



2020 Annual Report

New Jersey Pinelands Commission

Protecting the New Jersey Pinelands

The New Jersey Pinelands Commission is an independent state entity whose mission is to preserve, protect, and enhance the natural and cultural resources of the Pinelands National Reserve, and to encourage compatible economic and other human activities consistent with that purpose.

The Commission was created by the passage of the Pinelands Protection Act in 1979.

To accomplish its mission, the Commission implements a comprehensive plan that guides land use, development and natural resource protection programs in the 938,000-acre Pinelands Area of southern New Jersey. The Commission's 15-member board consists of state, county and federal appointees who volunteer their time and expertise. The panel meets monthly and receives guidance from its Executive Director and staff.



The Pinelands is home to vast forests, farms and towns that cover portions of seven counties in southern New Jersey. Photo/Paul Leakan

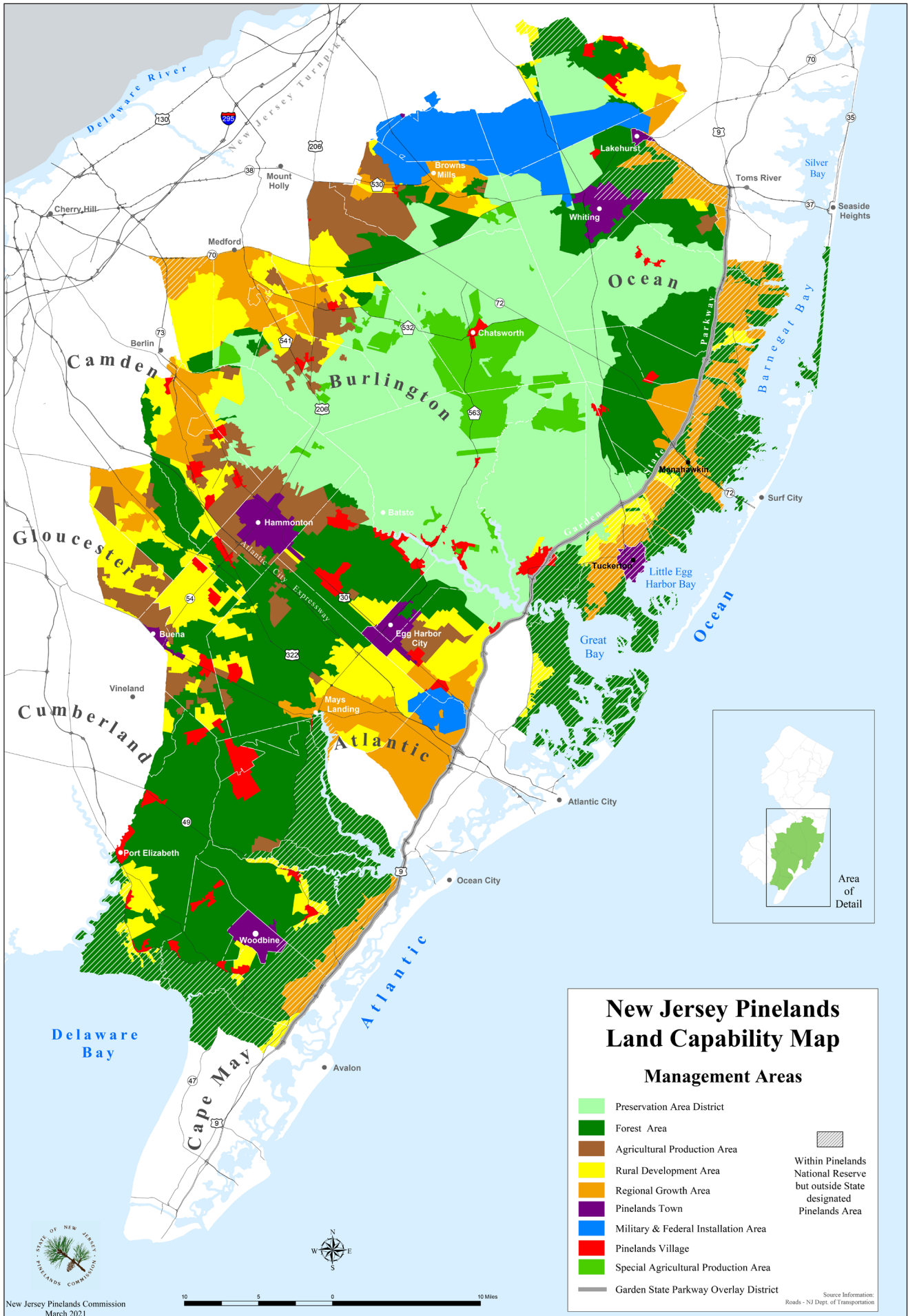
Commissioners:

Richard H. Prickett, Chairman
Alan W. Avery, Jr., Vice Chairman
Candace McKee Ashmun (January - May)
Daniel Christy
Sean W. Earlen (January - Dec. 12th)
D'Arcy Rohan Green
Shannon Higginbotham (Dec. 13th - Dec. 31st)
Jordan P. Howell
Jerome H. Irick
Jane Jannarone
Edward Lloyd
Mark S. Lohbauer
William Pikolycky
Gary Quinn

Nancy Wittenberg, Executive Director

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Executive Director's Message

Everyone was glad to see 2020 come to an end, as it was a very rough and challenging year. The Commission shifted to full remote operation in mid-March and remained so through the end of the year. It was and continues to be a successful transition, thanks to the efforts and support of staff.

The amount of work done not only didn't change, it increased. Applications were submitted for review in numbers consistent with prior years. Municipalities and counties continued to submit plans and ordinances. Science research work continued and expanded with new work on snake populations of the Pinelands. Maintaining the property and the communications and operating infrastructure provided ongoing challenges. We have also taken on new

initiatives, including developing avenues to respond to climate change. The Land Use, Climate Impacts and Sustainability Committee has been focused on these initiatives. Rulemaking work that is a key to our climate change efforts, dealing with water supply and stormwater management, are nearing completion. Our outreach efforts continued in a new virtual format that included webinars and increased and enhanced use of social media. We have also taken on a management role for the Pine Barrens Byway and are working on stronger communication about this great Pinelands resource. These issues and more are presented in this year's report.

We have learned a lot as we have dealt with the restrictions imposed by COVID-19, including new ways to communicate, new processes for receiving information via mail or digitally, and new ways to provide timely and accurate responses.

The past year also included the loss of two significant influences on the Pinelands: Candace McKee Ashmun and John C. Stokes. Candy served as a Commissioner from the beginning. She was the ultimate source of any question you had about the Commission. When Candy spoke about anything to do with the Pinelands Commission, it was decisive and the end of the conversation. John served in several positions at the Commission and he also served for a long time. Together there is so much they accomplished that has served the Pinelands well.



Above: The vibrant colors of fall take center stage at the 1.8-mile Batsto Blue Trail at Batsto Village in Wharton State Forest in November. The site is located along the Pine Barrens Byway. Photo/Joel Mott

Nancy Wittenberg
Executive Director

In Memoriam: Candace McKee Ashmun and John C. Stokes

2020 was a particularly difficult year for the New Jersey Pinelands Commission, given the passage of longtime Commissioner Candace McKee Ashmun and former Executive Director John C. Stokes.

When Ms. Ashmun died on May 22, 2020, she was still serving as a Commissioner, at the age of 96.

A resident of Basking Ridge, Ms. Ashmun had served as a gubernatorial appointee on the Commission's 15-member board since its inception in 1979, making her the longest serving board member in the agency's history. Commission members are unpaid volunteers who devote a significant amount of their time and expertise while serving.

"Candy was our guide, our institutional memory, and our inspiration," Commission Chairman Richard Prickett said, following her passing. "Perhaps no one in the history of our state has done more to safeguard the Pinelands and its world-renowned environment. Her contributions to the Pinelands are immeasurable, and we will miss her immensely."

In 1979, Ms. Ashmun received a call from then Governor Brendan Byrne, asking if she would serve on the newly created Commission, which faced enormous challenges in creating and then carrying out a comprehensive plan for protecting the region's resources. The Pinelands Comprehensive Management Plan (CMP) is now regarded as one of the most successful, large-scale, land-use conservation plans in the world.

