

White Paper on Climate Change Solutions for the Pinelands of New Jersey

Provided to: New Jersey Pinelands Commission

Provided by: Pinelands Preservation Alliance

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Summary

The Pinelands Commission is responsible for protecting the natural resources within the 1.1 million acres of the Pinelands National Reserve. The threats of development to water quality, water supply, plant and animal habitat still exist, but a potentially greater threat looms with climate change. Although more difficult to control and mitigate, it is still within the purview of the Pinelands Commission body to address.

Pinelands Preservation Alliance (PPA) created this white paper to provide suggestions on next steps for addressing climate change. Many of the suggestions are changes that have been pending with the Commission for years such as the recommendations from the Kirkwood Cohansey Aquifer study. Pinelands Preservation Alliance wants to help the Pinelands survive this change, and developed this white paper to document the impacts, potential changes, and opportunities. PPA would like to offer its assistance in further evaluating and implementing these changes.

A summary of our recommendations are as follows:

1. Adopt changes to reflect recommendations in KC Aquifer study.
2. Update stormwater requirements to include redevelopment, monitoring for at least five years, and non-structural requirements.
3. Assist municipalities in revising and adopting Climate Change and Hazard Vulnerability Assessments.
4. Adopt Pinelands Development Credit changes to incentivize more compact and mixed-use development.
5. Update list of Endangered and Threatened Plant Species to include protection of *all* listed plant species of concern.
6. Request DEP implementation of Prescribed Burn Bill.
7. Incorporate Coastal Area Facility Review Act (CAFRA) areas under Pinelands Commission jurisdiction.
8. Adopt no net tree loss.
9. Review Ecological Integrity Assessment and DEP mapping to determine if management area changes are needed to accommodate migration.

Introduction

Earth's climate is the average of all the world's regional climates. Therefore, climate change is defined as a change in the typical or average weather of a region or city as defined by NASA. A change in the climate could be a change in a region's average annual rainfall or a city's average temperature for a given month or season.

According to New Jersey's State Climatologist, New Jersey's climate has changed. New Jersey Department of Environmental Protection (NJ DEP) created a webpage specific to climate change indicators, impacts, and solutions at <https://www.nj.gov/dep/climatechange/data.html>. The DEP states on this page that:

During the last century, New Jersey has experienced rising temperatures, increased rainfall, more frequent extreme weather events and rising sea levels. These changes are the result of increasing greenhouse gas emissions in the atmosphere due to human activities such as the burning of fossil fuels (coal, oil, and natural gas), agriculture, and land clearing.

- New Jersey's average annual temperatures have increased by 2.2°F since 1900.
- Since 1980 New Jersey has begun to experience more rapid warming, with five of the warmest years occurring after 1998.
- 2012 was the warmest year on record for New Jersey, with an average temperature that was 2.8°F above the 1981-2010 mean.

Globally, sea level rose roughly 8 inches over the past 100 years. Along the coast of New Jersey, sea level has risen an additional 4 to 8 inches during the past 100 years due to subsidence (a sinking of the ground surface due to natural geological processes and/or human influences like removal of groundwater for human use) in the mid-Atlantic region. Total relative sea level rise (the combination of rising seas and subsidence) in New Jersey over the past 100 years is therefore approximately 12 to 16 inches.¹

In addition, the U.S. National Climate Assessment notes that the Northeast United States has already seen “a greater increase in extreme precipitation than any other region” with a roughly 70 percent increase in intense storms between 1958 and 2010, defined as the heaviest 1 percent of precipitation events.² Global Circulation Models (GCMs) are used to assess the potential for climate change globally and in major regions of the world. On average, GCMs indicate that our region of the nation may experience a further increase in the intensity of storms.³

¹ U.S. Climate Change Science Program (USCCSP) Report. <http://downloads.climate-science.gov/sap/usp/usp-prd-all09.pdf>

² Horton, R., G. Yohe, W. Easterling, R. Kates, M. Ruth, E. Sussman, A. Whelchel, D. Wolfe, and F. Lipschultz. 2014: Ch. 16: Northeast. Climate Change Impacts in the United States: The Third National Climate Assessment, J. M. Melillo, Terese (T.C.) Richmond, and G. W. Yohe, Eds., U.S. Global Change Research Program, 371-395. doi:10.7930/JOSF2T3P. Available from: <http://nca2014.globalchange.gov/report/regions/northeast>

³ <https://njadapt.rutgers.edu/docman-lister/conference-materials/166-climate-change-adaptation-in-water-supply-sector-final-1/file>

On June 30, 2020 the NJ DEP produced a “Scientific Report on Climate Change”. Key points that are relevant to the Pinelands include:

1. “Water supplies will be stressed from the increase in the growing season and extreme temperatures expected due to climate change.”
2. “Surface and groundwater quality will be impaired as increased nutrients and contaminants enter waters due to runoff from more intense rain events.”
3. “The persistence of Southern pine beetle in New Jersey represents an early example of the destruction of invasive pests that can occur due to climate change impacts.”
4. “Wildfire seasons could be lengthened and the frequency of large fires increased due to the hot, dry periods that will result from increased temperatures.”
5. “Atlantic white cedar, a globally rare species, is expected to lose habitat to New Jersey because of rising sea levels.”
6. “Some vernal ponds may even disappear due to drought.”

What does this all mean for the Pinelands? How can the Pinelands Commission address this threat?

