LEMN RESEARCH NEEDS WORKSHOP 3.12 EXECUTIVE SUMMARY - DRAFT

Planning for an Integrated Habitat Classification System and Map for the Lake Erie Basin

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An accurate inventory of the resource one intends to manage is a fundamental prerequisite to effective conservation. The goal of this project is to create a tool to facilitate the development of fish and wildlife habitat inventories for the Lake Erie basin. This inventory will provide means to measure progress toward ecosystem objectives by permitting resource managers to track habitat preservation, restoration, and land-cover change. This goal is being achieved by mapping and classifying six natural habitat zones in the Lake Erie basin and providing this information to scientific and general audiences. Development of a map of this nature has been identified as a fundamental element of the Lake Erie LAMP Habitat strategy.

The overall project objectives are to (1) verify the utility of establishing a unified, consensus-based classification system for the major Lake Erie habitat zones, based on existing habitat mapping projects underway at either the Great Lakes basinwide or lakewide scale; and (2) apply this integrated habitat classification system to pilot watersheds using the framework in the context of a supporting Geographic Information System (GIS). The data will be compiled to produce an integrated multilayer habitat map detailing the complete landscape of Lake Erie habitats and associated variables in a common format for the United States and Canada.

On January 30 – 31, 2006 an experts workshop was held at the University of Windsor that summarized existing and newly developed habitat classification schemes and geospatial datasets for six major environmental zones within the Lake Erie basin. The objective of this workshop was to affirm general consensus as to classification schemes most appropriate for these environmental zones within the broader hierarchical habitat classification scheme and suite of habitat maps for the Lake Erie basin. Workshop participants were also asked to identify critical attributes and/or types of data that, based on best professional judgment, control or regulate habitat pattern, distribution, and associated ecological functions within the Lake Erie basin.

The results of this workshop are being used to guide the development and implementation of a hierarchical classification scheme within two pilot watersheds – the Maumee River watershed in Ohio and the Grand River watershed in Ontario. Ultimately, these data and coverages will serve as a template to be used to compile and produce a suite of basinwide habitat maps detailing a complete mosaic of Lake Erie habitats in a common format for both the United States and Canada. The following framework and guiding principles were agreed upon at the workshop:

1. Initial classification within zones will be based on physical and chemical attributes that regulate habitat - Participants agreed to develop classification schemes focused initially on physical and chemical attributes that control and regulate habitat pattern and distribution within the Lake Erie basin. Physical, chemical, and biological integrity form the basis for ecological integrity and provide a sound framework for development of classification schemes within each environmental zone.

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2. A dynamic habitat classification scheme will be developed and implemented to identify and map Lake Erie habitats – A dynamic habitat classification approach was adopted based on multiple integrated geospatial data layers that contain information on physical, chemical, and biological attributes within each of the environmental zones. Using this approach, species-specific habitats are identified and delimited by the intersection of particular range of physical, chemical and biological values and functions required by a species or biological community of interest. Results will necessarily be inquiry-dependent. The linkage of these geospatial data layers and associated classification schemes at regional scales will create a *de facto* high-level hierarchical classification scheme across the entire basin. Instead of a single "Lake Erie habitat map", this project will provide the tools and protocols to begin implementation of a dynamic habitat classification *system* that can be accessed and manipulated by the end user to produce derivative map products that meet the specific needs of each user.

3. Six major environmental zones were identified and delineated (instead of five originally proposed) - Participants agreed to subdivide the nearshore zone into two zones - a coastal margin zone extending from ordinary high water to the 3-m isobath, and a nearshore open-water zone extending from the 3-m to 15-m isobaths. Environmental zones are defined, in part, by hydrogeomorphic characteristics and dominant physical processes. The six environmental zones are: Terrestrial, Inland Lakes and Tributaries, Wetlands, Coastal Margin, Nearshore Open-Water, and Open-Lake Offshore.

