MONMOUTH COUNTY PARK SYSTEM
GREEN HERITAGE
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LIFE BENEATH THE ICE:
How Aquatic Wildlife Survives Winter's Freeze

Zack Karvelas, Assistant Public Information Officer

As winter descends upon Monmouth County and before the sun and warmth returns, the serene surfaces of local ponds and lakes often transform into solid sheets of ice. While the landscape above ground becomes a frosty wonderland, a hidden world perseveres beneath the ice. Aquatic wildlife has developed remarkable adaptations to endure the harsh conditions of frozen water bodies, ensuring their survival until the thaw of spring.

The Science of Ice Formation

Understanding how ice forms on bodies of water is vital to understanding and appreciating the survival strategies of aquatic organisms. Typically, ice develops from the top down, creating an insulating barrier that helps maintain a relatively stable environment beneath. This insulation prevents the entire water column from freezing solid, providing a refuge for aquatic life during the winter months.

Partially frozen pond at Holmdel Park.

Getting ready for ice skating at Turkey Swamp Park.

Fish: Slowing Down to Survive

In Monmouth County, species such as chain pickerel and yellow perch remain active under the ice. These fish experience a decrease in metabolic rate due to the colder temperatures, leading to reduced activity levels. They often inhabit deeper waters where temperatures are more stable, allowing them to conserve energy until warmer conditions return.

Fish swimming under the ice. Photo by Steven Severinghaus.

A frozen sunfish ("sunnie") frozen at Shark River Park. Sunfish are one of the most widespread and abundant freshwater fish species in New Jersey.

Turtles: Underwater Dormancy

Snapping turtles, common in areas like Crosswicks Creek Greenway in Upper Freehold, exhibit unique adaptations to survive winter. As ectotherms, their body temperatures align with their surroundings, causing them to become less active as temperatures drop. During this period, snapping turtles submerge themselves in lakes and ponds, entering a state of dormancy. Remarkably, they can absorb oxygen through their skin, allowing them to remain underwater for extended periods without surfacing.

Continues next page...

A snapping turtle active under the ice. Photo from Wisconsin DNR.

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Frogs: Nature's Freeze Tolerance

The wood frog, found in various parts of North America, has evolved an extraordinary survival mechanism. These frogs can tolerate the freezing of up to 70% of the water in their bodies. They achieve this by producing glucose, which acts as a natural antifreeze, protecting their cells from damage. Unlike aquatic hibernators, wood frogs spend the winter nestled in leaf litter on the forest floor, only migrating to ponds for breeding after they thaw in the spring.

A wood frog partially frozen in a leaf-covered forest floor. (Photo by Jan Storey, National Science Foundation.)

A wood frog partially frozen in a leaf-covered forest floor. (Photo by Jan Storey, National Science Foundation.)

Beavers: Ingenious Architects of Winter Survival

Beavers are well-known for their engineering expertise, constructing lodges and dams that play a vital role in their winter survival. Their lodges, built with underwater entrances, provide protection from predators and insulation from the cold. Throughout the fall, beavers store food in submerged reserves near their lodges, ensuring a readily available food supply when the surface freezes over. This behavior allows them to remain active and nourished beneath the ice throughout the winter months.

A brown North American beaver (*Castor canadensis*) preparing for winter. Public Domain image, National Parks Gallery.

A brown North American beaver (*Castor canadensis*) sits on the shore of a frozen lake in winter

Muskrats: Thriving in Winter's Chill

Muskrats, commonly found in Monmouth County's wetlands, exhibit unique winter survival strategies. These small, semi-aquatic mammals remain active beneath the ice by creating intricate burrows in the banks of ponds and streams. They build their lodges in the mud at the bottom of the water, where the temperature remains more stable. Muskrats also store food such as cattails and other aquatic plants in underwater caches near their lodges, allowing them to access nourishment throughout the winter months. By remaining in these protected spaces, they can avoid the harshest conditions above the ice and continue their activities without being hindered by freezing temperatures.

Insects: Aquatic Larvae in Suspended Animation

Many aquatic insects, such as dragonfly and mayfly larvae, spend their juvenile stages underwater. To survive winter, these larvae enter a state of diapause, a form of postponed development that halts their growth and reduces metabolic activity. This adaptation allows them to endure the cold months beneath the ice, resuming their maturation when temperatures become favorable in the spring.

