



A Rapid Wetland Assessment Method Using Macroinvertebrates as an Indicator of Wetland Condition for Assessing Everglades Restoration

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Abstract

The U.S. Fish and Wildlife Service recognized a need to develop a rapid assessment tool to evaluate existing benchmark condition and future ecological changes to wetlands associated with Comprehensive Everglades Restoration Plan projects. A Habitat Evaluation Team (HET) was formed to develop a process that balances the need for a scientifically based investigation of wetland biological condition with administrative timelines and cost. Three biological groups - plants, fish, and macroinvertebrates - were considered critical ecosystem components that can be used to assess biological condition through time. Indices from each of these groups will be combined into a single Ecological Condition Index. The HET formed working groups composed of representatives from government agencies, universities, and environmental for-profit and non-profit organizations to seek advice for each biological group to develop specific methodologies. The multi-agency Invertebrate Working Group was given two constraints in the development of an index: 1) sampling was to be completed within one hour and 2) only field identifiable taxa could be used. A list of field identifiable taxa has been generated and is in the process of being field-tested. Also, a time-limited qualitative dip-net procedure for collecting field-identifiable macroinvertebrates that will provide a rating of wetland biological condition has been developed. At present, the method requires that one biologist, with an assistant, will sample representative wetland habitats for one hour, and puts no constraints on spatial coverage or number of dip-net sweeps taken. Fifteen macroinvertebrate metrics are currently being tested for efficacy in discrimination between wetlands in good condition and those impacted by hydrologic alteration and/or water quality degradation.

Introduction

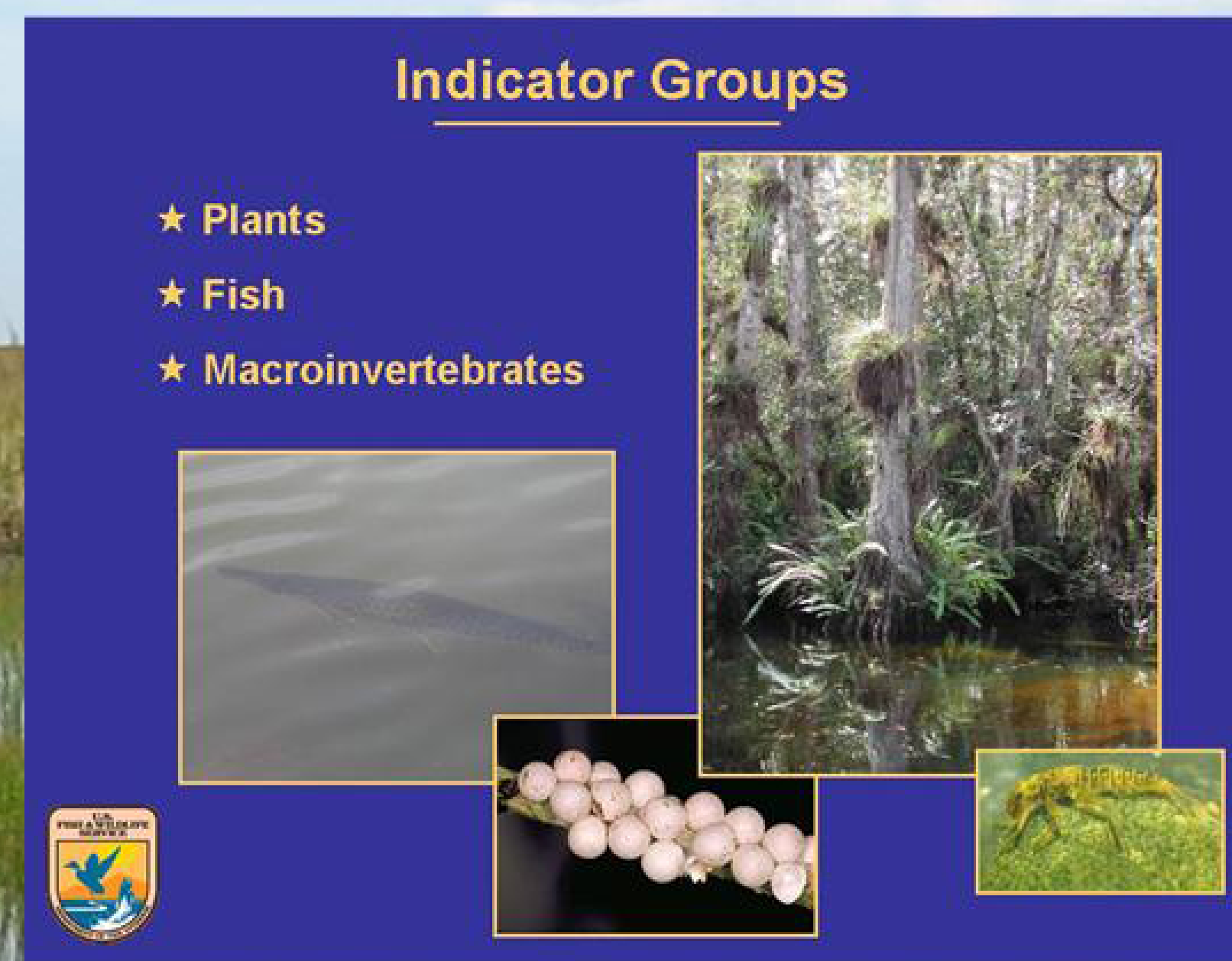
The Service is developing a method for evaluating existing ecological conditions of wetlands using macroinvertebrates. Macroinvertebrates were chosen because they are an important link in the food chain; they are linked to other factors (abiotic and biotic) which can be used to assess ecological conditions and potential impacts; they exhibit a diversity of responses to anthropogenic effects, and macroinvertebrate community composition can reveal the biological health of aquatic ecosystems.

