



Great Lake Deltas – the Huron-Erie Corridor

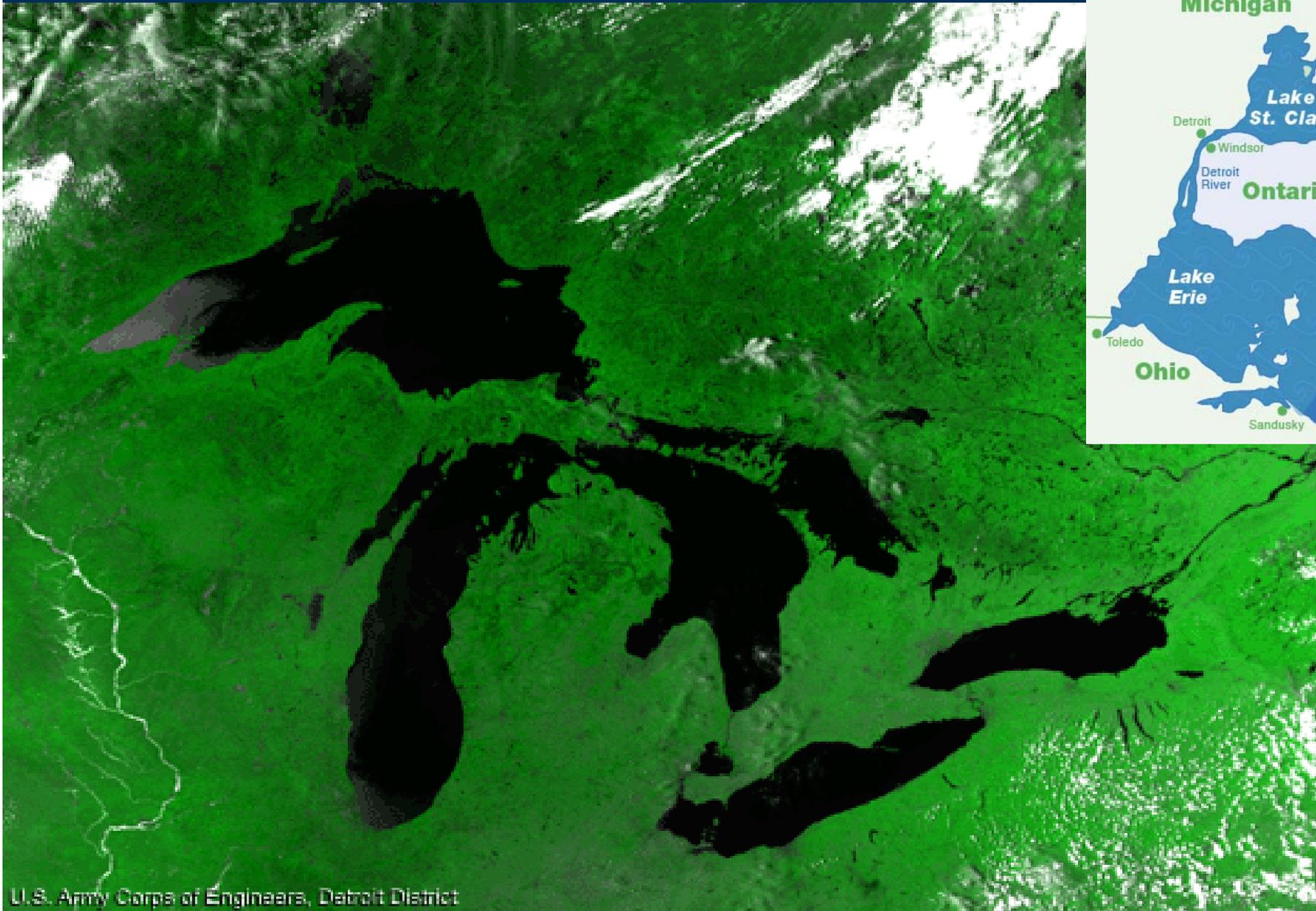
International Delta Roundtable
November 28-30, 2007

