

ST. CLAIR RIVER AREA OF CONCERN



Status of the Degradation of Aesthetics Beneficial Use Impairment

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Executive Summary

For many years, the St. Clair River has been influenced by industrial activities and urban development, leading to the input of contaminants to the waterway. As outlined in the Stage 1 Remedial Action Plan (RAP) report (1991), these inputs led to aesthetically unpleasant deposits on the river including floating scums, oil slicks, obnoxious odours and spills. Aesthetics refer to the beauty and appearance of the of the St. Clair River water.

As a result of the unpleasant deposits and odours described in the Stage 1 RAP report, the “degradation of aesthetics” Beneficial Use Impairment (BUI) was identified as “Impaired” in the St. Clair River. Despite improvements in the appearance over the last two decades, this BUI has not been assessed to determine its current status. Over the last twenty years, implementation of municipal and industrial discharge regulations (Municipal/Industrial Strategy for Abatement (MISA), Effluent Monitoring and Effluent Limits, Spills Prevention and Contingency Plans Regulation), improvements to municipal wastewater infrastructure and significant reduction in spills have helped to address the original pollution sources responsible for the Stage 1 aesthetic conditions. The Canadian Remedial Action Plan Implementation Committee (CRIC) decided in 2010 that an assessment of this BUI was warranted.

In order to assess the current status of aesthetics for the St. Clair River AOC, the following steps were taken:

- (i) surveys of St. Clair River water users;
- (ii) monitoring of aesthetics water quality parameters over three seasons;
- (iii) application of an aesthetic water quality index; and
- (iv) assessment of the results against the revised delisting criteria.

Additionally, discussions and interviews were conducted with long-time residents of the St. Clair River to gain their perspectives and insights on changes in the aesthetic quality of the river. These quotes are placed throughout the body of this report.

The surveys and monitoring completed during this assessment indicate that the majority of local water users in the region feel that the appearance of the St. Clair River has improved substantially and rated the aesthetic quality as “fair”, “good” or “excellent”. Aesthetic monitoring conducted since 2009 suggests that any observation of foam or oily materials are a result of natural processes and litter at monitoring sites was

no different than that observed in any other water course in the Great Lakes Basin. Furthermore, the application of an aesthetic index to data from each monitoring site ranked the St. Clair River AOC water aesthetics from “fair” to “excellent” (7.4 – 9.4).

The revised delisting criteria for the “degradation of aesthetics” BUI (2012) states “this BUI will be considered restored when the waters are devoid of anthropogenic substances at levels that produce a persistent objectionable deposit and/or odour.” Using these revised criteria, current evidence meets the identified target and supports the change of status of this BUI from “impaired” to “not impaired”. It is therefore recommended that the “degradation of aesthetics” BUI be re-designated from “impaired” to “not impaired”.

1.0 Introduction

The St. Clair River, a key shipping channel in the Great Lakes Seaway system, flows 64 kilometers from Lake Huron to Lake St. Clair. The St. Clair River was designated an Area of Concern (AOC) in 1987 under the Canada – United States Great Lakes Water Quality Agreement. AOCs are specific geographic sites in the Great Lakes Basin where environmental quality is significantly degraded and beneficial uses are impaired due to local sources of pollution. In each AOC, government, community and industry partners undertake a cooperative effort to restore the environmental integrity of the area through the implementation of a Remedial Action Plan (RAP).

The St. Clair River AOC covers an area of 3350 km² and includes the river, delta channels and immediate drainage basin (Figure 1.1). The area supports extensive recreational activities, is a source of drinking water for shoreline communities and serves as a source of water for industry and power generation. It is known for its characteristic “blue-green” and “blue-grey” colour and outstanding clarity. The flow of the St. Clair River is much faster towards the head of the river, decreasing as the river approaches Lake St. Clair. Approximately 170 000 people live in the AOC, particularly in the urban centers of Sarnia, Ontario and Port Huron, Michigan. Along most of the upper reach of the river, the shoreline is armoured with limestone blocks and steel retaining walls. Farther downstream, in the mid to lower reaches, the river channel widens and the shoreline becomes more natural. Sandy beaches and native vegetation are more prevalent in this region.

For many years, the river has been subject to industrial activity and urban development leading to the input of contaminants to the waterway. In particular, the primary sources of contaminants have been the discharges from a complex of 27 industrial facilities along the Ontario shoreline and six located in the United States. In addition, other sources of contaminants include municipal point sources such as combined sewers, urban storm water runoff and inputs from agricultural operations.

Despite improvements in the appearance of the St. Clair River since its listing as an AOC in 1987, “degradation of aesthetics” has been considered a Beneficial Use Impairment (BUI). In the 1991 Stage 1 RAP Report (Ontario Ministry of the Environment (OMOE) and Michigan Department of Environmental Quality (MDEQ) 1991, p. 207) aesthetics were impaired because of the “presence of substances in the water that degraded the visual quality of the water and/or contributed obnoxious odours.” The document

stated that floating scums, oil slicks, spills, odours and combined sewer overflow (CSO) events continued to occur in both Port Huron and Sarnia. Specific substances noted by members of the Binational Public Advisory Council were floating 'debris', scum and oil sheens (Figure 1.2). Spills from industrial discharges were also an issue with oil and gas products being the largest group of pollutants spilled into the river (OMOE/MDEQ, 1991). In particular, the Cole Drain located in the Sarnia Industrial Area and influenced by a number of industries, landfills and other indirect runoff sources, was the largest contributor of oil and grease to the St. Clair River (1300 kg/day between 1986 and 1989; OMOE/MDEQ, 1991).

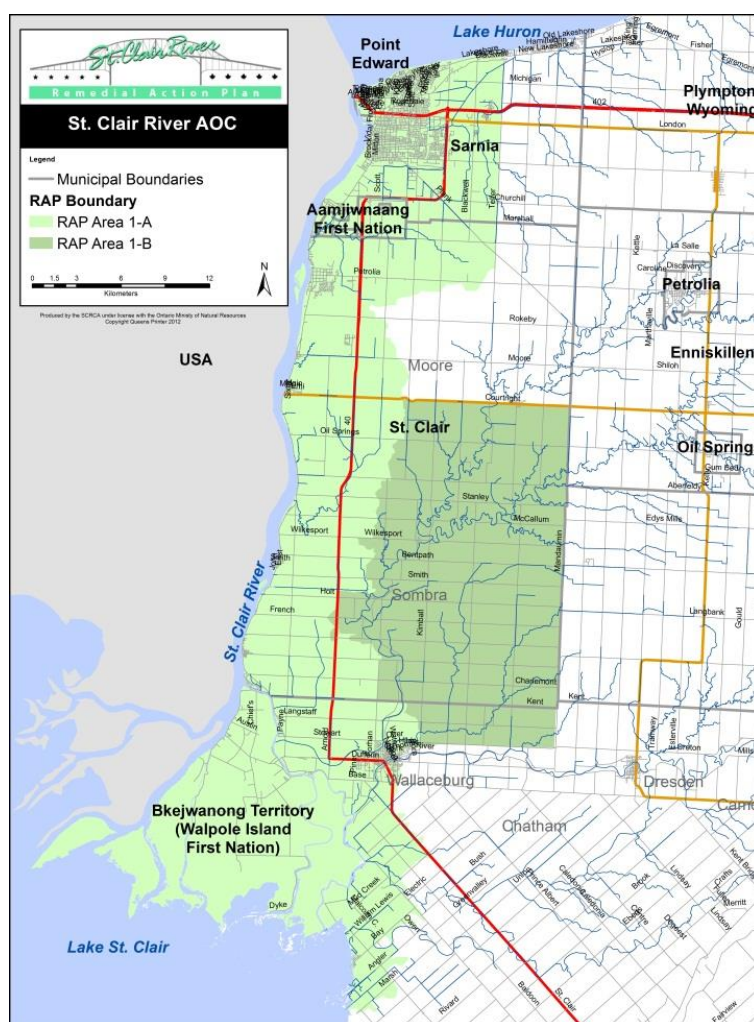


Figure 1.1: The location and boundaries of the St. Clair River Area of Concern (AOC).