Ms. Ashmun served with great distinction during her tenure as a Commissioner and as a member of numerous Commission committees. Her knowledge of the Pinelands Protection Act and of the Commission's past decisions were invaluable in the agency's efforts to strengthen and implement the CMP.

During its meeting on December 14, 2018, the Commission adopted a resolution to dedicate the agency's



Above: Candace McKee Ashmun toured the exhibits that were named in her honor on December 14, 2018.

Photo/Paul Leakan

educational exhibit in honor of Ms. Ashmun. The Candace McKee Ashmun Pinelands Education Exhibit features more than 400-square-feet of interactive displays, a 90-gallon aquarium with native fish, a terrarium with live, insectivorous Pinelands plants and dozens of Pinelands artifacts. Before dedicating the exhibit, several Commission members praised Ms. Ashmun for her contributions to the protection of the Pinelands, adding that the educational displays are a fitting way to build on her incredible legacy.



Above: Fellow Commissioners gave longtime Commissioner Candace McKee Ashmun (seated) a standing ovation before adopting a resolution to dedicate the agency's exhibits in her honor on December 14, 2018.

Photo/Paul Leakan

Ms. Ashmun spent the vast majority of her life volunteering to protect New Jersey's environment. She served on the State Planning Commission and as Executive Director and three-term President of the

Association of New Jersey Environmental Commissions. Ms. Ashmun chaired the New Jersey Department of Environmental Protection's Great Swamp Advisory Committee, and she was a trustee of the Coalition for Affordable Housing and the Environment. She was also a trustee on the Highlands Coalition and served as the Vice Chair of the Board of the Fund for New Jersey. At the local level, she served on the Bedminster Board of Education, Board of Adjustment and Environmental Commission, and served as Vice Chair of the Far Hills Planning Board.

The Commission suffered another tragic loss with the passing of John C. Stokes, who died on July 14, 2020. He was 70.

Mr. Stokes served as the Executive Director of the Pinelands Commission from April 2003 until his retirement on January 1, 2011. He was hired as the Commission's Executive Director after serving 23 years as the panel's Assistant Director.

A resident of Haddonfield, Camden County, Mr. Stokes was one of the original members of the Commission's staff and was one of the chief authors of the Pinelands CMP.

"John's service to New Jersey as Executive Director of the Pinelands Commission was invaluable," said former New Jersey Governor James Florio, who served as the Pinelands Commission's Chairman from 2002 to 2005. "When I served as chairman of the Pinelands Commission, I observed his practical, wise and environmentally sensitive work in action. His approach was key to protecting and preserving a fragile part of New Jersey that constitutes 20 percent of the state. New Jersey has lost one of its most valuable citizens."



Above: John C. Stokes (center) was one of the chief authors of the Pinelands Comprehensive Management Plan. He served as the Commission's Executive Director from April 2003 until his retirement on January 1, 2011.

Photo/Paul Leakan

As Executive Director, Mr. Stokes was responsible for the daily operations of the Commission and its staff of 43 planners, scientists, environmental reviewers, educators and others. Under Stokes' leadership, the Pinelands Commission:

- Established the Pinelands Conservation Fund, which has since helped to permanently preserve nearly 9,000 acres of land in the Pinelands and has financed numerous, critical Pinelands research and planning projects;
- Instituted innovative conservation measures in the Toms River and Oyster Creek Basins (Ocean County) that serve to better protect more than 7,000 acres of ecologically important lands in those areas;
- Adopted 15 amendments to the Pinelands Comprehensive Management Plan; and
- Launched a multi-year study of the Kirkwood-Cohansey aquifer system that lies beneath the Pinelands and contains trillions of gallons of water.

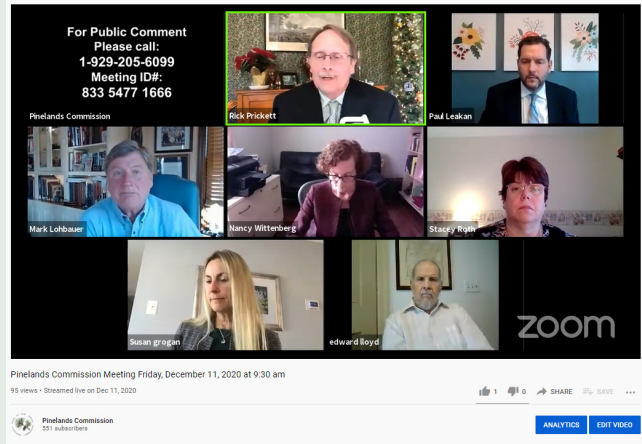
Among other activities, Mr. Stokes served as the Chairman of the Haddonfield Planning Board, as a member of the Haddonfield Environmental Commission, as treasurer of the Camden County Council of Girl Scouts, as assistant district administrator of the National Little League, and as a member of the Haddon Avenue Transit Corridor Study Committee. He earned a bachelor of science degree from North Carolina State University and was a New Jersey Professional Planner and member of the American Institute of Certified Planners. After his retirement, Mr. Stokes taught courses in the Master's Program in Environmental Science at Stockton University.

Persevering in a Pandemic

The Pinelands Commission found new and creative ways to continue its work in 2020, despite the challenges posed by the COVID-19 pandemic.

The Commission closed its offices in mid-March, due to health and safety concerns created by the virus. Staff members immediately started working at home, while using remote desktop software to connect to the state server and continue to do all facets of their work. Meanwhile, Business Services staff maintained Commission buildings and grounds, processed the mail and fed the native fish in the agency’s exhibit, among many other duties.

All offices were able to accomplish their tasks, including reviewing and processing development applications, reviewing ordinances and master plans to ensure conformance with the Pinelands Comprehensive Management Plan (CMP), working on amendments to the CMP, undertaking scientific studies, editing the website, and educating the public via weekly webinars (held in lieu of in-person educational events, which were cancelled). The Commission added messages on its website and social media sites, noting the office closure and encouraging the public to send all inquiries via e-mail. The public was also encouraged to use the agency’s Interactive Map as a resource and instructed to submit all development application materials in an



Above: Due to concerns raised by COVID-19, the Commission held its meetings virtually, starting in April 2020. The public could livestream the meetings on YouTube and call in with comments.

electronic format.

Virtual staff meetings were held each week, starting in late-March. Meanwhile, all Pinelands Commission meetings, Committee meetings and public hearings were held virtually, starting in April. The public could livestream every Commission or Committee meeting and public hearing on YouTube, and they could participate in meetings and hearings by calling in. Every virtual Commission or Committee meeting, public hearing and webinar hosted by the Commission has been recorded and can be viewed on the agency’s YouTube Channel at any time. The Channel can be accessed via www.nj.gov/pinelands.

Planning Activities

Land Use, Climate Impacts and Sustainability Committee

In 2020, the Commission’s Land Use, Climate Impacts and Sustainability Committee (LUCIS) made significant strides in helping to chart the agency’s future efforts to address climate change.

The seven-member Committee has been discussing the potential effects of climate change in the Pinelands and considering measures to mitigate impacts since its formation in 2019. It met three times in 2020.

During its August 28th meeting, the Commission’s staff provided an overview of the New Jersey Forest Stewardship Program and an update on solar activity in the Pinelands.

During a meeting held on October 7th, the Committee hosted a presentation by Vincent Mazzei, an Assistant Commissioner with the New Jersey Department of Environmental Protection (NJDEP)’s Watershed and Land

Management Program. Mr. Mazzei discussed the NJDEP's initiatives regarding climate change. The Committee also discussed a draft resolution that establishes the Commission's objectives relative to climate change in the Pinelands Area and the responsibilities of the LUCIS Committee. The Committee discussed a revised version of the resolution during its October 30th meeting. The resolution acknowledges the need to address the impacts of climate change on the Pinelands and New Jersey. It also identifies the necessary steps to be taken, including reviewing Commission policies and the Pinelands Comprehensive Management Plan (CMP) in order to identify ways to mitigate climate change impacts. Staff will also examine the day-to-day operations and management policies at the Commission facilities to identify changes needed to mitigate greenhouse gas emissions. The Committee advanced the resolution to the full 15-member Commission, which adopted it during its meeting on November 13, 2020.

