Geospatial datasets

Lake Erie Millennium Network
Huron-Erie/Lake St. Clair Corridor Workshop 3.0.1

University of Windsor
Windsor, Ontario
Canada

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TABLE OF CONTENTS

1. BATHYMETRY

Format: GIS MAPS

Pre-settlement shoreline bathymetry maps	http://www.ngdc.noaa.gov/mgg/greatlakes/greatlakes.html
"These maps are being created here presently under contract with a GIS specialist using USGS funds. The set will include the entire Huron-Erie Corridor. We presently have a completed 1900 map of the Detroit River only. It will be published as a product of this Center, giving the methodology used to compile the map from historic source documents. Where upon, that 1900 Detroit River data set will probably be approved by USGS for release to the public." –Bruce Manny	
Great Lakes Bathymetry	http://www.ngdc.noaa.gov/mgg/greatlakes/greatlakes.html
The National Oceanic and Atmospheric Administration (NOAA) is engaged in a program to compile Great Lakes bathymetric data and make them readily available to the public, especially to the communities concerned with Great Lakes science, pollution, coastal erosion, response to climate changes, threats to lake ecosystems, and health of the fishing industry. This program is managed by the National Geophysical Data Center (NGDC) and it relies on the cooperation of NOAA/Great Lakes Environmental Research Laboratory, NOAA/National Ocean Service, the Canadian Hydrographic Service, other agencies, and academic laboratories. Compilation of new bathymetry for the Great Lakes is an important part of this program, being carried out cooperatively between NOAA (NGDC and GLERL), and the Canadian Hydrographic Service. This new bathymetry provides a more detailed portrayal of lake floor topography, and reveals some lake floor features seen for the first time. Downloadable images of lake bathymetry available.	
ArcIMS Map Interface to Bathymetric Contours	http://map.ngdc.noaa.gov/website/mgg/greatlakesbathy/viewer.htm
Interactive map of the bathymetry of the Great Lakes region with the ability to zoom in and out of the entire area	

2. FLOW / HYDROLOGY

Hydrology and Hydraulics Data	http://www.glerl.noaa.gov/data/pgs/hydrology.html
Streamflow, channel flow, evaporation, water temperature, and other measurements of water quantity relative to the hydrologic cycle.	
Great Lakes Precipitation Data	http://www.glerl.noaa.gov/data/precip/precip.html
P_*_DAT files contain the monthly precipitation data for each station in the following states: Illinois, Indiana, Michigan, Minnesota, New York, Ohio, Pennsylvania, and Wisconsin. *-HST files contain the station history - latitude, longitude, elevation, station name, and period of record for each station location. These are ZIPPED files.	
Great Lakes Monthly Hydrologic Data	http://www.glerl.noaa.gov/data/arc/hydro/mnth-hydro.html
Hydrologic data: over lake precipitation, runoff, lake evaporation, net basin supplies, connecting channel flows, diversion flows, beginning of month lake levels, and changes in storage. Most of the data are available in the reports.	
Great Lakes Hydrometeorological Database	http://www.glin.net/gis/online/hydromet.html
The directory had 20,000 listings of station characteristics for over 11,000 hydrological and meteorological stations in the Great Lakes region. It is intended as a resource for determining period of record, types of data collected and data availability. The mapping tool provides a geographic orientation and allows the database to be searched both by station characteristics and by location.	
Great Lakes Hydrometeorological Database Directory (1991)	ftp://ftp.glerl.noaa.gov/publications/tech_reports/glerl-074/
This is an ftp site allowing users to access a pdf version of the NOAA Technical Memorandum ERL GLERL-74 and the Great Lakes Hydromet Database Directory.	
GLERL AHPS Products (Experimental)	http://www.glerl.noaa.gov/wr/ahps/curfcst/
Links to plots for monthly values of inflow, outflow, total supply and mean lake level for each of the Great Lakes and Lake St. Clair. For each lake there is also a page (accessed by clicking on the lake name) with many other hydrology and meteorology variables.	
Computer Program for Performing Hydrograph Separation using the Rating Curve Method	ftp://ftp.glerl.noaa.gov/publications/tech_reports/glerl-100/
NOAA Technical Memorandum TM-100, C.M. Sellinger (1996). This report presents a computer methodology for partitioning streamflow into overland flow or runoff and baseflow.	

