

Florida LAKEWATCH



Dedicated to Sharing Information About Water Management and the Florida LAKEWATCH Program Volume 62 (2013)

Why is My Lake Turning Dark?



Submitted photograph from LAKEWATCH volunteer

Colored water in the outflow from a coastal dune lake in the Florida Panhandle.

With the return of more normal rainfall patterns this last summer, volunteers and citizens have been calling us with concerns about the color of their lake.

Most people who have been fortunate enough to live on or near a Florida lake for a long period of time will tell you that the color of their lake seems to change seasonally. The reasons for these seasonal changes have been discussed in Vol.

XX (summer 2012) or in greater detail in the LAKEWATCH Circular 104. However, it may also change over a period of years, based on regional climate patterns. For example, in 1991 and again in 1998, residents of lake Santa Fe in Alachua and Bradford Counties, were alarmed to see the color of the water change from clear green, with a color measurement of 15 PCU, to a dark reddish brown, with color values exceeding 40 PCU (see Figure 1).

It turns out that rainfall patterns were largely the culprit. While looking at Figure 1, notice that for several years prior to each event, color concentrations were low. Due to a marked lack of rainfall, there was less of an opportunity for tannins and other dissolved substances to

UF UNIVERSITY of
FLORIDA
IFAS

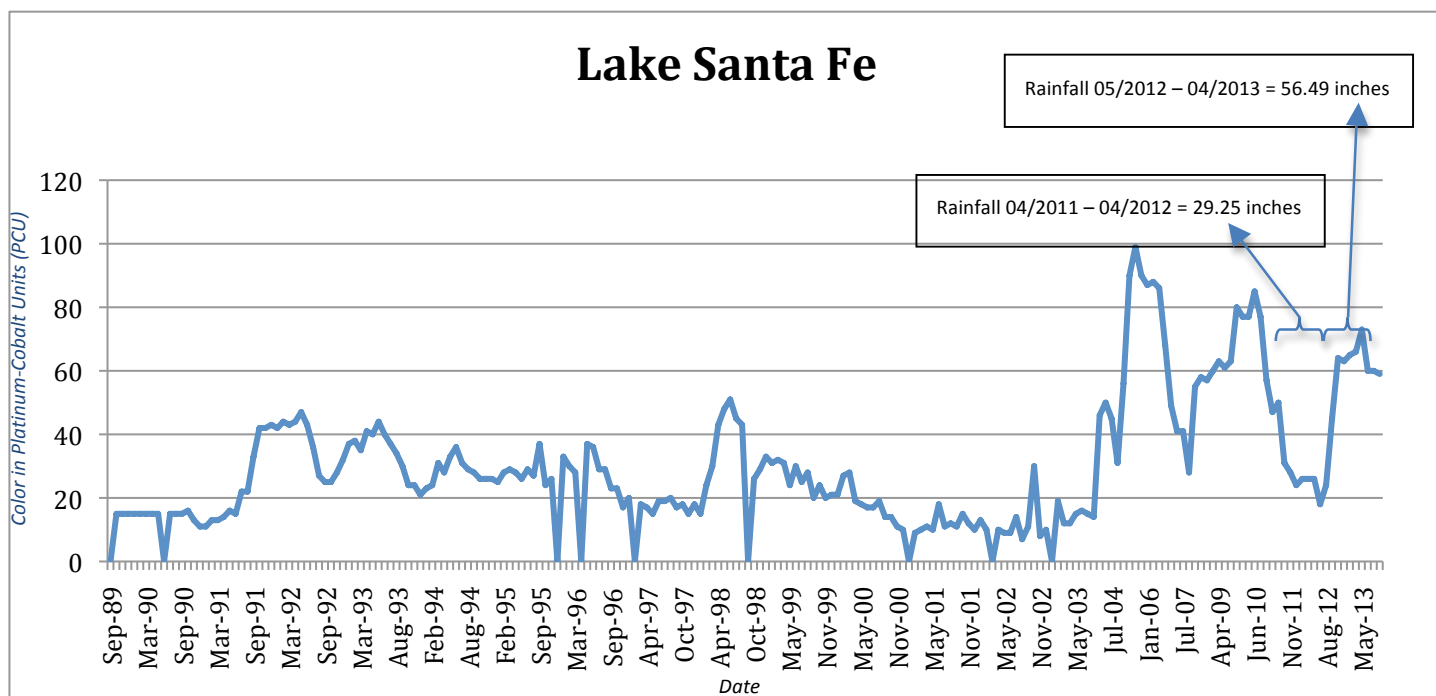


Figure 1. Color measurements (PCU) over time (1989 – 2013) from Lake Santa Fe in Alachua/Bradford Counties.

