UF|IFAS UNIVERSITY of FLORIDA

Florida LAKEWATCH

Dedicated to Sharing Information About Water Management and the Florida LAKEWATCH Program Volume 81 (2018)

Graduate Students and Support for their Research

By Mark Hoyer, Director of LAKEWATCH

Last newsletter you found out that LAKEWATCH kicked off a fundraising program to make sure graduate students are always available for research. LAKEWATCH is fundraising to establish an endowed assistantship. Gifts to support an endowed assistantship will be invested in perpetuity to provide permanent annual support for LAKEWATCH graduate students. Our initial goal is to establish a Master's endowment:

MS Endowment: Gifts totaling $350,000 will support $14,000/year, which will be augmented with tuition support from the Dean of the UF College of Agricultural and Life Sciences through the '41 Fellows Initiative, valued at $11,000/year.

- Checks to support this endowment should be made payable to the UF Foundation, Inc. with "LAKEWATCH assistantship" in the memo line.
- Please direct gifts to UF/IFAS Advancement, PO Box 110170, Gainesville FL 32611.
- Gifts can also be made at www.uff.ufl.edu/give/LW41. For more information, please contact John Hooker at 352-294-7868 or jdhooker@ufl.edu

While Kaitlyn the author of our first article is not a LAKEWATCH graduate student she is conducting research on the management of aquatic plants, which is of primary interest to many LAKEWATCH volunteers. So thank you for considering a donation the LAKEWATCH MS-Endowment and enjoy this quarterly newsletter.

In this issue:

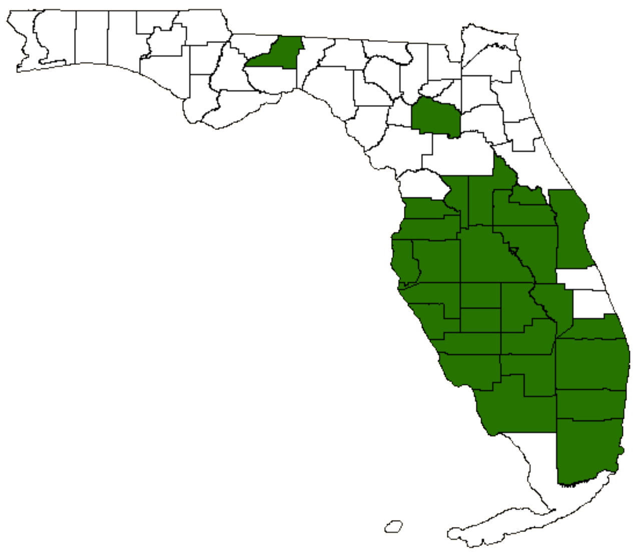
Biology and management of the invasive aquatic weed *Hymenachne amplexicaulis*, West Indian marsh grass

Kaitlyn Quincy, University of Florida Center for Aquatic and Invasive Plants

My name is Kaitlyn Quincy and I am an Interdisciplinary Ecology graduate research assistant at the University of Florida Center for Aquatic and Invasive Plants. I work with Dr. Stephen Enloe and my research focuses on the biology and management of the non-native, invasive species West Indian marsh grass (*Hymenachne amplexicaulis*), or “WIMG” for short. My research aims to assess WIMG’s response to graminicide treatment in the field and under different water depths, native grass response to graminicide treatment, and to better understand the longevity of WIMG in the seed bank.

WIMG is native to South and Central America, parts of Mexico, and the West Indies and was likely introduced into Florida as a forage species for cattle. The first record of WIMG in Florida was in 1957 in Palm Beach County and, although it was not found widespread in Florida until the 1990s, today it poses a serious problem for land managers. WIMG is currently recorded in 28 counties ranging from Leon County in North Florida to Miami-Dade County in South Florida. WIMG exists in littoral zones where fluctuation in water depth occurs seasonally. We often encounter WIMG on lakeshores, depression ponds, and it has even been spotted in roadside ditches in Central Florida. WIMG is a perennial species that is believed to primarily reproduce via stolons, or horizontal stems that can produce both root and shoot growth. Although literature suggests vegetative reproduction is the main form of propagation, recent observations from Myakka River State Park in Sarasota, FL suggest that WIMG readily reproduces from seed in the same season that seed is produced. Part of my research addresses seed germinability and storage in the seed bank. Regardless of how WIMG is introduced to an area, once it establishes, the stolons help to form monocultures that can replace native vegetation in freshwater ecosystems. These monocultures have the potential to alter the composition and populations of other species in the area such as insects and birds.