Computer Program for Estimating Evapotranspiration using the Thornthwaite Method	ftp://ftp.glerl.noaa.gov/publications/tech_reports/glerl-101/
This computer program allows the calculation of evapotranspiration using large data sets in a more efficient and timely manner.	
Derivative Outlook Weights Software	http://www.glerl.noaa.gov/wr/outlookweights.html
Large Basin Runoff Model Software	http://www.glerl.noaa.gov/wr/lbrmexamples.html
Related GLERL research project: Next Generation Large Basin Runoff Model - Thomas E. Croley II	
MIDLAKES: A Coordinated Hydrologic Response Model for the Middle Great Lakes. NOAA	ftp://ftp.glerl.noaa.gov/publications/tech_reports/glerl-109/
Technical Memorandum TM-109. A.H. Clites and D. Lee (1998). A model for simulating quarter-monthly lake levels and connecting channel flows for the middle Great Lakes (Michigan, Huron, St. Clair, and Erie).	
Temperature Data - NOAA Technical Memos	ftp://ftp.glerl.noaa.gov/publications/tech_reports/glerl-094/

- Lake Erie Water Temperature Data, Erie, PA 1916-1992. NOAA Technical Memorandum TM-094, McCormick (1996).
- Lake Erie Water Temperature Data, Put-in-Bay, OH 1918-1992. NOAA Technical Memorandum TM-097, McCormick (1996).
    - ftp://ftp.glerl.noaa.gov/publications/tech_reports/glerl-097/
- Lake Erie Water Temperature Data, Sandusky Bay, OH 1961-1993. NOAA Technical Memorandum TM-098, McCormick (1996).
    - ftp://ftp.glerl.noaa.gov/publications/tech_reports/glerl-098/
- Lake Huron Water Temperature Data, Bay City, MI 1946-1993. NOAA Technical Memorandum TM-093, McCormick (1996).
    - ftp://ftp.glerl.noaa.gov/publications/tech_reports/glerl-093/
- Great Lakes Monthly Hydrologic Data (T. Hunter) NOAA TM-083 (1994). Also listed under hydrology section
    - http://www.glerl.noaa.gov/data/arc/hydro/mnth-hydro.html
- Hydrologic data: over lake precipitation, runoff, lake evaporation, net basin supplies, connecting channel flows, diversion flows, beginning of month lake levels, and changes in storage. Dates: 1860-01-01 through 1990-12-31
- Great Lakes Precipitation Data (see under Hydrology section for full details)
    - http://www.glerl.noaa.gov/data/precip/precip.html

Real time water data for Michigan	http://waterdata.usgs.gov/mi/nwis/rt

Real-time data typically are recorded at 15-60 min intervals, stored onsite, and then transmitted to USGS offices every 1 to 4 hours, depending on data relay technique. Recording and transmission times may be more frequent during critical events. Data from real-time sites are relayed to USGS offices via satellite, telephone, and/or radio and are available for viewing within minutes of arrival.

State-wide streamflow table	http://waterdata.usgs.gov/mi/nwis/current/?type=flow
State-wide Lake and Reservoir table	http://waterdata.usgs.gov/mi/nwis/current/?type=lake
State-wide groundwater table	http://waterdata.usgs.gov/mi/nwis/current/?type=gw
State-wide water quality table	http://waterdata.usgs.gov/mi/nwis/current/?type=quality&group_key=NONE

Plumes model	http://www.epa.gov/ceampubl/archive.htm

PLUMES includes two initial dilution plume models (RSB and UM) and a model interface manager for preparing common input and running the models. Two far field algorithms are automatically initiated beyond the zone of initial dilution. PLUMES also incorporates the flow classification scheme of the Cornell Mixing Zone Models (CORMIX) with recommendations for model usage, thereby providing a linkage between the systems. PLUMES models are intended for use with plumes discharged to marine and some freshwater bodies. Both buoyant and dense plumes, single sources, and many diffuser outfall configurations can be modeled. This model has been archived.

