

NAPLES
BOTANICAL
GARDEN

Conserve

Shoring
up
Sand Dunes

Healing a
Biodiversity
Hotspot

Conserving
our
Coastline





Rookery Bay National Estuarine Research Reserve
Photo courtesy of Rookery Bay.



Table of Contents

Letters 4

In Brief 5

Perspective 7

Shoring up Sand Dunes 11

Healing a Biodiversity Hotspot 15

Conserving our Coastline 21

Anticipating a Campus Expansion 27

Collecting Endangered Cacti 29

ON THE COVER

Forest views in Puerto Rico
(courtesy of Thrity Vakil)

From Our Leadership

At Naples Botanical Garden, saving plants and safeguarding the natural world is at the core of our mission.

On our grounds, horticulturalists select plants that are rare or threatened for display—not simply because they are beautiful but because we can protect them. Educators design lessons to teach guests about the environment and inspire them to protect it. Conservationists study our 90-acre Preserve and unlock the secrets to growing and storing the seeds of native plants.

Our work doesn't stop at our property line. We're undertaking conservation and related environmental projects beyond our 170-acre campus. This inaugural issue of *Conserve* offers an inside look at the exciting collaborations and initiatives happening in Southwest Florida and beyond.

“Without plants, there is no life,” the Global Strategy for Plant Conservation states. “The functioning of the planet, and our survival, depends upon plants.”

I can think of no better way to explain the magnitude of this mission.



A stylized, handwritten signature in black ink, consisting of a large loop and a long horizontal stroke.

Donna McGinnis
President & CEO
Naples Botanical Garden

Rookery Bay was one of the first places I visited when I arrived in Southwest Florida 15 years ago. I was enamored with its rich history and the idea that so much of our coastal land was conserved in perpetuity. The mangrove forests, marshes, and scrub seemed like they went on forever, a band of green that shielded our coast from storms and nurtured the fish that are so essential to our ecosystem—and to our economy.

But the longer I spent exploring this protective land, the more I realized its fragility.

In 2017, I was part of a team that surveyed a population of endangered thatch palms after Hurricane Irma. The storm's winds and waves had decimated clusters of them along the intercoastal waterways. The hurricane wasn't their only cause of death. Saltwater had infiltrated their roots and lapped at their trunks, a result of rising seas. Like many of our coastal species, thatch palms are adapted to the coast's salty winds, but they are not able to tolerate saltwater flooding. Long before Irma, they were already dying. This palm represents both a plant and an ecosystem vastly altered within just a few years. I can cite many other examples.

That's why Naples Botanical Garden has made conservation a fundamental part of our mission. We may not be able to compete with rising seas, but there's much we can do to conserve coastal species for the future, create more resilient landscapes, adapt to changing climates, and find innovative ways to balance environmental and economic interests.

Thank you for your support.



A stylized, handwritten signature in black ink, featuring a large, sweeping initial 'C' and a long horizontal stroke.

Chad Washburn
Vice President of Conservation
Naples Botanical Garden

In Brief

Virtual collaboration yields real-world insights

JUST OVER a year ago, conservationists from Naples Botanical Garden and the Caribbean launched a “Red Listing” initiative surveying Caribbean plants and determining how likely they are to go extinct. The International Union for Conservation of Nature Red List process is used globally to evaluate extinction risks. The information helps guide conservation priorities, land management decisions, and preservation policies.

The Garden and its partners have nearly completed 26 species assessments—a significant accomplishment given that the pandemic limited in-person interaction and forced scientists to collaborate in the virtual arena. Over the course of the year, the small group of participants from Naples, Haiti, and Puerto Rico grew to include conservationists in the Dominican Republic and the U.S. Virgin Islands. Researchers from the United Kingdom’s Royal Botanic Gardens, Kew, who have extensive Red Listing experience, signed on as well.



Malpighia fucata

Of the 26 species assessed, about half face some level of extinction risk. One example is *Malpighia fucata*. It is a species that, after much research and deliberation, our Red Listing group determined to be “endangered,” the second-highest level of threat on the Red List scale. It is endemic to Puerto Rico, and development threatens its survival. In their second year of collaborative Red Listing, the participants hope to expand their group, assess greater numbers of species, and, critically, figure out how to conserve at-risk species such as *Malpighia fucata*.

In search of a rare beauty

GARDEN conservationists joined their counterparts with Lee County’s Conservation 20/20, a county-run land preservation organization, on a hunt for

one of the state’s rarest plants, *Deeringothamnus pulchellus*, also known as *Asimina pulchella*, or, more simply, “pawpaw.” Should you wish to be romantic, you may call it by one of its many other common names, the *beautiful pawpaw*.

This white-blossomed lovely is known to exist in just three counties in Florida, including Lee. It is listed as state and federally endangered. Our staff combed the flatwood habitats of Pine Island to learn more about the pawpaw’s prevalence. That information is important to share with land managers, who can ensure its habitat is protected.

Safeguarding the pawpaw is important because it has the potential to protect us—or our food at least. It is considered a “crop wild relative,” a cousin of domesticated plants. The genetic material contained in the wild relatives of economic crops may provide some resistance to a warming climate, drought, flooding, or pests. Botanical gardens around the world are working to conserve them.





Mind your (buttonwood) boundaries!

GLANCE ACROSS the marsh from the James and Linda White Birding Tower, and you may notice hundreds of small trees. In late spring, Garden conservation specialists wrapped up a buttonwood (*Conocarpus erectus*) planting project about a year and a half in the making. The trees will form a visual boundary between the Garden's property and that of a new housing development.

These aren't just any buttonwoods. Our staff grew them from seed they collected from our property. In most new construction projects, contractors purchase trees from commercial growers—a far easier process than trekking through swampy water to collect seeds. But nurseries often

get their seeds from elsewhere in the Southeast, meaning their plants aren't adapted to Southwest Florida's unique conditions. Using local genetics maintains the integrity and health of our ecosystems. The Garden is working to amass more locally collected seeds for future restoration projects on our property and elsewhere in the region.