Figure 1.2: Photos of original types of aesthetic impairments including from left to right: 1) spill from a cargo ship, 2) oil from industrial outfall and 3) oil spill from a freighter in the lower St. Clair River (Photos from: OMOE, 1979).

2.0 Purpose of this Report

In 2012, the St. Clair River AOC Canadian RAP Implementation Committee (CRIC) initiated a review of the status of the “degradation of aesthetics” BUI, to determine if the aesthetics of the St. Clair River had returned to an acceptable state. This report provides: (i) the status of implementation actions since the Stage 1 to address this BUI; (ii) the methodology used to assess the current status this BUI; (iii) the results of the work conducted and (iv) recommendations and conclusions regarding change in the designation of the BUI.

3.0 Implementation Actions since the Stage 1 RAP Report

Since the Stage 1 RAP Report, many of the sources of the “degradation of aesthetics” BUI have been addressed. Most recently, recommended actions related to this BUI were to (i) maintain and review point source regulatory monitoring (Municipal Industrial Strategy for Abatement (MISA)) and Environmental Compliance Approvals (formerly Certificate of Approvals) to ensure timely reporting and information dissemination on environmental concerns; (ii) ensure that Water Pollution Control Plants (WPCPs) continue to meet current regulations and do not negatively affect beneficial uses; (iii) complete programs to eliminate combined sewer overflows (CSOs) and (iv) continue to work closely with industries to improve spill prevention on the St. Clair River (CRIC, 2007). Substantial progress has been made to address these recommendations. The Work Plan 2007-2010 Report of Accomplishments (CRIC, 2012) for the St. Clair

River details progress for these recommendations. Highlights and progress on these recommendations and actions most pertinent to the degradation of aesthetics BUI are provided below.

3.1. Municipal Industrial Strategy for Abatement (MISA) and Environmental Compliance Approvals (ECAs)

The Municipal Industrial Strategy for Abatement (MISA) legislation was introduced by the provincial government in 1988. The MISA program regulates the discharge of pollutants from industrial facilities into Ontario's waterways. Publicly available Environmental Compliance Reports (ECRs) are prepared annually for MISA regulated industries outlining any exceedances of discharge limits. Where non-compliance is observed, a range of abatement measures and enforcement responses are implemented. Seven industrial discharge points originally regulated by MISA legislation are no longer located along the St. Clair River (e.g., Dow Chemical Canada, Royal Polymers) and MISA loading trends are steadily decreasing (Figure 3.1). Substantial improvements have also been observed in the number and frequency of industrial spills to the St. Clair River and will be discussed further in Section 3.4.

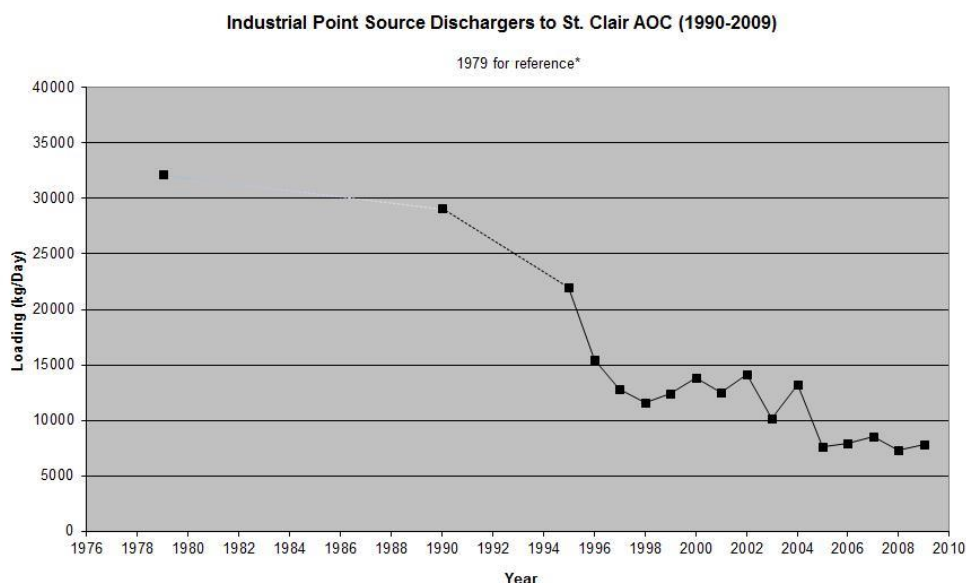


Figure 3.1: Chemical loadings of 19 parameters (suspended solids, solvent extractables, biological oxygen demand (BOD), chemical oxygen demand (COD), total organic carbon (TOC), ammonia, phenolics, phosphorus, copper, chromium, iron, lead, nickel, zinc, chlorides, fluoride, arsenic, cyanide and sulphates) between 1990 and 2009 for 17 facilities with point source discharges in the St. Clair River Area of Concern (AOC; OMOE, 2012).

"I've been fortunate to live near the mouth of the St. Clair River where the water flows rapidly from Lake Huron on its way through the Great Lakes system. I walk under the Bluewater Bridge just about every day of the year and I get to watch the River change from season to season, to see the fisherman collecting their catch, to look for migrating and resident water birds and to watch the boats of many shapes and sizes ply the water.

I have a very personal connection to the River as I walk along its banks.

I've also worked in the Chemical Valley as a chemist, working in quality control and research labs. I've tested the water that these plants have emitted to the River, getting a chance to see the beneficial changes that the companies enacted to reduce their pollution to the river and to reduce the actual quantity of water that is taken from the River.

When I first moved to Sarnia, the St. Clair River had a very bad reputation – oil slicks, the "blob" dead and diseased fish, etc. – but over the years through industrial and municipal waste water improvements, the River has changed for the better. It's a beautiful waterway, enjoyed both by residents and wildlife."

Brenda Lorenz, resident of Sarnia for 37 years

3.2. Water Pollution Control Plants (WPCPs)

Systems and processes are in place to provide for effective sustainment of WPCPs and lagoons by local municipalities. Provincial legislation specifies that all WPCPs must comply with limits and restrictions outlined in Environmental Compliance Approvals administered and monitored by the OMOE. Much like MISA regulated industries, ECRs are released annually and provide information on the compliance and exceedances of discharge limits along with information on plant bypassing and CSOs that may lead to aesthetic concerns. Five WPCPs are located within the St. Clair River AOC boundaries (Point Edward, Corunna, Courtright, Sarnia, and at the CF Industries property) along with two lagoons (Sombra and Port Lambton). The most recent inspections of these facilities by the OMOE indicate that with the exception of the Sarnia WPCP, no bypasses were reported. Some facilities noted some exceedances of their ECRs and were therefore subject to abatement measures. In 2011, the City of Sarnia began a sewage master plan to

assess their waste water system and infrastructure (e.g., existing plant capacities) that will allow for the long-term management and operation of WPCPs. Additionally, the city is currently in the process of separating their combined sewers to reduce CSO events (discussed further in Section 3.3).

