



PARKS & NATURAL  
RESOURCE DIVISION

LAND AND WATER  
PROGRAM

&

CROOKED LAKE



# MANAGING THE HEALTH OF THE NATURAL SYSTEMS

Water Quality Sampling of Lakes and Streams

Water Resources - Stormwater / NPDES

Aquatic Plant Management

Management of Environmental Lands



# WATER RESOURCES



# CROOKED LAKE

Water Quality Trends

Water Levels

Aquatic Plant Management



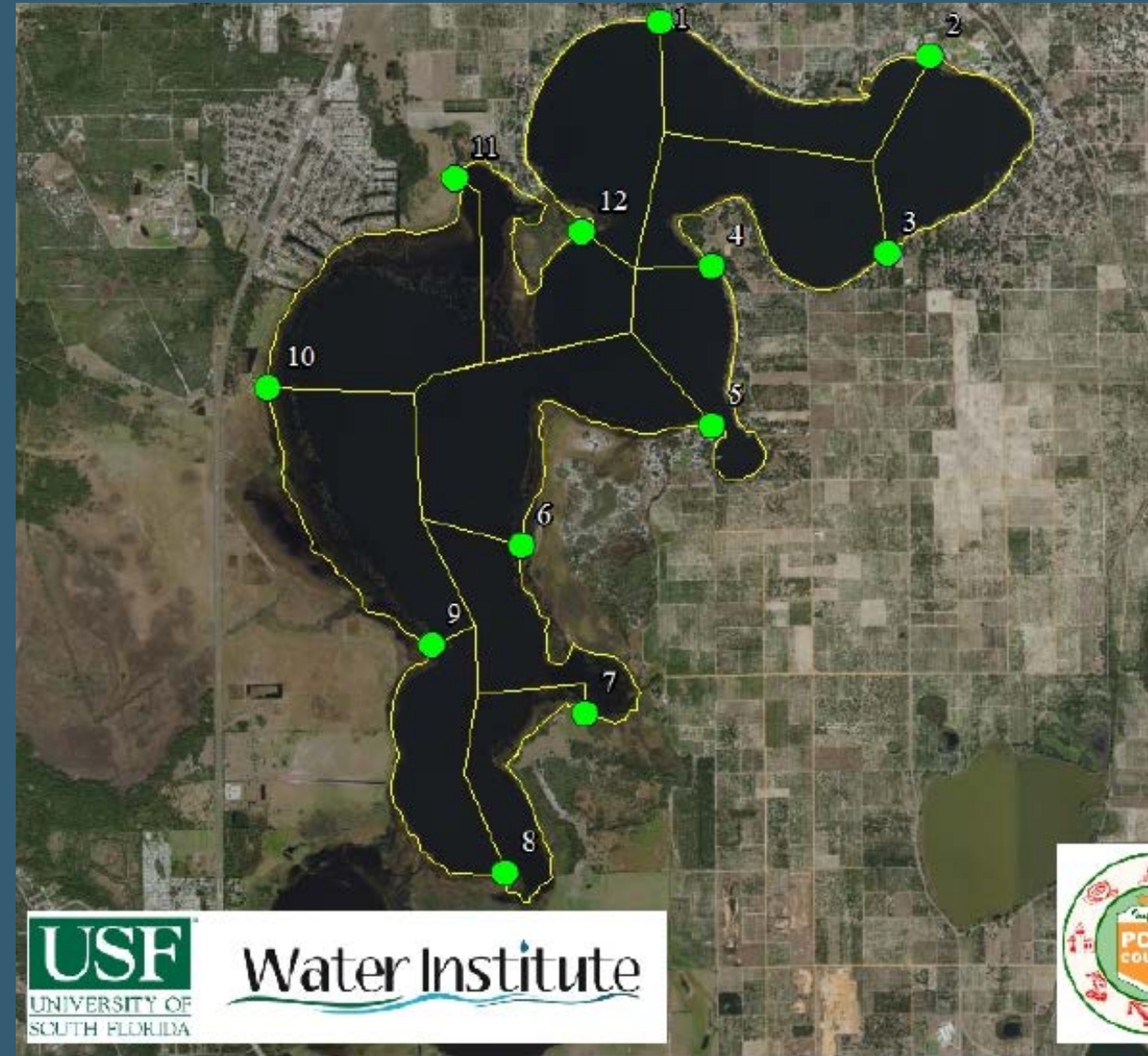


# LAKE VEGETATION INDEX - 2019

- 57 species of wetland vegetation (4 sections)
- 45 of 57 are native species
- Dominate species include maiden cane and fragrant water lily
- Crooked lake LVI score I was 49 (37 is impairment threshold)

The Lake Vegetation Index identified 57 species of wetland vegetation growing in the four selected sections along Crooked Lake. The majority of these species (45) are native species. The remaining 7 species (*Salvinia minima*, *Alternanthera philoxeroides*, *Eichhornia crassipes*, *Ludwigia peruviana*, *Melaleuca quinquenervia*, *Aeschynomene indica*, *Arundo donax*, *Schinus terebinthifolius*, *Sphagneticola trilobata*, *Urochloa mutica*, *Panicum