Commission protects water supply through provisions in its CMP that guide the location and intensity of development and regulate water allocations. The CMP permits water diversions only for agriculture, or where there is no alternative source and it is demonstrated that no adverse ecological impact will occur as a result of the diversion. The CMP also requires that such diversions be accompanied by conservation measures, but this provision has not been enforced. The NJDEP has broader authority, reviewing requests for both agricultural and non-agricultural allocations of water from the Kirkwood-Cohansey aquifer and other fresh water sources. The best approach is to plan for water needs on a watershed and regional basis. These planning efforts and site-specific regulatory decisions need strong, science-based thresholds.

REGIONAL AND STATEWIDE RECOMMENDATIONS SUMMARY	
<b>Water Supply Protection</b>	<ol style="list-style-type: none"> <li>1. Strengthen Existing Regulatory and Planning Thresholds for Water System Allocations</li> <li>2. Improve Existing Water System Efficiency</li> <li>3. Improve Water Supply Planning</li> </ol>
<b>Water Quality Protection</b>	<ol style="list-style-type: none"> <li>4. Explore Regulatory Incentives for Water Recharge</li> <li>5. Test Safe and Cost-Effective Alternatives for Winter Road Treatment</li> <li>6. Advance Green Infrastructure Implementation at the State, Regional and Local Level</li> <li>7. Authorize Municipalities to Establish Stormwater Utilities</li> <li>8. Encourage More Compact Growth and More Preserved Land as Opposed to Sprawl Development</li> <li>9. Monitor the Impacts of Recent Fertilizer Regulations on Water Quality</li> </ol>

8. See the Pinelands Commission's ecological reports here: <http://www.state.nj.us/pinelands/science/pub/#3>

*Recommendation:*

The Pinelands Commission and NJDEP should work aggressively to develop water supply alternatives to the Kirkwood-Cohansey aquifer at the same time that they ensure that withdrawals from the aquifer are based on ecologically-derived thresholds and protect against or correct deficits. All Kirkwood-Cohansey aquifer allocation requests should be consistent with watershed-based or regional water supply plans where such exist, and should be reviewed by the commission and the NJDEP using a two-tiered regulatory system: 1) Assessing water availability based on a) watershed-scale impacts on groundwater availability and b) site-specific impacts on aquatic ecosystems; and 2) Maximizing use of alternatives to withdrawals from the Kirkwood-Cohansey, developed through a comprehensive planning effort. The assessments can rely upon new, more specific thresholds that are being derived from the USGS Kirkwood-Cohansey Study based on biological effects and indicators, as described below.

1. Limit water withdrawals based on two assessments of water availability. Future demands should be assessed against the ecological availability of Kirkwood-Cohansey aquifer water by watershed, using the two thresholds described below, to determine whether future needs can be met by existing and/or new Kirkwood-Cohansey wells. If not, the water allocation permittees should be notified and encouraged to plan accordingly.

- a. Watershed Scale Threshold: A watershed-based threshold is critical to protecting existing and future watershed and downstream water needs, including aquatic ecosystems such as wetlands, ponds and streams, from excessive reduction in water flows to and through them. The relevant agencies should not permit any new or increased allocation for any regulated user (e.g., public water supply, agricultural, commercial and industrial) that, individually or cumulatively with other current or pending allocations, would exceed established levels of ground water availability.<sup>9</sup> The agencies should pursue a higher level of technical rigor to assure that protections are being achieved.

The threshold can be determined using either a percentage of recharge method or a low flow margin method applied either at the HUC 14 (subwatershed) or similar scale. The Pinelands Preservation Alliance has recommended limiting future water allocation to a stated percentage of recharge at the watershed level.<sup>10</sup> The Pinelands Commission is considering using a low-flow margin method (similar

to that used elsewhere in the United States) to assess regional impacts, using newly developed watershed delineations of approximately 20 square miles (larger than the average HUC 14, but smaller than most HUC 11) as a basis for planning and setting regional thresholds. Either approach could serve the goal if properly evaluated, supported, and documented. A two-tiered threshold should be used to provide greater protection to areas with high environmental values than to those areas that are designated for extensive growth.

- b. Site-specific Scale Threshold: A local threshold is critical to protecting aquatic ecosystems near the withdrawal point. The agencies should not permit any new or increased allocation from any regulated user (e.g., public water supply, agricultural, commercial and industrial) that, individually or cumulatively with other current or pending allocations, would exceed established allowable impacts to stream flow, wetlands and ponds.<sup>11</sup> The agencies should pursue a level of technical rigor to assure that protections are being achieved. One possible approach, recommended by the Pinelands Preservation Alliance, would set a specific threshold on anticipated impacts to wetlands due to a new or increased allocation.<sup>12</sup>

Alternatively, The Pinelands Commission is pursuing a conservative draw-down threshold that is based upon an enhanced Theim model approach to limit impacts on local wetlands and ponds. The Theim model approach is a collaborative effort with USGS that may enable accurate drawdown predictions to as little as 5 centimeters (roughly 2 inches). This model is intended to provide a rapid assessment of impacts as a rebuttable presumption, with allowance for a water allocation or water certification applicant to upgrade the assessment with a more rigorous analysis (such as MODFLOW). Either of these two approaches could serve the goal if properly evaluated, supported, and documented.

2. Protect the Kirkwood-Cohansey Aquifer and Support Sustainable Growth through Aggressive Investigation and Consideration of Water Supply Alternatives. The current requirements for applicants to prove that withdrawal from the Kirkwood-Cohansey is the only possible option available should be applied stringently. New or increased allocations and agricultural certifications from the Kirkwood-Cohansey, or withdrawals that will affect the Kirkwood-Cohansey, should be reviewed against a range

9. NJDEP has more and different statutory authority than the Pinelands Commission regarding water withdrawals for existing land uses and agriculture, and therefore will be involved more often in the implementation of this recommendation.

10. The thresholds recommended by the Pinelands Preservation Alliance can be found in Appendix B.

11. Also applies at the site-specific level of review.

12. The thresholds recommended by the Pinelands Preservation Alliance can be found in Appendix B.

of possible alternatives in a comprehensive planning review that incorporates growth potential and future agricultural demands. Alternatives analyses should be conducted for all water service areas. Water allocation permittees, NJDEP, and the Pinelands Commission jointly should conduct such analyses soon, in anticipation of future need.

A full range of applicable alternatives needs to be investigated to determine each one's feasibility and practicability for each specific situation. Alternatives include conservation measures, obtaining water from non-Pinelands sources, aquifer storage and recovery (ASR), conjunctive use, desalination, strategic well locating and pumping, beneficial reuse of wastewater, and ground recharge of treated wastewater (with enhanced treatment as needed) that is currently being disposed of into surface water bodies.<sup>13</sup> Where water is available, according to (1) above, new or increased allocations from or withdrawals that will affect the Kirkwood-Cohansey should only be approved if there are no technically practical, legally viable alternative sources for a demonstrated need that are allowed by the Pinelands CMP. Where water is not available from the Kirkwood-Cohansey aquifer, new water supply alternatives may support growth in a sustainable fashion, or growth expectations should be modified to sustainable levels.

## 2. Improve Existing Water System Efficiency

Both the Pinelands CMP<sup>14</sup> and the NJDEP rules for Water Supply Allocation Permits<sup>15</sup> establish requirements for water conservation. The Pinelands CMP, NJAC 7:50-6.86 (d), states, "All applications for the development of water supply wells or the expansion of existing water distribution systems shall address measures in place or to be taken to increase water conservation in all areas to be served by the proposed well or system. This shall include efforts by water purveyors and local governments to reduce water demands by users and to reduce losses in the supply and distribution system." The NJDEP water supply allocation permit rules, NJAC 7:19-6.5 (a), state: "Unless more stringent water conservation measures are required by the Department, all public community water systems shall... 4. File water rate structures which provide incentives for water conservation; with the Department and the Board of Public Utilities, as appropriate." Presently, there is limited enforcement of these existing provisions.

Water efficiency regulations can be developed in a way that

gives permit applicants the flexibility to generate innovative ways to reduce water usage. In Santa Fe, New Mexico, for example, a toilet retrofit program permitted new development under the condition that developers would replace older, inefficient toilets throughout the city with low-flow toilets.<sup>16</sup>

### *Recommendations:*

The Pinelands CMP and NJDEP rule provisions should be applied as written. All requests for new or revised water allocation permits should require proofs that existing water uses are efficient prior to receiving the allocation.

- Establish clear standards for compliance with Pinelands CMP (7:50-6.86, (d), such as the following:
  - Establish a target threshold for new residential-unit internal and external water use, based upon unit size and type. Require the Pinelands Commission and municipalities to review development proposals for their ability to meet these thresholds based on appliance fixtures, maximum permitted lot sizes in growth areas (and/or the maximum amount of turf area) and other potential conservation opportunities.
  - Strengthen the Pinelands Commission rule to require purveyors seeking an allocation permit or major permit modification in areas where existing allocations and other uses are exceeding the regional water availability threshold (described above) to demonstrate and specify how they will exercise water conservation measures to offset increases in the water availability deficit. Provide water purveyors flexibility, but recommend consideration of: 1) water conservation incentives for end users; 2) reductions in water loss through pipeline repairs and upgrades; and 3) revisions to water rate structures. Encourage purveyors to finance water conservation measures through revenues earned from high-volume users under the increasing block rate structures.
- Strengthen the NJDEP Water Allocation Permits rule (7:19) to require permit applicants to demonstrate and specify how they will exercise water conservation measures to offset increases in the water availability deficit in areas where users are exceeding the regional water availability threshold (described above). Provide water purveyors flexibility, but recommend consideration of: 1) water conservation incentives for end users; 2) reductions in water loss through pipeline repairs and upgrades; and 3) revisions to water rate structures.

13. In addition, investigation can be done into possible interconnections between water systems, such as those seen in northern New Jersey, that can reduce water usage in high-demand areas or during high-demand periods, and add redundancy for water system reliability and draw on the findings of the NJDEP Atlantic County Water Supply Feasibility Study from the late 1990s, recent Cape May County water supply investigations, and the Kirkwood-Cohansey Aquifer study.

14. See the Pinelands Commission's CMP here: <http://www.state.nj.us/pinelands/cmp/CMP.pdf>

15. See the NJDEP rules for Water Supply Allocation Permits here: [http://www.nj.gov/dep/rules/rules/njac7\\_19.pdf](http://www.nj.gov/dep/rules/rules/njac7_19.pdf)

16. Learn more about the Santa Fe, NM water conservation program here: [http://www.santafenm.gov/development\\_water\\_budgets#leave-site-alert](http://www.santafenm.gov/development_water_budgets#leave-site-alert)

- Strengthen the NJDEP Water Allocation Rules (7:19) to require that permittees implement water-loss accounting systems equivalent to or more detailed than described by the American Water Works Association Manual 36 (or the Delaware River Basin Commission current requirements, which are considered equivalent) and report to the public their findings regarding water loss rates and primary causes.
- Enforce the Water Allocation Rule 7:19-6.5<sup>17</sup> that requires public community systems to structure their rates to encourage conservation. Publish guidance on inclining block fee structures,<sup>18</sup> and suggest that top-tier revenue be dedicated to system repairs, conservation incentives and educational programs.<sup>19</sup>

### 3. Improve Water Supply Planning

New Jersey's Statewide Water Supply Plan is responsible for ensuring a safe supply of water without damaging aquifers, even during periods of drought.<sup>20</sup> The first Statewide Water Supply Plan was adopted in 1982 and was revised in 1996. An update to the 1996 plan has been developed, but it has yet to be released.<sup>21</sup>

#### *Recommendation:*

- NJDEP should release an updated version of the Statewide Water Supply Plan to provide watershed-based (HUC11) analysis of net water availability using methods that address needs for stream flows that support aquatic ecosystems. Subsequent revisions to the Statewide Water Supply Plan should examine water withdrawal impacts on the HUC14 scale, instead of the broader HUC11, in critical areas such as the Pinelands, Highlands and areas with known conditions of long-term aquifer decline.

### 4. Explore Regulatory Incentives for Water Recharge

The Highlands Regional Master Plan<sup>22</sup> requires that proposed development projects located in areas designated as having a water deficit, and where a Water Use and Conservation Management Plan does not exist, must achieve a certain percentage of mitigation (between 125 percent and 200 percent) as a way to reduce water deficits. Permitting development in a water-deficit area with the condition of deficit mitigation can help ease the strain on the aquifer while giving landowners and developers the ability to develop their land.

#### *Recommendation:*

- The NJDEP and the Pinelands Commission should study whether their water allocation rules should be modified to allow for water-deficit mitigation in situations where an applicant is seeking additional withdrawals in excess of regulatory limits, but can demonstrate that the withdrawals will be offset by a greater amount of groundwater recharge or conservation.

## WATER QUALITY PROTECTION

The Van Abs Pinelands report highlights how the quality of surface and groundwater in the study areas has been affected by soil modification (pH and nitrates) in addition to runoff from pets, geese, and improperly functioning septic systems (phosphorous, fecal coliform, *e. coli*), in addition to other constituents-associated intensive land use patterns. Water quality protection is especially important in the Pinelands where the soil and water chemistry help to sustain the unique ecosystems that led to its 1988 designation by the United Nations Educational, Scientific and Cultural Organization (UNESCO) as an International Biosphere Reserve. The sandy soils retain few organic nutrients, and the acidic ground water further reduces nutrient levels, resulting in an environment that can only be tolerated by specific species. When these qualities are altered, non-native species outcompete native species and endanger this ecosystem. Protection of surface and groundwater quality is critical to the efficacy of the Pinelands ecomosaic.

### 5. Test Safe and Cost-Effective Alternatives for Winter Road Treatment

As found in the Van Abs Pinelands report, the NJDEP and USGS Ambient Ground Water Quality Network reported high levels of sodium and chloride, which was likely from road salting in the winter months, at a well in Medford Township. Road salt can contaminate surface water and groundwater supplies and degrade physical road structures, while sand can clog stormwater drains. Thus neither is an ideal method of road safety, and both should be minimized as feasible.

#### *Recommendations:*

- In partnership with the New Jersey Department of

17. See the NJDEP rules for Water Supply Allocation Permits here: [http://www.nj.gov/dep/rules/rules/njac7\\_19.pdf](http://www.nj.gov/dep/rules/rules/njac7_19.pdf)

18. The EPA has published information on water use rate structures here: [http://www.epa.gov/watersense/our\\_water/understanding\\_your\\_bill.html](http://www.epa.gov/watersense/our_water/understanding_your_bill.html)

19. Water rates vary in structure from a flat fee that is equal for all ratepayers, to block rate structures that charge a higher (or lower) fee based upon the volume used. For example, in an increasing block-rate structure, ratepayers might pay \$1 for the first 1000 gallons of water used, but \$2 for the second 1000 gallons, and \$3 for the third 1000 gallons. This encourages heavy users to monitor and conserve water. For the purposes of this recommendation, since the base rates are less elastic, these revenues should go towards operations and maintenance, while revenue earned from the top tier use could go towards capital repairs and educational programs.