3.3. Elimination of Combined Sewer Overflows (CSOs)

The City of Sarnia has reduced the volume of CSOs by 50% since 2000 (EC & OMOE, 2011). Two CSOs at Exmouth Street and Christina Street have been eliminated and Sarnia continues with its multi-year sewer separation project to address the remaining CSOs at Cromwell and Devine Streets. Eight kilometers of the combined system in Sarnia have been separated. It is estimated that it will take 15 to 20 years to separate the 25 kilometers of combined sewers remaining, at current levels of federal and provincial funding. In addition to the construction and upgrades in the Sarnia sewer system, seasonal sampling by Environment Canada, the OMOE and the St. Clair Region Conservation Authority (SCRCA) in conjunction with continuous water quality monitoring administered by the Sarnia-Lambton Environmental Association in Courtright, Ontario provide valuable information on the state of water quality in the St. Clair River AOC before and after infrastructure upgrades.

“Over the years that I have been paddling in the Sarnia area, I’ve seen real improvement in the quality of the water. In the earlier years, I would avoid taking my boat near the government docks area because of the foul smell of the water. Since the completion of the Exmouth Street sewer projects, that problem has disappeared. It is delightful to be able to fully enjoy the river!”

Phil Vallance, avid kayaker of the St. Clair River

3.4. Spill Prevention and Contingency Plans

In 2008, Spill Prevention and Contingency Plan legislation was introduced by the Government of Ontario and required each regulated industrial or municipal facility in the province to develop and implement actions that would reduce the risks of a spill and/or if a spill did occur, would address it efficiently and effectively. The OMOE regularly inspects facilities to ensure plans are in place and continue to be followed. In Sarnia, all regulated industrial and municipal facilities have completed and implemented Spill Prevention and Contingency Plans. In addition to regulatory initiatives, many industrial facilities (on their own initiative and capital investment), have made upgrades to their facilities to further reduce the incidence of spills. These improvements have included upgraded industrial storm water retention ponds, more advanced spill

detection and diversion capabilities, the containment of wastewater on site and optimization of wastewater treatment. Figure 3.2 displays spill events from member industries of the Sarnia-Lambton Environmental Association (SLEA) since the mid-80's that required a water intake shut-down based on drinking water criteria. Advancements in spill prevention along with MISA regulations have resulted in decreases in the size and frequency of spills into the St. Clair River.

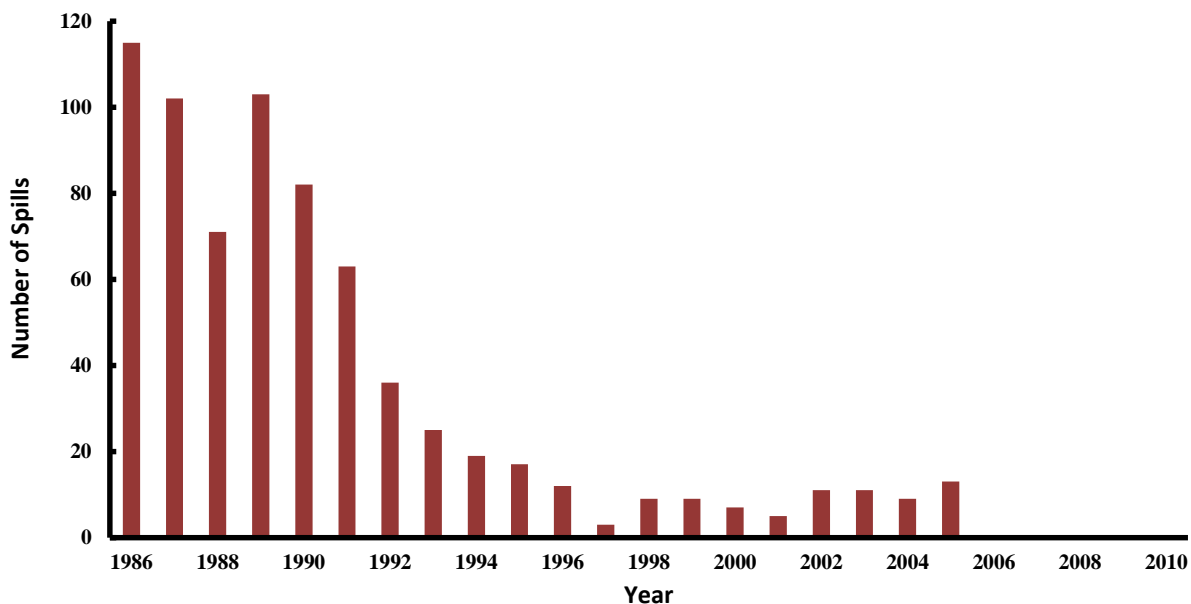


Figure 3.2: Number of spills from the Sarnia-Lambton Environmental Association (SLEA) member industries (1986-2005; SLEA, 2012).

Similar activities and programs have been implemented along the American side of the St. Clair River AOC. From 1997 to 2011, the CSO volume in the City of Port Huron was reduced by 94% from 1170 million liters (309 million gallons) in 1997 to approximately 72 million liters (19 million gallons) in 2011 (Clegg & Hufnagel, 2011). In addition, tremendous progress has been made in separating combined sewers in the city. Equivalent to the MISA program in Ontario, industrial and municipal discharge on the Michigan side of the St. Clair River is regulated by the National Pollutant Discharge Elimination System. In addition, spill prevention measures and requirements are outlined in the Michigan Water Resources Act.

The improvements in municipal and industrial discharge regulations, Spill Prevention and Contingency Plans, improvements to municipal and industrial infrastructure, reduced CSO overflow volumes and significant reductions in spills have generally addressed the issues outlined in the Stage 1 RAP Report that

lead to degraded aesthetic quality. Local perceptions on the current aesthetic quality of the water and an assessment of the current status of the “degradation of aesthetics” BUI is presented in Section 4.

4.0 Methodology

To assess the current status of aesthetics in the St. Clair River AOC, several approaches were developed and applied between 2007 and 2012. These approaches included:

- i) **surveys of St. Clair River water users:** the questionnaire focused on the “degradation of aesthetics” BUI and was distributed to anglers, First Nations, and other interested individuals. In addition, interviews were conducted with long-term residents of the St. Clair River;
- ii) **monitoring of aesthetics water quality parameters:** weekly monitoring of factors influencing the aesthetics (e.g., water colour, clarity, odour, objectionable deposits and the presence of plants and/or wildlife) of the St. Clair River was conducted for three seasons, and
- iii) **application of an aesthetic water quality index:** based on the index developed to assess the aesthetics of the Rouge River AOC and quantify qualitative observations.