Traditionally, broad-spectrum herbicides such as glyphosate and imazapyr have been used to manage weedy aquatic grasses such as WIMG. These types of herbicides affect all plant species and often leave an open area for invasive species to recolonize from outlying populations. My research looks at an alternative to traditional methods through the use of graminicides. Graminicides are ACCase-inhibiting herbicides that only affect grass species. This is because grasses produce only one type of the enzyme ACCase while non-grass species produce two forms. When graminicides are applied to non-grasses, they can compensate for the loss of one type by overproducing the secondary type. This selectivity allows graminicides to be applied in areas of high diversity to target grasses while non-grass species remain unharmed. These types of treatments give native species a chance to recolonize the area previously occupied by the invasive grass. Graminicides do not, however, discriminate between native and invasive grasses. Although we know graminicides are specific to grasses when it comes to control, we do not know how sensitivity to graminicides varies among grass species. Part of my research aims to better document this topic.



Reported Hymenachne in Florida

In the fall of 2017, I participated in the North American Lake Management Society's Student Video Series highlighting aquatic invasive plants. I submitted a video explaining how species spread and showcasing some of Florida's most invasive species. After a couple months of anxious waiting, I was informed I placed second in the competition. If you would like to learn more about the type of research I do and aquatic invasive species in general, visit their YouTube channel at https://www.youtube.com/watch?v=357SV2nboh0&t=2s or feel free to contact me through the information provided. I look forward to working closely with Lakewatch to prevent the spread of WIMG and to control current populations while preserving native habitats.

To examine the effects of graminicide treatments on WIMG and non-target effects on native grasses, we began experiments in Cypress Lake, FL in an area of high WIMG cover and in an area of high vegetative diversity in the fall of 2017. We are observing the effects of the graminicides sethoxydim and fluazifop-p-butyl on both of these communities. So far, we have seen significant control of WIMG compared to our untreated plots with little impact on the native grass community.

When working in aquatic systems with herbicide applications, it is also important to consider the water level. Research on different grass species has shown that the amount of tissue exposed at the time of herbicide application can have an effect on overall control of the species. This is due to the amount of tissue available to absorb the herbicide and translocate it to different parts of the plant. Through my research, I plan to investigate the effects of water depth on WIMG control using graminicides as well as broad-spectrum herbicides.

Water Quality Related to a Beaver Dam in Leon County

Jim Cavanagh, volunteer on Lake Susan in Leon

I live next to Lake Susan (5 acres) in Leon County 2 miles south of Lake Jackson which was created in 1940 by damming a creek. There is a road on the eastern edge that cuts off a 1 acre pond with a culvert beneath the road. The lake has dried up twice in recent years including the last draught in 2011. Since refilling that year the lake has been completely covered with duckweed and filamentous algae. On 1/29/16, I discovered a beaver dam that was twice as tall as the nearby original dam. Soon after, the road at the eastern end of the lake was flooded and partially destroyed. It was repaired. Thereafter I removed part of the dam at regular intervals to prevent flooding. In time the beavers built a hut near the dam and after a rainstorm the hut was flooded and the beavers lowered their dam by a foot. This solved the road flooding problem. The favorite food of the beavers is duckweed and today there is no obvious duckweed or algae on the lake.

I have been doing Lakewatch reports for 17 years. Until the beavers arrived the average nitrogen report was 8 and since they arrived the nitrogen level has dropped to 4. Other Lakewatch parameters have also improved. Fortunately for the beavers, duckweed still covers the 1 acre pond and they feed at night. I have left the dam alone but one day in Febuary, 2018 there was a heavy rainstorm which produced a little flooding. I removed 20 % of the dam. The next day inspection revealed that the dam had been mostly repaired. While I was standing there a beaver suddenly appeared nearby in the water. It started swimming in small circles and at times would slap the water with it’s tail hard enough to sound like a gunshot. One slap was so loud that an egret jumped out of a treetop. After 10 minutes of this I walked away along the edge of the lake and the beaver followed in the water near the water’s edge for 100 yards and then returned toward the hut. I have heard the warning and no longer adjust the dam.