Dr. Leon M. Carl, Director
Great Lakes Science Center

U.S. Department of the Interior
U.S. Geological Survey

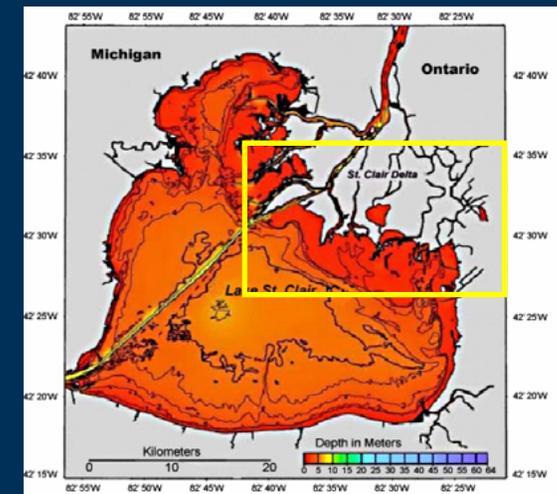


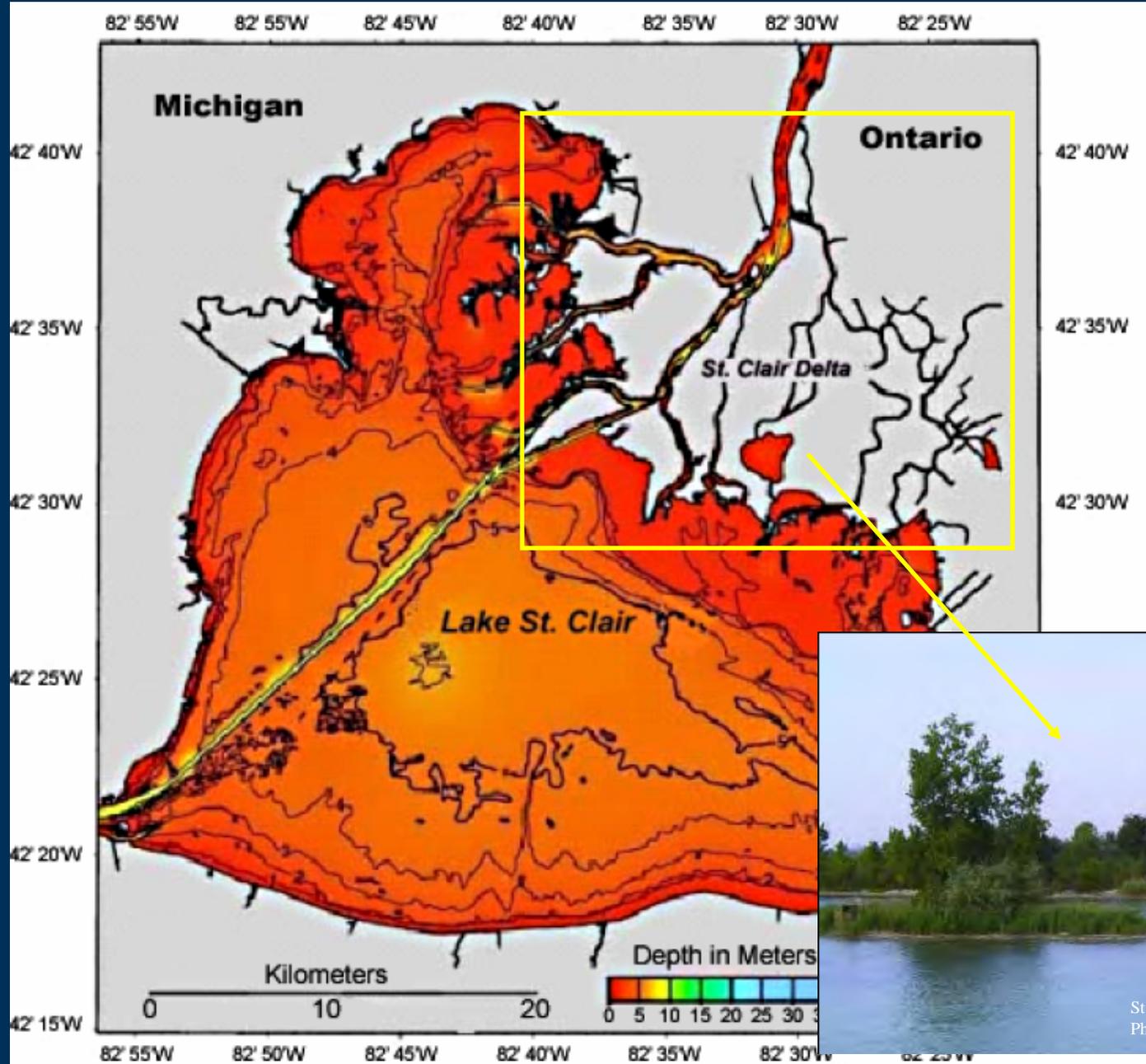
Deltas in the Great Lakes?



