



GLSLCI - Great Lakes Ecosystems

Decision Support for Asian Carp Population Assessment and Management in the Great Lakes: Using EOS to investigate the possible establishment of the Asian carp population.

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Decision Support for Asian Carp Population Assessment and Management in the Great Lakes

Community Concerns

- Asian carp threaten the biodiversity of the Great Lakes ecosystem
- Asian carp could decimate a \$7 billion sport/commercial fishing industry
- Asian carp jump out of water when disturbed and have injured recreational boaters

Potential Partners / Collaborators

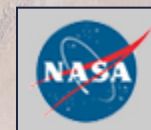
- United States Fish and Wildlife Service
- Illinois Department of Natural Resources
- United States Geological Survey
- National Oceanic and Atmospheric Administration
- US Army Corps of Engineers (Great Lakes and Ohio Division)
- Fisheries and Oceans Canada

Decision Making Process & Partner Needs

- Methodology of mapping potential spawning locations for invasive Asian carp in the Great Lakes using GIS
- Investigate phytoplankton blooms as potential feeding zones in the Great Lakes using the NASA instruments
- Use of the DEVELOP HIVE to project data into a 3D environment

Decision Support Tools

- Coordinate with partners to convert their maps and data into 3D imagery



Ecological Forecasting



Water Resources

Advisors

David Ullrich
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Decision Support for Asian Carp Population Assessment and Management in the Great Lakes

Project Objectives

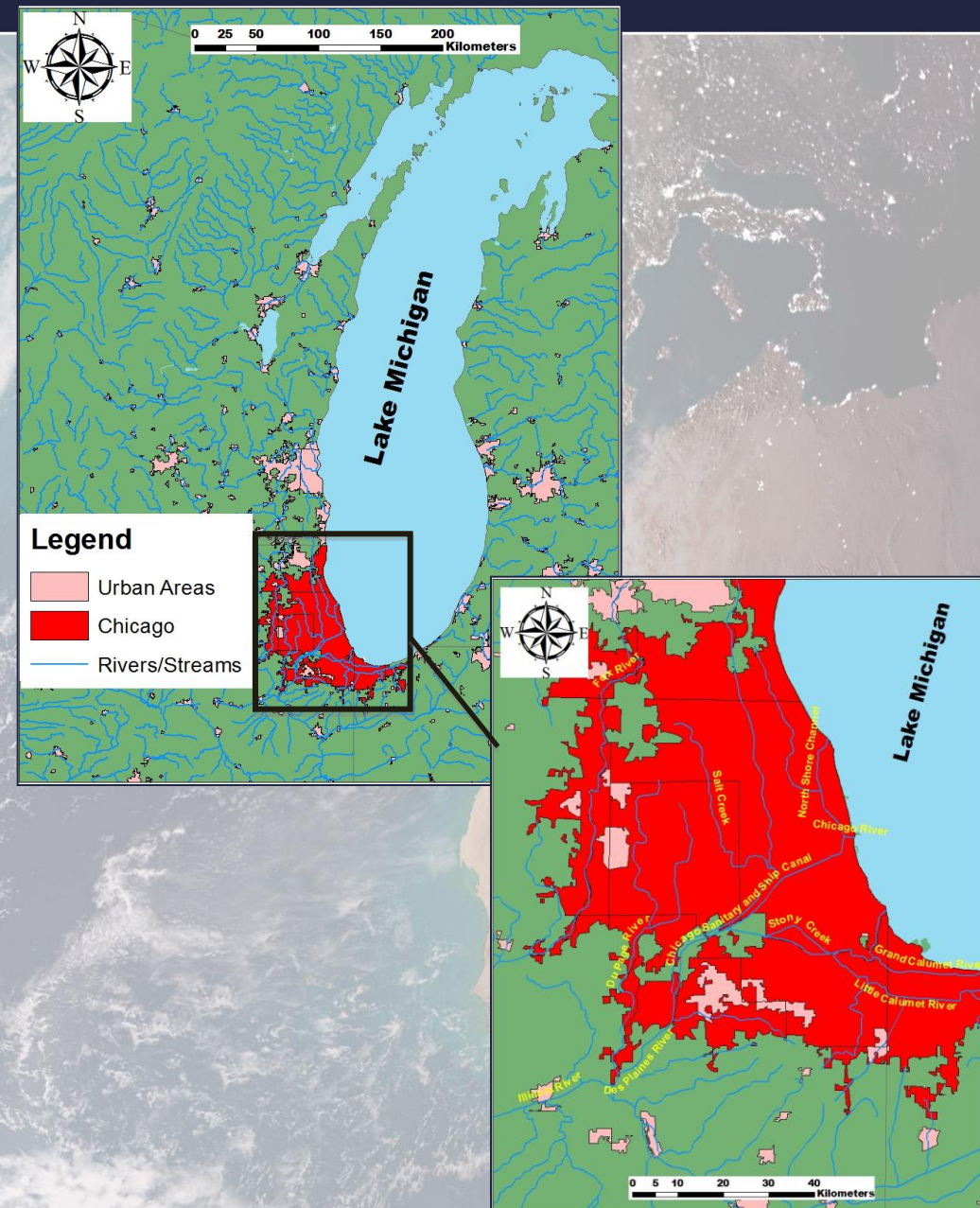
- Reach out to partner organizations and help visualize the Asian carp issue using the DEVELOP HIVE 3D environment and NASA remote sensing instruments.

Study Area & Period

- Great Lakes
 - Lake Michigan and Tributaries
- Study period
 - Appearance of Asian carp about 1970's – 1980's to present day

Benefits to Partners

- Geospatial identification of potential spawning locations for Asian carp around Lake Michigan
- 3D Projection of partner research to help communicate issue to a non-technical audience



Investigation of the Relationship Between Land Use/Land Cover and Water Quality - Methods

Satellites / Sensors

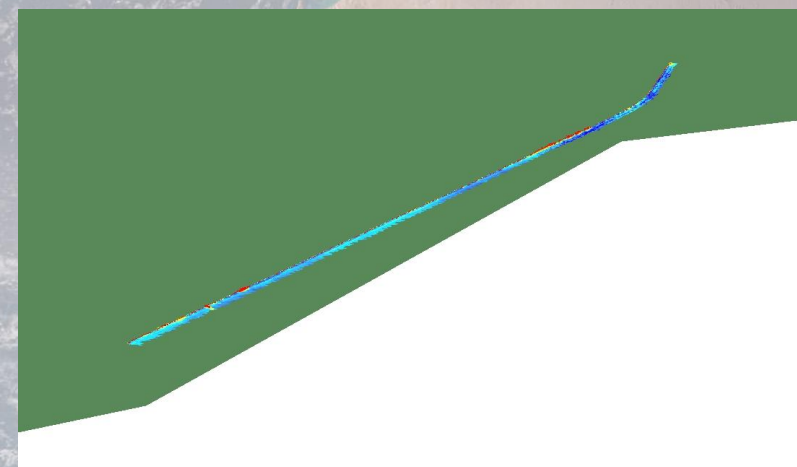
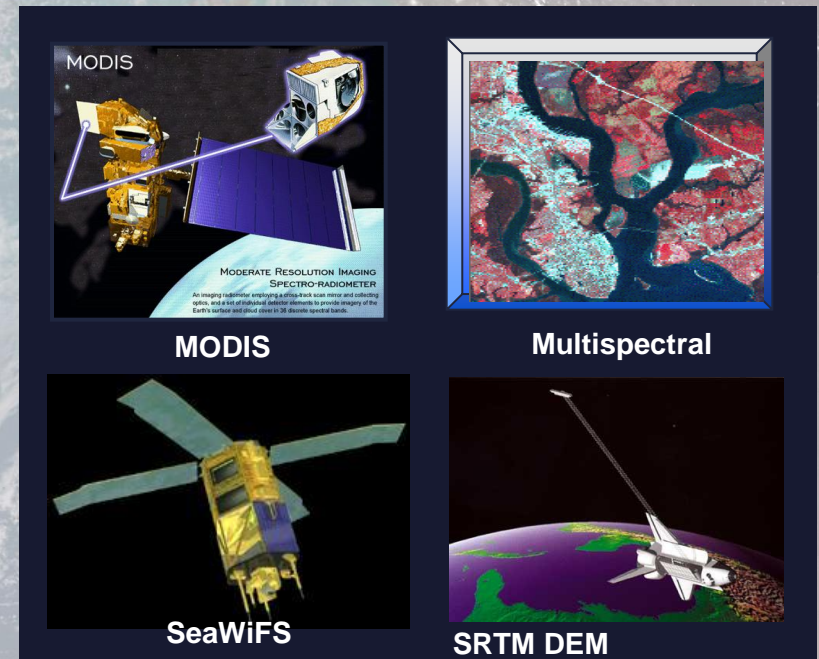
- SRTM
- SeaWiFS
- Terra/Aqua (MODIS)

