Overview of Florida's Lake Vegetation Index

Because of the complications in assessing human disturbance in lakes using the invertebrate community, FDEP developed a method involving the lake aquatic plant community. The Lake Vegetation Index (LVI) is a multi-metric index that evaluates how closely a lake's plant community resembles one which 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. Four metrics comprise the index **(Table 1)**.

TABLE 1. Description of LVI metrics and expected effects of human disturbance

LVI Metric	***Description and expected effects due to human disturbance***
% Native taxa	Native taxa are those whose natural range included Florida at the time of European contact (1500 AD)
% Invasive exotic taxa	Exotics that that have increased in abundance or frequency and/or are altering native plant communities by displacing native species, changing community structures or ecological functions, or hybridizing with natives
Coefficient of Conservatism (C of C)	The coefficient of conservatism is a number from 0 to 10 that indicates how broad or narrow a taxon's ecological niche is, as determined by expert botanists. Exotic and ubiquitous weedy native taxa have low C of C scores, and taxa that display fidelity to a particular community and are sensitive to disturbance have high C of C scores
% Sensitive taxa (C of C > 7)	Taxa that display fidelity to a particular community and are sensitive to disturbance have high C of C scores

The LVI method is performed from a boat, so it is intended for use in lakes and ponds that can be accessed by boat. The method involves dividing a lake into 12 units and identifying plants in 4 of the 12 units **(Figure 1)**.

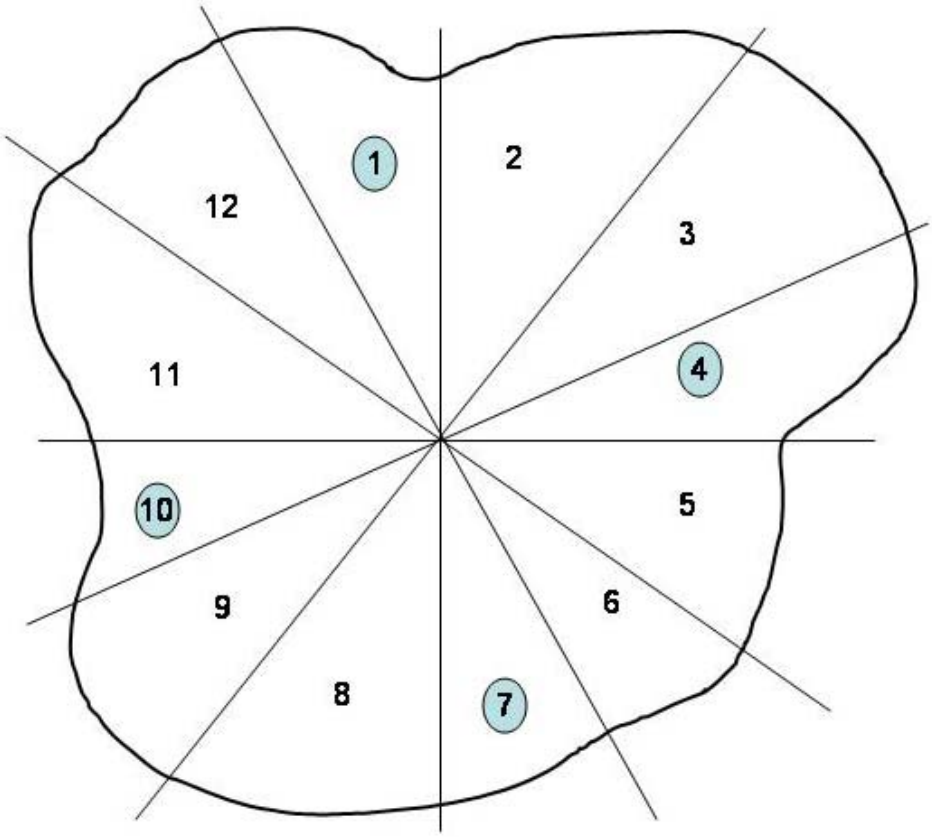

FIG. 1. Example of lake being divided into 12 units. Section 1, 2, or 3 is randomly selected as a starting section, and then every third section is sampled after that. In this example, section 1 was selected as the starting section.