The St. Clair System

- Lake Huron waters flow into the St. Clair River and into Lake St. Clair.
- The northeastern portion of Lake St. Clair is the only extensive delta system within the Great Lakes.
- Channelization begun in 1840's
- Most flow thru shipping channel





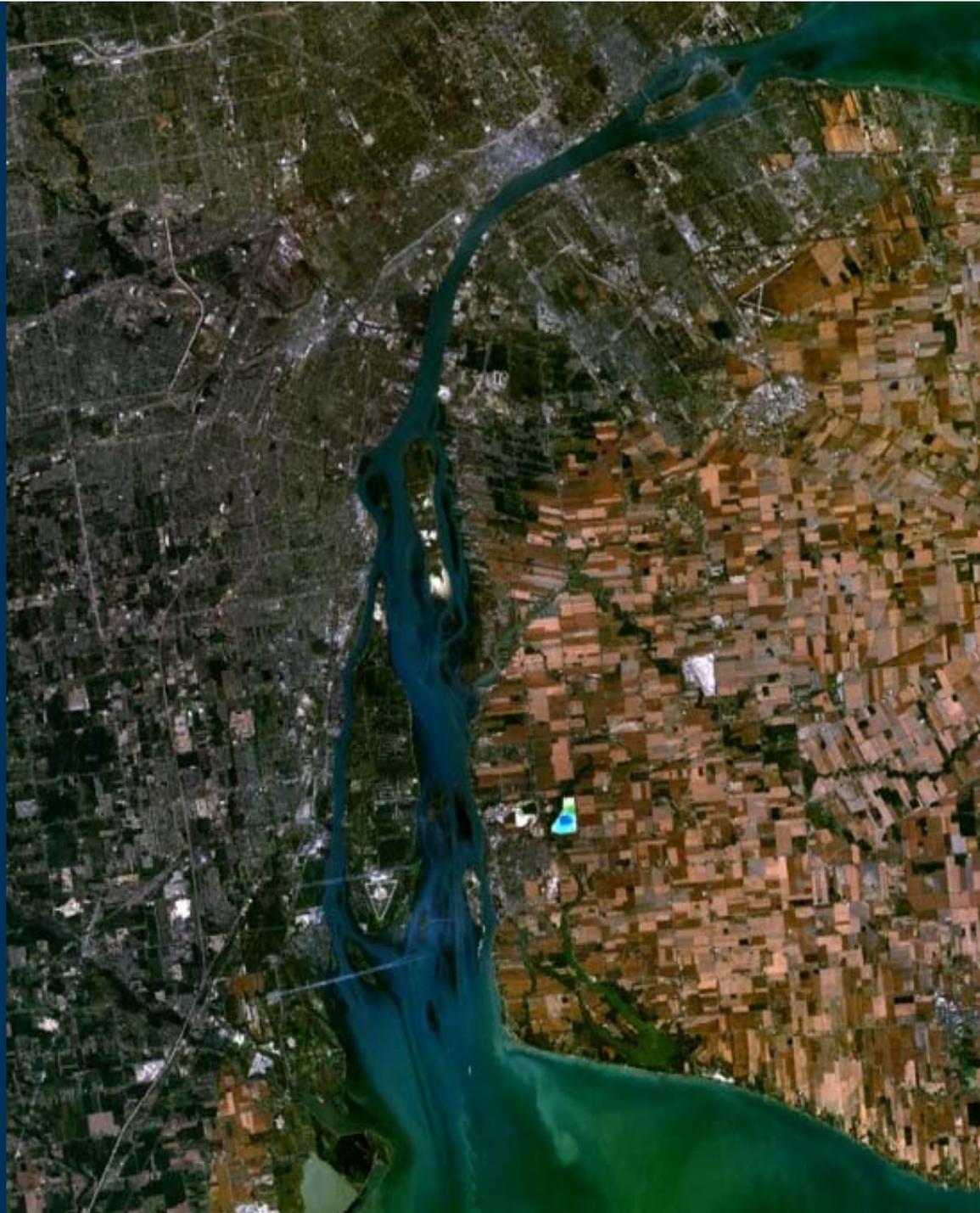
St. Clair River delta shore near Walpole Island;
Photo by Lisa Appel; Wildlife Habitat Council



Detroit River and Western Lake Erie

- Detroit River flows into western Lake Erie and has an average discharge of 5,200 m³/second.
- Lake Erie is the most biologically productive of the Great Lakes.
- The Detroit River International and Ottawa National Wildlife Refuges protect some of the marshes in the area.





- **The Huron-Erie Corridor (HEC)** is an international shipping route and one of the busiest navigation centers in the United States.
- Conflicting uses of HEC waters for activities such as shipping, recreation, and fishing have resulted in a number of environmental changes to this system.



