



# MONMOUTH COUNTY PARK SYSTEM GREEN HERITAGE

The Newsletter of Monmouth County's Open Space, Parks & Recreation Agency

Vol. 51 No. 4 Winter 2017-18

## COASTAL STORM PROTECTION UNDERWAY

### Army Corp Project In Port Monmouth Benefits Residents & County Parks

Destruction from hurricanes in Texas, Florida and the Caribbean this past summer, combined with our own ongoing repairs after Superstorm Sandy in 2012, remind us that flooding is now a part of life for many property owners near the coast. Here in Monmouth County, the Park System sustained an estimated \$8 million in damage from Sandy; and the low-lying Bayshore Region was one of the hardest hit areas with 750 homes damaged in Port Monmouth alone.



The beach at Bayshore Waterfront Park in Port Monmouth was raised to a height of 14' and widened to 95' with newly restored grass-covered dunes to help act as a floodwall: rock groin was added to prevent sand erosion and the fishing pier was extended to provide anglers with a place to cast. This site now hosts the Wind & Sea Festival each September, pictured.

Soon after Sandy, the Army Corp of Engineers began a series of major restoration efforts along the entire NJ coastline. In 2014, the \$110 million **Port Monmouth Hurricane and Storm Damage Risk Reduction Project** (which had been in development) got underway. The goal is to protect individual and commercial properties in the Bayshore region, but some project components also involved the county parks. During PHASE I (completed 2014-15) the entire length of beach at Bayshore Waterfront Park was elevated and widened and the dunes restored, using sand pumped in from the ocean. Also, a 300 ft. rock groin\* was built to minimize sand drift (erosion), and the site's famous fishing pier was extended to 500 feet. These improvements help the site function as a natural barrier, or floodwall, to protect the area from storm surge and flooding, and can also be enjoyed by area residents for recreation.

*\*People sometimes confuse rock groins like this one with jetties—jetties are much larger outcroppings used to define a channel of water. Visit the Monmouth Cove Marina.*



A different view of the higher, wider beach and restored dunes from the pier at Bayshore Waterfront Park.



In addition to protection against flooding, the rock groin and enhanced beach (and 500 ft. pier) are all popular fishing sites.

**Monmouth County Board of Chosen Freeholders**

Lillian G. Barry, Director  
 John P. Curley, Deputy Director  
 Thomas A. Arnone  
 Gary J. Rich, Sr.  
 Serena DiMaso

**Board of Recreation Commissioners**

Fred J. Rummel, Chairman  
 Kevin Mandeville, Vice Chairman  
 Michael G. Harmon  
 Violeta Peters  
 Thomas E. Hennessy, Jr.  
 David W. Horsnall  
 Mark E. Zelina  
 Patricia M. Butch  
 Thomas W. Adcock  
 James J. Truncer, Secretary-Director

**Green Heritage Staff**

Editor/Writer: Lisa Bonelli  
 Photographer: Maribeth Gardner  
 Graphics: Michelle Scolletta  
 Questions/Subscriptions:  
 732-842-4000 ext. 4336;  
 Lisa.Bonelli@co.monmouth.nj.us

This past summer, multiple contracts for PHASE II of the Port Monmouth project got underway. The MASTER MAP (right) shows all the different tide/water control features that are planned to protect this area. It may seem like every kind of stormwater management technology ever invented is now being installed, but this is typical of projects like these, as the components work together to control and divert a potentially huge volume of incoming water.



This **LEVEE** or earthen embankment shown as an example (left), is part of an Army Corp project in Greenbrook, NJ along the Raritan River. Levees in the Bayshore are planned along Pews Creek in the wetlands behind Monmouth Cove Marina (pictured), and also near the west end of Bayshore Waterfront Park, and further inland along Compton's Creek.

Contracts 2, 4 & 5



**ROAD CLOSURE GATES** like this one (from Army Corp Project in Greenbrook, NJ), are part of the flood wall and slide along tracks to close off the streets during flooding. These are planned along Old Port Monmouth Road Park, and further inland along Compton's Creek by the Henry Hudson Trail.

Contracts 3 & 4



A vertical **TIDE GATE** similar to the design shown here (from a project in Tokyo, Wikipedia/Photo by Joe Jones) but without the building on top will be installed at Pews Creek behind the marina and lowered to stop storm surge. The gates will be tied to a levee on one side and the Port Monmouth Rd. bridge on the other.

Contract 2



This ½ mile **FLOOD WALL** runs from the marina to the edge of Bayshore Waterfront Park where it meets with the dunes. Note the steel bar reinforcement and extensive underground structure.