wash or seep into the lake. As a result, Lake Santa Fe became fairly clear and stayed that way from about 1989 to 1991 and again from 1996 through mid-1998.

However, once the drought events were over and north Central Florida was back to its normal pattern of heavy afternoon thunder showers, rain water quickly began to flood the dying vegetation around the lake and surrounding swamp. This resulted in the release of dissolved substances into the lake.

Within a few months, the lake was tea-colored (PCU > 40) once again. The same scenario occurred for lake Grasshopper, in Lake County, with an even greater effect on Secchi depth (i.e., after heavy rains, Secchi depth measurements went from 12 feet to less than three).

We are now seeing that pattern once again. The rainfall totals in Gainesville (the largest city located near Lake Santa Fe) from April 2011 to April 2012 were only 29.25 inches

of rain for the 13 month time period. In April 2012 the color value in Lake Santa Fe had dropped to 18 PCU. From May 2012 till April 2013 Gainesville received 56.49 inches of rain (in the 11 month time period) and the color in Lake Santa Fe increased to above 70 PCU.

Of course, not everything is this easy to explain, but in Florida if a lake should happen to change from green to a brown color, there's a good chance it is related to rainfall patterns.



The Stick Marsh and Farm 13 reservoir in Indian River has an average color reading over 70 PCU.

Florida LAKEWATCH



Apalachicola Bay Oyster Situation Report

Contributors to this report: Karl Havens, Mike Allen, Traci Irani, Angela Lindsey, Andrew Kane, David Kimbro, Steve Otwell, Bill Pine, Carl Walters and Ed Camp.

Florida Sea Grant

In the previous article we saw how drought can affect the watercolor in freshwater lakes. Now we will take a look at how drought can affect coastal estuaries. The following is the Executive Summary from the Apalachicola Bay Oyster Situation Report.

This report summarizes efforts conducted through the University of Florida Oyster Recovery Team, in collaboration with various stakeholders, to describe conditions in Apalachicola Bay prior to and after a historic collapse of the oyster fishery. The report characterizes conditions in the bay, reviews possible causes for the fishery collapse, and outlines a plan for future monitoring, research and fishery management. Conclusions in this report are based on analyses of data collected in historical monitoring programs conducted by the Florida Fish and Wildlife Conservation Commission, Florida Department of Agriculture and Consumer Services, Apala-

chicola National Estuarine Research Reserve (Florida DEP) and Northwest Florida Water Management District, as well as field, experimental, and community data collected by the authors, who are reporting in their capacity as members of the UF Oyster Recovery Team.

Findings

- Apalachicola River discharge levels are strongly influenced by rainfall over the Apalachicola Chattahoochee- Flint River Basin. The lower part of this basin was frequently classified by the National Integrated Drought Information System as in an 'exceptional drought' during the last three years.
- Water quality data indicate that 2012 was a year of high salinity at all monitoring stations in the bay likely caused by low river flows and limited local rainfall in most months.
- A large decline in oyster landings was reported after August 2012 in the bay,

and the number of reported oyster harvesting trips also dropped off each month during the second half of that year.

- The 2012 decline in oyster landings and recruitment (the number of new oysters reaching a size/age where they represent a viable target for the commercial fishery) of juvenile oysters is unprecedented during the period of data analyzed and has likely involved recruitment failure or high mortality of small oysters.
- Fisheries independent monitoring data, collected by state agencies, indicates a general downward trend in abundance of legal-sized (3 inch or larger) oysters in the bay in recent years and a large decline in sub-legal (smaller than 3 inches) oysters present in 2012. Because of the low abundance of sub-legal oysters in 2012 there is a high like-

likelihood that legal-sized oysters will be in low abundance in 2013 and likely in 2014 as well.

