

LT 7000. DETERMINATION OF BIOLOGICAL INDICES

See also the following sections:

- FA 1000 Administrative Procedures
- FC 1000 Cleaning/Decontamination Procedures
- FD 1000 Documentation Procedures
- FM 1000 Field Planning and Mobilization
- FQ 1000 Field Quality Control Requirements
- FS 1000 General Sampling Procedures
- FS 7000 Biological Community Sampling
- FT 1000 General Field Testing and Measurement
- FT 3000 Aquatic Habitat Characterization
- LD 7000 Documentation of Biological Laboratory Procedures
- LQ 7000 Quality Control for Biological Community Analysis

LT 7100. Biorecon Determination

1. DEFINITION: Biological Reconnaissance (Biorecon) is a rapid community based biological assessment of stream health using benthic macroinvertebrates sampled via four sweeps of a D-frame dipnet, with organisms (excluding Oligochaeta, Chironomidae, and Acarina) identified to the lowest practical taxonomic level.

2. SAMPLING

- 2.1. Perform physical/chemical characterization and habitat mapping according to FT 3001.
- 2.2. Perform a habitat assessment according to FT 3100.
- 2.3. Conduct Rapid Bioassessment (Biorecon) sampling according to FS 7410.
- 2.4. Sort the organisms in the field according to FS 7410.

3. LABORATORY ANALYSES

3.1. Laboratory Verification of Field Identifications (Modified from American Public Health Association, *Standard Methods for the Examination of Water and Wastewater*, 10500 C)

3.1.1. Equipment and Supplies

- Dissecting microscope
- Identification references
- Forceps
- Petri dishes (100 x 15 mm or 60 x 15 mm) or other appropriate containers

- Laboratory counter (optional)
- Macroinvertebrate Bench Sheet (may vary from lab to lab)
- Pen

3.1.2. Methods

3.1.2.1. First, empty the contents of the vial into an appropriate container (100-mm diameter petri dish).

3.1.2.2. You may choose to separate the organisms into like groups. To do this, place the groups into smaller (60-mm diameter) individual petri dishes or group the animals within the larger dish.

3.1.2.3. Use the dissecting microscope to identify the organisms to the lowest practical taxonomic level, with the following exception. For the BioRecon procedure, do not identify Oligochaeta, Chironomidae, and Acarina below class, family, and order, respectively. See LT 7900 for guidance concerning “lowest practical taxonomic level” for the remaining groups of organisms. Use the most appropriate identification reference for each group. Enumerate organisms concurrently, and then place them back into the labeled vial with the forceps. Remove the animals as you count them in order to avoid counting any of them twice. It will take some time until sufficient experience with identification procedures and references is gained. In addition to the identification manuals, maintain a reference collection that can be used to compare specimens and facilitate identification. After using a dichotomous key to arrive at the name of an unknown organism, check the organism’s geographic range, habitat preferences, and morphological diagnosis to confirm that the identification is correct. Do not identify an organism by simply flipping through some pictures and assigning a name based on a superficial resemblance. Another taxonomist will recheck sample identifications according to LQ 7000.

3.1.2.4. If a large number of one or a few taxa are present, use a laboratory counter to keep a running total to facilitate the enumeration process. You may temporarily label counters to avoid mistakes. If you do not use a counter, tally the number of each taxon on your bench sheet.

3.1.2.5. If an organism is encountered in your laboratory for the first time, remove it and place it in an individual vial for inclusion in the reference collection. Make a note of this on the bench sheet, so that it can be located in the future, if necessary.

3.1.2.6. Record the individual taxon names on your bench sheet. Organisms are also enumerated during this process, and their numbers recorded on the bench sheet.

3.1.2.7. Follow proper Taxonomic Quality Assurance procedures (see LQ 7000).

4. DATA REDUCTION

4.1. For DEP staff only, enter all data into SBIO (the Florida Statewide Biological Database).

4.2. Follow the counting and collapsing procedures listed below. Keep a record of the original taxa list and the resulting collapsed list.

4.2.1. When combining biological data (taxa and counts), the number of taxa may become artificially inflated by the incorporation of the same taxon under different names and by counting high-level identifications (family or genus). An erroneously high taxa count creates additional anomalies among metrics involving these counts, such as the number of Ephemeroptera and Trichoptera taxa.

4.2.2. Collapse all taxa to the lowest practical taxonomic level.

4.2.3. Collapse taxa further, which follows the “Upward Collapsing” of Taxa (i.e., Preparation for Index Calculations) procedure listed in the *Statewide Biological Database Manual*, Florida Department of Environmental Protection.

As an example, see the following species list:

Conchapelopia sp. (2)
Helopelopia sp. (4)
Dicrotendipes simpsoni (21)
Dicrotendipes modestus (1)
Dicrotendipes sp. (20)
Hyalella azteca (20)
Planorbella sp. (1)

7 taxa and 69 individuals

Upward collapsing, however, will combine *Conchapelopia* and *Helopelopia* as synonyms, and will apportion the individuals from *Dicrotendipes* sp. to the two identified species of that genus, resulting in:

Conchapelopia sp. (6)
Dicrotendipes simpsoni (40)
Dicrotendipes modestus (2)
Hyalella azteca (20)
Planorbella sp. (1)

5 taxa and 69 individuals

Note that if “*Dicrotendipes* sp.” had represented a distinct species level entity with no available or known name, it would have properly been entered as “*Dicrotendipes* sp. 14 Epler” or a similar name, and would then not have been combined. Collapsing will also take place at other taxonomic levels: family level identifications will combine with generic level identifications, species will combine with subspecies, etc.

5. INDEX CALCULATION

Perform the following calculations based on collapsed data as outlined in Section 4.2.

5.1. Calculate and record the long-lived taxa score according to the list below (based on Fore, 2007 with minor modifications). Use the taxonomic order, family, and genus (or species) name of each taxon to calculate long-lived taxa richness. Taxonomic synonyms present in the current Florida data base are also shown as additional information. Long-lived taxa require more than one year to complete their life cycles.

Order	Family	Genus	Species (Long-lived)	Synonyms
Decapoda			All families, genera and species	
Basommatophora	Lymnaeidae	<i>Fossaria</i>	All species	
Mesogastropoda	Ampulariidae	<i>Pomacea</i>	All species	
Veneroida	Corbiculidae	<i>Corbicula</i>	All species	
Unionoida	Unionidae		All genera and species	

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Order	Family	Genus	Species (Long-lived)	Synonyms
Odonata	Aeshnidae	<i>Basiaeschna</i>	<i>Basiaeschna janata</i>	
		<i>Boyeria</i>	All species	
	Cordulegastridae		All species	
	Gomphidae	<i>Gomphus</i>	All species	
Odonata		<i>Haegenius</i>	All species	<i>Gomphurus</i>
		<i>Progomphus</i>	All species	
	Libellulidae	<i>Macromia</i>	All species	
		<i>Somatochlora</i>	All species	
Odonata		<i>Tetragoneuria</i>	All species	<i>Epitheca</i>
	Petaluridae	<i>Tachopteryx</i>	<i>Tachopteryx thoreyi</i>	
Plecoptera	Pteronarcidae	<i>Pteronarcys</i>	All species	
	Leuctridae		All genera and species	
	Peltoperlidae	<i>Tallaperla</i>	<i>Tallaperla cornelia</i>	
	Perlidae	<i>Acroneuria</i>	All species	
		<i>Agnetina</i>	<i>Agnetina annulipes</i>	
		<i>Eccopectura</i>	<i>Eccopectura xanthenes</i>	
		<i>Neoperla</i>	All species	
		<i>Paragnetina</i>	All species	
	Perlodidae	<i>Clioperla</i>	<i>Clioperla clio</i>	
		<i>Perlinella</i>	<i>Perlinella drymo</i>	
			<i>Perlinella ephyre/zwicky</i>	
		<i>Isoperla</i>	<i>Isoperla orata</i>	
Megaloptera	Corydalidae		All genera and species	
Trichoptera	Brachycentridae	<i>Brachycentrus</i>	<i>Brachycentrus americanus</i>	<i>Oligoplectrum americanum</i>
		<i>Micrasema</i>	All species	
	Calamoceratidae	<i>Heteroplectron</i>	<i>Heteroplectron americanum</i>	
	Hydropsychidae	<i>Diplectrona</i>	<i>Diplectrona modesta</i>	
		<i>Macrostemum</i>	<i>Macrostemum carolina</i>	<i>Macronema carolina</i>
				<i>Macronemum carolina</i>
	Lepidostomidae	<i>Lepidostoma</i>	All species	<i>Alepomyia</i>
				<i>Alepomyiodes</i>
				<i>Arcadopsyche</i>
				<i>Atomyia</i>
				<i>Jenortha</i>
				<i>Mormomyia</i>
				<i>Neuropsyche</i>
				<i>Nosopus</i>

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Order	Family	Genus	Species (Long-lived)	Synonyms
Trichoptera				<i>Notiopsyche</i> <i>Olemira</i> <i>Oligopsyche</i> <i>Phanopsyche</i> <i>Pristosilo</i> <i>Athripsodes</i>
	Leptoceridae	<i>Ceraclea</i>	All species	
	Limnephilidae	<i>Ironoquia</i> <i>Pycnopsyche</i>	<i>Ironoquia punctatissima</i> All species	
	Molannidae	<i>Molanna</i>	All species	
	Phryganeidae	<i>Banksiola</i>	<i>Banksiola concatenata</i>	<i>Neuronia concatenata</i>
		<i>Ptilostomis</i>	<i>Ptilostomis postica</i>	<i>Neuronia postica</i>
		<i>Agrypnia</i>	<i>Agrypnia vestita</i>	
	Psychomyiidae	<i>Lype</i>	<i>Lype diversa</i>	
	Rhyacophilidae	<i>Rhyacophila</i>	All species	
	Uenoidae	<i>Neophylax</i>	All species	

5.2. Calculate and record the sensitive taxa score according to the list below (based on Fore, 2007 with minor modifications). These taxa are identified as sensitive to human disturbance. Synonyms in the current Florida database are also included as additional information.

Order	Family	Genus	Taxon (sensitive)	Synonyms
Acariformes	Lebertiidae	<i>Lebertia</i>	All species	
Amphipoda	Crangonyctidae	<i>Crangonyx</i>	<i>Crangonyx</i>	
Coleoptera	Elmidae	<i>Ancyronyx</i>	<i>Ancyronyx variegatus</i>	
		<i>Gonielmis</i>	All species	
		<i>Macronychus</i>	All species	
Diptera	Chironomidae	<i>Microtendipes</i>	All species	
		<i>Parametriocnemus</i>	All species	
		<i>Polypedilum</i>	<i>Polypedilum aviceps</i>	
		<i>Rheocricotopus</i>	All species	
		<i>Stempellinella</i>	All species	
		<i>Tanytarsus</i>	<i>Tanytarsus sp. d epler</i>	
		<i>Tanytarsus</i>	<i>Tanytarsus sp. m epler</i>	
		<i>Tribelos</i>	<i>Tribelos jucundum</i>	
		<i>Hemerodromia</i>	<i>Hemerodromia</i>	
			All genera and species	
	Empididae			
	Simuliidae			
Ephemeroptera	Baetidae	<i>Acerpenna</i>	<i>Acerpenna pygmaea</i>	<i>Baetis pygmaeus</i>

Order	Family	Genus	Taxon (sensitive)	Synonyms
Isopoda	Ephemerellidae	<i>Caecidotea</i>	All genera and species	<i>Asellus</i>
	Heptageniidae		All genera and species	
	Leptophlebiidae		All genera and species	
	Leptohyphidae		All genera and species	
	Asellidae		<i>Caecidotea</i>	
	Libellulidae		All species	
			All families, genera and species	
	Hydropsychidae		All species	
	Leptoceridae		All species	
	Philopotamidae		<i>Chimarra</i>	
Trichoptera	Psychomyiidae	<i>Lype</i>	<i>Lype diversa</i>	

5.3. Tally the numbers for taxa richness (total taxa), Ephemeroptera taxa, and Trichoptera taxa.

5.4. Refer to Merritt and Cummins, An Introduction to the Aquatic Insects of North America to determine the number of clinger taxa. For clinger taxa, include only those taxa whose sole habit is listed as "clinger".