Contracts 3 (shown) & 5



LF=Linear Feet

Port Monmouth Hurricane and Storm Damage Reduction Project Map, Courtesy: Army of Corp of Engineers



This **SHEET PILE WALL** (left), made of large, corrugated steel sheets, was installed behind the marina along Pews Creek to stabilize the ground, prevent underground water seepage, and redirect or stop the flow of water over top. A coffer dam (top, right) allows construction below the waterline.

Contract 2

Blocking the flow of water with enhanced beaches and dunes, levees, gates and walls is only one part of this project. Other features such as pump stations, drainage pipes and regrading are also needed to direct and release the flow of water.

## Shoring Up Our Shoreline

Park System design staff have been working on these shoreline stabilization projects following hurricane damage from Superstorm Sandy, and ongoing erosion from other storms and rising sea levels.



At **Bayshore Waterfront Park** dune maintenance and restoration efforts are ongoing following erosion from storms.



While it requires giving up some beachfront, this dense and healthy dune system has been protecting property and providing wildlife habitat at **Seven Presidents Oceanfront Park** since 1983.



### Living Shoreline: Claypit Creek Area of Hartshorne Woods Park

The Park System recently completed this restoration project along the Navesink River in Middletown in partnership with the American Littoral Society. The existing bulkhead in this area of Claypit Creek had deteriorated and the backfill of materials used to support the height of the bulkhead hindered the establishment of the desired, native habitat. Instead of a natural tidal salt marsh, the area was dominated by the invasive plant species phragmites (common reed).

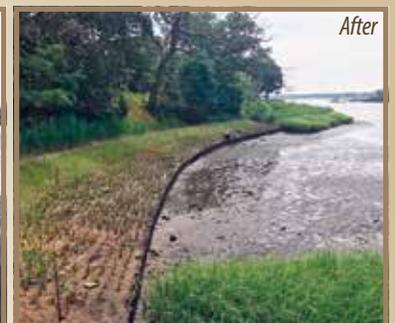
Design staff decided to remove the deteriorated bulkhead and protect the shoreline in a much more sustainable and ecological way. Instead of engineering a replacement bulkhead, they installed a living shoreline with native vegetation, which has been shown to be more stable and able to survive future storm damage. New vegetation also creates a highly desired nursery for shellfish, fish, wading birds and other animals at a fraction of the cost of bulkheading.

This design honors natural processes, conforms to state and environmental regulations, and also incorporates new CAFRA\* development rules encouraging sustainable ecological solutions to survive future coastal changes. As a result, the project did not have to go through a more costly permitting process, shortening the project timeline.

This project involved planting approximately 200 linear feet of living shoreline from the Locust Avenue Bridge. The existing bulkhead was cut at an elevation of 1 ft. above the mean sea level and the backfill was excavated and regraded to the height needed for the establishment of high and low salt marsh.



Before



After

At **Claypit Creek Shoreline** the eroding bulkhead and phragmites were removed and entire area graded and replanted.

*Invasive plants were removed and the low salt marsh area was planted with smooth cordgrass (*Spartina alternifolia*). The high salt marsh was planted with saltmeadow cordgrass (*Spartina patens*)*



\*CAFRA: Coastal Area Facility Review Act, a NJ state permit required for development along beaches, dunes or near tidal waters in the southern half of the state.

## A Stabilizing Vegetative “Matrix”: Portland Place, Hartshorne Woods Park

Portland Place is a National and State registered historic site within Hartshorne Woods Park perched on 20 ft. bluffs above the Navesink River. It sustained heavy damage from high winds and storm surge flooding during Sandy. Land along the river eroded and several large, mature trees were lost.



An aerial view of the estate and grounds at **Portland Place** (bluffs along the river). A close-up of damage to the bluffs after Sandy.

Park System design staff recognized the need for storm protection and wanted to use bank stabilization work at this site as a model for other property owners along the Navesink River. They are in the process of designing a protective matrix to reinforce the slope and then cover it with native vegetation. The root systems and plant mass will protect the land from the increased wave action of storm events. This project will also involve removing and managing invasive plants, such as phragmites. The effect will be a living shoreline, similar to the one established at Claypit Creek.



The design concept is to stabilize the bluffs at **Portland Place** with native vegetation.

Staff are also working with an engineering consultant on the underlying slope (see diagram), and to file the necessary permits with the NJDEP and obtain approval from the State Office of Historic Preservation. Permitting should be completed by the end of 2017 with construction to begin in fall 2018.