- The current size limit of 3 inches appears to be effective at reducing the risk of "growth overfishing" where yield (pounds of meat harvested) is reduced because oysters are harvested at too small a size. However, it is essential that this size limit be accepted by the community, adopted by the industry, and enforced by regulatory agencies and the county judicial system.

- Substantial future harvesting of sub-legal oysters could have negative effects not only on oyster populations but also a serious impact on the national reputation of Apalachicola oysters as a high-quality seafood product.

- Oysters, white shrimp, brown shrimp, blue crab and multiple finfish species have been analyzed for the presence of oil residue. All samples were either below the limits of detection or below quantifiable limits. Thus, based on analyses conducted so far, there is no evidence of chemical contamination from the Deepwater Horizon oil spill in the seafood sampled from Apalachicola Bay.

- A large percentage of oysters in the bay have some degree of shell parasitism by clams, polychaete worms (tube worms, sandworms, bristleworms), sponges or other organisms. This parasitism negatively affects the integrity and aesthetics of the oyster shell, the overall growth and productivity of the oysters, and the economic value of product bound for the half-shell market. There are no historic data to compare degree of shell parasitism observed in 2012-2013.

Recommendations Monitoring

- There is a need to continue the monitoring of oysters in Apalachicola Bay, both in terms of tracking landings reported by oystermen, and in the sampling done by state agencies. The fisheries independent monitoring program

needs to be expanded in its spatial extent to include all of the bay where oyster bars occur, including areas that are closed to fishing, because these may represent important sources of oyster spat (attached oyster larvae).

- Oysters should be included on the list of invertebrate species routinely assessed by Fish and Wildlife Research Institute (FWRI) stock assessment staff. These assessments can identify persistent uncertainties in oyster ecology or population status and help guide research such as the relationship between Apalachicola River flows and juvenile oyster survival rate or culling mortality.

Management and Restoration

- Acceptance by the community and industry, and enforcement and adjudication of rules regarding size limits, spatial restrictions, and weekly and seasonal closures is essential for these measures to be effective in sustaining the oyster population.

- Throughout our work on this project there were persistent reports of high levels of unreported harvest and illegal harvest from closed areas. While tangible evidence of illegal activity is not available, it is clear from our simulation models that lack of compliance with current regulations could greatly reduce the likelihood of Apalachicola Bay oyster populations returning to historic population levels, regardless of management action taken.

- Oyster leases should be explored as a possible alternative to open-access fisheries. The concept of TURF (Territorial User Rights Fisheries) as a lease arrangement could be appealing to oyster fishermen and help promote restoration actions such as re-shelling because the fishermen would benefit directly from the restoration activities they were engaged in by having a "share" of the restored area (the lease) to manage and harvest from.

- The total current area of oyster bar in Apalachicola Bay that is not open to

fishing is unknown, and the degree to which this area is the source of the oyster spat for the entire bay also is unknown. If this area is small or declining, then large-scale oyster relay from these closed areas to areas open to fishing may reduce the total spat available throughout Apalachicola Bay, increasing the risk of "recruitment overfishing" where harvests of adults could influence availability of future spat.

- Therefore, the practice of 'relaying' should be carefully evaluated in regard to its short-term benefits versus potential longer-term negative impacts to the fishery—in other words, whether or not it is depleting a substantive portion of the source population of oyster spat.

- Management actions such as shell planting could expedite the recovery of Apalachicola Bay oyster resources. However, a new modeling tool called ECOSPACE, brought forward by the UF Oyster Recovery Team, suggests that shell planting needs to be conducted at a considerably greater scale than current levels to be effective—approximately 200 acres per year for a 5-year period. A very important uncertainty is whether shell planting should concentrate large amounts of shell in small areas to create thick layers of shell or whether shell should be spread over larger areas but not in as thick a shell layer. Restoration should be done in a manner that provides information on efficacy and cost-effectiveness of different shelling strategies, including evaluating different densities of shelling and different kinds of shell material.