repens* and *Oxycaryum cubense*) are non-native and invasive to this region. The vegetation community along Crooked Lake is dominated by a variety of emergent species including *Panicum hemitomon* and *Panicum repens*. The floating leaved vegetation community in Crooked Lake was dominated by *Nymphaea odorata*. Submerged aquatic vegetation was present in Crooked Lake with moderate growth consisting of six species. The submerged vegetation community contained *Utricularia foliosa*, *Myriophyllum heterophyllum*, *Utricularia inflata*, *Nitella*, *Eleocharis* and *Utricularia gibba*.

The calculated LVI score for Crooked Lake was 49, above the impairment threshold of 37 classifying the result as "Healthy". Figure 4 shows the map of Crooked Lake detailing the LVI regions used for the assessment (Regions 3, 6, 9, 12). Table 1 details the species list results of the Lake Vegetation Index. Table 2 details the scoring result for the Lake Vegetation Index.





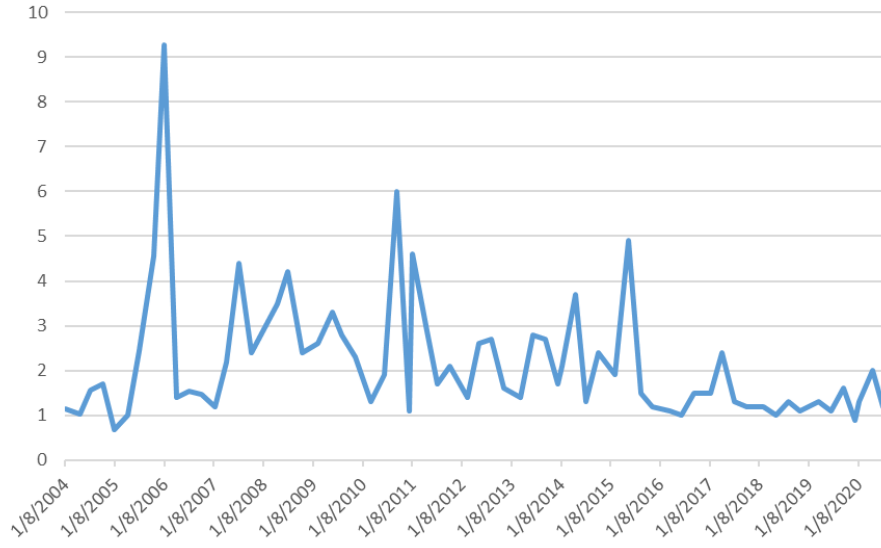
*Figure 2 Aerial photograph of the Crooked Lake showing typical coastal vegetation*