Importance of the HEC Fishery

- **The Great Lakes fishery brings in over \$4.5 billion annually to the regions economy.**
- **The HEC fishery is one of the most productive in the Great Lakes.**
- **Recreational boating and other tourism also add millions of \$\$ to the economy.**
- **A sustainable healthy fishery contributes to a stronger more resilient ecosystem.**

Environmental Changes Affecting the HEC Fishery

- Loss of spawning grounds and coastal wetlands through channelization, infill of aquatic habitat and shoreline armoring
- Over fishing – lake sturgeon endangered
- Water pollution, (contaminants, thermal, sediment)
- Many changes began in the 1800's and are poorly documented.

**HEC Research Focus:
Fishery Habitat Restoration**

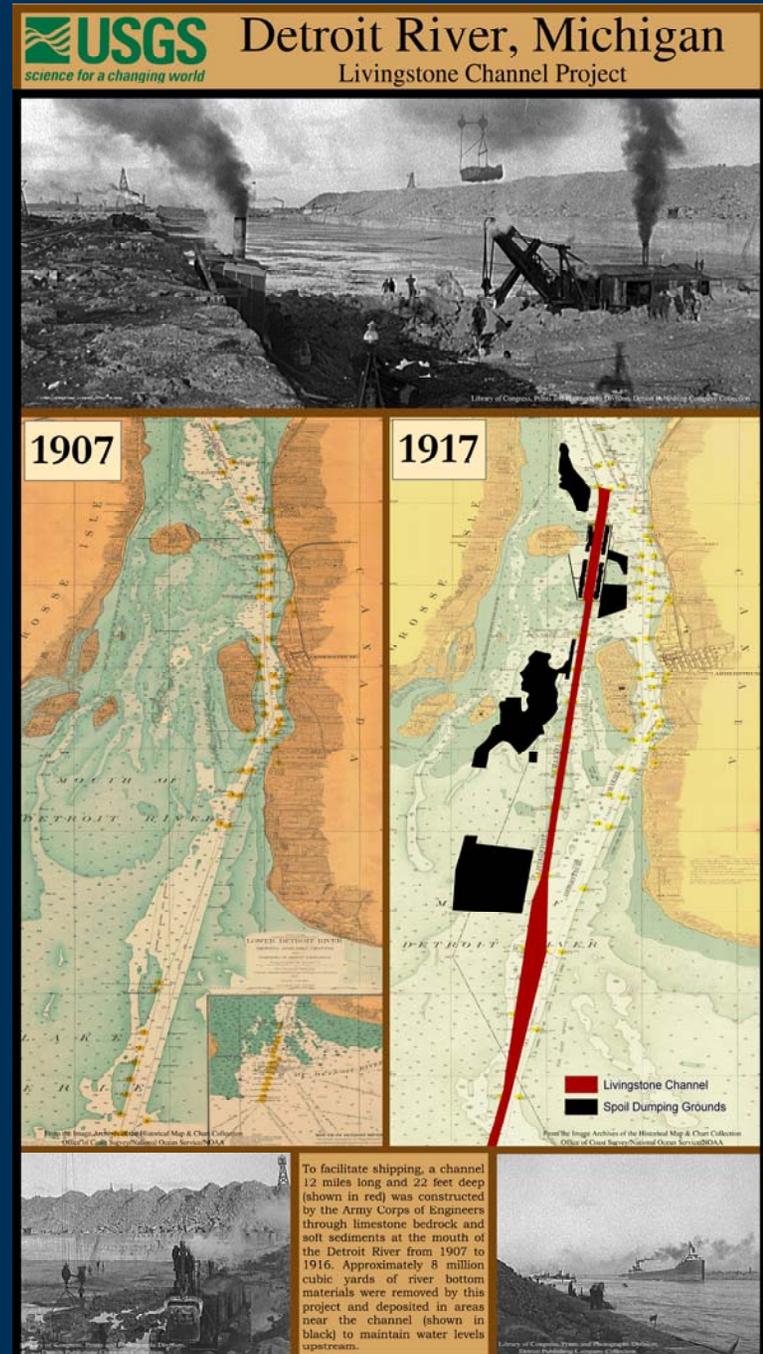
Creation of Navigation Channels

- A navigation channel bisects Lake St. Clair in a northeast-southwest direction between the St. Clair Delta and the Detroit River.
- Channelization continues through the Detroit River into Lake Erie.