WaterWatch—Current Streamflow Conditions for Michigan	http://water.usgs.gov/cgi-bin/waterwatch?map_type=real&state=MI

Real-time tracking of changes to rivers and streams within this location

Floods & High Water Flows	http://water.usgs.gov/cgi-bin/waterwatch?map_type=flood&state=mi&web_type=map

Real-time tracking of flood conditions within the state of Michigan

Historic Water Levels, USACE Detroit District	http://www.lre.usace.army.mil/greatlakes/hh/greatlakeswaterlevels/historicdata

- Long Term Average Min/Max Water Levels
- Storm Probability Tables
- Historic Great Lakes Water Level Data (1918-2004)
- Historic Connecting Channel Outflows

3. CONTAMINANTS

USGS National Water Quality Assessment Data Warehouse	http://waterdata.usgs.gov/nwis/qw
Data available for download includes: site Information, constituent Finder, ground-water, surface water/bed sediment, mixed (SW & GW). Animal tissue, daily discharge, bio community (see invertebrates for more info on this)	
Pesticide Water Models	http://www.epa.gov/oppefed1/models/water/index.htm
Scientists in the Office of Pesticide Programs (OPP) an the Environmental Protection Agency (EPA) frequently use simulation models to predict pesticide concentrations in surface and ground water for use in both human health and aquatic ecological exposure assessments. This site contains links to executable versions of each of the models currently in use, plus links to the documentation for these models.	
National Contaminant Occurrence Database (NCOD)	http://www.epa.gov/safewater/data/ncod/index.html
Listings of water sample analytical data that EPA is currently using and has used in the past for analysis, rulemaking, and rule evaluation. The data have been extensively checked for quality and analyzed for national representative-ness. Data available in Microsoft Excel PivotTables® of the various samples data to help you access, organize, and analyze the data by contaminant, geography, sample date, and various water system attributes. You can also download the underlying databases. You can access both the latest UCMR data, which are being collected and added to the NCOD, as well as static datasets that have been used in published regulatory analyses. These latter (static) datasets have been extensively quality-checked, and their corresponding reports provide full descriptions (meta data) of the data. You can also analyze the data across several attributes using the PivotTables. Brief descriptions of the NCOD data sets and their corresponding links are included below.	
Bioplume III Model	http://www.epa.gov/ada/csmos/models/bioplume3.html
BIOPLUME III is a 2D, finite difference model for simulating the natural attenuation of organic contaminants in ground-water due to the processes of advection, dispersion, sorption, and biodegradation. Biotransformation processes are potentially important in the restoration of aquifers contaminated with organic pollutants. As a result, these processes require evaluation in remedial action planning studies associated with hydrocarbon contaminants.	
Air Data	http://www.epa.gov/air/data/index.html
The AirData website gives you access to air pollution data for the entire United States. Want to know the highest ozone level measured in your state last year? Ever wonder where air pollution monitoring sites are located? Are there sources of air pollution in your town? AirData produces reports and maps of air pollution data based on criteria that you specify. AirData presents annual summaries of air pollution data from two EPA databases: Air Quality System (AQS) and National Emission Inventory. The AQS database provides air monitoring data-ambient concentrations of criteria and hazardous air pollutants at monitoring sites, primarily in cities and towns. The NEI database provides estimates of annual emissions of criteria and hazardous air pollutants from all types of sources. In 2002, the NEI database replaced two separate EPA databases for emissions of criteria air pollutants (National Emission Trends; NET) and hazardous air pollutants (National Toxics Inventory; NTI).	

4. GENERAL BIOLOGICAL DATA

GLERL Biological Datasets

http://www.glerl.noaa.gov/data/pgs/biological.html

Measured and modeled biological data sets acquired during field expeditions, from remote instruments, and laboratory studies.

Great Lakes Aquatic Non-indigenous Species Information System
http://www.glerl.noaa.gov/res/Programs/ncrais/glansis.html
This list was compiled by the NOAA National Center for Aquatic Invasive Species Research at GLERL from a number of publications and sources (see the list of citations below). The organisms are organized alphabetically by common name. We start with the 162 species identified by Mills et al. (1993) plus Ricciardi (2001). More species will be added as they are identified

Abundance, Biomass, and Species Composition of Benthic Macroinvertebrate Populations in Saginaw Bay, Lake Huron, 1987-1996.
ftp://ftp.glerl.noaa.gov/publications/tech_reports/glerl-122/
NOAA Technical Memorandum TM-122, Nalepa et al. (2002). The abundance (number per grab sample) of all taxa collected between 1987 and 1996 with the Ponar grab. Variables include year, season, station, replicate number, and taxa.