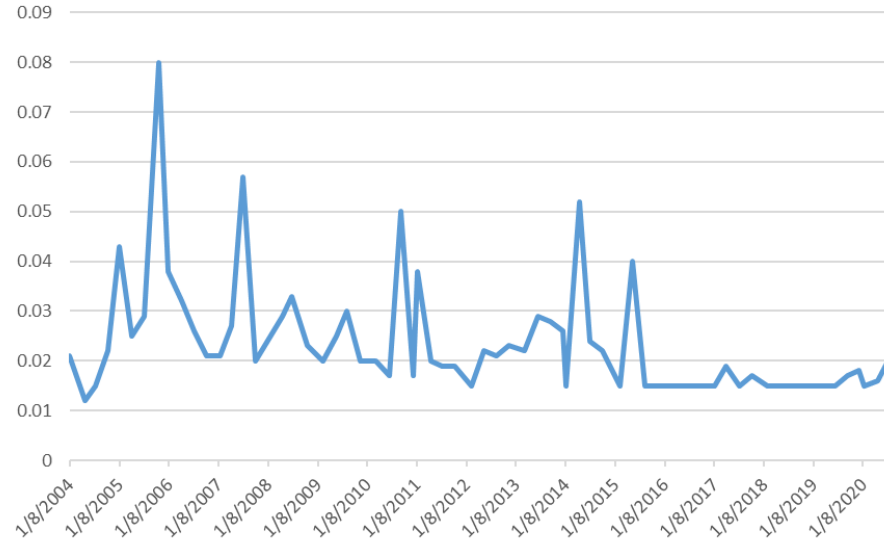
*Figure 3 Utricularia foliosa was the most common submerged vegetation species on Crooked Lake*



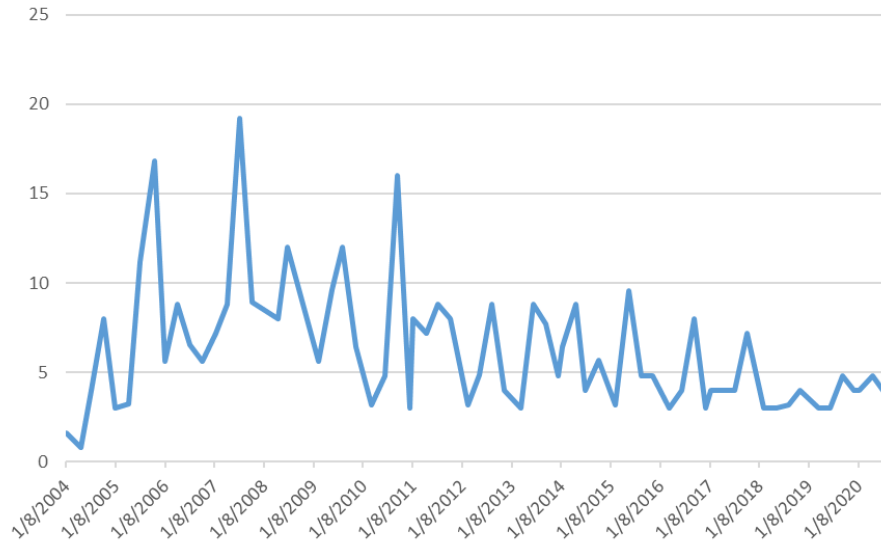
Turbidity (NTU)



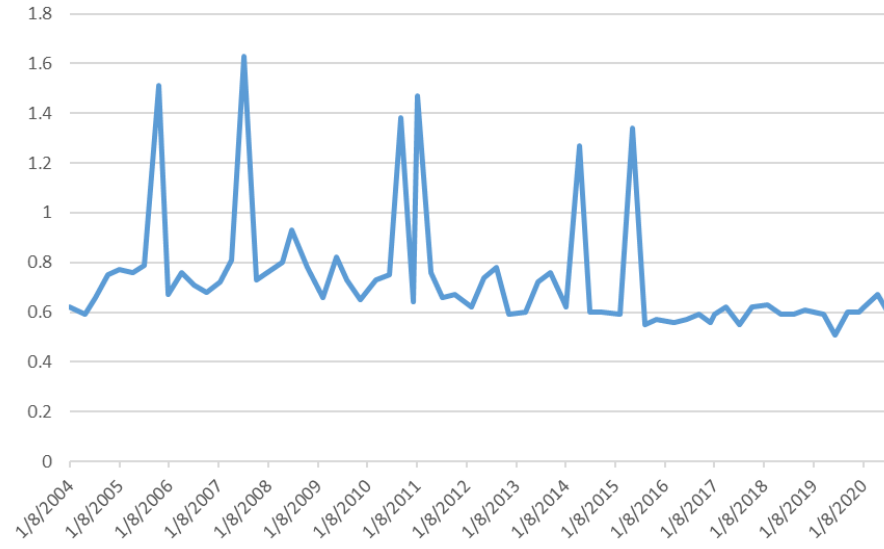
Total Phosphorus (mg/l)



