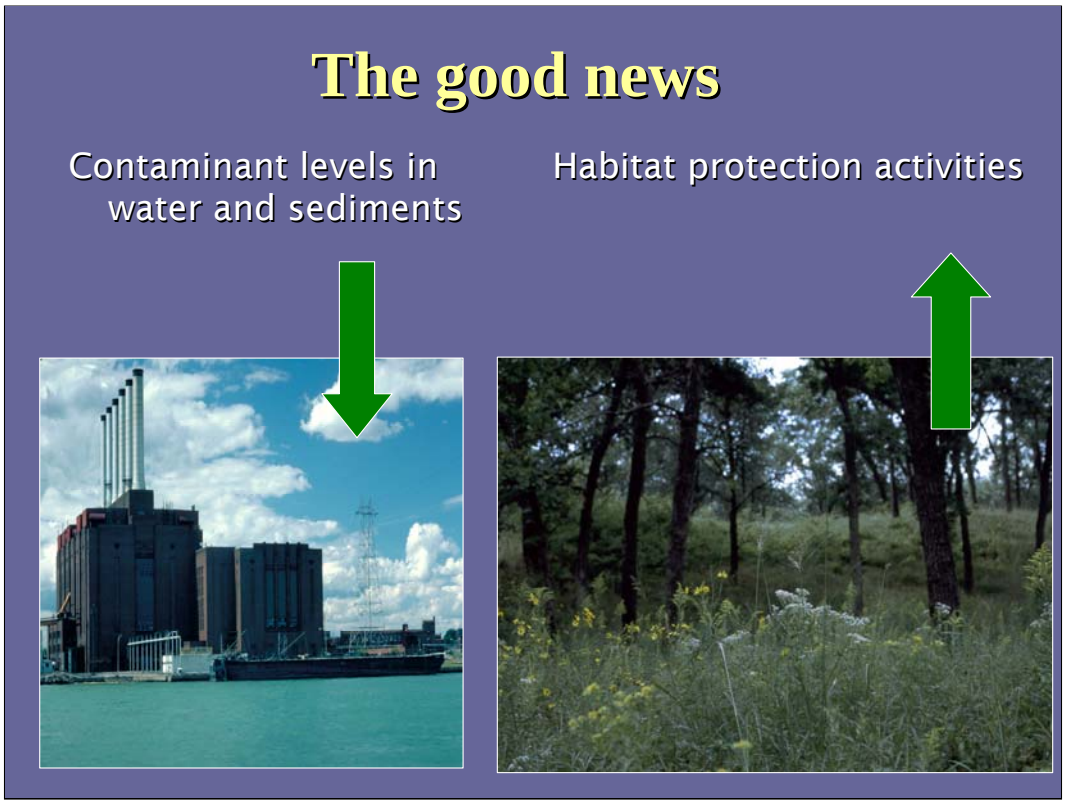
Upper Great Lakes Connecting Channels

Ted Briggs
Ontario Ministry of Environment

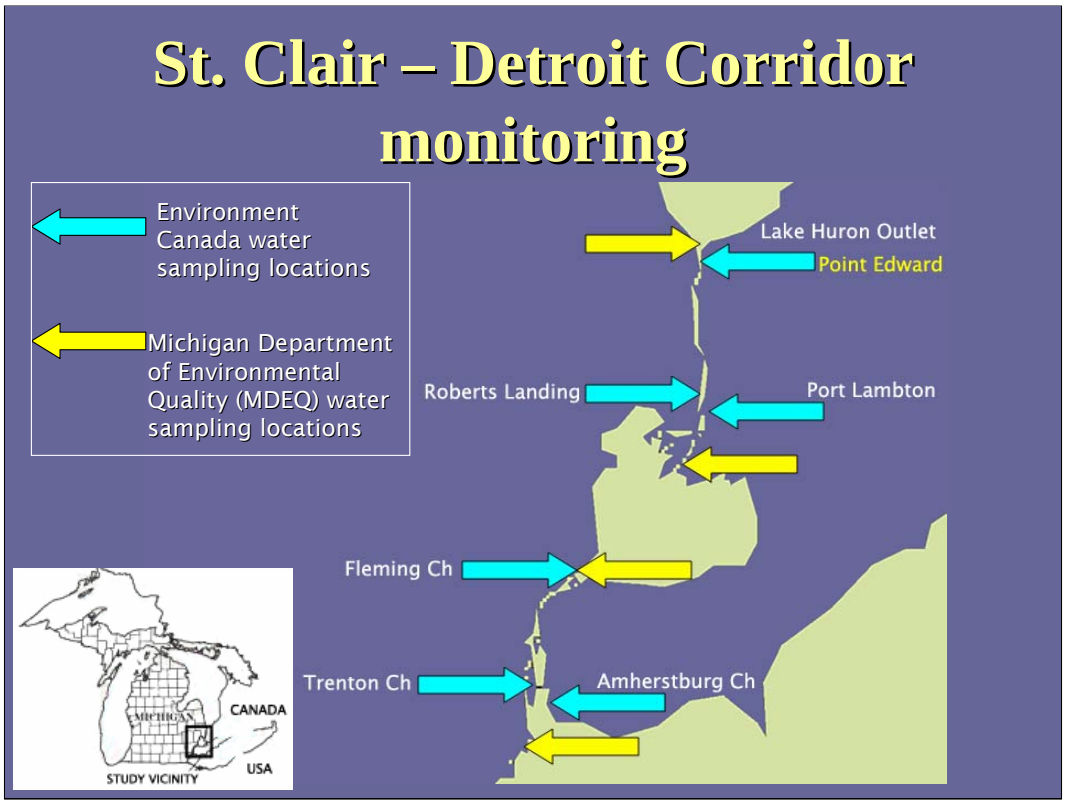
Status of the St. Clair-Detroit River Corridor ecosystem: Mixed

The status of the St. Clair-Detroit Corridor ecosystem is mixed.

The St. Clair River, Lake St. Clair and Detroit River together serve as a corridor connecting Lake Huron and Lake Erie and serve as a major shipping channel linking the Upper and Lower Great Lakes. As a result of this shipping link, the region has developed into one of the most highly industrialized and environmentally altered areas in the Great Lakes basin. The cities of Port Huron and Detroit, Michigan and Sarnia and Windsor, Ontario are significant petrochemical and manufacturing centres within North America.



Contaminant levels in water and sediment continue to decrease, and habitat protection activities have increased.



Michigan Department of Environmental Quality and Environment Canada have regular long-term monitoring programs for contaminants in the St. Clair – Detroit Corridor.

Environment Canada has been monitoring chemical contaminants in water and suspended sediment samples for a wide range of heavy metals and persistent organic contaminants since 1986. MDEQ has been conducting ambient water quality monitoring since 1969 in the Detroit River and since 1998 in the St. Clair River. While there is no similar programs instituted for Lake St. Clair some conclusions about ambient water in the Lake can be inferred from results between the St. Clair River downstream and the Detroit River Upstream stations

