CISMA
Everglades Cooperative Invasive Species Management Area

Newsletter

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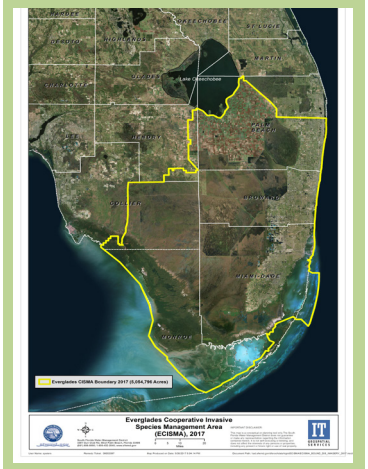
Abundant seed production of mission grass, *Cenchrus polystachion*, could make this species difficult to control (Photo by Christen Mason, SFWMD)

TABLE OF CONTENTS



Two New Noxious Grasses in the ECISMA Footprint

by Christen Mason, South Florida Water Management District

Any time an exotic plant grows aggressively in a region with a climate similar to South Florida there is cause for concern. When that plant is also on the U.S. Department of Agriculture's Federal Noxious Weed List, the apprehension is heightened. Two such grasses have recently been documented within the ECISMA footprint.

Wild sugarcane (*Saccharum spontaneum*) is native to India and was first vouchered in Florida in 2005 when it was collected in the Picayune Strand State Forest. Four years later it was discovered growing in the marsh on the east side of Lake Okeechobee. Wild sugarcane has been crossed with *Saccharum officinarum* (cultivated sugarcane) since the early 1900s so its discovery in close proximity to the Everglades Agricultural Area is not entirely surprising. But it has recently been found in multiple locations in Miami-Dade County, close to Everglades National Park (ENP). In 2016, approximately 20 plants growing in dense clumps across two acres were documented in the 8.5 Square Mile Area, which is located immediately east of ENP near the Chekika site. Four miles to the south, another population of approximately 40 plants was discovered in the Rocky Glades area. Scattered individual plants have been observed farther south in the Frog Pond area. It is possible that all these populations have been on the landscape for many years and have only just been observed. Perhaps they pose little threat to our natural areas. However, wild sugarcane has become a significant pest in other parts of the world. In Panama, it was first documented in 1960 and now covers more than three percent of the Panama Canal Watershed. Rather than give it an opportunity to spread farther in our region, the South Florida Water Management District began treating it. Fortunately, it appears to be relatively easy to control and after two treatments it has not yet grown back.

Mission grass (*Cenchrus polystachion*) has been in Florida since at least 1963 when it was documented in Sebring. It appears that more than 30 years passed before it was discovered outside its original Highlands County location.

CONTINUED ON PAGE 2

Two New Noxious Grasses in the ECISMA Footprint (continued from PAGE 1)

Wild sugarcane, *Saccharum spontaneum*, in bloom in the Rocky Glades (Christen Mason)

Mission grass has been problematic for the Southwest CISMA since the late 1990s and was just recently listed as a Florida Exotic Pest Plant Council (FLEPPC) Category II species on the FLEPPC List of Invasive Plant Species. In May we found it growing abundantly in dense clumps along a one-mile stretch of the C-51 canal in West Palm Beach. It was immediately treated and the area will be monitored closely for regrowth. In Northern Australia, where it has become a common weed, it spreads easily by seed. The concern for escape into our natural areas is great. Mission grass has invaded forests in Australia and dramatically impacted fire regimes as it carries flames up to 5 meters high into tree canopies.

Everyone should be on the lookout for these two species and should report them on EDDMapS (http://www.eddmaps.org/) if discovered. They're both very distinctive when in flower. Look for mission grass in bloom from early summer through the fall. Wild sugarcane is highly visible in the fall when the tall, silvery plumes rise above most other surrounding vegetation.

Biological Control of Weeds: Update

by James P. Cuda, PhD. Professor and Fulbright Scholar, UF/IFAS

According to the South Florida Ecosystem Restoration Task Force, over $48 million was spent by federal, state, and local agencies in 2015 to manage invasive plants in South Florida. There are various physical, chemical, and mechanical tools available to control invasive plants, but none are as selective or sustainable as biological control. Nonnative plants become invasive when they are introduced into Florida without the natural enemies that keep them in check in their native range. Biological control reunites the invasive plants with one or more of their specialized natural enemies.

Dr. Carey Minteer was hired by the University of Florida Institute of Food and Agricultural Sciences (UF/IFAS) as a biocontrol Assistant Professor in November 2016. Dr. Minteer replaced Dr. William Overholt at the UF/IFAS Indian River Research and Education Center in Ft. Pierce. She will be collaborating with Dr. James Cuda and other scientists and extension agents on biological control of Brazilian peppertree and other invasive weeds. Dr. Minteer, who received her Ph.D. in entomology from the University of Arkansas in 2012, spent the last two years as a postdoctoral scientist studying water hyacinth and water lettuce at the U.S. Department of Agriculture (USDA) Invasive Plant Research Laboratory (IPRL) in Ft. Lauderdale before joining UF.

Interagency collaboration between the USDA (Agricultural Research Service [ARS] & Animal and Plant Health Inspection Service [APHIS]), Florida Department of Agriculture & Consumer Services, Division of Plant Industry (FDACS-DPI), and UF/IFAS has led to the mass production and distribution of over 0.5 million air potato beetles to 50 Florida counties as well as Georgia and Louisiana since 2013. The recent success of the air potato beetle has generated considerable interest in biological control. For example, the UF/IFAS Extension Office in Hernando County, in collaboration with FDACS-DPI in Gainesville, has developed a citizen science project to educate residents about the beetle and track its distribution. A website (https://airpotatobeetle.com/), educational videos, and a blog have been created to inform and update participants. For more information on this project, contact Bill Lester at wlester@ufl.edu or (352) 754-4433 ext. 5.