A frozen dragonfly larva. Photo by Chris Helzer, The Nature Conservancy.

A frozen dragonfly larva. Photo by Chris Helzer, The Nature Conservancy.

Ice Skating and Ice Fishing in Monmouth County Parks

For residents looking to engage with the winter landscape, the Monmouth County Park System offers opportunities for ice skating and ice fishing when conditions permit. Parks such as the Manasquan Reservoir in Howell, Thompson Park in Lincroft, and Turkey Swamp Park in Freehold provide designated areas for these activities. It's essential to note that these activities are only permitted when ice conditions are deemed safe by park officials. Conditions can change rapidly due to fluctuating temperatures, so visitors are advised to check current statuses before heading out. For the most up-to-date information, call 732-842-4000, ext. 4312, or visit the Park System's official website.

Ice skating at Shark River Park.

A happy parkgoer playing ice hockey at Holmdel Park.

Ice skating at Turkey Swamp Park.

Ice skating at Turkey Swamp Park.

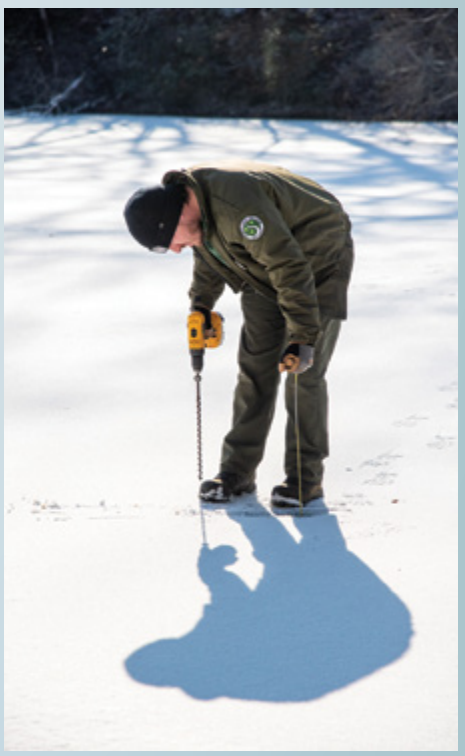
A young fisher posing with a fish they caught ice fishing at Holmdel Park.

Ice fishing at Historic Longstreet Farm in 1980.

Ice Safety: When is it Safe to Venture Onto the Ice?

For ice skating and ice fishing to be permitted in Monmouth County parks, the ice must reach a safe thickness to support human activity. Generally, ice needs to be at least four inches thick for safe skating and at least five to six inches for ice fishing. However, these numbers can vary depending on the type of ice—clear, blue ice is stronger than white or slushy ice, which can be weaker and more prone to cracking. It typically takes several consecutive days of below-freezing temperatures (ideally below 20°F overnight) for ice to form safely. Park officials regularly test ice conditions by drilling holes at multiple points to measure thickness and assess structural integrity. Visitors should never venture onto frozen lakes or ponds unless an official park notice confirms that conditions are safe. When in doubt, always check with the Monmouth County Park System before heading out for winter activities.

Marlu Lake at Thompson Park blocked off until/unless conditions become safe enough to allow parkgoers to venture out with park supervision.



Park Ranger Jesse Warrick measuring the thickness of the ice at Shark River Park to ensure safe conditions for winter activities like ice skating and ice hockey.

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CARVED IN STONE: Preserving Historic Cemeteries

Reagan Miller, Historic Preservation Specialist

As an archaeologist, I have always been captivated by historic cemeteries. Often overlooked, these spaces hold a wealth of information about the lives and beliefs of those who came before us. I have spent much of my academic and professional career researching and studying these venerable resting places. Here, the past comes alive, revealing insights into our understanding of history, genealogy, anthropology, and archaeology.

What is Cemetery Preservation?

Cemetery preservation refers to the practices and processes involved in protecting, maintaining, and restoring historic cemeteries and their features, including headstones, monuments, fences, and landscapes. The goal is to honor the historical, cultural, and genealogical significance of these sites while ensuring their longevity for future generations. Preserving historic cemeteries is a delicate and specialized process, best undertaken by professionals who have the knowledge and tools to prevent further damage.