Chlorophyll a (ug/l)



Total Nitrogen (mg/l)

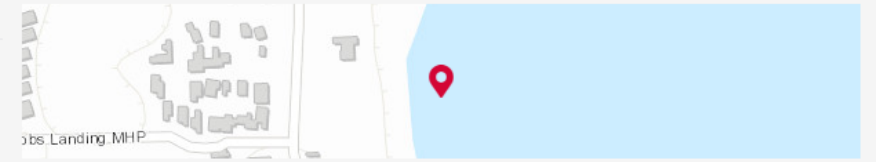




# Crooked Lake nr Babson Park

Station Number: 23857  
Resource Type: Surface Water  
Station Type: Lake

Latitude: 27.80858  
Longitude: -81.55517  
USGS ID: 02269200



Hydrology Water Quality

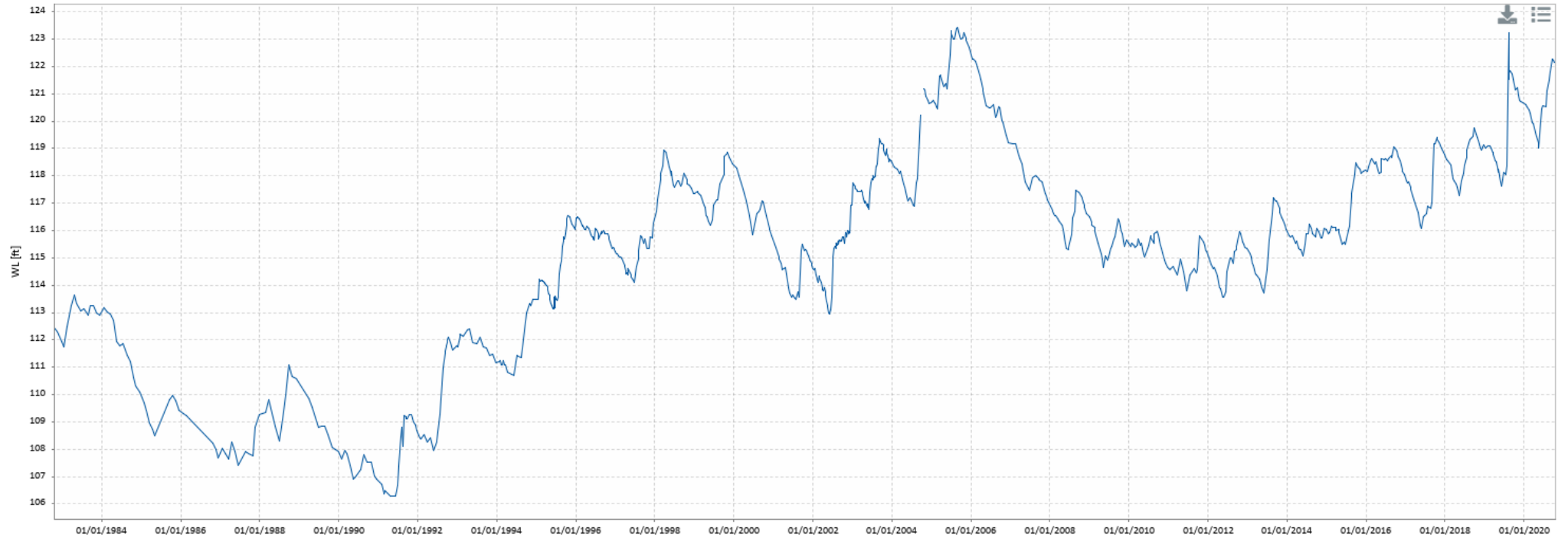
Selection Graph

Multiple Timeseries

Water elevation

3 d 10 d 1 m 3 m 1 y ∞

10/20/1982 10/12/2020



— Crooked Lake nr Babson Park / WL / 402.WL\_NGVD29\_District\_Manual.E

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# NATURAL AREAS



Aquatic Plant Management  
Environmental Lands Program

# AQUATIC PLANT MANAGEMENT TOOLS

Biological

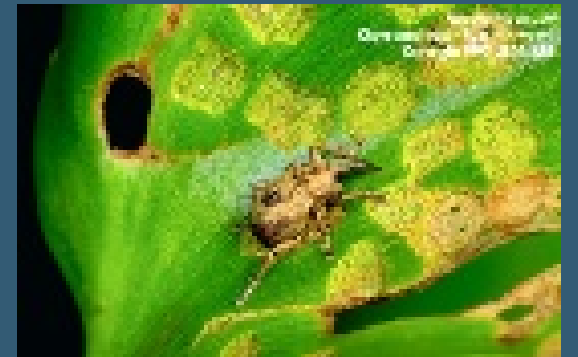
Mechanical

Herbicide

Revegetation

# BIOLOGICAL

Triploid Grass Carp (SAV)  
Alligator Weed Flea Beetle  
Hyacinth Moth & Beetle  
Hydrilla Weevil



# MECHANICAL

Remove Plant BioMass

Reduced Herbicides Needed

Selectivity Issues – natives and aquatic critters

Limitations for areas that can be treated

Disposal site

Access to target plants

Increased cost per acre and time of treatment

Increase of turbidity and increase biological oxygen demand

# Lake Kissimmee State Park Harvesting Project 2020 (boat marina, canal, and cove)



Estimated floating plants harvested: 30 acres  
Total Project Cost: \$260,690  
Project Duration: 39 days  
Harvesters Used: 3 total (two 9 ft harvesters and one 12 ft harvester)

 Control Area (88 acres)

# HERBICIDE APPLICATION



Registration of Herbicides through EPA

Crooked Lake Application Strategies

Selectivity of Products

Application Methods

## REGISTRATION OF AQUATIC HERBICIDES THROUGH EPA

- Must be effective at controlling target weeds