Adult male (left) and female of the cogongrass gall midge (Photos by Purnama Hidayat, Bogor Agricultural University)

As of April 2017, no release permits for new biological control agents of

CONTINUED ON PAGE 3

Biological Control of Weeds: Update (CONTINUED FROM PAGE 2)

Cogongrass with pink linear galls produced by the gall midge *Orseolia javanica.* (Photo by William Overholt)

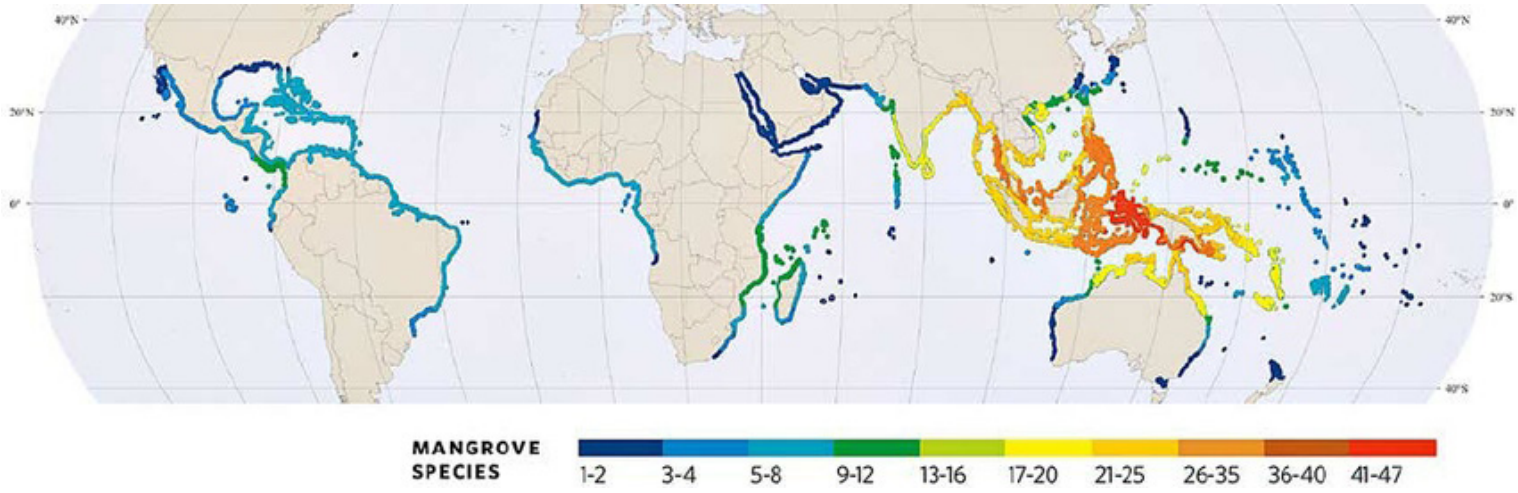
invasive weeds have been issued by USDA APHIS PPQ. On 16 June 2017, I received an email from Robert Tichenor, USDA APHIS Biocontrol Agent Permitting Office, in response to my request for the status of the release permit for the Brazilian peppertree leaf galling psyllid. The permit had been approved by the Technical Advisory Group for Biological Control Agents of Weeds (TAG) in April 2016. According to Mr. Tichenor, APHIS is still waiting for the Biological Assessment concurrence letter from the U.S. Fish and Wildlife Service (USFWS) that TAG requested in December 2016. Once APHIS receives the letter from USFWS, then it will take another 6 months to a year to complete the National Environmental Policy Act (NEPA) Environmental Assessment. So, it would appear a permit to release the psyllid for biological control of Brazilian peppertree would not be issued until sometime in 2018. Let's hope it's sooner.

The USDA Invasive Plant Research Laboratory in Ft. Lauderdale has been documenting ecosystem recovery during a 17-year period (1997–2014) following the release of biological control agents of melaleuca. Formerly dense melaleuca stands are gradually changing to more diverse plant communities consisting of mostly native species following an 85% reduction in melaleuca trees.

The University of Florida is working to develop a biological control for cogongrass, an invasive grass that invades pastures, pine plantations, and natural or disturbed areas throughout Florida. Cogongrass was introduced into Florida in the 1930s and 40s as a potential forage grass and soil stabilizer. Dr. Cuda and his colleagues recently found a gall-forming midge in Indonesia that impacts cogongrass and may be host specific.

Musings on the Menace of Exotic Mangroves

by Dennis J Giardina, Florida Fish and Wildlife Conservation Commission (FWC)



Map of global mangrove diversity (Photo by World Atlas of Mangroves, sponsored by the International Tropical Timber Organization)

Until I became involved with invasive, exotic mangroves, I thought that all mangroves were trees. The most comprehensive definition for the term "mangrove," I found on Mangrove Watch Australia's website: "A mangrove is a tree, shrub, palm or ground fern, generally exceeding one half meter in height that normally grows above mean sea level in the intertidal zone of marine coastal environments and estuarine margins. A mangrove is also the tidal habitat comprising such trees and shrubs. Mangrove plants are not a single genetic entity because the plant types represented in the tidal zone are not all closely related. So, while they sometimes look the same and have similar function, this tells us more about the environment they live in, rather than their family relationships."