5.5. Evaluate and record the biological metrics according to the scoring system in Tables LT 7100-1, 7100-2 and 7100-3.

LT 7110. REFERENCES

1. Merritt, R.W., and Cummins, K.W., An Introduction to the Aquatic Insects of North America, Third Edition, 1996.
2. Fore, L., R.B. Frydenborg, D. Miller, T. Frick, D. Whiting, J. Espy, and L. Wolfe. Development and Testing of Biomonitoring Tools for Macroinvertebrates in Florida Streams. Florida Department of Environmental Protection, 2007.
3. American Public Health Association, American Water Works Association, Water Pollution Control Federation, SM10500C, Standard Methods for the Examination of Water and Wastewater, 20th Edition, 1999.

Appendix LT 7100
Tables, Figures and Forms

Table LT 7100-1

Table LT 7100-2

Table LT 7100-3

Table LT 7100-1

BioRecon metric name and range of metric values used to assign a score of 0 (indicating degraded condition) to 1 (indicating minimal disturbance) by region. Metric values higher or lower than the listed range were assigned a score of 0 or 1 as appropriate. Bold values indicate scoring ranges that differ from the same SCI metric.

BioRecon metric	Northeast	Panhandle	Peninsula
Total taxa	14–37	16–49	11–36
Ephemeroptera taxa	0–3.5	0–12	0–5
Trichoptera taxa	0–6.5	0–7	0–7
Long-lived taxa	0–6	0–10	0–7
Clinger taxa	0–7	0–15.5	0–8
Sensitive taxa	0–11	0–19	0–9

Table LT 7100-2

BioRecon metric scoring formulae for converting metric values to a metric score ranging from 0 to 1. In each equation, 'X' stands for the raw metric value. For calculated values >1, score equals 1; for calculated values <0, score equals 0.

BioRecon metric	Northeast	Panhandle	Peninsula
Total taxa	$(X-14)/23$	$(X-16)/33$	$(X-11)/25$
Ephemeroptera taxa	$X / 3.5$	$X / 12$	$X / 5$
Trichoptera taxa	$X / 6.5$	$X / 7$	$X / 7$
Long-lived taxa	$X / 6$	$X / 10$	$X / 7$
Clinger taxa	$X / 7$	$X / 15.5$	$X / 8$
Sensitive taxa	$X / 11$	$X / 19$	$X / 9$

1. Check that none of the metric scores are >1 or <0. If so, change the scores to 0 or 1 as appropriate.
2. Sum the metric scores; check that the sum is between 0 and 6.
3. Divide the sum of scores by 0.6. This is a correction factor to change the BioRecon range from 0–6 to 0–10.

Table LT 7100-3

Categorical descriptions and range of index values for the BioRecon index. Square brackets indicate a value is included in the range; round brackets indicate a value is not included.

BioRecon	Index range
<u>1 sample</u>	
Category 1 ("exceptional")	[7–10]
Category 2 ("healthy")	[4–7)
Category 3 ("impaired")	[0–4)

LT 7200. Stream Condition Index (SCI) Determination

1. **DEFINITION:** The SCI is a community-based biological assessment of stream health using benthic macroinvertebrates sampled via 20 sweeps of a D-frame dip net, with organisms identified to the lowest practical taxonomic level.

2. SAMPLING

2.1. Perform physical/chemical characterization and habitat mapping according to FT 3001.

2.2. Perform a habitat assessment according to FT 3100.

2.3. Conduct SCI D-frame dip net sampling according to FS 7420.

2.4. See the SCI Primer for additional information about sampling (LT 7210, section 6, below).

3. LABORATORY ANALYSES

3.1. Sample Preparation

3.1.1. Equipment and Supplies

- Waterproof paper
- Permanent marker
- U.S. No. 30 mesh sieve
- Ethanol-filled squeeze bottle (80%)
- Pan marked with a grid of 24 5-cm squares (gridded pan)
- Random number table
- 250-mL glass jar
- Dissecting microscope
- Compound microscope
- 100 x 15 mm petri dish or other appropriate container
- Forceps
- Vials for picked organisms (1 or 2 dram)
- Laboratory counter
- Macroinvertebrate Bench Sheet (may vary from lab to lab)
- Discard bucket
- Lighted magnifier
- Ruler
- Lab coat

- Latex gloves
- Properly fitted respirator
- Safety glasses

3.1.2. Methods

3.1.2.1. Make two labels to go into each of the vials of picked bugs that clearly identify the sample. This could include information such as the sample identification number, station identification, date sampled, and replicate number.

3.1.2.2. Include the entire sample in this reduction and homogenization process.

3.1.2.3. Place sample material into a U.S. No. 30 mesh sieve over a discard bucket. Empty the contents of the sample into the sieve slowly, making sure not to lose any of the sample material. The formalin should go through the sieve and collect in the bucket. Once the sample is finished draining, pour the waste formalin into the proper container. Follow proper safety protocols (personal protective equipment, ventilation and handling) when handling samples preserved with formalin.

3.1.2.4. Gently rinse the sample material with tap water. Pull out large twigs, leaves, plants, etc., and place into a gridded pan. Wash fine debris (silt, mud) through the (U.S. No. 30 mesh) sieve. Repeat steps 3.1.2.3 and 3.1.2.4 until the entire sample from all the jugs has been processed. Visually inspect large debris (leaves, plants, twigs) held in the pan for animals before discarding. This inspection is best accomplished by observing it with a lighted magnifier. Randomly place found organisms into the gridded pan with the rest of the unpicked sample.

3.1.2.5. Thoroughly mix the sample so that a homogeneous distribution of organisms is achieved in the detrital matrix. Place the sieved sample in a labeled, gridded pan. Each 5-cm square should have a pre-assigned number (1-24). Liquid present in the sample should be sufficiently reduced to prevent material from shifting among squares during the sorting process. There are 24 total 5-cm squares in a standard pan. If the sample is small and does not cover all 24 squares, spread it out across a number of squares that is divisible by three (e.g., 18, 12, 21). Use a straightedge to delineate the edges of a grid while removing the sample.

3.1.2.6. Randomly select eight separate squares (or 1/3 of the total grids). A random number table is recommended. Remove the contents of these squares, in their entirety, and place in another labeled, gridded tray. Thoroughly mix the sample in the second tray so that a homogeneous distribution of organisms is achieved in the detrital matrix. Use a straightedge to delineate the edges of a grid while removing the sample.

3.1.2.7. Randomly select one square from the second tray, remove the contents of this square in its entirety, and place it into a third container (such as a gridded tray or Petri dish). After selecting your square, you may need to add some ethanol or water (in addition to a cover) to the trays to prevent them from drying out.

3.1.2.8. The intent of this step is to achieve a final target count of 150 (with an acceptable range of 140-160) organisms. **Note that if the correct counting range can not be achieved, the calculation of a reliable final score is diminished.** Randomly select an aliquot (any fraction of the square; for example, 1/4, 1/8, etc.),

remove its contents, and place it in a separate, labeled container. Divide this aliquot further, if necessary, to achieve the target number of organisms.

3.1.2.9. Place the container under a dissecting scope set at low power (approximately 7x or 10x). In a deliberate, systematic manner, pick every organism from the final aliquot and place it into an alcohol-filled vial (clearly identified as per section 3.1.2.1). Keep a running total of the number of organisms picked. When started, finish sorting this aliquot in its entirety.

3.1.2.10. Save the container (petri dish) until you have ten (10), and have a co-worker recheck them as described in LQ 7000. After a container has been checked, you may discard the material in the remaining containers.

3.1.2.11. If you have not reached the minimum count of 140 organisms, repeat steps 3.1.2.7-3.1.2.10. Use whatever size aliquot is necessary in order to reach the target count of organisms.

3.1.2.12. If you have exceeded the maximum count of 160 organisms, randomly sub sample 150 organisms. This may be accomplished by placing the organisms into a Petri dish that has been subdivided evenly into 16 squares. With the aid of a dissecting microscope, remove and discard any terrestrial organisms, pieces of worms and other organisms without heads. If still not within the target range, randomly select a square in the Petri dish and remove **all** the organisms in that square. Repeat this process until you have the target number of individuals.

3.1.2.13. If you have not reached the minimum target count of 150 (with an acceptable range of 140-160) after completely sorting the previous square from 3.1.2.7, go back to the second tray, randomly select a new square, and continue steps 3.1.2.8-3.1.2.12 until the target count has been obtained. If an obvious organism is observed but its grid number was not selected and no examples of that organism were present in the grids that were selected, you may note that organism as qualitatively observed. Do not include the organism in the analysis.

3.1.2.14. Record the number of squares, grids and aliquots selected (e.g., 8/24, 2/12, 1/4) to enable conversion to total abundance present in the original sample. Failure to record the number of squares and grids selected (out of the total possible) compromises the usefulness of the data. Save any remaining material in the third container and the remaining squares from the second tray in separate air-tight containers until both portions have been completely processed. This material may be necessary if the target counts fall below the acceptable range during the identification process.

3.1.2.15. Return to the tray in step 3.1.2.6 and without re-homogenizing repeat the entire process from steps 3.1.2.7-3.1.2.14 to obtain a second 150 (with acceptable range of 140-160) count. Place the organisms in a second vial.

3.1.2.16. If the entire sample is processed, and there are insufficient individuals for both (or one) of the aliquots to achieve the minimum of 140 organisms, this indicates an extremely unusual condition, either an environmental stressor (e.g., toxicity, lack of habitat, desiccation, etc.) or sampling error (e.g., sampling during flood conditions). **If this occurs, a final Stream Condition Index score should not be calculated, and the "X" qualifier should be used during reporting. "X" means there were insufficient individuals present in the sample, suggesting an extreme environmental stressor or sampling error.**

3.1.2.17. Record the date the sorting of the sample is completed.

3.2. Slide Preparation (Based on Beckett, D.C. and Lewis, P.A. 1982. An efficient procedure for slide mounting of larval Chironomidae. Trans. Amer. Microsc. Soc. 101: 96-99; Epler, J. 1992, Identification manual for the larval Chironomidae (Diptera) of Florida; and Pluchino, E. 1984, Guide to the common water mite genera of Florida.)

3.2.1. Equipment and Supplies

- Dissecting microscope
- 25 x 75 mm glass microscope slides
- 12-mm and 18-mm diameter round #0 or #1 cover slips
- Transparent tape and razor blade
- Pencil
- Forceps or needle
- 1 N KOH
- Mounting medium (CMC-10)

3.2.2. Methods

3.2.2.1. Prepare the slides for labeling. This task is most easily accomplished by lining up several slides with long ends together and applying a row of transparent tape to the right side of each slide. Usually, three slides are left taped together until organisms are mounted. Use a razor blade to separate the slides during the identification process.

3.2.2.2. Label each slide so it can be uniquely identified. For example, write the sample number, sample date, and abbreviated site information on each slide label with a soft pencil. Other station identifiers along with the total number of slides, the initials of the mounter, and the date mounted can be written on a small piece of paper and attached to the tray on which the slides are placed to dry. This is often helpful when identifying the organisms.

3.2.2.3. Place a drop of CMC on the slide for each organism you are mounting. An excess of CMC may be used, which will help to form a seal around the cover slip when it is pressed down. Mount three midges/worms per slide, under separate 12-mm cover slips. In the case of very large specimens, mount two per slide under separate 18-mm cover slips.

3.2.2.4. Using a needle or forceps, place the specimen in the CMC, ventral side up if it is a midge or mite.

3.2.2.5. Using forceps, place the cover slip over the specimen.

3.2.2.6. Using forceps or the eraser of a pencil, press the cover slip onto the specimen. Apply sufficient pressure to spread the mandibles and labrum. At this point, you may also orient the specimen by pushing or pressing the cover slip in various ways. Be careful not to break the cover slip, as the pressure required to flatten the specimen may be great. Mounting of aquatic mites requires more CMC along with a greater amount of pressure. Make sure you use enough of both. Otherwise, air will accumulate under the cover slip and the necessary structures will not be visible. Mites can be soaked in 1N KOH for softening before mounting.

3.2.2.7. Set the slides aside to dry; it may take 1 to 2 days for the slides to dry completely. Recheck the labels on the slides to make sure that each one has the correct sample number.