Michigan Department of Environmental Quality water monitoring results (1998-2000)

STORET ID	Location	Cd ug/L	Cr ug/L	Cu ug/L	Pb ug/L	Ni ug/L	Zn ug/L
740376	**St. Clair River (upstream)**						
Rule 57 Water Quality Value		2.1	69	8.3	9.4	48	110
Mean Concentration		0.00562	0.550	0.495	0.0502	1.19	0.420
Exceedance Rate		0%	0%	0%	0%	0%	0%
740016	**St. Clair River (downstream)**						
Rule 57 Water Quality Value		2.2	72	8.6	9.8	50	110
Mean Concentration		0.00738	0.632	0.599	0.0927	1.29	0.782
Exceedance Rate		0%	0%	0%	0%	0%	0%
820414	**Detroit River (upstream)**						
Rule 57 Water Quality Value		2.2	73	8.8	10	51	120
Mean Concentration		0.0120	0.640	0.840	0.371	1.40	1.23
Exceedance Rate		0%	0%	0%	0%	0%	0%
820017	**Detroit River (downstream)**						
Rule 57 Water Quality Value		2.2	74	8.9	10	52	120
Mean Concentration		0.00826	0.519	0.716	0.212	1.26	2.19
Exceedance Rate		0%	0%	0%	0%	0%	0%

MDEQ, 2003

1998 – 2000, MDEQ monitoring indicates declining or static trends over time in water quality in the corridor for most contaminants sampled. With the exception of total PCB, total DDT, and mercury, which, in some cases, exceeded MDEQ water quality values, concentrations of other contaminants met MDEQ water quality values.