Everglades ecosystem restoration benefits provided by a rapid wetland assessment method using macroinvertebrates include:

- Provides a rapid and cost-effective method to assess and monitor the effects of Everglades Ecosystem restoration projects on wetlands.
- Evaluates baseline benchmark and post restoration biological condition of wetlands to be affected by Everglades Ecosystem restoration projects.
- Macroinvertebrates included in this method (e.g., crayfish and shrimp) will be used as performance measures for modeling in the Everglades Restoration Alternatives Analysis.
- Fifteen macroinvertebrate metrics intended to indicate habitat and water quality, ecological function, and hydroperiod effects of Everglades Restoration projects are being assessed for effectiveness. Effective wetland indicator metrics will be combined into a single macroinvertebrate index.
- The macroinvertebrate index results will be integrated with indices for plants and fish to provide an overall index of wetland condition or quality.

Indicator Groups

- ★ Plants
- ★ Fish
- ★ Macroinvertebrates



Metric Name	Calculation Method
Augmented Florida Index	(Sum of Class I X 2) Plus (Sum of Class II)/24 X 10
Hydroperiod Indicator Metric	(Sum Sample Hydroperiod Indicating Taxa (HIT)/SUM all HIT) X 10
Long Lived Taxa	(Sum Long Lived Taxa/Total Number Long Lived Taxa from field sheet) X 10
Normalized Inverse OCH	10 - ((Sum Odonata+Coleoptera+Hemiptera Taxa/44) X 10)
Normalized Inverse Percent Air Breathers	10 - ((Sum Number Air Breathing Taxa/34) X 10)
Percent Crustacea Taxa	(Sum Crustacea Taxa/6) X 10
Normalized Percent Predators	(Sum Predator Taxa/23) X 10
Ratio of Predators / Shredders	(Sum Predator Taxa/Sum Shredder Taxa) X 10
Total Taxa	Sum Total Taxa/10
Normalized OET	(Sum Odonata+Ephemeroptera+Trichoptera Taxa/26) X 10
Percent Ephemeroptera Taxa	(Sum Number of Ephemeroptera Taxa/4) X 10
Inverse Percent Other Diptera and All Non-Insect Taxa	(Sum Other Diptera and All Non-Insect Taxa/44) X 10
South Florida Field Identifiable Biotic Index	(10-(SUM Sample Wetland Biotic Index Values)/ Total Number of Sample Organisms) X 10
Inverse FDEP Very Tolerant Taxa	(SUM FDEP Very Tolerant Taxa in Sample/Total FDEP Very Tolerant Taxa on Field Identifiable List) X 10
Wetland Invertebrate Quality Index (WIQI)*	Sum all Sample WIQI values/N

Indices in red font are under development.
*WIQI will be created using a process similar to that used for the Floristic Quality Index.

Testing the Field Qualitative Timed Sampling Method for Field Identifiable Taxa



Characterization of Impaired and Reference sites.

Impaired



- Monotypic Cattail Stands
- Open Water = Airboat Trails Or Alligator Holes

Reference (un-impaired)



- Ridge And Slough Mosaic
- Floating Mats Of Periphyton

Method

This qualitative method for wetlands requires one biologist with an assistant to sample for one hour. There are no constraints on spatial coverage or number of dip-net sweeps taken. This method should be conducted by experienced biologists who have the necessary competency in macroinvertebrate taxonomy.

- Visually survey the wetland for physical and habitat characteristics, and apportion your time among available habitats.
- Photograph the habitat, and record the locality information on the Field Sheet.
- Sample by working the net rapidly and vigorously within vegetation and other habitats. Place a small aliquot of the net contents into a shallow white pick-pan with a small amount of water. Identify all organisms to the field-identifiable level as indicated on the Field Sheet.
- The field assistant records taxa on the Field Sheet as they are encountered.
- Use tic marks to record the number of individuals for each taxon observed.
- Continue sweeping within a productive location until additional sweeps yield few additional taxa. Generally, up to ten minutes in a productive location is sufficient.
- If the first few sweeps in a new location do not yield new taxa, move on to the next location. Stop sampling when one hour has elapsed.

FIELD SHEET	
Time Limited Dipnet Qualitative Sample for Field Identifiable Wetland Macroinvertebrates	
Date:	Time:
Observer:	Collector:
Observations:	
Abundance categories: Present (P), Common (C), Abundant (A), Dominant (D)	
Class	Order
Family	Genus
Species	Sex
Number	Notes

Summary

- A two-year effort has resulted in development of:
 - 1) A list of South Florida wetland macroinvertebrate taxa
 - 2) A list of field identifiable wetland macroinvertebrate taxa
 - 3) A list of potentially effective wetland indicator metrics
 - 4) A time limited qualitative sampling method for using field identifiable macroinvertebrate taxa to assess Everglades wetland quality.
- Preliminary field-testing and data analysis indicates that discrimination of impacted wetlands from relatively unimpacted wetlands can be achieved using values of some of the candidate metrics.
- Additional testing for effectiveness of candidate metrics is necessary prior to combining them into a composite Macroinvertebrate Wetland Index.
- This method is intended to assess effects of Everglades restoration projects.