Data Acquisition

- Warehouse Inventory Search Tool (<https://wist.echo.nasa.gov/>)
- US Fish and Wildlife National Wetlands Inventory (<http://www.fws.gov/wetlands/data/>)
- USGS Water Data for the Nation (<http://waterdata.usgs.gov/>)
- USGS National Hydrology Dataset (<http://nhd.usgs.gov/>)
- Great Lakes Information Network (GLIN) (<http://www.great-lakes.net/>)

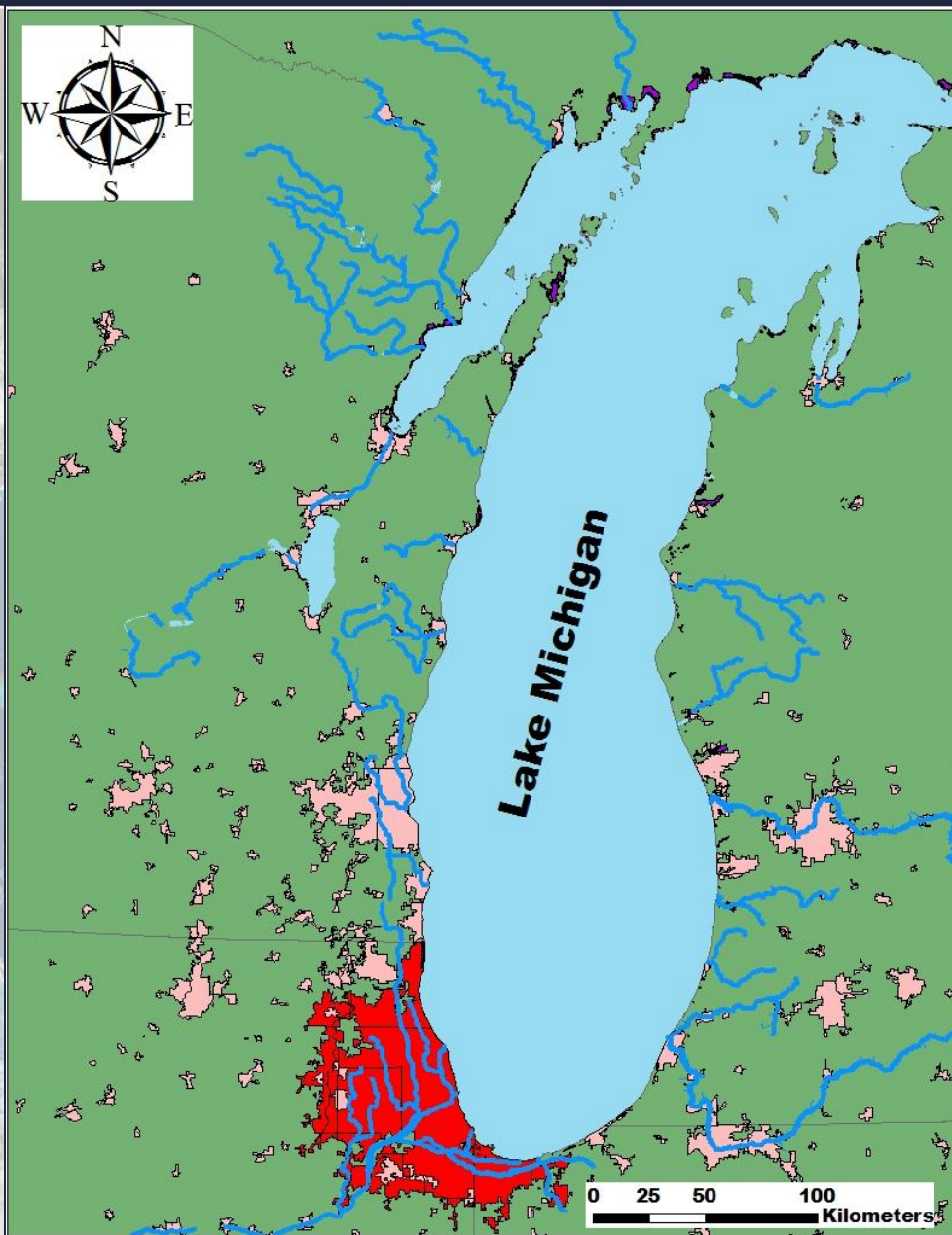
Data Processing & Analysis

- ArcGIS was used to analyze hydrology data and produce a potential spawning location map
- MODIS and SeaWiFS data was displayed to show phytoplankton blooms
- Data provided by partners was imported into ArcScene and converted into 3D imagery with the support of the HIVE team