Source: MDEQ, 2003

St. Clair River sediment cleanup

And progress is being made in the remediation of contaminated sediments. In 2003, Dow Chemical Canada began remediation of sediments contaminated by historical operations from Dow Sarnia. To date 9,300 cubic yards of material have been removed from one of the highest priority sediment areas in the St. Clair River. The final phase of the project commenced in May 2004 and is expected to be completed this year.

Photo source: http://www.friendsofstclair.ca/pdf/sediments.pdf

Lake St. Clair sediment cleanup

In 2002, a previously unknown source of PCB contaminated sediments to Lake St. Clair was discovered in St. Clair Shores, Michigan. PCBs above MDEQ criteria for direct contact were found in the Revere/Lange canal, a drain that empties into Lake St. Clair. Approximately 6000 tons of PCB contaminated material, at a cost of $6 million USD, was removed from the canal.

Habitat activities increase

Pigeon Marsh Reclamation, St. Clair River AOC

Habitat protection and restoration projects are a major emphasis for many public and private stakeholders along the corridor.

In recent years, stakeholder partnerships have brought about the acquisition or restoration of more than 2100 acres in the St. Clair River watershed, and more than 700 acres along the Detroit River. And in 2001, the U.S. Fish and Wildlife Service designated parts of the Detroit River a national wildlife Refuge.

Since 1995, 3,500 acres of grassland has been gained in the Lake St. Clair watershed, although majority of this increase is believed to be due to agricultural fields that have been taken out of cultivation.

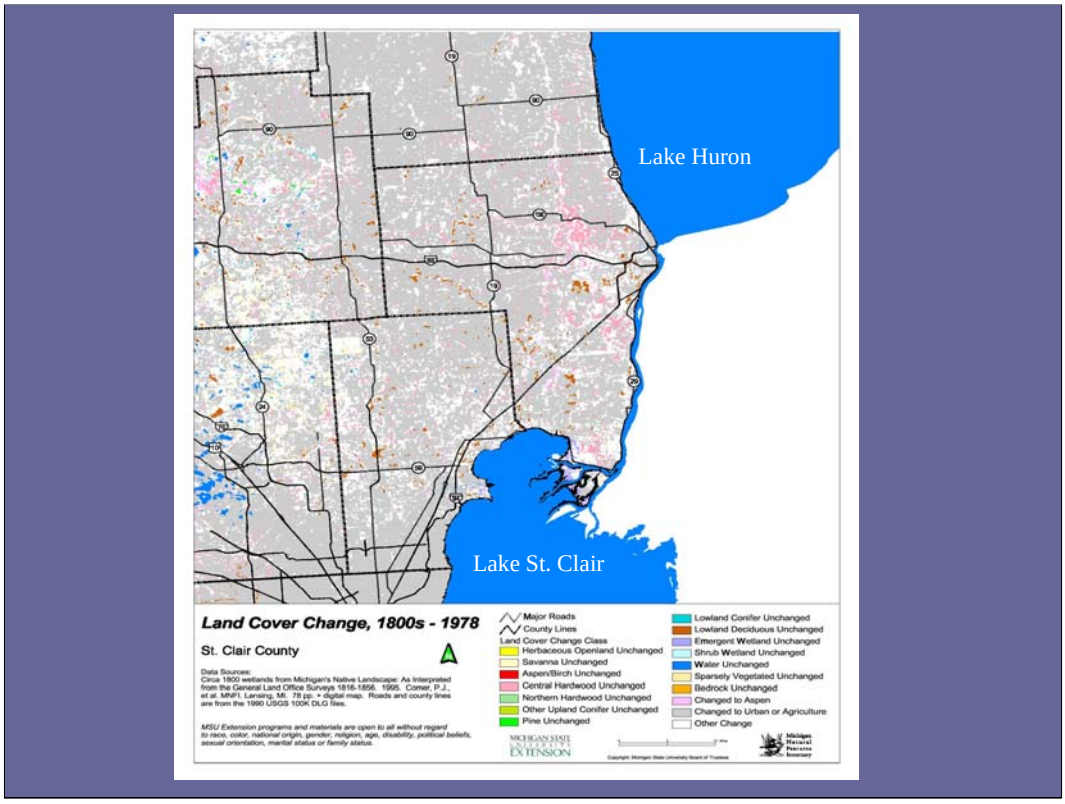
Photo: http://www.friendsofstclair.ca/pdf/habitat.pdf