The mangrove forests of the Western Hemisphere are extensive but species poor. The Pacific Coast of Panama and Colombia has the most diverse mangrove forests on this side of the planet, composed of 11 species, including a palm and a fern. Florida has only five species: four trees and one fern. In comparison, the mangrove forests of Indonesia, Malaysia, and Australia are particularly species rich. Indonesia has the largest and most diverse mangrove forests in the world, with approximately 45 species. People in Southeast Asia have depended upon the resources of mangrove forests for tens of thousands of years and there still remain expansive areas of dense, well-structured ecosystems. However, beginning in the 20th Century, industrial logging and land conversion to shrimp culture, agriculture, and development have taken a toll on them. Organizations like the Mangrove Action Project provide information and tools to help communities and governments conserve, restore, and sustainably manage mangrove forests.

Bunches of Lumnitzera seedlings from the morning sweep. (Photo by Dennis Giardina, FWC)

Lumnitzera racemosa is a wide-spread mangrove species from Southeast Asia, Australia, and the Pacific. Since it was discovered to have escaped from Fairchild Tropical Botanic Garden in 2008, *Lumnitzera* has spread throughout the garden and into Matheson Hammock County Park next door. Through ECISMA volunteer workdays and funding provided by Florida Fish and Wildlife Conservation Commission, the 20-acre invasion footprint of *Lumnitzera* has been repeatedly surveyed and treated since 2009. Stem densities have been reduced from thousands per acre to just hundreds removed from the entire area in 2016–17. It is remarkable that so many propagules continue to sprout and grow seven years after the last known mature *Lumnitzera* was removed. Mangroves have never been known to create a propagule seed bank in the environment but it seems as though that is what *Lumnitzera* has done at Fairchild and Matheson. Miami-Dade County work crews and volunteers continue to sweep through the known infestation area, searching for *Lumnitzera* and removing any seedlings and saplings that are found. However, at this point it is unknown whether *Lumnitzera* can be "eradicated" and it will likely take a

CONTINUED ON PAGE 5

MUSINGS ON THE MENACE OF EXOTIC MANGROVES (CONTINUED FROM PAGE 4)

Miami-Dade County's *Lumnitzera* strike force in the "hot zone" during an ECISMA workday in January 2017 (Photo by Dennis Giardina, FWC)

decade of continued surveys to find and remove it from within and around the known area of infestation before we can even imagine using that word.

So far as we can determine, exotic mangroves have not yet become commercialized in the ornamental plant trade in Florida. Because of that, perhaps we still have a chance to prevent other species of potentially invasive mangroves of the East from establishing here in the West. One encouraging development is the connection ECISMA made with plant ecologist Anthony Koop and colleagues at the USDA/APHIS' Plant Protection and Quarantine. They oversee the Not Authorized Pending Pest Risk Analysis (NAPPRA) process. This is not their full-blown Weed Risk Assessment (WRA), but rather a simpler process they use to support "banning" plants that are likely to be imported for planting. They have agreed to propose listing *Lumnitzera* and *Bruguiera* (Florida's other exotic mangrove) under NAPPRA regulations, which effectively stop any potential import of these species for planting until they are evaluated with their WRA. The listing of a species under NAPPRA can take a couple of years because an official notice has to be drafted and published in the Federal Register and they must receive and respond to comments from the public before they can issue a final notice.

Until then, the clock is ticking and the question is this: Will we be able to restrict or at least inhibit the commercialization of exotic mangroves in Florida (some of which are quite attractive), before they become a valuable commodity? A more haunting question is this: In the early 1970s, Fairchild made *Lumnitzera racemosa* available during one of their plant sales and there is a record of 14 individuals being sold. Where did they go? Were any planted in the ground where water could disperse their propagules? Until we learned of this sale made decades ago, we felt fortunate that the infestation of this aggressively invasive species was the result of its only being planted in one place. Now we face the specter of additional point sources of *Lumnitzera* and if that is the case, we will surely have our work cut out for us.

An Opulent, Jeweled Maiden Scorned

by Jimmy Lange, Fairchild Tropical Botanic Garden

If you haven't heard of the jeweled maiden fern (*Thelypteris opulenta*), it's probably because this large, aggressive, exotic fern is currently restricted to just a handful of preserves in Miami-Dade County. That doesn't sound so bad, but the problem is that these sites are home to several rare and endangered ferns already struggling to survive in the face of past deforestation, fragmentation, lowering water tables, and myriad other exotic species competing for space. *T. opulenta*, once introduced to an area by spore, can mature extremely quickly relative to our natives and further spread by both spore and creeping rhizome to quickly dominate the herbaceous understory of these limestone-laden habitats. It is already a documented nuisance weed in many parts of the tropics.

Infestations of *Thelypteris opulenta* in Miami-Dade County's Deering Estate, featuring Jennifer Possley (Photo by Jimmy Lange)


Compound leaves in ferns, and demonstration of how confusing it can be in the field. Can you spot them? (Center-left) tri-pinnate *Ctenitis sloanei*, (center-right) pinnate-pinnatifid *Thelypteris opulenta*, (center-bottom) once-pinnate *Nephrolepis exaltata* (Photo by Jennifer Possley)

Native to Asia (and interestingly classified as endangered by IUCN), *T. opulenta* was first discovered in Florida (where it had escaped from cultivation) in the 1980s. Local fern enthusiast and legendary self-taught botanist Don Keller discovered it while surveying all over South Florida for rare and unusual ferns, particularly the mysterious *T. patens*. He discovered roughly a dozen *T. opulenta* in "a small tree preserve near the Sears® store in Cutler Ridge." It has since been found in at least three other preserves, and has reached problematic levels in at least one. Areas where it is found are typically abundant with other fern species, many quite similar to the untrained eye, and identification can be problematic. We'll use this as an opportunity to use some fern jargon, and hopefully make all of us a bit more comfortable with our cryptogamic friends (and enemies).

