

**2022
NEW JERSEY
NATURAL LANDS TRUST
ANNUAL REPORT**

Preserving New Jersey's Natural Diversity



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STATEMENT OF PURPOSE

The New Jersey Natural Lands Trust was created in 1968 by legislation which became effective on January 23, 1969. The intent of this legislation was to create an independent agency with the mission to preserve land in its natural state for enjoyment by the public and to protect natural diversity through the acquisition of open space. The Trust preserves land primarily by donations of open space through acquisition of title in fee simple or of conservation easements, and manages its properties to conserve endangered species habitat, rare natural features, and significant ecosystems. The Trust invites passive use by the public for recreational or educational purposes wherever such use will not adversely affect ecological communities and biological diversity.

The Trust also recognizes that ownership and management alone are not enough to achieve its mission. Public education is an integral function of protecting natural diversity. The Trust distributes information designed to convey a conservation ethic for the protection of open space and its natural values.



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Explore the Mystic Island Preserve.

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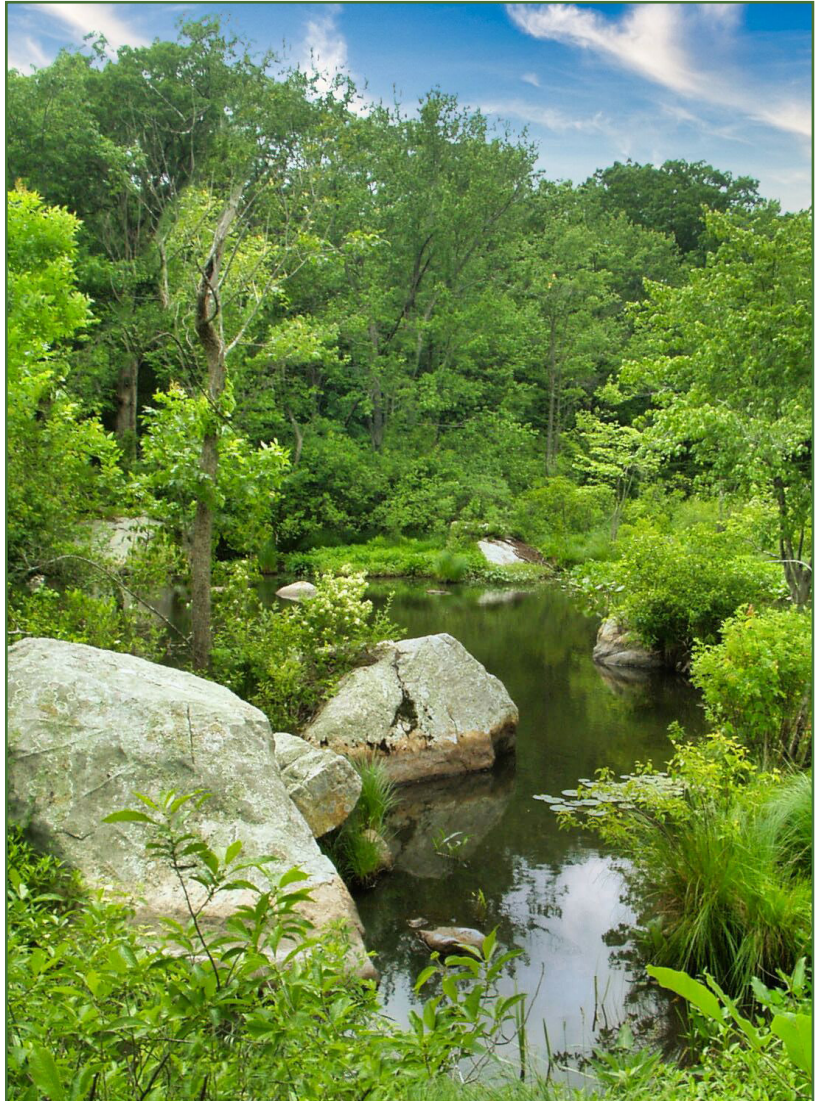
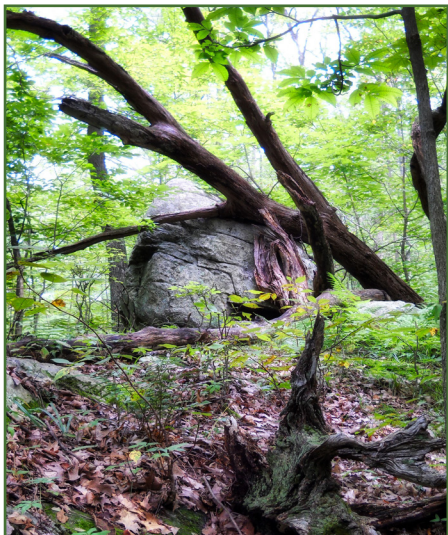
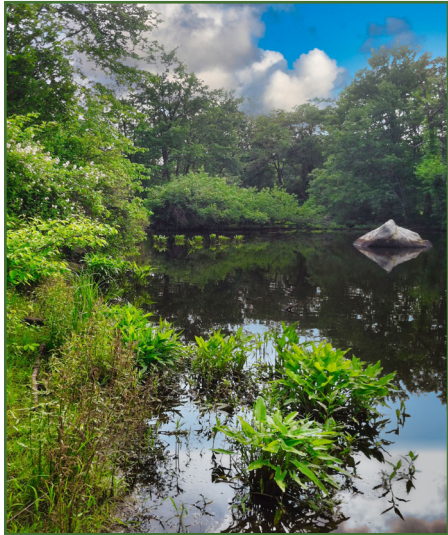
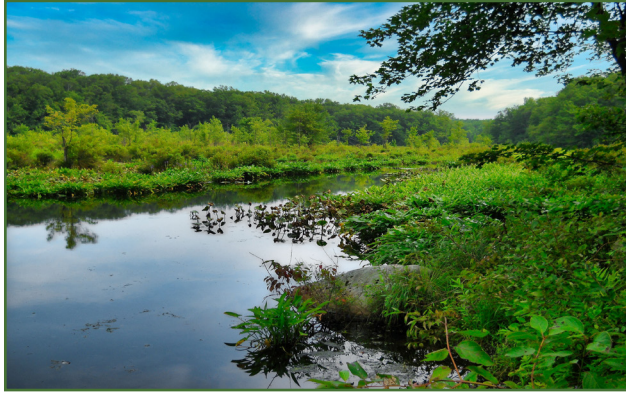
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Kathleen S. Walz, Cari Wild, Blair Young

In 2022...

The New Jersey Natural Lands Trust received a land donation as an addition to its Lubbers Run Preserve, one of more than 120 preserves throughout the state that comprise the Trust's system of nature preserves.



Scenes from Lubbers Run Preserve, named for the small tributary to the Musconetcong River that runs through it.

Petty's Island

Cultivating a Community of Justice

The Trust's Petty's Island Preserve located offshore of the Cramer Hill neighborhood in Camden is the Trust's only truly urban preserve. Currently, the Trust holds a conservation easement on the island with limited ability to provide public access but with a big vision of what this island, once restored, can mean for Camden and its neighboring urban communities. Industrial activities on the island during the 20th century meant that the surrounding community had no access to the island or its three miles of shoreline. In addition, these activities brought hundreds of trucks through the surrounding neighborhoods each week.

Although the public doesn't have unfettered access to the island yet, with the generous support of the William Penn Foundation, the Trust offers environmental educational programming there, including school field trips, history hikes, art workshops, clean ups, and more. The Trust provides this programming with the help of its programming contractor, the [Center for Aquatic Sciences](#) (CAS). Since CAS is located in Camden, it has built relationships and worked with schools throughout Camden County for more than a decade. Through these relationships, the Trust hopes to better engage and respond to the needs of the Camden community.