Preserving historic cemeteries involves more than physical intervention; it includes thorough documentation of the site, recording conditions, inscriptions, and various cemetery features. A historical record is established using photographs, maps, and written records. Evaluating the condition of the stones and determining the types of materials helps preservationists and conservators to develop a preservation plan that will appropriately serve the site in perpetuity.

The headstones of Julia Norton Hartshorne (left) and Benjamin Minturn Hartshorne (right).

The Importance of Historic Cemeteries

Cemeteries are not only an important place for remembrance and reverence. They are a collective representation of a community's beliefs about the relationship between the living and the dead. As a cultural resource and societal artifact, cemeteries are vital resources worthy of protection. They foster a tangible connection to history and heritage. They are outdoor, living museums, blending art, language, and culture into one accessible space.

Cemeteries also contribute to environmental health. They provide valuable open space in urban and suburban areas, acting as quiet sanctuaries amid bustling development. Discovering historic cemeteries in seemingly random or remote places, like deep in the woods or within a park, can feel surprising, but there are often historical or cultural reasons for their locations. Early settlers often established burial grounds near homesteads, small communities, or churches, which are now part of a changed landscape.

Browns Dock Burial Ground located within Huber Woods Park.

Located within Huber Woods Park in Middletown is the Browns Dock Burial Ground. Managed by the Park System, this small historic cemetery is located along Browns Dock Road and can be accessed by one of the many trails within Huber Woods. Most of the occupants here are related to Henry Johnson (1755-1841), a Revolutionary War soldier, and Lewis Brown (1759-1842). The Johnson and Brown families were prominent landowners in the area. As recent as 2021, the Park System collaborated with the Daughters of the American Revolution to carry out the dedication of the grave marker of Henry Johnson. The Park System regularly maintains this site and invites visitors to explore the rich history of the area.

Reading Between the Lines

Gravestone inscriptions reflect linguistic trends, regional dialects, and religious presence. Iconography, such as angels, floral motifs, or even skulls, reveals evolving attitudes toward death, the afterlife, and illustrates artistic interpretation of the time. Religious and spiritual practices of a community are often reflected in the imagery and language inscribed on the stones, while demographic patterns can be discerned through the ages, genders, and familial relationships.

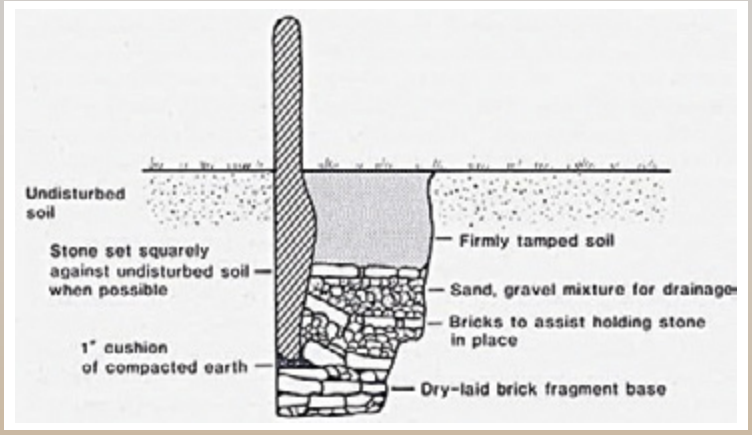
The depiction of a lamb commonly marks the graves of children, particularly infants, symbolizing innocence and sacrifice. Early portrayal of the lamb is tied to Christianity, as well as other religious denominations. Over time, as the gravestone material begins to breakdown, the features of the lamb tend to blur making the resemblance close to that of a seal.

The choice of materials, such as local fieldstone to imported marble, speaks to the availability of resources, technological advancements, and socioeconomic status. Together, these elements create a rich tapestry of history, shedding light on how societies remember and honor their dead and what they value most across generations.

What's Going on Beneath the Surface?

Over time gravestones can shift and lean. This is due to a combination of natural and manmade factors. The ground beneath these stones is typically disturbed during burial, making it less compact and prone to settling unevenly. Freeze-thaw cycles in colder climates cause the soil to expand and contract, leading to gradual shifting. Rainwater and wind can erode the soil around the base of a gravestone, undermining its stability. When you see forward or backward leaning stones, this not always an indication that intervention is required, but should be monitored by preservation specialists.