Macrophyte Distribution in the HEC Corridor

Bruce Manny "Our Center completed a survey of macrophyte distribution throughout the entire HEC in 1978 and a unpublished survey of macrophyte biomass and distribution in Lake St. Clair in 1995, as follows:

Citations

Brown, C. L. and B. A. Manny. 1985. Comparison of methods for measuring surface area of submersed aquatic macrophytes. Journal of Freshwater Ecology 3(1):61-68.

Edsall, T.A., B.A. Manny, and C.N. Raphael. 1988. The St. Clair River and Lake St. Clair: an ecological profile. U.S. Fish and Wildlife Service, Biological Report 85(7.3). 130 pp.

Manny, B.A., T.A. Edsall, and E. Jaworski. 1988. The Detroit River, Michigan: an ecological profile. U.S. Fish and Wildlife Service, Biological Report 85(7.17), 86 pp.

Edwards, C., P. L. Hudson, W. G. Duffy, S. J. Nepszy, C. D. McNabb, R. C. Haas, C. R. Liston, B. A. Manny, and W-D. N. Busch. 1989. Hydrological, morphometrical, and biological characteristics of the connecting rivers of the international Great Lakes: A review. Large Rivers Symposium. Special Publication of Canadian Journal of Fisheries and Aquatic Science 106:240-264.

Schloesser, D.W., and B.A. Manny, 1982. Distribution and relative abundance of aquatic submersed macrophytes in the St. Clair-Detroit River ecosystem. Administrative Report 82-7, U.S. Fish and Wildlife Service, Great Lakes Fishery Laboratory, Ann Arbor, MI 49 pp.

Schloesser, D. W. and B. A. Manny. 1984. Distribution of Eurasian watermilfoil (Myriophyllum spicatum) in the St. Clair-Detroit River system in 1978. Journal of Great Lakes Research 10:322-326.

Citations (continued)

Schloesser, D. W. and B. A. Manny. 1984. Rapid qualitative method for estimating the biomass of submersed macrophytes in large water bodies. Journal of Aquatic Plant Management 22:102-104. 44. Schloesser, D. W. and B. A. Manny. 1989. Potential effects of shipping on submersed macrophytes in the St. Clair and Detroit Rivers of the Great Lakes. Michigan Academician 21:101-108.

Schloesser, D. W., T. A. Edsall, and B. A. Manny. 1985. Growth of submersed macrophyte communities in the St. Clair-Detroit River system between Lakes Huron and Erie. Canadian Journal of Botany 63:1061-1065.

Schloesser, D. and B. Manny. 1986. Distribution of submersed macrophytes in the St. Clair-Detroit River system, 1978. Journal of Freshwater Ecology 3:537-544.

Schloesser, D., B. Manny, C. Brown, and E. Jaworski. 1987. Use of low altitude aerial photography to identify submersed aquatic macrophytes. Pages 19-28, In: Color Aerial Photography in the Plant Sciences and Related Fields. Proceedings of 10th (1985) Biennial Workshop, American Society of Photogrammetry and Remote Sensing, Falls Church, VA.

Schloesser, D. W., C. L. Brown, and B. A. Manny. 1988. Use of aerial photography to inventory aquatic vegetation. Journal of Aerospace Engineering 1:142-150. French, J.R.P, III. 1988. Effect of submersed aquatic macrophytes on resource partitioning in yearling rock bass (*Ambloplites rupestris*) and pumpkinseeds (Lepomis gibbosus) in Lake St. Clair. Journal of Great Lakes Research 14(3):291-300.

Schloesser, D. W. and B. A. Manny. 1990. Decline of wild celery buds in the Detroit River, 1950-1985. Journal of Wildlife Management 54:72-76.

Schloesser, D.W., B.A. Manny, and T.A. Edsall. 1996. Distribution and relative abundance of submersed aquatic plants in the Lake St. Clair ecosystem, August-September 1995. pp. 1-29. In: Edsall, T.A. (ed). Aquatic plant management investigation in Lake St. Clair, Michigan. 1995. Contract Research Completion Report to U.S. Army Corps of Engineers, Detroit District, Detroit, Michigan. 67 pp.

In addition, a thesis containing data on macrophyte biomass and distribution:
Dawson, S.A. 1975. Waterfowl food production and utilization in Anchor Bay, Lake St. Clair, Michigan. University of Michigan, MS Thesis, Ann Arbor 124 pp.