3D multi-beam rendering of CAWS

Potential Spawning Tributaries Examined

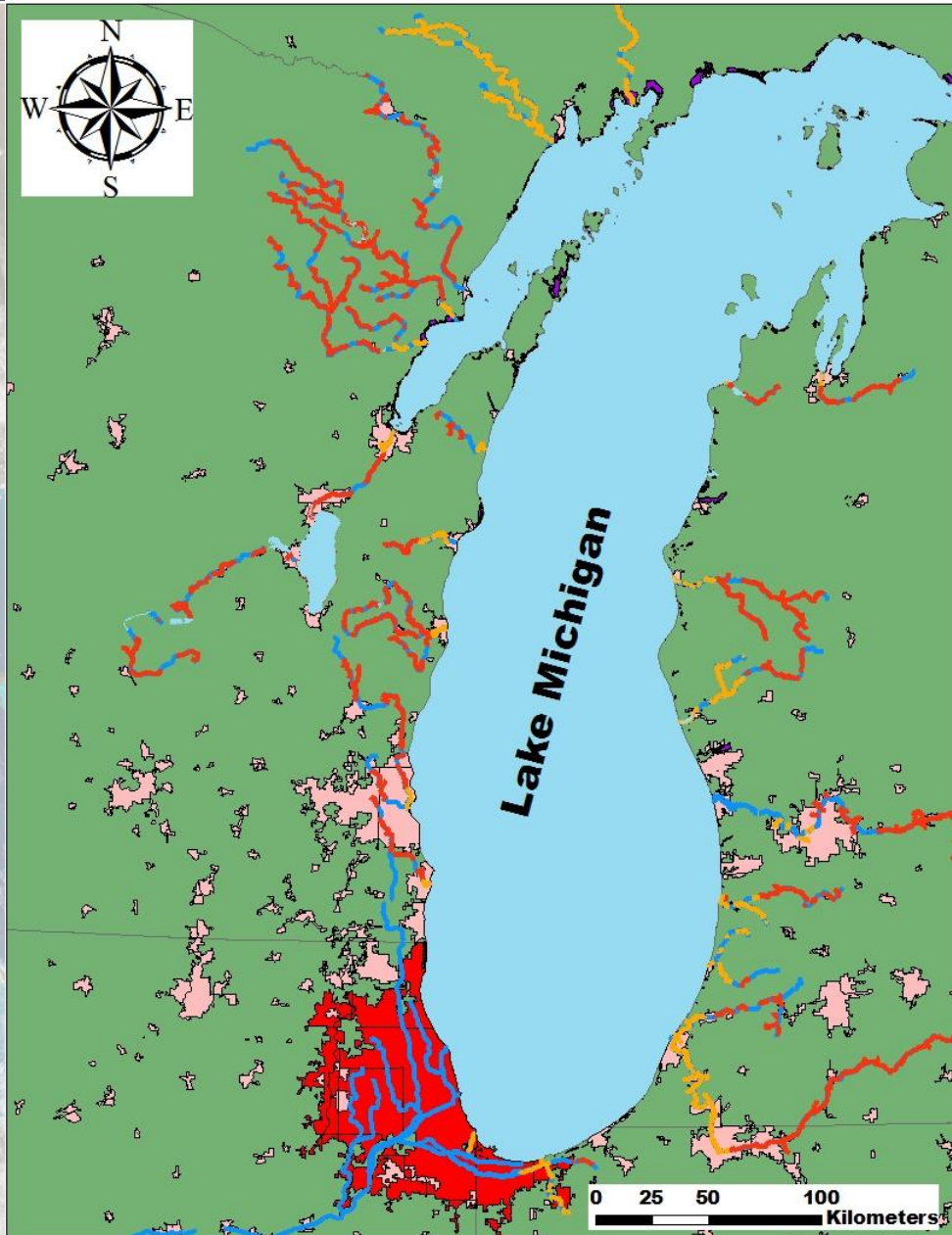


Legend





- Selected Rivers/Streams
- Chicago
- Urban Areas

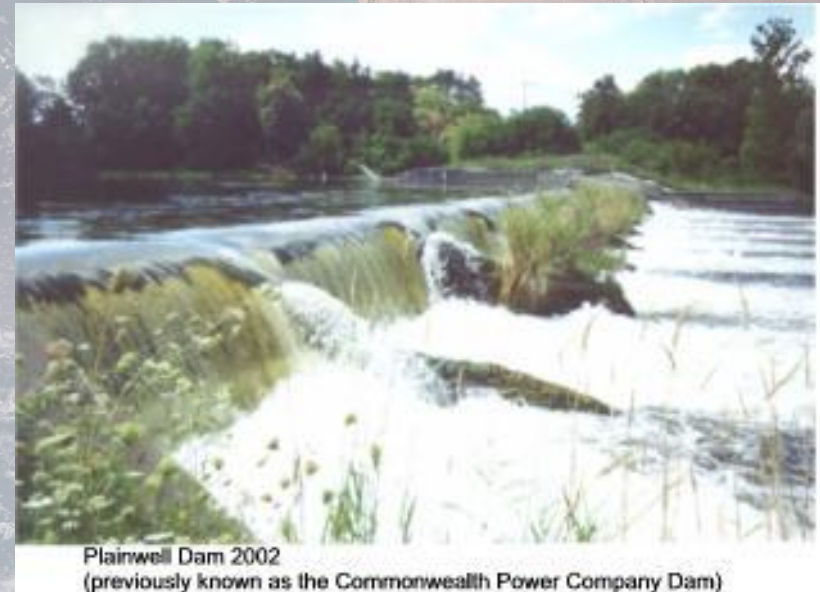


Tributary Access to Lake Michigan



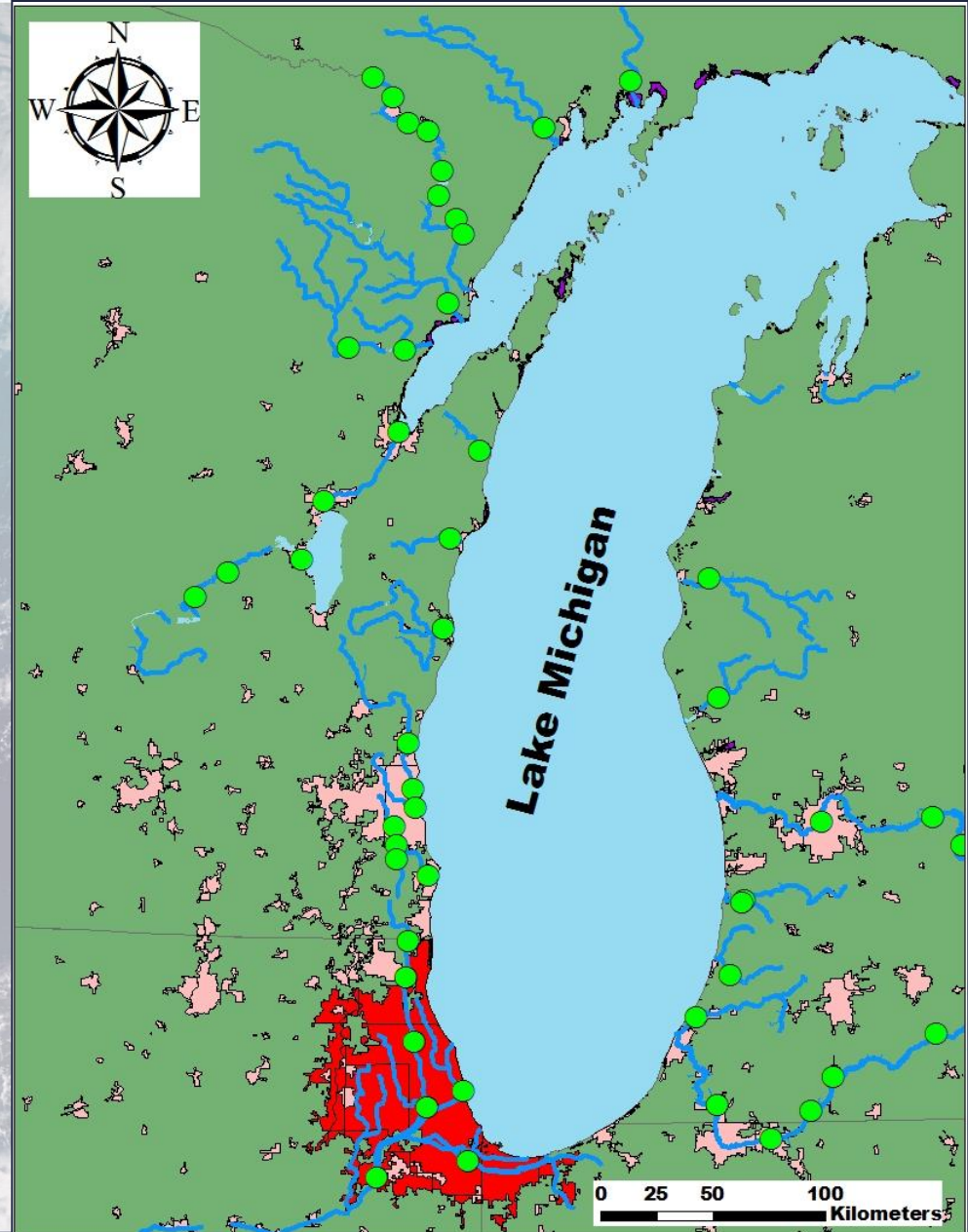
Legend

-  Accessible for Spawning
-  Blocked by Dam or Structure
-  Chicago
-  Urban Areas



Plainwell Dam 2002
(previously known as the Commonwealth Power Company Dam)