Preservation Specialists and conservators are equipped with the tools to identify the stones that require attention. They ensure the work adheres to best practices, preserving the cemetery's integrity while respecting its historical and cultural importance.



Cross section of a reset headstone depicting the necessary materials to achieve a level and plumb grave marker. Drawing by Carol Perkins.

Aging Gracefully

As you look around a historic cemetery, you may notice that some stones may "look better" than others. This may be due to the difference in gravestone material, such as marble, slate, sandstone, or granite. Varying rates of weathering are related to the physical and chemical composition of the materials.

All grave markers, regardless of their material, deteriorate when subjected to the effects of wind, rain, sunlight, atmospheric pollutants, and fluctuating temperatures. Depending on the level of exposure each grave marker endures, the discoloration you commonly see is indicative of the way in which water is shed.

When entering a historic cemetery, it is easy to be overwhelmed by the physical state of the gravestones. Some may be covered in lichen or other bio growth while others are covered with black streaking from air pollutants. However, it is important to consider why we may feel the need to clean headstones. Every time a headstone is cleaned, it is removing a protective barrier that has been created over time, exposing the stone to foreign pollutants and may lead to accelerated degradation. So, although it may be unsightly, the age of the stone may in fact be preserved in and by time. It is in fact okay for historic cemeteries to show their age!

The sandstone headstone of Sarah Smock (left), who died in March 1794, remains in excellent condition despite the abundance of bio growth and atmospheric pollutants.

Leave No Trace

By leaving no trace when visiting a historic cemetery, you can help protect and preserve these places of commemoration and contemplation for future generations. We at the Park System encourage people to explore the many historic cemeteries located throughout Monmouth County. We ask that these old burial grounds be respected and treated with care. If possible, please stay on designated paths and do not touch, move, or take rubbings of the stones, as many are fragile and can be easily damaged. You are welcome to take photos and document gravestone inscriptions. Your efforts to treat our historic cemeteries with care and respect helps preserve the rich, cultural heritage of Monmouth County.

Historic cemeteries located on Monmouth County Park System property are monitored and maintained by our Historic Preservation Specialists and Park Rangers. Is there a historic cemetery in mind that you would like to know more about? Please feel free to reach out to me or my colleagues at Reagan.Miller@monmouthcountyparks.com, and we would be happy to assist you with your questions and research.

Deep Cut Gardens
Home Gardener
152 Red Hill Road
Middletown, NJ 07748
GS Parkway Exit 114, to Red Hill Road
732-671-6050

THE EVOLUTIONARY ART OF PLANT MIMICRY

Stephanie Horton, Recreation Leader

If you have ever come across a plant or a flower that reminds you of something else – there's a chance it was not an accident. Whether it's a flower that resembles an insect or a leaf that looks a lot like the leaf from another plant nearby, there is a chance you are seeing an incredible adaptation in the plant world. Plants have continuously demonstrated a seemingly innate ability to adapt to their environment to ensure their survival. Plants have evolved methods to secure food, reproduce, and defend against predators. One of the most fascinating and mysterious methods of survival is the use of mimicry—a strategy in which plants deceive other species to stay alive. Some species use mimicry to attract pollinators and others use it to avoid predation. The subject of plant mimicry is not only a mystery which continues to puzzle scientists, but it is also a reminder of how plant life is constantly evolving.

Ophrys insectifera imitates the appearance and pheromones of female digger wasps to entice males to mate with the flower and transfer pollen.

Mimicry in plants can take many forms. Some orchid species have evolved to emit chemical cues—mimicking the pheromones of female bees—to entice unsuspecting males to attempt mating, thereby ensuring pollination[1]. Orchid species can pair this pheromone cue with visual deception as seen in the fly orchid (*Ophrys insectifera*). The flowers of *O. insectifera* have a velvety, purplish-brown labellum with an iridescent blue patch and very narrow petals which resemble antenna[2]. Two species of digger wasp are attracted to the fly orchid because of its close appearance and similar scent to female digger wasps. This type of sexual deception using mimicry is called Pouyannian mimicry.