3.3. Organism Identification (Modified from *Standard Methods 10500C*)

3.3.1. Equipment and Supplies

- Dissecting microscope
- Compound microscope
- Identification references
- Forceps
- Vials (1- or 2-dram)
- Petri dishes (100 x 15 mm or 60 x 15 mm) or Syracuse watch glasses
- Laboratory counter (optional)
- Microscope slides
- 12-mm diameter cover slips
- Macroinvertebrate Bench Sheet (may vary from lab to lab)
- Pen
- Pencil

• Methods

3.3.1.1. Sort and process samples according to section 3.1. Make permanent slide mounts of worms and midges according to section 3.2 when needed.

3.3.1.2. Identify organisms other than worms, midges, and aquatic mites with a dissecting microscope, unless higher magnification is needed. Make permanent slide mounts of worms, midges, and water mites as necessary from the 150-organism sample.

3.3.1.3. You may choose to separate the organisms into like groups. To do this, place the groups into smaller (60-mm diameter) individual petri dishes or Syracuse watch glasses, or group the animals within the larger dish.

3.3.1.4. Identify the organisms to the lowest practical taxonomic level, using the most appropriate identification reference for each group. See LT 7900 for guidance concerning "lowest practical taxonomic level". Enumerate organisms concurrently, and then place them back into the labeled vial with the forceps. Remove the animals as you count them in order to avoid counting any of them twice. It will take some time until sufficient experience with identification procedures and references is gained. In addition to the identification manuals, maintain a reference collection that can be used to compare specimens and facilitate identification. After using a dichotomous key to arrive at the name of an unknown organism, check the organism's geographic range, habitat preferences, and morphological diagnosis to confirm that the identification is correct. Do not identify an organism by simply flipping through some pictures and assigning a name based on a superficial resemblance. Another taxonomist will recheck sample identifications according to LQ 7000.

3.3.1.5. If a large number of one or a few taxa are present, use a laboratory counter to keep a running total to facilitate the enumeration process. Temporarily label counters to avoid mistakes. If you do not use a counter, tally the number of each taxon on your bench sheet.

3.3.1.6. If an organism is encountered in your laboratory for the first time, remove it and place it in an individual vial for inclusion in the reference collection. Make a note of this on the bench sheet, so that it can be located in the future, if necessary.

3.3.1.7. A compound microscope is required to identify worms, midges, and aquatic mites. Sometimes, parts of other organisms (e.g., mayfly labrums, etc.) must be mounted for proper identification. Most midges and mites can be recognized at 400x (40x objective and 10x eyepiece). Prepare specimens from these groups according to section 3.2.

3.3.1.8. If the structures that must be observed cannot be seen, use a 100x oil immersion objective. This procedure will give a magnification of 1000x.

3.3.1.9. Identify the specimens to the lowest practical taxonomic level. See LT 7900 for guidance concerning "lowest practical taxonomic level". Write the organism name or code directly on the slide label. If the specimen has no head or belongs to a group not classified as a benthic macroinvertebrate (e.g., nematode), draw a horizontal line through the slide label to indicate that it will not be counted. Specimens that are missing their heads are not counted. This situation will most often be encountered with the worms, as the heads are difficult to discern under the dissecting microscope when the pieces are mounted.

3.3.1.10. Record the individual taxon names and enumerate the organisms for each taxon on your bench sheet. Use of the laboratory counter will facilitate this operation, especially where large numbers of individuals are present.

3.3.1.11. Tally the number of organisms identified.

3.3.1.12. Follow proper Taxonomic Quality Assurance procedures (see LQ 7000).

4. DATA REDUCTION

4.1. For DEP staff, enter all data into SBIO (the Florida Statewide Biological Database).

5. INDEX CALCULATION

Perform the following calculations based on collapsed data as outlined in LT 7100, Section 4.2.

5.1. Calculate and record the biological metrics for long-lived and sensitive taxa according to LT 7100, Sections 5.1 and 5.2, respectively.

5.2. Calculate and record the % very tolerant taxa according to the taxa list below (based on Fore, 2007 with minor modifications). These taxa are identified as very tolerant to human disturbance. Synonyms in the current Florida database are also included as additional information.

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Order	Family	Genus	Taxon (very tolerant)	Synonyms
Basommatophora	Ancylidae	<i>Hebetancylus</i>	<i>Hebetancylus excentricus</i>	
		<i>Laevapex</i>	All species	
	Physidae	<i>Physella</i>	All species	
	Planorbidae		All genera and species	
Coleoptera	Haliplidae	<i>Peltodytes</i>	All species	
Diptera	Chironomidae	<i>Larsia</i>	All species	
		<i>Chironomus</i>	All species	<i>Tendipes</i> , <i>Chaetolabis</i>
		<i>Cladopelma</i>	<i>Cladopelma</i>	
		<i>Cricotopus</i>	All species	
		<i>Cryptochironomus</i>	All species	
		<i>Dicrotendipes</i>	<i>Dicrotendipes modestus</i> <i>Dicrotendipes neomodestus</i>	
		<i>Glyptotendipes</i>	All species	
		<i>Goeldichironomus</i>	All species	
		<i>Kiefferulus</i>	<i>Kiefferulus</i>	
			<i>Polypedilum beckae</i>	<i>Asheum beckae</i>
		<i>Polypedilum</i>		<i>Pedionomus beckae</i>
			<i>Polypedilum illinoiense</i> grp.	<i>Polypedilum illnoense</i>
		<i>Polypedilum</i>	<i>Polypedilum tritum</i>	<i>Chironomus tritum</i>
		<i>Tanypus</i>	All species	<i>Pelopia</i>
Diptera	Chironomidae	<i>Tanytarsus</i>	<i>Tanytarsus</i> sp. f epler	
		Stratiomyidae	<i>Odontomyia</i>	<i>Eulalia</i>
		Tipulidae	<i>Tipula</i>	<i>Nippotipula</i> <i>Playttipula</i> <i>Yamatotipula</i>
Haplotaxida	Naididae	<i>Bratislavia</i>	<i>Bratislavia unidentata</i>	
		<i>Dero</i>	All species	
		<i>Nais</i>	<i>Nais communis</i> complex	<i>Nais communis</i> <i>Nais elinguis</i> <i>Nais pardalis</i> <i>Nais variabilis</i>
Haplotaxida	Naididae	<i>Pristina</i>	<i>Pristina synclites</i>	

Order	Family	Genus	Taxon (very tolerant)	Synonyms
	Tubificidae	<i>Haber</i> <i>Limnodrilus</i>	<i>Haber speciosus</i> All species	<i>Camptodrilus</i>
Heteroptera	Mesoveliidae		All genera and species	
Hoplonemertea	Tetrastemmatidae	<i>Prostoma</i>	All species	
Lepidoptera	Pyralidae		All genera and species	
Lumbriculida	Lumbriculidae	<i>Lumbriculus</i>	All species	
Odonata	Libellulidae	<i>Pachydiplax</i>	All species	
	Coenagrionidae	<i>Argia</i> <i>Enallagma</i> <i>Ischnura</i>	<i>Argia sedula</i> <i>Enallagma cardenium</i> All species	<i>Enallagma coecum</i> <i>Anomalagrion</i>
Mesogastropoda	Hydrobiidae	<i>Pyrgophorus</i>	<i>Pyrgophorus platyrachis</i>	<i>Pyrogophorus platyrachis</i>
	Thiaridae	<i>Melanoides</i>	All species	
Rhynchobdellida	Glossiphoniidae		All genera and species	

5.3. Tally the numbers for taxa richness (total taxa), Ephemeroptera taxa, Trichoptera taxa, % Dominance, and % Tanytarsini.

5.4. Refer to Merritt and Cummins, An Introduction to the Aquatic Insects of North America to determine the number of clinger taxa and % filter feeders. For clinger taxa, include only those taxa whose sole habit is listed as “clinger”.

5.5. Evaluate and record the biological metrics according to the scoring system in Tables LT 7200-1, 7200-2 and 7200-3. See the SCI Primer (LT 7210, section 6, below).

LT 7210. REFERENCES

- Beckett, D.C. and Lewis, P.A., An Efficient Procedure for Slide Mounting of Larval Chironomidae, Trans. Amer. Microsc. Soc. V. 101, pp. 96-99, 1982.
- Epler, J., Identification Manual for the Larval Chironomidae (Diptera) of Florida, 1992.
- Pluchino, E., Guide to the Common Water Mite Genera of Florida, 1984.
- Merritt, R.W., and Cummins, K.W., An Introduction to the Aquatic Insects of North America, Third Edition, 1996.

5. Fore, L., R.B. Frydenborg, D. Miller, T. Frick, D. Whiting, J. Espy, and L. Wolfe.
Development and Testing of Biomonitoring Tools for Macroinvertebrates in Florida Streams.
Florida Department of Environmental Protection, 2007.
6. "Sampling and Use of the Stream Condition Index (SCI) for Assessing Flowing Waters: A Primer", FDEP, Environmental Assessment Section, Bureau of Laboratories, DEP/EA/002/07, June 2007

Appendix LT 7200
Tables, Figures and Forms

LT 7200-1

SCI metric scoring formulae for converting metric values to a metric score ranging from 0 to 10. In each equation, 'X' stands for the raw metric value; "ln" stands for the natural log.

SCI metric	Northeast	Panhandle	Peninsula
Total taxa	$10 * (X-16)/26$	$10 * (X-16)/33$	$10 * (X-16)/25$
Ephem. taxa	$10 * X /3.5$	$10 * X /6$	$10 * X /5$
Trichoptera taxa	$10 * X /6.5$	$10 * X /7$	$10 * X /7$
% Filterer	$10 * (X-1)/41$	$10 * (X-1)/44$	$10 * (X-1)/39$
Long-lived taxa	$10 * X /3$	$10 * X /5$	$10 * X /4$
Clinger taxa	$10 * X /9$	$10 * X /15.5$	$10 * X /8$
% Dominance	$10 - (10 * [(X-10)/44])$	$10 - (10 * [(X-10)/33])$	$10 - (10 * [(X-10)/44])$
% Tanytarsini	$10 * [\ln(X + 1) /3.3]$	$10 * [\ln(X + 1) /3.3]$	$10 * [\ln(X + 1) /3.3]$
Sensitive taxa	$10 * X /11$	$10 * X /19$	$10 * X /9$
% Very tolerant	$10 - (10 * [\ln(X + 1)/4.4])$	$10 - (10 * [\ln(X + 1)/3.6])$	$10 - (10 * [\ln(X + 1)/4.1])$

1. Follow Steps 2-5 for each of the two 150 aliquots. If there are less than two aliquots, stop at Step 1 and report a null result with a qualifier of "X" ("too few to calculate").
2. Determine the bioregion for the sample and calculate each of the 10 SCI metrics using the appropriate equation in the table above. Based on reference site community similarity, three SCI Bioregions have been established for Florida: the Panhandle, the Northeast, and the Peninsula. Note: The SCI is not calibrated for Ecoregion 76, the Southern Florida Coastal Plain, where few natural streams exist. 3. Change any of the resulting individual SCI metrics score that are >10 to 10 and any that are <0 to 0.
4. Sum the 10 SCI metric scores; check that the sum is between 0 and 90. If it is not, verify that the correct equations were used.
5. Divide the sum of scores by 0.9. Do not round the result to get the aliquot score.
6. Average the two aliquot scores from step 5 and round to the nearest integer (decimal portions <.50 round down; >=.50 round up). This value will be reported as the final score with an "A" qualifier (for "averaged value").
7. Use Table 7200-2 to assign a category to the result calculated in Step 6.

Table LT 7200-2

Category names, ranges of values for SCI, and example descriptions of biological conditions typically found for that category. Narrative metric descriptions are not used to score metrics, rather they describe values associated with a range of index values. The SCI 2004 category name is listed only for translating 2004 to 2007 category names and should not be used as an interpretation of SCI scores.