Why We Manage Aquatic Invasive Plants

Dr. Bill Haller, Center for Aquatic and Invasive Plants, University of Florida

Invasive aquatic plants harm Florida's natural environment and lead to a loss of biodiversity. They usually cannot be completely eradicated and will grow back quickly if not managed. The Florida Legislature designated the Florida Fish and Wildlife Conservation Commission (FWC) as the lead agency to "direct the control, eradication, and regulation of noxious aquatic weeds and direct the research and planning related to these activities . . . so as to protect human health, safety, and recreation and, to the extent possible, prevent injury to plant and animal life and property." FWC currently controls about 12 of the most problematic aquatic invasive plants. In Florida, hydrilla and water hyacinth are two of the the worst aquatic weeds, requiring constant attention and management.

Hydrilla

Hydrilla verticillata was first introduced into Florida from Sri Lanka as an aquarium plant during the early 1950s. Hydrilla can cover an entire waterbody in as little as a few seasons, and grow from 30% coverage to 70% coverage of a lake in just a few months. Hydrilla can spread by fragmentation, so nearly every fragment that breaks off can start a new plant. This can lead to dense stands of hydrilla where nothing else grows. Hydrilla now infests tens of thousands of acres in Florida public waters. It also has spread to about 30 states as far away as Massachusetts and California. Hydrilla requires constant management, most often using chemical and mechanical control methods. Management costs for this plant in Florida public waters approach $20 million each year.

Hydrilla infestation

Never empty your aquarium into a body of water, not even a ditch or canal.

Water hyacinth

Eichhornia crassipes is a floating plant native to South America. It was introduced into Florida during the late 1800s. Water hyacinth is one of the fastest growing plants; it can double its population in 6-18 days. When it covers the water's surface, sunlight is prevented from reaching native plants below. Control programs in recent decades have successfully reduced water hyacinth to low levels in most public waterways in Florida. This was not the case in earlier times. Florida has been managing aquatic invasive plants, beginning with water hyacinth, for over 110 years.

The goal of the FWC Invasive Plant Management Section is to manage small infestations of invasive plants *before* they get out of control. Decades of experience and applied research taught us that keeping problem plants at low levels is the most economical and environmentally sound strategy for managing invasive plants. This approach is known as "maintenance control." Many of us use the same strategy with our lawns or cars; keeping something maintained is easier and cheaper than waiting for a problem to develop, which leads to "crisis management."

In Florida, "maintenance control" of invasive aquatic plants:

- Reduces the environmental impact of noxious weeds;
- Provides greater use of our waters;
- Incorporates integrated management methods;
- Uses less herbicide;
- Greatly reduces the cost of long-term management;
- Promotes public confidence and cooperation

The FWC Invasive Plant Management Section oversees the maintenance control program for aquatic plants in Florida's public waters. They collaborate with Water Management Districts, city and county governments, and others charged with managing public waters.

Aquatic plants are managed with mechanical, biological, physical, or chemical treatment methods. Treatment is based on the specific conditions and circumstances of each waterbody.

- **Mechanical control** involves using large machines in the water to harvest and remove aquatic plants.

Completely covering Lake Rousseau many years ago (top), and Water hyacinth up close (bottom).

- **Biological control** involves the use of animals, insects or bacteria that feed on targeted plants. Grass carp are an example of a biological control agent.
- **Cultural or physical control** entails hand-pulling, raking, and water-level manipulation.
- **Chemical control** involves the use of registered aquatic herbicides to

Harvester working on Lake Okeechobee, 1939

manage plants. Before an aquatic herbicide is used in Florida waters, it must undergo extensive testing and risk-analysis for human health, fish, wildlife, and the environment and be registered for use by the United States Environmental Protection Agency (US EPA). FWC only uses EPA-registered herbicides that are accepted for use in state waters by the Florida Department of Agriculture and Consumer Services (FDACS).

Since no one knows what the next aquatic invasive plant will be, prevention and education are needed to protect our water resources.