The final, adopted version of the resolution is available on the Commission's website under the link for November 2020 Resolutions (<https://www.nj.gov/pinelands/home/meetings/documents/November%202020%20resolutions.pdf>).

Amendments to the Pinelands Comprehensive Management Plan

The Commission amended the Pinelands Comprehensive Management Plan (CMP) in 2020 by extending the Alternate Design Wastewater Treatment Systems Pilot Program and authorizing changes to the lineup of permissible technologies.

The Commission launched the Pilot Program in 2002 to test high-performance wastewater treatment systems that better protect the Pinelands environment by reducing the levels of nitrogen that enter groundwater. Through the program, the Commission has evaluated numerous septic systems technologies and identified several that successfully meet Pinelands water quality standards for residential development on lots as small as one acre. To date, more than 350 Pilot Program systems have been installed to service single-family residential development in 28 Pinelands municipalities.

On November 13, 2020, the Commission adopted amendments to the CMP that:

- Extend the pilot program through 2025, when the next Executive Director's report on newly tested programs will be due;
- Authorize the use of one system technology, SeptiTech, for residential development on minimum one-acre parcels on a permanent basis, in recognition of its success in meeting Pinelands water quality standards;
- Remove the Busse GT technology from the program, as this technology has not been installed in the Pinelands Area since being accepted into the Program in 2011;
- Remove the BioBarrier technology from the program, as it has not successfully met CMP water quality standards since being accepted into the Pilot Program in 2011; and
- Enable the Commission to add additional technologies to the Pilot Program by recruiting new NSF Standard 245 and/or USEPA ETV certified technologies to participate in the Pilot Program beginning in 2021, as adding new technologies to the program should lead to increased competition among the system vendors and may lead to continued price stability and potential cost reductions.

Aside from adopting the amendments to the Alternate Design Wastewater Pilot Program in 2020, the Commission's staff initiated discussions about amendments to CMP stormwater management standards in response to the state-wide amendments adopted by the New Jersey Department of Environmental Protection.

Pinelands Development Credit Program

The Pinelands Development Credit Program is a regional transfer of development rights program that preserves important agricultural and ecological land. Pinelands Development Credits (PDCs) are allocated by the Commission to landowners in the Preservation, Agricultural Production and Special Agricultural Production Areas, which are the sending areas. PDCs can be purchased by property owners and developers who are interested in developing land in Regional Growth Areas, which serve as the receiving areas.

Once PDCs are “severed” from a sending area property, the property is permanently protected by a conservation or agricultural deed restriction and the PDCs allocated to that property can be sold on the private market.

During 2020, 36.03 PDCs were allocated by the Commission to 16 sending area properties. A total of 0.75 PDCs were severed, protecting 32 acres of land in the Preservation Area District in Tabernacle Township and 18 acres in the Agricultural Production Area in Pemberton Township. Since 1982, 55,441



This 29-acre blueberry farm in Hammonton has been permanently preserved through the Pinelands Development Credit program.

Photo/Paul Leakan

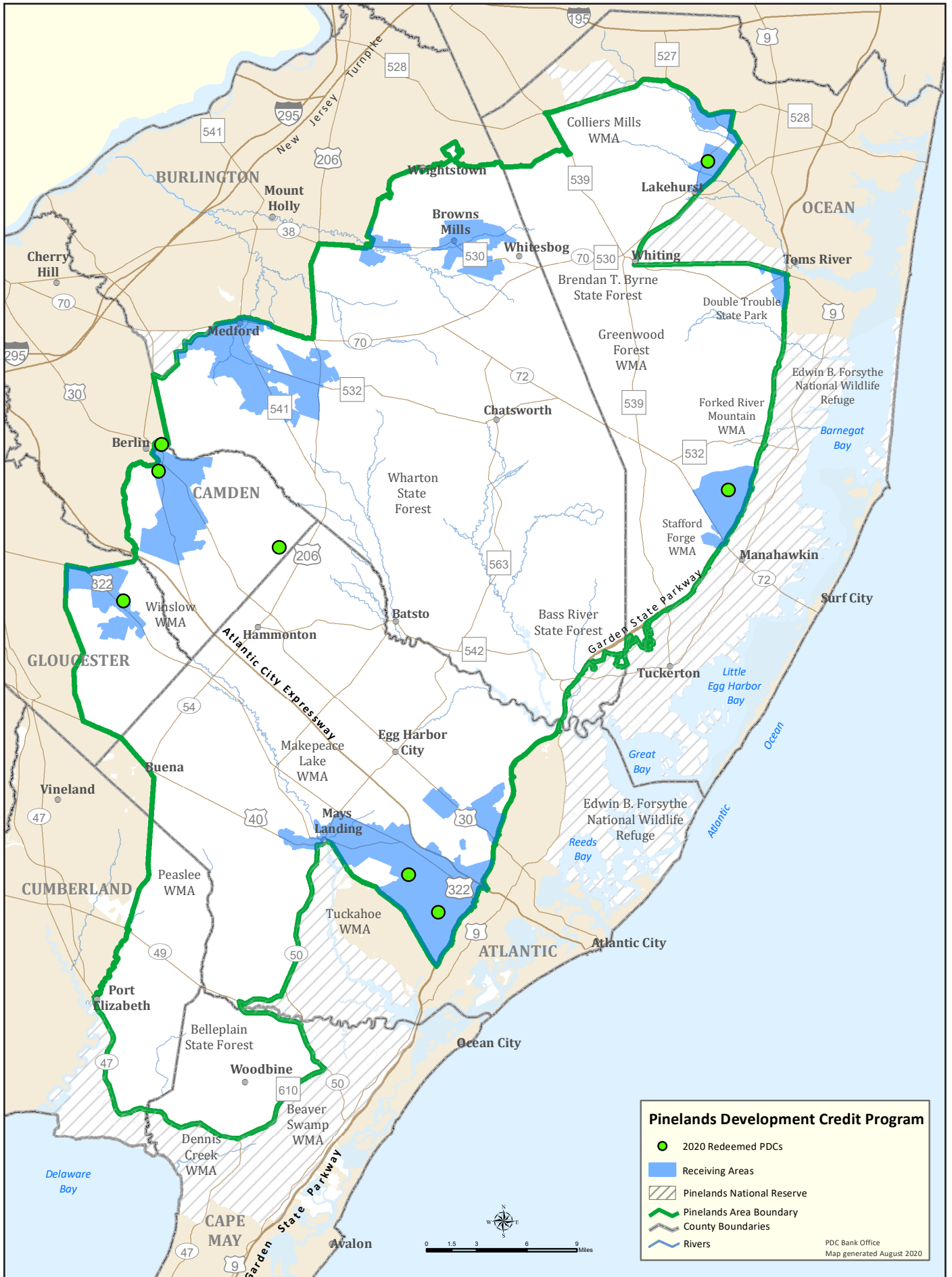
acres in the Pinelands Area have been permanently preserved through the PDC Program. In 2020, a total of 38.50 PDCs were sold, with an average sales price of \$44,740 per PDC. A total of 26.25 PDCs were redeemed for 13 residential projects in Barnegat, Egg Harbor, Manchester, Monroe, Waterford and Winslow townships and one nonresidential project in Berlin Township during 2020.

Please see page 9 for a map that illustrates all PDC redemptions that occurred in 2020.



This 636-unit planned development in Hamilton Township, Atlantic County required the use of 45.75 PDCs.

Photo/Paul Leakan



Reviewing Municipal Ordinances

The master plans and land use ordinances of all Pinelands municipalities and counties must be consistent with the Pinelands Comprehensive Management Plan (CMP). Consistency is ensured through the conformance process, by which municipalities and counties submit their plans, ordinances and amendments to the Commission for review and certification.

The Commission received and reviewed 109 municipal master plan and ordinance amendments in 2020.