## A New Kind of Trail Bridge: Henry Hudson Trail

The 14-foot high storm surge of Sandy along the bay in Atlantic Highlands destroyed all the wooden boardwalk crossings, stripped the trail surface and eroded the toe of the bluff making passage difficult or even hazardous for users of the trail. A one-mile waterfront section of trail between Popamora Point and Atlantic Highlands Marina was closed after the storm. But after a sustained outcry from the public, this section was temporarily repaired and re-opened under primitive conditions.

The recent and more permanent reconstruction of this one-mile section is a joint effort between the Park System and the Borough of Atlantic Highlands. The intent was to create a more sustainable trail that could withstand the now expected flooding and storm events that occur along this section. Here’s one key change: instead of traditional wooden boardwalks bolted to concrete footings, the trail has precast concrete boardwalk sections bolted to concrete piers.



This new boardwalk on the **Henry Hudson Trail** is made of pre-fabricated concrete sections.

Reconstruction began in 2017 and also includes subsurface drains to convey water across the trail quickly after rain events (especially important because local geology is

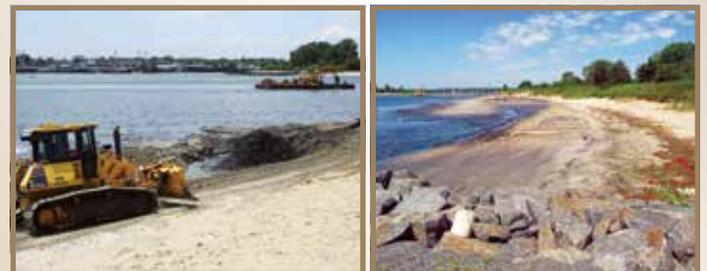


Unique scenery like this on the **HHT** has won over area residents.

susceptible to erosion/slumping), new surfacing of quarry dust and bituminous pavement in some sections, and additional storm water protection in the form of rocks along the bay side of the trail.

## Restoring the Riverfront Beach: Fisherman’s Cove

When the NJ Department of Transportation (DOT) made plans to pump sand from the Manasquan River Inlet to clear the channel for boat traffic\*, we agreed to have them place approximately 10,000 cubic yards of sand onto the beach at Fisherman’s Cove Conservation Area. This is similar to the beach replenishment done by the Army Corp of Engineers along the Atlantic Coast, just on a much smaller scale using sand from nearby work, and at no cost to the county. The sand was tested first to make sure it was clean, then pumped out wet through a pipe onto the beach. (NOTE: The sand looks black because it contains organic matter; in time, it will dry out and bleach in the sun.)



A bulldozer moves new sand pumped from the channel to widen the beach (which shrinks over time due to erosion).

\*Did you know? The DOT handles boat channels as well as roadways.

## THE DARK SIDE OF MOTHER NATURE

Christine Menapace, Seasonal Naturalist

As we approach the sometimes stark landscapes of winter, we are reminded that Mother Nature is a complex, fickle creature. This past hurricane season, as one relentless storm after another made landfall, the dark side of her nature was exhibited in full force. The lesson? While we may admire nature's aesthetics, underlying the enticement is a powerful ecosystem whose ultimate aim is survival at any cost.

Gardeners can't help but view this design intent in their own yards. The "volunteers" who plant themselves without invitation, or the mint, wild violets, black-eyed susans and morning glories that quietly smother all in their paths.

Plants aren't kind or gracious, they are ultimately self-serving. And some will go to extremes, entering the fascinating realm of scary, poisonous or downright wicked plants. They don't mean to be "bad," it's just their nature.

### The Corpse Flower: Queen of Scary Plants

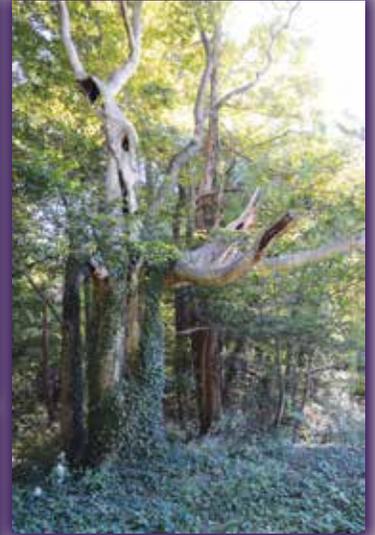
Consider the corpse flower of western Sumatra. The rare *Amorphophallus titanum* is an enormous plant with the largest unbranched inflorescence (up to 10 feet), and the largest known corm (typically 11 lbs.) in the world. It takes seven to 10 years of growth for the first bloom, which then generally only lasts 24 to 36 hours. While its sheer size is impressive, corpse flower is truly infamous for the bloom's odor, which smells like rotting meat or flesh. Even its red color and texture add to the "meaty" illusion.