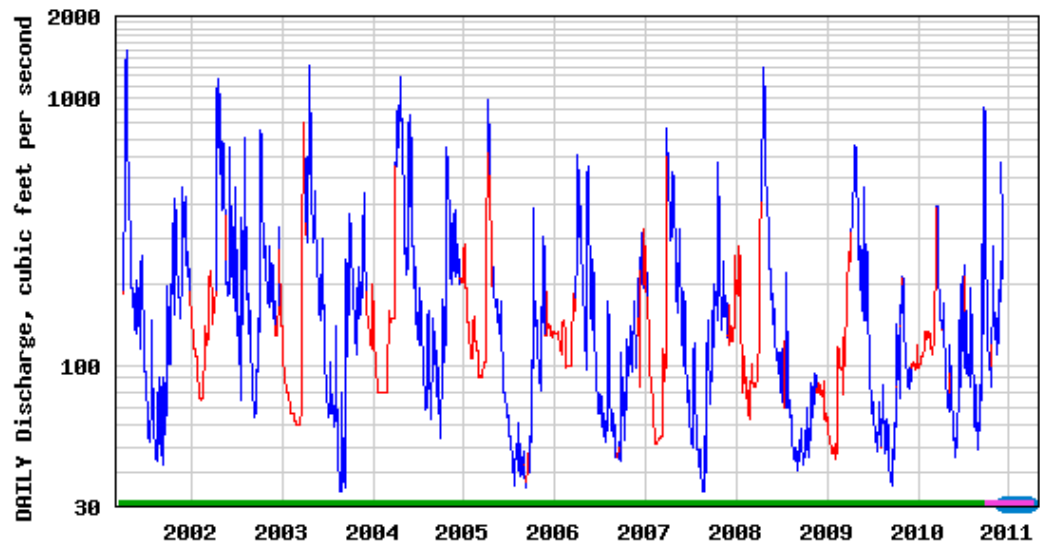
Tributary USGS Hydrological Stations



Selected Rivers with Longest Unobstructed Flow

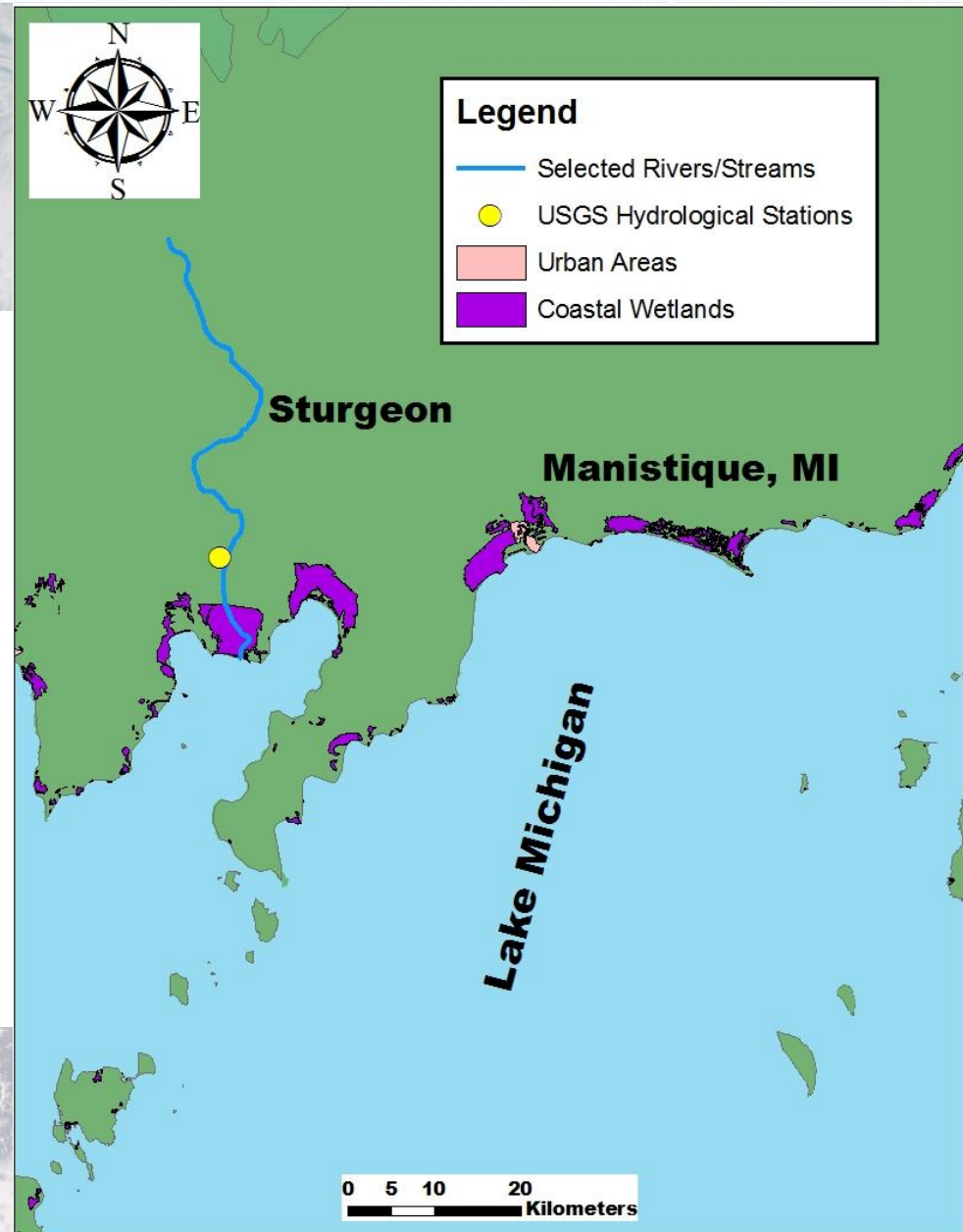
- **Sturgeon River**
 - ~60km unobstructed flow
 - Average discharge of ~200 cfs

USGS 04057510 STURGEON RIVER NEAR NAHMA JUNCTION, MI



— Daily mean discharge • Flow at station affected by ice
— Estimated daily mean discharge — Period of provisional data
— Period of approved data

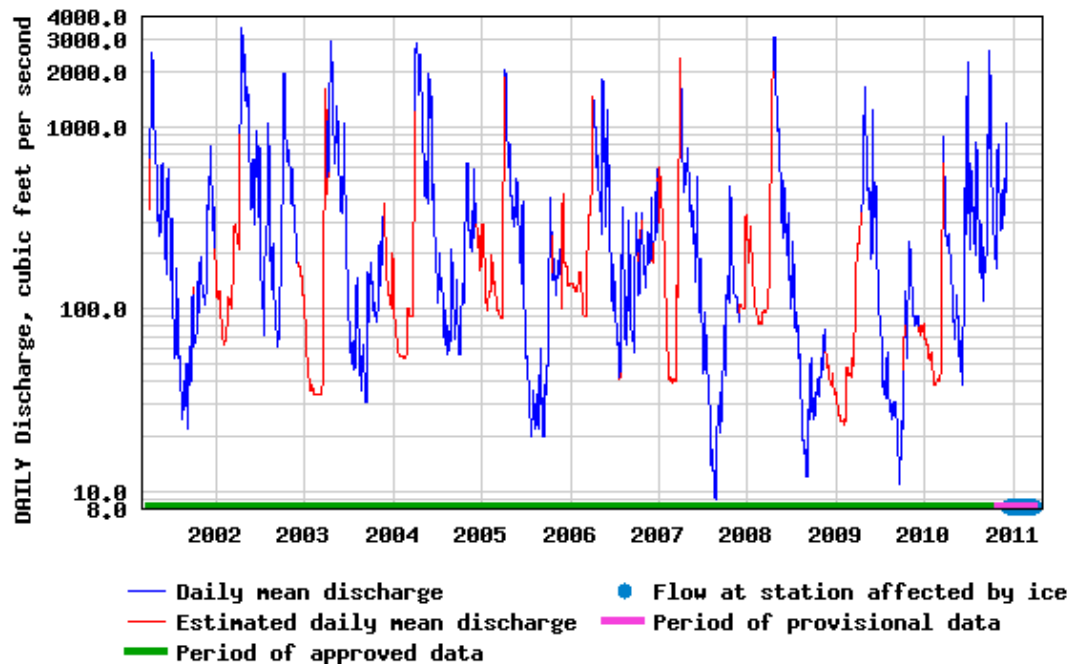
Discharge (cfs)



