



St. Clair River Sediment Quality Past, Present & Future

Pollutech EnviroQuatics Limited

Point Edward, Ontario

Tim Moran – President



Providing toxicity & environmental effects assessment, remediation and marine services to Canadian and international clients in the private and public sector for more than 30 years.

Bringing Clarity to Your Environment



Corporate Background



- Point Edward/Sarnia Facility Consists of Laboratory and Consulting Groups
- 10,000 sq ft ecotoxicity laboratory and offices in Point Edward
- Currently 25 employees
- Providing toxicity testing and environmental consulting services since 1972
- Evolved from one-test laboratory to provision of a number of aquatic, sediment and soil ecotoxicity tests



WHY SHOULD WE CARE?



We Live Here Too!

Area Background

- Native Americans for several thousand years with European settlement started over 300 years ago
- St. Clair River used as a transportation corridor as it links with the rest of the Great Lakes and the world.
- Industry includes petrochemical, organic chemical, inorganic chemical and hydroelectric.
- Source of oil, salt, plenty of water and transportation routes resulted in 100 years of major industrial development

Area Background - Cont'd



Memories Growing Up

- Swimming and Water Skiing
- Learning to Scuba Dive
- Boating & Fishing
- Beachcombing
- Ship passages

Memories Growing Up

- Oil sheens and rubber
- Extensive weed growths & die off
- Sombra Weed fights - Stench of it all
- Fish kills
- Raw sewage (brown trout) & floating garbage

Sarnia-Lambton Industrial Area Along St. Clair River



Environmental Background

- St. Clair River is listed as an Area of Concern
- Occurrence of degradation and subsequent ongoing recovery is well documented by the various investigative work completed, starting in the 1950's
- Shows recovery is ongoing and moving in the right direction
- Contaminated sediments one of the remaining sources that has the potential to impact use impairments

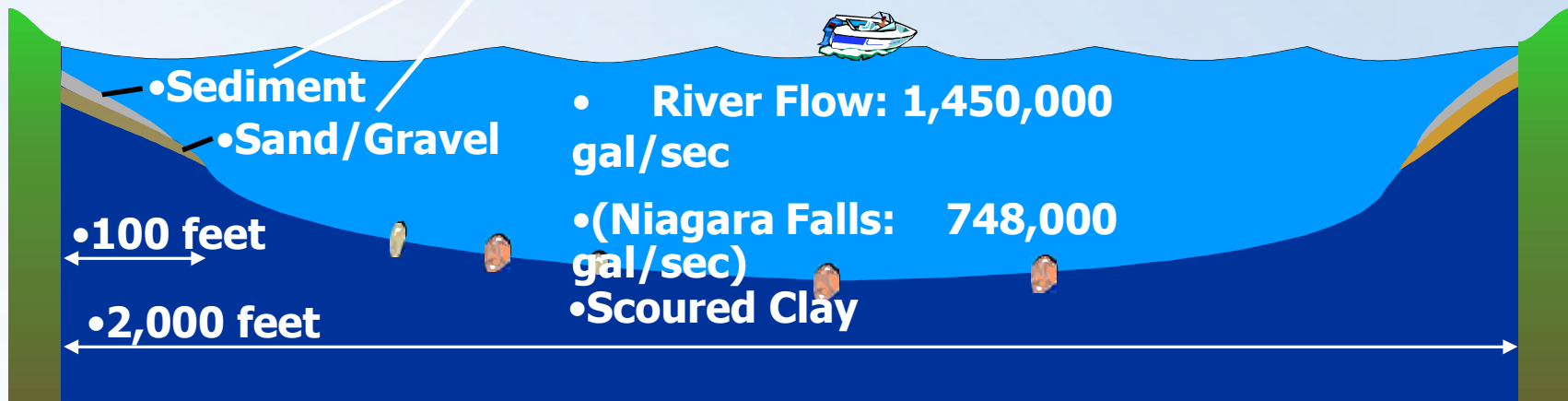
Numerous Studies Completed

- Benthic macroinvertebrate studies
- Fish survival and taste & odour studies
- Fish diversity studies
- Bioaccumulation studies
- Extensive chemistry (water & sediment) investigations
- Hydraulic and sediment transport modeling
- Implementation of an on-line downstream water quality analyzer by SLEA
- Water and sediment toxicity investigations
- And so on!!!