- A participatory decision-making process, involving SMARRT (the Seafood Management Assistance Resource and Recovery Team), relevant state agencies and experts from the state university system is needed to support long-term management of the oyster fishery in a more robust manner. The ECOSPACE model could further support members of SMARRT and management agencies to screen different policy or restoration alternatives.

Research

- Research is needed to identify an optimal approach for monitoring long-term settlement, juvenile and adult survival, productivity, health, mortality, oyster diseases, and product quality of oysters. Subsequently this information could be used to inform changes in the oyster monitoring program.

- Research is needed to quantify how oyster population dynamics, product quality and the fishery are affected by interactions between river flow, nutrients, salinity, harvesting intensity and restoration methods.

- There is a need to assess the harvesting practices of the oystermen and how they respond to changes in oyster abundance.

- The ECOSPACE model has additional functionality to identify effects of varying flow regimes and to screen flow alternatives, relative to Apalachicola Bay oyster population dynamics and harvest potential when the model is linked with the Apalachicola Basin River Model currently being used by the Apalachicola-Chattahoochee-Flint River Stakeholders Group.

Outreach and Education

- A community-based outreach and education program is needed to foster actions consistent with supporting a sustainable bay ecosystem and economy.
- Involvement of oyster harvesters and processors in research and restoration projects can aid in educating the entire



Florida Sea Grant

Oysters should be included on the list of invertebrate species routinely assessed by Fish and Wildlife Research Institute (FWRI) stock assessment staff

community about bay stewardship.

The Future

The situation in Apalachicola Bay, as outlined in the pages of this report, highlights a series of interwoven ecologic, fisheries, and community concerns. The bay is a national treasure, and its demise would sever critical links among our modern society, nature and our heritage. Work to date is a starting point toward understanding the processes underlying the current crisis, and includes steps that can and should be taken in initial efforts to restore the bay. However, if we are truly committed to bringing the bay back to a point even close to its former productivity, a great deal of work is still required. These studies and analyses were conducted on a shoestring budget with internal funds

from UF/IFAS, and limited support from Florida Sea Grant and from the National Institute of Environmental Health Sciences. If we are truly committed to the restoration of the bay, we can't stop here. There is a critical need for follow-up work, bringing together state and federal agencies, academic researchers, and the community, to look out over a 5-, 10-, and 20-year time scale, to conduct interventions, do the necessary research, and monitor outcomes. This will require a strong leadership structure and it will cost money. The question remains as to whether we, as a society, are willing to make this investment of time, and money, to preserve this priceless natural resource for our lifetime, and the lifetimes of our children.

This publication was supported by the National Sea Grant College Program of the U.S. Department of Commerce's National Oceanic and Atmospheric Administration (NOAA), Grant No. NA10-OAR4170079. The views expressed are those of the authors and do not necessarily reflect the view of these organizations. Additional copies are available by contacting Florida Sea Grant, University of Florida, PO Box 110409, Gainesville, FL, 32611- 0409, (352) 392.2801, www.flseagrant.org



Florida LAKEWATCH

The first thing you should know is that, with the exception of Antarctica, this amoeba is believed to exist in virtually every lake and river around the world.

Amoebas in Lakes

With the recent death of a 12 year old south Florida boy we decided to reacquaint our LAKEWATCH family with the aquatic amoeba (*Naegleria fowleri*) with a bad reputation. Of 128 known cases in the United States past half-century, just two patients have survived, according to the Centers for Disease Control and Prevention. Fortunately, the chances of coming in contact with *Naegleria*, or contracting the resulting illness (Primary Amoebic Meningoencephalitis—PAM, for short) are quite slim.

In Florida, health officials estimate that there is only one case for every 2.5 million hours that people spend in freshwater. Drowning and boating accidents pose a much greater threat to our state's water enthusiasts.

With that said, there are a few precautions swimmers can take to decrease their chances of exposure even more.