Fish and Invertebrate Data (USGS NAWQA Program)	http://infotrek.er.usgs.gov/traverse/f?p=NAWQA:HOME/ (WEBSITE CURRENTLY NOT FUNCTIONAL)

Data for approximately 2,000 fish community and 1,800 invertebrate samples are available for retrieval. The invertebrate data are a subset of ~5,000 samples. Algal community (approx. 6,800 samples) and instream habitat data (approx. 2,000 samples) are also available for download.

Biological community samples (fish, invertebrates, algae) are collected in streams and rivers as part of ecological studies in the U.S. Geological Survey's National Water-Quality Assessment (NAWQA) Program. Information from these ecological studies, together with chemical and physical data, provides an integrated assessment of water quality at local, regional, and national scales. During the program's first decade of operation (1991 - 2001), ecological studies were conducted to assess the occurrence and distribution of algal, invertebrate, and fish communities in about 59 study units (Gilliom et al., 1995). From 2001 to 2001, biological community samples will be collected at selected sites to provide long-term trends monitoring. Ecological studies are also part of nationally guided studies addressing selected water-quality issues such as the effects of watershed urbanization on nutrient enrichment and stream ecosystems.

Sampling Protocols (USGS NAWQA Program)	http://infotrek.er.usgs.gov/traverse/f?p=NAWQA:HOME/ (WEBSITE CURRENTLY NOT FUNCTIONAL)

Biological Communities - Biological community samples are collected within a defined length of stream, or "reach", at sites investigated for NAWQA ecological studies. Sampling reaches are established at a site by using a combination of geomorphic characteristics (Moulton and others, 2002). In general, reach length ranges from 150 to 300 meters for wadeable streams and from 500 to 1000 meters for non-wadeable streams (Fitzpatrick and others, 1998). Sampling approaches vary depending on the biological community that is targeted (e.g. fish) and the sampling objectives (i.e. generating a list of taxa that are present, estimating the proportional abundance of each taxon). For detailed information about sampling methods and procedures see Moulton and others (2002).

Fish Community Samples - A fish community sample consists of a representative sample of the fish community collected from the entire sampling reach. Such a sample contains most, if not all, species in the sampling reach at the time of sampling in numbers proportional to their actual abundance. One or more sampling methods or collection efforts are used to acquire a sample (Moulton and others, 2002).

Invertebrate Samples - Two general types of invertebrate samples are collected. Richest Targeted Habitat (RTH) samples are semi-quantitative samples that represent that habitat in the reach, usually erosional, where maximum taxa richness is likely to be observed. For example, invertebrate RTH samples typically are collected from riffles in moderate to high gradient streams dominated by coarse-grained substrates; in low-gradient streams dominated by fine-grained substrates RTH samples are often collected from woody snags. Qualitative Multi-habitat (QMH) samples are qualitative samples that document the presence of invertebrate taxa in addition to those taxa found in RTH samples. For QMH samples, separate discrete collections are taken from each of the instream habitats present in the reach and then combined into a composite sample (Moulton and others, 2002).

5. FISH AND FISHERIES

GLFC Lake Erie GIS (IFR University of Michigan)

http://www.glfc.org/glgis/support_docs/html/lake_GISs/LEGIS_index.htm

The primary objective of the GLGIS Project is to integrate data from each lake basin into a common database to provide an inventory of basin-wide aquatic resources.

The Institute for Fisheries Research (IFR) at the University of Michigan compiled existing geospatial datasets and developed a Lake-based GIS that integrates data developed by numerous U.S. and Canadian agencies and academic institutions. In addition to integrating existing geospatial data from federal, state, provincial, tribal, and non-governmental organizations, this information system provides a means of inventorying and monitoring basin habitat (e.g. terrestrial, tributary, nearshore, and offshore systems).

Lake Erie Data Inventory
Summary of available geospatial datasets with metadata

Lake Erie Mini-Projects
Example projects using the geospatial datasets

Lake Erie Project Files
(numerous geospatial datasets available for download)

- base political biological
- classifications
- environmental
- physical

Electrofishing Survey Data (Detroit River and St. Clair River)

These data were compiled and published as:

OMNR (Ontario Ministry of Natural Environment). 1986. Survey of critical fish habitat within International Joint Commission designated Areas of Concern. August - November 1986. Prepared for the Ontario Ministry of Natural Resources, Fisheries Branch, Fish Community and Habitat Section, J.G. Hamilton, B.A.R. Environmental, 532 Queen Street, Toronto, Ontario. 119 pp.