20. View the most recent (1996) Statewide Water Supply Plan for New Jersey: <http://www.nj.gov/dep/watersupply/pdf/swsp.pdf>

21. Some of the changes that will be found in the update to the 1996 plan can be found here: [http://www.nj.gov/dep/focus/pdfs/0808water\\_supply.pdf](http://www.nj.gov/dep/focus/pdfs/0808water_supply.pdf)

22. View the New Jersey Highlands Regional Master Plan here: [http://www.highlands.state.nj.us/njhighlands/master/rmp/final/highlands\\_rmp\\_112008.pdf](http://www.highlands.state.nj.us/njhighlands/master/rmp/final/highlands_rmp_112008.pdf)

Transportation (NJDOT), counties and municipalities should explore the feasibility of closing certain roads during snow events, designating certain roads for seasonal use only, or designating certain roads as “no salt” areas, as ways to reduce the amount of chemical treatment required in environmentally sensitive areas.

- NJDOT, county transportation departments and/or the Association of Public Works Managers should partner with the Pinelands Commission to test out new alternatives to maintaining safe road conditions during winter weather with fewer water quality and stormwater infrastructure damages, especially in environmentally sensitive areas.

## 6. Advance Green Infrastructure Implementation at the State, Regional and Local Level

A variety of state regulatory and funding actions can advance green infrastructure implementation by state, regional and local governments and private landowners. Because development that impairs water quality and quantity is regulated at the municipal level, these steps must include resources for municipalities to explore and implement green infrastructure.

### *Recommendations:*

- Permitting and enforcement. Use permitting and enforcement authorities to promote broad use of green infrastructure to meet Clean Water Act goals and reduce flooding risks. Update state stormwater regulations to do the same, by establishing strong runoff retention standards to minimize impacts from development.
- Funding. Prioritize state and regional funding for green infrastructure projects that relieve pressure from aging sewage treatment plants and storm sewer systems. Leverage water infrastructure funding (the Drinking Water State Revolving Funds) in combination with money from other funding sources, such as transportation, Green Acres, hazard mitigation, and storm recovery funding. The Legislature should redirect the constitutionally-dedicated watershed protection funding from the Corporate Business Tax to its originally intended use, without compromising existing NJDEP water science and water monitoring programs.
- Public projects. Maximize the use of green infrastructure designs in all publicly-funded capital projects including transportation, buildings and parks.
- Engineering standards. Clarify the performance standards for green infrastructure, integrating consideration of hydrogeological and soil conditions and accounting for expected variation in actual performance.
- Incentives for private landowners. The Legislature should authorize tax credits and other incentives for private residential and commercial property owners to install green infrastructure. Explore ways for the New Jersey Environmental Infrastructure Financing Program (NJEIFP) to provide low-interest loans through local government partners to private landowners to install green infrastructure.
- Ancillary regulations. The New Jersey Department of Community Affairs should ensure that state building codes such as the Residential Site Improvement Standards and other development-related codes and standards do not pose unreasonable barriers to green infrastructure. NJDEP should investigate what changes are needed to allow where appropriate for the redesign of existing parks to manage stormwater that avoid triggering the Recreation and Open Space Inventory (ROSI) diversion process.
- Training. The Pinelands Commission and NJDEP should offer educational and training opportunities to municipalities and private engineers/builders, in partnership with the Rutgers Continuing Professional Education Program and similar programs offered through state colleges and universities. This would build on existing training by NJDEP for engineers on the stormwater management rules to include training for elected and appointed officials including land use, planning and zoning board and environmental commission members, and continuing education for engineers, planners and landscape architects, both to implement the NJDEP stormwater requirements properly for new developments and to install stormwater retrofits and green infrastructure projects. NJDEP should publish and promote an engineering guide for green infrastructure that can be accessible to municipalities and engineering professionals.
- Local planning. The Pinelands Commission should work with the nonprofit and philanthropic community to provide access to small grants that allow municipalities to engage experts who can: 1) Assess opportunities for better stormwater management and highlight areas where green infrastructure could address localized water problems; 2) Develop stormwater mitigation plans that will permit flexibility in approving future development proposals when applicants have access to a list of potential mitigation projects; and/or 3) Encourage the development of long-term green-infrastructure plans to lay out a municipality's vision, as well as prioritize infrastructure investment. As part of these plans, municipalities should require the use of green infrastructure to reduce, or otherwise manage runoff from, some portion of existing impervious surfaces.

## **7. Authorize Municipalities to Establish Stormwater Utilities**

As of 2013, 39 states and the District of Columbia have permitted over 1400 municipalities<sup>23</sup> to create stormwater utilities. New Jersey municipalities lack the authority to establish stormwater utilities, which could impose fees for stormwater that is generated by a property, based on impervious cover, and use those fees to manage and upgrade stormwater infrastructure.

### *Recommendation:*

- The Legislature and governor should establish permissive statutory authority for municipalities and counties to create a stormwater utility or utility authority that can provide a stable funding stream for the operation and maintenance of stormwater infrastructure and the inspection of private facilities (to ensure compliance with their stormwater maintenance manuals) to help alleviate localized flooding and improve local water quality.

## **8. Encourage More Compact Growth and More Preserved Land as Opposed to Sprawl Development**

A land-use pattern with compact growth combined with land preservation has several benefits for water resources, as compared with large-lot sprawl development. It reduces the amount of stormwater generated per unit, reduces lawn area (reducing the amount of chemical treatment) and increases the quantity of natural lands.

### *Recommendation:*

- The Pinelands Commission should encourage higher density development in certain Pinelands growth areas complemented with more preserved land by revising the Pinelands Development Credits (PDC) program to encourage the use of PDCs and incentivize greater development density.

## **9. Monitor the Impacts of Recent Fertilizer Regulations on Water Quality**

In 2011, Gov. Chris Christie approved legislation that would address the impacts to water quality from fertilizer. The legislation has been implemented in stages: The first stage in 2011 included public education on best management practices with fertilizers; the second phase in 2012 required training and certification for professional fertilizer applicators and lawn-care providers; and the third phase in 2013 required all fertilizer products sold in the state to reduce the amount of nitrogen content, include the use of slow-release nitrogen, and eliminate the use of phosphorous.<sup>24</sup>

### *Recommendations:*

- NJDEP should conduct a monitoring study to assess the impacts of the new regulations on water quality. NJDEP should incorporate the findings of its monitoring study regarding both operational effectiveness and compliance and water quality benefits into its five-year review of the regulations.

23. Western Kentucky University publishes an annual survey of stormwater utilities: [http://www.wku.edu/engineering/civil/fpm/swsurvey/western\\_kentucky\\_university\\_swu\\_survey\\_2013.pdf](http://www.wku.edu/engineering/civil/fpm/swsurvey/western_kentucky_university_swu_survey_2013.pdf)

24. View the new fertilizer legislation that was passed in 2011: [http://www.njleg.state.nj.us/2010/Bills/PL10/112\\_.PDF](http://www.njleg.state.nj.us/2010/Bills/PL10/112_.PDF)

# RECOMMENDATIONS FOR MUNICIPAL ACTION

## OVERVIEW

While water resources cross municipal boundaries and need regional/statewide strategies to protect them, decisions made at the municipal level can play an important role in managing water resources. This section provides a variety of recommendations that can be tailored to the needs of different communities, both in the study areas and outside. In light of constricted fiscal resources at the local level, the recommendations highlight options for potential technical and financial partnerships and a guide to available funding, publications, and technical assistance is also included.

## GREEN INFRASTRUCTURE

### 1. Host Workshops on Green Infrastructure and Low Impact Development (LID)

Public education on the topic of green infrastructure and LID<sup>25</sup> ranges from showing residents how to install a rain barrel to advising land use, planning and zoning board members on how to review the stormwater management features of development proposals to providing installation and maintenance details for builders, landscapers, engineers, contractors and public-works employees. New Jersey Department of Environmental Protection (NJDEP) and groups like the Pinelands Preservation Alliance (PPA), Association of New Jersey Environmental Commissions (ANJEC), Sustainable Jersey, and the Rutgers Water Resources Program have offered such training and educational workshops. (See *Resource Section on page 22.*)

*Recommendations:*

- Municipalities should host a variety of workshops and training sessions to raise awareness and understanding of all aspects of green infrastructure. These should be tailored to the needs of different audiences, including the general public, green teams,

homeowners and professional staff including planners, engineers and public-works employees, appointed officials like land use, planning and zoning board and environmental commission members, and developers, building contractors and landscapers.

### 2. Install Green Infrastructure Demonstration Projects

A lack of familiarity with green infrastructure has led some developers and local officials to opt instead for a familiar, engineered “grey infrastructure” alternative. Demonstration projects offer the opportunity for residents, businesses, elected officials, engineers and others to see in person what is meant by green infrastructure and how it performs. The Rutgers Jacques Cousteau National Estuarine Research Reserve Coastal Center (JC NERR) in Tuckerton has a rain garden on display for visitors to the site, and the Rutgers Water Resources Program has installed rain gardens and rain barrels at schools, municipal buildings, and private residences across the state.

*Recommendations:*

- Municipalities should partner with community groups and nonprofit organizations to install a variety of different

#### MUNICIPAL RECOMMENDATION SUMMARY

<b>Green Infrastructure</b>	1. Host Workshops on Green Infrastructure and Low Impact Development (LID)
	2. Install Green Infrastructure Demonstration Projects
	3. Utilize Green Streets to Reduce and Retain Stormwater
	4. Promote and Install Native Plantings
<b>Water Conservation</b>	5. Restructure Water Rates to Reflect Water Conservation
	6. Promote Water Conservation to Residential and Commercial Users
<b>Development and Redevelopment</b>	7. Reduce the Impact of Future Development Through Compact Development and Preservation
	8. Remove Illicit Sewer Connections
	9. Update the Municipal Stormwater Ordinance
	10. Identify Ways to Balance Preservation and Development of Prime Groundwater Recharge Areas in Designated Growth Areas
<b>Asset Management</b>	11. Implement Asset Management for Water Supply, Sewer and Stormwater Infrastructure
	12. Inventory Deed-Restricted Land, Including Land With Stormwater Management Facilities
	13. Promote Restoration and/or Conservation of Riparian Areas

25. To learn more about LID, visit the EPA's LID resource page: <http://water.epa.gov/polwaste/green/>

types of green infrastructure demonstration projects in very public locations, such as public libraries, schools, parks, recreation fields and municipal buildings.

- Municipalities should undertake an impervious-cover assessment to understand where opportunities exist to reduce the quantity of stormwater runoff and improve its quality. They should identify and prioritize key sites for green infrastructure, as potential projects for the municipality, volunteer service groups, and student organizations or as potential mitigation projects for developers to undertake in exchange for a variance from stormwater-management rules.

### 3. Utilize Green Streets to Reduce and Retain Stormwater

New Jersey's Complete Streets program encourages municipalities to consider the needs of all users and abilities—not just automobiles—when building or repairing roads. To date, the New Jersey Department of Transportation (NJDOT), seven counties and more than 100 municipalities have enacted resolutions in support of a Complete Streets program.<sup>26</sup> In the northern part of the state, Passaic County has gone a step further with its “green streets,” program, where the use of green infrastructure is also included as part of roadway design.<sup>27</sup> For example, the installation of bioswales can help to reduce the amount of stormwater runoff generated by roads that makes its way into surface waters. Street trees can help to provide shade and reduce ambient temperatures, which can limit the amount of thermal pollution in stormwater (runoff that is warmed by impervious surfaces, such as roads, before it enters a much cooler water body) while beautifying the street landscape.

#### *Recommendations:*

- Medford, Medford Lakes, and Tuckerton should join the 412 municipalities that participate in Sustainable Jersey, to gain access to training and grant opportunities. Sustainable Jersey requires that participating communities form a “green team” that can help introduce municipal officials and residents to environmentally friendly programs and policies that can help promote environmental sustainability in the community.<sup>28</sup>
- Municipalities should adopt a Complete Streets policy and work towards implementation. This is eligible for

Sustainable Jersey points.

- Municipalities and counties should inventory opportunities where green streets can alleviate localized flooding and amend their Transportation Master Plans to include them.
- Municipalities should include green streets as part of capital-program budgeting as a way to incorporate installation during road upgrades.
- Municipalities should seek partnerships with community groups that may be able to help in the planting and maintenance of certain green streets elements, such as rain gardens or street trees.

### 4. Promote and Install Native Plantings

Native plantings are adapted to the local soil chemistry and water supply of the Pinelands, requiring much less irrigation, maintenance, and fertilizer and lime application. The region's soil and soil chemistry do not accommodate typical suburban landscaping and lawns, the installation of which requires extensive modification using fertilizers and lime. These soil amendments modify groundwater and local water supplies through the addition of nitrates and raising the pH level. In addition, non-native plants may require additional irrigation, as the sandy soils of the Pinelands retain less moisture than non-native plants require. Information on native plantings can be found through the PPA,<sup>29</sup> Pinelands Commission,<sup>30</sup> county soil conservation districts,<sup>31</sup> the Native Plant Society of New Jersey,<sup>32</sup> Rutgers University<sup>33</sup> and NJDEP.<sup>34</sup>

#### *Recommendation:*

- Municipalities should adopt a “save money, save water, go local” approach to planted areas that provides educational opportunities for all parties. This means: 1) offering educational materials, workshops and the resources necessary for residents interested in shifting from lawns to native vegetation; 2) providing information to land use, planning and zoning boards on local vegetation alternatives to recommend or require as part of new development; and 3) adopting policies for public lands that reduce or eliminate the need for mowing in non-recreational areas by replacing lawns with native plantings.

26. To learn more about New Jersey's complete streets programs, visit: <http://njbikeped.org/services/resolutions/>

27. To learn more about Passaic County's complete streets and green streets, visit: <http://www.passaiccountynj.org/DocumentCenter/View/2121> and <http://www.passaiccountynj.org/DocumentCenter/View/1664>

28. To see the list of communities participating in Sustainable Jersey, visit: <http://www.sustainablejersey.com/about/>

29. Visit the PPA's resource page on native plantings: <http://www.pinelandsalliance.org/ecology/plants/pinelandsnativeplants/>

30. Visit the NJDEP's resource page on native plantings: <http://www.state.nj.us/pinelands/infor/yard/>

31. Visit the Cape Atlantic Conservation District's resource page on native plantings: [http://www.capeatlantic.org/backyard\\_conservation1.htm](http://www.capeatlantic.org/backyard_conservation1.htm)

32. Visit the Native Plant Society of New Jersey's resource page on native plantings: [http://www.npsnj.org/pages/nativeplants\\_All\\_About\\_Natives.html](http://www.npsnj.org/pages/nativeplants_All_About_Natives.html)

33. View the Rutgers New Jersey Agricultural Experiment Station Cooperative Extension report on incorporating native plants: <http://njaes.rutgers.edu/pubs/publication.asp?pid=FS1140>

34. New Jersey Department of Environmental Protection has a resource page “Healthy Lawns Healthy Water” that explains the new fertilizer regulations and offers tips to protect water quality through the use of native plantings: <http://www.nj.gov/dep/healthylawnshealthywater/>

# WATER CONSERVATION

## 5. Restructure Water Rates to Reflect Water Conservation

Hammonton and Medford Township have restructured their water rates for residential users to encourage water conservation, by increasing the costs of excessive use through an increasing block rate structure, where the cost per unit increases after use exceeds a certain base threshold.