T. opulenta can be confused with several of our native ferns, but I'll discuss two here. *T. opulenta* resembles the state-threatened Abrupt-tipped maiden fern (*T. augescens*) with its relatively narrow pinnae (leaflets of fronds), but *T. opulenta* lacks the clearly abrupt tip. *T. opulenta* also has more widely-spaced pinnae, and the sinus (meeting point) of the pinnules (leaf-like lobes of pinnae) is closer to the midvein of the pinnae, giving it a more saw-like appearance. Due to its size, *T. opulenta* might also be confused with the state-endangered Florida tree fern (*Ctenitis sloanei*). However, *T . opulenta* is pinnate-pinnatifid (bi-pinnately compound with pinnule lobes on pinnae, or "pinnate-a-bit") when mature rather than tri-pinnate, like *C. sloanei*. The defining characteristic, however, of *T. opulenta*, that which gives it the descriptive moniker "jeweled" and the epithet meaning rich and luxurious, is the presence of small, yellow glands that litter the underside of the leaves, particularly on the veins. You will likely need a hand lens to see them, but they are your best bet for definitively identifying *T. opulenta*. You are now trained to be on the lookout!


Close-up of *T. opulenta* pinna, showing tiny golden (jewel-like) glands along veins on the underside of the frond (Photo by Robbin Moran)

2016 Python Challenge™ Raises Awareness and Concern about Invasive Species

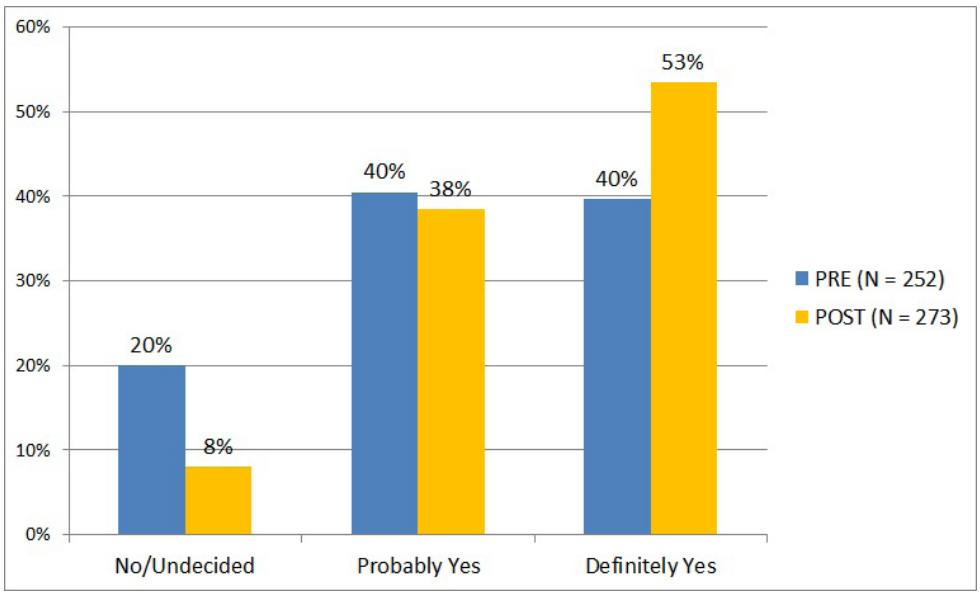
by Rebbecca Harvey, University of Florida

The Florida Fish and Wildlife Conservation Commission (FWC) and partners organized the 2016 Python Challenge™ with the goals of raising awareness of invasive species in Florida and engaging the public in Everglades conservation. The event included a Burmese python removal competition from January 16 to February 14, 2016. More than 1,000 people registered and collectively removed 106 snakes.

2016 Python Challenge™ participants with Burmese python (Photo by Edward Mercer, FWC)

FWC contracted the University of Florida to survey 2016 Python Challenge™ participants and members of the Florida public both before and after the competition (i.e., PRE and POST). Multiple regression analyses found significant PRE-POST differences among both groups, suggesting that the 2016 Python Challenge™ positively influenced knowledge and beliefs about invasive pythons.

General public POST respondents were significantly more likely than PRE respondents to know that there are Burmese pythons in Florida, to know about the 2016 Python Challenge™, and to score higher on a composite scale measuring knowledge of invasive species. Other factors shaping general public knowledge included age, race, ethnicity, hunting experience, and experience visiting South Florida natural areas. "Concern" about Burmese pythons (measured as a set of beliefs about the severity of the python problem and the importance of control and prevention measures) also increased significantly among the general public after the event. The public reported learning about the Python Challenge™ most commonly through TV and newspapers, so this result suggests that media messages raised public concern about the ecological threat of invasive pythons.



"Do you think that involving the public in python removal will help to reduce the number of Burmese pythons in Florida?" (2016 Python Challenge™ participation pre and post responses)

Among the 2016 Python Challenge™ participants, specific beliefs about python management changed from PRE to POST. POST participants were significantly more likely than PRE participants to believe that "involving the public in python removal will help to reduce the number of Burmese pythons in Florida" (Figure 1) and less likely to believe that "wildlife authorities are doing enough to control the Burmese python population in Florida."