The Pinelands has experienced changes and will continue to do so with increases in temperature, precipitation, wildfire risk, flooding, and invasive pests. The Pinelands Commission can play a role to help mitigate future climate change and foster opportunities for adaptation. The Coastal Flood Exposure Mapper⁴ is a great tool to analyze flooding risk in New Jersey. The Mapper, created by the National Oceanic and Atmospheric Administration, color codes regions according to the number of hazards that an area may experience now and into the future. Yellow indicates the least number of hazards, and the dark red indicates an area that can experience the most hazards. These hazards include high tide flooding, sea level rise anywhere from one to three feet above mean higher high water⁵, and storm surge categories 1, 2 and 3. In addition, each of these highlighted areas are designated a FEMA⁶ zone which is defined as the area that will be inundated by the flood event having a 1-percent chance of being equaled or exceeded in any given year. The 1-percent annual chance flood is also referred to as the base flood or 100-year flood⁷.

Screen shots are shown below that provide examples of high hazard areas in the Pinelands. Many of the areas in red include a hazard of 7 or greater which are all the hazards listed above. Some of the locations included in these zones are Bass River, Hammonton, Port Republic, Washington Township, Mullica Township, Mays Landing, Tuckahoe, and Galloway.

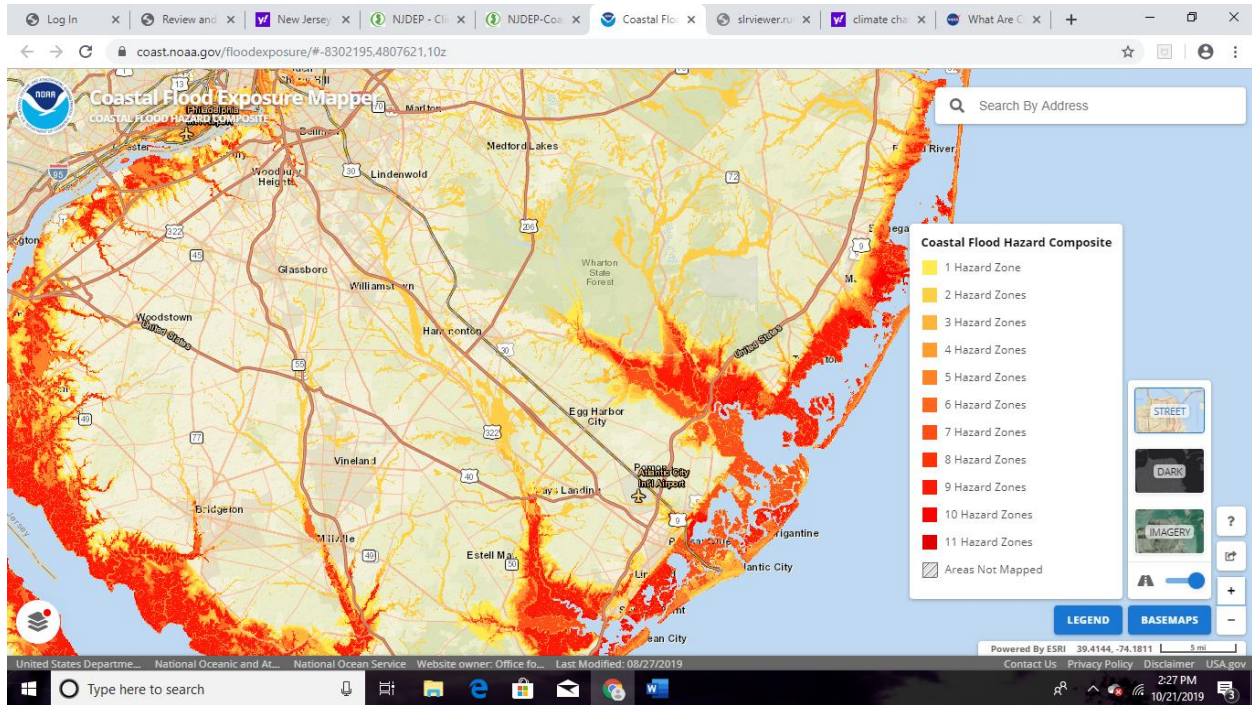
⁴ <https://www.coast.noaa.gov/floodexposure/#-8302195,4807621,10z>

⁵ The mean higher high water (MHHW), is the average height of the highest tide recorded at a tide station each day during the recording period. It is used, among other things as a datum from which to measure the navigational clearance, or air draft, under bridges.

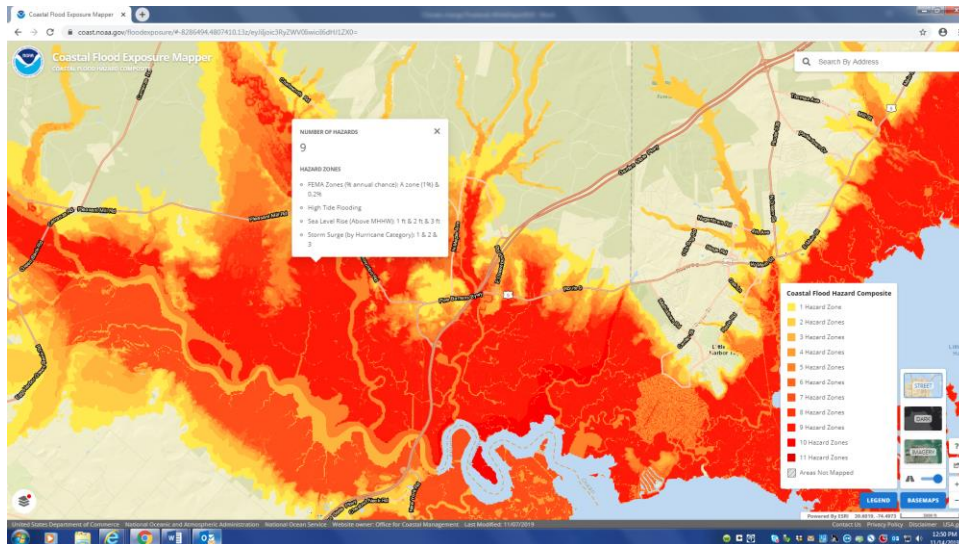
⁶ <https://www.floodsmart.gov/why/all-about-flood-maps>

⁷ <https://www.fema.gov/flood-zones>

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Besides the direct risk to people and property during flood events, water supply and quality are impacted because higher flows increase sediment, nutrient, and contaminant loads in surface waters used by downstream water users and ecosystems. Mineral weathering products, like calcium, magnesium, sodium, and silicon and nitrogen loads have been increasing with higher streamflows. Changing land cover, flood frequencies, and flood magnitudes are expected to increase mobilization of sediments in large river basins.⁸ Pinelands Commission actions can't stop the flooding, but changes made to the Comprehensive Management Plan (CMP) can help to adapt to and/or limit additional changes.