Illegal dumping and littering are rampant throughout the Cramer Hill neighborhood in Camden and along the Delaware River Back Channell. **Photos:** Linda Cairnes

Through enhanced engagement, the Trust hopes to help alleviate the problem of dumping in the Cramer Hill neighborhood across from Petty's Island. One need only to take a walk or ride down 36th Street towards Petty's Island, or along Harrison Avenue from Petty's to the Cramer Hill Waterfront Park, to see how illegal dumping and littering continue to adversely affect this disinvested area. Although the Trust and others conduct repeated clean ups in the area, better solutions are needed. Why do people dump along the streets in the Cramer Hill neighborhood? Is it because they are small haulers who can't afford to pay a full-size load tipping fee? Is it because they think no one cares or is watching? Everyone deserves to live on a clean street regardless of their zip code. This is an issue that is more than just unsightly trash; it's about a better quality of life for this community, which has been historically overburdened by industrial businesses including a former sewage treatment plant, the former Crowley Maritime truck traffic, and River Front Recycling. The Trust plans to seek better solutions, including convincing small time haulers to do the right thing and stop dumping.

As more fully explained in prior annual reports, Petty's is one of 23 environmental education centers comprising the [Alliance for Watershed Education](#) (AWE), which receives funding support from the William Penn Foundation and shares a mission to collectively increase and enhance constituent appreciation, knowledge, and stewardship of the Delaware River watershed. Petty's programming contractor CAS is also one of the AWE centers, as well as being one of our partners in [Discover the Delaware](#), which promotes education of and access to the Delaware River, and includes the County of Camden Parks through its Environmental Center, UrbanPromise, New Jersey Conservation Foundation, Independence Seaport Museum, Camden Community Partnership, Camden County Municipal Utilities Authority, and Upstream Alliance. AWE centers were initially chosen based on their location on the Circuit Trails network.

Search for the Cooper: A River Hidden in Plain View, a story of four teenagers challenged to find the source of the Cooper River that runs through Camden County, New Jersey.

[Circuit Trails](#), also known as “100s of Miles of Happy,” is a vision for a more than 800-mile network of bicycle and pedestrian trails connecting people to jobs, communities, and parks within the Delaware River Watershed. This initiative began more than a decade ago as the brainchild of the Circuit Trails Coalition, a collaboration of nonprofit organizations and government agencies, also funded by the William Penn Foundation. Through the efforts of the Circuit Trails Coalition and its partners, as of 2022 the Circuit Trails network has grown by 14%--adding 124 new miles of trail and bringing the total trail mileage to 374. This progress was made possible thanks to the more than \$240 million that have been invested by a combination of federal, state, and local governments and foundations to advance the development of the network over the last decade. Additional miles were added to the Circuit Trails network with the development of three parks featuring new trails in Camden: Cooper's Poynt Waterfront Park in 2017, RCA Pier and Gateway Park in 2019, and Cramer Hill Waterfront Park in 2022. In May of 2022, the Camden County Commissioners allocated \$10 million for the development of the [Camden County LINK trail](#), with its planned route through 17 Camden County municipalities from the Ben Franklin Bridge in Camden to the Pinelands National Reserve in Winslow Township.



Eagles soar over Petty's. **Photo:** William Culp



The meadows that replaced parking lots at Petty's provide lots of hunting grounds for fox. **Photo:** William Culp

The Trust and its Discover the Delaware partners also have a vision for a 13-mile water trail from the Cooper River in Pennypacker Park in Cherry Hill down to the Delaware River and Petty's Island. To bring attention to and garner support for this goal, the Trust partnered with Discover the Delaware on a documentary film, “[Search for the Cooper River](#),” which was a six-day, 16-mile expedition by four Camden teenagers from the mouth of the Cooper River to its source, a groundwater fed spring they drank from to celebrate their discovery. The goal of this project was to highlight how nature survives and thrives in urban places where many people tend to forget about the rivers and creeks that surround them. Hopefully, this awareness will inspire them to deepen their connections to water including advocacy for better access and quality. The Camden expeditioners were accompanied by Anand Varma, a National Geographic photographer, who captured them interacting with the plants and animals they discovered along the river. The film was shown at numerous film festivals and is now [available](#)

[online](#). We hope you get the chance to see this film which really accentuates the unexpected beauty and nature throughout Camden County.



Cooper River Paddle.
Photo: William Penn Foundation



Participants in the “Search for the Cooper River” studying some of their discoveries. **Photo:** Upstream Alliance

Speaking of youth doing big things, the Trust, along with CAS and Camden County Environmental Center, with the financial sponsorship of the William Penn Foundation, were assisted by a trio of AWE fellows throughout 2022. All of the fellows, Nyraisia “Ny” Robinson, Yamil Huerta, and Mitch Fiebus, attended events and participated in activities to help engage communities throughout Camden County. Yamil created a game that took participants on a pollinator adventure throughout Camden County. Ny created very beautiful and informative wildlife guides for Petty’s Island’s mammals, birds, reptiles, amphibians, and insects as well as colorful bookmarks representing some of the island’s numerous critters. Ny stayed on with Petty’s beyond the summer fellowship and represented the Trust and Petty’s at the annual Delaware River Festival, which hosted more than 2,400 visitors. This annual AWE-sponsored event is a celebration of the Delaware River along the waterfronts of Camden and Philadelphia offering free family entertainment from face painting, to music, to environmental exhibitions, and on-the-water experiences including free ferry rides on the RiverLink between Camden and Philadelphia. This year’s event also included the ability to enjoy a game of Aqua Marooned! which continues to be played and enjoyed at AWE centers throughout the Delaware River Watershed. Read more about this experiential game below.



Top: Ny Robinson and Eve Quinones at the Delaware River Fest.

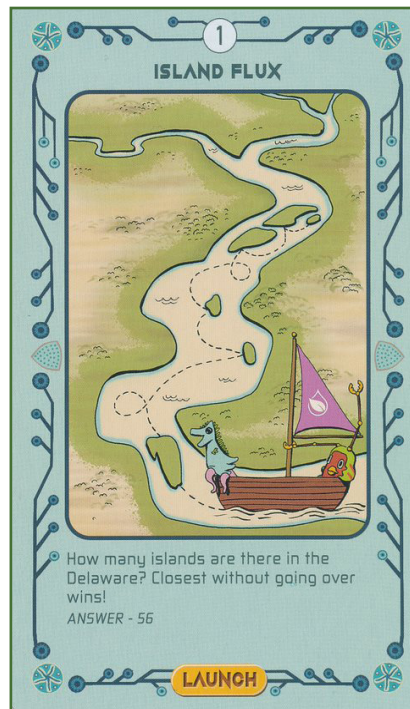
Bottom: The Petty’s sign is a popular spot for group shots.



Aqua Marooned!

Focus on Petty's Island Art and Culture

Aqua Marooned! is the second part of an art project of AWE's [Lenapehoking~Watershed](#) program, which looks to highlight its 23 member centers throughout the Delaware River Watershed as places to enjoy water, art, and culture. Lenapehoking is the Lenape name for the Lenape homeland, which is roughly the area of the Delaware River Watershed in what is now known as New Jersey, northern Delaware, eastern Pennsylvania, and southeastern New York. Under this wide-ranging art project, Adrienne Mackey, founder and artistic director of [Swim Pony](#), known for developing immersive experiences with art, developed a card game to encourage visitors to experience art and nature in innovative and participatory ways.



Aqua Marooned! casts players as extraterrestrial explorers curious to learn as much as they can about the earth's mysterious "watersphere." Each card is different, showing beautifully illustrated pictures of plants, insects, and animals—as well as a cast of playful alien characters. Illustrator/graphic designers Meg Lemieur and Bri Barton (known for their project Water Ways) and writer Brad Wrenn are responsible for the vivid and clever card designs.