Stress to the St. Clair-Detroit Corridor persists

However, stressors, such as, impacts of land use, contaminant inputs, contaminated sediment, and non-native species continue to impact the corridor

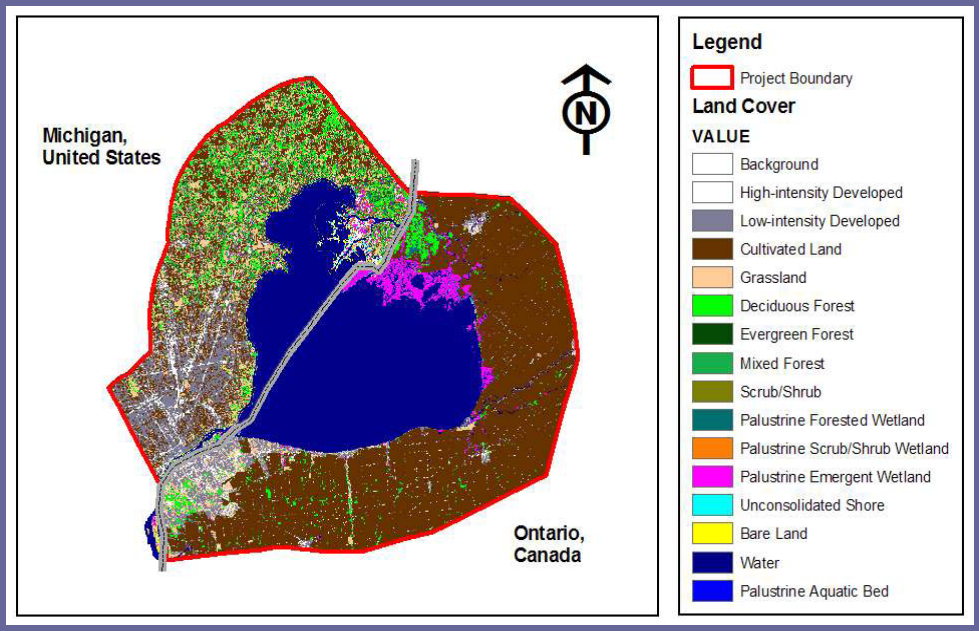
Land use stressors

Land use, chemical contamination, and non-native species all contribute to stress on the physical integrity of the corridor by physically, chemically and biologically effecting the ecosystem health of the corridor.



Population pressure and associated land use practices are the largest stressors to the St. Clair – Detroit River Corridor. The creation of impervious landscapes associated with urban, industrial and agricultural environments have altered the natural hydrologic cycle, fragmented forests and wetlands into isolated components, degraded aquatic communities and reduced the habitat of floral and faunal populations.

Land uses around Lake St. Clair



Land use on the Canadian side of the Corridor is predominantly agricultural, with major industrial centers on the St. Clair River, in Sarnia, and Windsor on the Detroit River. Population growth in Canada along the corridor is below the Provincial average with little growth expected over the next 20-25 years.

Land use on the US side of the corridor is more variable than the Canadian side, and ranges from heavy industry in Port Huron and Detroit, to a mix of high and low intensity development, agricultural land, grassland and deciduous forest, around Lake St. Clair and portions of the St. Clair River.