We can be part of the solution by following these easy steps:

- Practice good stewardship: never transport Florida's aquatic or wetland plants to other areas, and never empty your aquarium into a body of water or canal.
- Learn to identify which plants are

Hydrilla can make boating extremely difficult.

invasive in your area.
- When disposing of plants, completely dry or freeze them, and put in the trash (not the compost).
- Avoid chopping aquatic plants with boat propellers as some plant fragments can grow into new infestations.
- Remove plant matter from boats/trailers after use.

View the video, "Why We Manage Aquatic Invasive Plants"
plants.ifas.ufl.edu/manage/why-manage-plants

For information on aquatic plant management in Florida:
plants.ifas.ufl.edu/manage
myfwc.com/wildlifehabitats/habitat/invasive-plants

UNIVERSITY of FLORIDA IFAS Extension Center for Aquatic and Invasive Plants

FLORIDA FISH AND WILDLIFE CONSERVATION COMMISSION

A collaboration of the UF/IFAS Center for Aquatic and Invasive Plants and the Florida Fish and Wildlife Conservation Commission / Invasive Plant Management Section

North American Lake Management Society

Celebrate Lakes Appreciation Month - participate in the 2018 Secchi Dip-In!

THANK YOU for your interest and participation in past Secchi Dip-In activities! Your participation gathering water transparency measurements is an invaluable part of the effort to monitor lakes around the world.

YOU'RE INVITED to celebrate Lakes Appreciation Month in July by participating in the 2018 Secchi Dip-In! This year marks the 25th anniversary of the Dip-In and the 153rd anniversary of the first use of the Secchi disk by Father Pietro Angelo Secchi. Please note: although the official Dip-In takes place during Lakes Appreciation Month in July, we gladly welcome Secchi data from any time of year!

SHARE YOUR KNOWLEDGE

We'd love your help to make the 2018 Secchi Dip-In a success!

1. ORGANIZE – Work through your local lake or watershed association or use SciStarter to plan a social event. Create and distribute advertisements locally.

2. PREPARE to take measurements by watching the NALMS' studentproduced "How to Take a Secchi Depth" video.

3. SHARE your activities on social media! Make sure to use our hashtags - #SDI2018, #LakesAppreciation

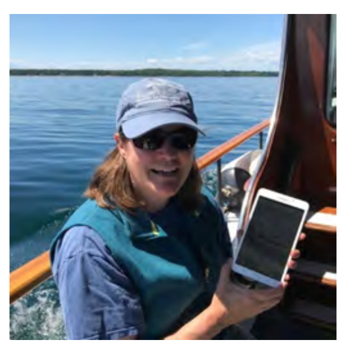
4. SUBMIT your data to the Secchi Dip-In Online Database.

   - You can also support lake-monitoring efforts by submitting your data through the Global Lake Ecological Observatory Network's (GLEON) Lake Observer App. Please submit via the app or the Secchi Dip-In website - BUT NOT BOTH!

5. FEEDBACK– Share your thoughts! E-mail secchidipin@nalms.org.

DIP-IN SAMPLING BASICS

A simple outline for training and assisting new samplers! Take a Secchi measurement during the month of July. Sample as close to midday as possible, while not wearing a hat or sunglasses. Record all information in the field. After sampling, please enter the data here. Share photos! Great ways to share include e-mail, Twitter, and Facebook.



Securing Our State's Water Wealth

It's time to make the Floridan aquifer system a priority

By Lesley Bertolotti
The Nature Conservancy Florida Water Resources Technical Planner

With our state's population projected to grow by 10 million by 2035, we face an urgent need to restore and protect our clean water supply. Our primary water source, the Floridan aquifer, is one of the most productive aquifer systems in the world and is the source of drinking water for nearly 10 million people. It is the centerpiece of delicately balanced ecosystems, providing water to our incredible freshwater springs and spring-fed lakes. It is also essential to the agriculture that drives our economy.

But the Floridan aquifer is in trouble. It's being depleted and degraded. Historic freshwater recharge sites are being developed and paved over. Ditches and canals to drain the land, handle stormwater runoff and reduce flooding were built, causing communities to lose the lands that naturally captured, stored and cleansed water, and recharged underground aquifers. In Central Florida alone, the aquifer in some areas has dropped more than 50 feet.