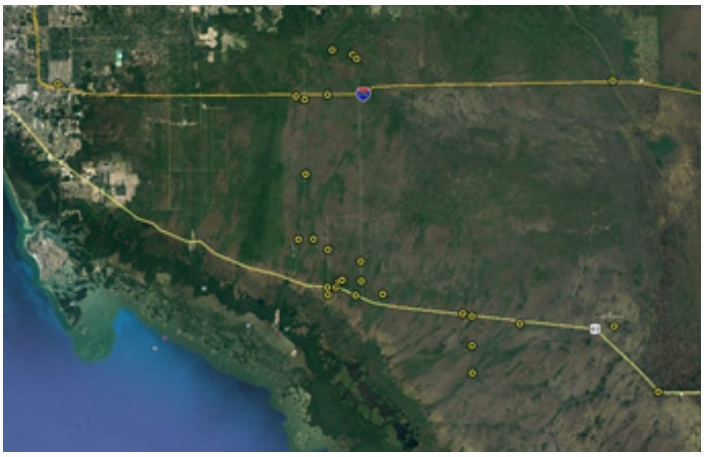
University of Florida conducted a similar survey after the 2013 Python Challenge™ (with POST data only) and concluded that "not seeing was not believing." That is, the experience of not seeing any pythons during the Python Challenge™ may have led some participants to doubt scientific accounts of Burmese python numbers and impacts. This finding was not corroborated by the 2016 data.

CONTINUED ON PAGE 8

The Fish Slam: Two Nonnative Fish Species Never Before Seen in Big Cypress National Preserve

by Kelly Gestring, FWC, and Pam Schofield, U.S. Geological Survey

Currently, Florida has at least 34 species of reproducing nonnative freshwater fishes, and maintaining current information on their geographic ranges can be a daunting task. In the first interagency effort to coordinate sampling, research, and management, biologists made an unexpected discovery in areas not commonly sampled. In 2013, Loxahatchee National Wildlife Refuge (Lox) staff collected Croaking gourami, a species not found in this area for decades. Shortly after, several teams of fish biologists converged and collected another nonnative species, Jack Dempsey, while sampling for more gourami. Thus, the group raised consideration for additional work on a more extensive geographic scale, and the idea for the Fish Slam was born.



Locations of sites sampled in Big Cypress National Preserve during March 2017 Fish Slam

The primary objectives of Fish Slams are to: 1) Use a large group of experienced fish biologists to sample waterbodies not routinely sampled to document nonnative fish fauna, and 2) To confirm reports of new nonnative fish species or document range expansions for established species. Over the past several years, Fish Slams have increased in participation and frequency. These semi-annual events facilitate partnerships of up to 30 biologists, various agencies and institutions. This coalition has adopted the name Non-Native Fish Action Alliance (NNFAA).

The NNFAA sponsored two Fish Slams this past year. In November 2016, 10 teams sampled 21 locations, primarily in Miami-Dade and Palm Beach counties and collected 20 nonnative fish species. The teams collected 1,277 individuals, primarily Spotted tilapia (39.3%), Asian swamp eel (17.1%) and African jewelfish (16.0%) but no new species.

Big Cypress National Preserve (BICY) in Collier County hosted the March 2017 Fish Slam. BICY requested NNFAA's assistance to detect and survey 7 nonnative fish in the Preserve, an effort last attempted 15 years prior. Eight teams sampled 28 locations, using a variety of methods including electrofishing, minnow traps, cast nets, and angling to sample the fish fauna. Participating teams collected 13 nonnative fish species from these sites. Team members collected 632 total individuals, primarily African jewelfish (49.8%) and Mayan cichlid (12.0%), which occurred at a majority of the sites. No new species were documented, but teams collected Nile tilapia and Brown hoplo for the first time in BICY.

CONTINUED ON PAGE 9

2016 PYTHON CHALLENGE™ RAISES AWARENESS AND CONCERN ABOUT INVASIVE SPECIES

(CONTINUED FROM PAGE 7)

In 2016, participants' concern for pythons remained stable PRE to POST regardless of whether or not they encountered any pythons. We think this is because 2016 participants were more likely than 2013 participants to see a positive impact of their efforts to remove pythons. Cooler weather, an increase in accessible areas, and more opportunities for hands-on trainings all contributed to higher python encounter rates in 2016 (40% of survey respondents saw a python) compared to 2013 (13%). Likewise, more pythons were removed in 2016 than in 2013 (106 vs. 68). Plus, 2016 promotional materials clearly conveyed the message that Burmese pythons "are notoriously difficult to find" (pythonchallenge.org), leading participants to have realistic expectations.

In conclusion, the 2016 Python Challenge™ succeeded both at raising awareness among the general public and providing a positive experience for participants. Public participation events like this are promising ways to increase public concern and involvement in invasive species management. We recommend that future programs employ the same or greater level of hands-on training and specific, realistic messages about the likelihood of encountering and catching invasive species.

THE FISH SLAM: TWO NONNATIVE FISH SPECIES NEVER BEFORE SEEN IN BIG CYPRESS NATIONAL PRESERVE (CONTINUED FROM PAGE 8)

Nile tilapia (top) and brown hoplo (bottom) were collected for the first time in BICY (Photos by USGS)

As a result of these collection efforts, USGS added 138 new nonnative fish records to their Nonindigenous Aquatic Species database and shared this information with the Wildlife Impact Management (FWC) database.

BICY and Friends of ECISMA (FOE) combined resources to cover the cost of lodging for all participants engaged in this Fish Slam. This generous contribution greatly increased participation, especially for those covering their own expenses. The Non-Native Fish Action Alliance is grateful for the support and will explore funding opportunities for future Fish Slam events.
More information on Fish Slams can be found at the USGS web site.