OMNR (Ontario Ministry of Natural Environment). 1987. Survey of critical fish habitat within International Joint Commission designated Areas of Concern. June - October, 1986. Prepared for the Ontario Ministry of Natural Resources, Fisheries Branch, Fish Community and Habitat Section, R.I.R. Dalziel, Ecocern Inc., 4 Nursewood Road, Toronto, Ontario, M4E 3R8. 84 pp.

Bruce Manny (USGS Great Lakes Science Center) has copies of both. Digital copies currently are not available.

GRP Map Maker

ftp://ftp.glerl.noaa.gov/publications/tech_reports/glerl-110/

A User's Guide to Spatial Models of Fish Habitat Combining Acoustic Data and Bioenergetics Models. NOAA TM-110, J. Tyler (1998). GRP Map Maker allows uses to convert data on fish distribution and on simple environmental measures into measures of fish growth rate potential, fish maximum potential consumption, and maximum fish growth.

6. SUBSTRATE/SEDIMENT

NWRI Sediment Archive	http://www.nwri.ca/sedarchive/sedarchive-e.html

The National Water Research Institute (NWRI) Sediment Archive is a compendium of sediment data from the Great Lakes basin and St. Lawrence River collected by NWRI in cooperation with other agencies between 1968 and 2001. The data have been subdivided into five groups according to location and purpose: a contaminated-sediments archive, a Great Lakes basin-sediment archive, a nearshore-sediments archive, a miscellaneous-studies archive combining data from a number of sites and supporting a variety of objectives, and a sediment-sample archive (a collection of over 7500 samples).

Contact Mr. Chris Prokopec by telephone (905-336-4903) or by email (chris.prokopec@ec.gc.ca) for access to the archive files
Contact Dr. Chris Marvin by telephone (905-319-6919) or by email (chris.marvin@ec.gc.ca) for the sediment-sample archive

7. VARIOUS

Aerial photos

Bruce Manny has the 14 CDs of this 1996 USACO low altitude, high resolution, color photography and the MrSID software to view and organize the photos of the Detroit River, courtesy of the USACOE, Detroit District. He also has a seamless mosaic of all this photography of the entire Detroit River in a GIS format. Currently, the data is not available online but it might be possible to order it. The data does not include Lake St. Clair or the St. Clair River. The United States Army Corps of Engineers (USACE) contact: David Gerczak, 313-226-6751. Photos require MrSID software to view.

Loadings

http://pubs.usgs.gov/circ/circ1203/

Donna Meyers et al., NAWQA USGS

Loadings from watershed, water quality related to watershed. These data are part of a comprehensive, nation-wide, USGS program of water quality assessment that included several years of sampling on most Michigan and Ohio tributaries to the HEC (but not the St. Clair River, Lake St. Clair or the Detroit River themselves).

USACE Geospatial Data Clearinghouse

http://corpsgeo1.usace.army.mil/

A collection of over 250 spatial data servers that have digital geographic data primarily for use in Geographic Information Systems (GIS), image processing systems, and other modelling software. These data collections can be searched through a single interface based on their descriptions, or "metadata".

EPA Geospatial Data Download Service

http://www.epa.gov/enviro/geo_data.html

Provides a pathway to find information about geospatial data available from the EPA.

GeoBase

http://www.geobase.ca/

GeoBase is a federal, provincial and territorial government initiative that is overseen by the Canadian Council on Geomatics (CCOG). It is undertaken to ensure the provision of, and access to, a common, up-to-date and maintained base of quality geospatial data for all of Canada. Through the GeoBase portal, users with an interest in the field of geomatics have access to quality geospatial information at no cost and with unrestricted use.

- **Landsat 7 Orthoimages & Control Points (Geobase Data Alignment Layer) Canadian geodetic network** - GeoBase lets you access horizontal and vertical geodetic control information for thousands of points distributed across Canada. The information for each marker includes geographic and UTM coordinates, orthometric height, marker information description, and inspection data.
- **Canadian Digital Elevation data** - an ordered array of ground elevations at regularly spaced intervals. The source digital data for CDED at scales of 1:50,000 and 1:250,000 are extracted from the hypsographic and hydrographic elements of the National Topographic Data Base (NTDB) or various scaled positional data acquired from the provinces and territories.