The Commission's staff works closely with Pinelands municipalities to help them achieve their objectives in a manner that is consistent with the CMP. In 2020, the Commission certified the Borough of Folsom's 2019 Master Plan Reexamination Report and implementing ordinance. The certification capped off a multi-year effort in which the Commission worked with the Borough and the New Jersey Department of Community Affairs. A top priority for the Borough was to increase commercial development potential along the Black Horse Pike. The planning effort led to the creation of a new commercial zone along the highway that required 49 acres to be changed from a Forest Area to a Rural Development Area. As an offset, the Borough rezoned 76 acres of land from Rural Development Area to Forest Area.

Commission Employs Ground Penetrating Radar to Search for Unmarked Graves at Mullica Site

The Pinelands Commission employed ground penetrating radar technology to search for possible unmarked graves at a 19th century cemetery in the Pinelands in late October 2020.

Tony McNichol, the Commission's Cultural Resource Planner and Archaeologist, used the radar technology to help find possible, unidentified historic graves at the St. Mary's of the Assumption/St. Mary's in the Pines Cemetery on Pleasant Mills Road in Mullica Township, Atlantic County.

The cemetery was established on a small parcel donated by Jesse Richards of Batsto (circa 1826-1827) for the use of his Catholic employees. As operations at Batsto declined in the late 1860's, many families moved from the

area, and the church and cemetery fell into disuse. It is thought that unmarked graves may remain on the site, as early wooden markers may have been destroyed by a forest fire that consumed the church structure in the early 1900's.

Ground penetrating radar (GPR) is a non-invasive, subsurface imaging technology that creates visual representations of buried materials by projecting radar waves of various wavelengths into the ground from a stable surface antenna. The National Park Service provided funding for the GPR technology that was used in this survey, which was initiated by Father Neal Dante of the Camden Diocese.

The results of the survey are pending.



Above: Tony McNichol, the Commission's Cultural Resource Planner and Archaeologist, uses ground penetrating radar to search for unmarked graves at St. Mary's of the Pines Cemetery in Mullica Township. Photo/Paul Leakan

Pine Barrens Byway

Over the course of several months in 2020, the Pinelands Commission’s staff researched, wrote and then submitted a Federal Highways Administration (FHWA) application to designate the Pine Barrens Byway as a National Scenic Byway.

The Commission is overseeing the administration of the Pine Barrens Byway, a state-designated byway that traverses roadways in 16 Pinelands municipalities.

Twenty-five high-resolution, digital photographs of the 130-mile Byway were selected and uploaded to the FHWA application, accompanied by descriptive captions. Staff members also created a highly detailed map of the Byway as a required element of the application, and they wrote summaries of the history and amenities offered at eight featured destinations located along the route.

The Commission secured letters of support from Citizens United to Protect Maurice River and its Tributaries, the Edwin B. Forsythe National Wildlife Refuge, the Jacques Cousteau National Estuarine Research Reserve, New Jersey Conservation Foundation, Pinelands Municipal Council, South Jersey Chamber of Commerce, Tuckerton Seaport and Baymen’s Museum and the



Above: The Tuckerton Seaport is one of many popular and educational sites located along the Pine Barrens Byway. Photo/Joel Mott

U.S. Biosphere Network (National Park Service, Department of the Interior).

Aside from submitting the application to the FHWA, the Commission sought to boost awareness and usage of the Byway by creating and sharing an ArcGIS StoryMap that can be used to plan excursions along the Byway route. Please see page 21 for more information.

The Commission’s work on the Byway was funded by the National Park Service through the Long Term Economic Monitoring Program.

Commission Delivers Annual Update on Permanent Land Protection

The Pinelands Commission’s staff delivered its annual update on permanent land protection in the Pinelands on October 9, 2020.

A total of 1,076 acres of land were preserved in the Pinelands Area from July 2019 to June 2020. Of that total, 211 acres were preserved through Pinelands programs, including 196 acres through clustering, five acres through density transfer and 10 acres through residential density/septic dilution.

As of June 2020, 51% (or 479,000 acres) of the Pinelands Area has been permanently preserved through a variety of programs. Of that total, 94% of the land is located in Pinelands Management Areas that are designated for conservation, including the Preservation Area District, the Forest Area, the Special Agricultural Production Area, and the Agricultural Production Area.

	Acres Protected
Pinelands Programs	211
State Acquisition (Green Acres)	420
County Farmland Preservation	86
County Open Space	356
Non-Profit Acquisition	3
Total Acres	1,076

Regulatory Activities

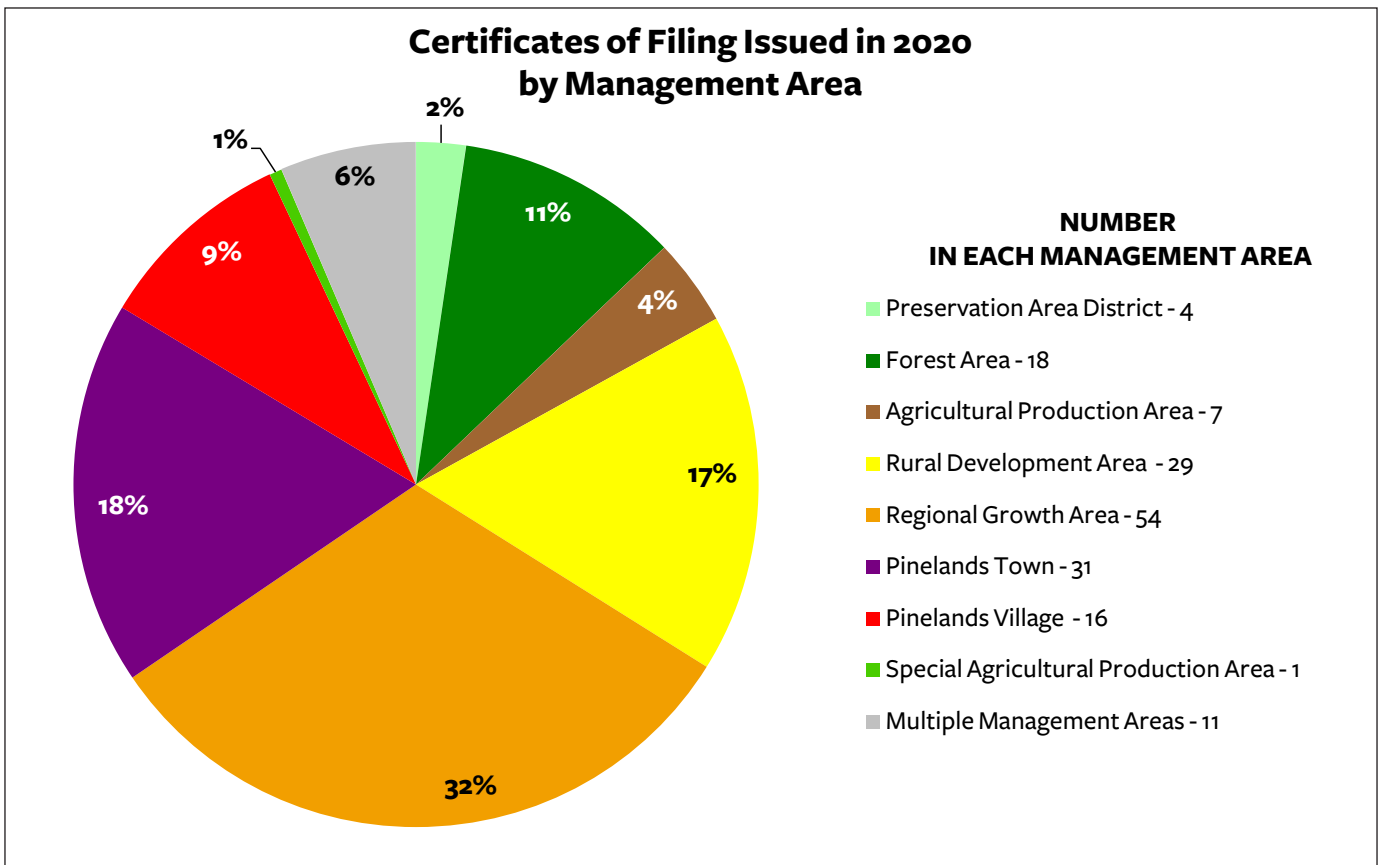
Applications

The Pinelands Commission reviews applications for development by evaluating proposals to ensure that they meet the regulations contained in the Pinelands Comprehensive Management Plan.