Although Aqua Marooned!, a card game meant to inspire experiences within our natural environment, was designed with the AWE centers in mind, it is playable anywhere. There is a core deck which features the flora and fauna of the Delaware River Watershed. Each card calls out a challenge ranging from the silly (Find a dead thing and give it a heartfelt eulogy. Most heartfelt wins.), to the physical (Race to the nearest body of water), to the reflective (Sit in silence and notice the sounds around you).

In addition to the core deck, a unique expansion deck was created for each center. The Petty's Island expansion deck acknowledges some of the legends and lore of the island (It's rumored that Blackbeard may have hidden his treasure on Petty's Island. Make up a legend about your surroundings.). It recognizes the various names of the island over the centuries (Rename the place you are now. Most interesting name wins!). The Lenape name for the island, "Aquikonaska," is said to be the Lenape word for "Place of Tall Grass or Reeds." There are lots of nonindigenous plants and grasses on the island including many clusters of invasive *Phragmites* reeds. One card plays on that by saying the "Captain who draws this Mission automatically wins its points until someone else sees a cluster of *Phragmites* reeds and says "Phrag OFF! to steal it."



Recognizing the history and culture of the Lenape, the card designers worked with Lenape tribal



Group enjoying the game Aqua Marooned! at Petty's Island

members to develop an extra special expansion pack that instills a sense of understanding and reverence for the land. One thought-provoking Lenape deck card notes, "The Lenape strive to follow the principle that we are responsible for decisions we make today seven generations into the future. How would you change your behavior if you lived by this idea?"



One player at Petty's noted that the game led us to having "meaningful conversations we otherwise wouldn't have had." Another noted that the game "helped us to experience our time in nature more deeply." The players said that the game, even while inspiring deep philosophical conversation about the environment and human behavior was, through its beautiful illustrations and silly characters, ridiculously fun to play.



*Because the Trust's mission is to preserve land in its natural state and protect New Jersey's natural diversity, our annual report profiles a selected rare plant each year. This year we profile **Schizaea pusilla**,*

Curly Grass Fern

By Elena Williams

New Jersey's Most Famous Plant. That is how this diminutive fern is described by David Fairbrothers and James Montgomery in their book about the ferns of New Jersey. And even if you're not a botanist, many people immediately associate this plant with New Jersey and the Pine Barrens. In addition to its fascinating life history, the story of this plant's discovery in the state is filled with intrigue and uncertainty.



[Climbing fern in Rural Hours, 1851.](#)

Ferns are part of a large, diverse group of species that is also one of the oldest lineages of plants in the world. Ferns first appear in the fossil record hundreds of millions of years ago. Since that time flowering plants (angiosperms) have evolved to become the predominant group of vascular plants in New Jersey and the rest of the world. However, a variety of fern species continue to thrive in the state. These include species that are commonly seen in the wild and also grown in suburban gardens, such as the northern maidenhair fern (*Adiantum pedatum*) and the ostrich fern (*Matteuccia struthiopteris*).

New Jersey's flora includes many other ferns and fern relatives that are vastly different in appearance and that are some of the rarest plant species in the state. For example, the climbing fern (*Lygodium palmatum*) looks more like a vine than a fern. This state imperiled plant prefers moist, acid soils and is found throughout the eastern half of the United States. The plant was highly sought by collectors in the 19th century for its attractive palmate (hand-shaped) foliage. In response to declining numbers, in 1869 the Connecticut State

Legislature prohibited collection of the fern. This is believed to be the first law passed in the United States for the protection of a plant species.

Even rarer fern relatives include plants such as [stiff club-moss](#) (*Lycopodium annotinum*). Despite its name, this State Endangered plant is actually more closely related to true ferns than to moss species. It belongs to the group of fern allies that includes ground pine (*Lycopodium obscurum*) and tree ground pine (*Lycopodium dendroideum*). And, indeed, all these evergreen species do resemble miniature evergreen trees. But these plants exhibit the characteristics of other ferns when it comes to a life cycle with different developmental stages and the use of spores, not seeds, for reproduction.

But let's get back to the most famous plant in New Jersey – Curly grass fern (*Schizaea pusilla*).

[Curly grass fern](#) is a globally rare plant species, but in New Jersey it is relatively secure with over 70 populations documented since 1980 in the NJDEP's Office of Natural Lands Management's Biotics database. It is a characteristic species of the Pinelands, but that doesn't mean it's easy to find! That's largely due to the small size of the plant which reaches a maximum height of approximately 5 inches. Even Cobb, Farnsworth, and Lowe's 2005 Guide to Ferns notes that "...it is almost impossible to find without lying flat on ground..." (p 206).

As a fern, *Schizaea* reproduces via spores and exhibits two extremely different stages in its life cycle. When spores land on a suitable surface they first germinate and then develop into a filamentous structure called a gametophyte that resembles algae. The gametophyte produces the gametes (eggs and sperm) which after fertilization develop into the more familiar version of the fern, known as a sporophyte. In the curly grass fern, the curly twisted grass-like blades that give rise to the common name are actually sterile fern fronds. The longer blades with the clublike tips are the fertile fronds that will produce the next generation of spores.

The attention surrounding the New Jersey discovery of curly grass fern in the early 19th century was amplified by larger worldwide trends involving botanical discovery and colonialism. As European states established colonies and competed for wealth, access to natural resources, and prestige across the globe, there was a simultaneous push to discover and catalog the plants and animals found in the New World. While the emphasis was on the economic potential of these species, wealthy collectors and landowners were also eager to obtain and display the most exotic specimens of plants and animals in their own public or private gardens and museums.



Ground pine.
Photo: Bob Cunningham



Sterile fronds of *Lygodium palmatum* near Pemberton, NJ.
Photo: [Choess](#)



[Ferns](#)

This trend would soon be joined by a Victorian era craze for ferns. “Pteridomania” as it was dismissively termed swept Great Britain in the 1800s. It was facilitated by the development and proliferation of the Wardian case, an early version of the terrarium, that enabled live plants to be transported and displayed. While most prevalent in England, Americans were not immune from fern mania.

By 1805 the stars were aligned for the botanical discovery of a new fern species. But who exactly was the discoverer and who got the credit? In 1805, a group of botanists made an excursion to the New Jersey Pine Barrens to the area around Quaker Bridge in what is now the heart of Wharton State Forest. At the time, Quaker Bridge was on the stagecoach route, and the Pine Barrens was a hub for botanists looking for new and unusual plants that could only be found in the specialized habitats of this region of the state. The party that found the plant consisted of Dr. C.W. Eddy, J. Le Conte, F. Pursh, and C. Whitlow. The plant was first described by Frederick Pursh and that’s where the trouble began.

[Pursh](#) was born in 1774, in what is now Germany, and emigrated to the United States in 1799. He was based in Philadelphia from 1802 to 1805, and then began to work for the wealthy naturalist and physician, Benjamin Smith Barton. In addition to financing Pursh’s collection trips throughout the eastern states, Barton also wanted to produce a new

flora describing the plants of North America.

Thomas Jefferson also was aware of Benjamin Barton’s background and wanted him to work with Meriwether Lewis to describe and write a natural history of the western plants collected during the Lewis and Clark Expedition of 1804-1806. The first specimens were sent back to Philadelphia, but Barton did not follow through with writing the flora. Instead Pursh was hired to begin examining the specimens, drawing pictures of the plants, and writing descriptions for eventual publication. The job remained unfinished when, after a series of publication delays and disputes about payment from various employers, Pursh decided to leave for England in 1811, taking some of the Lewis and Clark plant specimens with him.