*Recommendation:*

- Municipalities should adopt water-conservation rate structures. They should consider dedicating any additional revenues to support infrastructure improvements (e.g., pipeline upgrades or re-linings that reduce water loss) and

### **Best Practices in Water Conservation: Town of Hammonton**

*Facing a water availability crisis that is limiting current and future development and may cause damage to wetlands and aquifers, the Town of Hammonton is taking steps to encourage water conservation.*

*Hammonton offers an innovative water rebate program that rewards residents who replace older water appliances and watering devices with newer, more efficient models. Presently, residents can be reimbursed up to a maximum of \$100 per year. To drive further the need to conserve water, the town recently restructured its water rates and implemented water-conservation ordinances to encourage users to reduce consumption. Users now pay a certain rate for the first 3,000 gallons of water used in the billing period. If usage exceeds this threshold, users are charged at a higher rate, with costs increasing as usage passes additional thresholds.*

*In addition, local ordinances limit the amount of lawn watering with a hose or sprinkler to three days per week, and watering is not permitted during rain events. Automatic irrigation systems can only be used three days a week. Both methods are restricted to certain hours of the day and are limited in the amount of time that each area can be watered. Penalties for not abiding by the ordinance range from a written warning on the first offense to a fine of \$750 and 30 days' community service for the fourth and every subsequent offense.<sup>35</sup>*

*While it is too soon to know how effective these programs are in addressing Hammonton's water availability crisis, conservation-based water fee structures, water usage ordinances and rewarding residents for reducing their water usage are recognized best practices that can be replicated elsewhere.<sup>36</sup>*

water conservation education and incentive programs, all of which benefit ratepayers.

## 6. Promote Water Conservation to Residential and Commercial Users

The Van Abs Pinelands report describes how excessive water use can exacerbate problems with groundwater availability, stormwater runoff and water quality, as well as hasten the transition of wetland habitats into drier "uplands." To address these issues, municipalities can change local ordinances and land use patterns, but education can also be an important component, when water conservation may help people save money. For example, in response to the need to reduce the amount of water consumption, the Town of Hammonton created an incentive program for its residents that offers rebates for the purchase of water-efficient appliances.<sup>37</sup> Hammonton has secured a small Sustainable Jersey grant to run the program for the first two years, and then will evaluate the potential for additional funding.

*Recommendations:*

The municipalities and their partners should:

- Promote water conservation practices to residential and nonresidential users. For example, New Jersey American Water is available to provide presentations to its customers on the topic of wise water usage.<sup>38</sup>
- With the assistance of municipal green teams or staff, offer education to residents and businesses on the benefits of water-efficient fixtures. For example, a municipality could offer water-conserving devices at a reduced rate to customers through bulk purchasing, or with the assistance of water purveyors (as United Water does<sup>39</sup>).
- Confirm through the certificate of occupancy process that automatic irrigation systems are equipped with operational rain sensors to comply with state law.
- Consider adopting site design standards for new development and redevelopment that limit the amount of turf allowed. Less turf area reduces the demand for summer water use.
- Consider adopting ordinances limiting the watering of lawns by residents and businesses, even outside of drought periods.
- Adopt incentive programs that reward businesses and residents for water conservation.

35. See Hammonton's Water Conservation Ordinance: <http://www.townofhammonton.org/wp-content/uploads/2013/05/Hammonton-Water-Conservation.pdf>

36. See Hammonton's Green Committee web resources: <http://hammontongreencommittee.com/environmental-issues/water-conservation/> and <https://www.facebook.com/HammontonGreenCommittee>

37. More information on Hammonton's water rebate/tax credit program can be found here: <http://www.townofhammonton.org/wp-content/uploads/2013/05/Ordinance-029-2013-Water-Tax-Credit-dec-2013.pdf>

38. More on New Jersey American Water's wise water use programs can be found here: <http://www.amwater.com/njaw/learning-center/wise-water-use.html>.

39. More information on United Water's conservation kits program can be found here: <http://www.unitedwater.com/conservation-kits.aspx>

# DEVELOPMENT AND REDEVELOPMENT

## 7. Reduce the Impact of Future Development Through Compact Development and Preservation

Compact development leads to less water use and less stormwater runoff per house than “sprawl development” on large lots. Land preservation through fee-simple acquisition or easement purchase is one way to reduce development and its impacts, but is costly. Municipalities can also use density transfer tools such as noncontiguous clustering to encourage developers to increase development in one location and preserve land in other environmentally sensitive areas, including riparian areas, floodplains, prime groundwater recharge areas, and farmland. Noncontiguous clustering is authorized both by the Pinelands Comprehensive Management Plan (CMP) and the state’s Municipal Land Use Law (MLUL). As a result, noncontiguous clusters can reduce the amount of impervious surface generated from big lawns, larger driveways and more access roads, thus reducing the amount of stormwater generated by development.

### *Recommendation:*

- Municipalities should review their master plans to identify the areas where preservation and compact growth are desired, and then consider revising their zoning ordinances to authorize noncontiguous clustering in those locations. More information on noncontiguous clustering can be found at the New Jersey Future website.<sup>40</sup> For a fee, the Delaware Valley Region Planning Commission (DVRPC) offers municipalities in the DVRPC planning area<sup>41</sup> assistance in developing a noncontiguous cluster ordinance.

## 8. Remove Illicit Sewer Connections

Municipalities can reduce the strain on sewage treatment facilities by reducing the quantity of water that enters the system from sump pump or gutter connections. In some cases, homeowners may not even realize that such connections were made.

### *Recommendations:*

Municipalities should:

- Enact ordinances that prohibit the connection of gutters and sump pumps to the sewer system.
- Educate residents that sump pump and gutter connections to the sewer system are illegal.
- Amend ordinances to require sump pump or gutter connections be severed as a condition of a new certificate of occupancy.

- Ensure that sewer improvement projects (e.g., relining, jetting, replacement) identify and remove illicit connections.

## 9. Update the Municipal Stormwater Ordinance

Sustainable Jersey is planning to make available a new model stormwater ordinance in the second half of 2014. The ordinance will apply similar stormwater requirements to redevelopment as are required for new development, and ensure that smaller (5,000 sq. ft.) developments be required to address stormwater impacts.

### *Recommendations:*

- Local green teams should educate municipal officials on the new ordinance and encourage its adoption. Municipalities that do not participate in Sustainable Jersey should also consider the adoption of such an ordinance.
- Municipalities may wish to consider going beyond the minimum stormwater management rules when developing their stormwater management plans so that they can address local conditions effectively.

## 10. Identify Ways to Balance Preservation and Development of Prime Groundwater Recharge Areas (PGWRAs) in Designated Growth Areas

Prime groundwater recharge areas are well drained, which makes them both desirable for development and instrumental in restoring water to underground aquifers. Municipalities with strained water supplies and sensitive aquatic ecosystems should balance the need for development opportunities on PGWRAs in regional growth areas and rural development areas with the environmental benefits of preservation.

### *Recommendations:*

Municipalities should:

- Prioritize preservation of lands that are the most productive for groundwater recharge. Identify the most productive PGWRAs in the municipal master plan land use or conservation element, using a method similar to that discussed in the Van Abs Pinelands report, page 12. Municipalities should balance carefully preservation of these lands with the growth goals in the CMP. Depending on the nature of the subwatersheds and existing land use/cover conditions, municipalities should promote partial or complete protection of the most highly productive recharge areas. In addition to outright preservation, developers can be encouraged through site design, onsite clustering or noncontiguous clustering to steer development and impervious surfaces away from these lands.

40. Learn more about the noncontiguous cluster at New Jersey Future’s cluster resource page: [www.njfuture.org/cluster](http://www.njfuture.org/cluster)

41. DVRPC’s service area in New Jersey includes Burlington, Camden, Gloucester and Mercer counties (all of which, except Mercer County, are partially included in the Pinelands Management Area).

# ASSET MANAGEMENT

## 11. Implement Asset Management for Water Supply, Sewer and Stormwater Infrastructure

One of the most basic steps to ensuring the efficient provision of clean drinking water, wastewater treatment and stormwater management is to inventory the existing network of infrastructure, including its location, age, service life, quality and composition. With this information, municipalities and utilities can identify critical assets and plan effectively for maintenance and capital upgrades, in order to provide reliable service at the lowest life-cycle cost. Asset management is recognized as a best management practice, and is now an established requirement for funding from the New Jersey Environmental Infrastructure Trust.

### *Recommendation:*

- Municipal water and wastewater departments and utilities should use asset management planning, according to industry best practices and guidance from USEPA and NJDEP.<sup>42</sup>

## 12. Inventory Deed-Restricted Land, Including Land With Stormwater Management Facilities

The New Jersey Conservation Foundation is presently working<sup>43</sup> with Byram Township in Sussex County and the Town of Hammonton in Atlantic County to inventory lands with conservation easements, which often includes lands with stormwater management facilities like detention basins. Such an inventory can help municipalities understand the location and condition of stormwater management facilities, and opportunities for repairs and upgrades to help stormwater facilities function properly, thereby protecting water quality and reducing flooding.

### *Recommendation:*

- Municipalities should create and maintain an inventory of stormwater detention, retention and infiltration basins in public and private ownership. The inventory should include an assessment of easement compliance, the condition of the basins and the need for upgrades, if any. The maintenance of basins approved since 2004 should be assessed against the approved operation and maintenance manuals for those basins.

## ***Best Practices in Water Quality Protection: Medford Lakes***

*Medford Lakes Borough began as a lakeside community within Medford Township. While the borough has a community sewer system, residents rely upon individual wells for water. The borough recognizes that maintaining surface and groundwater quality is critical to its livelihood. In addition, managing the quantity and quality of stormwater runoff is important to maintain the quality of the lakes. The borough has the following restrictions in place that are designed to protect the quality of the surface and subsurface waters in Medford Lakes:*

- *Animal Control: Municipal ordinances limit the potential for nutrient-based pollutants and pathogens (e. coli and fecal coliform) from both wild and domestic animals to enter waterways. Municipal ordinances prohibit the feeding of waterfowl (§185-13), or any other activity that causes waterfowl to congregate and results in the accumulation of droppings or other threats to public health, safety and welfare. Regulations also target domestic animals (§70), and require owners to clean up after pets. Violation of these ordinances can include a combination of fines, community service, and jail time.*
- *Fertilizer Restrictions: To limit the amount of nutrient-based pollutants from entering the waterways as a result of fertilizers, the borough has restrictions in place on the application of fertilizers (§114). These restrictions prohibit the application of fertilizer when it is raining, or when rain has been forecast. To prevent unnecessary runoff of fertilizer into waterways, the borough prohibits the application of fertilizers to impervious surfaces, and requires that accidental application be immediately swept into the intended surface. Other restrictions prohibit the application of fertilizers on water-body buffers and limit application to no more than 15 days before or after the recognized growing season, March 1 thru October 15.<sup>44</sup> Violation of this ordinance can result in fines.*
- *Tree Protection: As a way to preserve the amount of natural cover in the community, limit the amount of soil erosion and maintain natural drainage patterns, the borough has a tree- and shrub-clearing ordinance (§217), that requires removal permits for most types of clearing. As part of the ordinance, applicants may only clear a maximum of 30 percent of their lots, the borough manager may require applications to include surveys and plans, and a survey is required if trees of more than six inches in diameter will be removed for construction. Violation of this ordinance can result in a combination of fines, community service and jail time.*

42. Learn more about asset management planning by visiting the following pages from the NJDEP ([www.nj.gov/dep/watersupply/pdf/guidance-amp.pdf](http://www.nj.gov/dep/watersupply/pdf/guidance-amp.pdf)) and the EPA (<http://water.epa.gov/infrastructure/sustain/index.cfm>).

43. Learn more about the New Jersey Conservation Foundation's public land inventory program at: <http://www.njconservation.org/PressReleases/ShowPressRelease.cfm?prid=106>

44. Fertilizer application after the growing season (mostly the fall and winter months) can place water supplies at unnecessary risk when soils are frozen, fertilizers don't get absorbed and precipitation can cause excess stormwater runoff.

### 13. Promote Restoration and/or Conservation of Riparian Areas

Riparian areas are natural lands that are contiguous to non-tidal natural rivers, streams and lakes. They serve as an essential component of the aquatic ecosystem and protect those waterways from adjacent land uses. Protection of these lands can help to reduce the amount of pollution (chemical or thermal) that reaches these surface waters.

#### *Recommendation:*

Municipalities should:

- Conduct a natural-resource inventory to identify riparian areas, as a way to inform subsequent education, restoration, protection or preservation efforts.
- Partner with other entities to encourage the creation of riparian buffers next to streams and lakes in residential, commercial and industrial areas, using native vegetation.
- Use findings from the natural resource inventory to restore riparian vegetation on public lands.
- Educate private landowners about the benefits and importance of proper stewardship techniques for riparian lands.
- Municipal preservation programs should target, or include as a factor of consideration, ecologically high-value riparian areas.

## AVAILABLE RESOURCES

### Programs and Technical Assistance

#### *New Jersey Department of Environmental Protection*

While state-level grant funding is presently limited, New Jersey Department of Environmental Protection (NJDEP) Division of Water Quality staff is available to provide outreach and education to municipalities interested in learning more about green infrastructure.<sup>45</sup>

#### *Rutgers Water Resources Program*

NJDEP contracts with the Rutgers Water Resources Program to provide programs and technical assistance. Some of its current initiatives:

- The Rutgers Water Resources Program co-hosted a workshop with the Association of New Jersey Environmental

Commissions (ANJEC) for local officials called “Asking the Right Questions”<sup>46</sup> as a way to educate local officials to their responsibilities in approving development projects. To reach a wider audience, Rutgers is in the process of scaling this program up by hosting an online training program.

- In response to increased demand, as well as a way to attract municipalities that may not have the funding to enlist the organizations like the Rutgers Water Resources Program to undertake an impervious coverage assessment, Rutgers is developing an “open source” impervious coverage assessment tool that can be utilized by municipal officials, with some training.