SCI Score	SCI 2007 Category Name	SCI 2004 Category Name (for reference only)	Example Description
68–100	Category 1 ("exceptional")	"Good"	Higher diversity of taxa than for Category 2, particularly for Ephemeroptera and Trichoptera; several more clinger and sensitive taxa than found in Category 2; high proportion for Tanytarsini; few individuals in the dominant taxon; very tolerant individuals make up a very small percentage of the assemblage.
48–67	Category 2 ("healthy")	"Fair"	Diverse assemblage with 30 different species found on average; several different taxa each of Ephemeroptera, Trichoptera, and long-lived and, on average, 5 unique clinger and 6 sensitive taxa routinely found; small increase in dominance by a single taxon relative to Category 1; very tolerant taxa represent a small percentage of individuals, but noticeably increased from Category 1.
35–47	Category 2 ("healthy")	"Poor"	Diverse assemblage with 30 different species found on average; several different taxa each of Ephemeroptera, Trichoptera, and long-lived and, on average, 5 unique clinger and 6 sensitive taxa routinely found; small increase in dominance by a single taxon relative to Category 1; very tolerant taxa represent a small percentage of individuals, but noticeably increased from Category 1.
0–34	Category 3 ("impaired")	"Poor" or "Very Poor"	Note: any score of 35 and above is not impaired using the current interpretation categories. Notable loss of taxonomic diversity; Ephemeroptera, Trichoptera, long-lived, clinger, and sensitive taxa uncommon or rare; half the number of filterers than expected; assemblage dominated by a tolerant taxon; very tolerant individuals represent a large proportion of the individuals collected.

LT 7300. Lake Condition Index (LCI) Determination

1. DEFINITION: The LCI is a community based biological assessment of lake health using benthic macroinvertebrates sampled via 12 deployments of an Ekman or petite Ponar dredge, with organisms identified to the lowest practical taxonomic level.
2. SAMPLING
 - 2.1. Perform physical/chemical characterization according to FT 3001.
 - 2.2. Perform a habitat assessment according to FT 3200.
 - 2.3. Conduct dredge sampling according to FS 7460.
3. LABORATORY ANALYSES
 - 3.1. Prepare the sample according to LT 7200, section 3.1.
 - 3.2. Prepare slides according to LT 7200, section 3.2.
 - 3.3. Identify the organisms according to LT 7200, section 3.3.
4. DATA REDUCTION
 - 4.1. For DEP staff, enter all data into the Florida Statewide Biological Database.
 - 4.2. Follow the counting and collapsing procedures listed in LT 7100 section 4.2.1-4.2.3.
 - 4.2.1. Keep a record of the original taxa list and the resulting collapsed list.
5. INDEX CALCULATION
 - 5.1. Calculate and record the Shannon-Weaver Diversity Index (SWDI) score according to the following definition: *The Shannon-Weaver Diversity Index is the negative summation (from $i = 1$ to s) of $(n_i/N) \log_2 n_i/N$, where s is the number of species in a sample, N is the total number of individuals in a sample, and n_i is the total number of individuals in species.*
 - 5.2. Calculate and record the Hulbert Index (HI) score according to the list below.

Hulbert Index = (# in Class A $\times$ 2) + # in Class B

Class A (2 points per taxon)

Hexagenia spp.
Ceratotina truncona (= *Polycentropus flavus*)
Orthotrichia spp.
Oxyethira spp.
Oecetis spp.
Palaemonetes paludosus
Chaoborus albatrus
Pagastiella spp.
Paralauterborniella nigrohalteralis
Pseudochironomus devinctus
Djalmabatista pulcher
Nilothauma spp.
Clinotanytus spp.
Stictochironomus devinctus
Cryptotendipes spp.
Ablabesmyia spp.

Class B (1 point per taxon)

Caenis spp.

Gammarus spp.
Hyalella azteca
Gomphus spp.
Aphylla williamsoni
Pachydiplax longipennis
Nectopsyche spp.
Byssanodonta cubensis (= *Eupera cubensis*)
Corbicula fluminea (= *C. manilensis*)
Unionidae
Campelema spp.
Procladius spp.
Polypedilum halterale group (= *P. digitifer*, *P. griseopunctatum*, *P. halterale*, and *P. simulans*)
Polypedilum illinoense group (= *P. illinoense*, *P. ophioides*, and several undescribed species)
Nimbecera pinderi (= *Tanytarsus limnetica*)
Einfeldia spp.

5.3. Calculate and record the solutions to formulae 5.3.1-5.3.6 below.

5.3.1. Taxa Score = $\text{MIN}(100, 100 \times \# \text{ Taxa} / 30.5)$

5.3.2. EOT (Ephemeroptera + Odonata + Trichoptera) Taxa Score = $\text{MIN}(100, 100 \times \# \text{ EOT Taxa} / 5.2)$

5.3.3. % EOT Score = $\text{MIN}(100, 100 \times \% \text{ EOT} / 34.4)$

5.3.4. % Diptera Score = $\text{MIN}(100, 100 \times (100 - \% \text{ Diptera}) / (100 - 13.6))$

5.3.5. SWDI Score = $\text{MIN}(100, 100 \times \text{SWDI} / 4.39)$

5.3.6. HI Score = $\text{MIN}(100, 100 \times \text{HI} / 17.4)$

5.4. Determine the LCI score by calculating the mean of the above six scores (5.3.1-5.3.6). Record the LCI score.

Appendix LT 7300
Tables, Figures and Forms

LT 7400. Algal Sensitivity Index Determination (*RESERVED*)

LT 7500. Lake Vegetation Index (LVI) Determination

1. **DEFINITION:** The LVI is a multimetric, community based biological assessment of lake health using aquatic plants. Macrophytes are identified to the lowest practical taxonomic level. The LVI procedure and calculations are described in "Fore, Leska S., Assessing the Biological Condition of Florida Lakes: Development of the Lake Vegetation Index (LVI), 2007."
2. **SAMPLING**
 - 2.1. Perform physical/chemical characterization according to FT 3001.
 - 2.2. Perform a lake habitat assessment according to FT 3200.
 - 2.3. Conduct macrophyte survey according to FS 7310.
3. **LABORATORY ANALYSES**
 - 3.1. Prepare unknowns for herbarium identification by an independent taxonomist or verification by a consulting botanist as voucher specimens.
 - 3.2. Identify and record the correct names of the unknown specimens on the Lake Vegetation Index Data Sheet.
 - 3.3. Follow quality assurance requirements addressed in FA 4330 and LQ 7310.
4. **DATA REDUCTION**
 - 4.1. For DEP staff, enter all data into the Florida Statewide Biological Database.
5. **INDEX CALCULATION**
 - 5.1. Calculate the % native taxa in a single sampling unit (pie slice) by dividing the number of native taxa by the total number of taxa in that sampling unit. Nativity status is determined by the Institute for Systematic Botany and is listed in Table 7500-1.
 - 5.2. Calculate the % invasive taxa in a single sampling unit (pie slice) by adding the number of FLEPPC Category I and II taxa and then dividing by the total number of taxa in that sampling unit. Category I and II lists are maintained by FLEPPC, the Florida Exotic Pest Plant Council, and are listed in Table 7500-1.
 - 5.3. Calculate the % sensitive taxa in a single sampling unit by summing the number of taxa with a C of C (Coefficient of Conservatism) score ≥ 7 and then dividing by the total number of taxa in that sampling unit. Refer to Table 7500-1 for a list of C of C scores.
 - 5.4. Calculate the Dominant C of C for a single sampling unit by inserting the C of C for the dominant taxon or the average C of C for the 2 co-dominant taxa. If no dominant taxon was identified, this metric will be null, not zero. Refer to Table 7500-1 for a list of C of C scores.
 - 5.5. Calculate the metrics according to the following table. If any result is less than zero, replace with zero, if a score is greater than 1, replace with 1. Make sure you use the correct equation for % sensitive taxa and dominant C of C, depending on the region in which the lake was located.

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Metric	5th %tile	95th %tile	Scoring rule
% Native taxa	54%	98%	$(x - 54)/44$
% Invasive taxa	0%	36%	$1 - (x/36)$
% Sensitive taxa			
North	0%	37%	$x/37$
South	0%	24%	$x/24$
Dominant C of C			
North	0	7.2	$x/7.2$
South	0	5.8	$x/5.8$

5.6. Average the results for the metrics within an individual sampling unit and multiply by 100. Note that you divide by 3 instead of 4 if the dominant (or co-dominant) C of C was not available. The result of this calculation must be between 0 and 100.

5.7. Average the LVI's determined for all the sampling units (four units are sampled) to calculate the final LVI score for the lake.

5.8. Evaluate the LVI according to the scoring system in the table below.

Aquatic life use category	LVI Range	Description
Category 1 "exceptional"	78–100	Nearly every macrophyte present is a species native to Florida, invasive taxa typically not found. About 30% of taxa present are identified as sensitive to disturbance and most taxa have C of C values >5.
Category 2 "healthy"	38–77	About 85% of macrophyte taxa are native to Florida; invasive taxa present. Sensitive taxa have declined to about 15% and C of C values average about 5.
Category 3 "impaired"	0–37	About 70% of macrophyte taxa are native to Florida. Invasive taxa may represent up to 1/3 of total taxa. Less than 10% of the taxa are sensitive and C of C values of most taxa are <4.

LT 7510. References

1. Fore, L. 2007. Assessing the Biological Condition of Florida Lakes: Development of the Lake Vegetation Index (LVI)
2. Institute for Systematic Botany website - <http://www.plantatlas.usf.edu/>
3. Florida Exotic Pest Plant Council website - <http://www.fleppc.org/>

Appendix LT 7500
Tables, Figures and Forms

Table 7500-1 Plant Attributes for LVI Calculation

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Table 7500-1 Plant Attributes for LVI Calculation

Scientific Name	C of C	Nativity	FLEPPC
Acalypha gracilens	3.29	Native	
Acer barbatum	7.7	Native	
Acer rubrum	4.65	Native	
Acer saccharinum	6.89	Native	
Acrostichum danaeifolium	5.79	Native	
Aeschynomene americana	2.47	Native	
Aeschynomene indica	0.49	Exotic	
Agalinis filifolia	6.69	Native	
Agalinis linifolia	7.04	Native	
Agalinis obtusifolia	6.5	Native	
Agarista populifolia	7.7	Native	
Albizia julibrissin	0	Exotic	Cat 1
Alternanthera philoxeroides	0	Exotic	Cat 2
Alternanthera sessilis	0.11	Exotic	
Alternanthera tenella	0	Exotic	
Amaranthus blitum	0	Exotic	
Amaranthus spinosus	0.04	Exotic	
Ambrosia artemisiifolia	0.95	Native	
Ammannia coccinea	5.06	Native	
Ammannia latifolia	4.55	Native	
Amorpha fruticosa	4.31	Native	
Ampelopsis arborea	3.25	Native	
Amphicarpum floridanum	5.7	Native	
Amphicarpum muhlenbergianum	5.7	Native	
Andropogon glomeratus	3.9	Native	
Andropogon gyrans stenophyllus	5	Native	
Andropogon liebmanii	6.13	Native	
Andropogon virginicus	3.44	Native	
Annona glabra	6.21	Native	
Apios americana	3.85	Native	
Aristida affinis	8.23	Native	
Aristida lanosa	8.73	Native	
Aristida palustris	8.54	Native	
Aristida patula	4.85	Native	
Aristida purpurascens	5.58	Native	
Aristida stricta	8.67	Native	
Aronia arbutifolia	5.2	Native	
Arundinaria gigantea	5.25	Native	
Arundo donax	0	Exotic	
Asclepias lanceolata	6.73	Native	
Aster carolinianus	3.93	Native	
Aster dumosus	2.53	Native	
Aster elliottii	6.76	Native	

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Table 7500-1 Plant Attributes for LVI Calculation

Scientific Name	C of C	Nativity	FLEPPC
Aster pilosus	2.38	Native	
Aster subulatus	5.74	Native	
Aster tortifolius	4.62	Native	
Axonopus affinis	1.89	Native	
Axonopus furcatus	2.12	Native	
Azolla caroliniana	1.81	Native	
Baccharis angustifolia	4.2	Native	
Baccharis glomeruliflora	6.12	Native	
Baccharis halimifolia	2.53	Native	
Bacopa caroliniana	5.31	Native	
Bacopa inominata	7.48	Native	
Bacopa monnieri	4.49	Native	
Bidens alba	1	Native	
Bidens laevis	7.19	Native	
Bidens mitis	6.31	Native	
Bidens pilosa	1.64	Exotic	
Bigelowia nudata	7.59	Native	
Blechnum serrulatum	7.15	Native	
Boehmeria cylindrica	5.91	Native	
Boltonia diffusa	4.96	Native	
Brachiaria mutica	0	Exotic	Cat 1
Brasenia schreberi	8.79	Native	
Burmannia capitata	8.13	Native	
Cabomba caroliniana	5.07	Native	
Callicarpa americana	3.2	Native	
Callistemon viminalis	0	Exotic	
Campsis radicans	2.53	Native	
Canna flaccida	6.75	Native	
Caperonia castaneifolia	4.94	Native	
Caperonia palustris	0.52	Exotic	
Cardamine pensylvanica	4.42	Native	
Carex alata	4.27	Native	
Carex albolutescens	3.47	Native	
Carex comosa	1.5	Native	
Carex fissa	3.9	Native	
Carex gigantea	5.07	Native	
Carex glaucescens	4.7	Native	
Carex longii	2.25	Native	
Carex lurida	4.29	Native	
Carex stipata	4.46	Native	
Carex verrucosa	7.97	Native	
Carex walteriana	4	Native	