Upon arriving in England, Pursh proposed to write his own flora of North America. In addition to a few of the Lewis and Clark specimens, Pursh had a large amount of material from his own collecting expeditions in eastern North America. His two-volume work, *Flora americana septentrionalis*, was officially published in January of 1814.

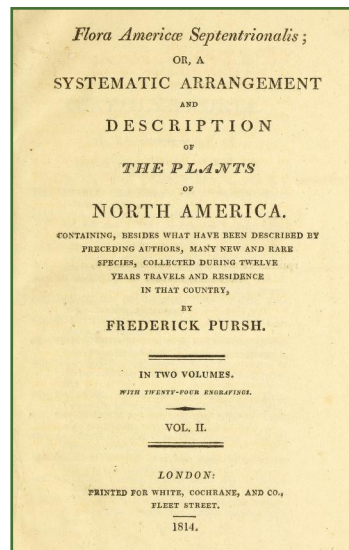
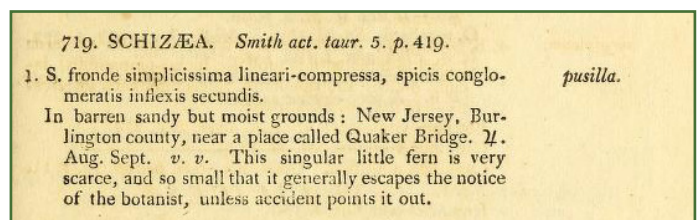


Image from the cover of Volume 2 of *Flora americana septentrionalis*.

Here is the description of Curly Grass Fern from his 1814 flora (vol 2, pl 657):



In the introduction to his flora, Pursh acknowledges the work of many other botanists as well as crediting the collections of their plant specimens that enabled him to include so many new species in his flora. He specifically cites the work of Meriwether Lewis, as well as John Le Conte, among others. Presumably, this is the same J. Le Conte who accompanied C.W. Eddy and the others on the 1805 trip on which the curly grass fern was first seen. Le Conte was born in New Jersey, but his family had a plantation in Georgia where he often spent time. Pursh credits him with helping to build up the collections with plant species from the southern states. Pursh also thanks Benjamin Barton for supporting his own collecting trips to visit southerly states in 1805 and northern states in 1806. He writes that he began his 1805 trip to the southern United States early in the year and did not return until late in the autumn.

In the description for *Schizaea* in his flora, Pursh assigned the code v.v. to those plants that he observed in a living state. For plants that he described from specimens, he used the code n.s., and often cited the herbarium or collection where the specimen was stored. Readers may notice that the description for curly grass fern claims that live plants were first observed in August or September, but at that time in 1805, he was still months away from returning to the Philadelphia region.

Based on this, it's apparent why Pursh was harshly criticized for taking credit for other's discoveries. According to Witmer Stone, the first to discover the plant was C.W. Eddy. Stone bases this statement on an 1818 review of the flora by another botanist, Constantine Rafinesque, who wrote that Pursh did not find any of the specimens and that he did not have the real discoverer's permission to write up the species' description. Stone also writes that Dr. John Torrey (another prominent 19th century botanist) credited the discovery to C.W. Eddy and noted that J. Le Conte was the only other person in the group to find a specimen on that day.

And who was C.W. Eddy? His full name was Caspar Wistar Eddy (1790-1828). He studied medicine and was interested in botany. His uncle, Samuel L. Mitchill, also studied medicine as well as law, but is mostly remembered for his interest in natural history.

Mitchill was one of the founders and first president of the Lyceum of Natural History, while Eddy was named the first vice president. This institution which started in 1817 later became the New York Academy of Sciences in 1876. Mitchill supported the work of other naturalists, such as Constantine Rafinesque and John Torrey, both of whom were also members of the Lyceum.

Perhaps Eddy's youth was one reason why Pursh may have stinted on crediting him with the discovery of *Schizaea*. In 1805, Eddy would have been fifteen years old, while Pursh was thirty-one. When he wrote his flora, he probably assumed no one would know or care what happened at Quaker Bridge on that botanical foray into the Pine Barrens. Perhaps he forgot in the rush to beat the competition and publish his flora. He was also reported to be an alcoholic which may have affected his work. However, there was some honest confusion about exactly when curly grass fern was first seen, and Eddy's supporters in the Lyceum definitely wanted to ensure that he was properly credited with the find.

Does it matter? Botanical nomenclatural rules include the name of the person who first published the name and species description. So, the complete scientific name and author name for curly grass fern is *Schizaea pusilla* Pursh. On the other hand, Dr. Torrey named an entire genus after C.W. Eddy - *Eddya*. Unfortunately, that name is now obsolete, and the preferred genus name is *Tiquilia*. Such is fame! But the fern itself is still in New Jersey, and well worth a trip to see, no matter what name is used and who discovered it.



Schizaea pusilla Pursh

Dogs -- A Rare Plant's Best Friend?

By Kathleen S. Walz

The wild ancestor of all domestic dogs is the gray wolf. Dogs have been domesticated by humans for more than 30,000 years, well before horses and ruminants (cattle, sheep). Working dogs have been trained to help people herd, hunt, search, and rescue. What, you may ask, can scent detection dogs contribute to conservation?

According to Working Dogs for Conservation, “dogs are suited to sniffing out plants and animals because their sense of smell is 10,000 to 100,000 times stronger than that of humans. Dogs have at least 220 million scent receptors in their noses, as opposed to only about 5 million for humans. In addition, dogs can smell continuously – not just on inhale.” Trained scent detection dogs have been used for medical research (detecting human and plant diseases), in finding narcotics, for search and rescue in disasters, in pest control (bed bugs), and recently in conservation.

Canis lupus familiaris:

- *Canis* (dog)
- *Lupus* (wolf)
- *Familiaris* (domestic, intimate, of family)

Detection dogs can be used to find invasive plants and animals, poached wildlife (ivory, rhino), and even elusive endangered species. The New Jersey Department of Environmental Protection (NJDEP), Endangered and Non-Game Species Program has been using scent detection dogs to help find and sample [bobcat scat](#) to research population genetics. The NY-NJ Trail Conference (NYNJTC) has a [Conservation Dogs Program](#) that has worked with great success on early detection and removal of invasive plant species along trails in the greater NY/NJ metropolitan area. Check out this great [“wagging tails, saving trails”](#) YouTube video by the NYNJTC Conservation Dog Program.

In 2022, the NJDEP, Office of Natural Lands Management worked with the NYNJTC Conservation Dogs Program to search on state lands for an elusive and rare orchid listed as state endangered and federally threatened. This is how they did it.



Meet the team from left: Fagen, Dia, and Peat.

Photo: [NYNJ Trail Conference](#)

Like most things worthwhile in life, scent training for dogs takes time. Introduce a new scent, isolate it from other scents, and reward the dogs for identifying that new scent in the bouillabaisse of scents that is their world. Repeat. Sometimes a fresh or dried plant can be used as that source material. But what can you do if the plant is so rare that you can't collect leaves or flowers? [Getxent](#) (get scent) tubes to the rescue! The NYNJTC Conservation Dogs Program's trainers utilize this new, innovative method to collect scent. Just place an inch-long hollow polymer tube on or next to the plant of interest, leave it in place for a few days, collect it and store the tube in a sterile container without touching it with human scent-rich fingers (easier said than done). The scent tubes can then be used to train detection dogs instead of using plant material. It works--amazing!