4.1. 2007-2010 Surveys of St. Clair River Water Users

To canvas opinions of target groups on the status of St. Clair River aesthetics, a questionnaire was distributed at the 2007 Annual Sarnia Fishing Derby and at local businesses (e.g., bait shops, fish markets, beer store, etc.) and to community members of Walpole Island and Aamjiwnaang First Nations. These groups were chosen to complete the survey as they were deemed to be people who were on the water often and would be aware of aesthetic issues. The questionnaire was also made available online at the Friends of the St. Clair River (FOSCR) website. For the aesthetics portion of the questionnaire it was composed of one categorical question on location of residence and three questions related to river aesthetics. Questions were a combination of open-ended and closed type. The survey questionnaire was a stand-alone document.

In May 2008, the same questionnaire was re-circulated within the Aamjiwnaang First Nation community in order to receive greater input. In March 2010, a slightly modified questionnaire was distributed at Walpole Island First Nation (Appendix B). At this time the aesthetics questionnaire was not paired with the “tainting of fish and wildlife” questions. There were no definitions or explanations of terms given with any of the surveys.

4.1.1. 2007 Surveys: Annual Sarnia Salmon Derby, First Nations, Local Businesses and Friends of the St. Clair River Website

In 2007, 162 responses to the aesthetic portion of the survey were collected at the Annual Sarnia Salmon Derby and from local businesses. Supplementary questionnaires administered online by the FOSCR increased the total to 189 respondents.

Six Lambton College students assisted by conducting shoreline surveys at the City of Sarnia weigh-in station between April 27th and May 6th, 2007. Numerous media releases and interviews were conducted to garner public interest and participation with information provided in local media outlets.

The Sarnia Salmon Derby is an annual event that typically attracts about 1000 boaters and shore anglers from the United States (US) and Canada. The tournament boundaries span 137 kilometers from Fawn Island at Port Lambton, north to the Lake Huron shoreline to Lexington, Michigan and northeast along the Lambton County shoreline to Grand Bend.

Approximately 80% of the survey participants were Canadian, 12% were First Nations (1% Aamjiwnaang and 11% Walpole Island) and 8% were from the US (Figure 4.1). Eighty-eight percent of the respondents fished more than once annually (Figure 4.1). Raw unanalyzed results of this survey are contained in Appendix C.

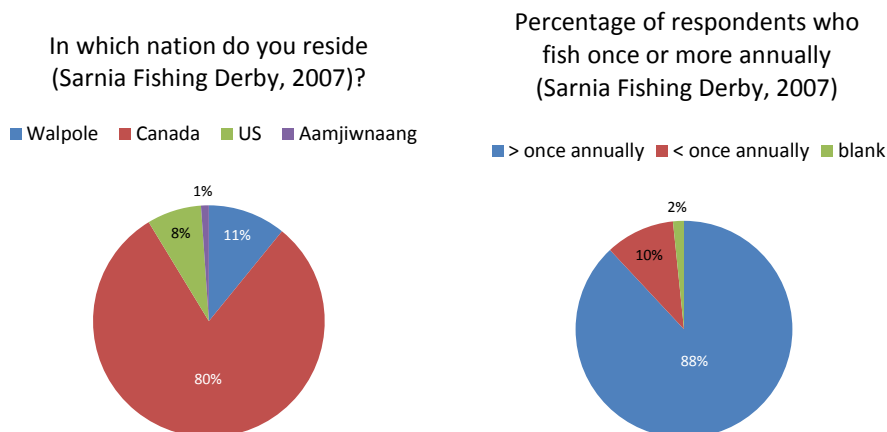


Figure 4.1: Survey participant make-up by nation of residence (*left*) and annual fishing frequency (*right*).

4.1.2. 2008 Surveys: Aamjiwnaang First Nation

In May of 2008, the same St. Clair River anglers' survey that was distributed in 2007 was circulated to the residents of Aamjiwnaang First Nation. The Aamjiwnaang First Nation reserve land is located in the northern region of the St. Clair River AOC and is situated immediately downstream of a section of the Sarnia-Lambton chemical complex. The reserve is surrounded by several large petrochemical, polymer, and chemical industrial plants. The Chippewas of Aamjiwnaang have approximately 850 band members (Information Management Branch Department of Indian Affairs and Northern Development 2001). The summarized data are in Appendix D. In total, there were 14 respondents; 13 respondents resided in Aamjiwnaang First Nation and one resided in Walpole Island First Nation.

4.1.3. 2010 Surveys: Walpole Island First Nation

On February 10, 2010, staff from the Walpole Island Heritage Centre met with the Walpole Island First Nation Habitat and Species Working Group to obtain feedback on the two questionnaires circulated to the community. The questionnaires related to the BUIs for fish quality and river aesthetics for the St. Clair River AOC. A Walpole Island First Nation community member was contracted to conduct the two surveys using revised questionnaires throughout the month of March 2010. Walpole Island is an island in southwestern Ontario, Canada, on the border of Ontario and Michigan, US. It is located at the southern end of the AOC at the mouth of the St. Clair River on the St. Clair delta. As of February 2013, the total registered population was 4521 with 2277 community members residing on Walpole Island (AANDC, 2013). There

were 101 respondents for the fish quality survey and 48 for the aesthetics survey. Tallied results and comments from the questionnaires are contained in Appendix E.

4.1.4. Survey Results

4.1.4.1. Change in Appearance

The questionnaires attempted to quantify perceptions about the changing appearance of the St. Clair River. Questions posed on the 2007 anglers questionnaire were “*Would you say the aesthetics/appearance of the St. Clair River has improved over the last 10 years? (Yes, No or Don’t Know)*” and “*What is this based on?*” In the 2010 Walpole Island questionnaire, the question was modified to “*Would you say that the appearance of the St. Clair River has changed over the following years (past 5 years, the past 10 years, the past 20 years, and over the past 50 years)?*” It also asked respondents to describe the changes in appearance.

For surveys conducted from 2007 to 2008 the majority of those who responded believed the appearance of the river had improved (65% answered yes; 121/189; Figure 4.2). These results were echoed in anglers who fished over ten times annually (72% answered yes; 57/70).

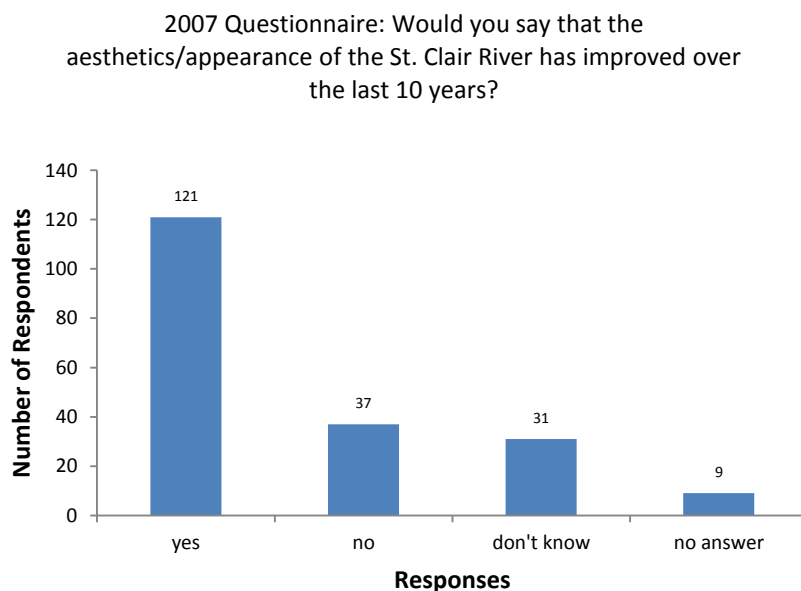


Figure 4.2: Aesthetic improvement perceptions of the St. Clair River over last 10 years (2007 Questionnaire).

