Lake Munson Lake Vegetation Index Results (10-14-2022)

The Lake Vegetation Index (LVI) is a multi-metric index that evaluates how closely a lake's plant community resembles one that would be expected in a condition of minimal human disturbance. It is based on a rapid field assessment of aquatic and wetland plants as indicators of various effects of human disturbance over time. Plants respond to physical disturbances such as introduction of exotic species or lakeshore alterations, and chemical disturbance such as introduction of excess nutrients, particulates, or herbicides from the surrounding land uses.

The LVI assessment is performed from a boat and involves dividing a lake into 12 pie-shaped units and identifying plants in four of the 12 units (**Figure 1**). Plants in the selected unit are identified by a visual boat "drive by" and via a transect approach. The resulting data is used to calculate the LVI score, and the waterbody is categorized according to the scoring system in **Table 1**.

The Lake Vegetation Index score for Lake Munson was 30, placing the lake's vegetative community in the impaired category. This score is a substantial decline from the previous years' score of 43 (2021) and 53 (2020).

TABLE 1. Category names, ranges of values for LVI, and example descriptions of biological conditions typically found for that category.

Aquatic life use category	LVI Range	Description
Exceptional	79–100	Nearly every plant present is a species native to Florida, invasive taxa typically not found. About 30% of taxa present are identified as sensitive to disturbance.
Healthy	43–78	About 85% of plant taxa are native to Florida, invasive taxa present. Sensitive taxa have declined to about 15%.
Impaired	0–42	About 70% of plant taxa are native to Florida. Invasive taxa may represent up to 1/3 of total taxa. Less than 10% of the taxa are sensitive.

Thirty-eight species were found in 2022 (**Table 2**) versus the fifty species found in 2021 and the sixty-six species that were found in 2020. Units surveyed can vary from year to year, potentially resulting in slight changes to number of plant species, or taxa; however, the decline in Lake Munson over the past three years is substantial. While the drop in taxa in 2022 contributed to the lower LVI score, the type and dominance of more (or less) sensitive taxa may be the main contributor in the LVI score decline.

In 2020, the native species coontail (*Ceratophyllum demersum*) and pond cypress (*Taxodium ascendens*) were the most dominant species in the lake but several invasive exotic plants were quickly establishing themselves in the water. The two most prevalent exotic plants were hydrilla (*Hydrilla verticillata*), and water hyacinth

(*Eichhornia crassipes*). Leon County staff were concerned with the rapid proliferation of these and other exotics, so in the latter part of 2020, the Florida Fish and Wildlife Conservation Commission (FWC) was contacted about the overabundance of exotic vegetation in the lake. In October 2020, FWC teams applied herbicides to the emergent and submersed invasive exotics in Lake Munson. A substantial amount of exotic plants were treated, and it was hoped that natives would continue to proliferate in the water column. Unfortunately, the Category I Invasive Exotic hydrilla quickly reestablished in early 2021. Due to the rapid proliferation of hydrilla, the 2021 survey showed that the native coontail and the exotic hydrilla were now either the dominant or codominant species found in the lake. Consequently, the 2021 LVI score was substantially lower than in past years.

TABLE 2. Scientific and common names of the plants identified during the Lake Munson LVI survey (10-14-22).

Scientific Name	Common Name
Acer rubrum	red maple
Alternanthera philoxeroides (II)	alligator weed
Andropogon sp.	broomsedge
Azolla caroliniana	mosquito fern
Baccharis sp.	salt bush
Bidens laevis	smooth beggartick
Boehmeria cylindrica	false nettle
Cephalanthus occidentalis	buttonbush
Ceratophyllum demersum	coontail
Cicuta maculata	water hemlock
Colocasia esculenta (I)	wild taro
Cyperus erythrorhizos	redroot flatsedge
Cyperus odoratus	fragrant flatsedge
Echinochloa walteri	coast cockspur grass
Eichhornia crassipes (I)	water hyacinth
Hydrilla verticillata (I)	hydrilla
Hydrocotyle sp.	water pennywort
Itea virginica	Virginia sweetspire
Lemna sp.	duckweed
Liquidamber styraciflua	American sweetgum
Ludwigia leptocarpa	anglestem primrose willow
Ludwigia peruviana (I)	Peruvian primrosewillow
Lycopus americanus	American water horehound
Myrica cerifera	wax myrtle
Nyssa sylvatica var. biflora	swamp tupelo
Panicum hemitomon	maidencane
Panicum repens (I)	torpedo grass
Polygonum densiflorum (glabrum)	denseflower knotweed
Sacciolepis striata	American cupscale-grass
Salix carolina	coastal plain willow
Salvinia minima	water spangles
Sapium sebiferum (I)	Chinese tallow tree
Schoenoplectus californicus	giant bulrush
Solidago sp.	goldenrod
Taxodium sp.	cypress
Typha sp.	cattail
Vitis rotundifolia	muscadine
Woodwardia areolata	netted chain fern