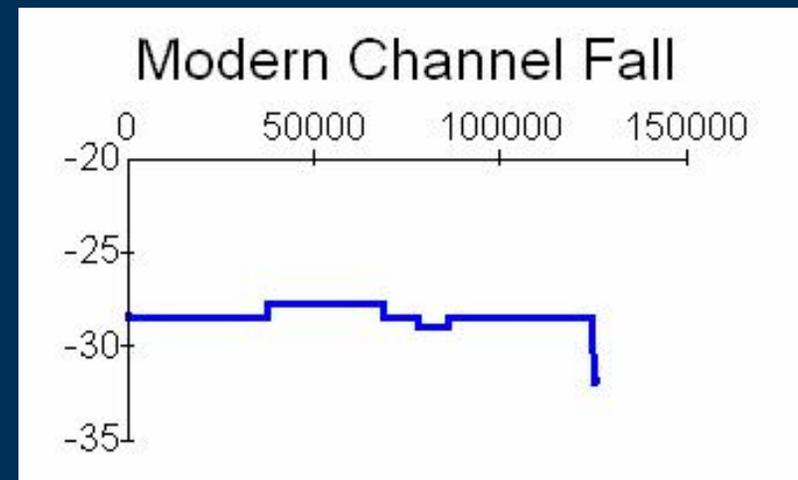
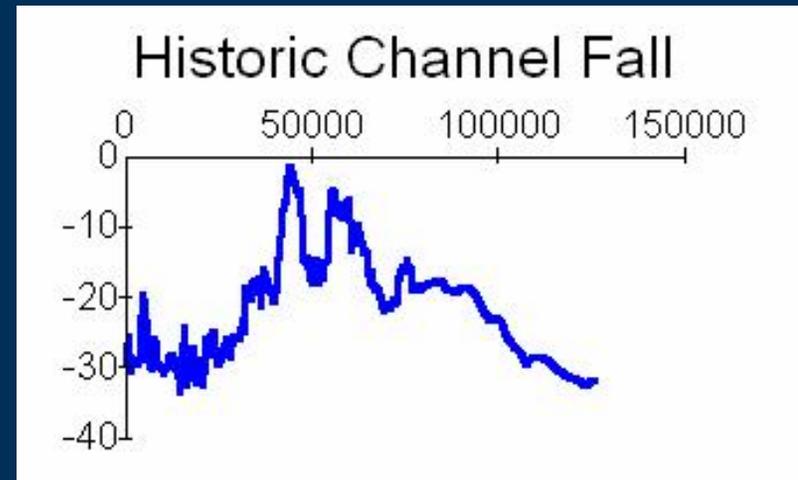
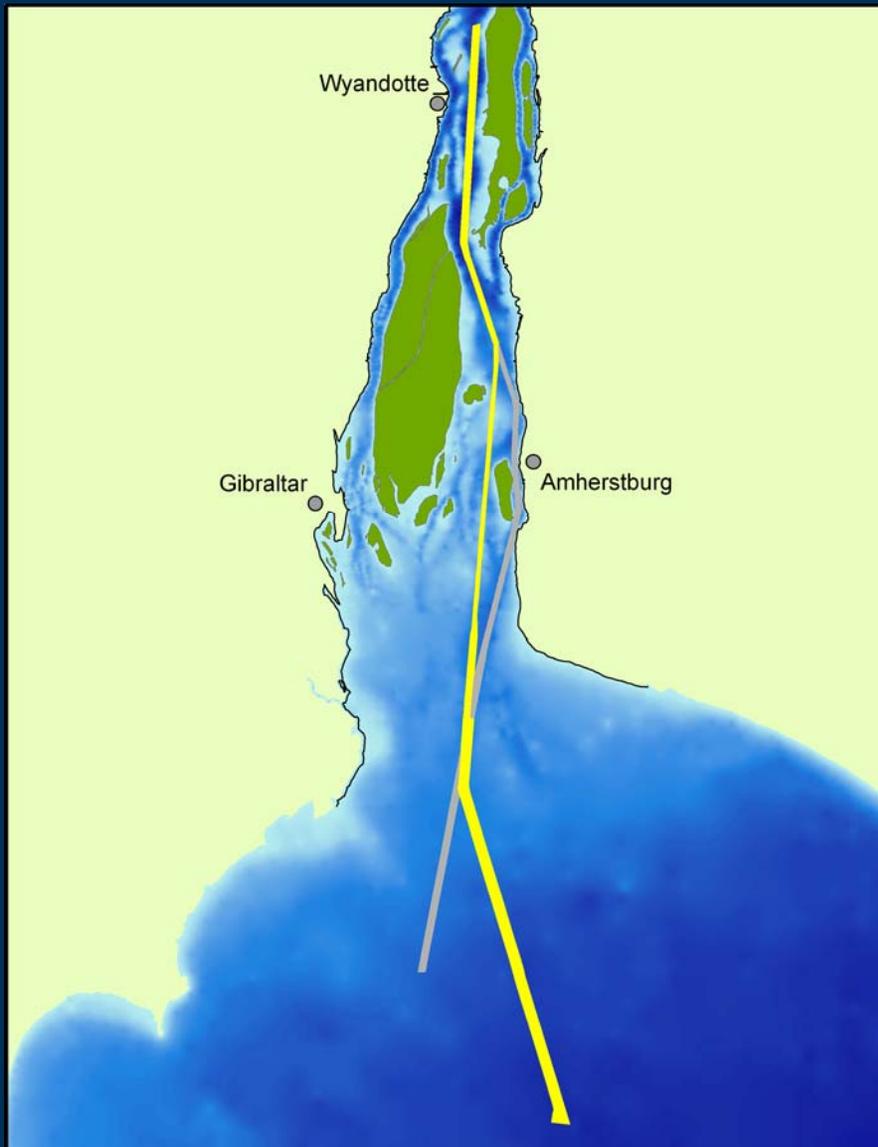