The responses varied for the question “*Would you say that the appearance of the St. Clair River has changed over the following years? (5, 10, 20 or 50)*” in the 2010 questionnaire circulated at Walpole Island First Nation (Figure 4.3). For the 5 and 10 year time frame, a large number of those who answered the question agreed that there was a change in river appearance (13/32 and 14/34, respectively). Almost the same number of respondents stated either they “didn’t know” or that the appearance had “remained the same” for the two time periods (15/32 and 17/34, respectively). As the number of years increased, a larger proportion responded either that they didn’t know or left the question blank. Eighty-three percent (40/48) of those surveyed did not know or did not answer whether the appearance of the river had changed over the last 50 years. The second part of the question “what is this based on” gave insight as to whether or not these observed changes were perceived as improvements.

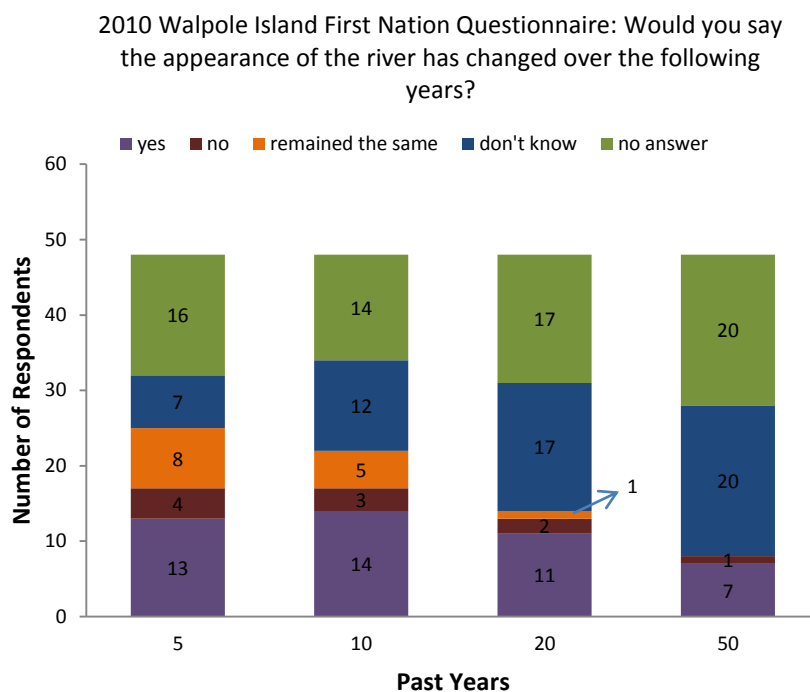


Figure 4.3: Perceived change in the appearance of the St. Clair River (2010 Walpole Island First Nation Questionnaire).

Overall, the 2007 questionnaire comments regarding the change in appearance of the St. Clair River were positive. Comments reflected aesthetic improvements such as shoreline restoration, spill reductions, less sewage and fewer spills (Table 4.1).

Comments regarding colour and clarity proved difficult to evaluate (e.g., brown plume, not able to see river bottom, etc.). According to the 2012 Delisting Guiding Principles “criteria should deal with anthropogenic causes that originate within the AOC.” For this reason it is important to distinguish between the natural appearance of the river and human caused change. There are differences in the colour of the water along the shoreline of the St. Clair River compared to the main river channel. Generally, the bottom profile is consistent with a deep central channel and shallow shelves close to the shore. Most of the flow (90%) occurs in the main channel, with the remaining flow divided along each shore (5%; OMOE, 1988). Within the near shore region, wave action stirs up sand and sediment under certain weather conditions. Sediment from upstream bank erosion tends to deposit at the river’s edge where water is slower moving. Flow concentrated in the main channel is fast moving and any local influence (e.g., St. Clair tributaries, Chemical Valley inputs) is diluted as it mixes with Lake Huron water.

Due to the characteristics of the St. Clair River, water colour and clarity can be influenced by location of the sample (e.g. near shore versus main channel), season and wind conditions. Since some deposition and stirring of sediment in the near shore is natural, without further information, it is impossible to say with any certainty that a “brown plume” is of anthropogenic origin or not. In addition, lack of information makes it difficult to evaluate the cause of changes in appearance from “sky blue to blue green” or “turquoise blue to a dull/blue green”. Colour and clarity changes can be attributed to natural processes or anthropogenic influences. Decreased clarity and changes in colour are noted in responses from both questionnaires. Other forms of measurement are required to scientifically quantify changes in colour and clarity. The 2009, 2010 and 2012 aesthetics monitoring helps to address some of these questions.

Some comments did not pertain to aesthetics impairment as defined by the International Joint Commission (IJC; e.g., water levels, parks and recreational areas, etc.). For example, although invasive species and land-use development (e.g. more apartment buildings) influence aesthetics, they were not originally listed as causes of degraded aesthetics in the St. Clair River. None of the respondents noted the presence of tar or grease balls, an aesthetic impairment originally noted in the St. Clair River AOC.

Table 4.1: Observations regarding the change in appearance of the St. Clair River.

2007 Anglers Questionnaire (distributed from 2007-2008.) - Have aesthetics improved over the last 10 years? What is this based on?*		2010 Walpole Questionnaire - Would you say that the appearance of the St. Clair River has changed over the following year? If yes, can you explain the change in appearance?	
Objectionable deposits	<ul style="list-style-type: none"> • shoreline improvements and spill reductions • less sewage deposited in river • few spills • less spills into river • no spills • I've seen no improvement and spills are still happening 	<ul style="list-style-type: none"> • more oily texture on top. • more sheens. • more trash in the water. 	
Unnatural color or turbidity	<ul style="list-style-type: none"> • clean and clear water now • green bacteria on water • clearer water, zebra mussels • brown plume • yes- clarity (although there is less weed growth) • green (slime) scum • yes- water clarity • 10 years ago I could see 10 feet down, 10 year after that's over • not being able to see to bottom, not clear 	<ul style="list-style-type: none"> • change in color – sky blue to a blue-green, water levels have dropped. • the change went from a nice blue to a more darker color and water level changes. More objects on the bottom. • change in color – turquoise blue to a dull blue/green. • the color, not as blue. • the color is not pure blue anymore. • started having more particles in it (late 60s). • more cloudy • the water use to be really blue now its kinda grayish blue • water seemed clearer when I was younger. Used to be able to look underwater when swimming when younger (about 30 years ago). 	
Unnatural scum/floating materials	<ul style="list-style-type: none"> • No comments relating to scum/floating material 	<ul style="list-style-type: none"> • No comments related to foam or scum 	
Other	<ul style="list-style-type: none"> • yes - Park and recreation • water quality • looks visibly cleaner • water looks cleaner • mussels cleaned plankton and small fish out • zebra mussels • cleaner water • clean-up • improvements to the shoreline • increase in both plants and vegetation • cleaner water • yes and no: park areas nice, apartment build-up no • too many buildings and seawalls • yes - worked in industry for 30 years • yes -frequent fishing and comments from visitors • I see what fish people are catching • the amount of fish has decreased as well as other aquatic wildlife • no naturalization of the river has occurred 	<ul style="list-style-type: none"> • water levels have dropped. • pollution. • there is just too much pollution in our waters seems to get worse every year. • lots of phragmites along shoreline. • as a child we used to drink the water now you see rotting fish floating in the river. • a lot of stuff comes to this river. • the water is dirty sometimes. • water levels going down, more algae, • the water just lowering • sort of murky, I guess • not as clear, taste different • too much pollution • the river level will usually drop by each year • water is getting lower in a couple of areas and when I was young there was a lot of water in those areas. • water level changes more than usual • it gets more dirty by year • I heard stories that it used to be deeper and clearer looking • ugly! • does not freeze over any more (1980+). Does not freeze 12" think (late 50s). 	