I - Category I Invasive Exotics
II - Category II Invasive Exotics
Names in **bold** are exotics

During the 2022 survey, it was found that hydrilla and the native coontail continued to be the most dominant plants in Lake Munson, with hydrilla continuing to overwhelm most native species. Further contributing to the 2022 LVI decline, the Category I Invasive

Exotics wild taro (*Colocasia esculenta*), water hyacinth (*Eichhornia crassipes*), the previously mentioned hydrilla (*Hydrilla verticillata*), Peruvian primrosewillow (*Ludwigia peruviana*), and Chinese tallow (*Sapium sebiferum*) were found in the lake. The Category II Invasive Exotic alligator weed (*Alternanthera philoxedroides*) and exotic water spangles (*Salvinia minima*) were also found.

Exotic apple snails

Historically, Lake Munson was dominated by exotic vegetation (**Figure 2**). In 2006-2007, the exotic apple snail *Pomacea maculate* (previously misidentified as *P. canaliculata*), consumed most of the vegetation in Lake Munson, allowing the lake to transition from a macrophytic vegetation dominated community to a community dominated by algae. Ironically, Lake Munson's LVI scores from the mid-2000s to the mid-2010s were influenced by the invasive exotic apple snail. Over time, the snails consumed all of the vegetation in the water column including the Invasive Exotics water hyacinth (*Eichhornia crassipes*), water lettuce (*Pistia stratiotes*), and hydrilla (*Hydrilla verticillata*). The snail also consumed native plants including the American lotus (*Nelumbo lutea*). Had the snails not consumed all the vegetation, the overwhelming abundance of Invasive Exotic species would have contributed to a lower LVI score and would have negated any positive effects of the native vegetation on the LVI score.

Efforts to eradicate the exotic apple snails were met with little success, but there was a precipitous decline in apple snails (probably due to a lack of food) beginning in the latter part of 2015. While still present in the watershed, and for reasons unknown, the snails have been unable to reestablish themselves to their previous numbers. The decline allowed native emergent and floating plants to proliferate in the lake including the welcome additions of southern waternymph (*Najas guadalupensis*) and coontail (*Ceratophyllum demersum*). Unfortunately, with the advent of the native submersed plants, hydrilla and water hyacinth have also reestablished and continue overwhelming the native species.

Lake Drawdown

In 2022, Lake Munson experienced algal blooms, a fish kill, and the continued abundance of Invasive Exotic aquatic vegetation. While the nutrient levels in the lake's water column have been steadily declining, the aforementioned issues posed a need for immediate mitigation. The preferred option was a lake drawdown, which would help address the algal, nutrient, and aquatic vegetation challenges in the lake. The drawdown would kill the hydrilla and algae and would form a "cap" on the sediment to reduce nutrients leaving the sediment while allowing sediment denitrification. A drawdown is most efficient during the "dry" season, which in Leon County roughly starts in October.

On November 1, 2022, three weeks after the presentation of the 2022-2023 Lake Munson Action Plan (Action Plan) to the Board of County Commissioners (BOCC), Public Works staff opened the gate on the Lake Munson Dam and began the drawdown. While the lake drained, staff monitored downstream conditions and the gate opening

size was adjusted based on the downstream response. Ultimately the gate was fully opened and remained fully open. By November 10th the lake had substantially drained. The Action Plan specified a drawdown period of 3-5 months, depending on the weather, and in consultation with FWC.