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Table 7500-1 Plant Attributes for LVI Calculation

Scientific Name	C of C	Nativity	FLEPPC
Carphephorus odoratissimus	6.93	Native	
Carpinus caroliniana	6.5	Native	
Carya aquatica	6.64	Native	
Cassia	1.46	Unknown	
Cassytha filiformis	3.34	Native	
Casuarina equisetifolia	0	Exotic	Cat 1
Catalpa bignonioides	3.27	Native	
Celtis laevigata	5.08	Native	
Centella asiatica	1.92	Native	
Centella erecta	1.92	Native	
Cephalanthus occidentalis	6.99	Native	
Ceratophyllum demersum	4.16	Native	
Ceratopteris pteridoides	2.67	Native	
Ceratopteris thalictroides	2.93	Exotic	
Chamaecyparis thyoides	7.09	Native	
Chara	3.9	Native	
Chasmanthium laxum	7.37	Native	
Chenopodium album	0.78	Exotic	
Chenopodium ambrosioides	0.59	Exotic	
Chrysobalanus icaco	5.63	Native	
Chrysoma pauciflosculosa	4.4	Native	
Chrysopsis mariana	3.7	Native	
Cinnamomum camphora	0	Exotic	Cat 1
Cirsium nuttallii	3.08	Native	
Cladium jamaicense	9.04	Native	
Clethra alnifolia	5.63	Native	
Cliftonia monophylla	5.63	Native	
Coelorachis rugosa	8.91	Native	
Coelorachis tuberculosa	10	Native	
Colocasia esculenta	0	Exotic	Cat 1
Commelina	2	Unknown	
Commelina diffusa	2.02	Exotic	
Commelina erecta	2	Native	
Conoclinium coelestinum	4.37	Native	
Conyza canadensis	1.01	Native	
Coreopsis gladiata	4	Native	
Coreopsis leavenworthii	3.43	Native	
Coreopsis tinctoria	0.9	Native	
Cortaderia selloana	0	Exotic	
Crinum americanum	8.67	Native	
Crotalaria pallida	0	Exotic	
Crotalaria spectabilis	0	Exotic	
Cuphea carthagenensis	1.92	Exotic	
Cynodon dactylon	0.29	Exotic	

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LT 7000 Determination of Biological Indices

Table 7500-1 Plant Attributes for LVI Calculation

Scientific Name	C of C	Nativity	FLEPPC
Cyperus alternifolius	0	Exotic	Cat 2
Cyperus articulatus	6.64	Native	
Cyperus brevifolius	1.42	Native	
Cyperus compressus	2.74	Native	
Cyperus croceus	1.3	Native	
Cyperus difformis	0	Exotic	
Cyperus distinctus	5	Native	
Cyperus erythrorhizos	2.89	Native	
Cyperus esculentus	0	Exotic	
Cyperus flavescens	2.17	Native	
Cyperus globulosus	1.3	Native	
Cyperus haspan	5.68	Native	
Cyperus involucratus	0	Exotic	Cat 2
Cyperus iria	1.69	Exotic	
Cyperus lanceolatus	2.04	Exotic	
Cyperus lecontei	2.33	Native	
Cyperus ligularis	1.55	Native	
Cyperus odoratus	4.25	Native	
Cyperus papyrus	0.31	Exotic	
Cyperus polystachyos	1.56	Native	
Cyperus prolifer	0	Exotic	Cat 2
Cyperus retrorsus	1.79	Native	
Cyperus rotundus	0	Exotic	
Cyperus strigosus	4.49	Native	
Cyperus surinamensis	2.03	Native	
Cyperus virens	5.7	Native	
Cyrtilla racemiflora	5.2	Native	
Decodon verticillatus	7.8	Native	
Desmodium triflorum	0.43	Exotic	
Dichanthelium commutatum	7.57	Native	
Dichanthelium erectifolium	7.39	Native	
Dichanthelium laxiflorum	6.79	Native	
Dichanthelium scabriusculum	7.15	Native	
Dichromena colorata	6.18	Native	
Dichromena latifolia	6.62	Native	
Digitaria bicornis	0	Exotic	
Digitaria ciliaris	1.3	Native	
Digitaria serotina	1.39	Native	
Diodia virginiana	4.96	Native	
Dioscorea bulbifera	0	Exotic	Cat 1
Diospyros virginiana	5.76	Native	
Drosera brevifolia	8.21	Native	
Drosera capillaris	7.09	Native	
Drosera filiformis	6.5	Native	
Drosera intermedia	8.23	Native	

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Table 7500-1 Plant Attributes for LVI Calculation

Scientific Name	C of C	Nativity	FLEPPC
Drymaria cordata	2.72	Native	
Dulichium arundinaceum	7.31	Native	
Echinochloa colona	0.24	Exotic	
Echinochloa crusgalli	0.22	Exotic	
Echinochloa muricata	6.01	Native	
Echinochloa walteri	3.36	Native	
Eclipta alba	3.22	Native	
Eclipta prostrata	3.22	Native	
Egeria densa	0.49	Exotic	
Eichhornia crassipes	0	Exotic	Cat 1
Eleocharis acicularis	3.4	Native	
Eleocharis atropurpurea	5.69	Native	
Eleocharis baldwinii	2.82	Native	
Eleocharis cellulosa	7.8	Native	
Eleocharis confervoides	4	Native	
Eleocharis elongata	6.97	Native	
Eleocharis equisetoides	9.1	Native	
Eleocharis flavescens	2.1	Native	
Eleocharis interstincta	7.8	Native	
Eleocharis melanocarpa	1.83	Native	
Eleocharis microcarpa	5.78	Native	
Eleocharis montana	3.17	Native	
Eleocharis montevidensis	5.2	Native	
Eleocharis olivacea	1.4	Native	
Eleocharis quadrangulata	2.5	Native	
Eleocharis robbinsii	8	Native	
Eleocharis vivipara	3.81	Native	
Elephantopus elatus	2.72	Native	
Eleusine indica	0	Exotic	
Eragrostis atrovirens	1.58	Exotic	
Eragrostis elliottii	4.14	Native	
Eragrostis spectabilis	3.44	Native	
Erechtites hieracifolia	1.37	Native	
Erechtites hieraciifolia	1.37	Native	
Erianthus giganteus	6.34	Native	
Erigeron quercifolius	3.31	Native	
Eriocaulon compressum	7.5	Native	
Eriocaulon decangulare	7.5	Native	
Eriocaulon lineare	6	Native	
Eriocaulon ravenelii	5.9	Native	
Eupatorium capillifolium	0.83	Native	
Eupatorium compositifolium	2.72	Native	
Eupatorium leptophyllum	4.94	Native	
Eupatorium mikanioides	5.08	Native	
Eupatorium mohrii	6.87	Native	
Eupatorium perfoliatum	5.85	Native	

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Table 7500-1 Plant Attributes for LVI Calculation

Scientific Name	C of C	Nativity	FLEPPC
Eupatorium recurvans	6.87	Native	
Eupatorium serotinum	3.43	Native	
Eustachys petraea	1.93	Native	
Euthamia caroliniana	3.25	Native	
Euthamia minor	1.64	Native	
Euthamia tenuifolia	3.25	Native	
Euthamia tenuifolia tenuifolia	3.25	Native	
Fatsia japonica	0	Exotic	
Ficus aurea	3.38	Native	
Ficus microcarpa	0	Exotic	Cat 1
Fimbristylis autumnalis	2.17	Native	
Fimbristylis castanea	4.92	Native	
Fimbristylis dichotoma	3.55	Native	
Fimbristylis miliacea	1.95	Exotic	
Fraxinus americana	5.27	Native	
Fraxinus caroliniana	5.21	Native	
Froelichia floridana	3.21	Native	
Fuirena breviseta	7.6	Native	
Fuirena pumila	5.92	Native	
Fuirena scirpoidea	6.5	Native	
Fuirena squarrosa	2.67	Native	
Galium pilosum	4.77	Native	
Galium tinctorium	5.08	Native	
Galium uniflorum	5.8	Native	
Gaylussacia dumosa	5.44	Native	
Gelsemium sempervirens	3.9	Native	
Gomphrena serrata	0.87	Exotic	
Gordonia lasianthus	9.03	Native	
Gratiola pilosa	6.63	Native	
Gratiola ramosa	6.87	Native	
Habenaria repens	4.58	Native	
Hedyotis corymbosa	2.31	Exotic	
Helianthus floridanus	5.85	Native	
Hibiscus coccineus	5.45	Native	
Hibiscus furcellatus	3.89	Native	
Hibiscus grandiflorus	6.86	Native	
Hieracium	5.2	Unknown	
Hydrilla verticillata	0	Exotic	Cat 1
Hydrochloa caroliniensis	4.79	Native	
Hydrocotyle	2	Native	
Hydrocotyle ranunculoides	2.75	Native	
Hydrocotyle umbellata	1.92	Native	
Hydrolea corymbosa	5.85	Native	
Hydrolea quadrivalvis	2	Native	

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Table 7500-1 Plant Attributes for LVI Calculation

Scientific Name	C of C	Nativity	FLEPPC
Hygrophila polysperma	0	Exotic	Cat 1
Hymenachne amplexicaulis	0	Exotic	Cat 1
Hypericum brachyphyllum	7.55	Native	
Hypericum chapmanii	5.8	Native	
Hypericum cistifolium	6.32	Native	
Hypericum fasciculatum	7.27	Native	
Hypericum gymnanthum	4.75	Native	
Hypericum hypericoides	5.44	Native	
Hypericum lissophloeus	7.56	Native	
Hypericum mutilum	4.04	Native	
Hypericum myrtifolium	6.56	Native	
Hypericum reductum	5	Native	
Hypericum tetrapetalum	6.38	Native	
Hypoxis	7.15	Native	
Hyptis alata	4.58	Native	
Ilex cassine	7.66	Native	
Ilex coriacea	3.1	Native	
Ilex glabra	5.85	Native	
Ilex myrtifolia	5.7	Native	
Ilex opaca	4.55	Native	
Ilex vomitoria	3	Native	
Imperata cylindrica	0	Exotic	Cat 1
Ipomoea aquatica	0	Exotic	Cat 1
Ipomoea carnea fistulosa	0	Exotic	Cat 2
Ipomoea indica	1.23	Native	
Ipomoea quamoclit	0.26	Exotic	
Ipomoea sagittata	6.42	Native	
Iris hexagona	6.97	Native	
Iris pseudacorus	0	Exotic	
Itea virginica	7.09	Native	
Iva frutescens	5.08	Native	
Iva microcephala	4.68	Native	
Juncus abortivus	2	Native	
Juncus acuminatus	2.25	Native	
Juncus coriaceus	8.51	Native	
Juncus effusus	3.25	Native	
Juncus elliotii	3.11	Native	
Juncus marginatus	3.65	Native	
Juncus megacephalus	5.7	Native	
Juncus polycephalus	4.96	Native	
Juncus repens	6.91	Native	
Juncus roemerianus	7.09	Native	
Juncus scirpoides	4.33	Native	
Juniperus siliciola	6.25	Native	
Juniperus virginiana	6.25	Native	

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Table 7500-1 Plant Attributes for LVI Calculation