St. Clair River Contaminant Movement



- Contaminants settled in sediments near discharge points and nearshore areas
- Select locations along river's edge



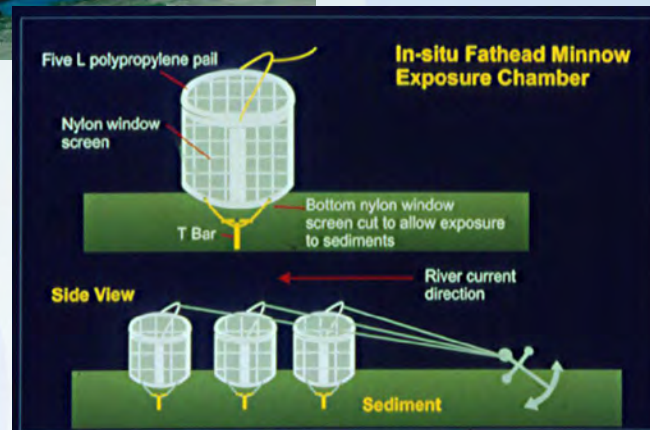
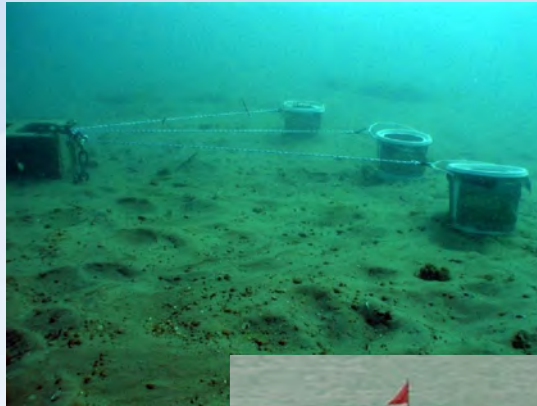
St. Clair River Sediment Studies – 1990s

- Determination of the spatial extent of sediments considered degraded within the St. Clair River
- Work has focused on three small zones of depositional sediment located along the Ontario side of the river adjacent to the industrial areas
- Tools included sediment chemistry, toxicity assessment using four species with seven endpoint responses and benthic community structure to provide a “weight of evidence” or integrated study design
- Toxicity test species completed under laboratory conditions included:
 - *Hexagenia* survival and growth
 - *Chironomus tentans* survival and growth
 - *Tubifex tubifex* survival and reproduction
 - Fathead minnow survival