Population growth

Southeastern Michigan
Household and Population Estimates, 1990 - 2000

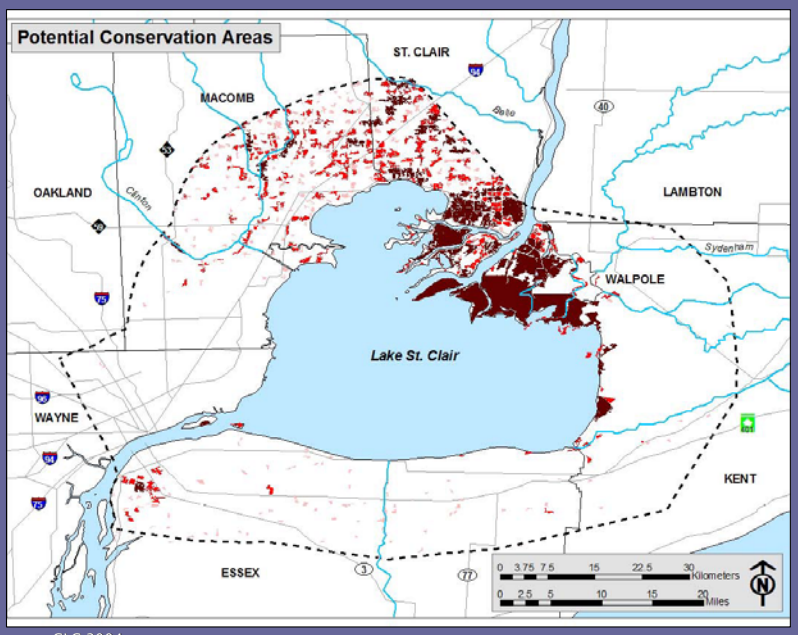
Households					Population			
April 1 1990	July 1 2000	Change Number	Change %	County	April 1 1990	July 1 2000	Change Number	Change Percent
Regional Summary								
264,991	312,451	47,460	17.9	Macomb County	717,400	770,995	53,595	7.5
46,508	55,556	9,048	19.5	Monroe County	133,600	148,129	14,529	10.9
52,882	63,630	10,748	20.3	St. Clair County	145,607	166,640	21,033	14.4
780,535	788,873	8,338	1.1	Wayne County	2,111,687	2,035,536	-76,151	-3.6
1,698,819	**1,875,871**	**177,052**	**10.4**	**Southeast , MI**	**4,590,468**	**4,826,562**	**236,094**	**5.1**

SEMCOG 2000

Population increase and related effects are much greater on the US side of the corridor. Between 1990 and 2000, the three US coastal counties bordering Lake St. Clair experienced an average 13.1% increase in number of households and a 6.1% increase in population. The raise in the average number of households over the average population rate increase indicates that the population is using more land per capita. This increase in suburban growth represents continued demands to convert remaining habitat for accommodation of new households and associated commercial and other development. A high percentage, more than 40%, of the US Lake St. Clair watershed is now comprised of high and low intensity development, representative of the northern expansion of the population from the Detroit Metropolitan area. Further, St. Clair County which borders both the St. Clair River and Lake St. Clair is expected to see a 40% increase in population over the next 30 years

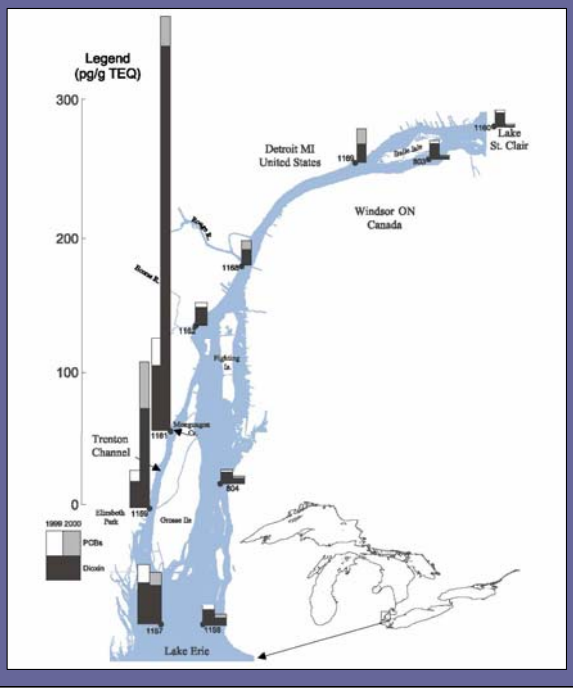
Source: Draft Habitat Management Plan for Lake St. Clair