Plants are identified in each unit by a visual boat "drive by" and also via a transect approach followed by the deployment of a type of sampling equipment known as the frodus **(Figure 2)**. Dominance or co-dominance in the plant community is also determined. The resulting data is then used to calculate the LVI. FDEP and EPA have concluded that a balanced lake floral community is achieved if the average score of at least two temporally independent LVIs, performed at representative locations and times, is 43 or higher. For more information about the LVI, please go to http://www.dep.state.fl.us/water/bioassess/methods.htm#Lakes.

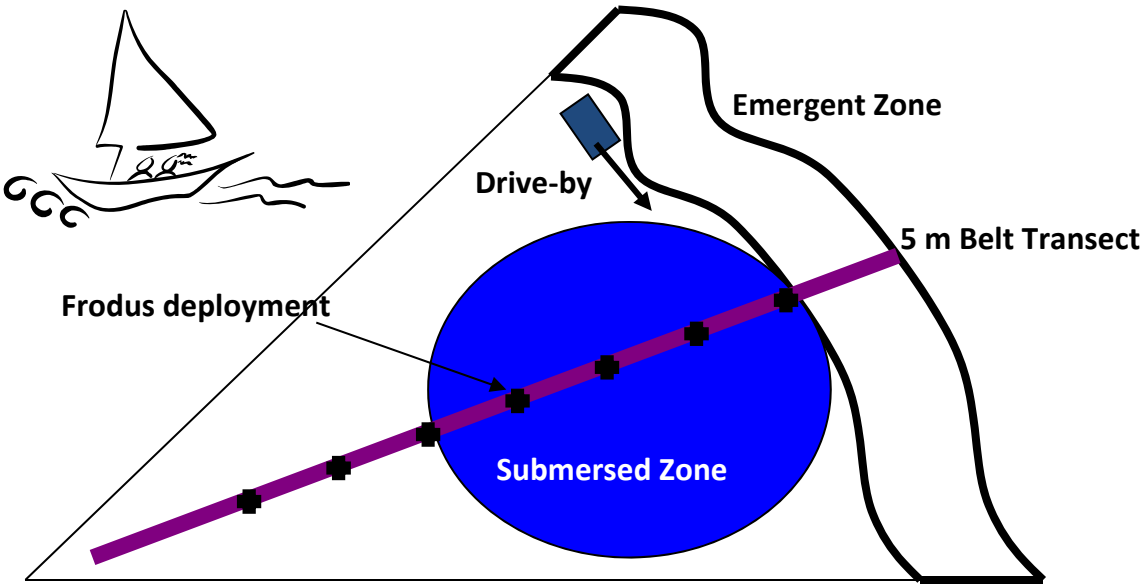

FIG. 2. For a given lake section, the sampling team conducts a drive-by survey of plant taxa, and then examines a 5 meter stretch of shoreline, followed by five frodus throws toward the lake center. Source: Sampling and Use of the Lake Vegetation Index (LVI) for Assessing Lake Plant Communities in Florida: A Primer
http://www.dep.state.fl.us/water/sas/training/docs/lvi_primer.pdf

Plant Resources

Staff utilize many field identification keys, including:

Aquatic and Wetland Plants of Southeastern United States: Dicotyledons. Robert K. Godfrey and Jean W. Wooten.University of Georgia Press. 1981

Aquatic and Wetland Plants of Southeastern United States: Monocotyledons. Robert K. Godfrey and Jean W. Wooten.University of Georgia Press. 1981

Florida Wetland Plants: An Identification Manual. Dr. John D. Tobe, et al. Florida Department of Environmental Protection. 1998

Guide to the Vascular Plants of Florida (Third Edition). Richard P. Wunderlin and Bruce F. Hansen. University Press of Florida. 2011

Many websites are also available to assist with plant identification. These include:

Atlas of Florida Vascular Plants - http://www.florida.plantatlas.usf.edu/

Flora of North America - http://www.efloras.org

Florida Department of Environmental Protection Plant Identification Resources page - http://www.dep.state.fl.us/water/bioassess/plantid.htm

Center for Aquatic and Invasive Plants - http://plants.ifas.ufl.edu/

Below is a sample field sheet used to record species observed during a LVI.