Yet it's all simply to attract the beetles and flies that pollinate the flower. When a corpse flower bloomed for the first time in 80 years at NY Botanical Garden last year, the stinky sensation drew not only beetles and flies, but 25,000 people flocked to see the rare occurrence.

### Venus Flytrap: A "Scary Gardens" Sensation

Clearly, we have a fascination with this darker side of plant life, so this year we paid homage to the Halloween season with a program called "Scary Gardens." Think of the wildly popular fairy gardens concept, but with a macabre twist. Creating these miniature creepy scenes has been growing in popularity, and what better plant to highlight a scary garden than a Venus flytrap? While diminutive in size, when scaled for a scary garden, these carnivorous plants become fabulous monsters.

First discovered in 1759, Venus flytraps are fascinating not only for their carnivorous diet, but for their highly-evolved trapping mechanism. The trap can distinguish between raindrops, and living prey.



With time, common English ivy or even this pretty wisteria vine at Historic Wainford in Upper Freehold, can strangle and take down a tree



The corpse flower in bloom at the NY Botanical Gardens, July 2016. Photo:Wikicommons (Phil Wong)



Scary Garden Program photos, featuring the venus flytrap

Two trigger hairs must be stimulated within 20 to 30 seconds for it to close, and hairs are spaced widely enough apart that smaller prey not worth digesting can escape. They shut in 1/10 of a second.

Native to North and South Carolina, particularly a 75 mile radius around Wilmington, NC, the species in the wild is "vulnerable." Luckily, a number of them are located in the protected Green Swamp Preserve, managed by the Nature Conservancy. Considered the state's "most famous natural legacy," Venus flytraps are protected under NC law; stealing a naturally growing Venus flytrap is a felony.

The plant generally lives 20-30 years under the right conditions. They like nutrient poor soil, bright light, good drainage, and humidity. Finally, these flytraps produce white flowers in spring, similar to wild garlic scapes. (However, it's recommended any flowering stems be removed since the bloom process exhausts the plant.)

While our flytraps needed a pot with drainage and a mix of perlite and peat moss, unlike other fairy gardens, scary gardens don't need to have many other live plants for charm. The idea is to create a creepy environment where many things look withered or dead. As a result, you can create much of the "garden" rather inexpensively with simple materials or found objects. We used dark green reindeer moss (actually, a lichen) and black gravel to create "grassy" areas and paths. You could also use rocks, black stones, or spanish moss, which is more drapery and less spongy.



Spanish moss, considered creepy or just moody by some, can be found draping this doorframe in the greenhouse at Deep Cut Gardens, year-round.

## Introducing Dark Color Plants for Garden Contrast

Good choices for black varieties that are either low growing or can be trimmed for "scary garden" size include the aptly named Apocalypse coleus (or any fall color coleus), dark colored vines and grasses, succulents, or ornamental plants black peppers.



Black mondo grass. Photo:Wikicommons (brewbooks)



Black rose succulent. Photo: Wikicommons (Zwartkop)



Ornamental black pepper varieties from the All America Garden: Black hawk and Black pearl.



Black pansy. Photo: centerofthewebb.ecrater.com

Black varieties of plants may also find a perfect home in your landscape, no matter the season. They create a stunning contrast to other more common botanical shades like green and yellow. Consider a black or dark shade variety of a flower or plant you already know such as hollyhock, iris, viola, shade loving heuchera, or pansies.



Black hollyhock



Black iris, 'Before the Storm'

## Carnivorous Pitcher Plants & More

Native to NJ is another plant that likes to eat “meat” and has developed a trick to capture its prey. Pitcher plants have specialized anatomy that helps trap and digest flying and crawling insects. The leaves have a broad lip where insects land, and a shape that encourages them to fall into a closed vessel that is naturally filled with rainwater. Stiff, downward pointing hairs prevent them from crawling back up. Once they are trapped in the bottom, they drown or are digested by enzymes.

([www.fs.fed.us/wildflowers/plant-of-the-week/sarracenia\\_purpurea.shtml](http://www.fs.fed.us/wildflowers/plant-of-the-week/sarracenia_purpurea.shtml))



This carnivorous native, the purple pitcher plant (*Sarracenia purpurea*), grows naturally in swampy areas of the **Manasquan Reservoir**. Look for it in May.



Get up close and personal with this tropical pitcher plant on display in the **Deep Cut Gardens** greenhouse, year-round.

If you'd like to see more examples from the dark side of the botanical world, keep an eye out for these unusual native plants in the Monmouth County parks.

The very rare Sticky catchfly (*Silene caroliniana*) is named for a sticky substance on its stem. It is thought to be this plant's way of foiling predators, especially small ants that try to climb to get at the flower. Can you see them? This photo was taken in May 2007 at **Crosswicks Creek Park**, but the plant hasn't been seen again for years. You will need some good luck if you plan to search for it.