*Did not have complete set of surveys or comment on this question, so at this time these comments represent a subset of the 184 surveys.

4.1.4.2. Rating Appearance

The question “How would you rate the appearance of St. Clair River water? (Poor, Fair, Good or Excellent)” was used for all three questionnaires. The majority (90%) of respondents rated the appearance of the St. Clair River as “fair”, “good” or “excellent” (Figure 4.4). This question is subjective in nature, as some people prefer a manicured, weed free appearance, while others consider emergent macrophytes and native shoreline plants an enhancement. Comments contained in other parts of the survey may in some cases provide a rationale for ratings. For example, one respondent who rated the river appearance “fair” also noted “very cloudy water color”. Another participant rated the river appearance as “good” and noted that it “looks visibly cleaner.” It is also evident from other parts of the survey that some respondents used criteria other than those outlined by the IJC such as the presence of parks and recreation, invasive species, and urban and industrial development.

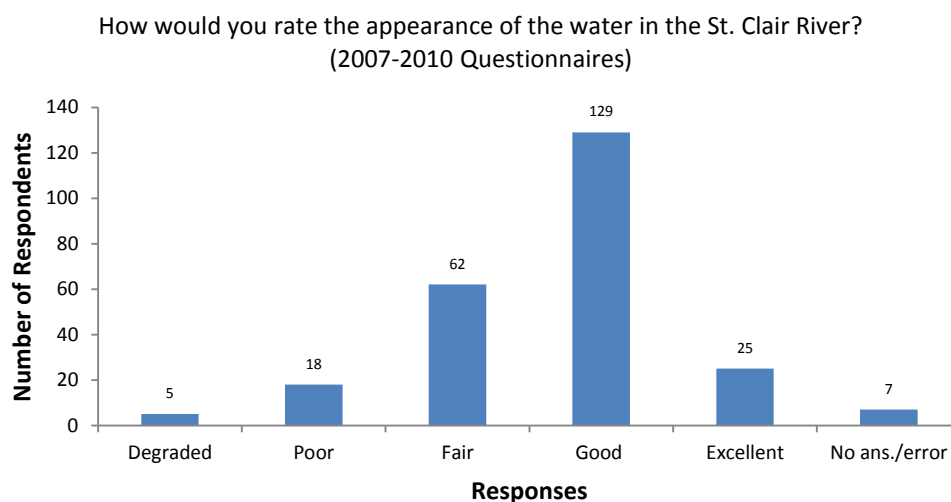


Figure 4.4: Rating the Appearance of the water of the St. Clair River (2007-2010 questionnaires).

4.1.4.3. Aesthetic Impairments: Objectionable Deposits, Unnatural Colour or Turbidity or Unnatural Scum/Floating Material

The questions on the types of aesthetic impairments were slightly different in the 2007 questionnaire compared to the 2010 Walpole Island questionnaire (Table 4.2). The 2007 questionnaire asked specifically about observations occurring over the previous two years, whereas no timeframe was defined for the 2010 Walpole Island questionnaire. In addition, the original questionnaire had all aesthetic parameters lumped

together while the Walpole Island survey had each aesthetic impairment broken down. The 2007 and 2008 questionnaires included multiple-choice questions about location (upper, middle or lower) and frequency (<1 time/year, 1-3 times/year, 4-6 times/year, 7-10 times/year, >10 times/year, always/constantly).

Table 4.2: Questions for the 2007 and 2010 aesthetics questionnaires.

2007 Anglers Questionnaire	2010 Walpole Island Questionnaire
Have you noticed any objectionable deposits, unnatural colour or turbidity, unnatural odour or unnatural scum/floating material in the last two years? (y/n). If yes, what was the appearance, where did it occur and how often did it occur?	Have you noticed any of the following in the St. Clair River? Objectionable deposits (y/n), unnatural colour (y/n), unnatural odour/smell (y/n), unnatural scum/floating material (y/n). If yes, can you describe its appearance, where you noticed it and when.

Because the questions were worded differently they could not be assessed together. The majority (55%) of those surveyed in 2007 and 2008 did not notice any of the listed aesthetic impairments (Figure 4.5), whereas, results for the 2010 Walpole Island questionnaire indicated that 38 of the 48 respondents (79%) noted one or more of the listed impairments (Figure 4.6). Interpretation of the terms “objectionable deposits”, “unnatural colour or turbidity”, and “unnatural odour or unnatural scum/floating material” was determined by the respondent. Based on the comments, there seems to have been confusion as to whether oil, litter, sheen and foams would be considered objectionable deposits or unnatural scum/floating material, or both. Several objects (e.g., foam, oil, litter) were considered by respondents to be both objectionable deposits and unnatural scum/floating material.

2007 Questionnaire: Have you noticed any objectionable deposits, unnatural colour or turbidity, unnatural odours or unnatural scum/floating material in the St. Clair River in the last 2 years?

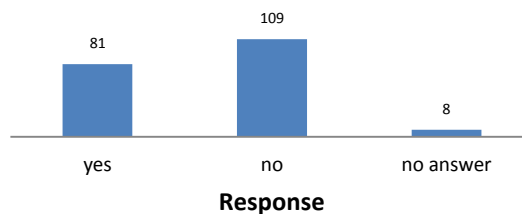


Figure 4.5: Number of respondents who noticed one of the listed aesthetic Beneficial Use Impairments (2007 Questionnaire).

Walpole Island First Nation 2010 - Number of Respondents who noticed specific aesthetic impairments in the St. Clair River

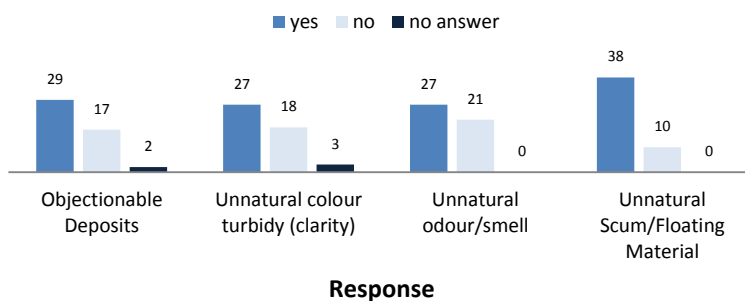


Figure 4.6: Number of respondents who noted specific aesthetic impairments in the St. Clair River.

Only a small proportion of the total number of respondents commented on the appearance of the substance. The most commonly observed aesthetic impairment from all surveys (2007-10) was oil/sheen (noted 34 times), followed by foam (noted 33 times), and litter (noted 27 times). In addition, sewage, turbidity and changes in water colour were noted 10 or more times each (Figure 4.7).