#### *Other*

- Each year, the members of the AmeriCorps New Jersey Watershed Ambassadors Program are placed across New Jersey’s 20 watershed management areas and are available to make free environmental education presentations to community organizations and schools.<sup>47</sup>
- The Pinelands Preservation Alliance (PPA) is interested in advancing better stormwater management. In the past, they have provided technical assistance and training on green infrastructure and restoration projects.
- ANJEC is also able to answer questions that come in to their Resource Center on the topic of green infrastructure.<sup>48</sup>
- The USEPA has developed a Stormwater Calculator Tool that can be used to estimate the amount of rainwater and runoff from a site, as well as the amount of mitigation possible under different Low Impact Development/ green infrastructure scenarios.<sup>49</sup>

### Publications

- The Pinelands Preservation Alliance (PPA), in cooperation with its partners, developed an easy-to-read LID guide<sup>50</sup> for the Barnegat Bay, that can be used to inform municipal recommendations for sustainable development, as well as individual projects that can be done by residents and businesses. PPA is presently revising its Barnegat Bay LID Manual to apply to a larger audience.
- ANJEC has also hosted green infrastructure workshops with local environmental commissions, as well as webinars. These resources can be found on the ANJEC Presentations page: <http://www.anjec.org/Presentations.htm>. They also produced a publication Municipal Options for Stormwater Management.<sup>51</sup>

45. Staff at NJDEP Division of Water Quality can be reached at: (609) 633-7021, or visit their resource website at: <http://www.nj.gov/dep/gi/>

46. A PDF copy of the “Asking the Right Questions” presentation can be found here: [http://www.water.rutgers.edu/Projects/MunicipalOfficialTraining/20140214MunicipalOfficialSWTraining\\_Final.pdf](http://www.water.rutgers.edu/Projects/MunicipalOfficialTraining/20140214MunicipalOfficialSWTraining_Final.pdf)

47. To learn more about the AmeriCorps New Jersey Watershed Ambassadors Program, visit: <http://www.nj.gov/dep/wms/bear/ameriCorps.htm>

48. Staff at ANJEC can be reached at: (973) 539-7547 or [info@anjec.org](mailto:info@anjec.org).

49. Access the EPA’s National Stormwater Calculator tool here: <http://www2.epa.gov/water-research/national-stormwater-calculator>

50. Access the Barnegat Bay LID Manual here: [http://www.pinelandsalliance.org/downloads/pinelandsalliance\\_816.pdf](http://www.pinelandsalliance.org/downloads/pinelandsalliance_816.pdf)

51. Access ANJEC’s Municipal Options For Stormwater Management publication here: <http://www.anjec.org/pdfs/Stormwater2011.pdf>

## Best Practices in Regional Collaboration: Little Egg Harbor and Tuckerton

In the aftermath of Hurricane Sandy, affected communities in New Jersey are struggling to manage immediate recovery and rebuilding efforts. Many of these towns need help balancing the political and local pressure to rebuild quickly with the growing knowledge that merely returning the community to its pre-storm condition will inevitably put people and property back in harm's way. To address this pressing need, New Jersey Future has secured funding to support three local recovery planning managers (LRPMs), who have been embedded in six communities – Sea Bright and Highlands boroughs in Monmouth County, Little Egg Harbor Township and Tuckerton Borough in Ocean County, and Maurice River and Commercial townships in Cumberland County – that were severely damaged by Hurricane Sandy. The LRPMs are working directly with the municipal staff and provide much-needed additional capacity to plan, manage and implement strategies and projects to address immediate recovery, mitigate future risks and foster resiliency. The LRPMs perform as adjunct staff and will continue to work with these communities for at least 18 months, depending on funding.

To guide the planning and recovery process, each community participating in the local recovery planning manager program has appointed a steering committee, comprising community elected and appointed officials, staff and residents. In the case of Little Egg Harbor Township and Tuckerton Borough, a joint steering committee was established creating the opportunity for tight integration of projects and the potential to share resources, thereby greatly increasing the potential impacts of recovery strategies. The committee is and will be engaged in a variety of activities including:

1. Overseeing the development of a detailed risk assessment of each community's built environment, natural resources and populations vulnerable to flooding, storm surge, and sea-level rise.
2. Participation in a vulnerability assessment that was developed by the staff of the Jacques Cousteau National Estuarine Research Reserve (JCNER). Reserve staff guided the committee



**Tuckerton Beach during Sandy (Credit: US Coast Guard via AFP/Getty Images)**



**Tuckerton Beach, after the floodwaters receded (Credit: Leah Yasenchak)**

3. through the "Getting to Resilience" process, an existing online questionnaire that is designed to help local decision-makers review and characterize their existing planning, response and recovery efforts.
3. Collaboration on efforts to seek grant funds for restoration of critical shared shoreline and marsh resources.
4. Participation in economic development planning.

- In May 2014, ioby released its *Guide to Green Infrastructure: 5 Projects Any Community Can Do to Reduce Storm Water Runoff in 5 Easy Steps*, which reads similar to a cookbook, listing the materials, costs, and time needed to develop green infrastructure projects.<sup>52</sup>
- The Regional Plan Association's *9 Ways to Make Green Infrastructure Work for Towns and Cities* includes everything from an overview of green infrastructure, to how to build and fund its management.<sup>53</sup>

### Capital Project Funding

- Supplemental Environmental Projects (SEP) (USEPA):<sup>54</sup> Supplemental Environmental Projects are environmentally beneficial projects that can be undertaken by a person or entity that the federal government has found to have violated environmental laws. As part of a pollution settlement agreement, the alleged violator can opt to complete one of these projects, as long as it relates to the violation, in exchange for mitigation of the penalty to be paid.
- Natural Resource Damages funding (NJDEP<sup>55</sup> and USEPA<sup>56</sup>): Natural Resource Damages are applied to major contamination cases, where the responsible party (in addition to cleaning up the contamination) must compensate the public for damage to public natural resources during the time of contamination. NRD payments can be used for a wide variety of environmental purposes, including land acquisition and ecosystem restoration. This program applies to both federal and state (site remediation) systems.
- New Jersey Environmental Infrastructure Finance Program (NJEIFP):<sup>57</sup> The New Jersey Environmental Infrastructure Financing Program provides counties, municipalities, water and wastewater utilities with low-interest loans for the construction of water and stormwater infrastructure, as well as open space acquisition and brownfield remediation.
- 604(b) Water Quality Planning Grants:<sup>58</sup> NJDEP's Water Monitoring and Standards Division receives funding from the federal government's Clean Water Act program that goes towards water quality management planning on the state, interstate, regional, county and local levels.
- 319(h) Nonpoint Source Pollution Control Grants:<sup>59</sup>

NJDEP's Water Monitoring and Standards Division also receives money from the federal government's Clean Water Act program under Section 319(h) that can be passed through to other entities for the purposes of implementing nonpoint source pollution (water runoff) control projects to improve water quality. At least 50 percent of this funding is required to go towards projects that implement approved watershed-based plans, with the remainder permitted to be used towards other projects related to nonpoint source pollution.

- Private foundations: Private foundations offer a different avenue to address water resources. New Jersey and the surrounding area are home to a variety of different foundations that differ in mission, funding priorities and funding budget. While foundations may not always fund work done by municipalities, they may fund nonprofits that can help assist the local government achieve a certain goal or project. The New Jersey League of Municipalities provides a partial list<sup>60</sup> of private foundations that municipalities and their partners may wish to contact.
- Crowdfunding: Crowdfunding refers to the practice of pooling smaller public donations to a specific cause or project through an internet-based platform, such as ioby. Anyone can propose a project on the ioby webpage, and others can choose whether to donate their time or money to it. Most donors live within two miles of the project to which they contribute, and make an average donation of \$35. According to website, ioby.org has helped communities raise \$732,011 towards 282 projects. The company notes that 58 percent of donors also end up volunteering with projects.
- Local bonding and capital improvement program funding: In situations where grant funding is unavailable or not an option, municipalities and utilities can explore the possibility of financing larger projects over time through bonding. While the prospect of taking on long-term debt may not be appealing to some, this approach can help address critical large-scale water resource projects without enormous upfront investment. The University of North Carolina's Environmental Finance Center has developed a series of tools and publications that municipalities can use to help inform their decisions when developing a capital planning budget.<sup>61</sup>

52. Access ioby's Guide to Green Infrastructure: 5 Projects Any Community Can Do to Reduce Storm Water Runoff in 5 Easy Steps here: [http://ioby.org/blog/wp-content/uploads/2014/05/Green\\_Infrastructure-5x5\\_FINAL.pdf](http://ioby.org/blog/wp-content/uploads/2014/05/Green_Infrastructure-5x5_FINAL.pdf)

53. Access Regional Plan Association's 9 Ways to Make Green Infrastructure Work for Towns and Cities publication here: <http://www.rpa.org/library/pdf/RPA-9-Ways-to-Make-Green-Infrastructure-Work.pdf>

54. Learn about Supplemental Environmental Projects at the EPA's website: <http://www2.epa.gov/enforcement/supplemental-environmental-projects-seps>

55. Learn more about natural resource damage funding on the state level at: <http://www.nj.gov/dep/srp/brownfields/funding.htm>

56. Learn more about natural resource damage funding on the federal level at: <http://www.epa.gov/superfund/programs/nrd/primer.htm>

57. Learn more about the New Jersey Environmental Infrastructure Finance Program at: [http://www.nj.gov/dep/grantandloanprograms/er\\_eifp.htm](http://www.nj.gov/dep/grantandloanprograms/er_eifp.htm)

58. Learn more about the 604(b) program at: [http://www.nj.gov/dep/wms/bear/604b\\_grant\\_program.htm](http://www.nj.gov/dep/wms/bear/604b_grant_program.htm)

59. Learn more about the 319(h) program at: [http://www.nj.gov/dep/wms/bear/319\\_grant\\_program.htm](http://www.nj.gov/dep/wms/bear/319_grant_program.htm)

60. The New Jersey League of Municipalities list of private foundations can be accessed here: <http://www.njslom.org/privatefoundations.html>

61. Visit University of North Carolina's Environmental Finance Center website: <http://www.efc.sog.unc.edu/content/about-environmental-finance-center-unc>

# SPOTLIGHT ON THE STUDY AREAS



Tuckerton Seaport (Credit: NJTPA)

## OVERVIEW

The three study areas explored in this report – Evesham/Medford/Medford Lakes, Hammonton, and Little Egg Harbor/Tuckerton – served as the basis for many of the statewide, regional, and municipal recommendations for preserving and improving water resources in growth areas in the Pinelands. Meetings between New Jersey Future and the local municipal stakeholders in each community served as a reciprocal learning experience: New Jersey Future presented the research questions and findings, and municipal stakeholders provided feedback and suggested areas for additional research. These meetings were invaluable to New Jersey Future, in that they created an open forum in which to discuss approaches to addressing different water resource impacts as well as to formulate possible solutions that address specific community needs. These discussions also highlighted the real or perceived hurdles that stand in the way of local action.

This section provides a more in-depth look at the water-resource issues in each of the study areas, as well as a few opportunities for near-term action that each municipality might

consider. These near-term opportunities do not comprise a complete solution, but offer some practical starting points on the road toward improving both the quality and availability of this critical resource. The previous section “Recommendations for Municipal Action” offers additional action items that should be given consideration as well.

OPPORTUNITIES FOR NEAR-TERM ACTION SUMMARY	
<b>Medford Township</b>	<ul style="list-style-type: none"> <li>Improve Performance of Aging Stormwater Basins</li> <li>Modify Residential Sewer Rates to Reflect Actual Sewage Generation</li> </ul>
<b>Evesham Township</b>	<ul style="list-style-type: none"> <li>Integrate Low Impact Development Practices into Redevelopment Projects</li> </ul>
<b>Medford Lakes</b>	<ul style="list-style-type: none"> <li>Advance the Sewer Relining Project</li> </ul>
<b>Town of Hammonton</b>	<ul style="list-style-type: none"> <li>Promote Education and Outreach to Encourage Greater Water Conservation</li> <li>Partner with the School District on Water Conservation and Green Infrastructure</li> <li>Educate Local Officials and Engineering Professionals on Green Infrastructure Approaches</li> </ul>
<b>Tuckerton and Little Egg Harbor</b>	<ul style="list-style-type: none"> <li>Create Educational Opportunities at the Tuckerton Seaport</li> <li>Integrate Low Impact Development into Rebuilding Activities</li> </ul>

# SPOTLIGHT: EVESHAM TOWNSHIP, MEDFORD TOWNSHIP AND MEDFORD LAKES, BURLINGTON COUNTY

## History and Land Use Profile

Medford Lakes was developed in the 1930s as a resort community and is almost completely built out. Evesham and Medford were sparsely populated until suburban development encroached from the Delaware River towns and Philadelphia after World War II, and are examples of typical post-war suburban development within a Pinelands context. Much of the townships were built out as of 2007 (Evesham—70 percent built-out, Medford – 63 percent built-out).<sup>62</sup>

## Population and Employment Growth and Projections

While experiencing dramatic population growth from 1980-2010, both Evesham Township and to a lesser extent Medford Township are projected to experience a slowed rate of growth over the 30-year period to 2040, with population increases of 16.8 percent and 4.8 percent respectively. Medford Lakes, which lost population between 1980 and 2010, is projected to grow by 1.0 percent over the 30-year period to 2040.

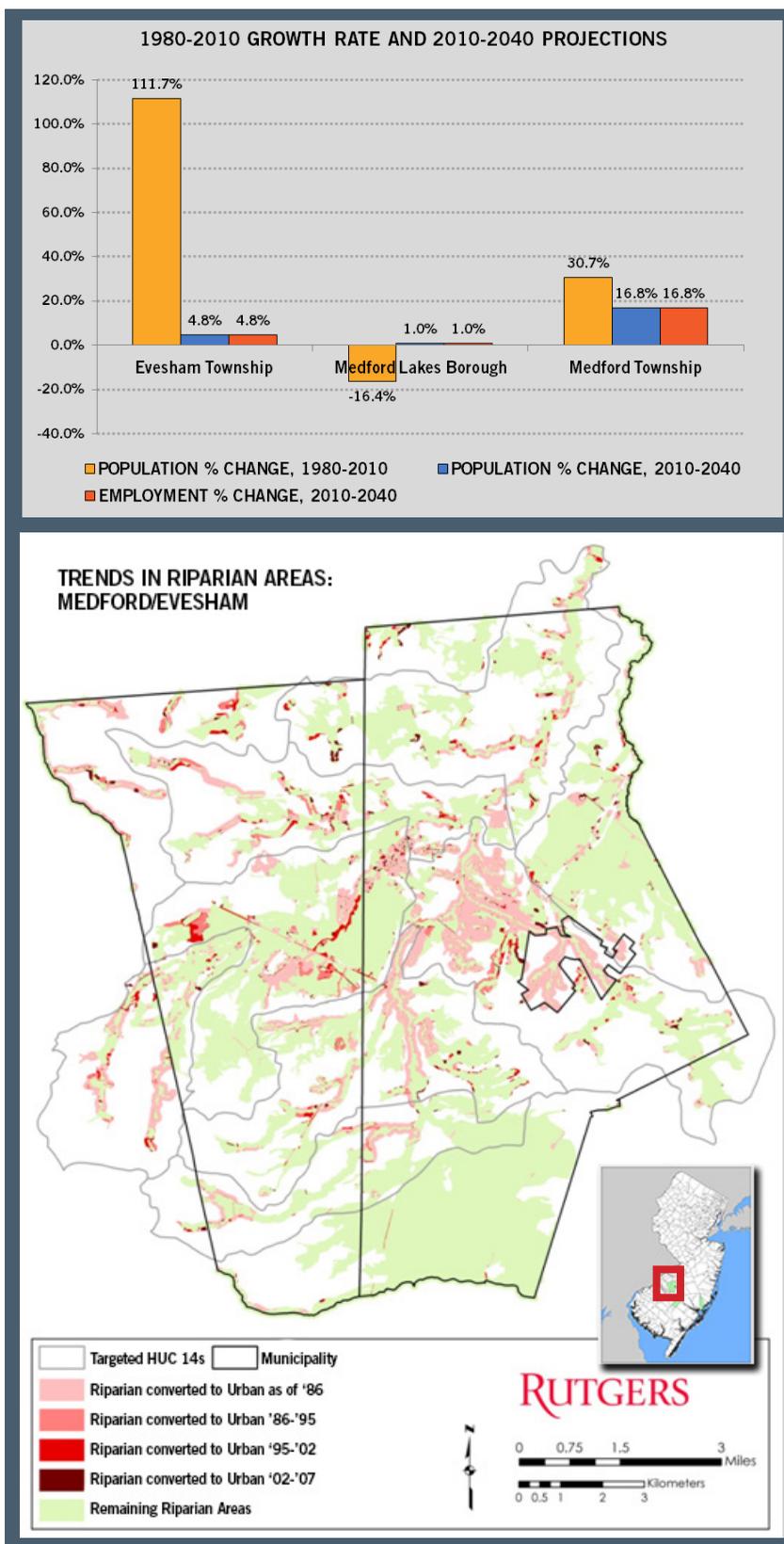
## Watershed Integrity

Between 1986 and 1997, low- to moderate-density suburban development patterns have had widespread effects on watershed integrity that vary by local subwatershed:

- Development in stream corridors have led to losses of riparian area of between 12 percent and 43 percent
- Moderate to high levels of impervious surface have been created, covering 7 percent to 21 percent of land
- Development in flood-prone areas ranges from 7 percent to 31 percent
- There have been seen significant losses of recharge areas, but some of these losses occurred prior to 1986.