Big problems require shared solutions

IN JUNE, the Garden and Botanic Gardens Conservation International (BGCI)—one of the world's leading plant conservation organizations—brought together botanical garden representatives from the United States, Caribbean, and Central America to tackle some significant

issues, including disaster preparedness and response. Participants also discussed BGCI's Global Conservation Consortia initiative, inviting conservationists to work together to save imperiled plants, such as magnolia. Magnolias are a favorite tree in tropical and subtropical communities around the world, but 47% of species are threatened with extinction in the wild. Incidentally, the Garden last summer acquired a number of magnolias to display in the Lea Asian Garden. As they grow, they'll add to the allure of that garden and ensure these valuable and vulnerable trees survive for generations to come.



LOOKED UP at the rising column of smoke and the billowing cloud amassing overhead. Below, orange flames engulfed trees, shrubs, palms, and grasses creating a symphony of sounds in the process—a prolonged tearing, a light crackle, and short bursts like water on a hot oiled pan. The smoke

was laden with pine resin, and I wondered: Did it alert the trees downwind of what was coming?

Collier-Seminole State Park's prescribed fire team and a cadre of volunteers from other agencies, including myself, had set this fire on the northeast side of the park, intentionally, just a few hours earlier one morning last spring.

The fire was slow to start, as is sometimes the case, but once the relative humidity dropped, we watched with satisfaction (and a great deal of attentiveness) as the blaze intensified. This was a prescribed burn, meant to help rather than hurt the land. The land managers at Collier-Seminole had spent months planning, preparing,



IGNITING A FLAME

Director of Natural Resources Eric Foht explains how fire sparks nature's renewal and why we should appreciate this elemental process

and waiting for an opportunity to light it safely.

As a native Floridian and Naples Botanical Garden's Director of Natural Resources, I'm fascinated with fire and its relationship to the plants and animals here. In Southwest Florida, summer is the natural fire season, as lightning is abundant,

but natural fires can occur in other seasons when conditions are right. These seasonal occurrences have been happening faithfully for thousands of years, and fire has literally shaped Florida's ecosystems. Without it, we would not have pine flatwoods or the marsh systems of our magnificent Everglades. Fire keeps hardwood

trees from infiltrating these habitats. It maintains the iconic open expanse of the River of Grass and grants the slash pines unique status as the flatwoods' only overstory tree.

Today, wildfires are often extinguished before they can do their jobs. This is necessary to prevent damage to homes and



properties in developed areas, but in many of Florida's diverse natural habitats, suppressing fire can cause more harm than the fire itself. So much plant and animal life depend on fire's rejuvenating force. That is why we need specially trained land managers to light prescribed burns in ecosystems that depend on fire. This practice protects both people and the land. The longer we go without fire, the more plant matter—fire's fuel—accumulates. Frequent fires are less intense than a once-in-a-great-while blaze.

Whenever I watch a prescribed burn, I discover more about the relationships between fire, plants, and wildlife, and how they interact in sometimes surprising ways.

At the Collier-Seminole fire, I scanned the sky and noticed a turkey vulture soaring in the lift of the rising heat and smoke. Turkey vulture wings are perfectly suited to use thermals—rising columns of warm air—from a hot summer day or, in this case, a fire.

I contemplated how long turkey vultures have been making use of this free ride. Probably as long as there have been fires in Florida, which means a very long time.

South Florida plants are equally suited to fire. The shape of the plants, the compounds within them, and their life cycles are all designed around nature's fire cycle.

Saw palmetto, for example, was built to harness the power of fire. Eighty percent of the plant is below ground, and it can withstand temperatures of nearly 2,000 degrees Fahrenheit! Saw palmettos resprout easily after a fire and have even evolved flammable compounds in their leaves. This promotes the spread of fire, helping keep hardwood trees from moving in and shading them out.

Slash pine takes an almost opposite approach, developing in a way that repels fire. Look closely at a slash pine tree. You will see that they shed their lower branches. This is thought to be so fire can't climb their trunks as readily. Their needled canopy towers above the fire and avoids the most intense heat. Their thick, layered bark, like the pages of a book, protects the living tissue underneath.

And then there is Florida rosemary. It dies in fire, but its death makes way for the plant's seeds to sprout. The young plants grow in the ashes of their parent and are nourished by the sacrifice.

Each time I volunteer on a prescribed burn, I learn so much

from the people I am with and the plants I am around. Witnessing nature's power is humbling. As I grow in my understanding of fire and our ecosystem's need for it, I grow in my desire to someday bring this force to the Garden.

The Garden's natural areas would do well with a carefully controlled prescribed burn. Fire,


“Witnessing nature's power is humbling.”

in fact, is the only thing that will ensure some of our rare and beautiful native species survive in the long term. By listening to and studying the land, we can reintroduce this elemental process in an act of reciprocity, our thanks for everything the land does for us. We can be a force for good for nature. And if you, like me, are awed by the power of fire and the renewal that follows, you may find yourself rejuvenated right along with the land.





Above, and pages 7-8, a controlled burn along the northeast side of Collier-Seminole State Park.



“We’re being invaded,” proclaimed a sunbathing couple, watching green-shirted Naples Botanical Garden staff trek across Naples Beach one late-April morning.

Indeed. More than a dozen staff members from across the organization had arrived, plants and tools in hand, ready to help the City of Naples on a sand dune restoration project using nature as a blueprint.

Dunes may not be top-of-mind for beachgoers, but their importance can’t be overstated. Well-planted and maintained dunes serve as barriers between sea and shore, protecting against storm surge and coastal flooding. They capture sand that would otherwise blow off the beaches, limiting costly renourishment projects. They also provide important habitat for wildlife, including birds, turtles, insects, crabs, and small mammals.