Priority habitat areas remaining around Lake St. Clair



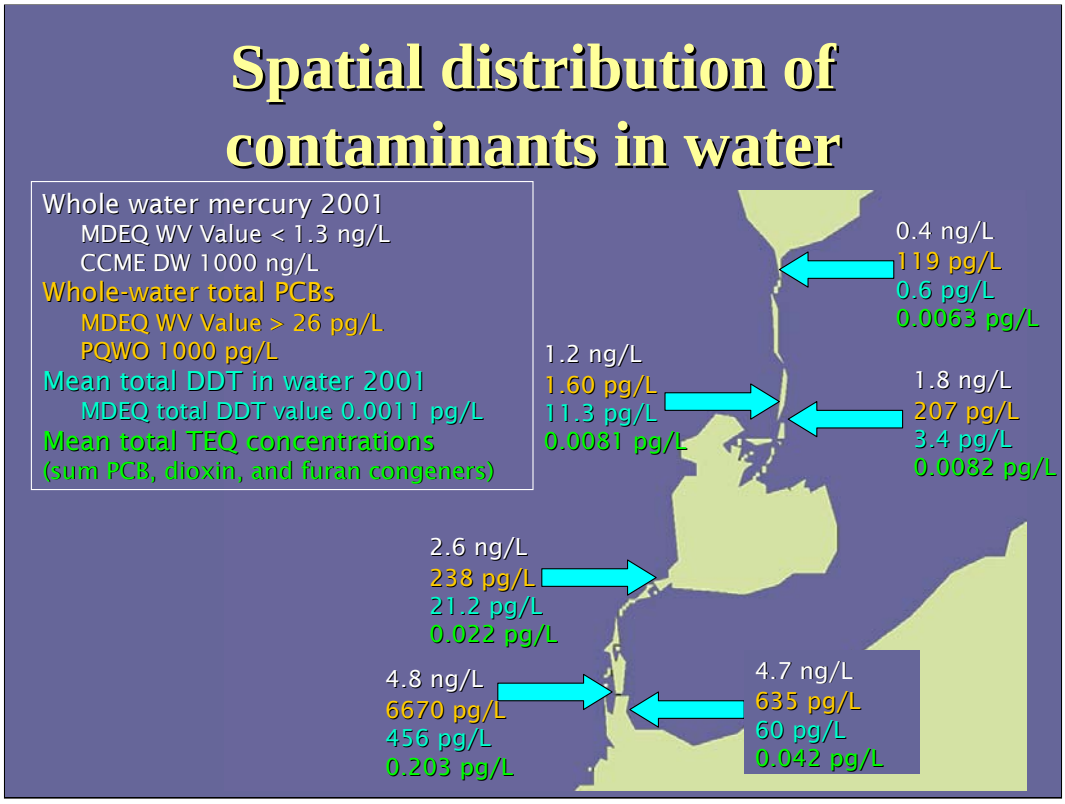
In the Lake St. Clair portion of the corridor, from 1995 – 2000 there has been a loss of 42 acres of wetland, 427 acres of wetland forest, 1000 acres of deciduous forest, most of which is due to development, and an increase of 2,163 acres in bare land.

Contaminant stressors



Marvin et al 2002

Although overall contaminant concentrations may be declining, head and mouth data for the St. Clair and Detroit Rivers reveal that, for most contaminants, there continues to be a increase in concentration in water samples from upstream to downstream, indicating that sources within the corridor are contributing contaminant loadings to the river.



Whole-water contaminant sampling by Environment Canada in 2001 – 2002 indicate that inorganic, pesticide, and industrial chemical concentrations increase from upstream to downstream in each water body of the corridor, and throughout the corridor overall.

In terms of the parameters sampled, mercury, DDT, and PCB in excess of MDEQ water quality values were found by MDEQ and Environment Canada at most stations along the Corridor. Additionally, Environment Canada also identified Dioxin levels above MDEQ water quality values at all sampling locations.

The highest contaminant concentrations were found in the lower Detroit River with concentrations increasing by a 12-fold factor for mercury, 761 fold factor for DDT, 54 fold factor for PCBs and a 4 fold factor for Dixon, when compared to levels found at the Lake Huron outlet.

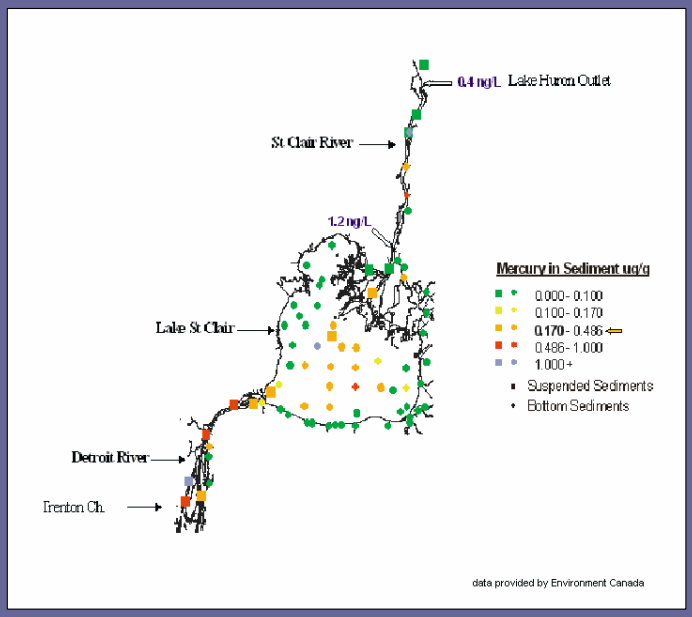
The largest increase in mercury concentrations were found in the St. Clair River, whereas, the largest increases in DDT, PCB, and Dixon concentrations were all found in the Trenton Channel of the Detroit River.