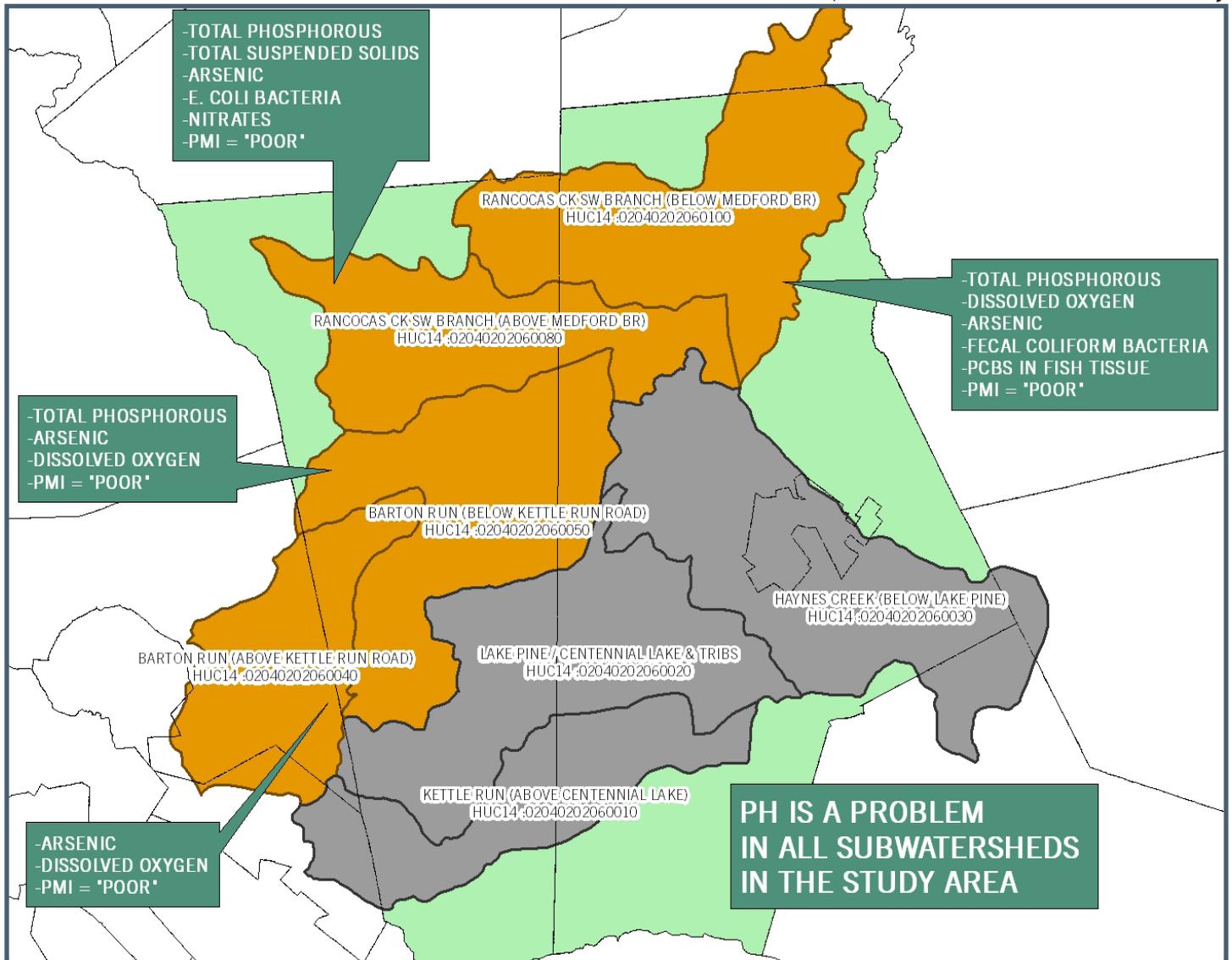
## Water Availability

Because water demands are being served by confined aquifers<sup>63</sup> and imports of water to the area, the Medford/Evesham area actually sees a net increase in water flows, meaning that the threat of water withdrawals on wetland ecosystems is not an issue.



62. Unless otherwise noted, all data comes from the Van Abs Pinelands report.

63. Confined aquifers are located below unconfined aquifers, and are mostly enclosed by a layer of impermeable material that exerts pressure on them. In contrast, an unconfined aquifer is closer to the surface and will sit atop an impermeable layer, but is not enclosed. The unconfined aquifer is generally known as the water table.



**Water Quality**

The Medford/Evesham area has numerous problems with water quality. Every subwatershed is in violation of the state’s Surface Water Quality Standards because of elevated pH levels (low acidity). Four subwatersheds have other contaminants that are typical of areas affected by land development – nutrients including total phosphorus (TP) and nitrates, bacteria (e. coli and fecal coliform) and dissolved oxygen (DO). In addition, salts have been found in a Medford monitoring well, likely a result of winter road treatment.

**Water and Wastewater Infrastructure**

**Medford Lakes**

- Medford Lakes has no community water system, relying on individual wells, and has sufficient sewer capacity.
- Sewers were built 1930s and upgraded in the 1960s and 1970s.
- The borough is planning to line aging sewer pipes to reduce water leaking into the lines, which will unlock existing capacity. This process will also identify illicit

connections into the system (e.g. from residential sump pumps).

- Instead of a comprehensive asset management process, Medford Lakes cleans the lines every three years, and plant operations and maintenance are on a five-year plan.

**Evesham Township**

- Evesham has ample water and wastewater capacity to meet growth projections.
- A 2011 Operations Assessment Report is the basis for system needs identification and project determination, and the beginning of an asset management system.

**Medford Township**

- Medford may have adequate sewer and water capacity for the projected 2040 population.
- Many of the water and sewer lines are relatively new, since the majority of development took place between the 1960s and 1990s.
- The township is working toward a formal asset management program and restarting its capital program.

## Opportunities for Near-Term Action: Medford Township

### **Improve Performance of Aging Stormwater Basins**

Medford Township owns and maintains many stormwater detention basins that are designed to keep stormwater from entering surface waters too quickly or pooling on roads and other impervious surfaces. These basins slow the entry of stormwater into surface waters, while also reducing the amount of sediment that enters with it. The municipality presently mows detention basins for aesthetic purposes: Overgrown grasses are viewed as a nuisance and even a tick-related health concern. Excessive mowing compacts soils in the basin and reduces permeability, and grass cuttings can clog storm drains. Lack of proper upkeep to a basin can reduce its effectiveness, causing nearby areas to flood. Retrofits to these systems are needed to ensure proper operation.

#### *Recommendations:*

- Where flooding has been a problem, the municipality should retrofit a sample basin into an infiltration basin or vegetated basin so that it can perform properly (i.e., infiltrate and filter stormwater), preferably with the use of native plantings. The Pinelands Preservation Alliance (PPA) is interested in working with the township to advance this project. In the past, PPA has partnered with municipalities and other organizations to offer public presentations on installation and maintenance of rain gardens, and has also provided plant materials. The township should select a sample basin(s), partnering with homeowners associations if appropriate, and then recruit volunteers and organize the retrofit event.
- With proper funding, the municipality and/or its partners could monitor the basin's performance before the retrofit and for at least two years afterwards to ascertain how the project improves water absorption and water quality, as a way of informing future retrofits, repairs, and municipal maintenance policies. Note that: 1) Regular visual inspection by volunteers during and after heavy rain events could be used to assess water absorption; 2) Water quality testing would require additional technical support to measure the change in stormwater quality from when it enters the basin to when it exits; and 3) New plantings should be given time to establish properly prior to the start of water absorption analysis and water quality testing.

### **Modify Residential Sewer Rates to Reflect Actual Sewage Generation**

Because the previous rates did not reflect the full cost of the system, Medford revised its sewage rate structure a few

years ago to a flat quarterly rate of \$141.48 per residential unit. Unfortunately, a flat-rate fee does not incentivize water conservation and affects unfairly those who use less water and generate less sewage but who must pay as much as larger households with greater use. In place of this, a sewer rate that includes a fixed service charge plus a variable consumption-based rate using winter water demands as a baseline<sup>64</sup> incentivizes conservation and makes the cost distribution more equitable, especially for small households, which often include senior citizens.

#### *Recommendation:*

- Medford should change the residential sewer rate structure from a flat quarterly fee to one with a fixed quarterly service charge plus a variable volume-based charge based on winter water demands.

## Opportunity for Near-Term Action: Evesham Township

### **Integrate Low Impact Development Practices Into Redevelopment Projects**

Evesham Township recently designated 28 lots along the Route 70 and 73 corridors in need of either redevelopment (13 lots) or rehabilitation (15 lots). The municipality is phasing the production of its redevelopment plans over the coming months, beginning with plans to redevelop a 1.7-acre site formerly used as a garden center, as well as a 20-acre site that contains a 184,000-square-foot shopping center that is approximately 75 percent vacant. The plans call for the garden center site to be redeveloped for commercial use and the shopping center to be redeveloped for either mixed-use residential and commercial or exclusively commercial use. Both plans include the use of stormwater management structures and facilities, and both sites include recommendations for the efficient use of water and energy, including the reuse of rainwater for irrigation.

Low Impact Development (LID)<sup>65</sup>/green infrastructure techniques – practices that reduce the stormwater impacts from extensive impervious development (such as the shopping center site) – can limit the amount of stormwater that enters roads or stormwater systems. LID that uses green infrastructure can also help to add economic value to the site.<sup>66</sup> Appropriate types of LID/green infrastructure will vary by site, but can include planted swales, street trees, green roofs, pervious pavement and rain gardens. Other on-site practices such as underground water storage systems may help reduce the amount of clearing required for large-scale retention basins.

64. Winter demand is the method used for calculating indoor water use, when use of water outdoors would be highly unlikely.

65. See the EPA's resource guide on LID to learn more about LID and potential applications: <http://water.epa.gov/polwaste/green/>

66. See the NRDC's report on the value of green infrastructure: <http://www.nrdc.org/water/files/commercial-value-green-infrastructure-report.pdf>

*Recommendations:*

- Evesham should shape the proposed or anticipated redevelopment plans and rehabilitation plans to require or encourage developers to utilize LID practices as part of site development to manage stormwater with fewer impacts on water quality.
- Evesham should modify any existing municipal redevelopment plans to require or encourage LID practices.

## Opportunity for Near-Term Action: Medford Lakes

### **Advance the Sewer Relining Project**

The original sewer system in Medford Lakes was installed nearly 80 years ago as part of a Depression-era Works Progress Administration project. The presence of a sewer system

protected the groundwater that provides residents with clean drinking water via individual, on-lot wells. Today, cracks in aging sewer lines threaten the quality of groundwater and the lakes and reduce system capacity when groundwater enters the pipes. If groundwater quality becomes a public health concern, a switch to public water might become necessary, but would carry a high cost. Relining the sewer system would help protect groundwater and lake quality while reducing the amount of sewage that must be treated.

*Recommendation:*

- The borough should continue the sewer repair process by relining the sewer lines, building on recent work to clean and video the lines in order to make a map of the system.

# SPOTLIGHT: TOWN OF HAMMONTON, ATLANTIC COUNTY

## History and Land Use Profile

Hammonton's development was influenced by the railroad, resulting in the development of a compact, traditional town center. Hammonton refers to itself as the "Blueberry Capital Of The World" in recognition of the local blueberry industry; Hammonton's developed center is surrounded by agricultural land.

## Population and Employment Growth and Projections

Growth projections for Hammonton suggest that the population will increase 32 percent over a 30-year period from 2010-2040, a rate 1.5 times as fast as its growth rate of 20 percent over the previous 30 years (1980 to 2010). Its employment is also expected to grow by 26 percent almost the same rate as its projected population growth. These trends are consistent with a recent general statewide trend toward more redevelopment of older cities and towns.