The first thing you should know is that, with the exception of Antarctica, this amoeba is believed to exist in virtually every lake and river around the world. It is also found in spas, hot tubs, thermally enriched waters and poorly chlorinated swimming pools. So, if you're thinking of simply avoiding these aquatic environments, you might get a little lonely.

What is an amoeba?

Several types of free living amoebas are found in soils, but only certain species cause disease. *Naegleria* is one of those species. It has three life forms, including cyst, trophozoite and flagellate.

The cyst permits the amoeba to overwinter in the lakes. The flagellate is the mobile form that can move from one place to another. The trophozoite is the feeding form that is infectious.

So, How Does One Avoid the Amoeba?

The best way to prevent exposure to *Naegleria* is to avoid stirring up bottom sediments, as this is where the amoeba lives and feeds on bottom sediments composed of fallen leaves and dead plants. Once sediments are mixed into the water column, the amoeba could be forced up the nose of a swimmer who jumps or falls into the water. This increases the chance for it to enter into an ear or nasal passage where it can follow the olfactory nerve and gain entry into the brain, where it

has been known to cause problems.

It's important to note that swimmers who have contracted PAM usually got it after rooting around the lake bottom, in heavy silt where the amoeba lives. Therefore, keeping one's face away from the bottom of a lake, river, canal, etc. and keeping swimmers from jumping off a dock into shallow water—or any other scenario that would result in the disruption of bottom sediments—will significantly reduce the risk of exposure to ***Naegleria***. Young children are at the highest risk of exposure as they tend to engage in such activities.

Everyone can be further protected by wearing ear plugs and a nose clip (or a dive mask that covers the nose) when swimming. Remember, exposure to bottom sediments is the single MOST important factor that increases chances for infection. During most of the year, concentrations of ***Naegleria*** are rarely high enough to cause public health problems. However, as



Joe Richard

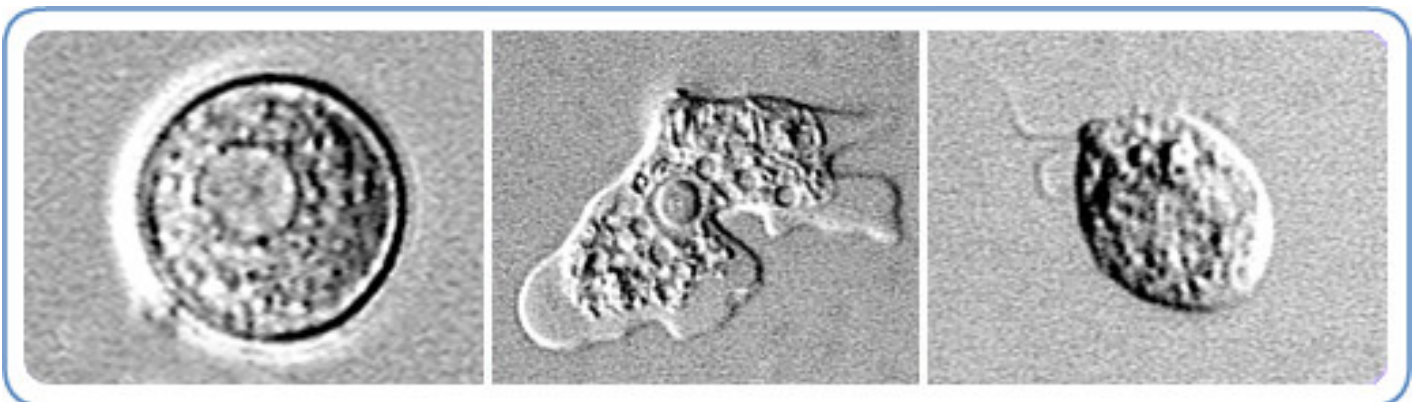
Everyone can be further protected by wearing ear plugs and a nose clip (or a dive mask that covers the nose) when swimming.

water temperatures rise during the summer (82-86 degrees Fahrenheit), it provides a more accommodating environment for the amoeba to feed and multiply. So, if possible, avoid swimming in warm shallow waters during this time.