The pseudo-copulation strategy via Pouyannian mimicry enables a wide spread of the orchid's genes because of the orchid's advanced mimicry abilities. Sexual deception is extremely specific since virtually all orchids have evolved alongside their pollinators[3]. When this occurs, it is called coevolution. Another example of coevolution and the use of sexual deception is the Australian hammer orchid (*genus Drakaea*) and its ability to mimic the thynnid wasp. The orchid mimics the appearance of a female wasp who waits at the top of a branch for a male to spot her. Natural selection has favored flowers that happen to bloom when males are looking for mates, but females are not out seeking mates. This ensures the males find the deceptive orchids instead of actual female wasps. The flower of the orchid even has the appearance of an insect. The flower appears to have a shiny head and furry body all while it releases an intoxicating female wasp pheromone. Males get fooled time and time again while trying to copulate with several flowers. This transfers pollen from flower to flower and allows for orchids to reproduce. Pouyannian mimicry is still a mystery in many ways and why orchids specifically have evolved to pollinate this way is still up for debate among scientists[4].

The Australian hammer orchid's insectoid labellum mimics the head and body of a female thynnid wasp.

Other orchids have taken a different route, tricking pollinators by resembling the appearance of food-rich pea plants, leading pollinators to visit in search of sustenance[5]. Some species of orchid from the genus *Oncidium* instead resemble territorial bees which causes insects to attack the flower in a bid for dominance. The flowers are prepared, however, and the design of the flower ensures contact with the pollinia or stigma, meaning this attack leads to pollination[3].

Although we see how it can be an effective strategy, mimicry isn't limited to pollination. Mimicry in plants can be used as a passive defensive strategy—an evolutionary advantage developed through natural selection. A plant species can avoid herbivory by becoming nearly indistinguishable from something its predators would avoid. For mimicry to be beneficial, it must increase the plant's fitness, meaning that the plant must produce more viable offspring due to efficacy of the mimicry[6]. This process is informed by the principles of natural selection, where genetic mutations lead to traits that enhance survival.

Mimicry, whether found in plants or animals, is built upon a relationship between three essential players: the model, the mimic, and the dupe. The model is the species with an undesirable or dangerous trait, such as toxicity or unpalatability, that predators have learned to avoid. The mimic, in turn, resembles the model in a way that deceives the dupe (the predator), leading it to avoid the mimic as if it were harmful. This form of mimicry is not an active defense but rather a passive one, where the plant or animal reaps the benefits of another species' traits through natural selection[6].

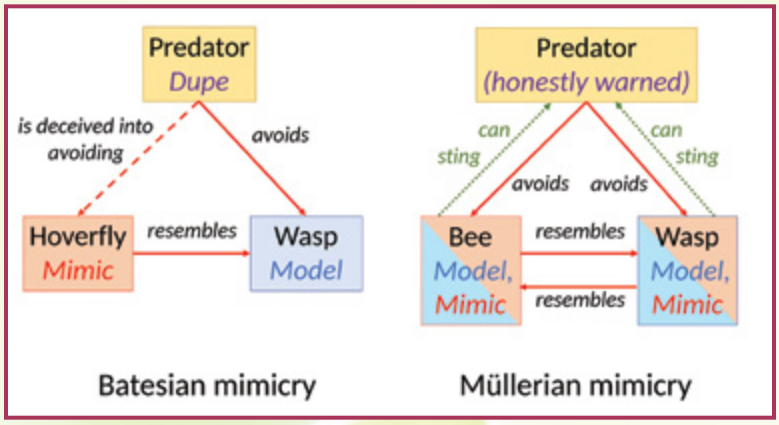


Figure 1. Illustrated map showing the relationship between the model, mimic, and dupe in both Batesian mimicry and Müllerian mimicry.

Batesian and Müllerian are the two main types of defensive mimicry identified in plant and animal species. Batesian mimicry occurs when a harmless species mimics the warning signs of a harmful or toxic species, tricking predators into avoiding it. An example of Batesian mimicry is seen in the hoverfly, which mimics the coloration of a wasp, despite lacking the stinger to defend itself[7]. Müllerian mimicry occurs when two harmful species evolve to share similar warning traits, creating a stronger collective signal to predators[8]. In this case, both species benefit from the overall avoidance of predators.