⁸ <https://nca2014.globalchange.gov/report/sectors/water/content/water-quality-risks-lakes-and-rivers>

1. Adopt Kirkwood-Cohansey Aquifer Study Changes

The Pinelands Commission has placed a high value on the Kirkwood-Cohansey aquifer system since the Commission's inception. The Pinelands CMP permits diversions from the Kirkwood-Cohansey system 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. When water is obtained from the Kirkwood-Cohansey, the Commission has also acted to control transfers of water between watersheds from water supply distribution and/or centralized wastewater systems. In addition, State legislation (N.J.S.A. 58:1A-7.1) prohibits the exportation of surface and groundwater beyond ten miles from the boundary of the Pinelands National Reserve.

The Commission's concern with the Kirkwood-Cohansey system is amply justified. Since this shallow aquifer provides from 80 to 95 percent of baseflow to streams and associated wetlands within the Pinelands, removal and distribution of water from this aquifer is of particular concern so as not to reduce streamflow and negatively impact wetlands and aquatic species. As noted above, climate change increases the risk of drought and excessive water flow during major storm events. Several findings and episodes below illustrate the vulnerability of the Kirkwood-Cohansey and associated habitats to excessive water withdrawals or poorly located wells which gives greater urgency to implementing ways to reduce this vulnerability.

- In February 1987, the Camden County Municipal Utilities Authority prepared a water quality management plan for Chesilhurst Borough, Waterford Township, and Winslow Township. The proposal called for the transfer of sewage from the Regional Growth Areas of these Pinelands townships to the Delaware Basin. It was determined that if the Kirkwood-Cohansey aquifer was used for water supply, the interbasin transfer of all of the wastewater to the Delaware River Basin would impact the flow of streams entering Wharton State Forest.⁹
- The Pinelands Commission found that the use of the Kirkwood-Cohansey aquifer to supply water for projected buildout of the Regional Growth Areas in Hamilton Township and portions of Galloway Township would significantly deplete stream flows, if wastewater was exported out of the area via sewers.¹⁰
- In Berlin Township, Camden County, approval for a municipal water supply well was rescinded when it was determined that withdrawals from the Kirkwood-Cohansey was impacting Swamp Pink, a plant that is federally listed as threatened pursuant to the Endangered Species Act.
- During 2003, a private water company's request for a 20 percent increase in allocation from the Kirkwood-Cohansey aquifer was thwarted when it was determined that there would be a loss of stream flow, and associated impacts to

⁹ Pinelands Commission. 1988. An assessment of sewer and water supply alternatives for Pinelands growth areas in the Mullica River Basin, Camden County. Pinelands Commission, New Lisbon, New Jersey, USA.

¹⁰ Schock, D. A. 1990. An assessment of the hydrologic impact resulting from development in regional growth areas in Hamilton Township, Atlantic County. Pinelands Commission, New Lisbon, New Jersey, USA.

Knieskern's beaked-rush, a Federal and New Jersey listed threatened wetlands plant. Seeing no alternative, the water company installed a new well to a depth of 1225 feet in a deeper aquifer.

In 2001, the State provided \$5.5 million in funding through the "Gibson Bill," N.J.P.L. 2001 c. 165, to study the aquifer, and the federal government subsequently provided additional funds to the project. The study came about in response to two growing concerns: the increasing demand for water to serve growth in South Jersey, and the recognition that while the Kirkwood-Cohansey is a readily available source to help meet this demand, it is also critical to the surface ecology of the region.

Based on the numerous reports completed to date as part of the study and the findings from the Pinelands Science-Policy Forum on the Kirkwood-Cohansey Aquifer, Pinelands Preservation Alliance (PPA) recommends specific science-based amendments to the CMP to protect the Pinelands environment. PPA recommends the following:

1. *Rules for Controlling Impacts of New or Increased Allocations:*

- For potential impacts to streams and rivers: Institute ecologically based thresholds for new or increased allocations from the Kirkwood-Cohansey Aquifer by using low flow margin, percent of 7Q10, or percent of drought of record, but with the ecological passing flow as a floor or limit in all cases.
- For potential impacts on wetlands: Require species-specific and Pinelands pond-specific criteria for judging acceptable versus unacceptable impacts of withdrawals on wetlands.
- Require quantifiable water conservation measures in the same sub-watershed to offset expected impacts of new and increased withdrawals.
- Incentivize all water conservation measures as part of permitting for new or increased allocations.
- Set a regulatory trigger that suspends new or increased allocations, or reduces existing allocation limits, in a watershed when a trend of increasingly severe impacts of current withdrawals shows the modeling on which permits are based is inaccurate.
- Require recipients of allocations to monitor and report streamflow and water table changes in the future.
- Permit no reductions of existing wetlands for applications for a new or increased allocation from the KC aquifer.
- Require all applicants to show that other sources are not available before using the KC aquifer.

2. *Water Supply Planning:*

- Set targets for total withdrawals from the aquifer in each basin/sub-basin and provide suggested water supply alternatives.
- Using available information from the New Jersey Geological Survey regarding water withdrawals, uses, transfers, and discharges, set limits on total withdrawals from the aquifer in each basin and identify required water supply alternatives.