These are wicked problems that will take a united effort to overcome, but we can do it. Let me tell you how The Nature Conservancy in Florida is helping to solve these problems. We are moving forward with partners on specific water-source protection efforts to expedite our end goal: sufficient clean water for people and nature now and into the future. Here are two of our key efforts.

Easement program to protect aquifer recharge areas: The Conservancy is launching an ambitious and innovative easement pilot program focused on protecting high aquifer recharge areas. Our vision: conserving the natural ability of these areas to recharge the aquifer with high quality water, prioritizing good land management practices that conserve water and reduce the amount of harmful sediments and nutrients that can make their way into the rivers, springs and aquifers.

Watershed protection: Working with community partners, we are demonstrating

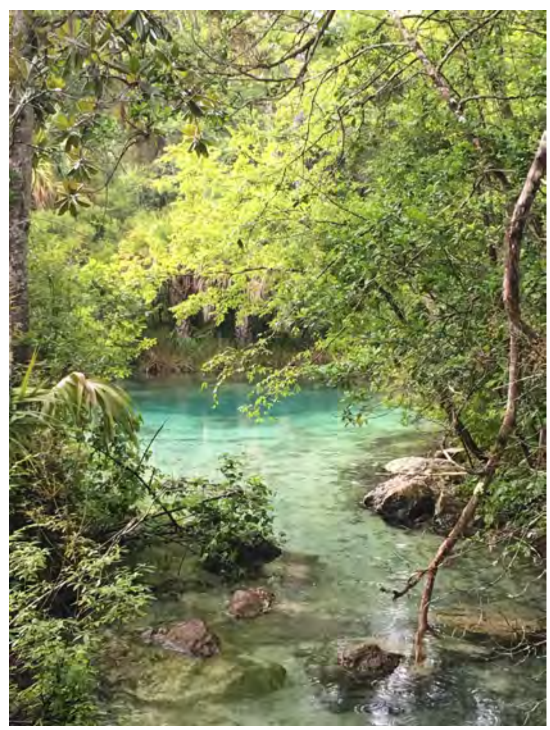


Photo guide by Lesley Bertolotti.

new ways to think about urban water management and the benefits (economic, social and environmental) of using natural solutions to solve water-related challenges.

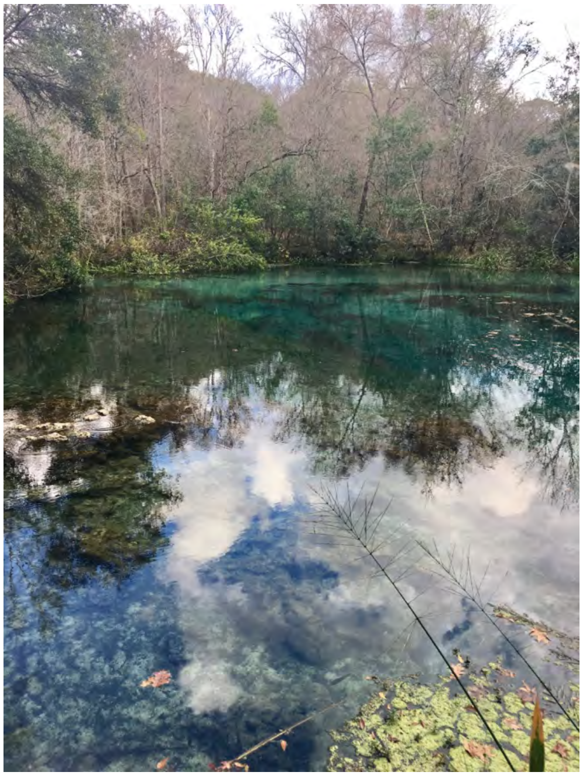


Photo guide by Lesley Bertolotti.

First, we'll focus on the Peace Creek Watershed at the headwaters of the Peace River, working with forward-thinking communities like the City of Winter Haven. We'll collaborate with them to help implement components of their Sustainable Water Resources Management Plan, which includes many natural approaches to managing their water (such as wetland and lake restoration and rain gardens). We will use this area as a model and build tools and strategies to encourage other communities across the state to incorporate natural infrastructure approaches into their water management to meet the needs of their

Photo guide by Lesley Bertolotti.

growing communities and preserve the natural areas that provide these benefits.