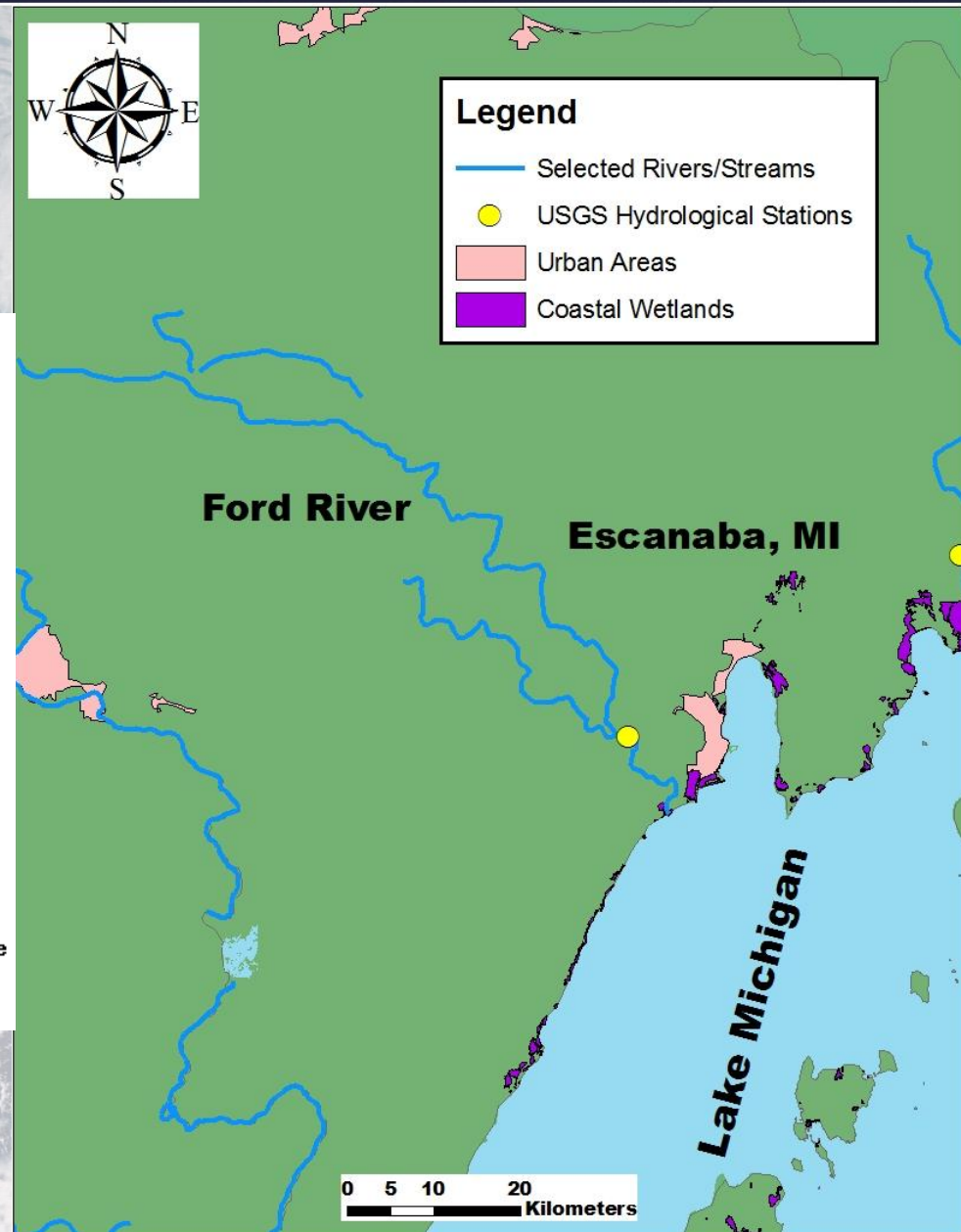
Selected Rivers with Longest Unobstructed Flow

- **Ford River**
 - >100km unobstructed flow
 - Average discharge of ~300 cfs

USGS 84059500 FORD RIVER NEAR HYDE, MI

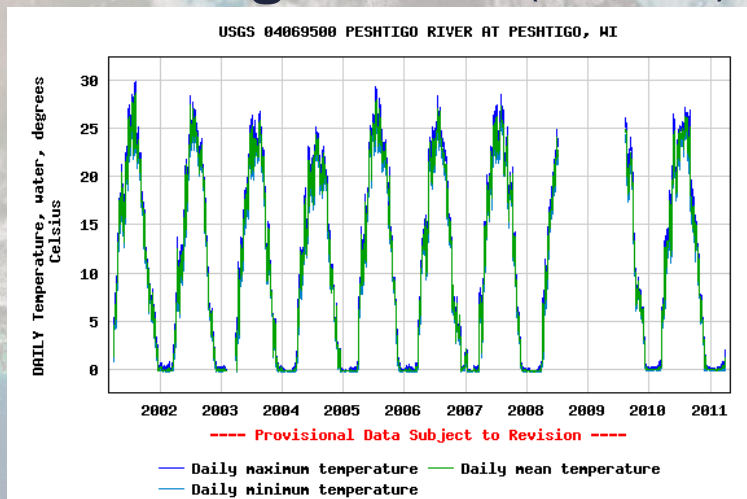


Discharge (cfs)