Getxent tubes

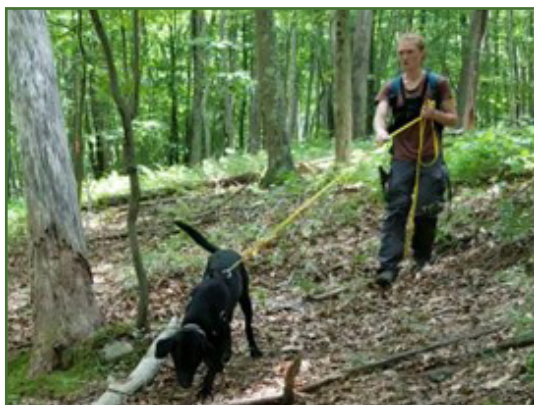
So how is it done? Starting in a scent-simple environment like a room, the treated scent tubes are carefully placed in a visually obvious sterile container and when the dogs sniff them, they are rewarded with a toy or food. It takes a while, but within a few days of training the dogs get the target scent memorized and reliably alert their trainer to the scent by freezing and staring at the source of the scent. Next step is to bring the scent tubes outside in the natural world where plenty of scent distractions exist. Eventually, the target scent is hidden, and the dogs must search for the scent using their sense of smell alone. Then, finally, the real test. Take the dogs into the wild where a known location for the target plant can be used for live training. Searching in transects directed by their trainers, the dogs will sniff and inhale myriad scents until they find the rare plant--voila! Sometimes they don't alert at the exact location of the rare plant. This is because time of day, temperature, humidity, wind direction and speed, and topography all interact to

determine where the strongest scent from the plant will be located. A dog might alert a few feet upslope of the plant because the scent is flowing uphill on the rising air. The NYNJTC uses a Cirrus Wind Indicator detector gadget that produces a puff of smoke close to the ground so that they can see where the air and scent is moving.

Alas, no new plant finds in 2022, but the dogs alerted to known plant locations. One of the most interesting finds during this work was that the dogs would alert very confidently to specific locations by a log or leafy spot where the human observers did not see any plants. Could these scent detection dogs possibly smell the plants that have not emerged from the soil and are underground? This rare orchid can remain under the soil surface for more than a decade before conditions are right for the plant to appear above ground. Those locations were noted and their trainers are hopeful that return visits may reveal the plants.

Searching for rare plants with the help of scent detection conservation dogs is a new and exciting way of covering a lot of ground, often on difficult terrain, looking for that elusive, "needle in a haystack" rare plant. Stay tuned!

First Nations names for dog:
Lenape: Mwekàne
Ojibwe and Algonquin: Animosh



Members of NYNJTC with conservation dogs Peat (LEFT) and Fagen (RIGHT).

A Bryologist's Brochure: Mosses of New Jersey and Where to Find Them

By: Blair Young

In the Garden State of New Jersey, spring is a time when flowers are blooming through the leaf litter and the lawn grasses, trees are pushing out bright green leaves to give shade from the lengthening days, and the squirrels, birds, and insects are all abuzz with renewed activity. However, there is another denizen of our state just as prevalent as these springtime neighbors which was with us all winter long, the humble mosses.

Mosses are plants that escape even the gaze of those who might admire the flowers or the trees, but they are a permanent fixture of the New Jersey landscape. In their natural habitats among the forests, glades, bogs, and trails they can be so abundant that they are hard to miss, and often add to the scenery of such places. But they are not restricted to these places. They are in the cracks of the sidewalks we walk upon, hidden among the plants of our gardens and lawns, and on the bark and branches of street trees. Mosses are just about everywhere you look, even where we live.

New Jersey is an especially lively place for mosses. The humid coastal air, frequent rains, and varied environments all contribute to a thriving abundance and diversity, rivaling that of larger nearby states. Nowhere else does a state of this size have such striking heterogeneity of habitat, and that fact is exemplified by the variety of mosses that occur in the state. The state's rich diversity is owed, in part, to its location at the confluence of several different ecoregions, namely the Atlantic Coastal Plain, the Northeastern Coastal Forests, and the Appalachian-Blue Ridge Forests. These three ecoregions all occur in the state, and each has state lands associated with them which most of the state's mosses call home.

There are some mosses that are quite common on New Jersey's state lands from the Pine Barrens to High Point that are easy to spot and tell apart. One of the most iconic is the delicate fern moss (*Thuidium delicatulum*), which is a large moss that resembles the fronds of a fern and snakes along its substrate in a dense carpet. This moss is one of the most abundant species in the state, growing on anything from fallen logs, rocks, soil, and occasionally along the edges of standing water. Its sure to be seen along the trails of the Watchung Mountains, the Great Swamp, High Point, and the Delaware Water Gap.



Delicate fern moss growing in a crevice of a boulder at the Delaware Water Gap.

Another eyecatcher that is sure to turn a few heads is the broom forkmoss (*Dicranum scoparium*). This species, as the name suggests, has shoots shaped like little brooms, with plumes of leaves at the tip that have a hair-like appearance when growing in their characteristic cushions. They are larger than most mosses, with their cushions often being over an inch deep, which gives them a pillowy structure. This moss grows on soil, logs, and occasionally on rock, and can be found along the trails of the Watchungs, Brendan T. Byrne State Forest, and in extreme abundance in the Delaware Water Gap.

The next moss is the common haircap moss (*Polytrichum commune*) which, despite the name, is a little less common than the other two mosses previously mentioned. What this moss lacks in its abundance it more than makes up for in its form, as this moss is one of the tallest mosses in the world, regularly reaching heights of several inches and growing up to a foot off the ground in exceptional circumstances. This moss resembles little pine forests, with shoots that possess needle-like leaves and an almost woody stem, all growing together in miniature stands. They grow on soil and can be found sporadically but consistently in almost any of the state's parks and natural areas.



Broom forkmoss growing on a rock sheltered by snow in the Delaware Water Gap

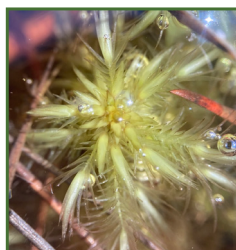
One of the most conspicuous and restricted common mosses are the many species of peatmosses (*Sphagnum*) that grow in the state's bogs, wetlands, lakes, and waterways. In wetland environments they grow as cushions or mats that are often many feet deep, growing slowly upward as they sink into the ground. They can hold large amounts of water within their cells, so much that they are essential in the formation of bogs, creating the very environments they require to live. These mosses grow in water, along its edges on soil or hummocks, and occasionally on hydric forest floors, and can be found throughout the wetlands of Brendan T. Byrne State Forest, Wharton State Forest, the Great Swamp, and in the unique Atlantic White Cedar bog at High Point.



Common haircap moss growing on soil next to a trail in Watchung Reservation.

These common mosses are some of the most abundant in the state, but since most of that abundance is in more natural environments, they are not necessarily the mosses state residents are most likely to notice in their day to day lives.

While some mosses are more common in natural areas and state lands, others are less common there, and have instead found success living in disturbed, polluted, and urban environments where their preferences for disturbance or tolerance of pollutants have allowed them to flourish without having to compete with mosses that cannot cope with the harsh conditions.



Left: Largeleaf peatmoss



Right: Recurved peatmoss

One such moss is the seductive entodon moss (*Entodon seductrix*), which grows in small carpets with individual shoots that are worm-like and light green at the tips. While sporadic in natural environments, it is one of the most common mosses in cities and the most conspicuous of the urban mosses due to its relatively larger size and light green color. This moss grows at the bases of trees and on rocks in natural areas, while in urban areas it also grows on soil due to the lack of leaf litter which would normally prevent it from doing so, and on hard surfaces like bricks and concrete which few mosses can tolerate.