The partnership was born out of a conversation between City of Naples arborist Heather Shields and Chad Washburn, the Garden’s Vice President of Conservation. Shields was overseeing the

removal of *Scaevola taccada*, an invasive shrub, along city beaches, leaving her with a blank slate to replant. Washburn and several Garden colleagues had studied dunes at Delnor-Wiggins Pass State Park about two years ago to understand the botanical workings of an untouched beach ecosystem. They were eager to put what they’d observed into practice.

Shields and Washburn agreed to use three beach access points, at 10th Avenue South, 11th Avenue South, and Broad Avenue, as a pilot project. Typically, dune restoration relies on a handful of species, predominantly sea oats. While better than barren dunes, that low-diversity practice limits pollinator and wildlife habitat, and it does not offer the same storm resilience as more biodiverse structures.

At the pilot sites, the Garden introduced the City and its landscape contractor to an array of species that they had identified at Delnor-Wiggins and plants that perform different roles in a dune ecosystem. For example, some species capture windblown sand, others hold it in place, and others release seeds quickly after a major storm event to foster new growth.



First Line of Defense

The Garden and City of Naples team up
to create more resilient sand dunes along
downtown neighborhoods



Under the supervision of Chad Washburn and Heather Shields (at center), Garden staff work with the City of Naples to restore beach dunes.

City and Garden staff will monitor this project for results and look for more collaborative opportunities.

“As we continue to remove the exotic species from the dunes, the more species we have in our toolkit to replant with, the better off we’re going to be in increasing the diversity in the dunes,” says Katie Laakkonen, the City’s interim Director of Natural Resources.

In the future, Washburn hopes to take sand dune work a step further—the Garden is working with Rookery Bay National Estuarine Research Reserve to collect seeds from coastal plants, some of which can be grown to provide material for area restoration projects (see page 21). Ecologists prefer using local genetics over importing plants from other regions; even if the species are the same, local plants are specifically adapted



to a region’s climate, weather, and soil conditions.

The model sites may become important teaching tools for landscapers and waterfront homeowners.

“I’m hoping in the end, we will be able to use these as reference points for landscape architects or residents or others who want to do something similar on their beach ends, or even in their home gardens, because some of these plants can be transferred over,”

Shields says. “We absolutely want to keep monitoring them and getting them to the point where they can be showcases of what dune planting can be.”

The Garden’s recommended approach may be more complex than a typical beach restoration, but creating better, more biodiverse dunes may ultimately save time and money.

“Dunes are an important part of both storm resiliency and our local economy,” Washburn says. “They are our first defense against erosion and storm surge during a hurricane or tropical storm and help to protect our beaches—the reason that many of us live here in Southwest Florida. It is important that we protect and promote them as healthy, diverse, and resilient ecosystems. That investment will pay off in the long run.”



In order to survive, beach dune plants must adapt to some of the most difficult conditions a plant can face—flooding, drought, salt air, shifting sands, storm-related erosion. Beach dune plants play several roles in their ecosystems, including accumulating and holding soil that creates the dunes themselves. Here are a few examples of the plants used in this project.



***Croton punctatus* (beach tea or gulf croton):** This dense, silver-hued plant helps accumulate sand. *Croton punctatus* is short-lived but produces abundant seed, which helps the plant to spread and to regrow quickly when storms erode beach dunes. Its tiny, fragrant flowers attract pollinators, and the seeds provide food for birds.



***Ipomoea pes-caprae* (railroad vine):** This deep-rooted vine can reach several feet below the sand surface, helping it stabilize dunes. Railroad vine grows in the foredune (the portion closest to the water), one of the most stressful environments on the beach. It forms dense mats of vegetation that can extend up to 75 feet long, helping to colonize new dune areas. The vine produces abundant purple flowers all year, providing nectar for pollinators and seeds for wildlife.



***Suriana maritima* (bay cedar):** A slow-growing and highly ornamental shrub or small tree, suriana has silvery foliage and attractive yellow flowers. It is an important larval host and nectar plant for many butterflies. It is typically found on the back side of the dune and is an important colonizer species that grows quickly from seed after storms.



***Scaevola plumieri* (inkberry, beachberry, gullfeed):** Inkberry is related to the invasive *Scaevola taccada* (beach naupaka) that takes over beach dune areas around the tropics. But this type of scaevola is an attractive plant that takes root in beach foredune and has a number of benefits. Inkberry, which is listed as “threatened” in Florida, forms dense clumps, spreading by rooting in where branches touch the sand. The large black fruits provide food for wildlife.

All images licensed under Creative Commons.

Changing Course

Discover how three Caribbean conservationists are reversing centuries of degradation—and why Naples Botanical Garden is so committed to their causes



The Caribbean is one of the world's 35 biodiversity hotspots, a region teeming with plant and animal life. It includes some 11,000 plant species—72% of which are endemic, occurring only within their island habitats. The region's forests contribute to environmental health on a global scale, circulating moisture and removing and storing vast quantities of carbon dioxide from the atmosphere.

But the Caribbean's natural resources have long been under assault. European colonizers, first arriving in the late 1400s, seized on the islands' agricultural potential and over time cleared forests for crops—sugarcane, pineapples, bananas, coffee. Farming and other pressures, such as a dependence on wood for fuel and housing, persist. Today, less than 10% of the original vegetation remains in its pristine state, according to the Critical Ecosystem Partnership Fund, an international conservation organization headquartered in Arlington, Virginia.