As a result of several rainfall events since the drawdown began, the lake retained water on several occasions but with the gate fully open, eventually receded. These events and the wetter than anticipated rainfall during the 2022-2023 winter led to discussions on the appropriate time to refill the lake. During their March meeting, the Science Advisory Committee (SAC) discussed extending the drawdown beyond the 3-5 months. The initial conversation included extending the drawdown into this summer and evolved into extending for one to several years, allowing more time for the lake sediment to dry out and oxidize. The concept of an extended drawdown is not new and has been discussed previously by the SAC. In conjunction with the Lake Munson Restoration Project in the early 2000s, the lake was drawn down for 2 years and benefited greatly. The 2010-2011 Lake Munson drawdown, originally planned for 3-5 months, was extended to 8 months to allow additional drying time of the lake bottom. Longer drawdowns provide more time and opportunity for the sediment to dry out, ultimately providing more benefit to the lake. As outlined in the Action Plan, as a State-managed waterbody, staff has been working closely with FWC to determine the optimal time to begin refilling the lake. In early March, staff met with representatives from FWC's Invasive Plant Management, Aquatic Habitat and Conservation Restoration, Fish and Wildlife Research Institute, Freshwater Fisheries Management, and Hunting and Game Management Divisions to discuss the appropriate time to refill the lake. FWC recommended continuing the drawdown until summer 2024 to allow additional time for the lake to dry and promote sediment capping to improve water quality. FWC advised there would be additional benefits to the ecosystem and wildlife habitat. Without water in most of the lake, terrestrial plants have filled in and are growing in the lake bottom. These plants provide an excellent benefit for wading birds, as well as providing fish habitat when the lake refills.

Based on the guidance from FWC for the State-managed waterbody and input from the SAC, the drawdown was extended through the Spring of 2024. Staff meet with FWC regularly to discuss progress of the drawdown, the SAC continues to receive quarterly updates on the drawdown to review with the Lake Munson Workgroup, and the Board continues to receive updates every six months.

Invasive Exotic Vegetation Management Program

The Action Plan calls for the County to implement an Invasive Exotic Vegetation Management Program to supplement the State's treatment efforts on Lake Munson. Invasive exotic plants adversely impact native plant communities and, if left untreated, will rapidly colonize, and take over a waterbody. Native species create a healthier ecosystem; they allow a variety of plants to grow and serve as food and nesting habitat for fish and wildlife. As a State-

managed waterbody, the County relies on FWC's Aquatic Plant Management Program for treatment of exotic vegetation for area lakes.

FWC's Northwest Region service area covers the entire Florida panhandle, from Escambia to Jefferson County, so County Water Resources staff often identify areas of exotic vegetation growth and notify the State. FWC spot-treats the areas of concern with a chemical herbicide subject to the availability of personnel and funding.

Leon County has a small vegetation management program that is limited to treating stormwater facilities. Leon County staff proposed to the Board that enhancing the Invasive Exotic Vegetation Management Program would be beneficial and would allow better management of the aquatic vegetation in area waterbodies by supplementing the State's plant management services to prevent the rapid growth of invasive exotic species and facilitate the growth of native aquatic vegetation. When an area is identified for treatment, County staff will coordinate with FWC to determine its availability to respond before reaching out to the County private contractor. This supplemental program is anticipated to provide a quicker response time and more frequent mitigation of the aquatic vegetation. More frequent treatment in smaller areas is better for lake ecology because less herbicide product is generally needed.

The Invasive Exotic Vegetation Management Program will be an in-lake mitigation tool the County can utilize as a long-term strategy to manage area lakes. This program will be implemented for Lake Munson following the drawdown and anticipates county-wide expansion in FY 2024.

While the lake continues to improve, undoing decades of damage will take continuous commitment. The above actions will help improve the lake's plant community, water quality, and overall ecosystem health.

For additional information about the LVI please go to the Florida Department of Environmental Protection webpage: https://floridadep.gov/dear/water-quality-standards-program/documents/lake-vegetation-index-primer

For additional information about exotic Category I and II invasive exotic plants, please go to the Florida Invasive Species Council: https://www.floridainvasives.org/.

The FWC's Invasive Plant Management Program can be accessed via the following webpage: https://myfwc.com/wildlifehabitats/habitat/invasive-plants/.