Development proposals must meet a series of environmental standards, including those that protect water quality, wetlands and threatened and endangered species.

The Commission's development approval process varies, depending on whether the application is submitted by a public agency or a private landowner. The Commission's staff reviews private development proposals, such as single-family dwellings, subdivisions and commercial projects. After applicants provide all of the necessary information, the Commission issues a Certificate of Filing (or CF) that allows applicants to seek all municipal and county approvals for the proposed development.

The Commission issued 171 Certificates of Filing (CFs) in 2020, most of which (54) were for proposed development in Regional Growth Areas (as shown in the chart below). There are 24 municipalities with Regional Growth Areas, or RGAs, in the 938,00-acre state Pinelands Area. RGAs make up 8% of the land in the Pinelands, and they are generally located on the fringes of the Pinelands boundary. The RGAs include areas of existing development and adjacent lands that have the infrastructure such as sewers, roads and other utilities needed to accommodate new development while protecting the essential character and environment of the Pinelands. The Pinelands Comprehensive Management Plan encourages future growth in the Regional Growth Areas as a way to prevent scattered and piecemeal development in other more sensitive portions of the Pinelands Area.



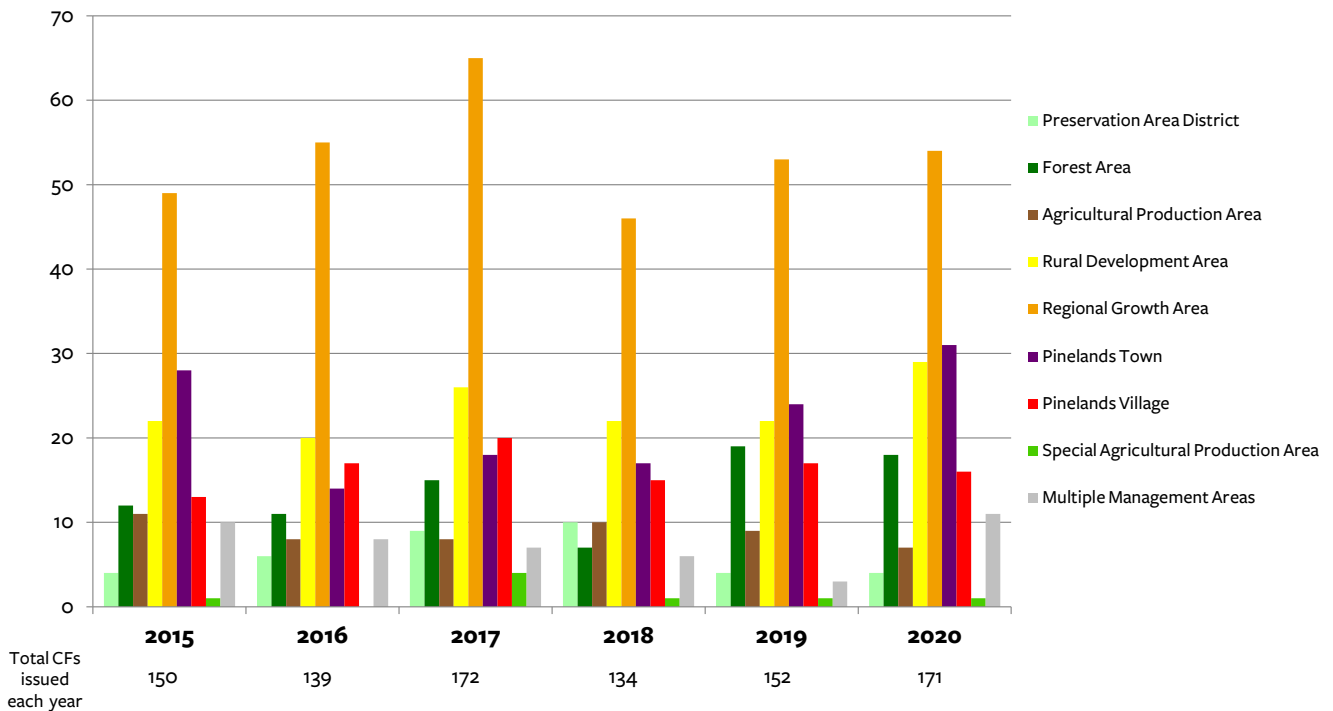
Of the 171 CFs that were issued in 2020, most involved proposals for residential development, followed by commercial development (as shown in the table below).

Certificates of Filing Issued in 2020 by Management Area and Type of Development

	Residential	Commercial	Infrastructure	Institutional	Resource extraction	Totals by management area
Preservation Area District	1				3	4
Forest Area	13	2			3	18
Agricultural Production Area	6	1				7
Rural Development Area	19	7	1		2	29
Regional Growth Area	32	17	2	3		54
Pinelands Town	16	13		2		31
Pinelands Village	7	9				16
Special Agricultural Production Area	1					1
Multiple management areas	3	4	3		1	11
Totals by type of development	98	53	6	5	9	171

The Commission issued similar numbers of CFs from 2015 to 2020, with the majority of the proposals for development located in Regional Growth Areas (as shown on the bar graph below).

Certificates of Filing by Management Area 2015 - 2020



The Pinelands Commission is also responsible for reviewing and approving development applications that are submitted by public entities, such as a municipality, county or a State agency. The full, 15-member Commission votes on whether to approve these applications during its monthly meetings.

The Commission approved a total of 33 applications for public development in 2020. Examples included the installation of numerous solar energy facilities, forestry to reduce wildfire risks, improvements to parks, planting native grasses and forbs to provide habitat for Northern bobwhite quail, and the construction of a deicing pad at the Atlantic City Airport.

Recreation Permits

In 2020, the Commission issued five Recreation Permits for organized, off-road vehicle events in the Pinelands. In order to receive a Recreation Permit, groups must submit a completed “Off-Road Vehicle Event Application” for each proposed event. In addition to the application form, the group must submit the course route in electronic format, an application review fee, proof of insurance, property owner permission and proof that the township and New Jersey State Police have been notified. Commission staff reviews the course route to determine if there are any issues with wetlands, threatened and endangered species, deed-restricted land and private and public ownership. Any portions of the route that have potential issues are site inspected by a member of the Commission’s staff. If any route changes are necessary, a revised route is required and must again be submitted for review.



Above: A member of the Commission’s staff checks a map while conducting a site visit of a route for a proposed off-road vehicle event in the Pinelands. Photo/Paul Leakan

South Jersey Transportation Authority Memorandum of Agreement

In 2019, the Commission and the South Jersey Transportation Authority (SJTA) entered into an amended Memorandum of Agreement (MOA) that eliminated seasonal mowing restrictions at the Atlantic City International Airport in Egg Harbor Township. The amended MOA authorized the SJTA to relocate the Grassland and Conservation Management Area (GCMA) off the airport property and to mow the existing grassland habitat on the property year-round. Previously, the SJTA was restricted from mowing the grassland management area between April 15th and August 15th. The SJTA sought the amended agreement due to safety concerns stemming from an increase in the number of damaging interactions between planes and birds and the potential for the onsite GCMA to attract wildlife and intensify aircraft and wildlife interactions.

In exchange for lifting the mowing restrictions, the amended MOA requires the SJTA to acquire, create and maintain a new GCMA. To satisfy that requirement, Atlantic County acquired an approximately 222-acre parcel in Hamilton Township on December 30, 2020. The land will become the new GCMA, which will be designed with the aid of a consultant retained by the SJTA.

The MOA also required the SJTA to contribute a total of \$3 million, \$500,000 annually, to the Commission’s Pinelands Conservation Fund. These funds will be used to acquire and preserve land in the Pinelands Area, with an emphasis on land that provides suitable habitat for threatened and endangered grassland birds. To date, the Commission has received three of the \$500,000 payments.