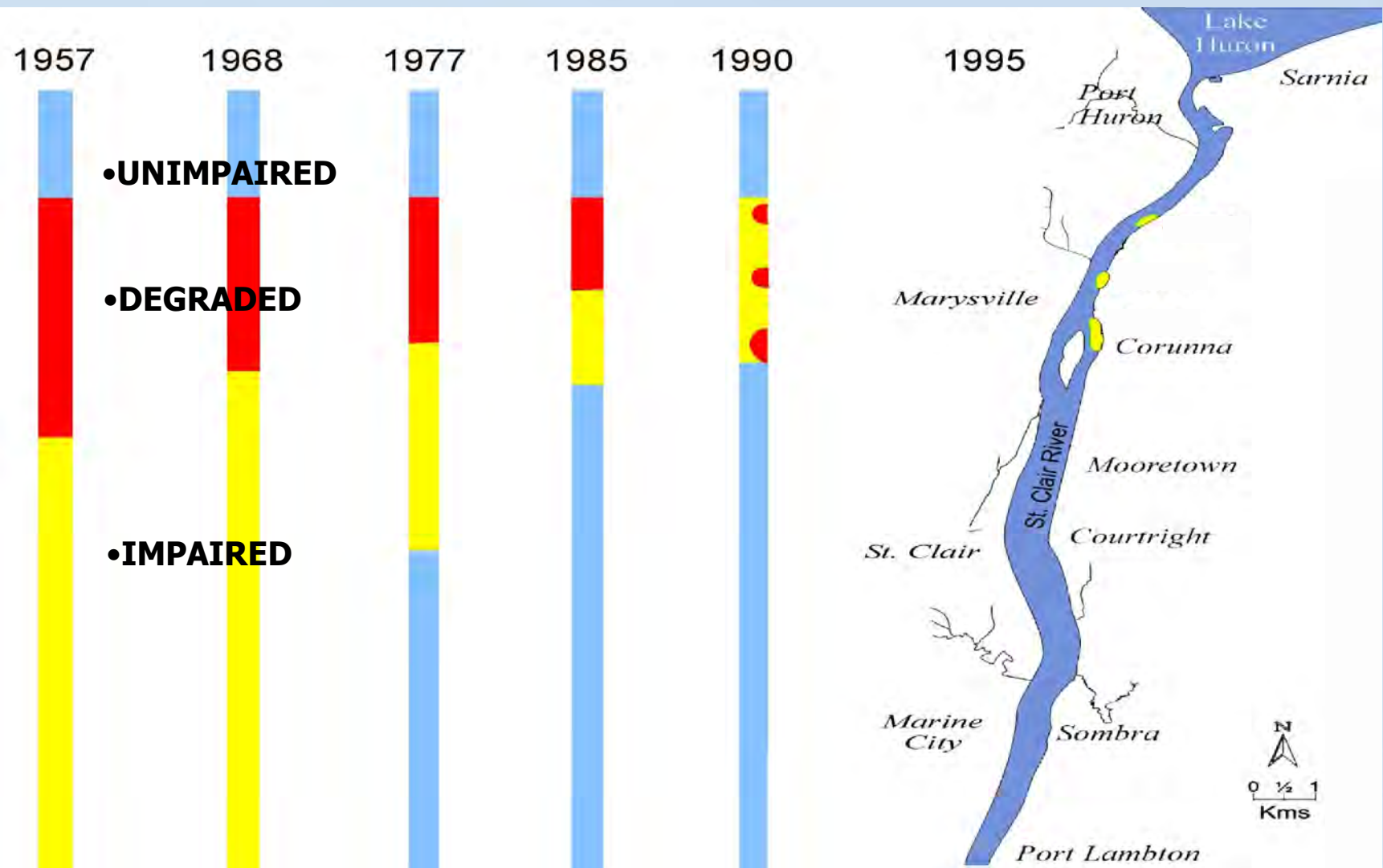
St. Clair River Sediment Studies



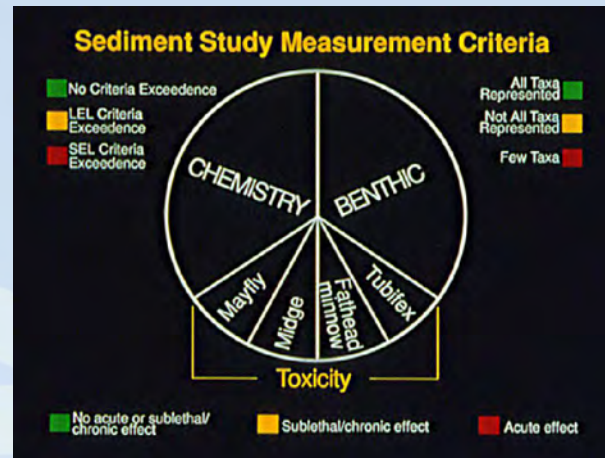
St. Clair River Sediment Studies Fathead Minnow Exposures



St. Clair River Sediment Studies - Area of Recovery



Data Interpretations



- 7 stations - Evidence of pollution induced degradation
- 20 stations - chemicals are stressing the system
- 4 stations - contamination is not bioavailable or alterations are not due to toxic chemicals

So what has changed that has coincided with improvements ?

- Studies have lead to a greater understanding and awareness of our environment
- Increased environmental regulation since the early 70s - Including use of **Toxicity Tests** to assess regulatory compliance
- Improved wastewater treatment
- Improved monitoring and detection technologies
- Spill prevention and source control
- Implementation of new process technologies with greater separation from river
- Public awareness

So what has changed that has coincided with benthic macroinvertebrate improvements ?

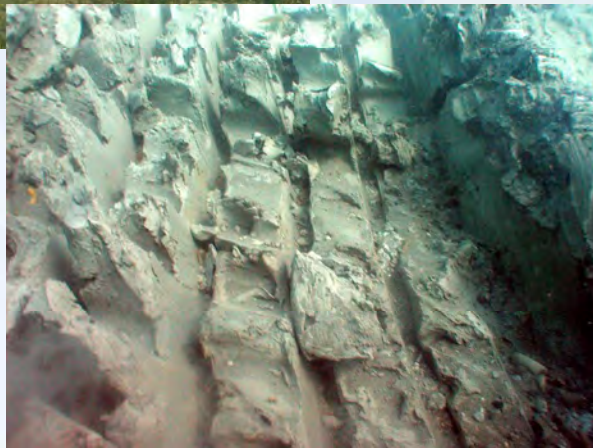
- River separation projects implemented
- Older processes phased out and facility closures
- Upgrade of municipal treatment facilities
- Combined sewer separations
- Fewer industrial spills
- Sediment remediation projects implemented
 - Cole Drain - late 90s
 - Dow outfall area - 2001 through 2005

Why Disturb the Sediment?

- To prevent potential adverse impacts on water quality and aquatic life, which could be caused by the movement of historically contaminated sediment during unforeseen events.