The Skunk cabbage (*Symplocarpus foetidus*) emerges in late winter with this dark and strikingly creepy hooded sheath (spathe) over a knobby flower center (spadix). Afterwards, however, this large-leaved bright green plant grows abundantly in wet trailside areas of **most Monmouth County parks**.

You'd be hard-pressed to NOT see any skunk cabbage while hiking the parks in the early spring.

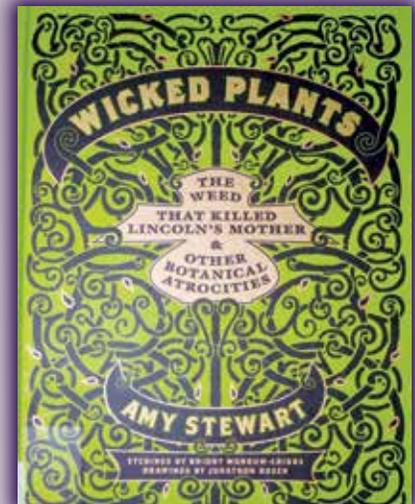


## Think “Donut” (NOT A VOLCANO!) When Mulching Around Trees

Improper mulching is a common mistake seen in area landscapes. Please take steps to spare your trees the suffocating side-effects of too much mulch, placed too high up the trunk. There should be a clear ring of clean ground around the base of each tree, so the trunk can “breathe.”



*It's tempting to suggest you leave enough room around the base of each tree after mulching to fit an average size cat, but this photo was just a funny scene caught on camera by the Rangers at Holmdel Park last year. Please use the other photo as your guide to proper mulching.*



Want to learn more? Check out “Wicked Plants: The Weed That Killed Lincoln's Mother & Other Botanical Atrocities” by Amy Stewart on your next visit to the Deep Cut Gardens library. Learn how cashews are related to poison ivy, oak and sumac. The nuts are fine to eat, but never touch the shells unless you want a nasty rash!

# It's Time To ....

## January ✓



- Gently remove snow from evergreens to prevent damage.
- Divide and repot houseplants. Check for insects.
- Check stored bulbs and tubers for rot; discard moldy ones. Make sure they are not too damp or too dry.
- Remember the birds; fresh water is essential. Seeds and suet will provide nourishment as natural food supplies dwindle.
- Clean and oil your garden tools now to add years to their life; take your mower for service before the rush.
- Start a garden diary for garden tasks. For example, record weather, temperature, seed-starting, fertilizing, pruning, etc.
- Plan and design your garden (e.g. sketch plans, make your plant list, etc.)



*Winter scene at Deep Cut*

## February ✓

- The greenhouse at Deep Cut is open year-round and filled with orchids, succulents and houseplants. (Orchids peak mid February-March.)
- Do NOT dig in garden beds (soil) if frozen or too wet. This can damage soil structure.
- Most seeds will not germinate outside yet, soil temperatures must first reach 45° F for a few days.
- Cut forsythia, pussy willow and lilac for indoor blooms. Keep misted, in a cool place, until they bloom.
- Insect and disease control is important for fruit trees – pesticide recommendations and spray schedules are available from the Rutgers Cooperative Extension Service (732-303-7614 or online at [www.njaes.rutgers.edu/garden](http://www.njaes.rutgers.edu/garden)).
- Pull any early weeds like henbit, chickweed and shepherd's purse.



*The trails of Tatum Park on a snowy day*

### **FROM THE FARMER'S ALMANAC**

- \* Start onions from seed indoors – they will be ready to set out by mid-April.
- \* Sow flowers, such as parsley, pansies and marigold indoors. Follow package instructions.
- \* Sow vegetables indoors, late February/early March: broccoli, Brussels sprouts, cabbage (summer), cauliflower, eggplant, lettuce, peas, pepper, tomato. (Planting dates are for Middletown, NJ)

## March ✓

- Plant deciduous trees and shrubs.
- Add well-rotted manure and compost to vegetable and annual beds, if not done in fall.
- Fertilize trees and shrubs, if not already done, after soil temperatures have reached 40° F.
- If not done in the fall, get a pH test and apply lime if needed.
- Don't work the soil until it will form a ball that crumbles when pressed with your thumb, but before new growth begins.
- Prune evergreens and summer flowering trees. Do NOT prune spring flowering shrubs such as azaleas and rhododendron until after they finish flowering.
- Divide and transplant perennials as needed; fertilize established ones when new growth appears. Pot up extras to bring to the Deep Cut Spring Perennial Plant Swap.