Scientific Name	C of C	Nativity	FLEPPC
Justicia ovata	8.88	Native	
Kosteletzkya virginica	7.49	Native	
Kummerowia striata	0	Exotic	
Kyllinga brevifolia	1.42	Native	
Kyllinga pumila	1.38	Native	
Lachnanthes caroliana	3.76	Native	
Lachnocaulon anceps	7.15	Native	
Lachnocaulon beyrichianum	9.18	Native	
Lachnocaulon minus	7.97	Native	
Lechea cernua	8.67	Native	
Leersia hexandra	5.61	Native	
Lemna minor	3.77	Native	
Leptochloa fascicularis	4.55	Native	
Leucothoe racemosa	9.44	Native	
Ligustrum sinense	0	Exotic	Cat 1
Limnobia spongia	4.79	Native	
Limnophila sessiliflora	0	Exotic	Cat 2
Lindernia anagallidea	5.57	Native	
Lindernia crustacea	0.27	Exotic	
Lindernia grandiflora	3.6	Native	
Lipocarpha maculata	4.55	Native	
Liquidambar styraciflua	5.56	Native	
Lobelia glandulosa	6.03	Native	
Lobelia paludosa	8.08	Native	
Ludwigia alata	5.85	Native	
Ludwigia alternifolia	6.24	Native	
Ludwigia arcuata	5.32	Native	
Ludwigia decurrens	6.76	Native	
Ludwigia erecta	2.55	Native	
Ludwigia grandiflora	1.44	Exotic	
Ludwigia hexapetala	1.43	Exotic	
Ludwigia lanceolata	6.15	Native	
Ludwigia leptocarpa	3.47	Native	
Ludwigia linearis	5.72	Native	
Ludwigia linifolia	7.04	Native	
Ludwigia maritima	5.85	Native	
Ludwigia microcarpa	4.81	Native	
Ludwigia octovalvis	4.09	Native	
Ludwigia palustris	4.77	Native	
Ludwigia peploides	2.33	Native	
Ludwigia peruviana	0.62	Exotic	Cat 1
Ludwigia pilosa	6.99	Native	
Ludwigia repens	5.2	Native	
Ludwigia sphaerocarpa	2.5	Native	
Ludwigia suffruticosa	6.23	Native	

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Table 7500-1 Plant Attributes for LVI Calculation

Scientific Name	C of C	Nativity	FLEPPC
Ludwigia virgata	6.73	Native	
Luziola fluitans	4.79	Native	
Lycopodiella alopecuroides	5.27	Native	
Lycopodium alopecuroides	5.75	Native	
Lycopodium appressum	7.89	Native	
Lycopus americanus	3.17	Native	
Lycopus amplexans	2.88	Native	
Lycopus rubellus	6.75	Native	
Lycopus virginicus	3.67	Native	
Lygodium japonicum	0	Exotic	Cat 1
Lygodium microphyllum	0	Exotic	Cat 1
Lyonia ferruginea	8.39	Native	
Lyonia fruticosa	5.93	Native	
Lyonia ligustrina	8.67	Native	
Lyonia lucida	7.06	Native	
Lyonia mariana	4.8	Native	
Lythrum alatum	3.55	Native	
Lythrum lineare	3.82	Native	
Macroptilium lathyroides	0.41	Exotic	
Magnolia grandiflora	4.36	Native	
Magnolia virginiana	9.44	Native	
Mayaca fluviatilis	8.45	Native	
Melaleuca quinquenervia	0	Exotic	Cat 1
Melanthra nivea	6.07	Native	
Melia azedarach	0	Exotic	Cat 2
Melinis repens	0	Exotic	Cat 1
Melochia corchorifolia	2.24	Exotic	
Melothria pendula	3.31	Native	
Micranthemum glomeratum	5.85	Native	
Micranthemum umbrosum	5.66	Native	
Micromeria brownei	6.34	Native	
Mikania scandens	1.95	Native	
Mimosa pigra	0	Exotic	Cat 1
Mitchella repens	7.37	Native	
Mitreola petiolata	5.41	Native	
Mollugo verticillata	1.3	Exotic	
Muhlenbergia capillaris	5.43	Native	
Murdannia keisak	2.34	Exotic	
Murdannia nudiflora	1.42	Exotic	
Musa sapientum	0	Exotic	
Musa sapientum paradisiaca	0	Exotic	
Myrica cerifera	3.82	Native	
Myriophyllum aquaticum	0.98	Exotic	
Myriophyllum heterophyllum	4.77	Native	

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Table 7500-1 Plant Attributes for LVI Calculation

Scientific Name	C of C	Nativity	FLEPPC
Myriophyllum laxum	5.85	Native	
Myriophyllum pinnatum	5.85	Native	
Myriophyllum spicatum	0	Exotic	Cat 2
Najas filifolia	8.45	Native	
Najas gracillima	3	Native	
Najas guadalupensis	5.07	Native	
Najas marina	7.15	Native	
Najas minor	3.64	Exotic	
Nasturtium officinale	2.93	Exotic	
Nelumbo lutea	6.26	Native	
Nitella	7.28	Native	
Nuphar	4.64	Native	
Nuphar advena	4.64	Native	
Nymphaea mexicana	8.61	Native	
Nymphaea odorata	6.99	Native	
Nymphoides aquatica	6.09	Native	
Nyssa sylvatica biflora	9.04	Native	
Orontium aquaticum	8.39	Native	
Osmunda cinnamomea	6.44	Native	
Osmunda regalis	8.04	Native	
Ostrya virginiana	5.91	Native	
Oxalis corniculata	1.37	Native	
Oxypolis filiformis	8.69	Native	
Panicum abscissum	9.22	Native	
Panicum anceps	4.61	Native	
Panicum chamaelonche	7.69	Native	
Panicum dichotomiflorum	4.96	Native	
Panicum dichotomum	5.61	Native	
Panicum ensifolium	6.5	Native	
Panicum erectifolium	7.39	Native	
Panicum hemitomon	5.82	Native	
Panicum hians	6.63	Native	
Panicum maximum	0	Exotic	Cat 2
Panicum repens	0	Exotic	Cat 1
Panicum rigidulum	5.47	Native	
Panicum scabriusculum	7.15	Native	
Panicum spretum	6.63	Native	
Panicum tenerum	8.67	Native	
Panicum verrucosum	6.83	Native	
Panicum virgatum	5.44	Native	
Parthenocissus quinquefolia	3.43	Native	
Paspalidium geminatum	6.36	Native	
Paspalum acuminatum	1.06	Exotic	
Paspalum conjugatum	3.84	Exotic	
Paspalum dilatatum	4.33	Exotic	

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Table 7500-1 Plant Attributes for LVI Calculation

Scientific Name	C of C	Nativity	FLEPPC
Paspalum distichum	5.54	Native	
Paspalum floridanum	6.11	Native	
Paspalum laeve	5.79	Native	
Paspalum monostachyum	9.8	Native	
Paspalum notatum	0.14	Exotic	
Paspalum praecox	6.5	Native	
Paspalum repens	6.69	Native	
Paspalum setaceum	3.44	Native	
Paspalum urvillei	0	Exotic	
Passiflora incarnata	2.89	Native	
Peltandra	7.31	Native	
Peltandra virginica	7.31	Native	
Pennisetum	2.79	Exotic	
Pennisetum purpureum	0	Exotic	Cat 1
Persea borbonia	8.02	Native	
Persea borbonia humilis	7.43	Native	
Persea palustris	8.31	Native	
Phlebodium aureum	6.85	Native	
Phragmites australis	4.39	Exotic	
Phragmites communis	4.39	Exotic	
Phyla nodiflora	1.92	Native	
Phyllanthus urinaria	0.22	Exotic	
Physalis	2.04	Native	
Phytolacca americana	2.09	Native	
Pinus echinata	2.78	Native	
Pinus elliotii	4.21	Native	
Pinus glabra	5	Native	
Pinus palustris	4.77	Native	
Pinus taeda	5.34	Native	
Pistia stratiotes	0	Exotic	Cat 1
Platanus occidentalis	4.36	Native	
Pluchea camphorata	3	Native	
Pluchea foetida	6.65	Native	
Pluchea longifolia	5.85	Native	
Pluchea odorata	4.96	Native	
Pluchea rosea	5.45	Native	
Poinsettia cyathophora	1.57	Native	
Polygala cymosa	7.67	Native	
Polygala rugelii	8.17	Native	
Polygonella gracilis	4.77	Native	
Polygonum densiflorum	5.32	Native	
Polygonum hirsutum	8.17	Native	
Polygonum hydropiperoides	4.02	Native	
Polygonum lapathifolium	1.95	Exotic	

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Table 7500-1 Plant Attributes for LVI Calculation

Scientific Name	C of C	Nativity	FLEPPC
Polygonum meisnerianum	3	Native	
Polygonum meisnerianum beyrichianum	3	Native	
Polygonum punctatum	4.02	Native	
Polygonum virginianum	2.75	Native	
Polypogon monspeliensis	1	Exotic	
Polypremum procumbens	1.71	Native	
Pontederia cordata	5.38	Native	
Pontederia rotundifolia	0	Exotic	
Portulaca amilis	0.87	Exotic	
Potamogeton diversifolius	7.15	Native	
Potamogeton illinoensis	6.64	Native	
Potamogeton pectinatus	7.8	Native	
Potamogeton pusillus	7.8	Native	
Proserpinaca palustris	5.85	Native	
Proserpinaca pectinata	5.5	Native	
Prunus caroliniana	4.03	Native	
Prunus serotina	3.9	Native	
Psilocarya nitens	5.2	Native	
Psilocarya scirpoides	3.29	Native	
Pteridium aquilinum	3.9	Native	
Pteris tripartita	0.27	Exotic	
Ptilimnium capillaceum	2.73	Native	
Quercus laurifolia	5.14	Native	
Quercus nigra	4.14	Native	
Quercus virginiana	4.85	Native	
Rhexia alifanus	4.6	Native	
Rhexia cubensis	7.22	Native	
Rhexia mariana	5.5	Native	
Rhexia nashii	7.8	Native	
Rhexia nuttallii	7.93	Native	
Rhexia petiolata	7.9	Native	
Rhexia virginica	3.8	Native	
Rhodomyrtus tomentosa	0	Exotic	Cat 1
Rhus copallinum	3.65	Native	
Rhynchelytrum repens	0	Exotic	Cat 1
Rhynchospora baldwinii	6.44	Native	
Rhynchospora caduca	7.61	Native	
Rhynchospora cephalantha	6.19	Native	
Rhynchospora chalarocephala	1.88	Native	
Rhynchospora corniculata	4.43	Native	
Rhynchospora curtissii	3.75	Native	
Rhynchospora debilis	7.8	Native	
Rhynchospora divergens	5.53	Native	
Rhynchospora fascicularis	5.92	Native	

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Table 7500-1 Plant Attributes for LVI Calculation

Scientific Name	C of C	Nativity	FLEPPC
Rhynchospora fernaldii	4.77	Native	
Rhynchospora filifolia	8.13	Native	
Rhynchospora globularis	3.45	Native	
Rhynchospora inundata	7.25	Native	
Rhynchospora microcarpa	5.29	Native	
Rhynchospora microcephala	6.5	Native	
Rhynchospora nitens	5.2	Native	
Rhynchospora perplexa	5.2	Native	
Rhynchospora pleiantha	4.63	Native	
Rhynchospora pusilla	7.54	Native	
Rhynchospora rariflora	8.63	Native	
Rhynchospora scirpoides	5.43	Native	
Rhynchospora tracyi	9.03	Native	
Rhynchospora wrightiana	7.8	Native	
Ricciocarpus natans	1	Native	
Richardia scabra	0	Exotic	
Ricinus communis	0	Exotic	Cat 2
Rorippa nasturtium-aquaticum	2.93	Exotic	
Rorippa teres	4.2	Native	
Rosa palustris	6.01	Native	
Rubus argutus	3.56	Native	
Rubus cuneifolius	3.9	Native	
Rubus trivialis	2.6	Native	
Rumex	2.23	Unknown	
Rumex crispus	0	Exotic	
Ruppia maritima	7.24	Native	
Sabal palmetto	4.85	Native	
Sabatia brevifolia	7.8	Native	
Sabatia campanulata	4.4	Native	
Sabatia grandiflora	7.09	Native	
Saccharum giganteum	6.34	Native	
Sacciolepis indica	0.92	Exotic	
Sacciolepis striata	5.35	Native	
Sagittaria filiformis	6.76	Native	
Sagittaria graminea	5.53	Native	
Sagittaria isoetiformis	5.8	Native	
Sagittaria kurziana	9.75	Native	
Sagittaria lancifolia	4.96	Native	
Sagittaria latifolia	6.5	Native	
Sagittaria stagnorum	7.24	Native	
Sagittaria subulata	5	Native	
Salix babylonica	0	Exotic	
Salix caroliniana	2.95	Native	
Salix eriocephala	4	Native	
Salix floridana	9	Native	
Salvinia minima	2.03	Exotic	