- Design plans to maintain current ecological functions and restore natural flow and water levels where existing withdrawals have already reduced flows or water levels.
- Set explicit criteria for determining when each potential alternative source will be considered available, desirable and required for consideration by purveyors.
- Incorporate water supply alternatives into targets, limits and options for those basins where the aquifer is already stressed.
- Incorporate impacts to and withdrawals from connected aquifers, such as the Atlantic City 800-foot Sands.

2. Adopt Changes to the Stormwater Management Rules

According to a November 2010 Report by the New Hampshire Stormwater Study Commission, “Through its work, the Commission found that stormwater is recognized as one of the leading causes of water pollution in the United States.” States cannot meet their requirements under the Clean Water Act unless aggressive measure are taken to address stormwater. The report further adds, “While the monetary cost of managing stormwater is high, the potential cost of inaction is even higher. Without new programs, new revenue sources, and a significant shift of thinking, the state will likely experience even more extensive flooding and degradation of water resources.”¹¹ We applaud the changes adopted and proposed so far by the Pinelands Commission and recommend additional changes for incorporation.

In particular, PPA suggests the following:

1. Incorporate non-structural stormwater requirements into site design. PPA agrees that the former stormwater requirements needed improvement, but removal of strategies that are absolutely necessary for environmental protection and stormwater reduction does not make sense. In addition, placing these requirements in only the stormwater management plan by municipalities creates unnecessary conflict and confusion for developers.

When NJ Department of Environmental Protection removed the non-structural stormwater requirements, it created the possibility that developers could clear out vegetation and trees and place rain gardens or other “green” infrastructure and receive approval unless towns have ordinances that specifically limit clearance or provide tree protection. This process is detrimental to water quality, habitat, and water supply.

The Pinelands Commission should adopt and clarify non-structural requirements. For example, Strategy 1 of the non-structural stormwater requirements¹², “Protect areas that provide water quality benefits or areas particularly susceptible to erosion and sediment loss.” The rules should require identification of riparian buffers, corridors, highly

¹¹ New Hampshire House Bill 1295 Chapter 71 Laws of 2008 Stormwater Study Commission Final Report November 2010.

¹² State of New Jersey, Department of Environmental Protection. (2004). *New Jersey Stormwater Best Management Practices Manual*. Retrieved from https://www.njstormwater.org/bmp_manual/NJ_SWBMP_2%20print.pdf

erodible soils, and wetlands and require no disturbance. Another option is to disconnect anything over 10% of impervious cover to better define Strategy 2.

2. All new stormwater management/green infrastructure should require 5 years of “monitoring” to guarantee the performance of the systems. Monitoring doesn’t necessarily mean setting up a test well, but making sure that it is draining or functioning as designed. There should also be a bonding requirement so that there is a financial guarantee that the systems will work long term and that there is money available for the municipalities to use to fix failing systems. If the systems fail by year 4, the guarantee period should resume again to make sure there is a time frame of 3 to 5 years of proper functioning before returning the bond funds.
3. Redevelopment projects should be required to meet the stormwater requirements. New Jersey will never improve its water quality unless we address the problems of the past.

3. Incorporate changes to Pinelands Development Credits

As currently structured, the Pinelands CMP’s transferable development rights program requires developers to purchase PDCs as a condition of building at *higher* densities. This structure provides a financial incentive to build at lower density and provides no incentive to adopt any other beneficial design feature in a development plan. Thus, the current structure encourages exactly the kind of sprawl development that most harms environmental, scenic and cultural values. The current system has also been slow to generate demand for PDCs in some growth areas, as builders have stuck with lower density subdivision designs.

PPA supports amending the PDC rules to reverse these incentives and to make the PDC system a positive incentive to build in a more environmentally and socially beneficial fashion. The Commission has already developed an extensive amendment to the PDC program that was fully reviewed by the Commissioners and reviewed by the public. PPA fully supports moving forward with these previously identified changes.

In general terms, we support the program that a developer:

- a. must buy PDCs to build at *low* density or with a reduced wetlands buffer as defined by the buffer delineation model;
- b. need not buy PDCs, or must buy a much lower number of PDCs, if developer builds using design features such as the following:
 - retain a 300-foot buffer to wetlands
 - manage stormwater using only non-structural stormwater strategies
 - have multi-use structures

We also hope that the original amendment for applying the PDC program to include non-residential (essentially commercial) structures to create incentives for reducing impervious coverage will still be included for consideration in plan review. This change would only apply in a small number of cases.

4. Offer Assistance to NJ Department of Environmental Protection to Review and Provide Guidance to Municipalities for Completing Climate Change-Related Hazard Vulnerability Assessments

A climate change-related hazard vulnerability assessment is meant to identify risks, vulnerabilities, and impact to communities, provide a rationale for allocating resources, and guide municipalities in considering climate change impacts on development. Senate Bill 2607 was signed into law February 2021 and requires municipalities to include in the land use element of their master plans a climate change-related hazard vulnerability assessment, which includes but is not limited to:

- Environmental effects and weather events associated with climate change
- Mitigation of reasonably anticipated natural hazards
- Current and future vulnerabilities in the municipality associated with climate change
- Build-out analyses of future development in the municipality and an assessment of the vulnerabilities related to that development
- Critical infrastructure for evacuation and life sustainability during a natural disaster
- Risk reduction strategies and design standards
- The most recent natural hazard projections and best available science provided by NJDEP.

The Pinelands Commission should offer assistance to NJ DEP and municipalities to review these assessments. First, the Pinelands environment is unique and so will face distinct challenges from climate change. Pinelands Commission staff have the expertise to keep the region's unique characteristics and vulnerabilities in mind when defining what areas municipalities should address in a hazard vulnerability assessment. Second, because Pinelands municipalities must submit proposed master plan changes to the Commission, the municipalities will have to ensure their assessments conform to the CMP and the Commission can thus exercise a level of oversight of the assessments.