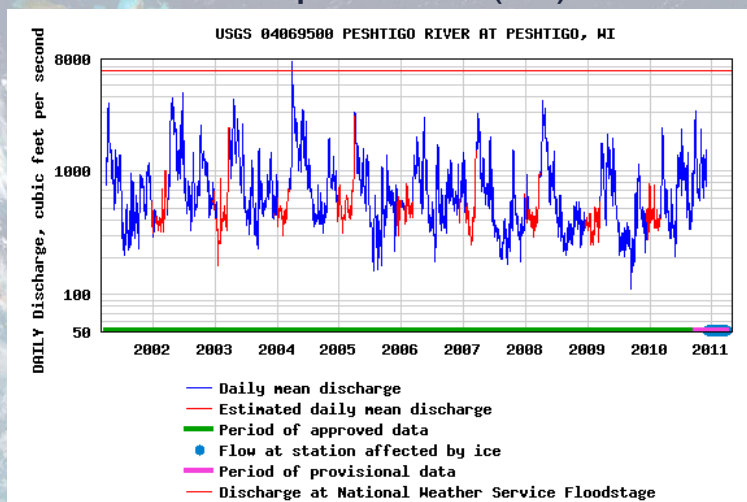


Selected Rivers with Longest Unobstructed Flow

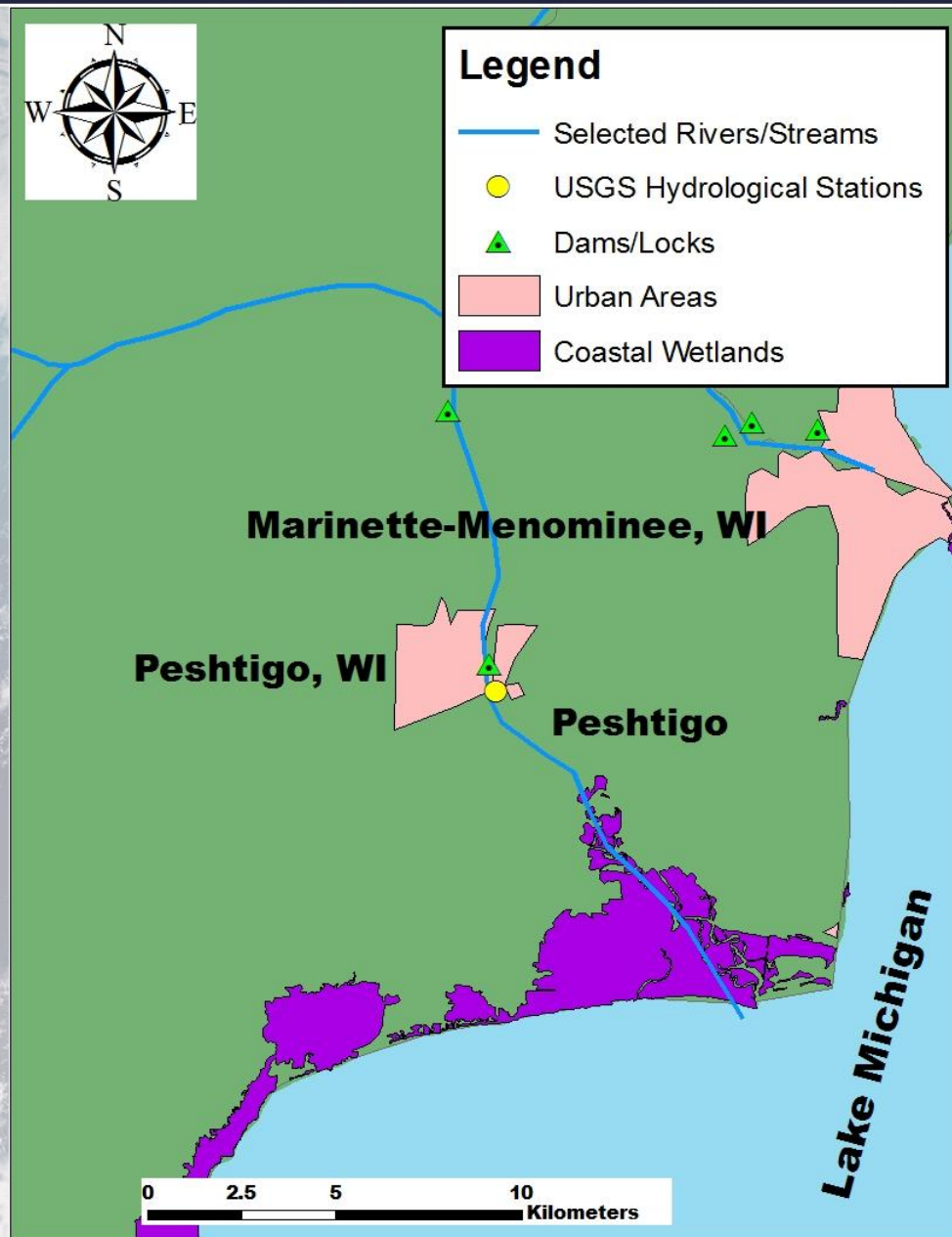
- **Peshtigo River (~10 km)**



Temperature (°C)



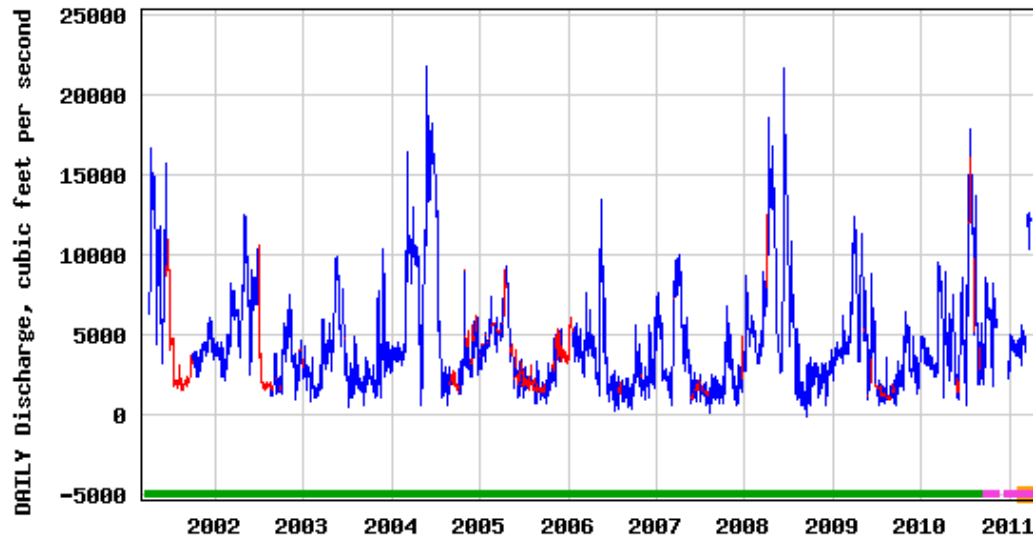
Discharge (cfs)



Selected Rivers with Highest Sustained Flow

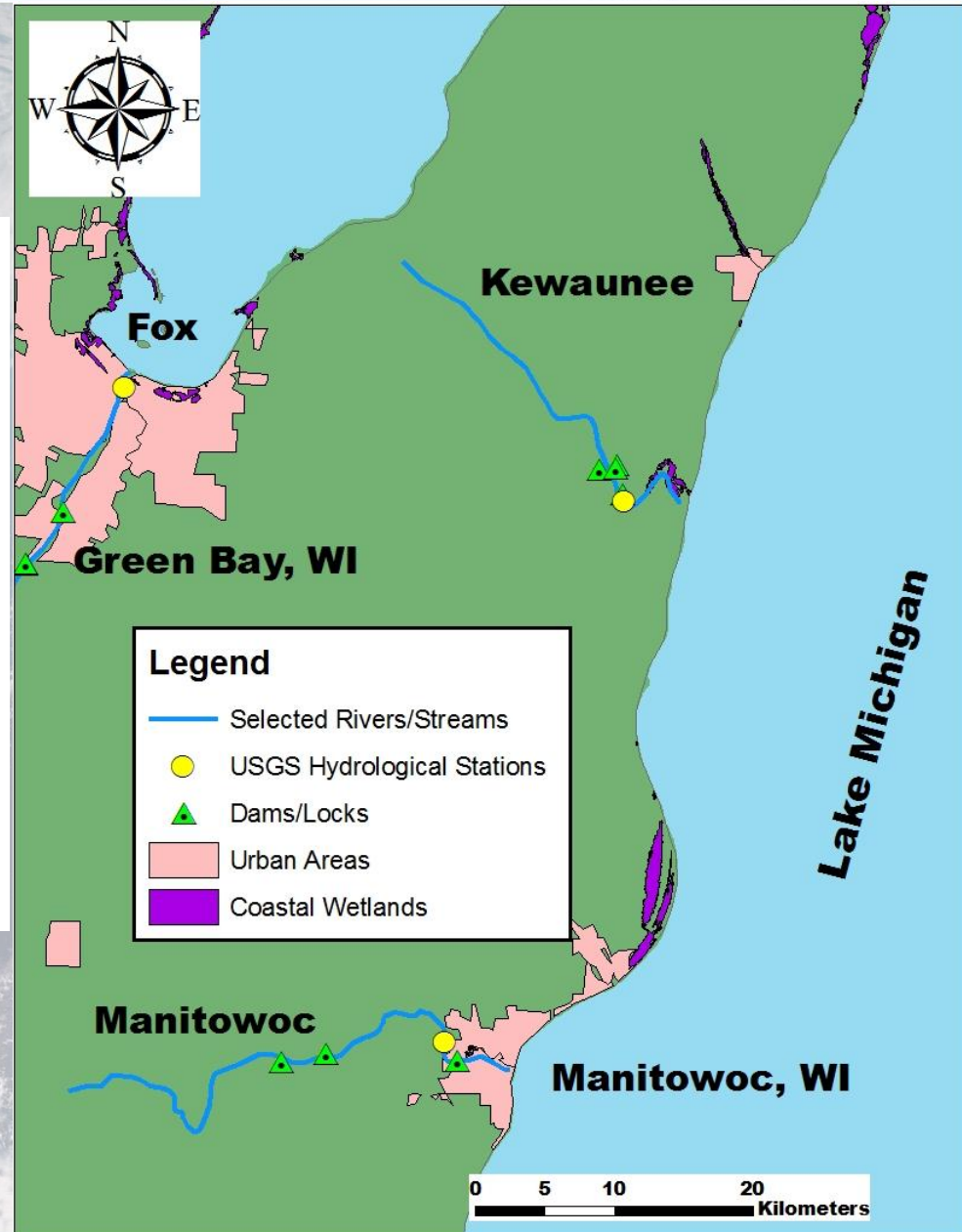
- **Fox River**
 - Average discharge of ~5000 cfs