Contact and resources for more information

www.LeonCountyWater.org

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FIGURE 1. Lake Munson showing unit divisions. Circled numbers denote surveyed units.

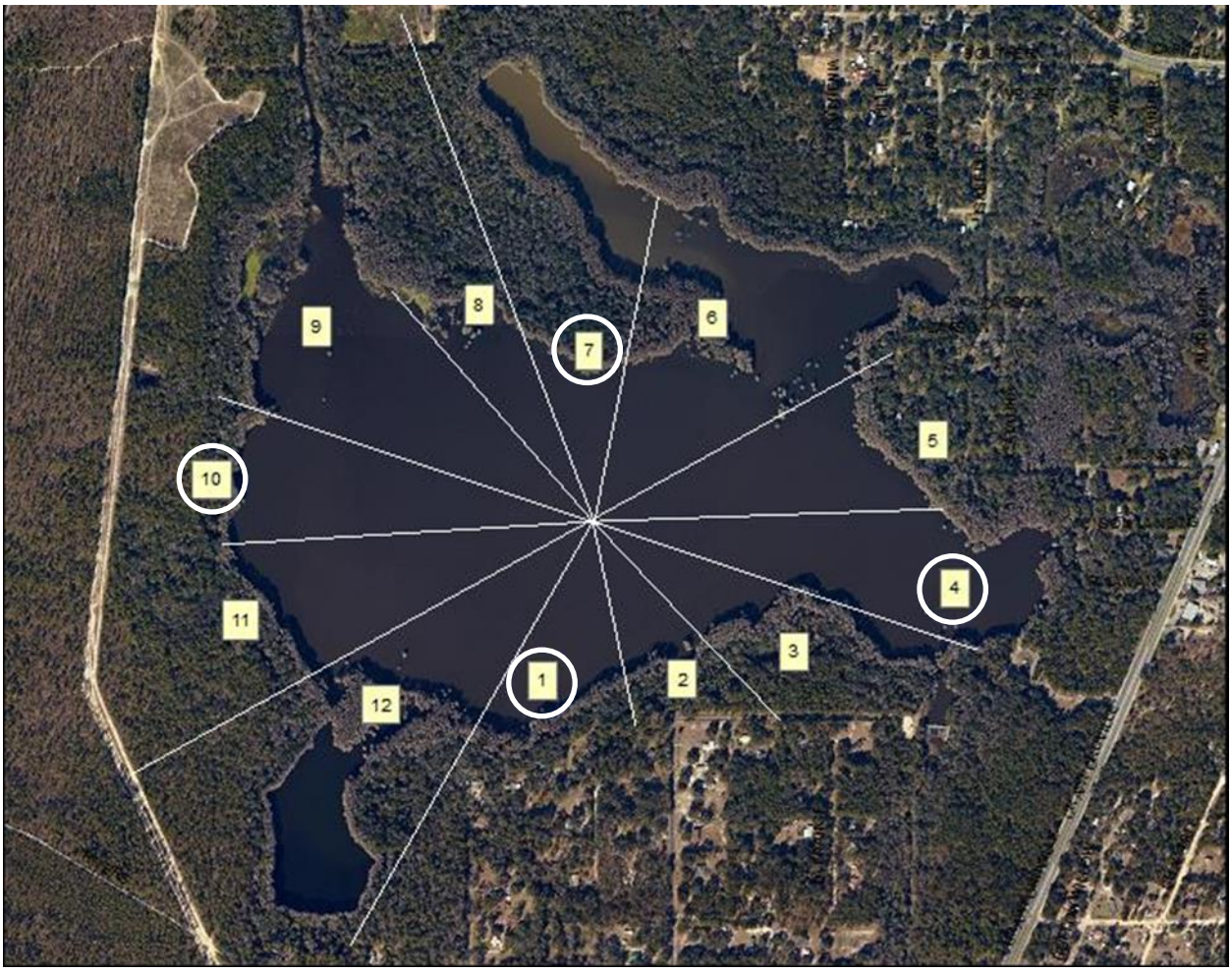

FIGURE 2. Lake Munson in 2003, showing the invasive exotic water hyacinth (*Eichhornia crassipes*) dominating the aquatic plant community.