Detroit River Channelization

- The size and depth of the shipping channels were increased in the early 1900's.
- The limestone substrate that was removed was spawning habitat for lake whitefish and numerous other native fish.
- Caused collapse of whitefish fishery.



Flow Changes from Channelization

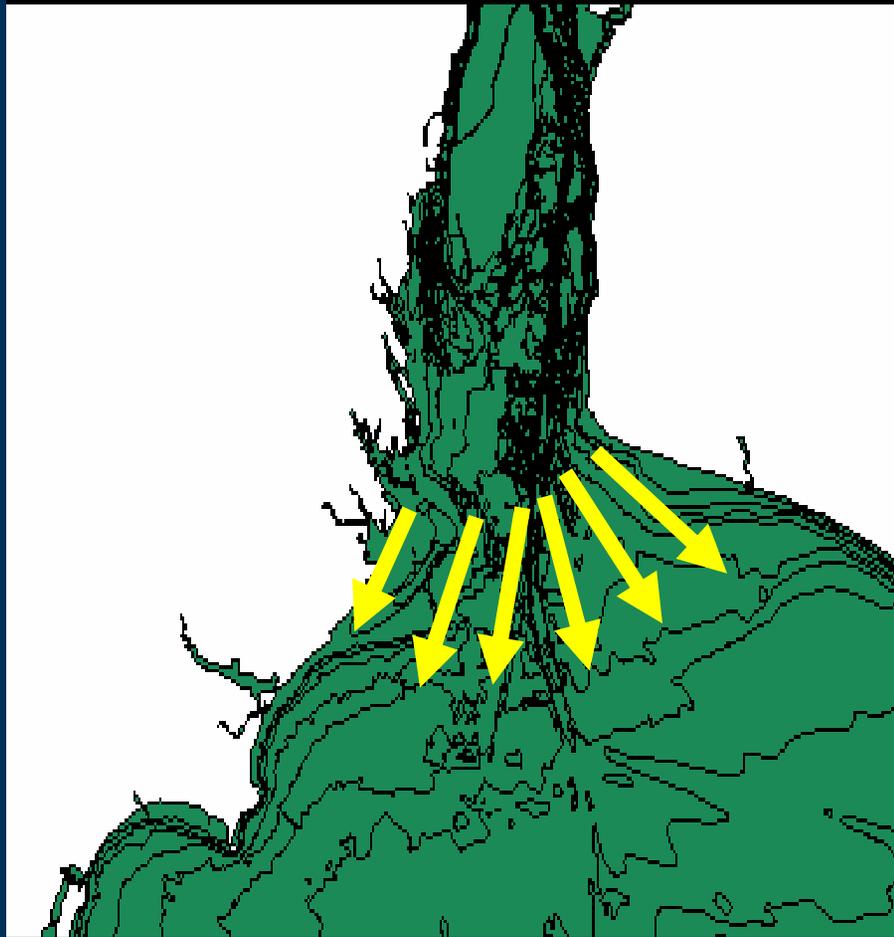


Loss of Spawning and Nursery Links

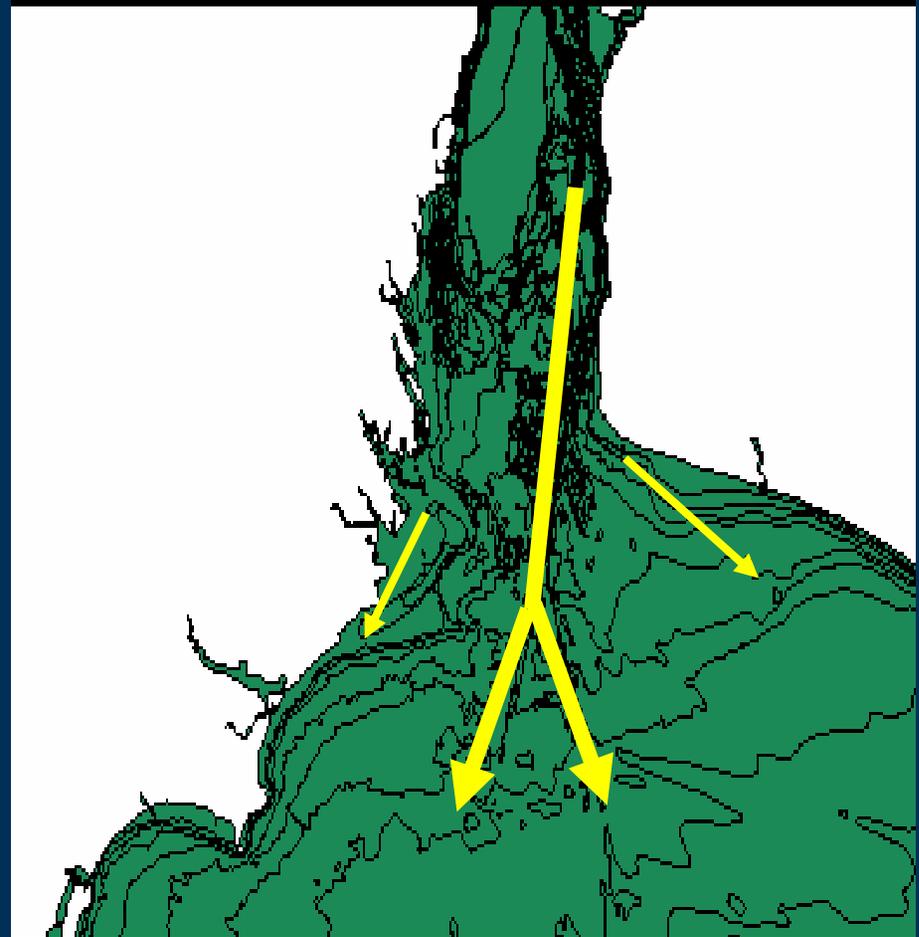
The St. Clair River spawning habitat has been severely modified such that no major populations use it or the Lake St. Clair for larval rearing.

The Detroit River is an important pathway for fish larvae moving from spawning areas to Lake Erie. Scientists believe that linkages connecting upstream spawning habitats in the river with productive nursery areas in western Lake Erie are disconnected due to changes in natural hydrologic patterns.