Form FD9000-27 **Lake Vegetation Index Data Sheet** (06-21-11)

Waterbody:	County:	Date:
Analyst:	Signature:	STORET:

Except where noted as "sp." species level identification required. *Genera that may require lab verification* Plants in bold= FLEPPC invasive exotic.

It is important to note dominant or co-dominant taxa (by areal extent) for each unit. Use "D" to denote dominant taxon, or "C" for the 2 co-dominant taxa.

Lake units sampled (circle one group):

1, 4, 7, 10 2, 5, 8, 11 3, 6, 9, 12

SPECIES					Collected? (√)	SPECIES					Collected? (√)
Acer rubrum						Eleocharis baldwinii					
Acmella oppositifolia						Eleocharis cellulosa					
Aeschynomene indica						Eleocharis equisetoides					
Albizia julibrissin (1)						Eleocharis interstincta					
Alternanthera philoxeroides(2)						Eleocharis robbinsii					
Ambrosia trifida						Eleocharis vivipara					
Ampelopsis arborea						Eriocaulon compressum					
Amphicarpum muhlenbergianum						Eriocaulon decangulare					
Andropogon glomeratus						Eriocaulon lineare					
Andropogon virginicus						Eremochloa ophiuroides					
Arundinaria gigantea						Eryngium prostratum					
Azolla caroliniana						Eupatorium capillifolium					
Baccharis glomeruliflora						Eupatorium leptophyllum					
Bacopa caroliniana						Fraxinus caroliniana					
Bacopa monnieri						Fuirena pumilla					
Betula nigra						Fuirena scirpoidea					
Bidens alba						Gordonia lasianthus					
Bidens laevis						Habenaria repens					
Bidens mitis						Hibiscus grandiflorus					
Boehmeria cylindrica						Hibiscus moscheutos					
Boltonia diffusa						**Hydrilla verticillata(1)**					
Brasenia schreberi						Hydrocotyle					
Cabomba caroliniana						Hydrolea quadrivalvis					
Canna flacida						**Hygrophila polysperma(1)**					
Carex albolutescens (C. longii)						Hypericum fasciculatum					
Carex comosa						Hypericum hypericoides					
Carex crus-corvi						Hypericum myrtifolium					
Carex lupuliformis						Ilex cassine					
Carex stipata						Ilex myrtifolia					
Carex verrucosa						Ilex opaca					
Catalpa bignonioides						**Ipomoea aquatica(1)**					
Celtis laevigata						Ipomoea sagittata					
Centella asiatica						Iris hexagona					
Cephalanthus occidentalis						Itea virginica					
Ceratophyllum demersum						Juglans nigra					
Chara spp.						Juncus effusus					
Cladium jamaicense						Juncus marginatus					
Clethra alnifolia						Juncus megacephalus					
Cliftonia monophylla						Juncus repens					
Colocasia esculenta(1)						Juncus scirpoides					
Commelina diffusa						Juniperus virginiana					
Crinum americanum						Lachnanthes caroliana					
Cyperus alternifolius(2) (C. involucratus)						Lactuca canadensis					
Cyperus articulatus						Leersia hexandra					
Cyperus esculentus						Lemna minor					
Cyperus haspan						Leucothoe racemosa					
Cyperus lecontei						**Ligustrum sinense (1)**					
Cyperus odoratus						Limnobium spongia					
Cyperus polystachos						**Limnophila sessiliflora(2)**					
Cyperus retrorsus						Liquidamber styraciflua					
Cyperus surinamensis						Liriodendron tulipifera					
Cyrilla racemiflora						Ludwigia arcuata					
Decodon verticillatus						Ludwigia leptocarpa					
Dichanthelium ensifolium						Ludwigia linearis					
Diodia virginiana						Ludwigia octovalvis					
Diospyros virginiana						**Ludwigia peruviana (1)**					
Dulichium arundinaceum						Ludwigia repens					
Echinochloa crusgalli						Ludwigia sphaerocarpa					
Echinochloa walteri						Ludwigia suffruticosa					
Eclipta prostrata (E. alba)						Luziola fluitans (Hydrochloa carolinensis)					
Egeria densa						Lycopus amplectans					
Eichhornia crassipes(1)						Lycopus rubellus					
						Lyonia lucida					