Ontario Region's Information System for the Environment (ORISE)	http://www.on.ec.gc.ca/ORISE/orise.html?Lang=e
ORISE provides a single access window for sharing and retrieving environmental data and information in Ontario. ORISE provides custodians of environmental data with the opportunity to share their data while maintaining ownership and control of their data	
The National Hydrography Dataset (NHD)	http://nhd.usgs.gov/
A comprehensive set of digital spatial data that contains information about surface water features such as lakes, ponds, streams, rivers, springs and wells. While initially based on 1:100,000-scale data, the NHD is designed to incorporate and encourage the development of higher resolution data required by many users.	
USGS National Datasets (through The National Map Viewer)	http://nmviewogc.cr.usgs.gov/viewer.htm
Includes eight primary data themes: boundaries, elevation, orthoimagery, land use/land cover, transportation, geographic names, hydrography, and structures. Most themes are populated, and content will continue to be added.	
Wetlands Mapper	http://wetlandsfws.er.usgs.gov/
Data are from the Wetlands Master Geodatabase. This provides a truly seamless digital wetland data layer and map data in a single standard projection. Build, search, query, and download custom digital maps in the area you choose: Can download Shapefiles (UTM NAD83) for single quads, Personal Geodatabases (UTM NAD83) ARC data (UTM NAD27) for single quads or download 1:250,000 zipped file folders. Updated ARC data (UTM NAD83) for single quads or download 1:250,000 zipped file folders.	
Great Lakes' Shoreline Photos	http://www.nwri.ca/whatsnew/greatlakephotos-e.html
A series of 70 colour photographs of the Canadian Great Lakes' shoreline is available in jpg format. The photos were taken by staff at the Canada Centre for Inland Waters during a number of shoreline flights between 1977 and 1979. The collection includes examples of the major shoreline types in all the lake basins along with a brief description and a map showing locations where the photos were taken. The photos are available in the hope that they will be useful to coastal researchers, high school and university staff and students, and anyone with an interest in the beauty and diversity of the shoreline. To access all photographs and their descriptions, please contact Mr. Chris Prokopec at the National Water Research Institute (905-336-4903 or chris.prokopec@ec.gc.ca). If used please credit the National Water Research Institute.	

Real Time Data (GLERL)

http://www.glerl.noaa.gov/data/pgs/realtime.html

Real-time and near real-time data acquired from field and remote instruments, web-cams and satellites, and products based on real-time or near real-time data.

GLERL webcams (contact: John C. Lane) at Toledo (Lake Erie) http://www.glerl.noaa.gov/webcams/
Water Levels (contact: Cynthia Sellinger) http://www.glerl.noaa.gov/data/now/wlevels/levels.html

For all Lakes
Great Lakes water levels constitute one of the longest high quality hydro-meteorological data sets in North America with reference gage records beginning about 1860 with sporadic records back to the early 1800's. These levels are collected and archived by NOAA's National Ocean Service.
Satellite Data (contact: George Leshkevich) http://www.glerl.noaa.gov/data/now/satellite.html

Real time satellite data

- Great Lakes Surface Environmental Analysis (GLSEA)
- Great Lakes Visible Reflectance imagery* Great Lakes Surface Temperature Contour Maps
- AVHRR satellite imagery
- GOES-8 satellite imagery
- Great Lakes NOAA/Port Marine Observations
- Great Lakes NDBC buoy data http://www.ndbc.noaa.gov/
- Western / Eastern Great Lakes (past 36 hrs.) http://www.nws.noaa.gov/

Archival Data [links to NODC web site]

- Great Lakes Sea Surface Temperatures (link under satellite data on GLERL) http://www.coastwatch.msu.edu/
- National Data Buoy Centre - Eastern Great Lakes Section http://www.ndbc.noaa.gov/Maps/EastGL.shtml

Physical Properties Data

http://www.glerl.noaa.gov/data/pgs/phyproperties.html

Physical properties, characteristics, and measurements of the Great Lakes including topographic, cartographic, geomorphologic, and hydrodynamic properties and measurements.

USACE Digital Library

http://images.usace.army.mil/

The photographic and graphic images located on this web site are provided to visually communicate programs, projects and events of the US Army Corps of Engineers and are made available through the combined efforts of team members throughout the Corps. The searchable library consists of photographs, illustrations, artwork, clipart, logos, maps, and posters of a majority of the Corps of Engineers civil and military projects from around the world. New images are added on a continual basis so check back often. The images on this web site have been cleared for public release and are provided for free.