Impact on Fishery Production

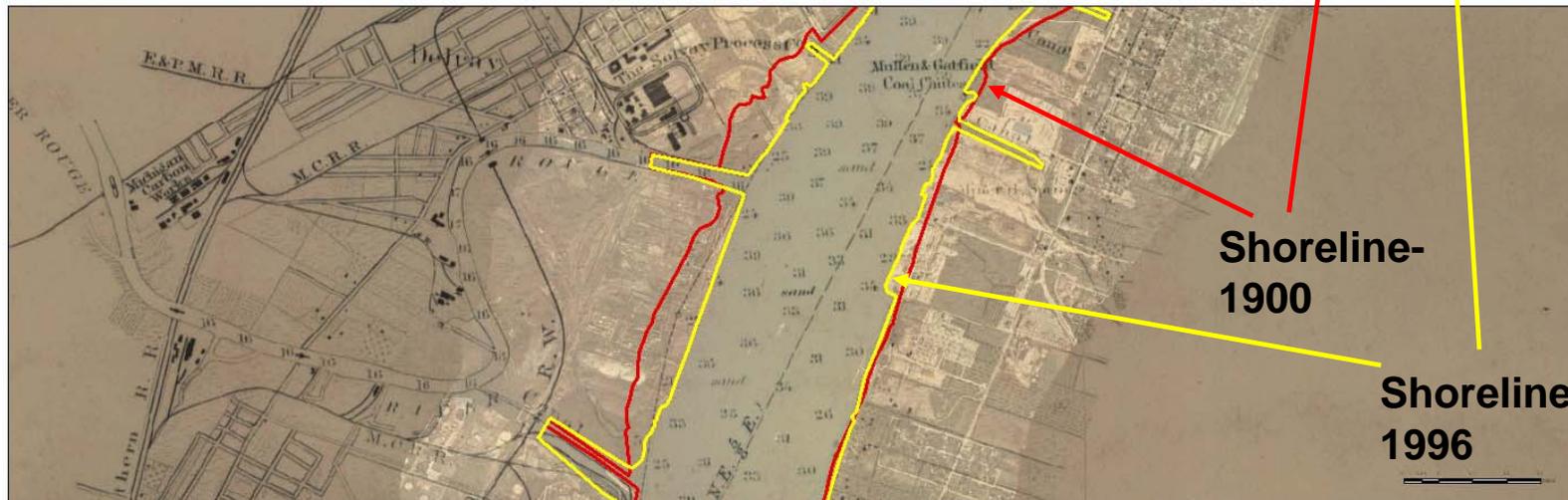


**Historic flow – diffuse;
connected to nearshore**



**Present day flow –
linear; disconnected**

Shoreline Changes Affect the Fishery



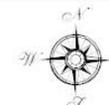
Shoreline-
1900

Shoreline-
1996



Legend
 — 1996 Shoreline
 — 1900 Shoreline
 1900 Detroit River Chart
 1996 Aerial Imagery

**Detroit River Shoreline
 Areas Of Change
 1900 to 1996**



Fish Habitat Restoration Questions

- Where did these habitats exist historically?
- How have river flow and other physical properties of the river changed?
- How have these changes affected fish habitat and reproduction?
- What conditions do fish require to successfully reproduce?