*Snowdrop are among the earliest flowers to bloom, late winter or early spring...even before the crocus*

- \* Direct-sow seeds outdoors for cool crops: Brussels sprouts, cabbage, cauliflower, kale lettuce and peas. (Planting dates are for Middletown, NJ)

- Clean pots and bird baths: scrub with a brush then soak in a 10% bleach solution for 15 minutes, then rinse thoroughly.

## Citizen Scientists Help Discover Monarch Migration Route

By Susan Harasty, Park Naturalist

**M**onarch butterflies are a common summertime sight in our parks and neighborhoods. Even so, people find them enchanting. The adult is large, graceful and easy to recognize with orange wings and black veins. During development, the monarch passes through stages of growth where it looks profoundly different, spending a short while as a jade-colored chrysalis, embroidered with gold like a jewel. Weighing less than a paper clip (half a gram), the monarch completes the longest insect migration known to science.



Monarch chrysalis. Photo: L. Whitaker

### Migration from Mexico for Milkweed

Monarch butterflies originated in Mexico and the southern United States. About 20,000 years ago at the end of the last ice age, new habitat became available and the monarch slowly expanded northward to Canada. This expansion was directly linked to the availability of its host plant, milkweed.



Monarch egg, caterpillars and adult on milkweed.

There are only two populations of migratory monarchs in the world and both are found in North America. **Eastern monarchs** migrate to and from Southern Canada. During fall, they may fly as far as 3,000 miles (50-100 miles a day) to arrive at their overwintering grounds in the mountains of central Mexico. **Western monarchs** migrate to and from the Pacific Coast of California near Santa Cruz and San Diego.

Monarchs are unique because this extreme migration distance is more like that of birds or even mammals, rather than other insects. Since the “complete” round trip takes longer than any one butterfly lives, it requires multiple generations to perform this task in a type of relay. It can take five generations to complete the migration from Canada to Mexico and back. You can’t help but wonder, how do they do this?

### Mating & Migration

Monarchs have different life expectancies related to the season and if they are migrating. Summer monarchs that don’t migrate only live 4-6 weeks, while fall monarchs that migrate south can live up to eight months. Fall monarchs delay sexual maturity in a state called diapause, triggered by changes in the environment, such as cooler temperatures, shorter days and aging milkweed. They will not mate until they begin the return journey back north in February or



March. After reproducing, their next generation will continue the northern migration. Each subsequent generation born during the northward migration has a life expectancy of about one month.

Monarchs ‘canoodling’ in the Pollinator Garden. **Manasquan Reservoir**, purposely designed to attract butterflies and bees. Photos: M. Reilly and A. Merrill.



When monarchs fly south for the winter, they do so in masses using the same flyways as birds. They navigate by instinct, using the sun and internal clock called a sun compass. Eventually, they merge into one major flyway in central Texas. At night they cluster together at roosting sites, which are very important for rest, protection and maintaining warmth. Often the same trees are chosen every year; fir, pine and cedar are their favorites.

**The monarch butterfly is currently under review for protection under the Endangered Species Act (ESA). The listing decision is due June 2019.**

## Citizen Scientists Discover Migration Routes

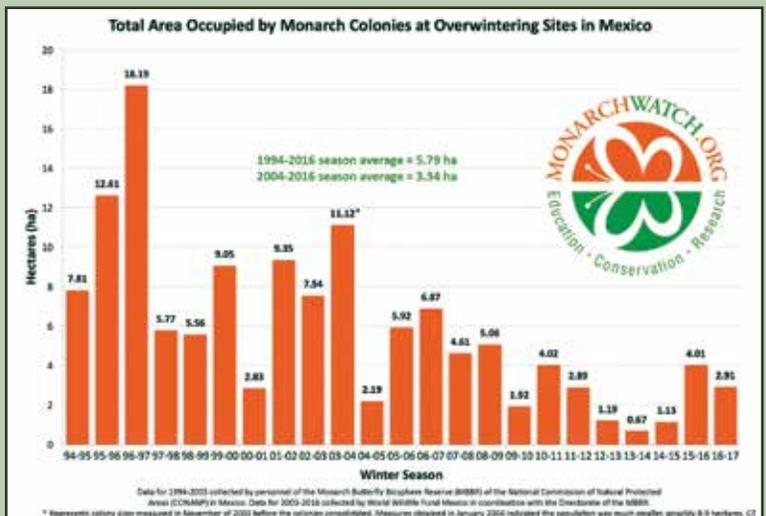
In January 1975, two of these citizen scientists living in Mexico, resident Catalina “Cathy” Aquado and Ken Brugger who was visiting from the US, found the first site in the forest there covered with monarchs. They had responded to an ad placed by Dr. Urquhart in the *Mexico City News*, an English language newspaper, seeking “research associates” to help track monarch butterflies. Even aided by Cathy’s knowledge of the countryside and fluency in the language, it took them two years of searching the isolated areas of the mountains to find the butterflies, and another year after that trying to find a tagged monarch as proof of migration.