An additional option is for the Pinelands Commission to spearhead a grant program, with funds perhaps coming from multiple sources. Grants could be offered to incentivize municipalities to write climate change-related hazard vulnerability assessments, and implement redesigns and retrofits of municipal infrastructure to address their respective vulnerabilities. By way of example, the Commonwealth of Massachusetts created a Climate Municipal Vulnerability Program, wherein municipalities can receive support to first identify their climate hazards, and then implement actions to address them. The program is divided into two components: planning grants and action grants. As part of the planning process in identifying climate hazards, the municipality must go through a community-driven process that prioritizes the voices of all affected communities and identifies environmental justice populations. Once planning is completed, municipalities may then be eligible to apply for action grants to carry out various works, including green infrastructure, improved stormwater management, and nature-based solutions for public health. To date, an overwhelming majority of municipalities in

Massachusetts have participated in the planning phase, and nearly half have embarked on action grant projects.¹³

5. Adopt List of Plant Species of Concern

The overriding purpose of the Pinelands Protection Act and the CMP is to conserve the Pinelands' natural resources. Both the Act and the CMP recognize that conservation of characteristic Pinelands resources includes protection of endangered and threatened flora and fauna. The CMP recognizes this policy specifically through its prohibitions on development at 7:50-6.27, "Development prohibited in the vicinity of threatened or endangered plants." This section reads, "No development shall be carried out by any person unless it is designed to avoid irreversible adverse impacts on the survival of any local populations of those plants designated by the Department of Environmental Protection as endangered plant species pursuant to N.J.A.C 7:5C-5.1 as well as the following plants, which are hereby found and declared to be threatened or endangered plants of the Pinelands" and is followed by a list of 54 plant species. The background story of how these protections came to be is too complex to briefly summarize here, but the main point we would like to make is that without protecting all of the plant species occurring in the Pinelands which are tracked by the New Jersey Department of Environmental Protection's Natural Heritage Program and therefore classified by the Natural Heritage Program as "endangered" plant species and plant "species of concern," the CMP is not providing the environmental protections it was enacted to provide, and climate change is going to make conditions for these species worse. Unless the Pinelands Commission take immediate action to protect them now, the Pinelands can lose more species than expected.

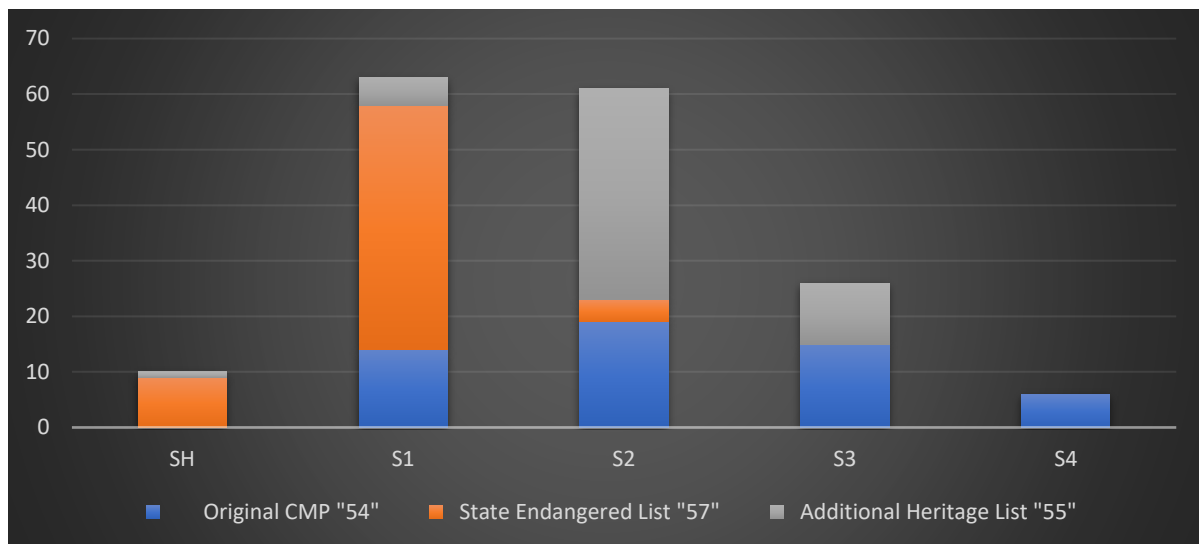
Currently, the CMP does not protect all threatened and endangered species of plants, because the list of species in the CMP omits a number of Pinelands species that the State of New Jersey recognizes as threatened. Though the Natural Heritage Program uses the phrase "species of concern" rather than the word "threatened," these species of concern are indeed understood to be threatened. The Federal Endangered Species Act defines "threatened species" as "any species which is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range." As defined in New Jersey's Endangered Plant Species Program rules, "Plant Species of Concern" serves as the official "working list for transition of species to and from the Endangered Plant Species List," and thus fits the federal model of "threatened" on which the CMP's use of the term is based. All Plant Species of Concern at issue in the Pinelands are ranked S1 (critically imperiled), S2 (imperiled), or S3 (rare and may soon become imperiled if current trends continue), with a small number designated SX (determined or presumed to be extirpated) or SH (historically present but no extant occurrences known). These rankings clearly fall under the definition of "threatened" and these species should therefore be protected under 7:50-6.27 which prohibits development "in the vicinity of threatened or endangered plants."