Lastly, the MOA required the SJTA to enhance habitat for the frosted elfin butterfly at two locations on the airport site. The SJTA continued its efforts to locate nurseries who can supply the volume of wild indigo required for these sites. Regional nurseries, however, are struggling to establish the necessary plants. As a result, the SJTA is considering additional options to acquire the needed plants, such as harvesting seeds from the established Elfin Butterfly Colony on the FAA Tech Center base.

Science & Research Activities

Long-term Environmental Monitoring Program

Snake Fungal Disease: In 2018, Commission scientists began collaborating with Dr. Joanna Burger and her colleagues at Rutgers University, Robert Zappalorti of Herpetological Associates, and Dr. Jeffrey Lorch of the United States Geological Survey (USGS) to conduct research on snake fungal disease in the Pinelands. Snake fungal disease is an emerging disease found in populations of captive and wild snakes and has been found to



Above: The soft and crusty brown blotches on this northern pine snake indicate potential snake fungal disease infection.

Photo/ John Bunnell

infect snakes in North America, parts of Europe, and Australia. Laboratory analyses have demonstrated that the fungus *Ophidiomyces ophiodiicola* is consistently associated with snake fungal disease, but often additional fungi are also found. Although snakes can show signs of fungal disease just after spring emergence from hibernation, it was previously unknown if *O. ophiodiicola* was present inside the hibernacula.

Dr. Burger and Mr. Zappalorti have been excavating a group of northern pine snake hibernacula, or winter dens, annually for the past 35 years. Their long-term study provides a unique opportunity to sample inside snake dens to determine if the fungus is present in the soil or on the hibernating snakes. Excavating the dens during hibernation also allows the sampling

of a number of individual snakes from a population at one time. A passive integrated transponder (PIT) tag is inserted into each new snake found during the excavations. A PIT tag is a tiny, glass-coated microchip commonly used in wildlife research that allows for the permanent identification of an animal through the use of a special scanner that reads the unique tag number.

To determine if *O. ophiodiicola* was present in the dens or on hibernating snakes, initial sampling was completed in 2018 during den excavations at three locations. Because the initial sampling indicated that *O. ophiodiicola* was present on snakes and in the soil inside the dens, in 2019, a second round of sampling was completed on hibernating snakes at all four of Dr. Burger and Mr. Zappalorti's study sites. A total of 35 pine snakes, one corn snake, one black racer, and one timber rattlesnake were found during the excavations. Each snake was swabbed for the fungus on the head, belly, vent, and on visible body sores. Preliminary results show that the fungus was present on the visible body sores much more than the other body locations sampled. During the winter of 2020, all snakes found during the den excavations were swabbed in an effort to determine the best method and body location to sample a snake for the presence of the fungus and to document changes in fungal infection for individual snakes over time. In 2021, all hibernating snakes will be swabbed again to document changes in fungal infection for individual snakes over time and investigate changes in snake fungal disease among dens.

Rare Snake Population Monitoring: Aside from the long-term artificial den excavations mentioned in the Snake Fungal Disease Monitoring component, no long-term data exist to assess rare snake population trends in the Pinelands. Therefore, the Commission is establishing a network of natural snake dens, shed areas, and nest sites to monitor long-term population changes in several species of rare snakes. As part of ongoing snake studies, numerous winter dens have been identified for corn snakes and kingsnakes. The Commission is attempting to identify more natural pine snake dens and natural dens for other rare snake species. In 2018 and 2019, corrals have been built around most dens to capture snakes as they enter hibernation in the fall and

emerge from hibernation in the spring. The den corrals offer an effective non-invasive method to census snakes each fall and spring without physically disturbing dens or hibernating snakes. In 2020, the Commission corralled additional corn snake and pine snake dens. In 2020, scientists radio tracked nine corn snakes and one pine snake to find new dens or nest areas. Dens and potential dens observed by tracking these snakes will be corralled during the winter of 2020-2021 and productive dens will be incorporated into the monitoring program.

Other 2020 environmental monitoring activities included surveying calling frogs and toads at a group of ponds that are surveyed annually, measuring bimonthly water quality at 47 stream sites, recording monthly water levels at 35 forest plots and 30 ponds, and maintaining continuous water-level recorders installed in seven other ponds and in a shallow observation well installed within a pine lowland forest.

Long-term environmental monitoring research is being funded by the National Park Service.

Microorganism Study

In 2017, the Commission was awarded funding to study the effects of land use on water quality and microorganisms in 60 natural ponds, excavated ponds, and stormwater basin study sites. The goals of the Microorganism Study are to assess the relationship between surrounding land use and various water-quality and biological attributes and to compare the plants and animals from these natural and created wetlands. In 2018, field work was conducted at 20 of the 60 wetlands. Commission scientists and collaborators with the N. J. Department of Environmental Protection and U.S. Geological Survey sampled surface water for nutrients, metals, pesticides, and chlorophyll-a (an indirect measure of algal plant growth) and collected samples of diatoms (single-celled algae), phytoplankton (free-floating algae in the water), zooplankton (tiny animals that swim or drift in the water), and benthic macroinvertebrates (primarily aquatic larval insects). In 2019, field sampling occurred at 20 different sites.

In 2020, project scientists collected samples at the remaining 20 sites, bringing to completion all field work for the study. Taxonomic consultants are continuing to process and identify zooplankton,



Above: Phytoplankton (free-floating algae) samples were collected at 60 wetland sites during the study. This species of *Closterium* was found at over a third of the study sites and equally among the three wetland types.

Photo/EcoAnalysts, Inc.

algae, diatoms, and macroinvertebrates that were collected from the study sites.

This research is being funded by a grant from the U.S. EPA and a match by the Commission through the Pinelands Conservation Fund.

Endocrine Disruption Study

The William Penn Foundation is funding scientific research in the Delaware River Watershed through the Delaware Watershed Research Fund, which is administered by The Academy of Natural Sciences. The Kirkwood-Cohansey aquifer, which underlies the Pinelands, was identified as one of the research areas eligible for funding. Commission scientists and U.S. Geological Survey scientists Kelly Smalling, Dr. Vicki Blazer, and

Heather Walsh proposed a study to investigate point and non-point sources of endocrine disrupting chemicals and the potential impacts on fish and frogs in the Pinelands. The study was awarded funding in 2016.

The endocrine system is a collection of tissues in animals that produce hormones to regulate essential life processes, such as metabolism, tissue function, reproduction, and development. A large group of natural and synthetic chemicals are known to disrupt endocrine function. Examples include plant hormones, plastic components, flame retardants, surfactants, fragrances, and pesticides. Endocrine disrupting chemicals, or EDCs, are a global environmental problem and have been linked to reproductive and developmental abnormalities in a variety of animal species, especially fish and amphibians.

Commission and U.S. Geological Survey scientists proposed to sample water chemistry and fish above and below municipal wastewater treatment plants, which represent direct point sources of EDCs, and water chemistry and frogs at ponds and stormwater basins, which may receive indirect non-point sources of EDCs from runoff and the aquifer. Results from these sites will be compared to those from appropriate, minimally impacted reference sites.



Non-native black crappie was one of the fish species sampled for evidence of endocrine disrupting chemicals at lakes upstream and downstream of a sewage treatment plant.

Photo/ John Bunnell

In 2017, 2018, and 2019, green frogs were collected from ponds and stormwater basins for histological analysis, and water chemistry was sampled at the sites on multiple occasions. In 2019, fish were collected from stream sites above and below a sewage treatment plant for histological analysis, and water chemistry was also sampled. In 2020, fish were collected at lakes above and below a different sewage treatment plant for histological analysis by U.S. Geological Survey scientists. All field work for the project has been completed.

The study is being funded by a grant from the Delaware Watershed Research Fund, a match by the Pinelands Commission, and a match by the USGS.