Another common urban moss is silvery bryum (*Bryum argenteum*), which grows in small, tight cushions that appear blue green to whitish-green due to the white color of the tip of each shoot. It is arguably the most common moss in urban environments, though small and inconspicuous. The relationship between urban individuals of this species and their counterparts in natural environments is hazy, as this species occurs all over the world and is associated with urban environments globally. Because of this it is likely the urban members of the species in New Jersey are a melting pot of lineages from all over the world. This moss grows on freshly disturbed soil in natural environments, while in urban areas it is ubiquitous in sidewalk cracks, common on metal, wood, concrete, roofs, and occasionally on soil.



Seductive entodon moss growing on a wooden post at Douglass Campus-New Brunswick, NJ.



Silvery bryum growing on a red brick walkway underneath a bench at Douglass Campus, New Brunswick, NJ.

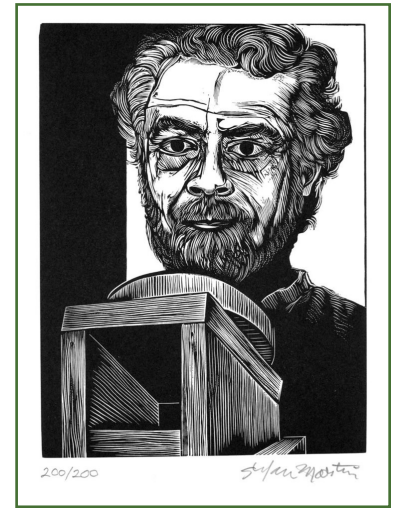
These are just some of the mosses that may be noticed in the state, and though they may be unassuming plants, there is an entire world right under our noses to appreciate, if you're willing to look.

As winter gives way to spring and the flowers, trees, and animals come back into our lives, give a thought to the humble mosses of New Jersey, which are rarely seen, but often abundant. Mosses are often referred to as a whole, but rarely recognized for their diversity, are almost always taken for granted, and nearly never appreciated. None of the species mentioned here are exclusive to New Jersey, none of them are rare, but they are living with us in this place at this time, and here they live in a way that's not quite the same anywhere else. Keep looking at the flowers, at the trees, at the animals, but as residents of the Garden State, take the time to appreciate our mossy home, too.

*Article Photos: Blair Young

The Trust and Artist Stefan Martin

Almost 40 years ago, the Trust embarked on a project with artist Stefan Martin (1936–1994), renowned wood engraver. One of only a handful of wood engravers in the United States, Martin earned a B.F.A. from the Art Institute of Chicago but burnished most of his commercial and traditional techniques while working at Sanders Wood Engraving Company in Chicago. Martin's engraving style relied on rubbing egg white on end-grained laminated boxwood and then using a combination of white line technique, where the artist cuts into the block directly making expressive marks with the burin (type of engraving tool), and black line technique, where the artist makes a drawing in black and then cuts away the negative space between the lines. As he told the Asbury Park Press in 1983, "Depending on the piece, I usually figure an hour a square inch. An 8" by 11" piece will take me two to three weeks to complete." Following that, Martin would do his own printing on Japanese rice paper using a press made in 1890 that had no motor. He noted, "After engraving for many hours, it's nice to get up and pull the gears of the press. It's like a finale to the process."



Self Portrait

Over his career, Martin earned recognition for his mastery of the exacting art of wood engraving. His prints were much admired and can be found in private collections and museums, including the Metropolitan Museum of Art in New York City, the Smithsonian's National Portrait Gallery in Washington, the Philadelphia Museum of Fine Art, and the Chicago Art Institute.

Although born in Illinois, Martin's home was in Roosevelt, New Jersey, which had become a hub for several artists after Ben and Bernarda Bryson Shahn put it on the map. In 1938, the Farmland Security Administration commissioned Shahn, who had previously worked with Diego Rivera on the Rockefeller Center mural, to paint a fresco mural in what was known as "Jersey Homesteads," a cooperative farming community made up of Jewish garment workers, commemorating the New Deal resettlement community. The town was renamed Roosevelt in 1945 after Franklin D. Roosevelt's death. Shahn's mural can still be seen in the Roosevelt Public School and depicts the passage of European Jews through Ellis Island followed by their escape from New York's dark tenements and sweatshops to create a new way of life and work through cooperative farms and factories out in the country. The cooperative experiment failed, but Shahn drew attention to Roosevelt, which soon became an enclave for artists, writers, musicians, and poets, including Martin and his parents--David Stone Martin, an artist best known for his illustrations on jazz albums, and Thelma Durkin Martin, a muralist, who painted the post office mural "Wild Boar Hunt" in Sweetwater, Tennessee.



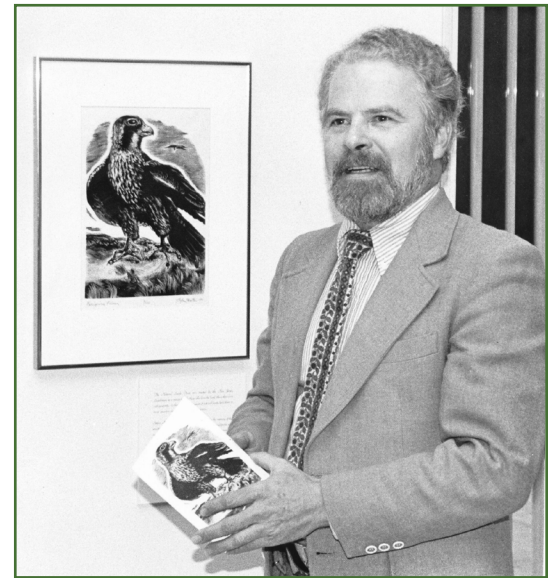
Stefan Martin working on "Morning Stream," one of three prints commissioned by the Trust.



Shahn was a lifelong friend of Martin's father and collaborated with Martin on an engraving of Martin Luther King. Shahn once said this about Martin in describing one of his works, "Lone Pine:"

Stefan Martin is almost unique as a craftsman in the field of wood-engraving. He learned this dying art as a means of supporting himself from one of the few venerable practitioners [Sanders Wood Engraving] left on earth. A full master at a youthful age, Martin then converted his high craft to the service of his sensitive and poetic feelings. Grouped or single figures shape and reshape themselves in the penumbra of vague shadows in his work. Or aspects of nature emerge through a perfection of lines. Of living in Roosevelt, Martin said to the Asbury Park Press in 1983, "I like to experiment, but basically, I'm very interested in the human being in relation to nature. Where I live in Roosevelt, it's very woody."

Based on his local connection and love of nature, Martin agreed to collaborate with the Trust to celebrate its 15th anniversary by creating a series of three engravings of 250 prints each. This was an exception to his usual practice of canceling his wood blocks after 100 prints. As he told the Asbury Park Press, "I X it out, so it can't be printed from again. ... After all that work it's like cutting off your arm, but I do it to keep it kosher." The three prints in the series are entitled, "Peregrine Falcon," "Gentian," and "Morning Stream." The first print of the series was presented to Governor Thomas Kean on Earth Day, April 24, 1984, in recognition of his past environmental efforts and support of the Trust. At a reception held on May 3, 1984, the Trust donated a set of all three prints in the series to the NJ State Museum for public enjoyment. On October 7, 1994, ten years after his collaboration with the Trust, Martin drowned in Assunpink Lake, Millstone, New Jersey when, according to his brother Tony Martin, a rowboat he was in apparently capsized.



Stefan Martin unveiling "Peregrine Falcon" at the NJ State Museum in 1984.

Recently, because of Martin's connection to the Trust and its continued sale of the series he created for it, the Trust has received generous donations of both Martin and his father's artwork from Joan Ogden and Gretchen Bingham. This donated art will also be made available for sale by the Trust in the near future. All proceeds from any sales will be used by the Trust to further its mission of protecting New Jersey's biodiversity and Martin's love and respect for our natural world.