## Watershed Integrity

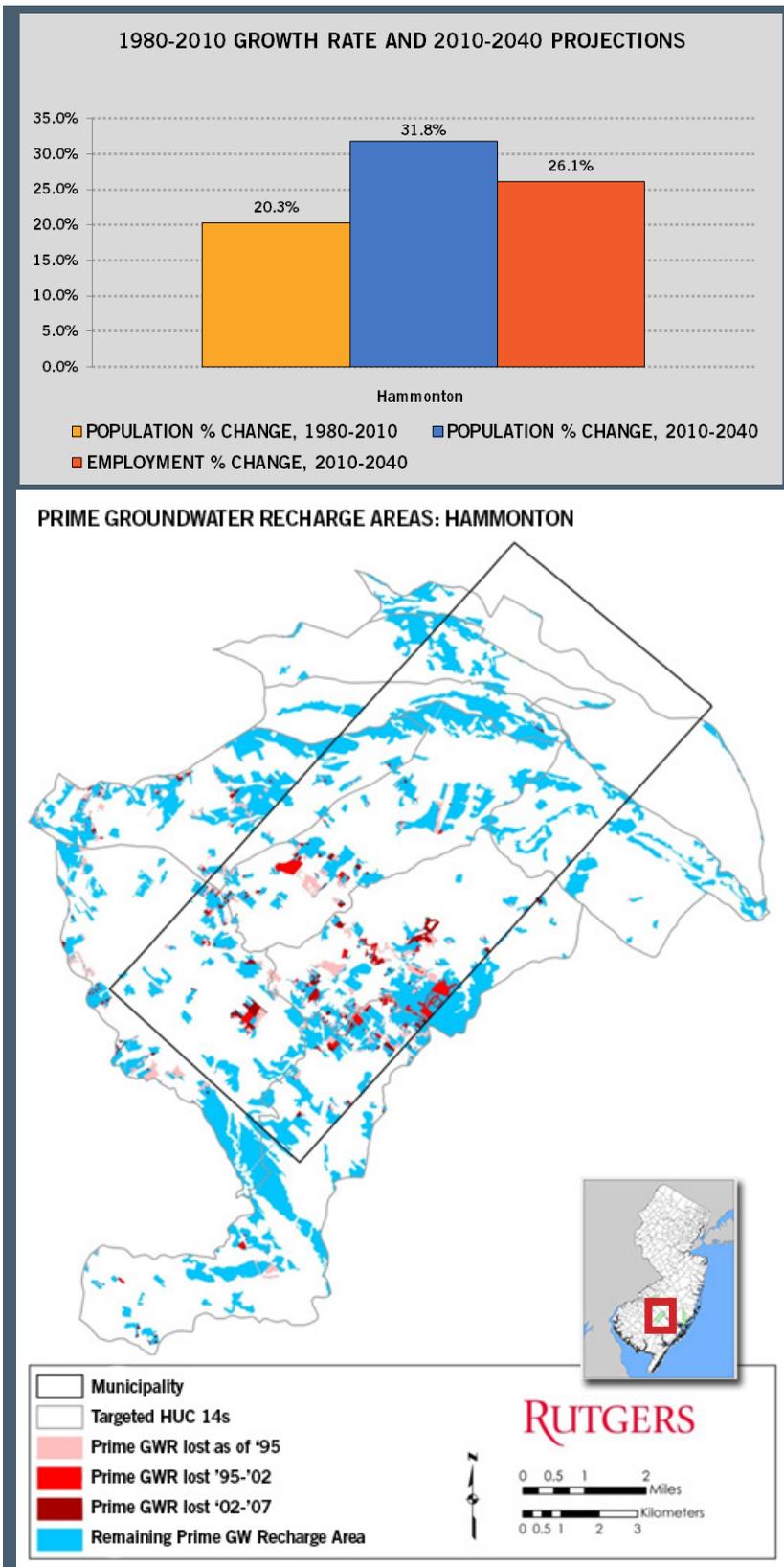
Hammonton has seen relatively little change in land use and land cover since 1986, with the one exception of the losses of groundwater recharge areas. Most of its developed areas were already developed prior to the adoption of the Pinelands Comprehensive Management Plan (CMP).

## Water Availability

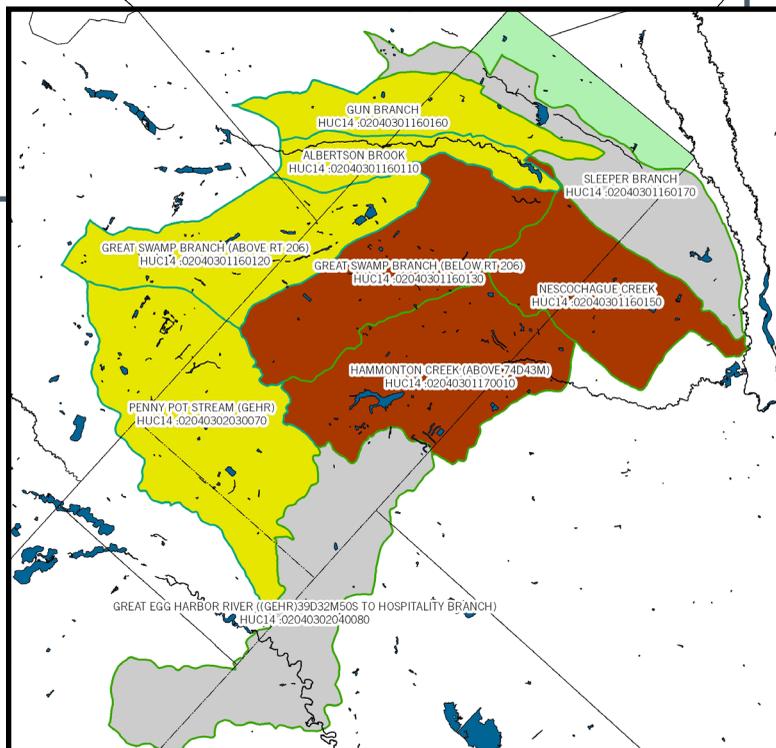
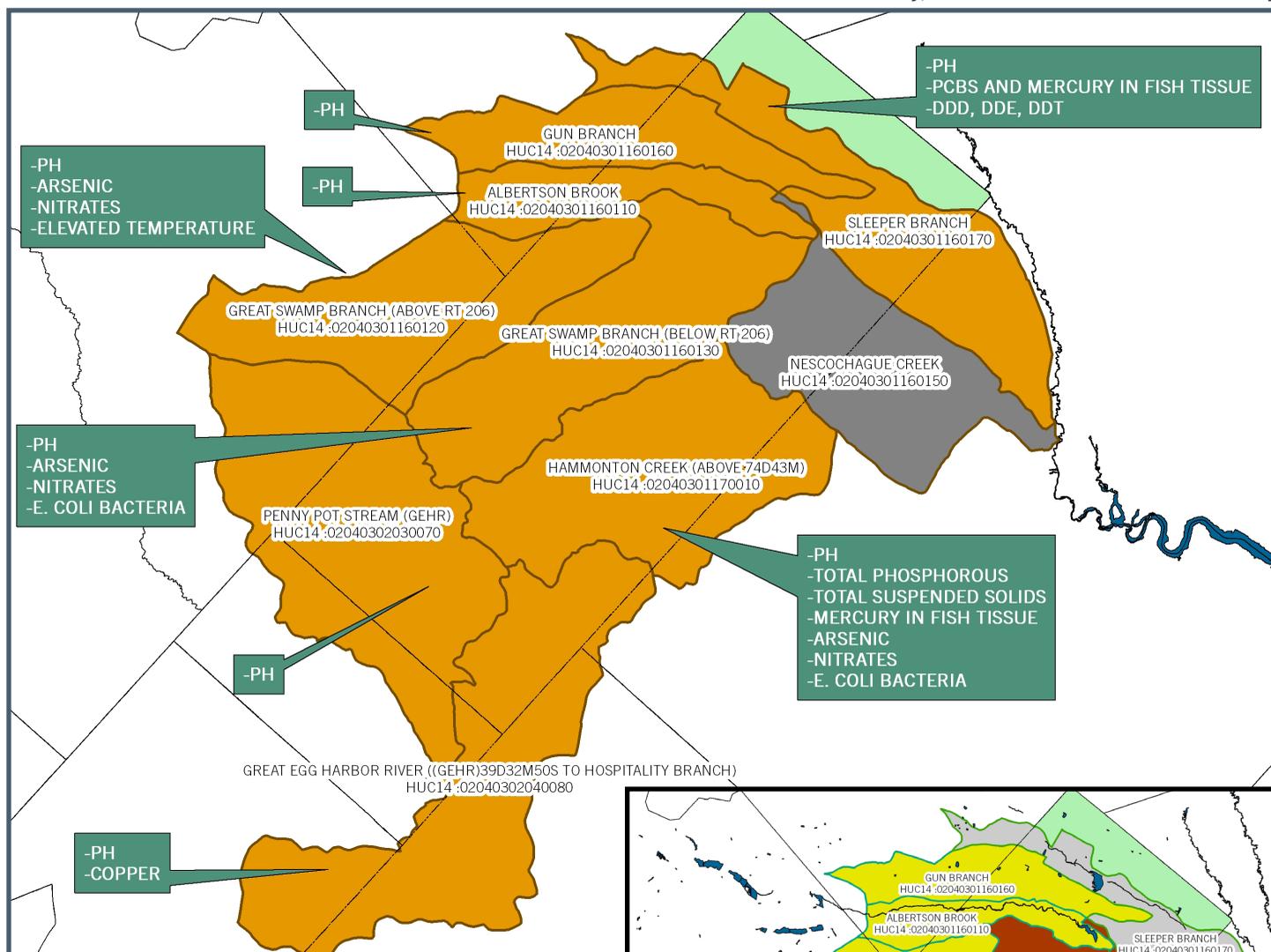
Water availability is a major issue in Hammonton, both for aquatic ecosystems and the municipality. The research team used a method developed by the US Geological Survey to estimate reductions, or "drawdowns," in water levels in wetlands as a result of current (year 2012) well-water withdrawals. The team found that, of the three study areas, water withdrawals in Hammonton had the greatest impacts on associated wetlands. The model suggests that six subwatersheds experience high impacts on wetlands from water withdrawals. The picture above shows that for the subwatersheds highlighted in yellow, water withdrawal has caused an estimated 10 cm drawdown in more than 10 percent of total wetland area, and for the subwatersheds highlighted in red, more than 50 percent of total wetland area is estimated to experience a 10 cm drawdown.

## Water Quality

Hammonton has numerous problems with water quality. Nearly every subwatershed is in violation of the state Surface Water Quality Standards because of elevated pH levels (low acidity). Three subwatersheds have other contaminants that are typical of areas



Below: Hammonton Water Quality, Inset: Hammonton Water Availability



affected by land development – nutrients including total phosphorus (TP) and nitrates, bacteria (e. coli and fecal coliform), and even elevated water temperatures. Since Hammonton has had sewers since the 1920s, it is likely that the nitrate pollution has come from fertilizers rather than septic systems. Other contaminants, including DDD, DDE, DDT, and mercury, are or could be the result of extensive agricultural land use.

### Water and Wastewater Infrastructure

- Hammonton has neither the water or wastewater capacity to meet growth projections.
- Existing demands are exceeding both the firm capacity and the water allocation permit for the local water supply system.
- Hammonton’s wastewater capacity is constrained in its ability to serve increased demands, due to the limitations of the new ground water discharge system.
- Hammonton has had sewers since the 1920s. Many of the original terra cotta sewer pipes need to be upgraded, although gradual replacements are under way.

- Hammonton is working to eliminate the number of illicit sump pump connections to sewer lines that reduce existing capacity.

## Opportunities for Near-Term Action: Town of Hammonton

### Promote Education and Outreach to Encourage Greater Water Conservation

The Town of Hammonton and its Green Committee already offer educational resources for conserving water in the home, at work, in the community and in the schools. Through its website<sup>67</sup> and Facebook page, the Green Committee promotes water conservation practices and announces educational events, such as “H2Know” and “Save \$ Save H2O: Be Water Smart.” Hammonton also recently began a water tax-credit and rebate program for customers who purchase and install certain water-conserving devices, and the town plans to promote this new program as a way to reduce the strain on its water system as well as save customers money.<sup>68</sup> The Pinelands Preservation Alliance is in discussion with the town about a more extensive public outreach program.

#### Recommendations:

- Educate homeowners about how much water they use for everyday activities, and identify ways to reduce their water usage. For example, make residents more aware of the water rebate program and which appliances and watering devices qualify. As another example, host a contest that challenges residents to hit specific water demand levels, awarding individuals or neighborhoods that achieve the greatest reduction.
- Promote alternatives to thirsty lawns, such as providing a native plant guide.
- Identify and implement ways to encourage commercial users to conserve water.
- Partner with lawn sprinkler companies to retrofit older and inefficient sprinkler systems at a lower costs based on bulk purchases.

### Partner with the School District on Water Conservation and Green Infrastructure

Establishing a partnership with the Hammonton School District to incorporate programming on water conservation could produce multiple benefits: introducing students (and subsequently their parents) to the benefits and importance of water conservation; and putting green infrastructure installations on school property that can reduce the amount

of mowing, lawn treatment and irrigation required, and, most importantly, that can increase the amount of stormwater that recharges on-site.

#### Recommendations:

- Fit water conservation and water quality protection into existing curriculum. Explore the use of the *Stormwater Management in Your Schoolyard program*,<sup>69</sup> developed by Rutgers for grades K-12, that incorporates science, math and communication skills. New Jersey Department of Environmental Protection (NJDEP) also has a resource page for educators.<sup>70</sup>
- Recruit a champion within the district who can spearhead the NJ Water Champions water audit process<sup>71</sup> and devise recommendations.
- Secure funding to partner with an organization such as the Rutgers Water Resources Program to conduct an impervious-surface assessment and outline potential green-infrastructure projects that can be carried out by the school administration, PTA, student groups, or scout groups. Such projects should capture stormwater runoff from roofs and parking lots.
- Seek funding for these retrofits through federal, state or local grants, private foundations or innovative approaches like crowdfunding,<sup>72</sup> or the use of water revenue generated from the top tier (heavy use) from an inclining block fee structure.<sup>73</sup>

### Educate Local Officials and Engineering Professionals on Green Infrastructure Approaches

Educational programming on green infrastructure should target different perspectives. A general presentation on the benefits of green infrastructure may be suited for an audience of residents and elected officials; however, technical programming will be necessary for the local regulatory officials, the landscape contractors and builders.

#### Recommendation:

- Partner with the Pinelands Preservation Alliance to hold a technical training session for local builders, elected officials, code officers, staff engineers and planners, and members of the land use, planning and zoning boards on the use of green infrastructure/low impact development (LID)<sup>74</sup> for residential and commercial properties.

67. See Hammonton Green Committee's website on water conservation: <http://hammontongreencommittee.com/environmental-issues/water-conservation/>

68. See Hammonton's water rebate/tax credit ordinance: <http://www.townofhammonton.org/wp-content/uploads/2013/05/Ordinance-029-2013-Water-Tax-Credit-dec-2013.pdf>

69. See the Stormwater Management in Your Schoolyard Program: <http://www.water.rutgers.edu/Projects/SWMIYSchoolyard/SWMIYSchoolyard.html>

70. See the NJDEP resource page for educators: [http://njwatersavers.rutgers.edu/MunicipalGuidetoEducationalOpportunities/Water%20Savers/ForMunicipalities\\_EducationalOpportunities\\_ProjectWET.html](http://njwatersavers.rutgers.edu/MunicipalGuidetoEducationalOpportunities/Water%20Savers/ForMunicipalities_EducationalOpportunities_ProjectWET.html)

71. Learn more about the Water Champions program here: <http://www.njwatersavers.rutgers.edu/NJWaterSavers-Educator%20site%20updates/C.%20Water%20Champions-General%20Information/5.%20%20Introduction%20to%20Water%20Champions.pdf>

72. See “ioby” in the section on funding options.

73. Learn more about different water pricing structures on the EPA's website: [http://water.epa.gov/infrastructure/sustain/pricing\\_structures.cfm](http://water.epa.gov/infrastructure/sustain/pricing_structures.cfm)

74. Low Impact Development (LID) and green infrastructure refer to techniques that minimize the impact of development by managing stormwater on site. Measures include pervious pavements, rain barrels and rain gardens. See page 28 for a more detailed description.