Diagnosis

Early diagnosis is the best bet for survival. In the two known cases where patients survived infection

from ***Naegleria***, the family doctor recognized the symptoms immediately and was quick to react with appropriate antibiotics. Persons who complain of severe headaches, rigidity of the neck, impaired sense of smell and taste, nausea, vomiting and/or a high fever, and who have been swimming in a lake should be taken to a doctor. If the treatment is going to be effective, it needs to be administered quickly.



Left: EM image of *Naegleria fowleri* in its cyst stage. Center: EM image of *Naegleria fowleri* in its ameboid trophozoite stage. Right: EM image of *Naegleria fowleri* in its flagellated stage. Credit: **DPDx** and GS Visvesvara.

Outstanding Florida Waters (OFWs)

Floridians are lucky to have a state with so many beautiful waterways. An Outstanding Florida Water is a waterbody deemed worthy of special protection because of its natural attributes (e.g., excellent water quality, or exceptional ecological, social, educational, or recreational value). These areas must be formally designated by law. Outstanding Florida Waters generally include surface waters in the following areas:

- National Parks
- National Wildlife Refuges
- National Seashores
- National Preserves
- National Marine Sanctuaries and Estuarine Research Reserves
- National Forests (certain waters)
- State Parks & Recreation Areas
- State Preserves and Reserves
- State Ornamental Gardens and Botanical Sites
- Environmentally Endangered Lands Program, Conservation and Recreational Lands Program,

and Save Our Coast Program Acquisitions

- State Aquatic Preserves
- Scenic and Wild Rivers (both National and State)
- “Special Waters” (*see list below*)

“Special Waters” OFWs include 41 of Florida’s 1700 rivers, several lakes and lake chains, several estuarine areas, and the Florida Keys:

Many areas managed by the state

“Special Waters” OFWs		
Apalachicola River	Homosassa River System	Santa Fe River System
Aucilla River	Kingsley Lake & Black Creek (North Fork)	Sarasota Bay Estuarine System
Blackwater River	Lake Disston	Shoal River
Butler Chain of Lakes	Lake Powell	Silver River
Chassahowitzka River System	Lemon Bay Estuarine System	Spruce Creek
Chipola River	Little Manatee River	Suwannee River
Choctawhatchee River	Lochloosa Lake	Tomoka River
Clermont Chain of Lakes	Myakka River (lower part)	Wacissa River
Crooked Lake	Ochlocknee River	Wakulla River
Crystal River	Oklawaha River	Weekiwachee Riverine System
Econlockhatchee River System	Orange Lake, River Styx, and Cross Creek	Wekiva River
Esterio Bay Tributaries	Perdido River	Wiggins Pass Estuarine System
Florida Keys	Rainbow River	Withlacoochee Riverine and Lake System
Hillsborough River	St. Marks River	

or federal government, including parks, wildlife refuges, preserves, marine sanctuaries, state or national forests, scenic and wild rivers, or aquatic preserves, are designated as OFWs. Generally the waters within these managed areas have OFW designations because the managing agencies have

requested this special protection. In addition, a waterbody demonstrated to be of exceptional significance may be designated as an OFW regardless of whether it is within an area managed by the state or federal government. Anyone who wishes to propose waters for an OFW designation may sub-

mit a petition to the Department of Environmental Protection (DEP) in accordance with Chapter 120 of the Florida Statutes. Waters are designated OFW to prevent the lowering of existing water quality and to preserve the exceptional ecological and recreational significance of the waterbody.

Authority:

Section 403.061(27), Florida Statutes, grants the DEP the power to establish rules that provide for Outstanding Florida Waters. DEP is the agency that designates a waterbody as an OFW; however, each OFW must be approved by an arm of DEP known as the Environmental Regulation Commission (ERC). The ERC is a seven member citizen’s body appointed by the Governor. For more information, contact the DEP Standards and Assessment Section at (850)245-8064 or view the DEP Water Quality Standards website at www.dep.state.fl.us/water/wqssp A complete listing of Outstanding Florida Waters is provided in Rule 62-302.700 (9) of the Florida Administrative Code. Use your browser to search the underlined text.