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Table 7500-1 Plant Attributes for LVI Calculation

Scientific Name	C of C	Nativity	FLEPPC
Sambucus canadensis	1.48	Native	
Samolus	5.67	Native	
Sapium sebiferum	0	Exotic	Cat 1
Sarcostemma clausum	3.81	Native	
Saururus cernuus	7.33	Native	
Schinus terebinthifolius	0	Exotic	Cat 1
Schizachyrium scoparium	5.44	Native	
Schoenolirion albiflorum	9.1	Native	
Scirpus americanus	6.5	Native	
Scirpus californicus	6.01	Native	
Scirpus cubensis	3.77	Exotic	
Scirpus cyperinus	3.5	Native	
Scirpus pungens	4	Native	
Scirpus validus	5.55	Native	
Scleria baldwinii	8.67	Native	
Scleria georgiana	8.78	Native	
Scleria reticularis	6.79	Native	
Scleria triglomerata	6.74	Native	
Scoparia dulcis	2.36	Native	
Senna obtusifolia	1.01	Exotic	
Senna occidentalis	0.37	Exotic	
Serenoa repens	7.03	Native	
Sesbania drummondii	1.8	Native	
Sesbania herbacea	1.5	Native	
Sesbania punicea	0	Exotic	Cat 2
Sesbania vesicaria	1.44	Native	
Setaria geniculata	3.4	Native	
Setaria magna	3.25	Native	
Setaria parviflora	3.4	Native	
Sida rhombifolia	1.65	Native	
Smilax auriculata	3.96	Native	
Smilax bona-nox	3.78	Native	
Smilax glauca	2.7	Native	
Smilax laurifolia	4	Native	
Smilax pumila	6.01	Native	
Solanum americanum	1.16	Native	
Solanum carolinense	2.13	Native	
Solanum tampicense	0	Exotic	Cat 1
Solanum viarum	0	Exotic	Cat 1
Solidago canadensis	2.45	Native	
Solidago elliotii	2.57	Native	
Solidago fistulosa	4.49	Native	
Solidago latissimifolia	7.45	Native	

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Table 7500-1 Plant Attributes for LVI Calculation

Scientific Name	C of C	Nativity	FLEPPC
Solidago leavenworthii	2.73	Native	
Solidago sempervirens	4.36	Native	
Solidago stricta	5.49	Native	
Solidago tortifolia	6.96	Native	
Sorghastrum secundum	7.73	Native	
Sorghum bicolor	0.11	Exotic	
Sparganium americanum	6.5	Native	
Spartina alterniflora	7.94	Native	
Spartina bakeri	5.98	Native	
Spartina patens	5.23	Native	
Spermacoce assurgens	3.09	Native	
Sphagnum	7.43	Native	
Spilanthes americana	7.08	Native	
Spirodela polyrhiza	2.95	Native	
Spirodela punctata	0.25	Exotic	
Sporobolus domingensis	2.47	Native	
Sporobolus indicus	0.99	Exotic	
Steinchisma hians	6.63	Native	
Stenotaphrum secundatum	1.57	Native	
Stillingia aquatica	8.32	Native	
Stillingia sylvatica	7.3	Native	
Syngonanthus flavidulus	6.93	Native	
Syzygium cumini	0	Exotic	Cat 1
Taxodium	7.2	Native	
Taxodium ascendens	7.21	Native	
Taxodium distichum	7.21	Native	
Teucrium canadense	6.44	Native	
Thalia geniculata	7.12	Native	
Thelypteris dentata	1.62	Exotic	
Thelypteris interrupta	6.74	Native	
Thelypteris palustris pubescens	5.31	Native	
Thespesia populnea	0	Exotic	Cat 1
Tilia americana	5.55	Native	
Toxicodendron radicans	1.44	Native	
Toxicodendron vernix	6.64	Native	
Tradescantia zebrina	0	Exotic	
Triadenum virginicum	8.16	Native	
Triadenum walteri	7.92	Native	
Trifolium	1.49	Unknown	
Tripsacum dactyloides	6.03	Native	
Typha	0.8	Native	
Typha domingensis	0.59	Native	

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Table 7500-1 Plant Attributes for LVI Calculation

Scientific Name	C of C	Nativity	FLEPPC
Typha latifolia	1.6	Native	
Ulmus americana	7.68	Native	
Uniola paniculata	6.43	Native	
Urena lobata	0	Exotic	Cat 2
Utricularia biflora	6.37	Native	
Utricularia cornuta	7.46	Native	
Utricularia fibrosa	6.37	Native	
Utricularia floridana	6.34	Native	
Utricularia foliosa	6.44	Native	
Utricularia gibba	6.37	Native	
Utricularia inflata	5.85	Native	
Utricularia juncea	6.24	Native	
Utricularia obtusa	6.37	Native	
Utricularia olivacea	3.33	Native	
Utricularia purpurea	6.5	Native	
Utricularia radiata	6.01	Native	
Utricularia resupinata	5.46	Native	
Utricularia subulata	7.23	Native	
Vaccinium corymbosum	5.63	Native	
Vaccinium darrowii	7.15	Native	
Vaccinium elliotii	4	Native	
Vaccinium myrsinites	5.64	Native	
Vallisneria americana	6.99	Native	
Verbena bonariensis	0.56	Exotic	
Verbena brasiliensis	0.35	Exotic	
Viburnum nudum	5.55	Native	
Vigna luteola	2.31	Native	
Viola lanceolata	5.32	Native	
Viola primulifolia	6.11	Native	
Vitis aestivalis	2.48	Native	
Vitis rotundifolia	1.18	Native	
Websteria confervoides	4	Native	
Wedelia trilobata	0	Exotic	Cat 2
Wolffiella	4.37	Native	
Woodwardia areolata	7.68	Native	
Woodwardia virginica	6.5	Native	
Xanthosoma sagittifolium	0	Exotic	Cat 2
Xyris ambigua	6.43	Native	
Xyris baldwiniana	6.97	Native	
Xyris brevifolia	7.2	Native	
Xyris caroliniana	6.14	Native	
Xyris difformis	7.5	Native	
Xyris elliotii	6.69	Native	

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Table 7500-1 Plant Attributes for LVI Calculation

Scientific Name	C of C	Nativity	FLEPPC
Xyris fimbriata	7.08	Native	
Xyris flabelliformis	7.43	Native	
Xyris jupicai	3.51	Native	
Xyris platylepis	5.32	Native	
Xyris smalliana	7.8	Native	
Zingiber	0	Unknown	
Zizania aquatica	6.69	Native	
Zizaniopsis miliacea	6.21	Native	

LT 7600. Reserved

LT 7700. Reserved

LT 7800. Reserved

**LT 7900. Taxonomic Effort for Freshwater Macroinvertebrate
Identifications**

The table below is intended to provide guidance on defining lowest practical taxonomic level for freshwater taxa. Identify organisms at least to this level unless specified by another method (e.g., the Biorecon procedure specifies a reduced taxonomic effort for worms, mites and midges). Recommended taxonomic references are available on the DEP Bureau of Laboratories website.

Table LT 7900-1

Phylum	Class	Order	Family	Genus	Species	ID Level
Annelida	Branchiobdellida					Order
Annelida	Hirudinea					Genus
Annelida	Hirudinea	Rhynchobdellida	Glossiphoniidae	Gloiobdella	elongata	Species
Annelida	Hirudinea	Rhynchobdellida	Glossiphoniidae	Helobdella		Species
Annelida	Oligochaeta					Species
Annelida	Oligochaeta	Tubificida	Naididae	Dero	digitata complex	Complex
Annelida	Oligochaeta	Tubificida	Naididae	Nais	communis complex	Complex
Arthropoda	Arachnida	Acariformes				Genus
Arthropoda	Arachnida	Oribatida				Order
Arthropoda	Hexapoda	Coleoptera				Genus
Arthropoda	Hexapoda	Coleoptera	Chelonariidae			Family
Arthropoda	Hexapoda	Coleoptera	Chrysomelidae			Family
Arthropoda	Hexapoda	Coleoptera	Curculionidae			Family
Arthropoda	Hexapoda	Coleoptera	Dryopidae			Family
Arthropoda	Hexapoda	Coleoptera	Elmidae			Genus
Arthropoda	Hexapoda	Coleoptera	Elmidae	Ancyronyx	variegatus	Species
Arthropoda	Hexapoda	Coleoptera	Elmidae	Dubiraphia	vittata	Species
Arthropoda	Hexapoda	Coleoptera	Elmidae	Gonielmis	dietrichi	Species
Arthropoda	Hexapoda	Coleoptera	Elmidae	Macronychus	glabratus	Species
Arthropoda	Hexapoda	Coleoptera	Elmidae	Microcylloepus	pusillus	Species
Arthropoda	Hexapoda	Coleoptera	Elmidae	Oulimnius	latiusculus	Species
Arthropoda	Hexapoda	Coleoptera	Elmidae	Promoresia		Species

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Phylum	Class	Order	Family	Genus	Species	ID Level
Arthropoda	Hexapoda	Coleoptera	Gyrinidae	Gyretes	iricolor	Species
Arthropoda	Hexapoda	Coleoptera	Hydrophilidae	Derallus	altus	Species
Arthropoda	Hexapoda	Coleoptera	Hydrophilidae	Dibolocelus	ovatus	Species
Arthropoda	Hexapoda	Coleoptera	Hydrophilidae	Helobata	lavalis	Species
Arthropoda	Hexapoda	Coleoptera	Hydrophilidae	Helobata	striata	Species
Arthropoda	Hexapoda	Coleoptera	Hydrophilidae	Hydrobiomorpha	castus	Species
Arthropoda	Hexapoda	Coleoptera	Hydrophilidae	Hydrobius	tumidus	Species
Arthropoda	Hexapoda	Coleoptera	Hydrophilidae	Sperchopsis	tessellatus	Species
Arthropoda	Hexapoda	Coleoptera	Noteridae	Suphis	inflatus	Species
Arthropoda	Hexapoda	Coleoptera	Staphylinidae			Family
Arthropoda	Hexapoda	Collembola				Order
Arthropoda	Hexapoda	Diptera				Genus
Arthropoda	Hexapoda	Diptera	Ceratopogonidae			Family
Arthropoda	Hexapoda	Diptera	Ceratopogonidae	Atrichopogon		Genus
Arthropoda	Hexapoda	Diptera	Ceratopogonidae	Dasyhelea		Genus
Arthropoda	Hexapoda	Diptera	Ceratopogonidae	Palpomyia/bezzia	grp.	Genus
Arthropoda	Hexapoda	Diptera	Chironomidae			Genus
Arthropoda	Hexapoda	Diptera	Chironomidae	Ablabesmyia		Species
Arthropoda	Hexapoda	Diptera	Chironomidae	Ablabesmyia	(Karelia) grp.	group
Arthropoda	Hexapoda	Diptera	Chironomidae	Ablabesmyia	rhamphe grp.	group
Arthropoda	Hexapoda	Diptera	Chironomidae	Alotanypus		Species
Arthropoda	Hexapoda	Diptera	Chironomidae	Antillocladius		Genus
Arthropoda	Hexapoda	Diptera	Chironomidae	Apedilum	elachista	Species
Arthropoda	Hexapoda	Diptera	Chironomidae	Apsectrotanypus		Species
Arthropoda	Hexapoda	Diptera	Chironomidae	Brillia		Species
Arthropoda	Hexapoda	Diptera	Chironomidae	Conchapelopia	Thienemannimyia grp.	group
Arthropoda	Hexapoda	Diptera	Chironomidae	Cricotopus	bicinctus	Species
Arthropoda	Hexapoda	Diptera	Chironomidae	Cricotopus	sylvestris grp.	group
Arthropoda	Hexapoda	Diptera	Chironomidae	Cricotopus	trifascia	Species
Arthropoda	Hexapoda	Diptera	Chironomidae	Cricotopus or Orthocladius		Genus gr.
Arthropoda	Hexapoda	Diptera	Chironomidae	Demicryptochironomus		Species
Arthropoda	Hexapoda	Diptera	Chironomidae	Dicrotendipes		Species
Arthropoda	Hexapoda	Diptera	Chironomidae	Djalmabatista		Species
Arthropoda	Hexapoda	Diptera	Chironomidae	Einfeldia		Species
Arthropoda	Hexapoda	Diptera	Chironomidae	Endotribelos	hesperium	Species