Intensifying storms and wildfires exacerbate the problems. During the devastating 2017 hurricane season, some islands lost as much as 32% of their tree cover, according to Global Forest Watch. Worldwide that

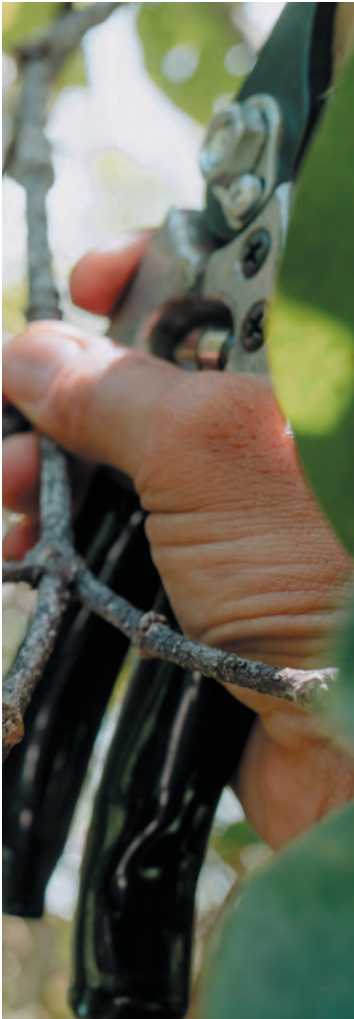
year, 39 million acres of tropical tree cover—an area the size of Florida—disappeared due to natural disasters, farming, and demands for timber.

But throughout the Caribbean, botanical gardens and related organizations are striving to conserve native plants, restore and protect forests, and balance environmental and economic concerns. Naples Botanical Garden supports these efforts in various ways, from offering technical guidance to assisting with grant applications.

Meet three Garden partners to understand the environmental pressures they face, the ways in which they are striving to make a difference, and why the Garden champions their causes.

Puerto Rico: A storm, a setback, and a resurgence

“Everything is broken.” Voice cracking, Thrity Vakil, director of a sustainable forestry project in Puerto Rico, addresses a camera in the aftermath of Hurricane Maria in 2017. She's standing amid a denuded and devastated forest—her life's work since the late 1990s. The video is posted on YouTube.



The hardest part: the destruction of two large tree nurseries housing about 5,000 trees, many of them rare, endangered, and found only on Puerto Rico, she reflects later. They were about 15 years old and ready to be planted.

“I’m still traumatized,” Vakil admits in a Zoom call with *Conserve* in March.

Things, at last, are looking brighter.

Naples Botanical Garden helped Eye On The Rainforest, Vakil’s organization, secure two grants: \$7,500 from the Association of Zoological Horticulture for a new nursery and \$15,000 from the Franklinia Foundation for the conservation of two rare trees, *Ravenia urbanii* and *Garcinia portoricensis*.

“The nursery is the symbol of the future,” she says of the 22-by-12-foot structure. “The trees, for me, are a metaphor for that resilience ... Be a tree in the wind. Bend, and come back.”

The nursery, as of late spring, housed plants representing 35 different species.

Puerto Rico’s environmental story departs from the region’s theme. In the early 1900s, forests covered only about 6% of the island, due to agricultural demands. Today, they comprise 65%. Over time, residents had abandoned the tree-cleared mountains for lower-elevation crops and for urban jobs and lifestyles, Vakil explains. Secondary forests emerged.

But Puerto Ricans never fully embraced the forests’

environmental or economic potential, she says. That’s where her organization comes in.

Vakil belongs to the Institute for Ecotechnics, a New Mexico-based group that seeks to strike a balance between ecology and technology. Its projects are far-ranging—and rather far-out, the most infamous being Biosphere 2, an air-tight structure in the Arizona desert designed to test humankind’s ability to live on another planet. Prior to Biosphere’s



Thrity Vakil leads efforts to protect Puerto Rico’s forests.

1991 launch, the Institute had purchased 1,000 acres adjacent to Carite State Forest, in the island’s southern mountains, seeking to demonstrate how to manage forests in a way that was ecologically sound and provided economic benefit. Puerto Rico’s climate is ideal for growing hardwood, and yet the island imports virtually all its lumber.

The project’s founders planted 40,000 seedlings on 300 acres between 1984 and 1990, primarily mahogany along with mahoe

and native hardwood species. Approximately 20,000 more have been planted since.

The remaining 700 acres are set aside for research and conservation. Vakil joined in 1999, following a three-year stint on the Institute’s research vessel, the *Heraclitus*, and has directed it since 2007.

“We are the only sustainable forestry project in the Caribbean as far as I know,” says Vakil, who recently won second place in the Yale University Chapter of the International Society of Tropical Foresters’ Innovation Award. Too often, she says, people regard secondary forests as “wasteland,” failing to see their full potential. “The best thing to do in Puerto Rico is to farm trees, it doesn’t matter what type. Just plant trees! Plant trees for the future.”

In addition to selectively harvesting trees, Vakil founded a for-profit company, Puerto Rico Hardwoods, that salvages and sells lumber that otherwise would go to waste—like the millions of cubic feet of trees sent to the landfill after Hurricane Maria.

Vakil and Naples Botanical Garden Vice President for Conservation Chad Washburn met a few years ago at a conference Vakil hosted.

“I could see when I first met Thrity that she is the type of person who can bring people together to rally around a cause,” Washburn says. “If we could just give her the opportunity to do the work she wanted to do, she would make it happen.”



The new nursery takes shape in Puerto Rico.

Since receiving the grants, Vakil and her team have built the nursery and assembled some of the world's leading tropical plant experts for plant expeditions. They comb the region seeking the two target species, conducting

“The nursery is the symbol of the future.”
— Thrity Vakil

general botanical research, and collecting seeds. As she ventures through the forest, Vakil is struck by how many trees, seemingly dead after the hurricane, have sprung new life.

“I have just been awed by the survival of so many trees,” she says. “And that’s a reflection of humans. It does take time to re-emerge. You wait for an optimal time, temperature, climate, surrounding, community to put out your new growth and say, ‘Hey, I’m back.’”



U.S. Virgin Islands: Reintroducing native plants

You might imagine the U.S. Virgin Islands as lush, abounding in jungle-like foliage—and to a certain extent, they are. But Dewey Hollister is concerned with the opposite, the “plant deserts,” as he calls them.

Hollister runs the Virgin Island Rare Plant Initiative (VIRPI), dedicated to studying, growing, and reintroducing native plants throughout the territory, in collaboration with Naples Botanical Garden.