USGS 040851385 FOX RIVER AT OIL TANK DEPOT AT GREEN BAY, WI



■ Data temporarily unavailable ■ Period of approved data
— Daily mean discharge ■ Period of provisional data
— Estimated daily mean discharge

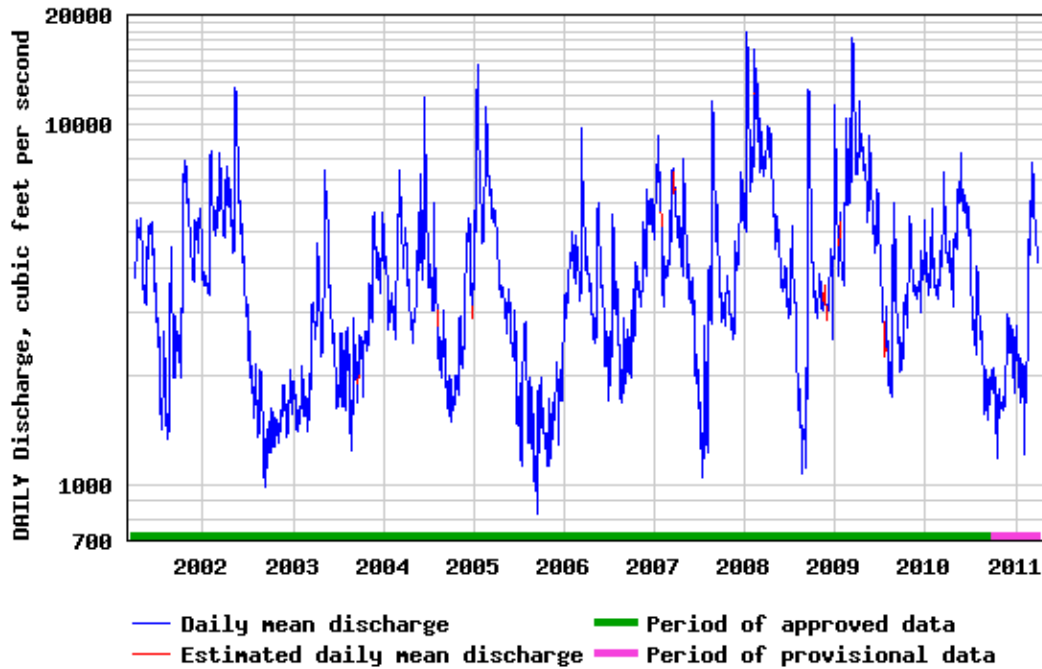
Discharge (cfs)



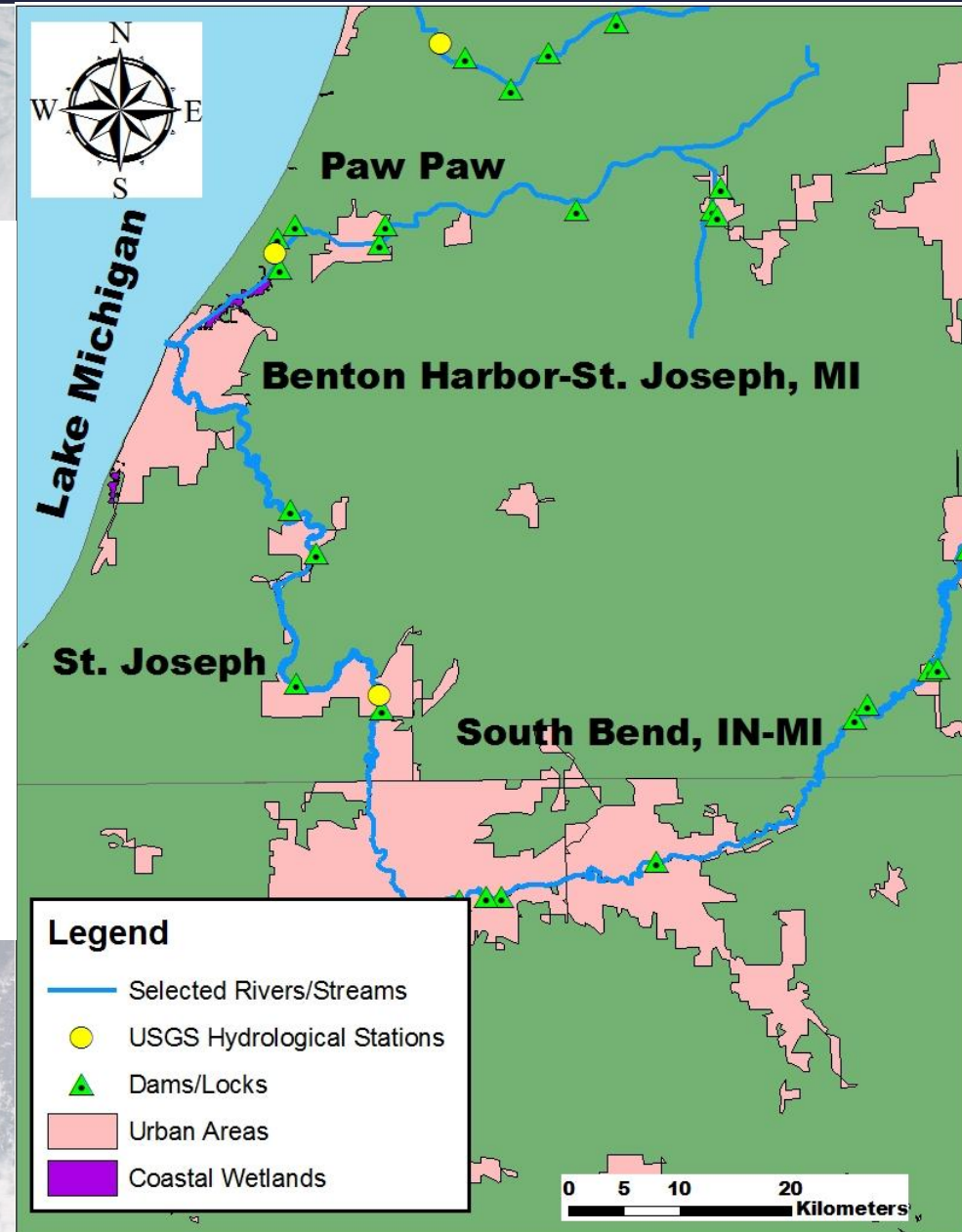
Selected Rivers with Highest Sustained Flow