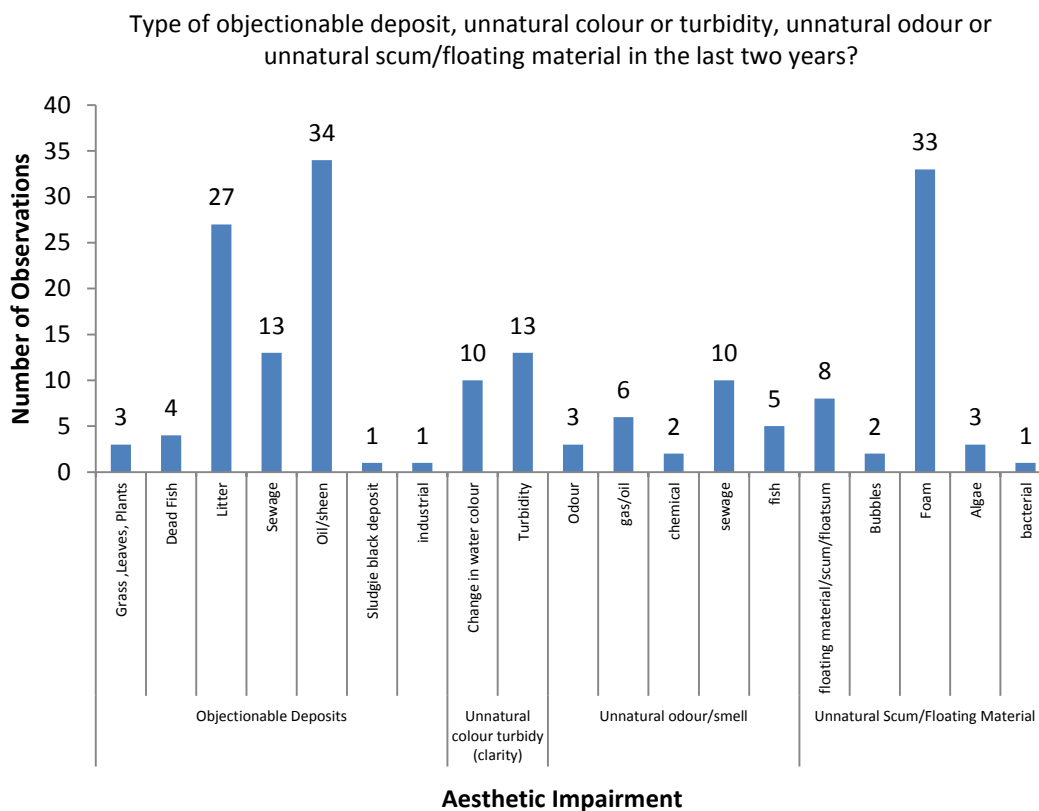


Figure 4.7: Type of objectionable deposits, unnatural colour or turbidity, unnatural odour or unnatural scum/floating material in the last two years.

Sheens are very thin layers and generally represent very small volumes of oily material. Table 4.3 outlines common types of oil, its appearance and an approximation of the amount of oil per square kilometer. An oil sheen typically represents less than $0.1 \text{ m}^3/\text{km}^2$ (100 liters/ km^2). The term “oil slick” is indicative of a greater volume of oil. Only one drinking water intake closure, in Wallaceburg, Ontario occurred between January 2006 and December 2010 due to the appearance of oil. The intake was closed for 15 hours in March 2008 due to an oil sheen on the Chenal Ecarte. Data from the Sarnia-Lambton Environmental Association water quality monitoring station suggests that St. Clair River water quality is showing the impacts of recreational boat traffic. For example, summer weekend increases in toluene detection, possibly from outboard pleasure craft traffic, have been recorded in recent years. Comments from the 2010 survey related some of the gas and oil to boats. There was no mention of a brown or black colour which is

indicative of crude or fuel oil. It is also possible that some of the oily substance observed results from natural occurring decomposition of organic material.

Table 4.3: Oil observations and approximate volume (Bureau of Ocean Energy Management, Regulation and Enforcement, 2011)

Oil Type	Appearance	Approximate Thickness	Approximate Volume (m ³ /km ²)
Oil Sheen	Silver	<0.0001 mm	0.1
Oil Sheen	Iridescent (rainbow)	<0.0003 mm	0.3
Crude and Fuel Oil	Brown to Black	<0.1 mm	100
Water-in-oil Emulsions	Brown/Orange	<1 mm	1000

Foam on the surface of the St. Clair River was cited 33 times by survey respondents. Although most did not describe what the foam looked like, those who did described the colour as white, grey, dark beige or brown. In addition, some respondents noted where they observed foam on the St. Clair River. Typical locations included along the shoreline, in wetlands and by structures such as marina docks. The largest number of foam observations was from Walpole Island. Foam is often perceived to originate from anthropogenic sources, but is frequently the result of natural processes. Distinguishing natural and anthropogenic foam can be difficult however there are indicators that can help identify one from the other (Table 4.4).

Regardless of where foam originates, its development requires the presence of a compound (called a surfactant) along with a source of air in the upper layer of the surface water (Shilling and Zessner, 2011). Surfactants are compounds that are produced either naturally or synthetically that reduce the surface tension of water allowing increased incorporation of air (Severn Sound Environmental Association; 2012; Shilling and Zessner, 2011; Alberta Environment, 2005). When waters containing surfactants are agitated, bubbles form on the surface and accumulate producing foam. Wind, wave action, waterfalls and boating activity are common forces of water agitation associated with the formation of foam (Shilling and Zessner, 2011; Schmitt, 2005).

Surfactants are used in many industries particularly in the pulp and paper and leather industries (Shilling

and Zessner, 2011) but are also commonly used at petrochemical facilities (Alberta Environment, 2013). Foam on surface waters originating from industrial activities is white in colour and commonly associated with a fragrant smell (Severn Sound Environmental Association, 2012). Anthropogenic foam is persistent, accumulates close to the source and generally not associated with windy conditions (Alberta Environment, 2005).

Naturally produced foam originates from the release of organic compounds by decomposing organisms such as aquatic plants and algae (Shilling and Zessner, 2011; Alberta Environment, 2005). Additionally, fallen leaves and buds from terrestrial vegetation add organic substances to lakes and rivers. These compounds dissolve becoming surfactants promoting the production of foam. Natural foam is typically associated with a fishy or earthy aroma (Severn Sound Environmental Association, 2012). At first, natural foam can be white but becomes a browner colour as time passes (Alberta Environment, 2005). Accumulations of natural foam are common along shorelines. Additionally, long streaks can develop in open water due to the formation of Langmuir cells (Alberta Environment, 2005). Langmuir cells are underwater currents created by and parallel to wind. Where two cells converge, debris is trapped creating foam (Severn Sound Environmental Association, 2012).

Based on the number of observations, locations and descriptions of the foam observed, it is the opinion of the authors that foam largely stems from natural processes, especially in the lower reaches of the river. Some stretches of the St. Clair River such as Walpole Island, for example are characterized by an abundance of wetlands and wetland vegetation. It is likely the foam (commonly described as brown in colour) is produced from abundant dissolved organic material originating from the soils, abundant wetlands (68.9 km² on Walpole Island) and diverse tallgrass prairie, oak savannah and Carolinian forest characteristic of this region (Hayman, 2009). The 2010 and 2012 aesthetics monitoring further describes the types and amounts of foam observed on the St. Clair River.