Bay Snook Control Efforts

A component of Fish Slam events this year continued efforts to eradicate Bay snook from an isolated stream system inside Pinecrest Gardens in Pinecrest, FL. ECISMA partners first removed Bay snook from Pinecrest Gardens in August 2014, a date that marks the first ECISMA nonnative fish control effort. ECISMA currently uses non-chemical methods of collection including backpack electrofishing, seines, cast nets, and angling to remove this nonnative fish and protect the highly-coveted koi and other fish found throughout the Gardens. The team collected 31 Bay snook during both Fish Slams, but the size of collected fish appeared smaller with time. Twenty-six of 31 fish collected in March 2017 measured less than 100 millimeters in total length. Continued removal of adult Bay snook will decrease the reproductive output in this system and in conjunction with removing juveniles, may result in a successful eradication of this unwanted nonnative species. The FWC and USGS have interest in developing an eDNA probe for Bay snook. This technique would determine if removal efforts were successful in Pinecrest Gardens and could function as an EDRR tool for locations suspected of having Bay snook.

Juvenile bay snook from Pinecrest Gardens (Photo by M. Brown, USGS)

Nonnative Fish Round-Up

The Everglades CISMA held the 8th annual Everglades CISMA Nonnative Fish Round-Up on April 28 and 29, 2017. The Nonnative Fish Round-Up utilizes anglers to gather distribution information on nonnative fish in south Florida while promoting consumptive use of nonnative freshwater fish. Anglers compete for prizes for catching the most nonnative fish weight, the biggest nonnative fish, and the most species of nonnative fish. This year, 56 anglers registered for this event and checked-in nonnative fish at weigh stations in Miami-Dade, Broward, Palm Beach, and Collier counties. Anglers caught 2,228 fish (21 species) and set a new weight record of 1,564 pounds. The principal species caught, Oscars and Mayan cichlid, comprised 82% by number and 62% by weight of the fish removed.

Nonnative fish species caught as part of the 8th Annual Nonnative Fish Contest, April 2017

This year's Nonnative Fish Round-Up ran for a 24-hour period, primarily to accommodate nighttime bowfishing teams and to increase the amount of fishing time. This successful change allowed bowfishing teams to compete. Bowfishing teams contributed substantially to the total weight submitted, nearly 1,000 pounds more than previous contests. Participants submitted some rarely caught species including Pacu, Brown hoplo, and Pike killifish; however, anglers did not catch any new species. Event organizers donated all unwanted fish to Flamingo Gardens.

The Everglades CISMA Fish Slams, Round-Ups, and nonnative fish control efforts are excellent examples of what cooperative efforts between partners can accomplish. The partnerships within the Non-Native Fish Action Alliance will continue to strengthen as we collectively tackle nonnative fish issues in south Florida.

Tree Island Restoration in the Florida Everglades: Reversing the Exotic Plant Invasion

by Marsha Ward, Florida Fish and Wildlife Conservation Commission

Before (left) and after (right) showing the dramatic difference just with the removal of large dominant Brazilian pepper trees from an island in northern Water Conservation Area 3A (Photo by FWC)

Restoring the tarnished gems of the Everglades — tree islands overtaken by invasive exotic plants — is no easy feat, but something that Florida Fish and Wildlife Conservation Commission (FWC) staff have been working towards for many years. This effort to restore tree islands in Everglades and Francis S. Taylor, Holey Land, and Rotenberger Wildlife Management Areas (known collectively as the Everglades Complex of Wildlife Management Areas, ECWMA) has been going on since the early 1990s. This includes removing invasive exotic vegetation (primarily Brazilian pepper), planting native tree and shrub species on tree islands, and collecting associated survivorship data. There are well over 100 islands across the northern Everglades undergoing restoration, with over 23,000 native trees and shrubs planted over the years. The goal of the program is to successfully control invasive species and restore functional diverse natural wildlife habitat.

Although tree islands comprise a relatively small portion of the spatial area within the Everglades, they are essential to the ecosystem. These unique forested islands contain two to three times the plant and animal diversity of the surrounding freshwater marsh and provide important habitat for local fauna. Tree islands serve as a "nursery" for much of the Everglades' macrofauna. Several species of wading and other birds use the woody vegetation present for nesting substrate, as do much of the herpetofauna. Tree islands are stopover habitats for migrating birds. In addition, tree islands act as a terrestrial refuge for upland wildlife during the rainy season and especially during high water conditions. Tree islands vary greatly in size and elevation across the landscape, which is an important consideration during restoration.

Why do islands need restoration? In the past, natural patterns of water flow and storage were altered for flood control and agriculture needs. Prolonged floods, droughts, and wildfires destroyed many islands; nonnative plants invaded others. In portions of the ECWMA, over half of the historic tree islands have disappeared as a result of hydrological changes.

Mechanical removal of exotic vegetation (Photo by FWC)

CONTINUED ON PAGE 11

TREE ISLAND RESTORATION IN THE FLORIDA EVERGLADES: REVERSING THE EXOTIC PLANT INVASION (CONTINUED FROM PAGE 10)

Transport of native plants to tree islands by airboat (Photo by FWC)

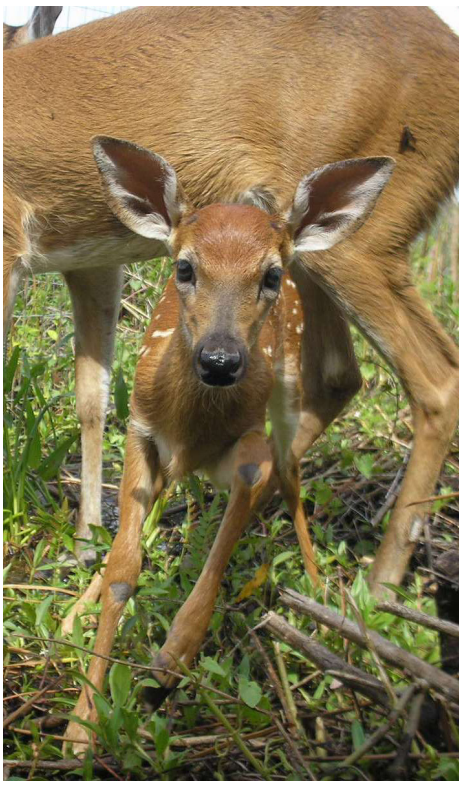
Planted firebush with exclosure (Photo by FWC)

So, how do you accomplish this restoration feat?