On certain islands, native plant populations are so small and isolated that pollinators can’t effectively spread their genetics and spur new growth.

“You just have open scrub,” Hollister says, referring to St. Croix, where sugar production once reigned.

VIRPI is a multi-pronged effort to address the impacts of deforestation, development, and

other threats to native plants. Hollister and his team will identify target plants, collect seeds and cuttings, develop growing protocols, and make plants available for reintroduction and restoration projects—with a particular focus on those “plant deserts.” In Naples, Garden conservation experts will assist with establishing the procedures for saving and growing seeds. Potentially, Garden staff may also start seedlings here and return them to the Virgin Islands.

Eventually, Hollister aims to make native plants publicly available and encourage property owners to landscape using them. They may show up in Southwest Florida streetscapes or parks, too. Washburn says the plants Hollister shares are well suited to our growing conditions.

Hollister is targeting about 30 plants, but his list is fluid. The term “rare” is deliberately ambiguous, he says. It could refer to plants that are scarce on a certain island, those that

are globally sparse, species infrequently found in the landscape trade, or ones that are absent from botanical collections.

The fledgling project is small—for now—and the needs are daunting, Hollister says.

“We’re planting things now, but it will be years before those plants produce seeds,” Hollister says. “But you’ve got to start somewhere. We really do have to start thinking in terms of hundreds of years. How can we start preserving these things until, hopefully, humanity can come to its senses and can live in a balanced way with the natural world?”

Haiti: Rallying citizens to restore the environment

Last February, William Cinea, founder of Haiti’s Jardin Botanique des Cayes, signed a memorandum of understanding with Naples Botanical Garden, solidifying our longstanding relationship and advancing an ambitious plan to study and protect his country’s plant life.

Following a ceremonial tree planting in the Kapnick Caribbean Garden, Cinea sat down to offer a broader sense of what his country faces and how he and his team are pushing for change.

But first, a history lesson.

The country’s environmental challenges date back centuries, explains Duke University professor Laurent Dubois, writing in *The New York Times*. French



Atop St. Croix’s Mount Eagle, Dewey Hollister checks on native flora and rescues native orchids.

colonizers in the 1600s felled trees for lumber, fuel, and mahogany. By the 1700s, Haiti was the most profitable plantation colony in the world, and landowners demolished forests for sugarcane, coffee, and other cash crops. Degradation continued after Haiti won its independence; the United States in the 1940s, for example, negotiated for the right to clear 50,000 acres of woodlands to plant rubber trees for the war effort. Today, residents continue to rely on wood, mainly in the form of charcoal, the primary cooking fuel for 80% of urban residents, according to the World Bank.

By one widely publicized study in the *Proceedings of the National Academy of Sciences*, less than 1% of Haiti’s original primary forest remains. Other researchers counter that the situation is not

quite so dire; Cinea says the more accepted estimate is that 3% of virgin forest remains. Regardless, no one denies deforestation’s troubling legacy.

Enter Cinea and his team.

“Restoring Haiti’s environment is the most important thing to do now,” he says. Deforestation resulted in massive soil erosion throughout the country, three-quarters of which is mountainous. The trees also regulated water cycles, ensuring the rivers were fed into the dry season. Now the runoff gushes into rivers during the wet



William Cinea collects data and photographs of Haiti’s flora.

season, and there's nothing to replenish them during the dry, rendering them an unreliable irrigation source. Haiti today imports about 60% of its food, according to the International Fund for Agricultural Development, a nonprofit based in Rome. Cinea believes his country needs to move away from such short-term solutions and nurture the land back to productivity.

"I see how bad it is, and I see how people don't understand it. They are short-term thinking.

"They are short-term thinking ... we need to teach them to think in a new way."

– William Cinea

They are [taking] short-term action. It's myopic thinking," he says. "We need to teach them to think in a new way."

Research and education are his top priorities. Shortly before signing the memorandum, Cinea launched a "Flora of Haiti" citizen science project to amass information about Haiti's plant life. The last such plant inventory was compiled a century ago—by foreigners. This time, Cinea wants his fellow Haitians to join the effort, hoping to spur environmental appreciation, awareness, and activism.

Cinea is also working with Garden staff on a "Red Listing" project to determine the status of native plant species and

understand which are abundant and which are nearing extinction. (Haiti, one of the world's most biodiverse regions, boasts some 2,000 plants that grow only on the island.)

Data like this will help Cinea and his team advise government officials and nongovernmental organizations on science-backed restoration strategies. He's hoping to correct well-intentioned but

throughout Collier County, steering landscapers and local governments away from temperate species and toward plants better suited for the tropics. Cinea and other Caribbean partners advise us on what to plant and frequently supply seeds since our climates, weather, and growing conditions are so similar.

"The environment is our economy, it's our health, it's



Despite a legacy of deforestation, Haiti's beauty persists.

problematic reforestation efforts. In the rush to replace trees, he says, nonprofit organizations plant a mere handful of species, creating environmentally detrimental monocultures.

"You need a forest ecosystem," he says. Another issue: Many groups choose fast-growing, nonnative species, exacerbating ecological issues. Native trees are slow growing and develop deep roots to withstand the region's many hurricanes.

"We want to change the mindset. The slow-growing plants, they are slow for a reason," he says.

In Naples, the Garden is working on similar projects

everything," Washburn says. And, increasingly, botanical gardens realize they hold the key to many of these pressing problems—plants and the knowledge of how to use them. "This is the challenge botanical gardens all over the world are taking up."

Photos courtesy of Ramesh Cintron (page 15); Thrity Vakil (pages 17-18); Dewey Hollister (page 19); William Cinea (page 19-20).



AN APRIL morning dawns unseasonably cold with a wind advisory, prompting Jared Franklin to navigate his skiff gingerly through the Ten Thousand Islands, avoiding the exposed Gulf and its bluster. The going is slow, a 45-minute journey extending twice that long.