We propose that section 7:50-6.27 be amended to read, "No development shall be carried out by any person unless it is designed to avoid irreversible adverse impacts on the survival of any local populations of those plants listed by the New Jersey Natural Heritage Program as 'Endangered

¹³ <https://www.mass.gov/doc/mvp-webinar-recording-fy21-funding-round/download>

Plant Species and Plant Species of Concern.’” Doing so would bring the Pinelands protections into alignment with the Highlands protection standards, which call for protection of *all* listed plant species of concern. This is the only sensible approach from a conservation perspective. On the following chart:

- The **Gray** bars depict the 54 plant species protected by the original Pinelands Comprehensive Management Plan.
- The **Orange** bars depict 57 species listed on the current State of NJ Endangered Species Plant List. These species are protected as a result of the adoption of the Endangered Species List by the Pinelands Commission. About 19 of these 57 species may not actually occur in the jurisdictional Pinelands, as there are no recent records, or they generally would be expected to occur outside of the boundaries of the Pinelands CMP.
- The **Blue** bars depict 55 unprotected rare species (Heritage Ranks S1, S2, and S3) that do occur within the Pinelands, for which the NJ Heritage Program has accumulated more accurate information than was available 35 years ago as the original CMP list was being formulated.
 - **SH** = State Historic (no extant populations currently known)
 - **S1** = between 1 and 5 populations known
 - **S2** = between 6 and 20 populations known
 - **S3** = between 21 and 50 populations known
 - **S4** = more than 50 populations known.



6. Request DEP implementation of Prescribed Burn Bill

The New Jersey Pine Barrens is a fire dependent ecosystem where frequent fires create a mosaic of varying successional stages across the landscape¹⁴. The natural form of disturbance is important in maintaining the natural communities of fire adapted species we have come to consider characteristic of this region. Periodic burns can reduce shrub cover, maintain an open canopy, and delay the encroachment of late successional species¹⁵. The New Jersey Forest Fire Service for the last 60+ years has employed a wildfire suppression program and has conducted cold weather prescribed burns to control fuel loads¹⁶. Although prescribed burns are effective at reducing fuel load¹⁷, their intensity and fire return intervals may deviate from historical cycles, which may impact the demography of early-successional, fire-adapted species¹⁸. Changes to our natural fire regimes have been documented for decades. Soon after the establishment of the Pinelands Protection Act, ecologists found significant changes in the scale and frequency of fires when compared to pre-1940 levels. While they found the number of wildfires from pre-1940 and 1940-1980 to be approximately the same, total area burned per year decreased significantly (54,000 acres per year to 19,000 acres per year) as well as the frequency of any one location in the pine barrens burning in a given year (every 20 years to every 65 years). This change in fire regime has led to measurable changes in forest composition, primarily near developed areas of the Pinelands. Researchers have found that fire frequency decreases near developed land and upland oak species cover increases in these same areas¹⁹. The change in disturbance regimes has led to a change in forest composition from the characteristic pine forest to an oak dominated forest.

Carbon Sequestration

Increasing carbon sequestration through land management is becoming an increasingly studied strategy particularly for states such as New Jersey that are looking to address and mitigate the impacts of climate change. Wildfires and prescribed burns produce a net release of carbon, but a pair of studies from the US forest service show that even with these forms of disturbance, the forests of the New Jersey Pine Barrens act as a carbon sink. Scheller et al. found that the Pine Barrens of New Jersey are expected to continue to be a carbon sink over the next 100 years in models that reflect current burning practices, an increase in prescribed burns and even a longer response time to wildfire.²⁰ More recent studies have shown that all carbon released during a fire is recovered within 2-3 years in Pine Barren systems²¹. These studies highlight that robust Pine

¹⁴ McCormick, J., and R.T.T. Forman. 1998. Introduction: Location and boundaries of the New Jersey Pine Barrens. In: Forman, R. T. T. (ed.), *Pine Barrens: Ecosystem and Landscape*. Rutgers University Press, New Brunswick, New Jersey

¹⁵ Forman, R.T.T. 1998. *The Pine Barrens of New Jersey: An ecological mosaic*.

¹⁶ Buell, M.F., and J.E. Cantlon. 1953. Effects of Prescribed Burning on Ground Cover in the New Jersey Pine Region. *Ecology* 34:520-528

¹⁷ Clark, D.L., and M.V. Wilson. 2001. Fire, Mowing and Hand-Removal of Woody Species in Restoring a Native Wetland Prairie in the Willamette Valley of Oregon. *Wetlands* 21:135-144

¹⁸ Wilcove, D.S., D. Rothstein, J. Dubow, A. Phillips, and E. Losos. 1998. Quantifying threats to imperiled species in the United States. *BioScience* 48:607-615

¹⁹ La Puma I.P., R.G. Lathrop and N.S. Keuler. 2013. A large-scale fire suppression edge-effect on forest composition in the New Jersey Pinelands. *Landscape Ecology* 28: 1815-1827

²⁰ Scheller R.M., S. Van Tuyl, K.L. Clark, J. Hom and I. La Puma. 2011. Carbon sequestration in the New Jersey Pine Barrens under different scenarios of fire management. *Ecosystems* 14: 987-1004

²¹ Clark, K.I., N. Skowronski and M. Gallagher. 2015. Fire Management and Carbon Sequestration in Pine Barren Forests. *Journal of Sustainable Forestry* 34: 125-146

Barren systems not only thrive on fire but the resulting regeneration captures enough carbon to more than offset the burns, and to even function as a carbon sink.

Prescribed Burning

The duration of the wildfire season in New Jersey may increase as the spring season begins earlier in the year and the summer season is expected to be hotter and last longer. In addition, the winter season when the majority of prescribed burns are conducted is expected to become shorter and wetter²². This has the potential to limit the number of days conducive for prescribed burning. By supporting the implementation of the Prescribed Burn law pass in 2019, the Commission can support the expansion of burning for both safety and ecological reasons. Introducing mixed-severity fires can also be a usefully tool that is found to be more effective than traditional low-severity burns in driving structural complexity and post fire diversity²³. Implementing the Prescribed Burn law may then have the effect of giving burn managers greater flexibility in their burning season but also the leverage needed to conduct burns that can promote the ecological functions we often associate with natural disturbance regimes.