# SPOTLIGHT: LITTLE EGG HARBOR TOWNSHIP AND TUCKERTON BOROUGH, OCEAN COUNTY

## History and Land Use Profile

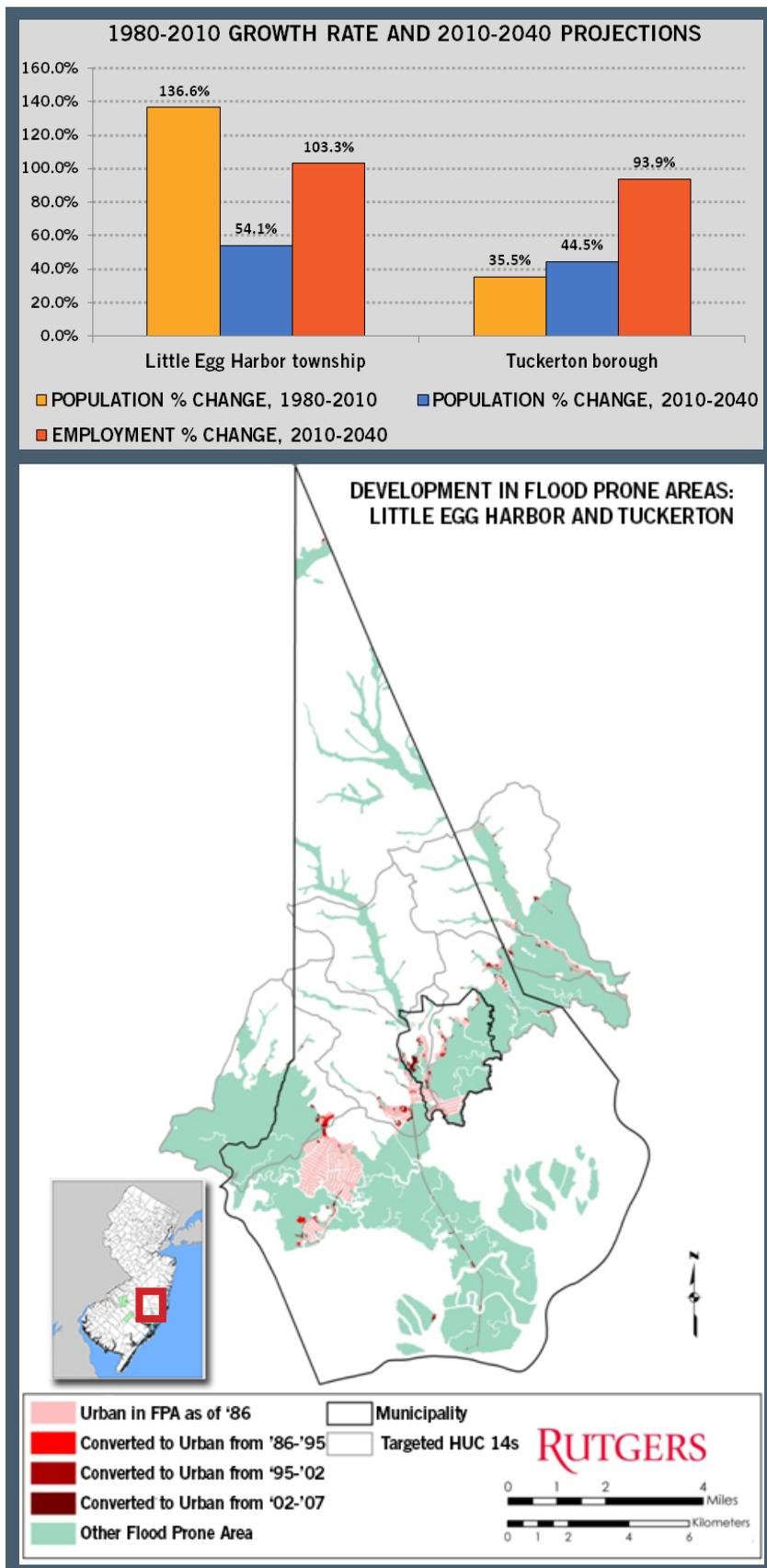
Tuckerton Borough is a small town center that focused on shipbuilding in the 1800s, later becoming a port for shore visitors to Long Beach Island, and now serving as the town center for both the borough and Little Egg Harbor Township. Little Egg Harbor Township remained very rural until after World War II, when the development of “lagoon communities” began attracting residents to the area. The recent conversion of seasonal lagoon homes to year-round residences and the development of retirement communities have caused the township’s population to increase rapidly. While Tuckerton has seen relatively little development since 1986, Little Egg Harbor Township has grown considerably. Today they are approximately 80.1 percent built out and 50.6 built out, respectively. Development in the northern part of Little Egg Harbor is limited because of its designation by the Pinelands Comprehensive Management Plan as Preservation and Forest areas. In 2012, Hurricane Sandy caused extensive damage to houses and local infrastructure in both Little Egg Harbor and Tuckerton, especially in and around the lagoon communities.

## Population and Employment Growth and Projections

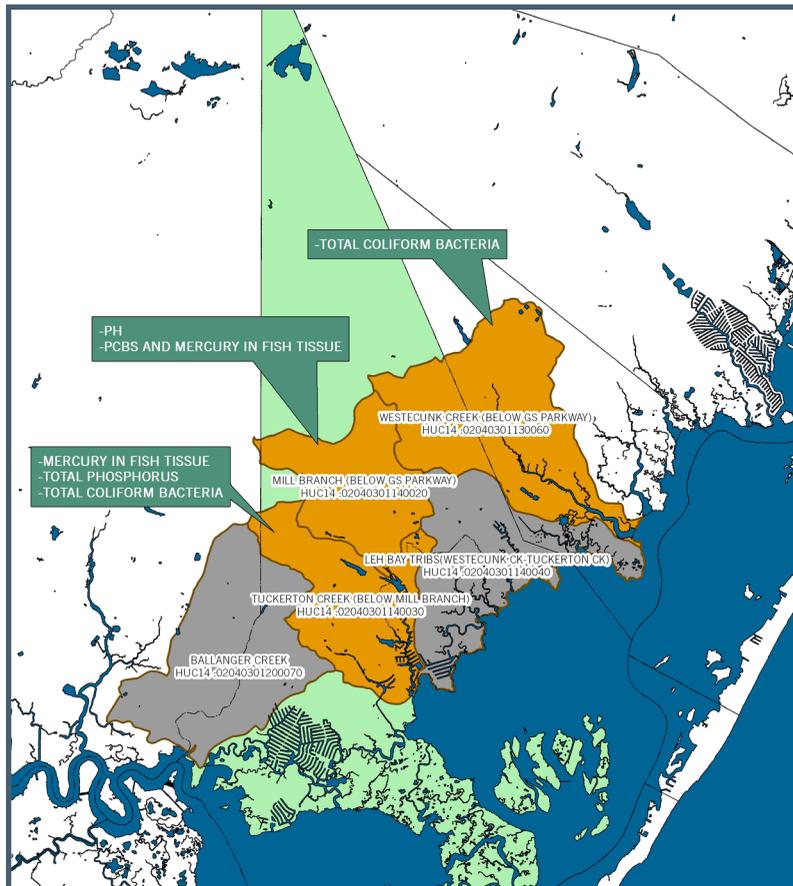
Over the 30-year period from 1980-2010, Little Egg Harbor experienced dramatic population growth, increasing its population by 136.6 percent, while Tuckerton only grew by 35.5 percent. These trends are expected to change, as projected growth from 2010-2040 suggests that Little Egg Harbor’s growth will slow (to a 54.1 percent increase), while Tuckerton will grow by 44.5 percent. Little Egg Harbor’s population estimates are projected to outpace the township’s capacity for new development, suggesting that more seasonal residences will convert to year-round use. However, these projections were developed prior to, or using data that predated, Hurricane Sandy, so it is unknown how rebuilding efforts will change development in the area.

## Watershed Integrity

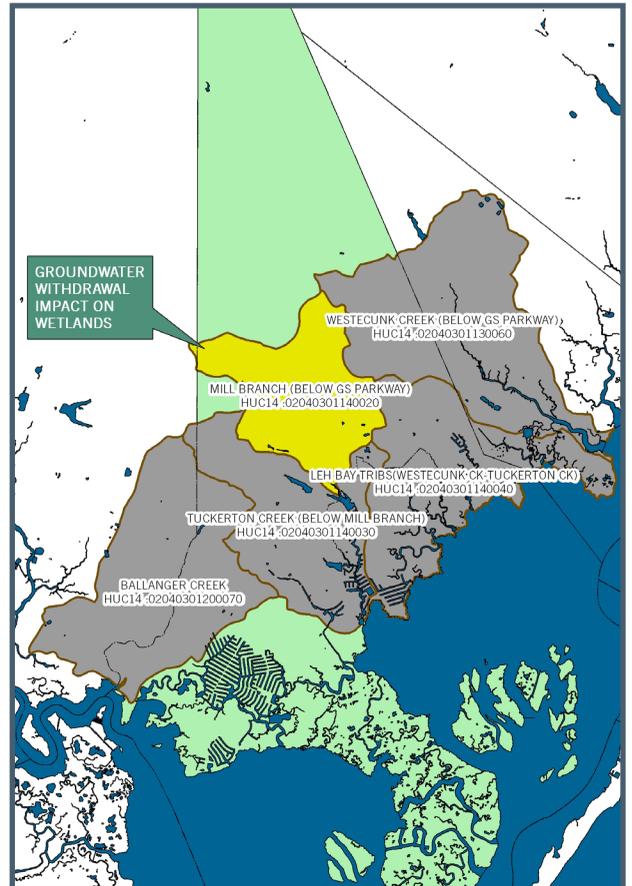
Tuckerton and Little Egg Harbor area have experienced large land use changes, with significant losses to forest (75 acres in Tuckerton, and over 1,500 acres in Little Egg Harbor) and groundwater recharge areas as a result of an increasing shift to urbanized uses. From 1986 to 2007, urban land use increased by 1,700 acres in Little Egg Harbor Township and 100 acres in Tuckerton. Losses to tidal wetlands amount to 30 acres in Tuckerton, but Little Egg Harbor lost the second highest amount of wetlands in this study, at 366 acres. In addition, the Tuckerton Creek subwatershed has had the most urban development in



**Little Egg Harbor/Tuckerton Water Quality**



**Little Egg Harbor/Tuckerton Water Availability**



flood-prone areas of any subwatershed studied in the Van Abs Pinelands report.

**Water Availability**

In the Little Egg Harbor/Tuckerton study area, the model used to estimate the impacts on wetlands from water withdrawals was run using two different scenarios, because it is unclear whether the municipalities’ use of the confined Atlantic City 800 Foot Sands aquifer affects the drawdown in the overlying unconfined Kirkwood-Cohansey aquifer. The first scenario assumes that withdrawals from the Atlantic City 800 Foot Sands aquifer have no effect, and the second scenario assumes that water use from the Atlantic City 800 Foot Sands aquifer affects the Kirkwood-Cohansey aquifer. Under the first scenario, water withdrawals have little effect on wetlands. Under the second scenario, three subwatersheds show at least 15 percent of wetlands affected at the 5 cm level, and one shows more than 15 percent of wetlands affected at the 10 cm level. In addition, water withdrawal stress can hasten saltwater intrusion and ground subsidence.

**Water Quality**

The limited agricultural activity and low number of septic systems in the area correlate with the minor water quality impacts found in the available ground water quality data. Nonetheless, some subwatersheds of the Little Egg Harbor/Tuckerton area have some of the most visible water quality problems, such as the recent closure to shellfishing of

23.5 acres of Tuckerton Creek due to the presence of fecal coliform (Two additional subwatersheds have shown the presence of total coliform). Unlike the other study areas, only one subwatershed is in violation of the Surface Water Quality Standards because of elevated pH levels (low acidity). Other contaminants, such as the mercury and PCBs found in fish tissue, exist from older pollution problems entering the food chain via the water supply.

**Water and Wastewater Infrastructure**

**Little Egg Harbor Township**

- Little Egg Harbor has ample wastewater capacity and may have water capacity to meet growth projections.
- Little Egg Harbor is the only municipality studied that has a formal asset management system in place for its water and wastewater utilities.
- Little Egg Harbor’s wastewater pipes are approaching replacement age, which has been accelerated by damage from Hurricane Sandy in addition to corrosive soils.

**Tuckerton Borough**

- Tuckerton has ample wastewater capacity and may have adequate water capacity to meet growth projections.
- Corrosive soils and infiltration have stressed wastewater pipes located near Tuckerton’s beach. Replacement has taken place on three streets, but additional replacement is needed.

## Opportunities for Near-Term Action: Tuckerton and Little Egg Harbor

### **Create Educational Opportunities at the Tuckerton Seaport**

Tuckerton Seaport attracts over 120,000 visitors annually to its educational and interpretive center and through its outreach programs, showcasing New Jersey's maritime history and contemporary folk life. This popular tourist attraction presents an excellent site at which to educate visitors, school groups and residents about water conservation, green infrastructure and resilient design and how they can do their part to reduce flood impacts and improve local water quality.

#### *Recommendations:*

The municipalities and their partners should:

- Complete development of the existing rain garden. Develop interpretive signage explaining how green infrastructure and low impact development (LID) can manage and retain stormwater on site.
- Launch the permanent green infrastructure exhibit with a special public event that provides a fun, hands-on opportunity to learn about the practical applications of green infrastructure or water conservation.
- Link the education program with New Jersey Department of Environmental Protection's (NJDEP) 2014 decision to close Tuckerton Creek to shellfish harvesting, showing how water pollution caused by stormwater runoff can damage an economic resource. This kind of education and public

outreach on the topics of stormwater management, water quality protection, and habitat protection may also improve municipal eligibility for Community Rating System (CRS) credits.<sup>75</sup> (The Community Rating System offers a maximum credit of 755 points for stormwater management, some of which can be awarded for the requirement of LID as a condition of development or redevelopment.)

### **Integrate Low Impact Development Into Rebuilding Activities**

The rebuilding activity in Tuckerton and Little Egg Harbor taking place after Hurricane Sandy offers an opportunity to use LID<sup>76</sup> techniques that help to absorb stormwater on site. Reducing stormwater runoff can mitigate localized flooding in some situations and improve water quality, since percolation of stormwater through the soil helps to remove contaminants before it runs into local water bodies.

#### *Recommendations:*

- Little Egg Harbor and Tuckerton should seek training on LID for the planning and zoning boards and planning and engineering staff and find ways to incorporate LID techniques into their land development ordinances.
- The municipalities should provide educational materials on LID, along with training sessions, to residents who are rebuilding, as a way to describe the options available for resilient design.