But there are treasures to be had on Fakahatchee Island, a 73-acre strip nestled within a maze of mangroves and open water. Franklin, an Environmental Specialist with Rookery Bay National Estuarine Research Reserve, and Jessica DeYoung, Conservation Horticulture

Manager for Naples Botanical Garden, are determined to find them.

Though bounty of the archaeological sort is surely present—the island was first a Calusa settlement and later a fishing outpost—the scientists seek something of a different nature entirely: seeds. They and their respective organizations have teamed up to document the plant life of Rookery Bay and protect it from sea-level rise, coastal storms, altered hydrology, and other pressures affecting the 110,000-acre reserve, which comprises 40% of Collier County's coastline. The project has tremendous implications for conservation, land management, climate change monitoring, and ensuring the availability of native plants for restoration projects.



Racing Tide, Time & Temperature

Scientists embark on a mission to collect and conserve Rookery Bay's native plant seeds

Aerial photos courtesy Rookery Bay National Estuarine Research Reserve.



Conservation Horticulture Manager Jessica DeYoung collects soapberry seeds.

Armed with a comprehensive plant inventory they completed last December, DeYoung and Franklin venture into the Reserve twice monthly to gather seeds as they ripen. Today's targets? Soapberry (*Sapindus saponaria*), a native tree, and sixangle foldwing (*Dicliptera sexangularis*), a coastal wildflower. Franklin leads the way through the brush; DeYoung scans the ground and gazes overhead. The soapberries are readily apparent, bunches of grape-sized, reddish-hued seeds clumped on branches; the flowers are more elusive—modest plants with slender, sphere-shaped blooms. DeYoung finds one ready to harvest and opens her hand to reveal flea-sized seeds.

"There are not a whole lot ripening, but at least we know what they look like now," she says. She secures them in an envelope.

THE GARDEN and Rookery Bay joined forces three years ago out of concern for a single species, Florida thatch palm, *Thrinax radiata*. These mid-sized palms are state endangered,

and Collier County represents the northernmost tip of their range, making them of interest to plant scientists curious about the adaptations that allow them to tolerate climate conditions beyond the Caribbean. Rookery Bay's three thatch palm stands are located near the shoreline, unfortunate real estate for a species with limited salt tolerance. With rising seas, strengthening storms, and eroding coasts, their outlook is bleak.

DeYoung and Franklin collected 1,062 thatch palm seeds, 446 of which germinated and are growing in the Garden's nursery. The organizations have discussed planting some within the Reserve and using others for coastal projects, ensuring their continued existence. Garden staff, in fact, planted three of those palms at Naples Beach recently in a dune restoration venture with the City of Naples (see page 11).

"We don't always know what the end use of these seeds will be," says Chad Washburn, the Garden's Vice President of Conservation.

"This project is about conserving the genetic material before it's gone."

The thatch palm efforts opened the door to further collaboration, beginning with documenting and studying the Reserve's botanical life.

ROOKERY BAY is a curious place. By air or by boat, it looks like a mangrove monoculture. In reality, it houses tremendous biodiversity and varied habitats. Plants proliferate the shell mounds, and the Reserve—like the Garden—includes precious coastal scrub, a unique habitat that has largely vanished from the Sunshine State as development expands.

The last plant inventories of significance had been conducted back in the 1990s with small-scale follow-ups in the decades since.

"Nothing as comprehensive as what we're doing now," Franklin says. Coupled with his and DeYoung's efforts, local ecologist

**"We probably have the best understanding we've ever had of what's happening in the Reserve in these habitats."
– Keith Laakkonen**

Mike Barry has provided data on long-term habitat changes. "We probably have the best understanding we've ever had of what's happening at the Reserve in these habitats," says Rookery Bay Environmental Administrator

Keith Laakkonen. “Working with the botanical garden and a talented botanist like Jared has really given us the tools ... to understand how these ecosystems work.”

That knowledge drives management decisions, such as scheduling prescribed burns in areas where fire-dependent plants grow. Or prioritizing invasive plant removal in sections that contain rare or threatened native species. Conservationists favor protecting plants within their natural habitats, and the inventory will help Rookery Bay advance its land management protocols to do just that.

“We can start to prioritize areas for certain management activities based on what those specific plants need,” Franklin says.

It also has given DeYoung and Franklin a roadmap for seed collecting. Once they had identified the Reserve’s plant life, they ran each species through various databases to see which plants were absent from botanical garden collections around the globe.

Of the approximately 535 plants they inventoried, 220 were found in three or fewer botanical collections; 102 were in none. Protecting plants in their natural habitats may be the frontline method of conservation, but getting them into botanical collections is a critical safeguard. Franklin and DeYoung target those underrepresented species—soapberry and sixangle folding among them—along with threatened

species, such as thatch palms, and species that may be prevalent now but whose habitats are likely to succumb to natural or human-made pressures.

Simply collecting the seeds isn’t enough; there’s little published research on many of these native species, and it’s up to DeYoung to take them back to the Garden and figure out how they function.

“There’s a lot of plant material that has never been successfully grown. No one knows if the seeds can be stored in a seedbank. What protocols do we need to follow



to make sure they can be stored for the long term? What are the propagation protocols? This is vital to know when we only have a few chances to collect seed for some of the rarest species,” Washburn says.

DeYoung studies how the plants reproduce in their ecosystems and determines what steps, if any, she needs to take to get them to grow. The seeds of some wetland plants, for example, need to be soaked in order to sprout; seeds that are typically windblown may need their coats eroded to wear down their seed coats.

“It’s like unlocking a code to figure out a plant and make it survive,” she says.

That knowledge will allow for long-term seed storage and the ability to grow locally collected seeds for use in restoration projects—another important conservation strategy and a way to ensure we keep homegrown genetics in our ecosystems.

LIKE ALL coastal ecosystems, Rookery Bay faces significant change.

“It’s crazy how fast it’s changing,” says Mike Barry, the ecologist who has studied plant life and habitat change throughout the Western Everglades region, including Rookery Bay and the Ten Thousand Islands. For the past 30 years, he has compared his datapoints with historic maps from the 1940s.