Fresh water is a top priority for The Nature Conservancy and our goal is clear: water security for nature and people in the state of Florida. As Lake Watch volunteers, you already realize every little bit helps and we can all do our part to minimize our water footprint. Some additional thoughts on how to do this include using landscaping that has low water requirements, installing rain barrels and purchasing water-efficient appliances. I applaud you for your efforts with the Lake Watch Program. Keep up the good work.

Living Docks: Promoting the growth of benthic communities for improved water quality

Kelli Hunsucker and Robert Weaver
Indian River Lagoon Research Institute, Florida Institute of Technology

Habitat alteration is one of the biggest problems facing today's estuaries, resulting in water bodies with fundamentally different structure and function. Over the past several years the health of the Indian River Lagoon (IRL) has undergone a serious decline. The system has seen an increase in the presence of total suspended solids, as well as high nutrient concentrations, which in turn have fueled large scale algal blooms, such as those observed in 2012 caused by the brown tide pelagophyte Aureoumbra lagunensis. Both the rise in turbidity and algal cell density has had a negative impact on the IRL system, blocking sunlight from reaching the benthos and leading to a decline in seagrass beds and fauna mortality.

Oyster reefs are known to provide many benefits to coastal ecosystems, one of which is their ability to filter large volumes of water. This process removes suspended particulates from the water column, including harmful algal species, which improves water clarity, and also provides a link between pelagic and benthic communities. Unfortunately, many coastal ecosystems have seen a reduction in oyster populations, with an estimated decline in biomass of 88% between the early 1900's and early 2000's, resulting in a 64% reduction in filtration capacity.

Figure 1: Oyster Mat Construction

Oyster populations throughout the IRL have also decreased as a result of overharvesting, habitat degradation, and low salinity. In addition to oysters, there are other sessile or fixed organisms present within the IRL that also have the ability to filter water.

These organisms are commonly referred to as "fouling" which gives a negative connotation, however they provide many ecosystem services such as habitat, shelter, food, and water filtration. Man-made structures, such as dock pilings, provide a considerable amount of hard surface area for colonization by these benthic organisms.

Another benefit to these communities, is that they are found throughout the IRL, and in abundance. In 2013, the Living Dock program was started at the Florida Institute of Technology (FIT) to promote the recruitment of filter feeding benthic organisms to oyster substrates affixed to docks. Working with volunteers, oyster mats are constructed and wrapped around dock pilings (Figures 1 & 2). The method is simple, requires little maintenance, and engages the support of citizen scientists throughout the process. In addition to contributing to improved water quality, Living Docks also provide habitat for mobile organisms (i.e. shrimp, crabs, worms) and have been shown to be fish aggregating devices. The first Living Dock was created at a private residence near the Eau Gallie River with the assistance of a Girl Scout Troop and members of the community. After one year of immersion, there was an average of 32 live oysters per piling, with a maximum of 63 live oysters on one piling. With the filtration rates for healthy oysters at up to 50 gallons per day per adult oyster (Crasstrostrica virginica) a community with healthy Living Docks can potentially filter 57,000 gallons of water per day or about 21 million gallons (approx. 80,000 cubic meters) per year per dock (of 37 pilings with an average of 32 oysters per piling). This estimate does not take into account the healthy populations of the other benthic filter feeders: barnacles, mussels, tunicates, and sponges.