4. Classification Schemes and key environmental attributes were identified for each environmental zone -

a) The Terrestrial classification will be based on crosswalked National Land Cover Data (NLCD) (U.S.) and Provincial LCD Land Cover Data (Ontario) datasets.

b) The Inland Lakes and Tributaries classification will be based on he landscape/valley segment approach jointly developed by the USGS Great Lakes GAP program and the U.S. EPA STAR WILMI River Classification project (University of Michigan).

c) The Wetlands classification will be based primarily on a modified hydrogeomorphic wetland classification developed by the Great Lakes Coastal Wetlands Consortium (GLCWC) for coastal wetlands and the National Wetland Inventory classification system developed by Cowardin et al. (1979) for inland and riparian wetlands.

d) The Coastal Margin and Nearshore Zone habitats will likely be classified based on some combination of relative energy, substrate texture, substrate stability, water chemistry, and shoreline characteristics. The nearshore open-water classification will share common elements with the open-lake offshore classification, and geospatial integration will be required between these zones at regional scales.

e) The Open-Lake Offshore classification will likely be based on a combination of a) the Ohio Department of Natural Resources (ODNR) preliminary classification scheme derived from bathymetric, substrate, thermal, hydraulic (gyres and riverine outwelling), and ecological parameters; and b) affinity zones identified by researchers at the Institute for Fisheries Research - University of Michigan who are using cluster analyses to develop linkages between biological data and bathymetry, slope, substrate, and thermal characteristics in Lake Erie.

5. "Super variables" applicable to more than one environmental zone were identified - Terrestrial, Inland lakes and Tributaries, and Wetlands subgroups worked together to identify common variables and/or geospatial datasets that would apply to all "land-based" environmental zones and functions. Similarly, the Coastal Margin, Nearshore, and Open-Lake Offshore subgroups worked together to identify common variables and/or geospatial datasets that would apply to all "water-based" environmental zones and functions (Table 1).

6. Data gaps, scaling issues, and dataset integration/crosswalking needs were identified – Participants identified significant data gaps in the wetland datasets including an incomplete digital National Wetlands Inventory dataset for Ohio and the fact that basinwide wetland datasets may be 30 years out-of-date as they were based on imagery taken during the 1970's and 1980's. The coastal margin, nearshore, and offshore subgroups identified significant data gaps in nearshore and coastal margin areas and recommended that a unified substrate map be created for the entire Lake Erie basin. The subgroups also recommended that hydrodynamic models be used to assist with the identification of major seasonal circulation patterns, tributary outwelling zones, and mixing zones that could define the boundaries between coastal margin, nearshore, and offshore areas. The suggestion was made that in providing information and data to users, that the resolution of the data provided be hierarchically related to scale of the request, i.e. whole basin requests will generally yield coarser-scale data while site-specific requests may yield finer-scale data.

7. Restrictive data sharing policies are a major impediment to implementation of a basinwide habitat classification system and map - For this project, initial data access and data sharing may be possible through existing data sharing or loan agreements with project partners. However, over the long term, major users will require access to raw data layers and will need unrestricted ability to share and distribute derivative products. This will require a broad, comprehensive data sharing agreement that should be in force for an extended period of time (say 10 years) and be renewable. For occasional users, there is also a need to develop independent data sharing agreements to permit access to raw data layers and/or derivative products. One suggestion was made to develop a web-based agreement that is digitally signed before accessing or downloading "proprietary" datasets.

8, Products and Dissemination Strategies - The project design currently identifies the Great Lakes Commission as the primary clearing house for geospatial datasets and associated classification tools or protocols developed by the project team. The types of products that would meet the needs of these users range from a suite of fixed map products (i.e. layered maps) in a traditional summary report format (downloadable) to a fully interactive online system that allows users the flexibility to access, download, and manipulate geospatial datasets at multiple scales. Anticipated products include a geospatially-based habitat classification system, crosswalk tables upon which the habitat classification is based, and a suite of derivative map products focused on the two pilot watersheds to illustrate the potential power and utility of a dynamic habitat classification system (Lake Erie basin land cover example - Figure 1).