Photos: [Trust's commissioned prints by Stefan Martin available for purchase.](#)



Recognizing and Appreciating the Virtues of Age: New Jersey's Old- and Older-growth Forests

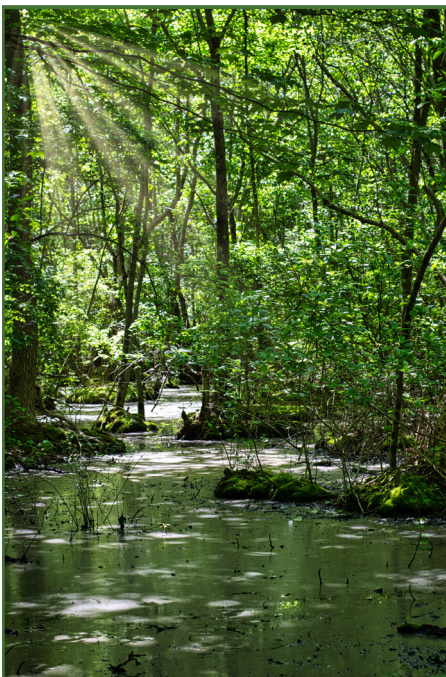
Over the years, the Trust's long-time preserve manager, Martin Rapp, noted that some Trust preserves included some forested areas which he had taken to calling "old-growth forests." This was not based on anything scientific but rather his sense that there was something different, special, and almost sacred about these areas. Not long after Martin retired, the Trust became aware of the [Old-Growth Forest Network](#) (OGFN), a non-profit organization founded by Joan Maloof in 2011 that has been working across the country to designate areas as existing old-growth, or forests suitable for management as future old-growth, with designations so far in 32 states. Their goal is to have a designated forest from every county in every state. The OGFN notes that it "is the only national network in the U.S. of protected, old-growth, native forests where people of all generations can experience biodiversity and the beauty of nature."

The Trust is proud to announce that, in 2022, its Bear Swamp at Red Lion Preserve and a portion of the Game Branch Preserve were officially designated into the OGFN as the first and second designations from New Jersey and the 167th and 168th designations nationally.

The Memorandums of Agreement between the Trust and the OGFN formalizing the designations stipulate that no commercial logging will take place within either of the designated forests. While the Trust does not foresee any ecological need to remove trees from these areas, the MOAs provide exceptions to the "no logging" requirement for "situations of visitor safety, trail maintenance, non-native tree species, or non-native insect infestations."



Very old Atlantic white cedars at Bear Swamp at Red Lion Preserve.



Old growth forested wetlands deep within the Game Branch Preserve.

[Bear Swamp at Red Lion Preserve](#) is located in Burlington County and spans Southampton, Medford, and Tabernacle townships. This Preserve boasts ecologically significant Atlantic white cedar swamps. A tree core taken of one of the larger cedar trees and estimated to be at least 130 years old. There's also a portion of the preserve that contains some American beech which are thought to be in excess of 150 years old.

The Trust's [Game Branch Preserve](#) is located in Salem County within Oldmans and Carneys Point townships. Forested wetlands dominated by red maple, sweetgum, tupelo, and swamp white oak span much of the center portion of the preserve. These swamps are seasonally flooded and contain several vernal pools important for amphibians in the spring. Large, coarse woody debris provides habitat for a wide diversity of saprophytic fungi and myxomycetes (slime molds). The Trust hired Biostar Associates, Inc. to conduct a biodiversity inventory at Game Branch Preserve in 2017, which included a Floristic Quality Assessment (FQA).

It's likely that both preserves endured historical logging, but available evidence suggests no logging has occurred for the past 150 years. Even though they may not be considered true "old-growth" forests, the Trust believes they are ecologically significant enough to be managed for species dependent on conditions found in older-growth forests.

While New Jersey does have a few small examples of what are thought to be true old-growth forests which have never experienced any logging (sometimes called primeval or virgin forests), most of our forests have undergone repeated logging events. It's unknown to what extent New Jersey's biodiversity has suffered as a result, but taxa groups that are particularly sensitive to logging include lichens, beetles, syrphid flies, and mosses. Species within each of these taxa groups are used as indicators to identify pockets of older-growth biodiversity refugia that have somehow persisted in the forests of eastern North America.

The New York Natural Heritage Program has developed an [Old-growth Rapid Evaluation](#) (OGRE) protocol to identify and delineate older-growth forests, which includes a moss, liverwort, and lichen as indicator species. The Pennsylvania Natural Heritage Program has also been surveying for older-growth forests and wrote an article about their work in a [newsletter](#) last year. In addition to having mature trees and older-growth indicator species, older-growth forests also typically have fewer invasive species, coarse woody debris in various stages of decay and size, and large tree branches in the canopy level. Aerial imagery going back to 1930 and the Vermeule maps of the late 1800s can also be used to assess older-growth forests here in New Jersey.

Many of the species that are potentially vulnerable to logging have insufficient data to assess statewide or global rarity. For example, even though there is a recently published [checklist of lichen species in New Jersey](#), there is no official list of rare or state endangered lichen species. The NJDEP does not have the statutory authority to promulgate a list of state endangered fungi, and there is also not enough data to assess which of the 475 lichen species known from New Jersey are rare or declining. Several of the lesser documented lichens recorded from New Jersey are thought to be old-growth specialists not seen in New Jersey for over 100 years.

The Trust's Bear Swamp at Red Lion and Game Branch preserves are both forested wetlands in southern New Jersey, but in 2023 the Trust intends apply for OGFN designation of an upland, hardwood forest preserve in northern New Jersey. The Trust is committed to conducting biodiversity inventories targeting old-growth indicator species on our preserves as important refugia for disturbance-intolerant species. Our hope is not only to better understand these species' presence on Trust preserves, but also contribute to our understanding of their distribution and rarity status statewide. Finding and designating to the OGFN more examples of suitable older-growth forests that do not experience routine natural disturbance is critical to the conservation of these lesser-appreciated forms of New Jersey's biota.



Within old-growth forests there is a diversity of mosses and lichens such as old man's beard lichen.

"... old-growth, native forests where people of all generations can experience biodiversity and the beauty of nature..."

Hunting News

During the 2022-2023 hunting season, 4,666 hunters registered at Trust preserves through its website: www.njnlt.org. The Trust allows hunting for deer only at many of its preserves to maintain biodiversity. The deer population in New Jersey is far greater than the ecosystem can sustain. Over browsing by deer depletes native vegetation resulting in impacts to animal and plant habitat, such as decreased food sources and increased invasive plants.

To hunt deer at selected Trust preserves, hunters access the Trust's website, electronically submit information to the Trust, and print their own hunter registration letter with the required accompanying preserve map. The Trust can use this information to sort hunter registrations by preserve. Trust staff may reach out to hunters registered at a specific preserve to determine their interest in volunteering for clean-ups and maintenance projects.

It is important to note that the Trust does not allow hunting for waterfowl, small game, turkey, or bear, as it maintains that only over browsing by deer poses a threat to biodiversity. In addition, Sunday bow hunting is not authorized on Trust preserves as it is on state wildlife management areas and private property during deer season.

While hunting on Trust preserves, all NJ Fish and Wildlife Game Code rules and regulations must be followed. Hunting deer by bow and arrow, shotgun or muzzleloader are acceptable, depending on the preserve. No target shooting or discharge of weapons other than for deer hunting purposes is permitted. Permanent deer stands are not allowed, and portable deer stands, while permitted, must be removed after the hunting season is completed or are subject to confiscation by the Trust.