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Phylum	Class	Order	Family	Genus	Species	ID Level
Arthropoda	Hexapoda	Diptera	Chironomidae	Eukiefferiella		group
Arthropoda	Hexapoda	Diptera	Chironomidae	Fittkauimyia		Species
Arthropoda	Hexapoda	Diptera	Chironomidae	Glyptotendipes	paripes	Species
Arthropoda	Hexapoda	Diptera	Chironomidae	Goeldichironomus		Species
Arthropoda	Hexapoda	Diptera	Chironomidae	Guttipelopia		Species
Arthropoda	Hexapoda	Diptera	Chironomidae	Hayesomyia	Thienemannimyia grp.	group
Arthropoda	Hexapoda	Diptera	Chironomidae	Helopelopia	Thienemannimyia grp.	group
Arthropoda	Hexapoda	Diptera	Chironomidae	Heterotrissocladius		Species
Arthropoda	Hexapoda	Diptera	Chironomidae	Krenopelopia		Species
Arthropoda	Hexapoda	Diptera	Chironomidae	Labrundinia		Species
Arthropoda	Hexapoda	Diptera	Chironomidae	Larsia		Species
Arthropoda	Hexapoda	Diptera	Chironomidae	Lauterborniella		Species
Arthropoda	Hexapoda	Diptera	Chironomidae	Meropelopia	Thienemannimyia grp.	group
Arthropoda	Hexapoda	Diptera	Chironomidae	Microtendipes		group
Arthropoda	Hexapoda	Diptera	Chironomidae	Monopelopia		Species
Arthropoda	Hexapoda	Diptera	Chironomidae	Natarsia		Species
Arthropoda	Hexapoda	Diptera	Chironomidae	Nilotanytus		Species
Arthropoda	Hexapoda	Diptera	Chironomidae	Orthocladius		Species
Arthropoda	Hexapoda	Diptera	Chironomidae	Orthocladius		Species
Arthropoda	Hexapoda	Diptera	Chironomidae	Parachironomus		Species
Arthropoda	Hexapoda	Diptera	Chironomidae	Paracladopelma		Species
Arthropoda	Hexapoda	Diptera	Chironomidae	Parakiefferiella	coronata	Species
Arthropoda	Hexapoda	Diptera	Chironomidae	Paralauterborniella		Species
Arthropoda	Hexapoda	Diptera	Chironomidae	Paratanytarsus	dissimilis	Species
Arthropoda	Hexapoda	Diptera	Chironomidae	Paratendipes		Species
Arthropoda	Hexapoda	Diptera	Chironomidae	Pentaneura		Species
Arthropoda	Hexapoda	Diptera	Chironomidae	Phaenopsectra		Group
Arthropoda	Hexapoda	Diptera	Chironomidae	Polypedilum		Species
Arthropoda	Hexapoda	Diptera	Chironomidae	Psectrotanytus	dyari	Species
Arthropoda	Hexapoda	Diptera	Chironomidae	Pseudochironomus		Genus
Arthropoda	Hexapoda	Diptera	Chironomidae	Rheocricotopus		Species
Arthropoda	Hexapoda	Diptera	Chironomidae	Rheopelopia	Thienemannimyia grp.	group
Arthropoda	Hexapoda	Diptera	Chironomidae	Rheotanytarsus	exiguus grp.	group
Arthropoda	Hexapoda	Diptera	Chironomidae	Robackia		Species

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Phylum	Class	Order	Family	Genus	Species	ID Level
Arthropoda	Hexapoda	Diptera	Chironomidae	Saetheria	sp.A	Species
Arthropoda	Hexapoda	Diptera	Chironomidae	Stelechomyia		Species
Arthropoda	Hexapoda	Diptera	Chironomidae	Stempellinella		Species
Arthropoda	Hexapoda	Diptera	Chironomidae	Synorthocladius		Species
Arthropoda	Hexapoda	Diptera	Chironomidae	Tanypus		Species
Arthropoda	Hexapoda	Diptera	Chironomidae	Tanytarsus		Species
Arthropoda	Hexapoda	Diptera	Chironomidae	Thienemannimyia grp.		group
Arthropoda	Hexapoda	Diptera	Chironomidae	Tribelos		Species
Arthropoda	Hexapoda	Diptera	Chironomidae	Tvetenia		Species
Arthropoda	Hexapoda	Diptera	Chironomidae	Unniella		Species
Arthropoda	Hexapoda	Diptera	Chironomidae	Xenochironomus		Species
Arthropoda	Hexapoda	Diptera	Chironomidae	Xylotopus		Species
Arthropoda	Hexapoda	Diptera	Chironomidae	Zavreliella		Species
Arthropoda	Hexapoda	Diptera	Chironomidae	Zavreliomyia		Genus
Arthropoda	Hexapoda	Diptera	Corethrellidae			Genus
Arthropoda	Hexapoda	Diptera	Culicidae			Genus
Arthropoda	Hexapoda	Diptera	Dixidae			Genus
Arthropoda	Hexapoda	Diptera	Dolichopodidae			Family
Arthropoda	Hexapoda	Diptera	Empididae			Genus
Arthropoda	Hexapoda	Diptera	Ephydriidae			Family
Arthropoda	Hexapoda	Diptera	Muscidae			Family
Arthropoda	Hexapoda	Diptera	Psychodidae			Genus
Arthropoda	Hexapoda	Diptera	Ptychopteridae			Genus
Arthropoda	Hexapoda	Diptera	Sciaridae			Family
Arthropoda	Hexapoda	Diptera	Sciomyzidae			Family
Arthropoda	Hexapoda	Diptera	Simuliidae			Genus
Arthropoda	Hexapoda	Diptera	Stratiomyidae			Genus
Arthropoda	Hexapoda	Diptera	Tabanidae			Genus
Arthropoda	Hexapoda	Diptera	Thaumaleidae			Genus
Arthropoda	Hexapoda	Diptera	Tipulidae			Genus
Arthropoda	Hexapoda	Ephemeroptera				Species
Arthropoda	Hexapoda	Ephemeroptera	Caenidae			Genus
Arthropoda	Hexapoda	Ephemeroptera	Ephemerellidae			Genus
Arthropoda	Hexapoda	Ephemeroptera	Leptophlebiidae			Family/ Genus
Arthropoda	Hexapoda	Ephemeroptera	Ephemeridae	Hexagenia		Genus
Arthropoda	Hexapoda	Ephemeroptera	Heptageniidae			Species

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Phylum	Class	Order	Family	Genus	Species	ID Level
Arthropoda	Hexapoda	Ephemeroptera	Oligoneuriidae	Isonychia		Genus
Arthropoda	Hexapoda	Hemiptera	Hemiptera			Genus
Arthropoda	Hexapoda	Homoptera	Homoptera			Order
Arthropoda	Hexapoda	Hymenoptera				Order
Arthropoda	Hexapoda	Lepidoptera				Family
Arthropoda	Hexapoda	Megaloptera				Species
Arthropoda	Hexapoda	Odonata				Species
Arthropoda	Hexapoda	Odonata	Gomphidae			Genus
Arthropoda	Hexapoda	Odonata	Gomphidae	Hagenius	brevistylus	Species
Arthropoda	Hexapoda	Odonata	Libellulidae	Libellula		Genus
Arthropoda	Hexapoda	Odonata	Coenagrionidae			Genus
Arthropoda	Hexapoda	Odonata	Coenagrionidae	Argia	sedula	Species
Arthropoda	Hexapoda	Odonata	Coenagrionidae	Enallagma		Genus
Arthropoda	Hexapoda	Odonata	Coenagrionidae	Enallagma	cardenium	Species
Arthropoda	Hexapoda	Odonata	Coenagrionidae	Ischnura		Genus
Arthropoda	Hexapoda	Plecoptera	Plecoptera			Species
Arthropoda	Hexapoda	Plecoptera	Capniidae			Genus
Arthropoda	Hexapoda	Plecoptera	Leuctridae			Genus
Arthropoda	Hexapoda	Plecoptera	Nemouridae	Amphinemura		Genus
Arthropoda	Hexapoda	Plecoptera	Perlidae	Perlesta		Genus
Arthropoda	Hexapoda	Plecoptera	Perlodidae			Genus
Arthropoda	Hexapoda	Plecoptera	Perlodidae	Isoperla	orata	Species
Arthropoda	Hexapoda	Plecoptera	Perlodidae	Clioperla	clio	Species
Arthropoda	Hexapoda	Plecoptera	Taeniopterygidae			Genus
Arthropoda	Hexapoda	Trichoptera				Species
Arthropoda	Hexapoda	Trichoptera	Dipseudopsidae			Genus
Arthropoda	Hexapoda	Trichoptera	Hydropsychidae	Cheumatopsyche		Genus
Arthropoda	Hexapoda	Trichoptera	Hydropsychidae	Hydropsyche		Genus
Arthropoda	Hexapoda	Trichoptera	Hydroptilidae			Genus
Arthropoda	Hexapoda	Trichoptera	Lepidostomatidae			Genus
Arthropoda	Hexapoda	Trichoptera	Limnephilidae			Genus
Arthropoda	Hexapoda	Trichoptera	Limnephilidae	Ironoquia	punctatissima	Species
Arthropoda	Hexapoda	Trichoptera	Philopotamidae			Genus
Arthropoda	Hexapoda	Trichoptera	Polycentropodidae			Genus
Arthropoda	Malacostraca	Amphipoda				Genus
Arthropoda	Malacostraca	Amphipoda	Hyalellidae	Hyalella	azteca	Species

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Phylum	Class	Order	Family	Genus	Species	ID Level
Arthropoda	Malacostraca	Amphipoda	Talitridae			Family
Arthropoda	Malacostraca	Decapoda				Genus
Arthropoda	Malacostraca	Decapoda	Atyidae			Family
Arthropoda	Malacostraca	Decapoda	Cambaridae			Genus
Arthropoda	Malacostraca	Decapoda	Palaemonidae			Genus
Arthropoda	Malacostraca	Isopoda	Asellidae			Genus
Arthropoda	Malacostraca	Isopoda	Munnidae			Family
Arthropoda	Malacostraca	Isopoda	Munnidae	Uromunna	reynoldsi	Species
Arthropoda	Malacostraca	Isopoda	Oniscidae			Family
Arthropoda	Malacostraca	Isopoda	Sphaeromatidae			Family
Arthropoda	Malacostraca	Mysidacea				Family
Cnidaria	Hydrozoa	Hydroida	Hydridae	Hydra		Genus
Ectoprocta	Phylactolaemata	Plumatellida	Plumatellidae	Plumatella		Genus
Ectoprocta		Ectoprocta	Ectoprocta			Phylum
Entoprocta		Loxosomatida	Urnatellidae	Urnatella		Genus
Mollusca	Bivalvia					Genus
	Bivalvia	Veneroida	Corbiculidae	Corbicula	fluminea	species
Mollusca	Gastropoda					Genus
Mollusca	Gastropoda	Basommatophora	Anclidae	Hebetancylus	excentricus	Species
Mollusca	Gastropoda	Basommatophora	Lymnaeidae			Family
Mollusca	Gastropoda	Basommatophora	Physidae			Genus
Mollusca	Gastropoda	Basommatophora	Planorbidae			Species
Mollusca	Gastropoda	Basommatophora	Planorbidae	Gyraulus		Species
Mollusca	Gastropoda	Mesogastropoda	Hydrobiidae			Genus
Mollusca	Gastropoda	Mesogastropoda	Hydrobiidae	Pyrgophorus	platyrachis	Species
Mollusca	Gastropoda	Mesogastropoda	Pilidae			Species
Mollusca	Gastropoda	Mesogastropoda	Pleuroceridae			Genus
Mollusca	Gastropoda	Mesogastropoda	Thiaridae			Species
Mollusca	Gastropoda	Mesogastropoda	Viviparidae			Genus
Mollusca	Gastropoda	Mesogastropoda	Viviparidae	Viviparus	georgianus	Species
Nemertea		Nemertea				Phylum
Nemertea		Hoplonemertea	Tetrastemmatidae	Prostoma		Genus
Platyhelminthes		Tricladida				Order
Porifera						Phylum