- Data from nearly 150 tests must be submitted and evaluated
- Evaluate the potential impact of pesticides to non-target organisms through an Ecological Risk Assessment
- Registration generally takes 8 to 10 years
- Must meet rigid environmental and toxicology criteria required by the EPA

## STUDIES INCLUDE, BUT ARE NOT LIMITED TO

- Potential residue in potable water, fish, shellfish, and crops that may be irrigated
- Environmental fate
- How the compound breaks down
- Whether or not it is absorbed by test animals
- Short-term or acute toxicity to test animals
- Whether or not it causes birth defects, tumors, or other abnormalities after long-term exposure
- Toxicity to aquatic organisms such as waterfowl, fish, or invertebrates



# COMMON HERBICIDES USED ON CROOKED

| Herbicide      | Maximum Rate  | LC 50                | Half Life    | Breakdown Pathway                 |
|----------------|---|----------------------|--------------|-----------------------------------|
| Diquat         | 37 mg/L   | 245 mg/L             | 1-7 Days     | photolysis, microbial, adsorption |
| Flumioxazin    | 400ppb  | >21 mg/L             | 22 min-1 Day | alkaline hydrolysis               |
| 2, 4-D         | 4.0 mg/L  | 263 mg/L             | 7-48 days    | microbial                         |
| Florpyrauxifen | 6.75oz/ac-ft<br>per application<br>20oz/ac-ft per year                        | >120 mg/l<br>(carp)  | 6-10 hours   | photolysis<br>in water            |
| Glyphosate     | 0.5 mg/L not applied<br>to water only to<br>foliage on emergent<br>vegetation | 120 mg/L<br>in water | 1-7 days     | microbial                         |