Site: Date:

SPECIES					Collected? (√)	SPECIES					Collected? (√)
Magnolia virginiana						Sabal palmetto					
Mayaca fluviatilis						Saccharum brevibarbis					
Micranthemum glomeratum						Saccharum giganteum					
Micranthemum umbrosum						Sacciolepis striata					
Mikania scandens						Sagittaria kurziana					
Morus rubra						Sagittaria lancifolia					
Myrica cerifera						Sagittaria latifolia					
Myriophyllum aquaticum						Sagittaria filliformis					
Myriophyllum heterophyllum						Sagittaria graminea					
Myriophyllum laxum						Sagittaria isoetiformis					
Myriophyllum pinnatum						Salix caroliniana					
Myriophyllum spicatum(2)						Salvinia minima					
Najas guadalupensis						Sambucus canadensis					
Najas marina						**Sapium sebiferum(1)**					
Najas minor						Saururus cernuus					
Nelumbo lutea						Schoenoplectus californicus					
Nitella spp.						Schoenoplectus tabernaemontani (Scirpus validus)					
Nuphar sp.						Scirpus cubensis					
Nymphaea odorata						Scirpus cyperinus					
Nymphoides aquatica						Scleria reticularis					
Nyssa aquatica						Sesbania herbacea					
Nyssa ogeechee						**Sesbania punicea (2)**					
Nyssa sylvatica var. biflora						Sida rhombifolia					
Orontium aquaticum						**Solanum tampicense(1)**					
Osmunda cinnamomea						Solidago fistulosa					
Osmunda regalis						Sparganium americanum					
Packera glabella						Spartina alterniflora					
Panicum hemitomon						Spartina bakeri					
Panicum repens(1)						Sphagnum moss					
Panicum rigidulum						Spirodela polyrhiza					
Paspalidium geminatum						Spirodela punctata (Landoltia punctata)					
Paspalum repens						Taxodium ascendens					
Paspalum urvillei						Taxodium distichum					
Peltandra virginica						Thalia geniculata					
Pennisetum purpureum(1)						Thelypteris palustris					
Phanopyrum gymnocarpon						**Tradescantia fluminensis (1)**					
Phragmites australis						Triadenum walteri					
Phyllanthus urinaria						Triadenum virginicum					
Pinus elliottii						Typha sp.					
Pinus taeda						**Urochloa mutica (Brachiaria mutica)**					
Pistia stratioides(1)						Utricularia cornuta					
Platanus occidentalis						Utricularia gibba (U. biflora)					
Pluchea odorata						Utricularia floridana					
Pluchea rosea						Utricularia foliosa					
Polygonum densiflorum						Utricularia inflata					
Polygonum hirsutum						Utricularia purpurea					
Polygonum hydropiperoides						Utricularia radiata					
Polygonum meisnerianum						Utricularia subulata					
Polygonum punctatum						Valliseneria americana					
Pontederia cordata						Vitis rotundifolia					
Potamogeton diversifolius						Websteria confervoides					
Potamogeton illinoensis						**Wedelia trilobata(2)**					
Potamogeton pusillus						Wolffiella spp.					
Potamogeton pectinatus						Woodwardia areolata					
Proserpinaca pectinata						Woodwardia virginica					
Ptilimnium cappilaceum						Xyris ambigua					
Quercus nigra						Xyris elliottii					
Quercus virginiana						Xyris jupicai					
Rhexia mariana						Xyris smalliana					
Rhynchospora chapmanii						Zizania aquatica					
Rhynchospora corniculata						Zizaniopsis milacea					
Rhynchospora inundata											
Rhynochospora scirpoides											
Rhynochospora tracyi											
Riccia fluitans											
Ricciocarpus natans											
Rubus argutus											
Rubus trivialis											