Beginning in 2010, Barry began noting significant change.

“We started seeing more rapid die-off of pines and cabbage palms, and there had been no changes to hydrology.” He wondered why they were dying. The region’s hydrology had been severely altered in the late 1950s with the dredging of canals for a failed housing development, but if anything, the hydrology has improved in recent years with the plugging of those waterways.

“The tides, I realized, were higher,” Barry says. Collier County’s coastal waters rose 23 centimeters between 1940 and the 2010s—a faster rate than the global average, Barry says. Since 2010, low tides



Rookery Bay Environmental Specialist Jared Franklin takes copious field notes on the Reserve's plant life.

have measured 40% higher than their previous levels. The effects are evident in several species, including saw palmetto, an upland plant. From Naples to Everglades City, the palmettos are dying.

"It's the inundation," Barry says. The plants are drowning.

Barry has also chronicled significant changes in mangrove and marsh habitats.

"We're always talking about the competition of mangrove and marsh. The tides have come up so fast in this decade they are no longer competing. The marsh has died out in advance of the mangroves."

PLANTS MAY take center stage in this partnership, but they are far from the sole beneficiaries.

"This whole project is about plants, but it's not just about plants," Laakkonen says. Plants, he explains, provide nourishment for other species along the food chain. "Right now, as I'm looking

outside my window, gumbo limbo is in seed. The gumbo limbo is in seed because birds are migrating out of the Caribbean. There's this synchronicity between plants and wildlife and these ecosystems. I think if you better understand these plants, you better understand the entire ecosystem, and you have a better understanding of how much these conservation lands are helping to protect more than plants."

For Franklin and DeYoung, each trip yields new discoveries. On Fakahatchee Island, they examined two nearly identical trees growing on either side of a footpath, eventually determining they were different species.

"This is a huge part of it, just trying to figure out what the plant is," Franklin notes. On White Horse Key, near Fakahatchee Island, Franklin stumbles upon a euphorbia on their target list, an unexpected find. DeYoung extracts a clump of grass to bring to Dr. George Wilder, a botanist who runs the Herbarium of Southwestern Florida, located on the Garden's campus. He's an expert on grasses, notoriously difficult to identify.

Listening to the two, it's clear the Reserve's botanical "treasures" will be endless. And with a rapidly changing climate, DeYoung and Franklin's finds may yield a wealth of knowledge to guide management and conservation practices that protect the region's ecosystems.

"I'm learning more about these plants as we go along," DeYoung says. "It makes me feel closer to the environment, and that I'm making a positive difference in the world, even if it's small steps."



Calopogon multiflorus. Photo courtesy of Jared Franklin.

Worried about Florida native plants succumbing to natural and human-made pressures, a national plant conservation group has launched a new, statewide "biobanking" initiative to collect and conserve seeds before they're gone.

The Center for Plant Conservation (CPC), a California-based group dedicated to saving North American plants, recently launched a pilot project to secure rare Florida native species that are absent from botanical collections. Naples Botanical Garden, in conjunction with Rookery Bay National Estuarine Research Reserve, is one of four botanical gardens participating. We're seeking two of CPC's 10 target species: *Calopogon multiflorus*, a terrestrial orchid that requires a wild or prescribed fire to trigger its growth, and *Dyschoriste angusta*, a small wildflower that blooms in pinelands and prairies. Both are found within Rookery Bay.

"We're really passionate about doing this in Florida specifically because Florida has a lot of threats—hurricanes, sea-level rise, development, and temperature rise on this amazing peninsula where some of these species don't have any place to go," says Katie Heineman, the CPC Vice President of Science & Conservation. "I'm excited to work with Naples on this. They're a new member of our network, and it's great that they're focusing on conservation as a young organization."

CPC is modeling its Florida biobanking initiative after the California Plant Rescue, in which partnering institutions, armed with CPC-administrated grant funding, collaborated to identify and conserve rare plants. At the close of 2020, the organizations had collected seeds of 250 rare species. The Florida pilot project, which is funded with \$30,000 in private donations, will be used as the basis to launch a larger effort in the coming years, Heineman said.



Room to Grow

The Evenstad Horticulture Campus will allow the seeds of new ideas to blossom into reality

In Naples Botanical Garden's early days, nursery space abounded. The inaugural staff grew the plants that would become its foundation on a 2-acre plot, with a secondary nursery on the property's north end, and a half-acre plot near the administrative building. These days, production is compressed to that north-side nursery, an aviary converted into a greenhouse, and space shared with Florida Gulf Coast University in the Harvey Kapnick Education and Research Center, including a classroom-turned-propagation lab.

That squeeze comes as the Garden has refined and expanded its mission, seeking collections with scientific value, amplifying conservation efforts, developing multinational partnerships, and assisting local governments and

organizations on ecosystem projects essential for Southwest Florida's wellbeing.

"We're doing twice as much production as we used to do with a third as much space," says Vice President of Horticulture Brian Galligan.

Relief is on the horizon. This fall, the Garden will break ground on the Evenstad Horticulture Campus, adding more than 75,000 square feet of greenhouses, laboratories, offices, and, critically, nursery space. Construction will last about a year.

The Florida Legislature recognized the Garden's role in regional environmental efforts, awarding a \$750,000 appropriation toward its construction. The Garden is seeking private donations to fund the rest.

"I'm grateful for the state funding. I'm equally grateful that our elected officials recognize our expertise and support our mission," says President & CEO Donna McGinnis. "We're eager to identify more nature-based solutions for Florida's environmental challenges, while connecting people with nature through our beautiful tropical gardens. The Horticulture Campus is the key to our future."

Groundbreaking can't come soon enough.

"We talk about the Horticulture Campus just about every day," Galligan says. While the staff maintains world-class horticultural displays despite the space crunch, they can't go full throttle on enhancement plans until they have more nursery space. The lack of

facilities, for example, limits their ability to prepare specimens with scientific, horticultural, historic, cultural, or conservation value for public viewing. There's simply no room to grow the plants to a size suitable for display.