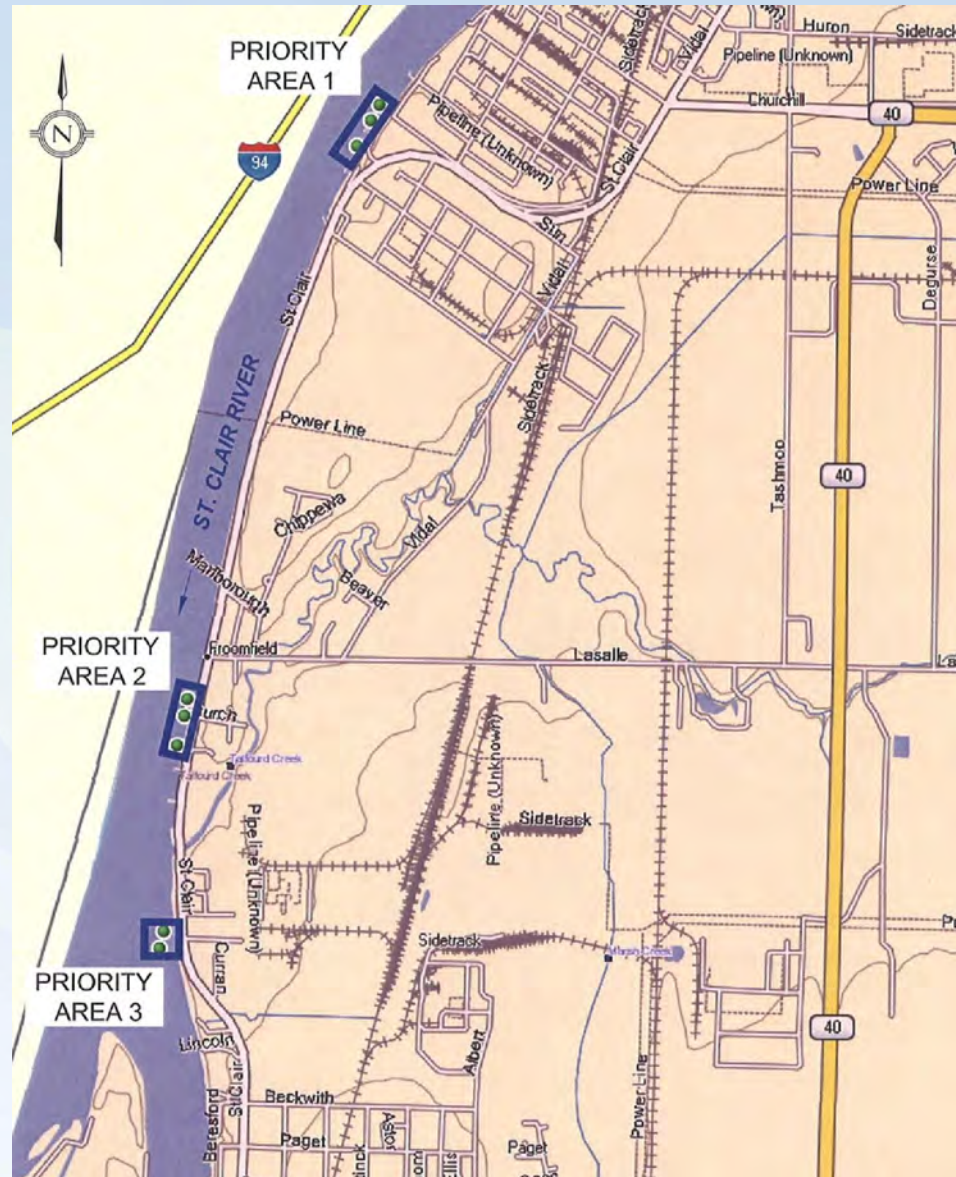
St. Clair River Sediment Remediation Activities



Path Forward - Contaminated Sediments

- Risk assessment of sediment Zones 2 & 3 following the “Canada-Ontario Decision-making Framework for Assessment of Great Lakes Contaminated Sediment” for determination for need for remediation.
- Leave in place or passive remediation, cap, sediment removal or implementation of a combination of options
- Assess sediment remedial options
- Management & stakeholder decision

SCRCA - 2011 Study Areas



Path Forward - Monitoring

- Development of an integrated monitoring program to provide an ongoing assessment regarding the biological conditions within the St. Clair River and potential for impacts associated with historical sediment conditions.
- Application of an integrated study design that incorporates the following elements:
 - Sediment Chemistry
 - Sediment Toxicity
 - Benthic Macroinvertebrate Community Assessment
 - Assessment of Bioaccumulation/Biomagnification Potential as an option
- Utilize established monitoring locations to assess for trends.
- Initiated in 2001 and work is ongoing

Path Forward - Emerging Issues

- Assessment of the potential impacts of estrogenic compounds from municipal and industrial sources on the feminization of fish



Other Emerging Issues

- Invasion Species

Gobies, Mussels, Asian Carp



- Climate change and impacts on water water levels and aquatic habitat
- Navigation Dredging and Disposal Needs

Questions??



Photos Courtesy - Brad Martin - "The Port Huron Initiative"
St. Clair River - May 2010