- **St. Joseph River**
 - Average discharge of ~5000 cfs

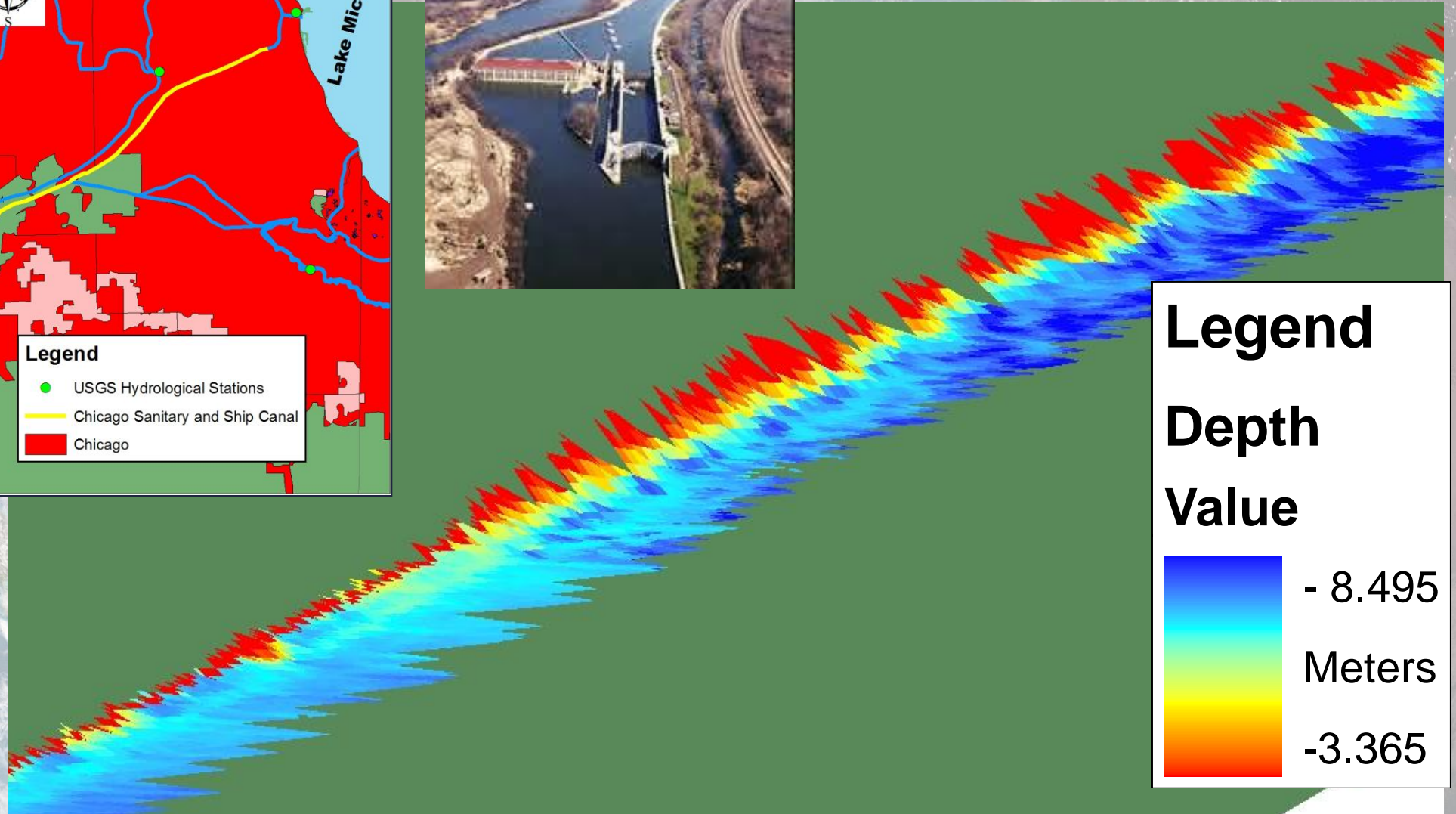
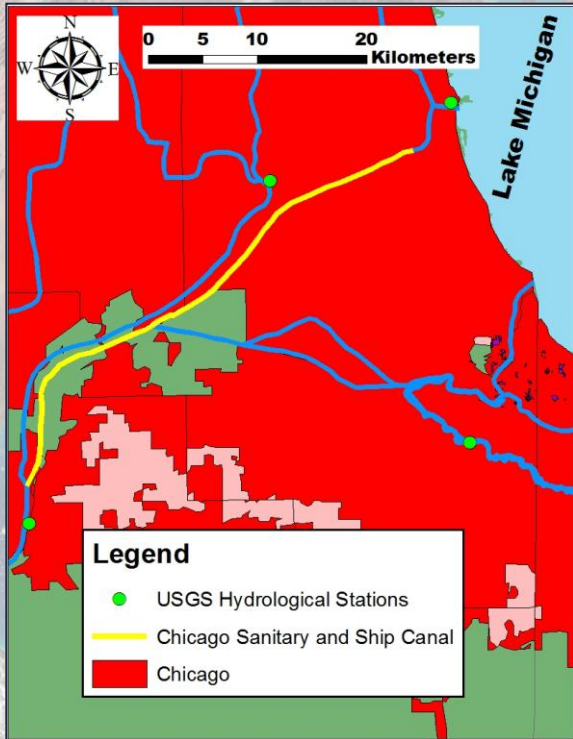
USGS 04101500 ST. JOSEPH RIVER AT NILES, MI



Discharge (cfs)



3D Multi-Beam Sonar Data of CAWS



Development of an invasive species decision support tool- Results

Conclusions

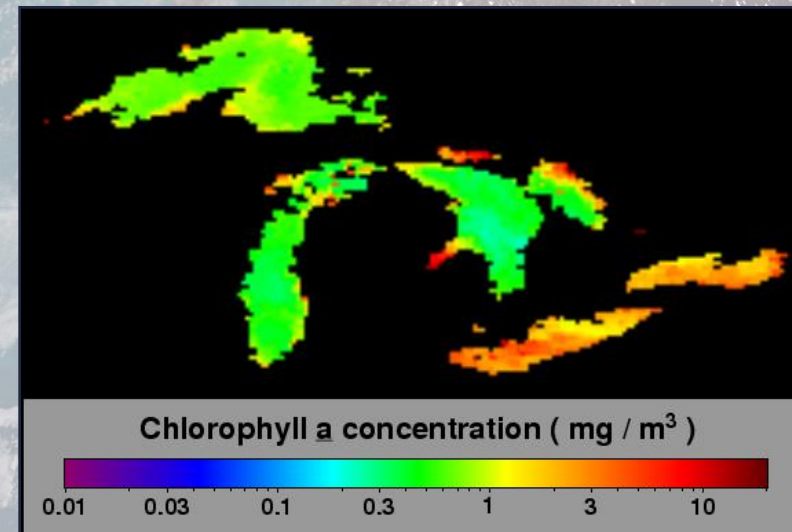
- Potential spawning mapping is possible with ArcGIS
- NASA instruments can aid invasive Asian carp research
- ArcScene can turn USGS multibeam data into 3D imagery for insertion into HIVE

Partner Transition

- Tech paper and potential spawning location map to show methodology
- Visualization of NASA data to show potential feeding locations in Lake Michigan
- 3D presentation in HIVE to be presented at June 15-17th GLSLCI conference



Aqua MODIS Chlorophyll concentration June 18-25 2010



SPoRT Great Lakes SST product