7. Incorporate CAFRA areas under Pinelands Commission jurisdiction.

In considering the unprecedented scale and imminent threat of climate change, it is crucial to consider the Pinelands National Reserve (PNR) holistically, including the land and waters to which the Coastal Area Facility Review Act (CAFRA) applies. N.J.A.C. 7:7-9.42(d) recognizes the direct connection between coastal ecosystems and inland resources: “[b]ecause the living marine resources in the bays and estuaries of the coastal zone depend on the flow of freshwater from the pinelands, changes to the quality and quantity of the pinelands water resource caused by pollution and contamination would have a significant impact on coastal resources.” The original PNR boundary was established to protect specific ecosystems, vulnerable species and their habitats, and vulnerable waters, all of which are now facing increased risk and should all be subject to consistent relief precisely because of their interconnectedness.

The Coastal Zone Management Rules and 1988 Memorandum of Agreement (MOA) between the Pinelands Commission and NJ Department of Environmental Protection (DEP) make an attempt at that consistency in the management of the overlapped area, which was clearly the intent of the Pinelands Protection Act. Section 13:18A-23 states, “[T]he Department of Environmental Protection shall, in consultation with the commission..., review the environmental design for the coastal area as it affects the planning and management of the development and use of any land in the coastal area which is also within the boundaries of the Pinelands National Reserve, make any necessary revisions to such environmental design as may be *necessary in order to effectuate the purposes of this act and the Federal Act...*” (emphasis

²² Runkle, J., K. Kunkel, S. Champion, R. Frankson, B. Stewart, and W. Sweet. 2017. New Jersey State Climate Summary. *NOAA Technical Report NESDIS 149-NJ*, 4 pp

²³ Roberts, C.P., V.M. Donovan, S.M. Nodskov, E.B.Keele, C.R. Allen, D.A. Wedin, and D. Twidwell. 2020. Fire legacies, heterogeneity, and the importance of mixed-severity fire in ponderosa pine savannas. *Fire Ecology and Management* 459: 117853

added). The Coastal Zone Management Rules themselves state, “Coastal development shall be consistent with the intent, policies and objectives of the National Parks and Recreation Act of 1978, P.L. 95-625, Section 502, creating the Pinelands National Reserve, and the State Pinelands Protection Act of 1979 (N.J.S.A. 13:18A-1 et seq.)” The 1988 MOA is even more explicit in mandating the application of Pinelands regulations to sections of the PNR within the Coastal Areas in its second point of agreement, which states, “The Department of Environmental Protection, Division of Coastal Resources (DEP-DCR), agrees to implement the Pinelands Comprehensive Management Plan within the coastal zone”.

Despite this clarity, a lack of coordination between the Pinelands Commission and DEP in the overlapped areas have led to approval of projects held to lesser standards than the rest of the PNR. Some project applications are not sent by the DEP to the Commission for review, and when they are, Commission recommendations are only taken as advisory. Given that coastal areas are at the highest risk for climate impacts, those very areas should be held to the strictest standards allowable by the CMP *and* the CAFRA.

Since the State of New Jersey has adopted both the CMP and CAFRA regulations, resources within the overlapped area should be evaluated in accordance with the standards of both. In the event of different parameters, the strictest should be applied, therefore providing the maximum level of protection to these most vulnerable areas.

Currently, point 4 of the 1988 MOA states that “[b]oth agencies recognize that each agency has the independent authority to approve or deny applications pursuant to its own regulations.” This language should be amended to mandate that both sets of regulations must be upheld, and to remove any question of which standards should be applied. It must be those which provide the greatest level of protections.

8. Adopt No Net Tree Loss

Requiring new developments to limit tree canopy removal and/or compensate for necessary tree removal would help reduce energy consumption, preserve tree function as a carbon sink, improve air quality, and generally contribute to maintaining Pinelands characteristics. This requirement could be implemented in a number of ways through either incentivizing canopy preservation and/or penalizing canopy removal. The CMP already requires certain landscaping and vegetation standards under N.J.A.C. 7:50-6.21, and amendments could be made to this section.

New Jersey already has a requirement for state projects. The New Jersey No Net Loss (NNL) Compensatory Reforestation Act, N.J.S.A. 13:1L-14.1 et. seq., ‘the Act’, requires that a State entity submit a compensatory reforestation plan to the NJ Department of Environmental Protection, New Jersey Forest Service (NJFS), for each project that results in the deforestation of one-half acre (0.5 ac/21,780 square feet) or more on land the State entity owns or maintains. The compensatory reforestation plan shall have a goal of no net loss of existing forested area. Each plan is subject to review and comment by the NJ Community Forestry Council prior to approval

by NJFS. The law requires that the State entity obtain NJFS approval of the compensatory reforestation plan prior to commencing the project.

The Pinelands Commission can adopt a similar provision for all development that result in deforestation of one-half acre or more. Extensive guidance for determining reforestation requirements is provided in New Jersey's program guidelines found here - https://www.state.nj.us/dep/parksandforests/forest/community/pdf_files/NNL_Program_Guidelines.pdf

9. Review EIA and DEP mapping to determine if management area changes are needed to accommodate migration

The following maps have been generated using the NJ Conservation Blueprint Mapper.²⁴ The Conservation Blueprint is an interactive mapping tool that empowers users to identify land best suited for conservation. A consortium of non-profit organizations, universities, state and local agencies oversaw the development of this tool and continue to oversee updates to the maps that are available to the public.