"The orchid house is slammed with a collection of rare and charismatic plants that we want to get into the Garden," Galligan says.

He also aspires to introduce bold ornamental displays—such as bright swaths of curcuma or bromeliads—to our subtropical vistas.

"We replicate nature really well. What we want to start doing are these 'wow' displays," Galligan says. New propagation labs will make that a reality.

Meanwhile, the campus promises to bolster conservation work, provide educational opportunities, and allow the Garden to take on more projects to improve Southwest Florida's ecosystems and water quality.

"The Horticulture Campus is the linchpin in our conservation work," Vice President of Conservation Chad Washburn says.



An artist's rendering of a greenhouse in the Evenstad Horticulture Campus

“The Horticulture Campus is the linchpin in our conservation work.”

– Chad Washburn

Take, for example, the beach dune project (page 11). The Garden procured the needed plants through outside growers. In the future, staff experts would like to grow their own plants from seeds collected right here in Southwest Florida. Those plants will be perfectly acclimated to the region's unique climate and soil conditions. Or consider the

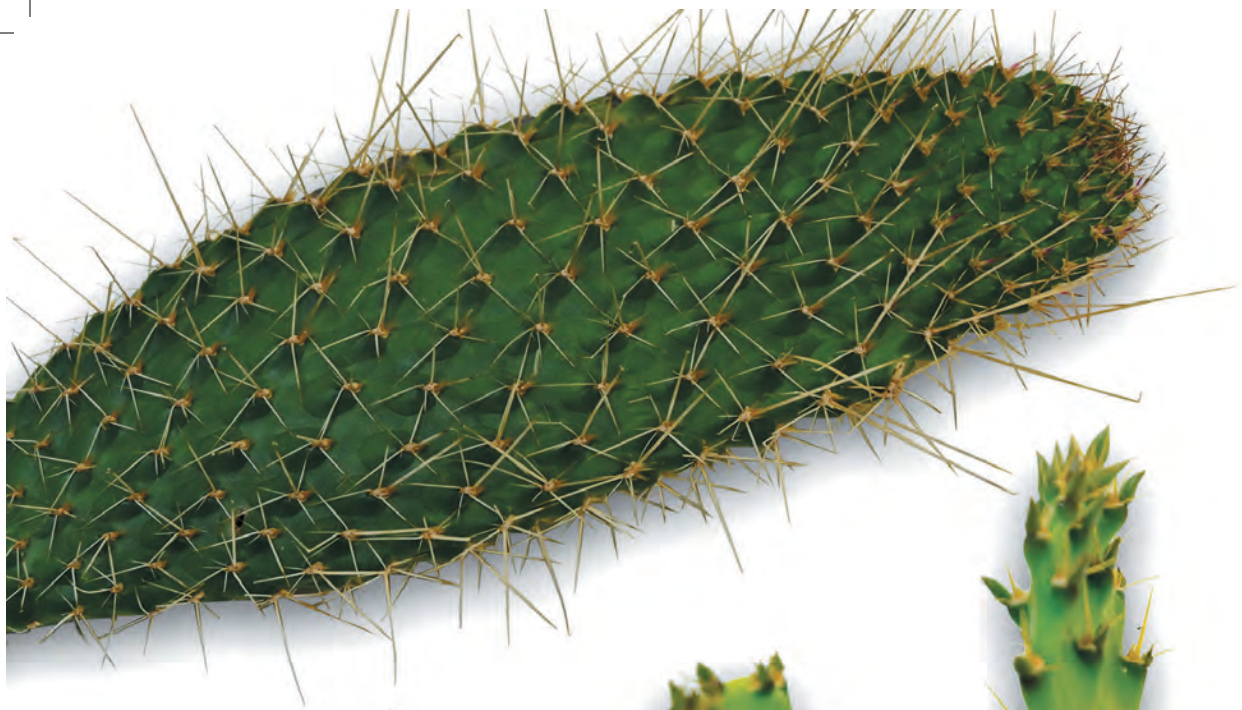
collection of rare, threatened, and endangered plants that our partner, the founder of Jardin Botanique des Cayes, sends from Haiti (page 15). Garden researchers study how to grow them and share their findings with Haitian conservationists who are restoring troubled ecosystems. Additional space and equipment will increase the staff's capability to manage those and related projects.

The new campus also will house the Garden's seedbank, support additional research into Southwest Florida native plants, and allow staff experts to investigate trees, shrubs, and ground covers to recommend for environmentally friendly landscapes.

"We can't evaluate a tree if we don't know its history," Galligan says. The best way to know that history? Grow it from seed or cutting. But the only way to do that is to have a nursery big enough to nurture it from seedling to ground-ready sapling.



The new Evenstad Horticulture Campus will offer Conservation Horticulture Manager Jessica DeYoung additional resources and space to care for important collections, such as these cacti from Puerto Rico.





Puerto Rico's cacti are in trouble.

Two pests, the harissia cactus mealybug (*Hypogeococcus pungens*) and the cactus moth (*Cactoblastis cactorum*), have decimated several species that appear only in Puerto Rico. To protect these precious plants, the U.S. Department of Agriculture turned to Naples Botanical Garden to assist with a proactive conservation project. Puerto Rico conservationists earlier this year combed the main and offshore islands, searching for uninfected cacti. They took cuttings, with careful attention to gathering genetically diverse samplings from numerous locales. Following USDA inspections, they sent the cuttings to Naples for safekeeping. This ensures the plants' genetics won't be lost if the pests worsen before scientists find a means of eradicating them. Our staff experts are now caretakers to hundreds of prickly young plants!

Photos by Paul Osborn



Naples Botanical GARDEN

4820 Bayshore Drive
Naples, FL 34112
239.643.7275
naplesgarden.org

Non-Profit Org.
US Postage
PAID
Ft Myers, FL
Permit #215