Part 1: Set the stage!
Exotic vegetation is removed both mechanically and chemically. About a year later, a detailed planting plan is created based on each island's characteristics (i.e., soil depth, size, hydroperiod). Trees and shrubs commonly planted include red maple, pop ash, bald cypress, dahoon holly, hackberry, willow, pond apple, cocoplum, elderberry, wild coffee & myrsine—just to list a few! Plant locations are carefully selected to help ensure success. For several years after planting, plants are placed within exclosures which protect them from over-browsing by wildlife and from overgrowth by vines and weeds.

Part 2: Maintain the shine!
Ensuring success includes consistent follow-up work including annual exotic plant control, annual exclosure maintenance, annual survivorship tracking, and routine prescribed burning around the tree islands. Vegetation on tree islands, especially woody vegetation, decreases in tolerance to fire and flooding from the outer edge of the island to the center. Because of this intolerance, protecting tree islands from fire is a priority.

Part 3: Enjoy the results!
Overall, success rates for planted species are high (about 70%). For example, bald cypress, pop ash, buttonbush, and red maple all have large sample sizes and probability of success greater than 75%. Cocoplum and firebush had lower probability of survival, but still greater than 50%. Cameras document wildlife use of the tree islands, and panoramic photo-monitoring shows plant growth and the diversity of species now present on the once-degraded tree islands. Over time, the planted trees will begin to self-recruit. The importance of plant diversity and resulting benefits for wildlife cannot be underestimated. Monitoring tree islands helps guide management and restoration efforts throughout the Everglades to ensure long-term success for both wildlife and people.



Deer are just one example of the diversity of species now present on a restored tree island (Photo from FWC wildlife camera)

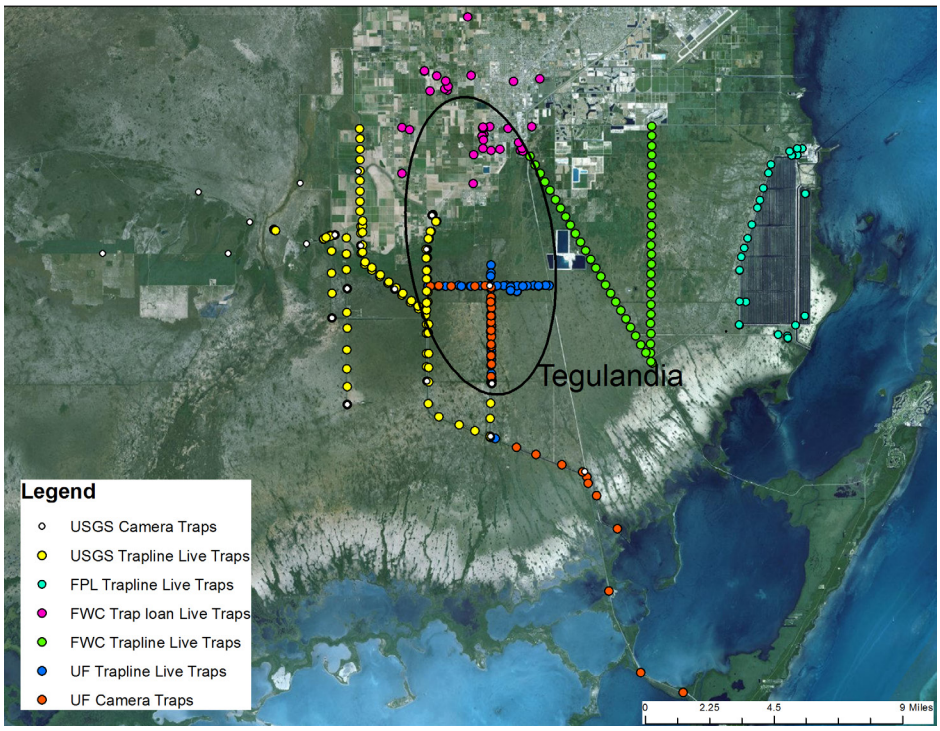
Removing Nonnative Lizards from Florida's Everglades Ecosystem

by Eric Suarez, Florida Fish and Wildlife Conservation Commission

Argentine Black and White Tegus

The Argentine black and white tegu (*Salvatore merianae*) is a large, omnivorous lizard native to south America. Since their introduction in the early to mid-2000s, at least two populations have become well established in central and south Florida. This invasive lizard's active season spans from February through October in Florida, and this year ECISMA partners and private landowners have removed over 1000 tegus from the environment. Florida Fish and Wildlife Conservation Commission (FWC) has increased trapping efforts, partnering with the University of Florida (UF) to continue trapping and removing tegus in the heart of "Tegulandia." FWC has also partnered with the United States Geological Survey (USGS), Florida Power and Light (FPL), and private landowners to trap and remove hundreds of tegus from the dispersing population that occurs between the eastern boundary of Everglades National Park (ENP) and the Turkey Point Nuclear Generating Station in Miami-Dade County. This year, ECISMA partners have deployed more traps than ever, covering much of the known range of tegus in south Florida.