Joint Corn Snake Radio Tracking and Drift Fence Study

In 2017, Commission scientists began to collaborate with Dr. Howard Reinert of The College of New Jersey, Mr. Robert Zappalorti of Herpetological Associates, and the New Jersey Department of Environmental Protection Endangered and Nongame Species Program staff to conduct an intensive research project on the corn snake in the Pinelands. The corn snake is a colorful, secretive species of rat snake that reaches the northern limit of its range in the New Jersey Pine Barrens. Also called the red rat snake, the corn snake is listed as an endangered species by the New Jersey Department of Environmental Protection. The goals of the corn snake research is to better understand the habitat requirements and life history of this secretive serpent to develop meaningful conservation management programs for the species and ensure its continued survival in the Pinelands.

The research includes two components: radio-telemetry and headstarting, which is a conservation technique where vulnerable young animals are raised in captivity until they attain a larger size and are then released



Above: A clutch of eggs surrounds a newly hatched corn snake. Growth and survivorship of hatchlings will be assessed in this study.

Photo/ John Bunnell

into the wild. For the telemetry aspect, researchers surgically implant small radio-transmitters in adult corn snakes and locate the snakes on a regular basis to collect data on their activity range; types of habitats used; and the locations for nesting, shedding, and hibernation. In 2019, scientists completed radio tracking of 29 corn snakes, which concluded the telemetry component of the study. Corn snake telemetry data will be analyzed by research collaborators at The College of New Jersey.

For the headstarting component of the study, researchers collect corn snake eggs from nest areas and transport them to a laboratory for incubation and hatching. All of the hatchlings are microchipped and one-half of them are released back to the primary nest area as cold released

snakes. The other group of hatchlings are kept in the laboratory over the winter and released the following spring as headstarted snakes. The goal is to recapture as many of these snakes as possible to assess growth and survivorship of the cold released and headstarted hatchlings over time. While in the laboratory, hatchlings are fed, weighed, and measured to determine the efficiency of assimilating food and their growth rates. Researchers are also conducting experiments on the laboratory hatchlings to understand their preferences for temperature, the amount of vegetation canopy cover, and whether they prefer to lay on sand, soil, leaf litter, or pine needles.

In 2019, 28 headstarted corn snakes from 2018 and 11 newly hatched corn snakes from 2019 were released at the primary nest area. Twenty-two newly hatched corn snakes were selected to be held over the winter to be released the following year. In the spring of 2020, these held over snakes were released at the nest area. Additionally in 2020, a total of 22 corn snakes were hatched out in the lab and cold released during the hatching season.

A drift fence was established at the primary nest area to help recapture corn snake hatchlings to assess the survival of headstarted and cold released hatchlings and to compare the effectiveness of using a drift fence outfitted with box traps and artificial cover to detect corn snakes and other species of snakes. In 2019, a total of 1,994 animals were found along the drift fence, under the artificial cover, or in the box traps. Thirteen species of snakes were captured, including 19 corn snakes. In 2020, the fence, cover, and traps yielded a total of 2,047 animals. Eleven species of snakes were captured, including 12 corn snakes. For 2019 and 2020 combined, the drift fence and trap array captured two headstarted and three cold released corn snakes. In 2020, to assess whether corn snakes were able to maneuver around the drift fence without getting caught, four corn snakes were radio tracked in the immediate vicinity of the fence. Twice these snakes moved from one side of the fence to the other without getting captured in the box traps, suggesting that adult corn snakes have the ability to climb over the fence.

This Joint Corn Snake Study is being funded by the Pinelands Commission and the New Jersey Department of Environmental Protection.

Eastern Kingsnake Study

In 2019, the Commission was awarded funding for a grant proposal, titled “Activity range, habitat use, shedding, denning, and nesting of the wetland-dependent eastern kingsnake.” The eastern kingsnake is listed as a species of special concern in New Jersey because it is vulnerable to multiple threats, is potentially declining, and its distribution and population status are not known. Although kingsnakes are a wetland-dependent species that use wetlands for overwintering, the specific wetland habitat types needed for hibernation and the amount and type of associated upland habitats used for foraging, shedding, and nesting have not been documented.

Commission scientists are collaborating with Robert Zappalorti of Herpetological Associates and Dr. Howard Reinert of The College of New Jersey on this four-year study. Scientists will use radio telemetry to determine the activity range; upland and wetland habitat use; and timing of shedding, denning, and potentially nesting of the eastern kingsnake. In anticipation of obtaining funding and to ensure an adequate number of snakes to track if funding was secured, radio transmitters were surgically implanted in 13 kingsnakes in 2019. Although one kingsnake was killed by a predator, the remaining 12 snakes were tracked to their winter dens. In 2020, 18 of 24 newly found kingsnakes were radio tracked in addition to the individuals that were tracked in 2019. Seven radio tracked kingsnakes died in 2020, either from predation or unknown causes. Another kingsnake was lost due to suspected transmitter failure. The remaining snakes were tracked to winter dens in the fall of 2020.

This research is being funded by a grant from the U.S. EPA and a match by the Commission through the Pinelands Conservation Fund.

Corn Snake and Kingsnake Genetics Research

Previous genetics research by Dr. Laretta Bushar and Dr. Howard Reinert showed that timber rattlesnake populations in the Pinelands are geographically and genetically isolated from all other populations of rattlesnakes, and that paved roads in the region provide significant barriers to gene flow among Pinelands timber rattlesnakes. No work has been done on the population genetics of corn snakes or eastern kingsnakes. In 2019, Drs. Bushar and Reinert began using published genetic information on related species to develop genetic markers for corn snakes and kingsnakes. Snakes collected during other snake research as well as additional snakes found dead on roads from around the Pinelands should provide enough individuals to assess levels of genetic variation, population substructure, and the effect of roads on gene flow for corn snakes and kingsnakes in the Pinelands.



Above: A four-year study will focus on the wetland-dependent eastern kingsnake.

Photo/ John Bunnell

This research is being funded by Arcadia University, the New Jersey Department of Environmental Protection Endangered and Nongame Species Program, and the Commission through the Pinelands Conservation Fund.

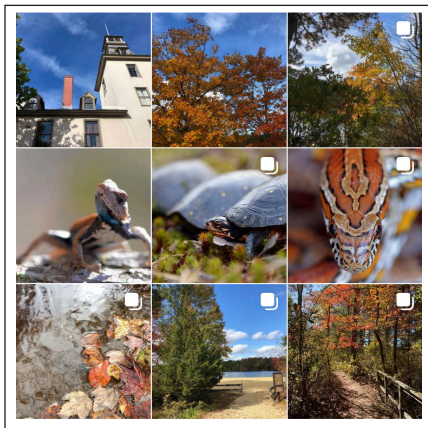
Public Information, Education & Outreach

Raising Awareness, Fostering Stewardship

Although 2020 posed many challenges for the Commission, staff members seized every opportunity to educate the public about the agency's work and the Pinelands' special resources.

Due to health and safety concerns posed by COVID-19, the Commission canceled numerous popular events such as the spring and summer editions of the Pinelands Short Course, the annual Pinelands-themed World Water Monitoring Day, and the annual Orientation for Newly Elected Pinelands Officials. However, the Commission turned to technology and reached far greater audiences than ever before.

Staff reached and educated exponentially more people in 2020 by organizing, hosting and recording 25 webinar presentations,



Above: The Commission launched a new Instagram site in 2020, and here is a gallery of images that were posted in 2020.

launching a new Instagram site that was updated with 180 posts, filming and sharing 21 videos of the Pinelands on the Commission's YouTube Channel, taking and posting more than 1,200 photos and messages on Facebook, and creating and sharing four Adobe Spark video slideshows that highlight the Commission's work and the resources in the Pinelands.