*The hornet mimic hoverfly (*Volucella zonaria*) uses mimicry to signal danger to predators even though it has no stinger to defend itself.*

*Scientists discovered that both Monarch butterflies (*Danaus plexippus*) (left) and Viceroy butterflies (*Limenitis archippus*) (right) are toxic to predators making them an example of Mullerian mimicry.*

While mimicry may be well understood in the animal kingdom, it takes on an entirely different dimension in the plant world. Plants don't face the same version of threats from predators that animals do. Herbivores don't necessarily kill a plant by foraging on it, but they can severely damage them by transmitting pathogens that cause diseases. In the case of Dutch elm disease, pathogens spread by predatory beetles can prove devastating to the survival of a species[9]. In response, plants have evolved an array of defensive strategies that go beyond mimicry. Visual deterrents, chemical defenses, and camouflage have all evolved to provide plants with an edge in their battle for survival.

Of course, mimicry couldn't exist without nature's original warning sign - aposematism. Aposematism is a tactic where plants display bright, eye-catching colors or patterns to signal to potential predators that they are unpalatable or toxic[10]. Plants that display aposematic traits, like the vibrant spines of cacti or agave, signal that attacking them could result in a painful or damaging experience. This form of visual defense is widespread in the plant kingdom, though it functions differently from mimicry. While mimicry involves imitating harmful traits from other species, aposematism relies on the predator's learned experience of associating specific colors with danger[11].

*The brightly colored strawberry poison dart frog (*Oophaga pumilio*) uses aposematism (aka warning coloration) to signal their toxicity to would-be predators.*

*Globe thistle (*Echinops adenocaulos*) employs aposematism in the form of vibrant purple spines which acts a physical defense against herbivory.*

Many plants are difficult to identify, for both humans and herbivores. Plants who can confuse would-be predators could gain an advantage in their survival as a species. One recently discovered example of plant mimicry is a rare and fascinating look at a plant's ability to blend into its surroundings. *Boquila trifoliolata*, a woody vine native to Chile, has developed a remarkable form of mimicry that sets it apart. This vine mimics not just one, but several different species of trees by altering its leaf shape, color, and structure to blend seamlessly with its host trees[12]. The vine's ability to adopt multiple forms—depending

Boquila trifoliolata is a non-parasitic vine sometimes called the "chameleon vine" for its ability to mimic multiple other host species.

Continues next page...

on the host it is climbing—makes it an exceptional mimic, enabling it to confuse herbivores and avoid predation.

Over time, plants have entered a coevolutionary "arms race" with their predators, each trying to outlive the other through an ever-evolving cycle of attack and defense. This relationship is at the heart of Earth's incredible biodiversity[13]. In this coevolutionary competition, plants like *Boquila trifoliolata* may thrive by foiling the visual and olfactory cues that herbivores use to find food. By blending into their environment, these plants reduce the likelihood of being eaten, which is crucial for their survival. However, as more plants develop these adaptive strategies, herbivores are continuously forced to evolve new methods of detection, creating an endless cycle of evolutionary competition.

The world of plant mimicry is a testament to the intricacies of evolutionary biology. From sexually deceptive orchids to the cunning vines like *Boquila trifoliolata*, plants have evolved a diverse range of defensive strategies to protect themselves from herbivory and ensure their continued existence. Mimicry—whether through sexual deception, aposematic signaling, or the imitative traits seen in various species—represents an extraordinary adaptation that allows plants to thrive in a world filled with predators and competition. Survival in the natural world is never a straightforward battle. Instead, it is a complex dance between species that continues to unfold in ways we are only beginning to understand. By studying these defensive strategies, we uncover not just the brilliance of plants and their ability to survive, but the resilience of Earth's foundational plant ecosystems.

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PLANT PROFILE: Staghorn Fern

(Platycerium Bifurcatum)

Kate B. Lepis, Ph.D. Horticulturist

At first sight some visitors to Deep Cut's display greenhouse are not sure what they're looking at. With green leafy structures emerging from a large globular mass of papery brown layers – many think aloud, "Is that a dinosaur egg?!"

One of Deep Cut Garden's enormous staghorn ferns.

Of course, it's not an egg, but arguably one of the most exotic house plants available. Staghorn ferns are large epiphytes (air plants) originating from tropical forests of Southeast Asia to Australia[1]. In their natural habitat they form colonies in the forest canopy on the crooks of large trees.