Included below is a reference called Connecting Habitats Across New Jersey (CHANJ) Habitat Stepping Stones. CHANJ is an effort to make our landscape more permeable for terrestrial wildlife by identifying key areas and actions needed to preserve and restore habitat connectivity across the state. This initiative is designed to help 1) prioritize land protection, 2) inform habitat restoration and management, and 3) guide mitigation of barrier effects on wildlife and habitats. CHANJ offers tools and resources to guide these goals forward in a strategic way and help target local, regional, and state planning efforts. The tools also help land use, conservation, and transportation planners to be more proactive and collaborative, which reduces conflict and saves time and money. The success of CHANJ depends on partnerships to implement its guidance.²⁵

Areas of currently unpreserved lands are displayed in red, orange, and pink, and CHANJ Habitat Stepping Stones are identified in brown. Areas displayed are within the Pinelands, but the Pinelands reference layer was removed to make the maps more legible. We are recommending that the Pinelands Commission target lands for preservation or evaluate potential changes to management areas for the lands that are:

- (1) Connected to wildlife habitat cores and corridors as identified by the NJDEP CHANJ maps
- (2) Overlap with CHANJ Stepping Stones
- (3) Are located within Pinelands Regional Growth or Rural Development Areas.

PPA is happy to share the maps as generated below at the request of the Pinelands Commission staff, but John Hasse with Rowan University is the expert for NJ Conservation Blueprint Mapper. He offered to provide an overview to the Pinelands Commission, and PPA highly encourages the Commission to take him up on his offer.

²⁴ www.njmap2.com

²⁵ https://www.njfishandwildlife.com/ensp/chanj_guidance.pdf

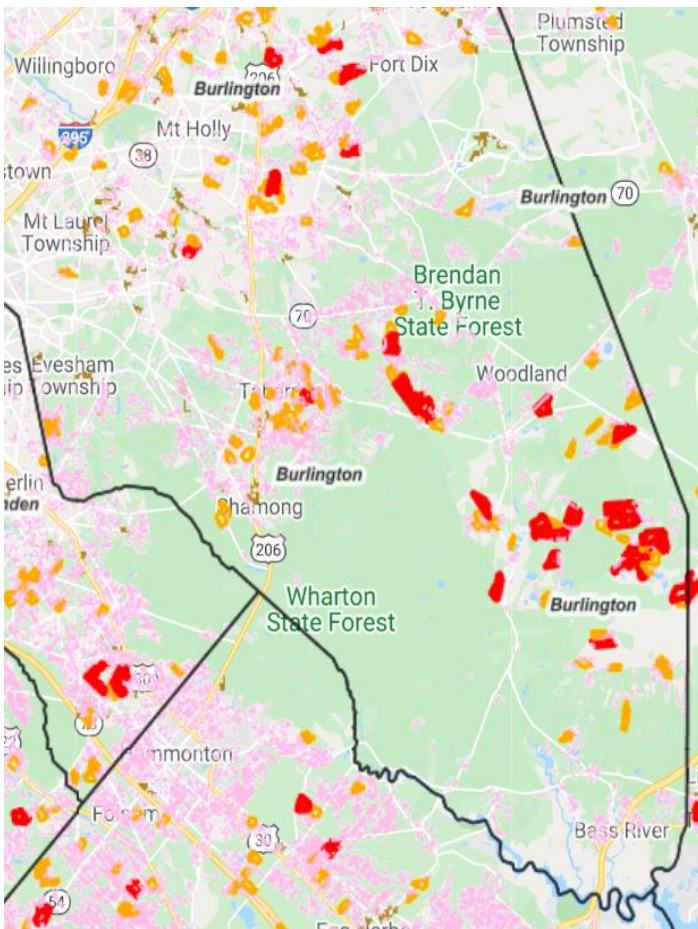


Figure 1 Unpreserved land in Burlington County (Red, Pink, Orange) and Stepping Stone habitat areas displayed in brown.

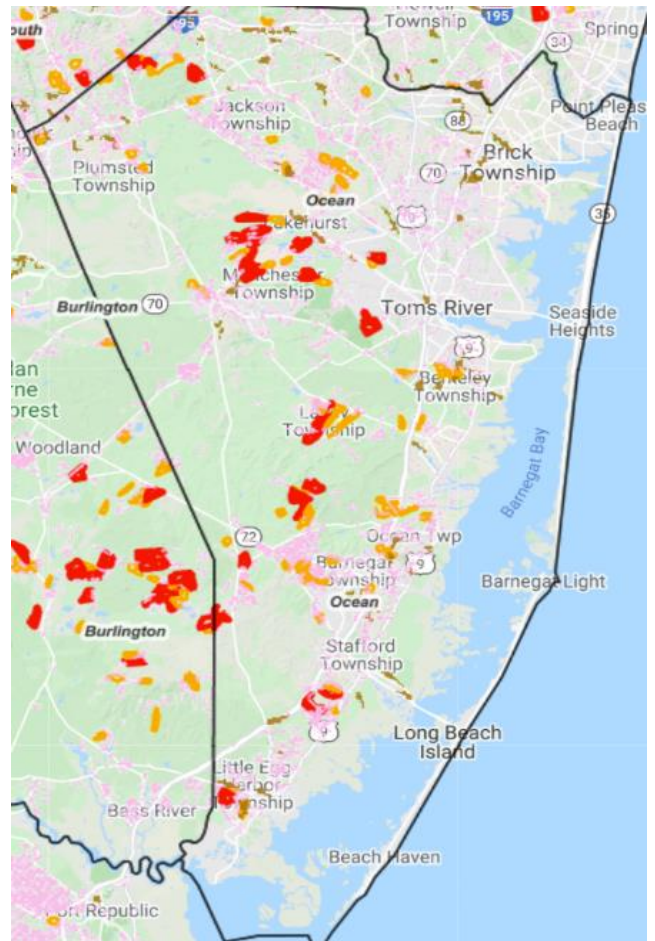


Figure 2 Ocean County Unpreserved Lands (Red, Pink, Orange) and NJDEP CHANJ Stepping Stones (Brown)