The identification and relative contribution of sources for loadings of mercury, DDT, PCB, and Dioxin in the corridor are currently unknown

Contaminants in sediments are another predominant stressor to the environmental quality of the connecting channels, particularly mercury and PCBs.

Source: Marvin, 2004; McCrea, ppt

Mercury in sediment



In 2000, Environment Canada continued to find the influence of upstream sources of mercury in surficial sediment samples in Lake St. Clair. They found the average mercury value in Lake St. Clair was roughly 5-times higher than the average for Lake Huron, and high levels of mercury in the eastern Lake St. Clair delta, compared to lack of elevated levels in the western delta, which, due to St. Clair River flow characteristics, point to the conclusion that there remains sources of mercury in the St. Clair River (Marvin, 2004), most likely from historical Canadian chlor-alki facilities.

PCBs in sediment

- Significant decrease in western Lake Erie over last 25 years
- Downstream of the Trenton Channel contains 62% of total PCB mass
- Detroit River still a source of loadings to Lake Erie

Although an assessment of temporal trends in sediments in western Lake Erie has determined that loadings of PCBs have decreased significantly in the last 25 years (Marvin, PCB report), suspended sediment samples from the Detroit River show a definitive spatial gradient toward increasing sediment contamination moving downstream from the upper reaches of the River through the Trenton Channel. USEPA surficial sediment sampling in 1995-96 indicated that concentrations of a number of metals in the Trenton Channel exceeded Ontario Provincial Sediment Quality Guidelines (Rossman) , and a mass balance analysis of PCBs in surficial sediment of the Detroit River by the University of Windsor shows that the region located downstream of the Trenton Channel, which represents just under 17% of the total sediment surface area for the river, contains approximately 62% of the total PCB mass. These results indicate that the river continues to be a source of loadings for a variety of contaminants to the western basin of Lake Erie but the source and significance of these loadings, compared to material originating in the upper lakes and connecting channels, is difficult to determine. (Haffner PCB report)

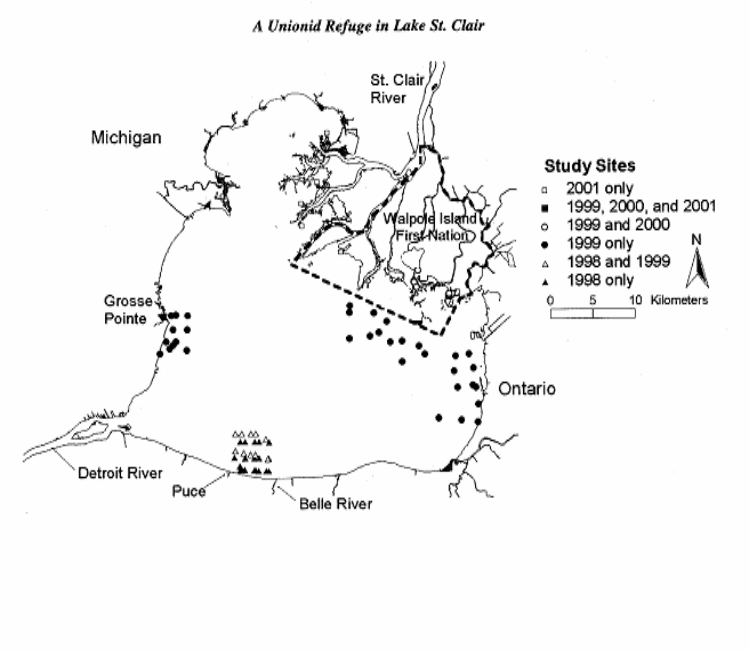
Due to the heavy amount of shipping in the St. Clair – Detroit River Corridor, and the fact it is a Great Lakes connecting channel, the corridor has been impacted by the introduction of many non-native species. As has been well documented, the zebra mussel was first discovered in Lake St. Clair, and in 1990 the round goby was first detected in the Great Lakes in the St. Clair River

Recent estimates suggest that there are over 600 aquatic and terrestrial non-native species now present in the Great Lakes region. The corridor region has many of these non-native species.