- **LC<sub>50</sub>** is the concentration of a chemical in water required to kill 50 percent of the test population (fish).
- **Breakdown** is the chemical transformation of a herbicide active ingredient into non-toxic compounds.
- **Half-life** is the time it takes for the concentration of a compound such as a herbicide to be reduced by half because of breakdown or deactivation of the molecule.
- 1 part per million (ppm) = 1 mg/L = 1 mg/kg.

# APPLICATION METHODS

## Helicopter

- Effective in large open areas, away from structures or large trees
- Can treat 40 to 80 acres per day under normal conditions

## Airboat

- Effective at accessing target plants not accessible by helicopter
- Effective at selective targeting smaller, hard to reach, plant populations
- Can operate in extreme shallow water

## CURRENT STRATEGY

- Target large infestation areas with helicopter where applicable
- Regular maintenance treatments by airboat on all areas of the lake that can be accessed
- Use selective herbicides at the lowest rates feasible



Crooked Lake Park

Babson Park

Hillcrest Heights

Crooked Lake

### Treated Areas

- Green = Hydrilla
- Red = Marsh Grass
- Purple = Oxycaryum
- Yellow = Floating

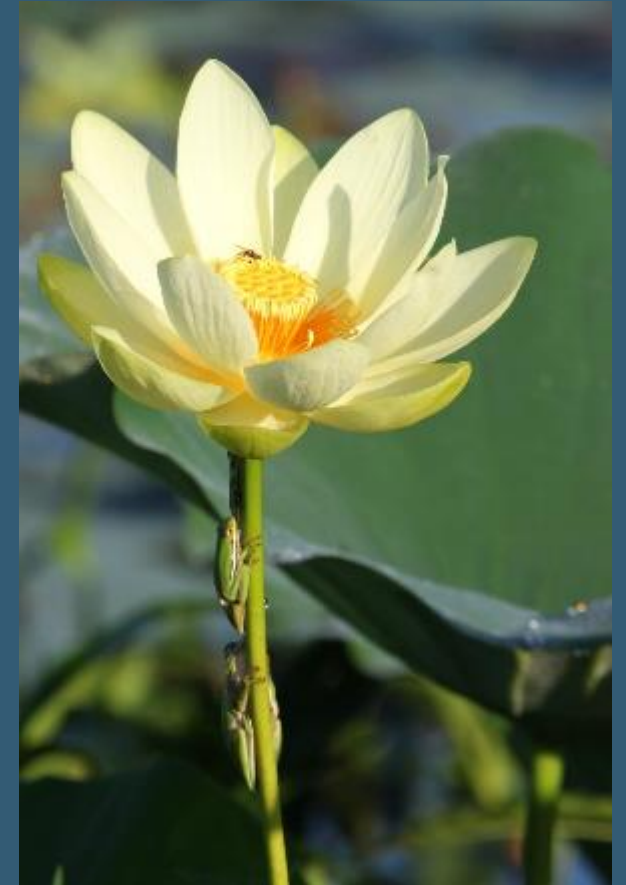
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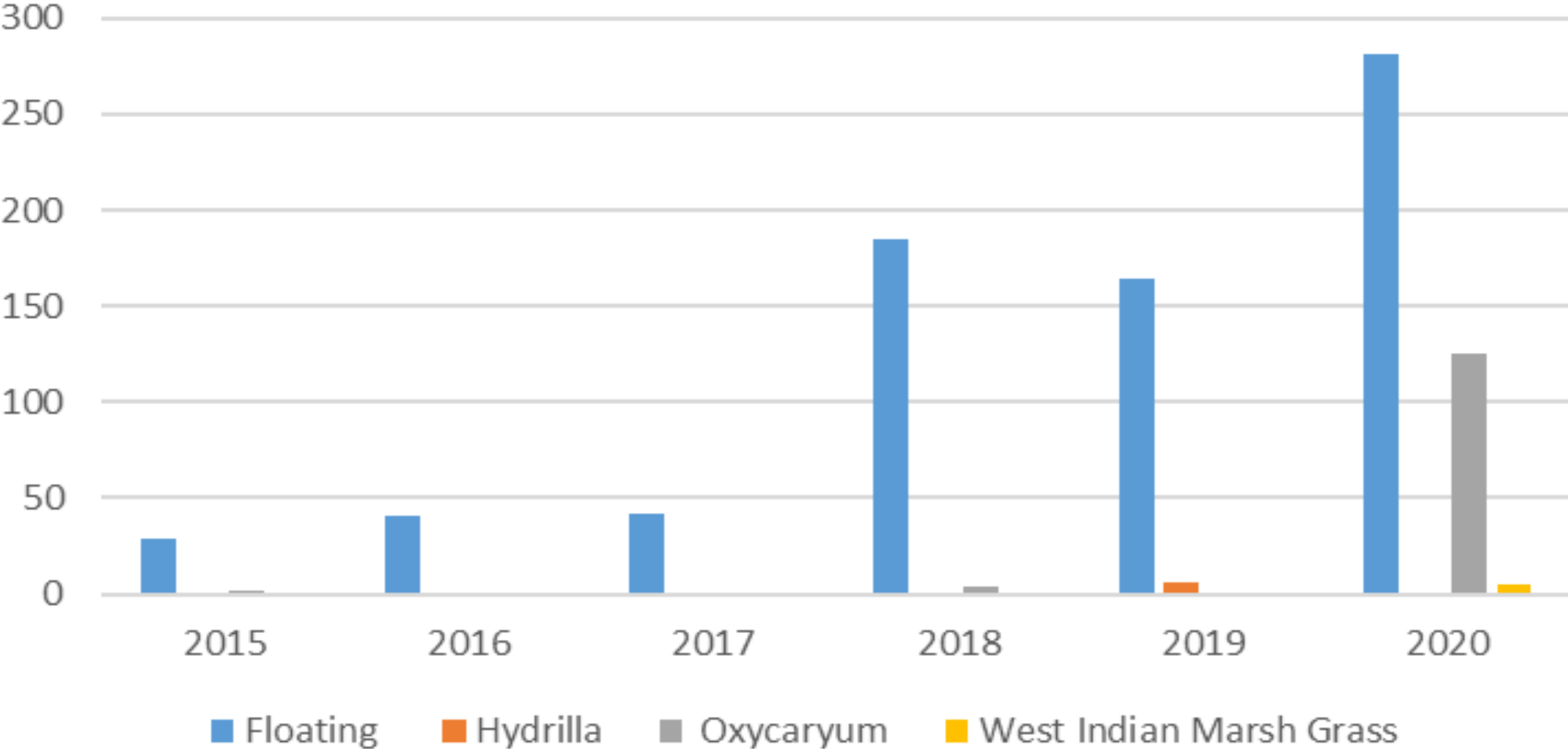


# AQUATIC PLANT MANAGEMENT CHALLENGES

- High water
- Accessibility to target plants
- Work towards small maintenance treatments
- Negative press on social media



# Treatment Acreage Trends



# HOW COULD DEFENDERS ASSIST?

Education of Practices that Protect Water Quality  
Citizen Science Opportunities – Aquatic Vegetation  
Notifications

Report Water Quality Concerns (HAB)

Reduce Fertilizer Use (read the label and timing)

Report illicit Discharges

Agriculture BMP's

Shoreline Management



# RESOURCES FOR CITIZENS

Polk County Water Atlas <https://polk.wateratlas.usf.edu/>

What's Happening on my Lake (FWC) <https://ipm-myfwc.shinyapps.io/whoml/>

Center for Aquatic Plant <https://plants.ifas.ufl.edu/>

Polk Natural Areas [www.polknature.com](http://www.polknature.com)