—by Karen Brown, UF/IFAS Center for Aquatic and Invasive Plants

Labeling Reminders

Bottle Labeling:

Using a permanent waterproof marker, label the sample bottle with the following information:

- Water body name
- County name
- Month-day-year
- Station 1, 2, or 3, etc.

You may want to label your bottles before you start out to sample. The labels are very difficult to write on when wet. Be sure your pen is waterproof. Always double check your labels; dates and station numbers are essential to recording your data correctly.

Example:

Water Body: Little Weston

County: Polk

Date: 3-26-01

Station: 3

Split bottles:

Because the sample will be frozen, pour some water out of the bottle in order to allow some space for the water to expand as it freezes. If the bottle is over-filled, it might crack or split open. A good fill level is about one-half inch below the shoulder of the sample bottle. If the bottles bulge after they are frozen, pour out a little more water next time. Be gentle with the frozen bottles. They may become brittle and can shatter if they are dropped.

Recording on the data sheet

Please fill out the data sheet completely. Fill in your lake name, the county the lake is in, your name, phone number and the time that you begin your sampling.

To record the Secchi reading, several special notations are used: Write "B" on the data sheet to indicate that the disc went to the bottom and could still be

seen and record the depth.

Write "W" on the data sheet to indicate that the Secchi disc disappeared into weeds growing in the water body. Also record the depth at which the disc disappeared into the weeds.

Record the cloud coverage when the Secchi reading was taken in the column headed "Sun Code #" by writing a number between 1 and 5 chosen from the data sheet column headed "Sun Codes." Do not indicate how much cloud cover there was in the sky at the time the Secchi reading was taken; record the cloud cover directly over the sun only. For example, if the sky was very cloudy, but the sun popped out from behind the

clouds during the time the Secchi disc was being read, a #1 would be entered for the Sun Code #.

Fill out the remainder of the data sheet. Write comments on the back of the data sheet if necessary. Include anything that might possibly be useful. For example, "limerock washed into water body from torrential rainfall on roads, "grass carp were stocked in water body last week," or "public beach was closed by Health Department on May 10th." If you choose to record water levels regularly, please clearly label the type of gauge you are reading. If you do not know the type of gauge then call the LAKEWATCH office to get help determining the type of gauge.

Florida LAKEWATCH Freshwater Data Sheet

Lake Name: Little Weston County: Polk

Sampler: Joe Smith

Phone: (800) 525-3928 Date: 9/7/13 Time: 9:30 AM

Yes ☒ No ☐ : Surface Water Collected for Total Phosphorus and Total Nitrogen.

Yes ☒ No ☐ : Surface Water Collected for Chlorophyll and Filtered Within 48 Hours.

Yes ☒ No ☐ : Secchi Depth Reading Taken

Secchi Disc Measurements:

• For **Secchi depth** and **water depth** measurements, please indicate the number of feet and then estimate and circle the appropriate fraction, if needed.

• If your **disc is visible on the bottom** write **B**. If your **disc disappears in the weeds** write **W**, in the **vanishing point** column and the **depth** at which your disc disappears.

Vanishing Point	Sun Code Number	Sun Code Key <small>Use the codes from below to fill in the Sun Code Number column.</small>	Water Depth
Sta 1 12 ft. <u>1/4</u> 1/2 3/4	2	1 = full sun	18 ft. 1/4 <u>1/2</u> 3/4
Sta 2 11 ft. 1/4 1/2 <u>3/4</u>	3	2 = haze over sun	22 ft. 1/4 1/2 3/4
Sta 3 12 ft. 1/4 1/2 3/4	2	3 = thin cloud cover	15 ft. <u>1/4</u> 1/2 3/4
		4 = medium cloud cover	
		5 = heavy cloud cover	

DESCRIBE the amount and duration of any unique occurrences that have occurred within two weeks or so before your sampling date either in the lake or on the local watershed:

Why We Manage Aquatic Invasive Plants

By Dr. Bill Haller



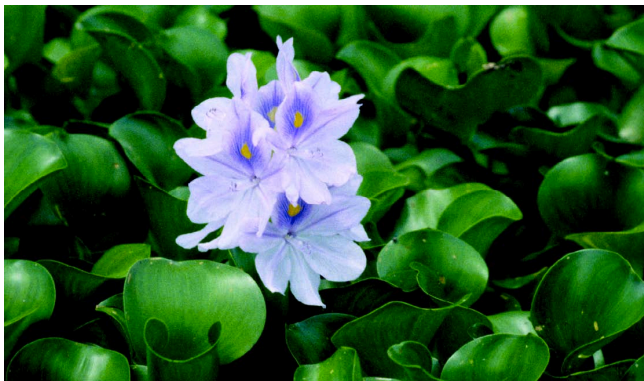
Center for Aquatic and Invasive Plants

A Hydrilla infestation

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.

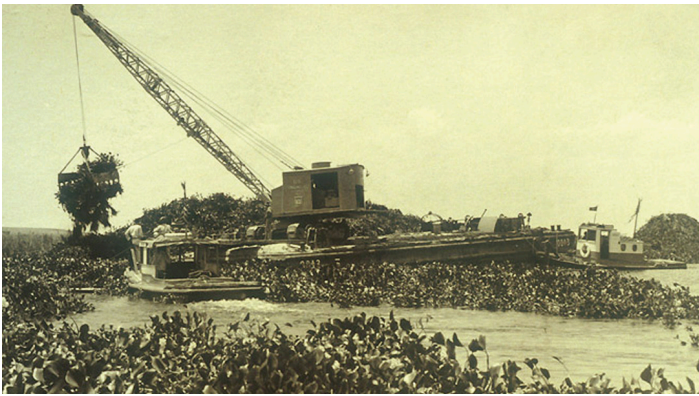
Hydrilla (*Hydrilla verticillata*) was first introduced into Florida from Sri Lanka as an aquarium plant during the early 1950s. Hydrilla can cover an entire waterbody in as little as a few seasons, and grow from 30% coverage to 70% coverage of a lake in just a few months. Hydrilla can spread by fragmentation, 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.

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



Center for Aquatic and Invasive Plants

Water Hyacinth up close (left) and completely covering up Lake Rousseau (right) many years ago.



Harvester working on Lake Okeechobee, 1939.



Hydrilla can make boating extremely difficult.

Center for Aquatic and Invasive Plants

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.
- **Biological control** involves the use of animals, insects or bacteria that feed on or damage 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 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 invasive in your area.
- When disposing of plants, completely dry or freeze them, and put in the trash (not the compost).



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

Center for Aquatic and Invasive Plants

Florida LAKEWATCH



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:

Florida LAKEWATCH
Fisheries and Aquatic Sciences
School of Forest Resources and Conservation
7922 NW 71st Street
Gainesville, FL 32653

or call
1-800-LAKEWATCH (800-525-3928)
(352) 392-4817
E-mail: fl-lakewatch@ufl.edu
<http://lakewatch.ifas.ufl.edu/>

All unsolicited articles, photographs, artwork or other written material must include contributor's name, address and phone number. Opinions expressed are solely those of the individual contributor and do not necessarily reflect the opinion or policy of the Florida LAKEWATCH program.

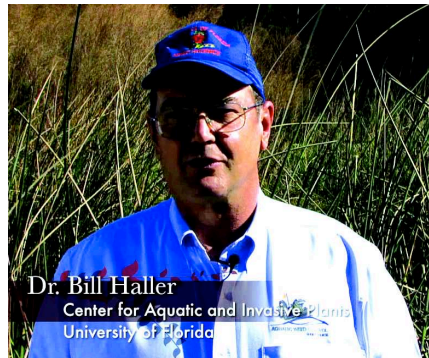
- Avoid chopping aquatic plants with boat propellers as some plant fragments can grow into new infestations.
- Remove plant matter from boats and trailers after use.

View the video, "Why We Manage Aquatic Invasive Plants"

plants.ifas.ufl.edu/manage/videos

For more information on plant management in Florida:
myfwc.com/wildlifehabitats/habitat/invasive-plants

For information on aquatic herbicides:
epa.gov/pesticides/regulating



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

Center for Aquatic and Invasive Plants