Staghorn ferns can reach three to four feet in height/width and display two types of fronds (leaves). The sterile nest fronds function as anchors, emerging green from the base of the plant and wrapping around the growing surface. With age, they turn brown and papery. As the layers accumulate, they serve another purpose – a place for water and organic matter to collect and decompose – creating a moisture/nutrient source for the plant.

Natural habitat in Australia[2]

Strap fronds have the staghorn shape and remain green. Referred to as fertile fronds, these leaves often produce sporangia (spore producing structures) on the underside of each leaf tip.

A new sterile nest frond.

Fertile fronds with sporangia emerging from behind a nest frond.

PLANT CARE[3]

Light:
Provide a bright location but avoid direct sunlight. A bright corner in a room with plenty of south or west facing windows would suffice. During the summer place outside under the shade of a tree.

Water:
During the growing season water freely – enough to keep evenly moist but not waterlogged. Cut back during the winter rest period but do not allow it to dry out. Water smaller specimens by soaking the nest frond mass for about 15 minutes; reduce to 2-3 minutes during the rest period[4]. Misting the plant every few days will also help create the humid environment they enjoy.

Fertilizer:
Platycerium does not require artificial feeding. Large established specimens can be fed once per year at the beginning of the growing season. Mix a standard water soluble solution and mist using a spray bottle.

Potting and Repotting:
As epiphytes, these plants do not want to be grown in a pot. Mounting a newly purchased plant or a division on a plank of wood or large piece of bark works well. An orchid basket can also be used.

As plants grow, they simply grow over the parts that already exist making repotting unnecessary. Use strong roping and wrap a sling supporting larger plants – leave a significant loop out the top for hanging. Eventually the nest leaves will grow over and hide the roping.

Staghorn fern mounted on a plank of wood.

STAGHORN FERNS: The 1st Known Eusocial Plants?![1]

A common example of a eusocial (truly social) species is the honeybee (*Apis millefera*). The eusocial hive has multiple generations of closely related individuals; identifiable castes practicing a division of labor, and young raised collectively. In a honey bee hive the castes include the queen – the only one to lay eggs, the workers – sterile females that do all the work (raise young, build nests, forage for food, etc.), and drones – male bees that mate with new dispersing queens.

A queen bee surrounded by worker bees.[2]

Scientists studied staghorn fern colonies in Australia and observed distinct castes dividing the labor of water/nutrient capture, water/nutrient storage, and reproduction. Some individuals produced only nest fronds, others only strap fronds lacking sporangia, and less than ½ of the individuals in the colony produced fertile fronds. It was demonstrated that while most individuals sacrificed their ability to reproduce, the entire colony had improved access to water and nutrients. This phenomenon is not fully understood, but the more we learn about our planet the clearer it becomes that life is more similar than it is different.

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THE RESERVOIR EXPOSED

Blake Beyer, Principal Park Naturalist

The 2024 fall season marked record low precipitation throughout New Jersey. The third driest September on record gave way to the driest October in over 60 years, resulting in the driest two month pairing to occur in the garden state in over 130 years. The effects of the meager .80 inches of rainfall for this time could be seen throughout the state as leaves wilted and browned, forest fires burned, and water restrictions were urged. One of the most striking physical depictions of the drought could be seen at our very own Manasquan Reservoir. Constructed to supply drinking water in times of drought, the reservoir was rapidly depleted as the Manasquan River was no longer able to supply the volume of water needed. Many news outlets flocked to the reservoir as more and more of the shoreline dried up, providing a dramatic backdrop to their coverage of the drought. With water levels falling below the 50 percent mark, some rather interesting things were exposed which haven't seen the light of day in over 30 years.

Before the reservoir's construction in 1990, much of the land currently inundated with the reservoirs water was forest, field, and wetland. Although largely removed and highly disturbed, these habitats can still tell a story about the past so long as you know where to look. As the reservoirs water recedes every season many visitors and staff alike have pointed out an inordinate amount of charcoal washing ashore. The origin of the charcoal was unknown and presumed to be old campfires. However, this past October the true source of the charcoal was discovered.