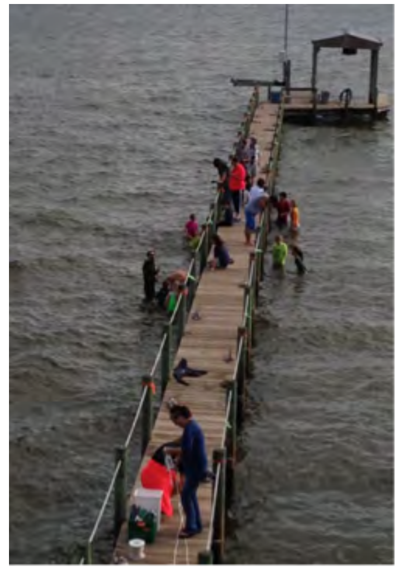


Figure 2: *Living Dock* deployment

While the growth on the oyster shells will vary depending on location in the IRL, all will accumulate benthic organisms that have the ability to improve water clarity. A small pilot project was undertaken to observe the filtering capacity of the oyster shells from the Living Dock project. The shells had been immersed for about six months and were covered with a diversity of benthic organisms: arborescent bryozoans (Bugula neritina), encrusting bryozoans (Watersipora spp.), colonial tunicates, sea squirts (Styela plicata), calcareous tubeworms (Hydroides elegans), sponge (Halichondria sp.), anemones (Aiptasia sp.), sedimentary tubeworms, ribbed mussels (Geukensia demissa), barnacles (Amphibalanus amphitrite, A. eburneus), and amphipods (Caprellid sp. and Gammarid sp.) After identification of the benthic community, the shells were placed into one of two five-gallon fish tanks. The second tank remained free of oyster substrates, and acted as a non-treated reference. Both tanks were filled with IRL water, and aerated constantly with several air stones. While both tanks had a decline in suspended material (due to the settling of particulates), a noticeable difference in water clarity between the two tanks could be observed after one hour (Figure 3). The results of the pilot study are not surprising, as many of these organisms have significant contributions to water filtration. S. plicata is a pleated sea quirt which has been shown to be effective at removing bacteria and microalgae from IRL waters, with a filtration rate around 29 gallons per day. Encrusting bryozoans are colonial or comprised of many organisms (called zooids) living as one, and can form colonies as large as 1.6 ft in length, housing 2,000,000 individuals. This colony could filter about 2,500 gallons of water per day. Another type of bryozoan, the spaghetti bryozoan (Zoobotryon verticillatum) so named for its appearance, can also significantly contribute to water clarity. It has been estimated that colonies living with a one square meter area of the IRL could filter upwards of 48,000 gallons of water per day.

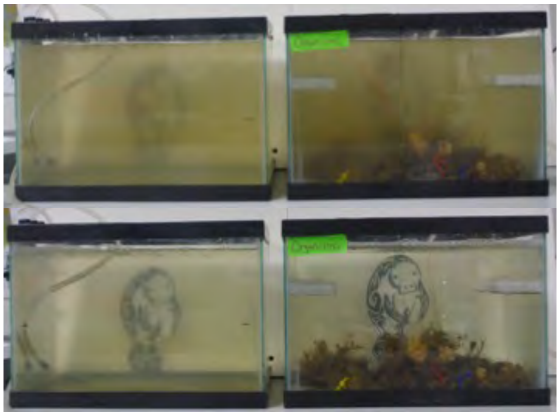
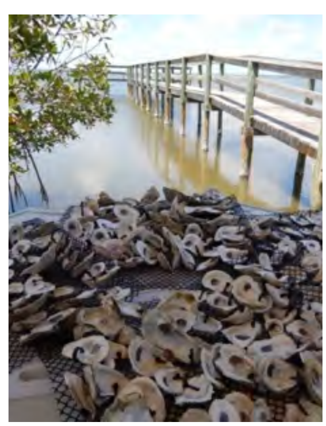


Figure 3: Photographs from the pilot study which observed changes in water quality as a result of filter feeding benthic organisms. The photograph on the top is from the beginning of the experiment, and the photograph on the bottom is after several hours.

Living Docks continue to be implemented throughout the Indian River Lagoon. If you are interested in getting involved with a deployment or starting a Living Dock of your own please contact the authors below.

Dr. Kelli Hunsucker (khunsucker@fit.edu) is an Assistant Professor of Oceanography at FIT. Dr. Robert Weaver (rjweaver@fit.edu) is an Associate Professor of Ocean Engineering at FIT (and UF alum). Both are affiliated with the Indian River Lagoon Research Institute (fit.edu/indian-river-lagoon).



This newsletter is generated by the Florida LAKEWATCH program, within UF/IFAS. Support for the LAKEWATCH program is provided by the Florida Legislature, grants and donations. For more information about LAKEWATCH, to inquire about volunteer training sessions, or to submit materials for inclusion in this publication, write to:

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