Table 1. Common Environmental Attributes

	Land Data Layers			Water Data Layers		
"Super variables"	**Terrestrial**	**Inland Lakes & Tribs**	**Wetlands**	**Coastal Margin**	**Nearshore**	**Offshore**
Elevation	Topography	Bathymetry	Bathymetry	Bathymetry	Bathymetry	Bathymetry
Slope	Land Surface	Water Surface	Bottom Slope	Bottom Slope	Bottom Slope	Bottom Slope
Energy		Stream Power	Wave/Currents	Wave/Currents	Wave/Currents	Wave/Currents
Climate	Degree Days	Temperature	Temperature	Thermal Stratification	Thermal Stratification	Thermal Stratification
Hydrography/ Geomorphology	Drainage Network	Drainage Network	Wetland/ Shoreline	Shoreline	Lakebed Structure	Lakebed Structure
Hydrology/Hydraulics	Precipitation Runoff Infiltration	Flow Regime/ Water Source	Water Levels/ Flow Regime/ Water Source	Water Levels/ Circulation/ Outwelling	Water Levels/ Circulation/ Outwelling	Water Levels/ Circulation/ Outwelling
Geology	Soils/Surficial Materials/ Bedrock	Substrate/ Stability/ Bedrock	Substrate/ Bedrock	Substrate/ Stability/ Bedrock	Substrate/ Stability/ Bedrock	Substrate/ Stability/ Bedrock
Turbidity	Point and Non-Point Sources	Suspended Sediment Load/ Turbidity	Turbidity/Light Attenuation	Turbidity/Light Attenuation	Turbidity/Light Attenuation	Turbidity/Light Attenuation
Water Chemistry	Point and Non-Point Sources	Nutrients/ Contaminants	Nutrients/ Contaminants	Nutrients/ Contaminants	Nutrients/ Contaminants	Nutrients/ Contaminants
Vegetation	Land Cover	Submergent/ Emergent	Submergent/ Emergent	Submergent/ Emergent	Submergent	Submergent
Land Cover	All	Riparian/ Upstream	Riparian/ Upstream	Riparian/ Shoreline Type		

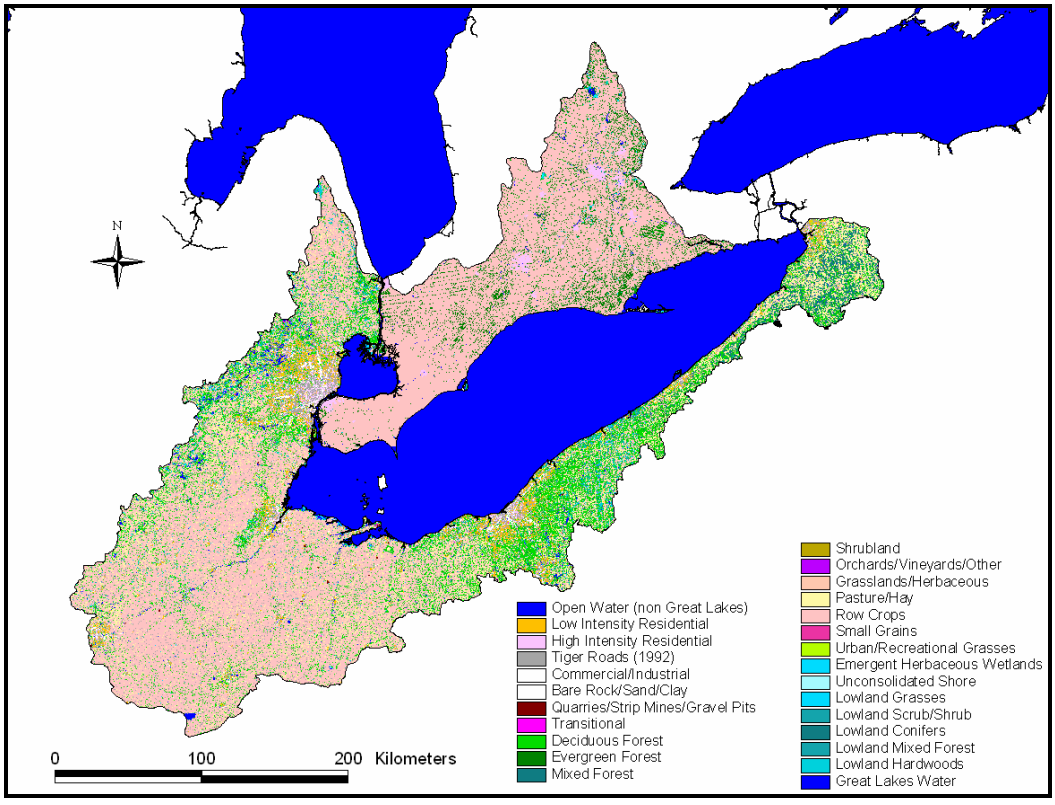

Figure 1.Example of integrated land cover data coverage for the Lake Erie Basin based on crosswalk tables. Agriculture is the dominant land cover in southern Ontario and in the southwestern portion of the Lake Erie basin (Tom Hollenhorst – University of Minnesota).