"Impacts of deer abundance are not limited to plant species, but cascade throughout the food web."*



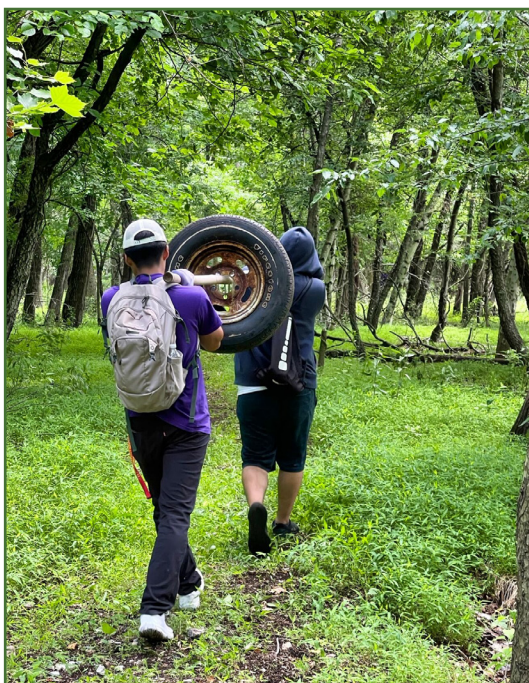
Deer hunting with bow is permitted at the Mackenzie's Bog Preserve.

*Kelly, JF. 2018. Results of white-tailed deer (*Odocoileus virginiana*) surveys in Watchung Borough in April 2018. Raritan Valley Community College.



Thanks to Our Volunteers

The Trust would like to acknowledge and thank its many volunteers for their invaluable contributions to the maintenance of Trust preserves.



Always something to clean up at Petty's Island. Always lots of volunteers on hand to help.

Photos: Linda Cairnes and Anthony Lara

Contribute to the Delaware Bay Shorebird Fund

Each spring in Delaware Bay, from about the first week in May to the second week in June, the largest concentration of horseshoe crabs in the world comes onshore to spawn. At the same time, tens of thousands of shorebirds arrive at the Bay en route from southern wintering grounds to Arctic breeding territory, and Delaware Bay is their most critical stopover. The shorebirds need to quickly double their weight to complete their migration north and breed successfully. To refuel at such capacities and in only a 10-day window, high-energy horseshoe crab eggs provide essential nourishment. But since the early 1990s, there have been major declines in both the number of adult horseshoe crabs and their eggs. With the decline of their critical food source, shorebird numbers also plummeted. For the past 35 years, the Trust has funded scientific research and conservation efforts through the Delaware Bay Shorebird Fund with the goal that someday Delaware Bay's skies will be once again filled with shorebirds.

The Delaware Bay Shorebird Fund was initially created in 1985 through an agreement between the Department of Environmental Protection and Public Service Electric and Gas Company (PSEG). The agreement provided that \$600,000 would be transferred to the Trust, as a fiduciary, to invest and administer solely for protection and management of shorebird habitat. After funding critical shorebird research for the past 35 years, the Delaware Bay Shorebird Fund is now nearing depletion. With contributions, the Delaware Bay Shorebird Fund could continue critical long-term shorebird and horseshoe crab research.

In order to protect these shorebirds, please consider making a donation to the Trust's Delaware Bay Shorebird Fund. Donations can be made online through PayPal:

Donate with PayPal button:



Please indicate that the donation is being made to the Delaware Bay Shorebird Fund.



Delaware Bay Shorebirds
Photos: William Culp

Donations



Duke Farms
William Penn Foundation
New Jersey Conservation Foundation
The Nature Conservancy
Robert C. and Tracey E. Vanderbilt
Urban Promise
New Jersey Audubon Society
CITGO Petroleum Corporation
Shania Hackett
AmeriCorps/PowerCorps Camden
William Culp
Gretchen Bingham
Stewards of Open Space Camden County/South Jersey Land and Water Trust
NJDEP Endangered and Nongame Species Program
Dr. Jay F. Kelly/Raritan Valley Community College
Ridge and Valley Conservancy
Pinelands Preservation Alliance
Bruce Bieber
Keith Seager
John King
National Fish & Wildlife Federation
Barnegat Bay Sportsmen's Club
Upstream Alliance
Wayne Township
Wildlife Preserves, Inc.
Edward Casson
Betsey Schnorr
Brett Berry
Edward Martoglio

For more information about how you can donate to further the Trust's mission to acquire, preserve and manage natural lands for the protection of natural diversity, please visit the [Trust's website](#).



Board of Trustees

The Trust is governed by an eleven-member Board of Trustees. The Board is comprised of six representatives from the private sector and five representatives from State government. The State government members include the Commissioner of DEP and two DEP staff members designated by the Commissioner; the State Treasurer; and a member of the State House Commission. Employees of the Office of Natural Lands Management, State Parks, Forests, and Historic Sites, serve as staff to the Trust and implement the policy set by the Board.

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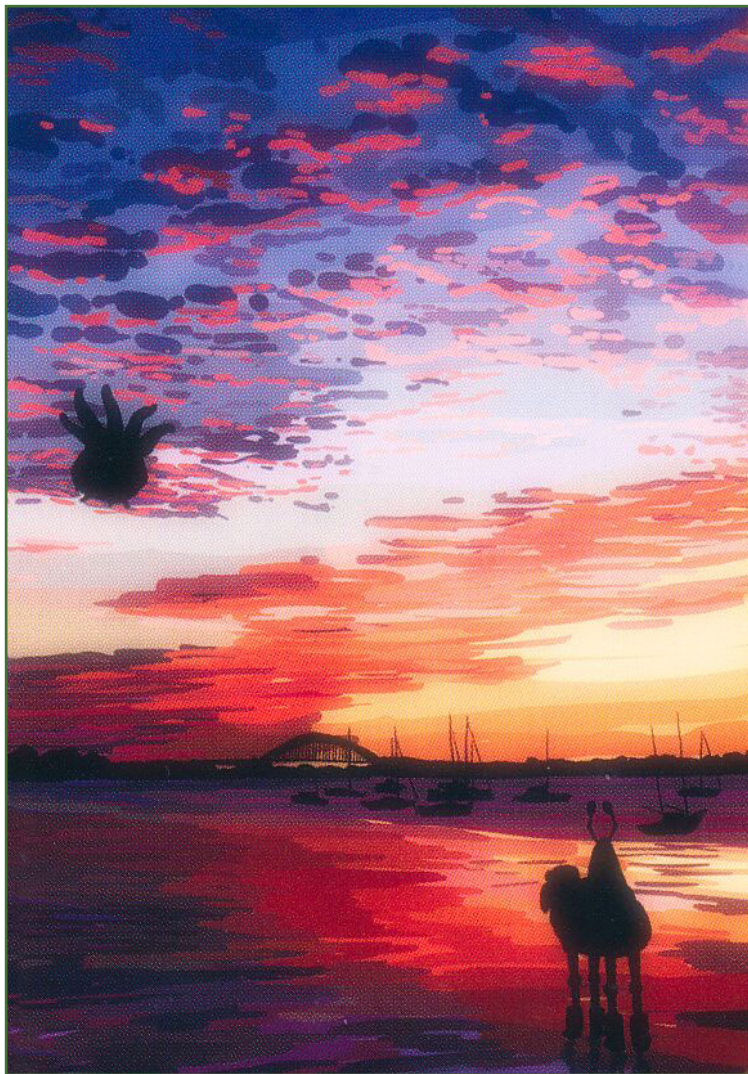
Terry Schmidt

South Jersey Preserve Manager

Cari Wild

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In the spirit of healing, the New Jersey Natural Lands Trust acknowledges and honors the Lenni-Lenape, Munsee Lenape, Ramapough Lenape, and Nanticoke Tribes, the original people of the lands that we manage as Trust preserves.



Aqua Marooned! depicting sunset along the Delaware River.

Graphic: Meg Lemieur and Bri Barton