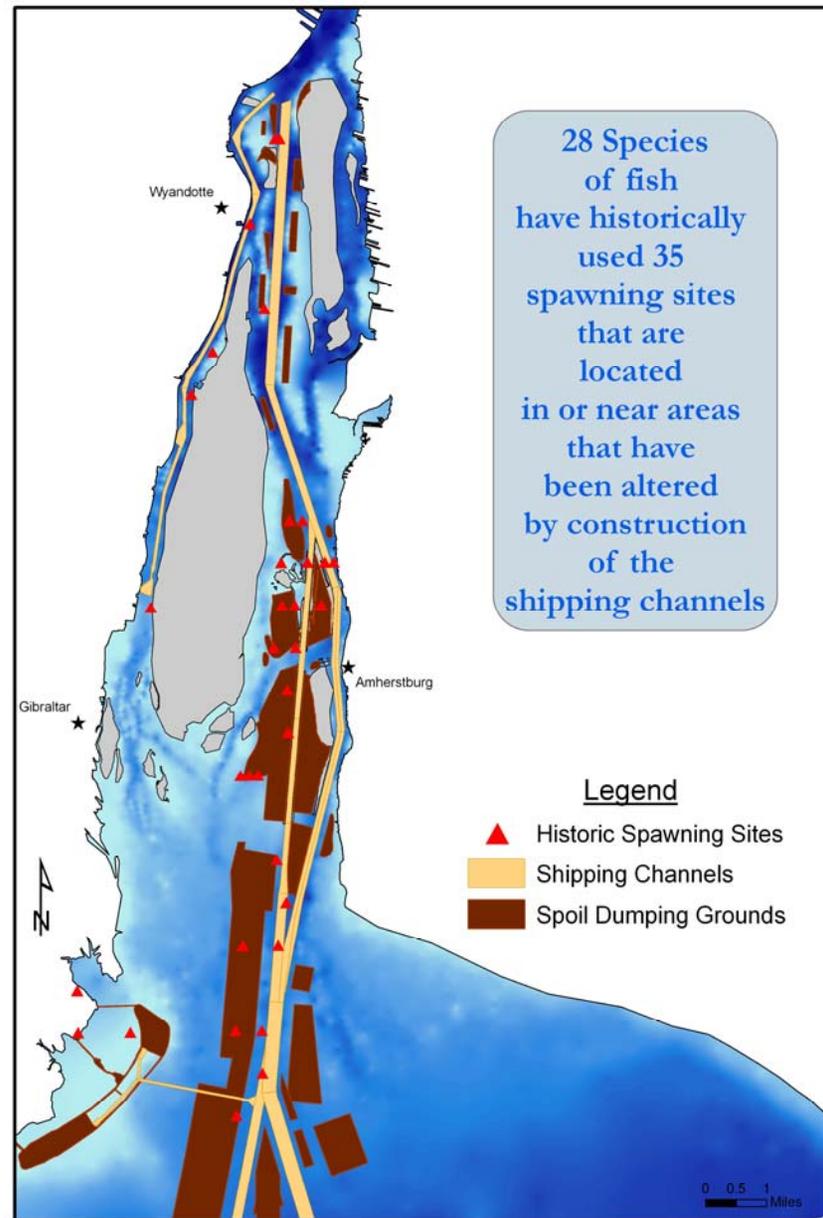
Use of Historical Data and GIS to Answer These Questions

- Factors such as flow changes, shoreline encroachment, fluvial geomorphic change, and alteration of river bed substrate can be explored with historic spatial datasets.
- Historic data can be analyzed and displayed in GIS to help identify and prioritize sites as best candidates for habitat restoration or creation.
- Scientists are using this information to enhance biological studies and develop fish habitat restoration strategies in the HEC.

Example of the use of historic data, flow modelling and GIS analysis to identify potential fish spawning restoration sites and to determine connectivity to larval rearing habitat.



Historic Spawning Sites in Construction Areas Lower Detroit River



Questions?



U.S. Army Corps of Engineers, Detroit District