In 1980, the Mexican government established **The Monarch Butterfly Biosphere Reserve (MBBR)** to protect the butterflies. The Urquharts played a major role in its creation. It consists of 12 sanctuaries, covering a total area of about 60 sq. miles. Usually 80% of the butterflies are located in four of them, arriving in November and departing in March.

## Tracking & Aiding Monarchs Today

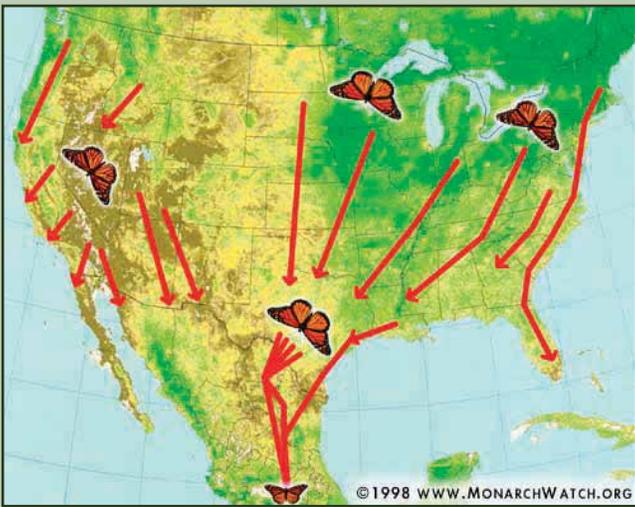
At the time of discovery, it was estimated that there were over one billion monarchs at these sites in Mexico. Today the population has dropped 90%. Contributing factors to the decline are: excessive logging causing forest fragmentation, climate change, habitat loss of milkweed and the ubiquitous use of herbicides and pesticides.

According to research from the MBBR, the number of monarchs overwintering in Mexican forests is estimated by the area they occupy in hectares (1 ha=2.5 acres). Since 1994, their numbers have been declining (see chart).



Tagging is still an important part of monarch research, providing critical information about population size, the timing of migration, male and female ratios and migratory success rate. In 2017, the Manasquan Reservoir Environmental Center in Howell, NJ raised over 175 monarch caterpillars to butterflies and tagged 75.

**References:** monarchlab.org/biology-and-research/biology-and-natural-history, ncbi.nlm.nih.gov/pmc/articles/PMC4331202, fs.fed.us/wildflowers/pollinators/Monarch\_Butterfly/migration, learner.org/jnorth/tm/monarch/SanctuaryFacts.html, flightofthebutterflies.com, texasbutterflyranch.com/2012/07/10/founder-of-the-monarch-butterfly-roosting-sites-in-mexico/, fws.gov/midwest/monarch/overwinteringmonarchs.html, monarchjointventure.org/images/uploads/presentations/Lovett.pdf, monarchwatch.org



The entire eastern population of monarchs will ultimately cluster 60 miles northwest of Mexico City in the Oyamel fir forest of Sierra Nevada mountains. This very rare forest type is found only at elevations 10,000 ft. above sea level, and is “just right” for overwintering monarchs. Densely growing trees provide shelter from extremes of wind and temperature, the fog and clouds in the mountains allow the right amount of moisture in an otherwise dry environment, and the clustering of thousands to millions of monarchs together on branches create warmth and protection from predators.

## Early Monarch Research

The world first learned where monarchs overwintered in **National Geographic** magazine, published in August 1976. Dr. Fred Urquhart and his wife Norah from the University of Toronto made the discovery after finally overcoming a major obstacle facing this type of research. *Exactly how do you monitor a large population of small insects, over a vast large area to determine if and to where they might migrate?*

The Urquhart’s had been experimenting with different ways to track butterflies, and eventually developed the first “tag” that could stick without harming the delicate, moist butterfly wings in 1940. But once they began tagging, they realized they’d need more help. So they created a citizen science project, enlisting thousands of volunteers to help apply these tags to the monarchs in hope of tracking their migration route and destination.



Monarch “tags” are still used for tracking today. Photo: Cytryn.

Norah Urquhart posted ads in newspapers calling for volunteers from all over Canada and the United States. Over time, thousands of “citizen scientists” responded, tagging hundreds of thousands of butterflies. This group became the first Insect Migration Association, known today as Monarch Watch. What’s truly astounding is that they accomplished this task in an age before computers or any of the modern technologies that would have made their task easier.