The new webinars are part of the Pinelands Speaker Series, which the Commission previously hosted at its headquarters in Pemberton Township. The webinars were livestreamed, and the public had the ability call in to ask questions. Every webinar is recorded, archived and is available for viewing on the Commission's YouTube Channel at any time. Five members of the Commission's staff delivered webinar presentations, and they covered bog gardening, the colonial privateers of the Mullica River, Pinelands history, plants of the Pine Barrens, and climate impacts on the Pinelands. Other presentation topics ranged from lichen and fungus to forgotten towns in the Pinelands. The video webinar recordings were viewed more than 6,700 times last year, so many more people were reached and educated than through the Commission's traditional means of in-person education programs such as the Pinelands Short

By the Numbers:

In 2020, the Commission's staff:

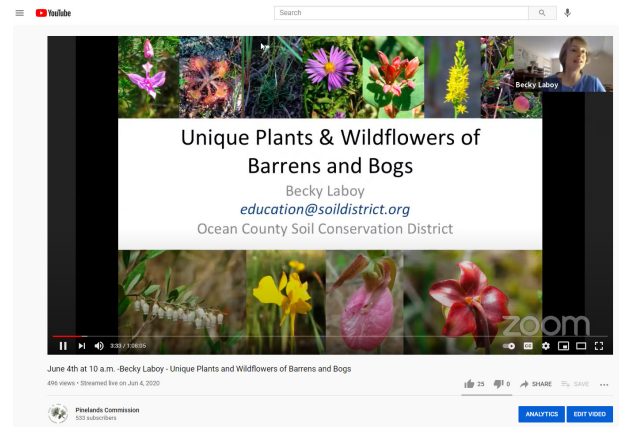
- Organized, hosted, promoted and recorded 25 educational webinar presentations that are archived on YouTube and have been viewed more than 6,780 times;
- Maintained, enhanced and reviewed every page and link on the Commission's website, which was viewed a total of 132,592 times;
- Launched a new Instagram site, then gained more than 1,000 followers after composing and sharing 180 posts;
- Took and shared 1,266 photos or videos on the agency's Facebook page;
- Filmed and shared 21 videos of the Pinelands on the Commission's YouTube Channel, whose number of subscribers grew from 30 to 490 by the end of 2020;
- Created and shared four Adobe Spark videos, including one that provides an overview of the agency and its work, and videos that highlight land that has been permanently preserved through the Pinelands Conservation Fund, the history and importance of the region's blueberry industry, and the endangered timber rattlesnake population;
- Conducted and recorded 10 video interviews for the planned celebration of the Pinelands Comprehensive Management Plan; and
- Responded to more than 2,298 public inquiries about recreation and other non-development application questions.

Course, which typically attracts 500 to 600 attendees.

Commission staff also sought to raise awareness and appreciation of the region by creating and sharing several Pinelands word scrambles, wordfinder sheets, two quizzes, a crossword puzzle, Pine Barrens tree frog-themed mazes and other entertaining and educational worksheets. This included a Pinelands Bingo score sheet that encourages the public to find and identify various plant and animal species. All of the educational materials are available on the Information and Education section of the Commission's website (www.nj.gov/pinelands).

In addition to creating and sharing new educational content, Commission staff completed a comprehensive review of the agency's website in 2020. This entailed reviewing every line of text on more than 110 web pages, updating information where necessary, and testing every link on the site. Several pages were greatly enhanced with new text, new photo galleries and new videos. Meanwhile, staff reviewed and made changes to the agency's internal website, or Intranet, in 2020.

Seeking to boost awareness and usage of the Pine Barrens Byway, Commission staff created and shared a StoryMap with ArcGIS mapmaking software in October 2020. The Commission is overseeing the administration of the Byway, which traverses 130 miles of roadways in the Pinelands, and the new StoryMap serves as a trip planner for Byway excursions. The StoryMap, shown below, features a fully searchable, interactive map of the entire route, along with miniature maps, detailed descriptions, links, and 36 photos of nine featured destinations on the Byway. The StoryMap can be accessed via the Pine Barrens Byway section of the Commission's website (<https://www.nj.gov/pinelands/landuse/current/byway/>). The Commission's staff also prepared and submitted an application to designate the Pine Barrens Byway as a National Scenic Byway in June 2020. Please see page 11 for more information.



Above: The Commission hosted 25 educational webinars in 2020, including this popular presentation on unique plants and wildflowers of the Pinelands on June 4th.



Above: The Commission created an interactive Trip Planner for the Pine Barrens Byway in October 2020.

Pinelands National Reserve Calendar

The Pinelands Commission issued its fifth edition of the Pinelands National Reserve wall calendar in early December 2020.

The calendar features its first-ever theme -- the Pine Barrens Byway -- and includes 38 stunning photos that showcase the natural, cultural and historic treasures that can be found along the 130-mile Byway route.

The calendar helps to increase awareness and usage of the Byway, while highlighting important locations along the route, such as Atlantic County Park in Estell Manor City, Bass River State Forest, the Batona Trail, Batsto Village, Belleplain State Forest, the Edwin B. Forsythe National Wildlife Refuge, Lake Lenape Park East, the Mullica River, the Tuckahoe River, the Tuckerton Seaport and Wharton State Forest.

The Commission worked with Rowan College at Burlington County to design and print the calendar. All of the photos were taken by members of the Commission's staff.

Aside from the photos of the region's resources,



Above: Signage directs travelers along the 130-mile route of the Pine Barrens Byway, which features stunning sights such as this fiery field of blueberry bushes in the fall.

the calendar includes State and Federal holidays, dates of Pinelands Commission meetings and important dates in Pinelands history.

Six-hundred and fifty copies of the calendar were distributed free of charge at the General Store at historic Whitesbog Village, Jake's Branch County Park and Wells Mills County Park.

Preparing for a Celebration of the Pinelands Comprehensive Management Plan

The Pinelands Comprehensive Management Plan (or CMP) will turn 40 on January 14, 2021, and the Commission will mark the milestone by creating and sharing videos, informative social media posts and informative e-mails in early 2021.

In December 2020, Commission staff conducted and recorded 10 interviews with former Commission members and former staff members who wrote, adopted and/or implemented the CMP, which guides land-use, development and the protection of resources in the state Pinelands Area. The final video interview enabled nine participants to reflect on their experiences in writing the 500-page plan amid a daunting deadline and without the benefit of computers or mapping programs. The

video interviews will be archived on the Commission's YouTube Channel (<https://www.youtube.com/channel/UCBgpC8sbR3Acrjo7ppxs3Uw>).



Aside from the interviews, staff also researched and started to write dozens of posts that will be shared on the agency's Facebook page, Instagram site, and/or YouTube Channel every day in the first few months of 2021. The videos and the posts chart the history, purpose, implementation and success of the CMP, and they will include spotlights on all nine Pinelands Management Areas, plant and animal species that benefit from Pinelands protection, as well as features on the work of the agency's Planning, Regulatory Programs, Science and Communications offices.

Finances

Fiscal & Budget

The Commission's Operating Budget for Fiscal Year 2020 totaled \$5,915,074. Of this, \$4,917,580, or 83.14% percent, was budgeted for personnel expenses.

Budgeted revenue sources included \$383,000 in federal grants, a \$2,949,000 State appropriation, \$841,040 in State grants and other State funding, \$690,000 in application fees and \$1,052,034 from the Commission's fund balance and reserves.

The 2020 budget for the Kirkwood-Cohansey Study, funded through legislation passed in 2001, was \$70,000. The budget for the Pinelands Conservation Fund was \$618,255.

The Commission's Audit Report for Fiscal Year 2019, which ended June 30, 2019, is posted on the State Auditors web site. The website address is: https://www.njleg.state.nj.us/legislativepub/auditreports_department.asp#PINE.

Pinelands Application Fees

Since April 2004, the Pinelands Commission has received application fees to partially underwrite the direct costs associated with reviewing development applications in the Pinelands Area. During Fiscal Year 2020, unaudited application fee revenues actually collected totaled \$379,398.49 (\$310,601.54 less than Fiscal Year 2019).

Certification

As required by State Executive Order #37, all State authorities are required to certify that during the preceding year the authority has, to the best of its knowledge, followed all of the authority's standards, procedures, and internal controls. I hereby certify to the best of my knowledge that, during the 2020 calendar year, all of the Commission's standards, procedures, and internal controls were followed.



Nancy Wittenberg
Executive Director



Cover image: A setting sun projects hues of purple and pink that reflect onto a cedar swamp in the New Jersey Pinelands. Photo/John Bunnell