In addition to the zebra mussel, and roundnose goby recent introductions include, Eurasian water milfoil, phragmites, and Emerald ash borer. Key nearshore and coastal non-native species include phragmites, purple loosestrife, and Eurasian water-milfoil. Other species may be on the verge of entering the corridor, including the spiny waterflea and the European ruffe, which are found elsewhere in the Great Lakes region. While there are limited studies of the impact of these non-native species specific to the corridor, it is believed that continued introduction of non-native species is one of the greatest threats to the area's biodiversity

Source: draft LSC Habitat Management Plan

Mussel refugia in Lake St. Clair



An example of negative impacts and positive discovery regarding non-native species on the corridor's biodiversity is the decimation of the Lake St. Clair native mussel population which has been virtually extirpated (Zanatta, et al. 2002) due to the invasion of the zebra mussel.

However, recently a "refuge" site for native mussels has been found in Lake St. Clair near Walpole Island. Ninety-five sites in various areas around the lake were surveyed between 1998 and 2001, and 2,356 live native mussels of 22 species were found alive at 33 of these sites. Almost all sites (31) were in the St. Clair delta. Five species considered to be at risk were found alive. The community is now dominated by thick-shelled species which are known to be least susceptible to zebra mussels. However, it is unknown if native mussel populations in the delta are stable, and what mechanisms contribute to native mussel survival in the delta.

Summary

- Key stressor: Land use
- Habitat protection and restoration ongoing
- Contaminant concentrations decreasing over time throughout the corridor
- Sediment contamination is localized
- Non-native species are an ongoing threat

Land use will continue to be one to the key stressors in the corridor. For example, population increases, especially on the US side of the upper corridor, and the resulting loss of original habitat continues. However, many stakeholders throughout the corridor are actively pursuing actions to protect and restore key habitat areas.

Contaminant concentrations have been generally decreasing over time throughout the corridor. However, geographically, contaminant inputs throughout the system is resulting in a net increase in contaminant concentrations from the head of the St. Clair to the outlet of the Detroit River.

Heavily industrialized areas along the connecting channels were primary sources of a variety of persistent toxics, including mercury, DDT, PCBs, and Dioxin. Localized areas of highly contaminated sediment associated with these historical industrial areas may continue to act as sources of contamination and contaminant distribution in the connecting channels. (Marvin, 2004).

Non-native species are continuing to pose an on-going threat to native species in the corridor.

Ongoing and future projects

- Great Lakes Environmental Indicators Project
- Canada St. Clair River Habitat Management Strategy
- NOAA/Great Lakes Commission coastal habitat and restoration
- Huron-Erie Corridor System Habitat Assessment
- Black Lagoon sediment cleanup
- Suspended sediment and water quality monitoring

Government agencies and stakeholders continue to actively pursue a variety projects and research to address the ongoing stresses to the St. Clair – Detroit River Corridor. Some of this work includes:

•Great Lakes Institute of Environmental Research (GLEIR)long-term benthos and sediment corridor monitoring Program

•Canadian St. Clair River Habitat Management Strategy

•National Oceanic and Atmospheric Administration/Great Lakes Commission Lake St. Clair Coastal Habitat Restoration and Conservation work

•US Army Corps of Engineers, USEPA, Environment Canada, Michigan Department of Environmental Quality (MDEQ), and Ontario Ministry of Environment's Lake St. Clair Management initiatives

•Environment Canada, USEPA, Michigan Department of Natural Resources, Ontario Ministry of Natural Resources, GLEIR, and Ohio State - HURON-ERIE CORRIDOR SYSTEM HABITAT ASSESSMENT

•USEPA and MDEQ's Legacy Act cleanup of the Black Lagoon in the Trenton Channel

•Environment Canada's St. Clair – Detroit River long-term suspended sediment and water quality monitoring

•MDEQ's St. Clair River – Detroit River water quality monitoring program

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