On the western shore of the reservoir many of the standing timbers had matching damage to their trunks. The damage was a large vertical opening in the bark of the tree, located from the base of the roots reaching to about two to three feet up the trunk. The edges of this damaged area have in curled margins which suggests that the trees survived the injury and continued to grow. Finding multiple trees in a single location with this type of injury is a telltale sign of a low temperature forest fire sometime in the forest's past. The fires burned hot enough to kill portions of the trees inner living tissue but were not hot enough to kill the entire tree. This hypothesis is further supported by the abundance of charcoal in this location. Forest fires play an important role in the ecosystem recycling nutrients and altering the landscape. This is particularly true for the New Jersey Pine Barrens which begins only 10 miles south of the Manasquan Reservoir.

Matching scars on trunks showing evidence of past fire.

Arial View of the Manasquan Reservoir in November 2024

Scarring on trees was not the only oddity discovered within the flooded timber. On a shallow peninsula south of the Environmental Center, it was discovered that almost all of the trees had multiple trunks sprouting from an abnormally wide base. Multi trunked trees are not uncommon in a healthy forest; however, they are not the typical growth form of the oaks, pines, and sassafras that comprise the forest of the area. Finding a tree with multiple trunks (also known as co-leaders) is sometimes indicative of a past stressor on the tree. These stressors could be anything from a deer biting off the top of the tree when it was a small sapling, or evidence of the tree suffering damage that killed the initial solo trunk.

It is speculated that at some point several years prior to the flooding of the reservoir this section of the forest had been cut down. The remaining stumps resprouted numerous shoots in a process called suckering. These shoots continued to grow larger and larger until the reservoirs completion and subsequent flooding which killed the trees. When under water, these “extra” trunks provide more vertical structure for wildlife such as fish, tadpoles, and macroinvertebrates to utilize.

Reservoir construction showing cut trees

During the design and construction of the reservoir great care was taken to ensure the reservoir not only fulfilled the role of providing drinking water, but also provided great habitat for future animals. The most obvious of which can be seen year-round in the form of the flooded timber intentionally left as perches and structures for fish, but the most extensive habitat creation has been hidden under water and can only now be seen exposed. The northwest shore of the reservoir is covered in a vast gravel bed which stands in stark contrast to the sand/mud bottom found elsewhere in the reservoir. This gravel bed was built as a spawning ground for fish species such as small mouth and largemouth bass who prefer gravel bottoms to nest in. The fish nests can be seen as one to two-foot diameter divots into the gravel, roughly five inches deep. Amongst the gravel multiple structures of logs can be seen stacked upon one another like a giant Lincoln log set. These are fish hides, structures designed to provide small fish and fry to hide, keeping them safe from predators. The gravel closest to these hides are highly desirable real estate. In these areas where the fish nest, they are so close together there is no space between them, forming a golf ball like texture.

Most standing timber in this section showing co-leader growth pattern.

Spawning bed construction 1990

Fish hides construction 1990

The seasonal change from fall to winter brought with it some much needed rainfall thus ending the record setting dry spell. The water levels in the reservoir slowly began climbing up the 13 + feet lost and again covered up many of these findings. The low levels of the reservoir were alarming to many, but its usage was testament to its importance in times such as this. These climatic conditions were less than ideal, but provided a unique opportunity to peek below the surface of the reservoir and get a glimpse into the areas past.

Spawning bed November 2024

Fish hides November 2024

Fish nests visible as circles darkened by sediment trapped in the depression as water levels dropped.

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GREEN HERITAGE

805 Newman Springs Road, Lincroft, NJ 07738-1695

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The Park System is once again pleased to participate in the annual
"A Weekend in Old Monmouth," on Saturday & Sunday, May 3 & 4.
Organized by the Monmouth County Historical Commission and the Monmouth County Board of Commissioners, the weekend features over 50 of the County's historic gems. Details can be found at visitmonmouth.com

The weekend coincides with the opening of the Historic Racing Stable in Thompson Park. The 1880s timber frame structure recently underwent a historic rehabilitation. It originally housed 40 thoroughbred horses in handsome box stalls. Located within the Brookdale Farm Historic District in Thompson Park, the site now features exhibits that share the stories of the powerful horses, owners, and elite trainers and jockeys associated with Brookdale Farm in the 19th and 20th centuries.

The Park System's additional historic sites, all of which are listed on the National Register of Historic Places, will also be open for tours during this special weekend. These sites are Battery Lewis Navesink Military Reservation, Historic Portland Place, Holmes Hendrickson House, Historic Longstreet Farm, Seabrook-Wilson House, and Historic Walnford.

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