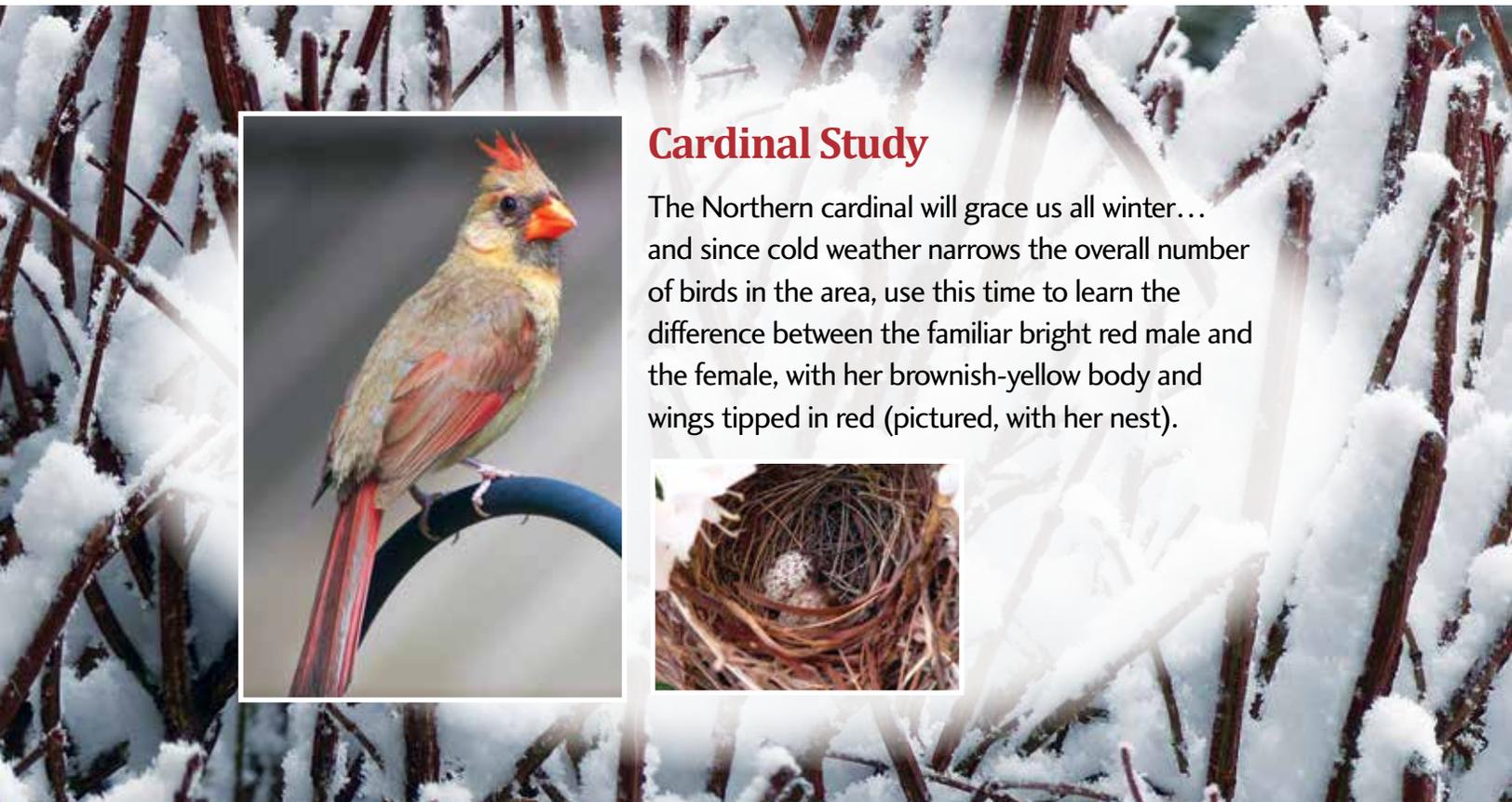
# GREEN HERITAGE

805 Newman Springs Road, Lincroft, NJ 07738-1695

Volume 51, No. 4 Winter 2017-18

G17646 11/17

PRSR.T. STD.  
U.S. POSTAGE  
PAID  
MONMOUTH CO.  
PARK SYSTEM



## Cardinal Study

The Northern cardinal will grace us all winter... and since cold weather narrows the overall number of birds in the area, use this time to learn the difference between the familiar bright red male and the female, with her brownish-yellow body and wings tipped in red (pictured, with her nest).



Visit [www.MonmouthCountyParks.com](http://www.MonmouthCountyParks.com)