75. The Community Rating System is a voluntary program that provides communities with financial incentives to go beyond the minimum floodplain management requirements set by the National Flood Insurance Program. More information on the CRS can be found here: [http://www.fema.gov/media-library-data/1395661546460-d6859e8d080fba06b34a6f1a4d0abdba/NFIP\\_CRS\\_March%202014%20508.pdf](http://www.fema.gov/media-library-data/1395661546460-d6859e8d080fba06b34a6f1a4d0abdba/NFIP_CRS_March%202014%20508.pdf)

76. Low Impact Development (LID) and green infrastructure refer to techniques that minimize the impact of development by managing stormwater on site. Measures include pervious pavements, rain barrels and rain gardens. See page 28 for a more detailed description.

# APPENDIX A

## MEETING ATTENDEES

### ***Initial Pinelands Commission Meeting***

**Date: July 30, 2014**

**Location: Pinelands Commission**

Larry Liggett, Pinelands Commission  
Joseph Sosik, Pinelands Commission  
Kim Laidig, Pinelands Commission  
John Bunnell, Pinelands Commission  
Jaclyn Rhoads, PPA  
Amy Karpati, PPA  
Carleton Montgomery, PPA  
Chris Sturm, New Jersey Future  
Nick Dickerson, New Jersey Future  
Dan Van Abs, Rutgers  
Tim Evans, New Jersey Future

### ***Report Presentation to NJDEP***

**Date: April 15, 2014**

**Location: 401 E. State Street, Trenton**

Meeting at DEP (April 15, 2014)

Leslie McGeorge, NJDEP  
Michele Putnam, NJDEP  
Alena Baldwin-Brown, NJDEP  
Patricia Gardner, NJDEP  
Jason Lonardo, NJDEP  
Victor Poretti, NJDEP  
Jack Pflaumer, NJDEP  
Jeffrey L. Hoffman, NJDEP  
Jennifer Myers, NJDEP  
Jaime Ewalt-Gray, NJDEP  
Julie Krause, NJDEP  
Liz Semple, NJDEP  
Janice Brogle, NJDEP  
Jim Murphy, NJDEP  
Terry Pilawski, NJDEP  
Donna Milligan, NJDEP  
Barbara Hirst, NJDEP  
Nick Procopio, NJDEP  
Kimberly Cenno, NJDEP  
Jeffrey Reading, NJDEP  
Bill Purdie, NJDEP  
Ovidiu Petriman, NJDEP  
Nick Dickerson, New Jersey Future  
Chris Sturm, New Jersey Future  
Tim Evans, New Jersey Future  
Carleton Montgomery, PPA  
Rich Bizub, PPA  
Dan Van Abs, Rutgers

### ***Report Presentation to Pinelands Commission***

**Date: April 15, 2014**

**Location: Pinelands Commission**

Larry Liggett, Pinelands Commission  
John Bunnell, Pinelands Commission  
Joe Sosik, Pinelands Commission  
Ed Wengrowski, Pinelands Commission  
Chris Sturm, New Jersey Future  
Nick Dickerson, New Jersey Future  
Dan Van Abs, Rutgers

### ***Case Study Presentation #1***

**Date: April 24, 2014**

**Location: Tuckerton/Little Egg Harbor**

Leah Yasenchak, New Jersey Future  
David Johnson, Little Egg Harbor MUA  
Michael Fromosky, Little Egg Harbor  
Paul Hart, Tuckerton Seaport  
Gene Kobryn, Little Egg Harbor  
Jenny Gleghorn, Tuckerton  
Tim Evans, New Jersey Future  
Nicholas Dickerson, New Jersey Future  
Chris Sturm, New Jersey Future  
Dave Fuller, Little Egg Harbor  
Rich Bizub, PPA  
Jim Edwards, Tuckerton

### ***Case Study Presentation #2***

**Date: April 29, 2014**

**Location: Hammonton**

Chris Jage, Hammonton  
Dan Bachalis, Hammonton  
Mayor Steve DiDonato, Hammonton  
Rich Bizub, PPA  
Jaclyn Rhoads, PPA  
Nick Dickerson, New Jersey Future  
Chris Sturm, New Jersey Future

### ***Case Study Presentation #3***

**Date: May 8, 2014**

**Location: Medford/Evesham**

William Cromie, Evesham  
Nancy Jamanow, Evesham  
Ila Vassallo, Evesham  
Paul E. Hayden, Medford Lakes  
Jeff Dyremose, Medford Lakes  
Robert D. Hanold, Sr., Medford Lakes

Carleton Montgomery, PPA  
Beth Portocalis, Medford  
Regina Kinney, Evesham  
Nicholas Dickerson, New Jersey Future  
Chris Sturm, New Jersey Future

### ***Recommendation Development Meeting***

**Date: July 7, 2014**

**Location: 401 E. State Street, Trenton**

Nicholas Dickerson, New Jersey Future  
Chris Sturm, New Jersey Future  
Rich Bizub, PPA  
Ginger Kopkash, NJDEP  
Larry Liggett, Pinelands Commission  
Dan Van Abs, Rutgers  
Fred Sickles, NJDEP  
Dan Kennedy, NJDEP  
Nick Angarone, NJDEP  
Jeff Hoffman, NJDEP  
Jaime Ewalt Gray, NJDEP  
Michele Putnam, NJDEP  
Nancy Wittenberg, Pinelands Commission  
Jim Murphy, NJDEP

# APPENDIX B

## PINELANDS PRESERVATION ALLIANCE'S PROPOSED REGULATORY AND PLANNING THRESHOLDS FOR KIRKWOOD-COHANSEY AQUIFER ALLOCATIONS

The NJ Department of Environmental Protection currently reviews all requests for allocations of water from the Kirkwood-Cohansey aquifer and other fresh water sources. The thresholds the Department applies have proven inadequate to protect the aquifer from the cumulative and individual impacts of withdrawals on surface waters. The Pinelands Commission, at least in theory, also reviews all allocation requests, but historically has not applied any specific thresholds to protect Pinelands resources from the impacts of removing water from the aquifer.

Pinelands Preservation Alliance proposes that both agencies adopt and apply the following three-tiered regulatory thresholds to all Kirkwood-Cohansey aquifer allocation requests. These thresholds derive from the state's Kirkwood-Cohansey Aquifer Study and are based on biological effects and indicators.

### 1. Kirkwood-Cohansey Only As Last Resort

New or increased allocations from the Kirkwood-Cohansey, or withdrawals that will affect the Kirkwood-Cohansey, should only be approved if there are no alternative sources for a demonstrated need. Alternative sources include, at a minimum, confined aquifers, bulk purchases from non-Kirkwood-Cohansey sources, conjunctive uses and water conservation.

### 2. Threshold at a "Regional" Scale - Percent of Recharge:

The agencies should not permit any new or increased allocation that, individually or cumulatively with other current or pending allocations, would exceed stated percentages of recharge at the watershed level.

We specifically recommend the following thresholds be applied either at the HUC-14 scale or by Pinelands CMP Management Area within each municipality:

- a. No withdrawals permitted in the Pinelands Preservation Area, unless in a Pinelands Village as addressed below.
- b. Do not exceed 5% of recharge for the defined area in which the withdrawal would take place, when all or part of the area is in the Pinelands Preservation, Forest Management or Rural Development Areas, or a Pinelands Village within the Preservation Area.
- c. Do not exceed 15% total withdrawal as a percentage of recharge, when the area is entirely in Pinelands Regional Growth Areas, Pinelands Towns, Pinelands Village not within the Preservation Area, or a Military and Federal Installation area.

Withdrawing 5% of recharge from the Kirkwood-Cohansey has been found by the Pinelands Commission to be associated with alteration of ecological metrics such as changes in wetland class and conversion of wetlands to uplands. Withdrawing 15% of recharge is associated with more significant impacts to stream flow in addition to wetland impacts.

### 3. Threshold at the Local Scale - Impacts to Wetlands:

The agencies should also set a threshold on anticipated impacts to wetlands due to a new or increased allocation.

PPA specifically recommends the adoption of the following thresholds based on impacts to wetlands, which can be evaluated using either or both of the Theim or the Gompertz equation models analyzed in the Kirkwood-Cohansey Study:

- a. No more than a 15cm drawdown of wetlands across 10% of total wetland area within the relevant HUC-14, when the HUC-14 lies all or in part in the Pinelands Preservation, Forest Management or Rural Development Areas,
- b. No more than a 15cm drawdown of wetlands across 15% of total wetland area within a HUC-14, when the HUC-14 lies entirely in Pinelands Regional Growth Areas, Pinelands Towns or a Military and Federal Installation area.

A drawdown level of 15cm is a reasonable threshold, as this level of drawdown has been shown in studies conducted by the Pinelands Commission to impact wetland communities, particularly populations of a federally endangered wetland plant species, *Helonias bullata* (swamp pink). An extent of 10% of total wetland area experiencing 15cm of drawdown is a reasonable threshold in ecologically sensitive areas because this is the approximate value associated with a 5% withdrawal:recharge ratio. A 5% withdrawal:recharge ratio has been shown by the Pinelands Commission to be associated with changes in ecological metrics such as changes in wetland class and conversion of wetlands to uplands.

An extent of 15% of total wetland area experiencing 15cm of drawdown is a reasonable threshold in more developed (or developable, as per Pinelands regulations) areas, as this value is correlated with a 10% withdrawal:recharge ratio. And, as shown by the Pinelands Commission, a 10% withdrawal:recharge ratio has more significant impacts on stream flow in addition to wetland impacts.

## ABOUT NEW JERSEY FUTURE

Founded in 1987, New Jersey Future is an independent not-for-profit organization, working for better development and quality growth in the Garden State. New Jersey Future focuses on promoting smart growth and advancing implementation of the State Development and Redevelopment Plan by conducting research and analysis on key issues, building consensus for broad solutions, hosting events to educate and inform, and implementing plans on the local level to build stronger, more resilient communities.



## ABOUT THE AUTHORS

### **Chris Sturm** *Senior Director of State Policy*



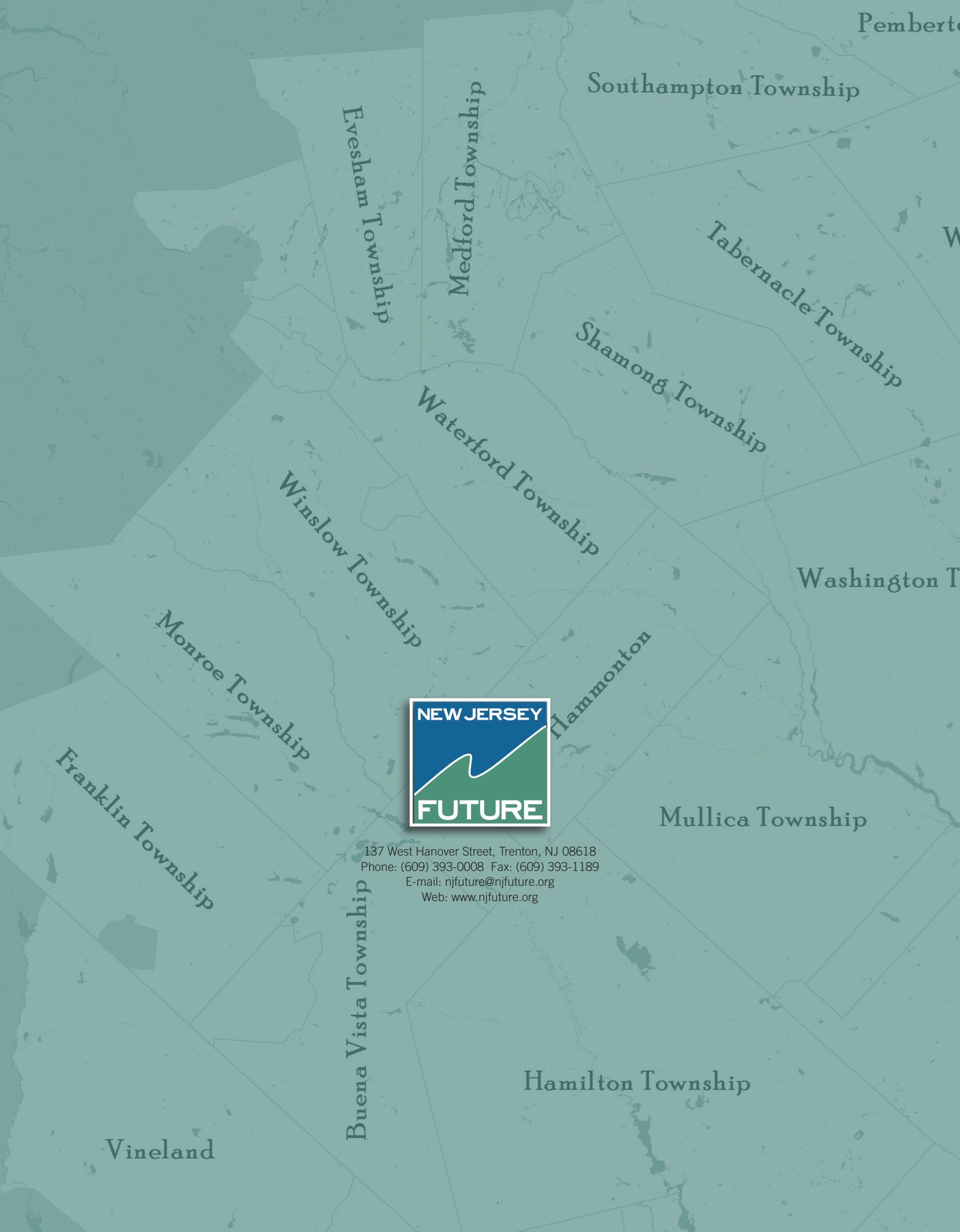
Chris Sturm directs New Jersey Future's policy development and advocacy across a host of issues including state and regional planning, sustainable infrastructure, and incentives for compact, equitable development. She spearheaded the adoption of legislation authorizing better cluster development tools, and is frequently quoted in the media. Chris is a member of the Clean Water Council of New Jersey and the New Jersey Climate Adaptation Alliance. Her career experience includes serving as the assistant director of the Capital City Redevelopment Corporation, as well as working for the MSM Regional Council (now PlanSmart NJ), the Eagleton Institute, and the Office of State Planning. She holds a master's degree in public affairs from the Woodrow Wilson School at Princeton University, where she concentrated in urban and regional planning.

### **Nicholas Dickerson** *Planning and Policy Analyst*

Nick focuses on policy and planning initiatives ranging from research to on-the-ground implementation, focusing on issues including water and natural resources, sustainable infrastructure and ways to develop compact, livable communities. Prior to joining New Jersey Future, he served as the community and natural resource planner for Pike County, Pennsylvania, where he monitored implementation of the county open space plan, provided planning assistance to local municipalities, coordinated the county's shale gas task force and communicated with print and televised media on planning projects. Recently Nick was selected to participate as a member of the Environmental Leadership Program's Eastern Regional Fellowship Class of 2014.







Pemberton

Southampton Township

Evesham Township

Medford Township

Tabernacle Township

Shamong Township

Waterford Township

Winslow Township

Washington T

Monroe Township

Hammononton



Mullica Township

Franklin Township

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Buena Vista Township

Hamilton Township

Vineland