Argentine black and white tegu in a live trap (Photo by Sarah Cooke, University of Florida)



FWC map of "Tegulandia" with live trapping locations for Argentine black and white tegus

As of October 2017, over 1000 tegus have been removed from Miami-Dade County. Forty-eight sightings occurred on game cameras monitored by USGS and UF on the eastern boundary of ENP. These sightings were used to capture tegus, monitor dispersal, and abundance. FWC has also contracted with UF to perform a telemetry study along the canal and levee systems that border ENP to better understand tegu behavior and to determine their response to these removal efforts. Along with the telemetry study, FWC supports UF's efforts to continue trapping tegus in the core area, while also increasing awareness of the species on the edge of its known range.

Nile Monitors

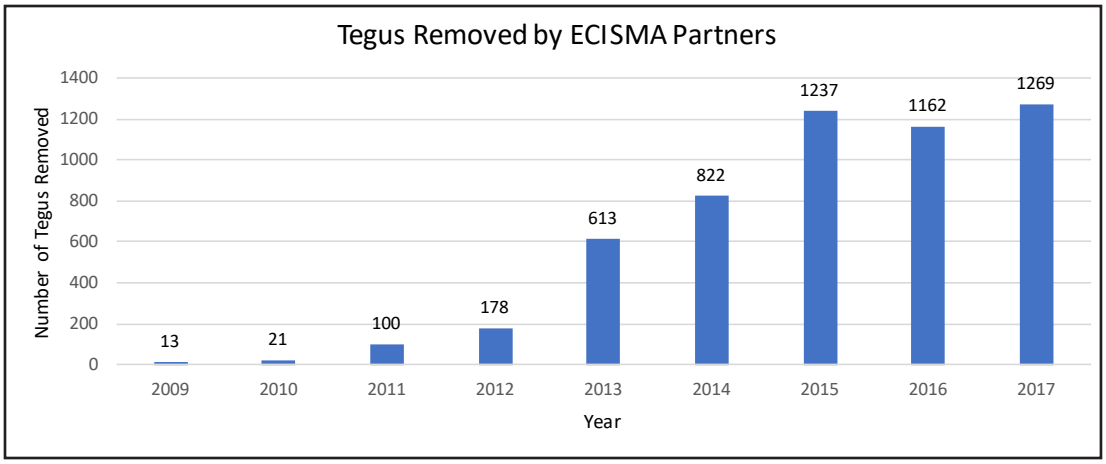
The Nile monitor (*Varanus niloticus*) is a large, carnivorous lizard native to sub-Saharan Africa. It is one of the largest lizard species in the world and has made a new home in south Florida. From 2011 to June 2016, ECISMA partners removed 61 Nile monitors from Palm Beach County in an effort to eradicate this species from the environment. This past year, FWC hired a new staff member dedicated to Nile monitor management. Due to increased efforts, from July 2016 to July 2017, the FWC removed 21 out of 51 monitors observed on two canal systems in, resulting in 51% removal rate.

CONTINUED ON PAGE 13

REMOVING NONNATIVE LIZARDS FROM FLORIDA'S EVERGLADES ECOSYSTEM (CONTINUED FROM PAGE 12)

Historically, trapping has been ineffective in Palm Beach County. In 2016, FWC contracted with UF to research the effectiveness of different bait and trap types for Nile monitors. Although only four Nile monitors were trapped during this study, we did learn that chicken meat is an effective bait. FWC also performed a short bait preference study using five different bait types. Of the five bait types tested, Nile monitors showed the most interest in consuming green iguana (*Iguana iguana*) meat, based off game camera images. This bait type is now used in a live trapping study managed by FWC, but has yet to yield any captures. Trapping will continue through 2017 and into 2018, with the hope that we will determine how to trap Nile monitors successfully and efficiently.

Nile monitor swimming in a canal (Photo by Nick Scobel)



FWC works with ECISMA partners to employ Early Detection and Rapid Response (EDRR) whenever confirmed Nile monitor sightings occur throughout the state. In December 2016, FWC worked with the Davie Police Department in response to a large Nile monitor reported in the town of Southwest Ranches in Broward County. Within a few hours, FWC responders removed two Nile monitors while surveying the area, one measuring over six feet in total length. To ensure control and management, monthly surveys will continue in Southwest Ranches through 2018.

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Agency/Organization Abbreviations

DOI - Department of Interior
ECISMA - Everglades Cooperative Invasive Species Management Area
EDDMapS - Early Detection and Distribution Mapping System
EDRR - Early Detection and Rapid Reponse
EEL (Miami-Dade County) - Environmentally Endangered Lands
FDACS/DPI - Florida Department of Agriculture and Consumer Services /Division of Plant Industry
FLEPPC - Florida Exotic Pest Plant Council
FPL - Florida Power and Light
FWC - Florida Fish and Wildlife Conservation Commission
IUCN - International Union for Conservation of Nature
NPS - National Park Service
SFWMD - South Florida Water Management District
UF - University of Florida
USDA - U.S. Department of Agriculture
USFWS - U.S. Fish and Wildlife Service
USGS - U.S. Geological Survey

CISMA

Everglades Cooperative Invasive Species Management Area

ECISMA was created to formalize cooperation among land management agencies to improve the effectiveness of exotic species control by sharing information, innovation and technology across borders through a memorandum of understanding with the ultimate goal of helping to ensure the success of the Comprehensive Everglades Restoration Plan.

ECISMA contact information:

Tony Pernas
U.S. National Park Service
Big Cypress National Preserve
33100 Tamiami Trail East
Ochopee, FL 34141
(239) 695-1111
Tony_Pernas@nps.gov

Dennis J. Giardina
Florida Fish & Wildlife
Conservation Commission
298 Sabal Palm Road
Naples, FL 34114
(239) 229-5403
Dennis.Giardina@myfwc.com

www.evergladescisma.org

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Editors: Rebecca G. Harvey, UF
and Justin Dalaba, UF
Designer: Justin Dalaba, UF