Table 4.4: Guidelines for identifying natural and anthropogenic foam (Indiana Department of Environmental Management, 2001).

Guideline for determining Natural versus Anthropogenic Foam
"Natural" Foam:
<ul style="list-style-type: none">• Light tan or brown in colour, but may be white• An "earthy" or "fishy" or "fresh cut grass" odour• Dissipates fairly quickly when not agitated
Foam from Human Activity:
<ul style="list-style-type: none">• Usually white in colour• A fragrant, perfumed or soapy odour• Foam persists for a longer period of time

The presence of litter was noted 22 times in the 2010 Walpole Island Questionnaire (as an objectionable deposit and an unnatural scum/ floating material). Litter was only reported three times in the 2007 questionnaire. This difference could be attributed to the altered wording of the question, increased amount of litter present along the river in 2010 or a reflection of the locale the respondents were describing.

4.1.3. Aesthetic Survey Conclusions

Overall, the majority of the aesthetic survey responses were positive. The surveys conducted between 2007 and 2008 had the largest participation with 65% suggesting the appearance of the river had improved. In addition, 90% of respondents rated the appearance of the St. Clair River as "fair", "good" or "excellent." Fifty-five percent of those surveyed between 2007 and 2008 did not report any of the aesthetic impairments listed on the questionnaire.

The comments portion of the survey helped identify some perceptions regarding the aesthetics of the St. Clair River. A small number of the respondents most commonly reported objectionable deposits as oil sheens, litter and unnatural scum/floating material (mainly foam). Comments did not describe the size of the sheen. Comments provided by the survey participants suggest that most of the foam (especially in the lower reaches) is the result of natural processes rather than anthropogenic.

The survey and responses to the questionnaires proved beneficial in identifying local perceptions about the aesthetics of the St. Clair River. However, the "degradation of aesthetics" BUI is subjective and the RAP committee felt that a more in-depth investigation was needed. Hence, a monitoring program was initiated.

This aesthetics monitoring was conducted between 2009 and 2012 and provided a systematic, longer-term view and allowed for the documentation of observations regarding river aesthetics. It was proposed that by evaluating the aesthetic surveys and aesthetic monitoring together, a more complete picture of St. Clair River aesthetics would emerge.

4.2. Long-Term Monitoring of Aesthetics of the St. Clair River

The revised delisting criteria for the “degradation of aesthetics” BUI states “this BUI will be considered restored when the waters are devoid of anthropogenic substances at levels that produce a persistent objectionable deposit and/or odour” (CRIC Delisting Subcommittee, 2012). The revised criterion was only slightly modified from the original developed in the Stage 2 RAP Report that stated the “Degradation of Aesthetics” BUI would “be considered restored when over a two year period there is/are no, objectionable deposits, unnatural colour or turbidity, or unnatural scum/floating materials” (OMOE/MDEQ, 1995). It was felt that the revisions would better reflect the issues outlined in the Stage 1 RAP Report and ensure the evaluation of on-going issues rather than one-time incidents. In order to evaluate the persistence and level of river aesthetics impairment, observations were recorded by staff at the SCRCA at eight near shore sampling stations in the St. Clair River AOC in 2009, 2010 and 2012 (Appendix G; Figure 4.8). Observations were also recorded by the Lambton County Community Health Services Department (LCCHSD) staff in conjunction with their beach monitoring program in 2011.

The eight monitoring sites were located along the St. Clair River extending from the Blue Water Bridge, in Point Edward south to Marshy Creek, just north of Port Lambton (Figure 4.8). In 2009, aesthetic observations were recorded at the discretion of field staff collecting *E. coli* samples as part of a beach monitoring program. The 2009 aesthetic monitoring observations have been used to supplement the 2010 and 2012 observations which had a formal monitoring protocol. Between June 2nd and July 14th, 2009, location and temperature were recorded at each site along with observations on wind, water clarity, current, visible debris and wildlife (Table 4.5).

In early 2010, a formal monitoring protocol was developed based on that used in the Rouge River AOC in Michigan (Heidtke & Tauriainen, 1996) that attempted to quantify qualitative and subjective aesthetics observation data. The end result is the assignment of a numerical value that reflects the status of aesthetic conditions at a specific time and location (i.e., good, poor). The method is discussed more thoroughly in

Section 4.3. Stations were sampled at ten intervals between June 2 and August 23, 2010. Appendix F provides a sample of the monitoring sheets used to record the aesthetics data. The 2012 monitoring program followed the same protocol and was conducted from late April until the end of September. The following observations were recorded at each site:

- Water appearance (clarity, colour, odour, visible debris),
- Substrate (woody debris and detritus),
- Aquatic macrophytes and algae,
- Wildlife, and
- Recreational users.

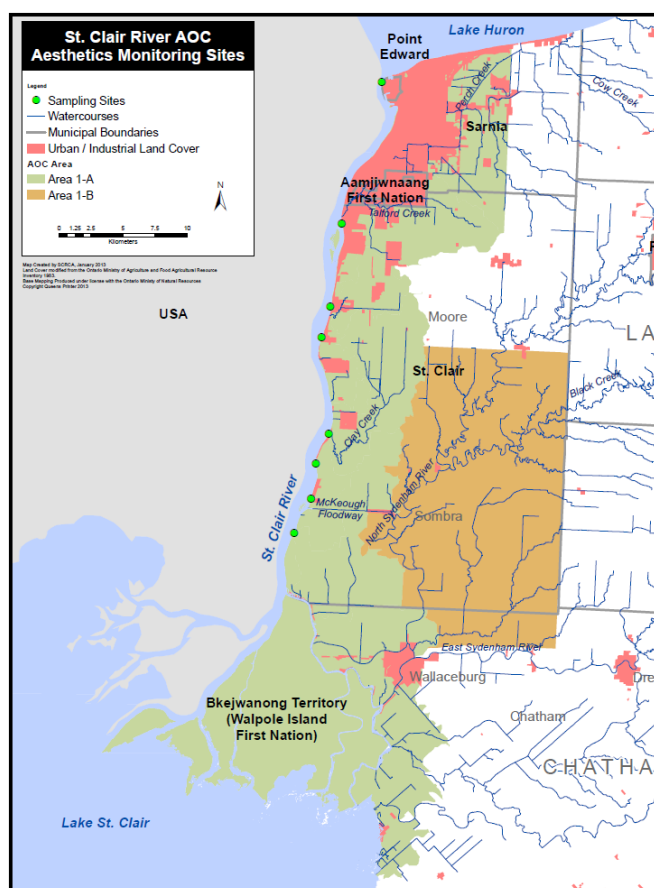


Figure 4.8: Onshore sampling stations.

Table 4.5: Aesthetics monitoring sampling schedule.

2009	2010	2012	
June 2	June 14	April 27	July 16
June 9	June 28	May 10	August 1
June 16	July 5	May 17	August 17
June 23	July 12	May 25	August 31
July 7	July 19	June 8	September 14
July 14	August 3	June 15	September 26
July 21	August 17	June 29	
	August 23	July 12	

4.2.1. Visible Debris (Objectionable Deposits and Unnatural Scum or Floating Material)

During the monitoring period, very little visible debris was observed in the waters of the St. Clair River. Only litter, foam and natural debris were observed with any frequency. The most common types of litter recorded were disposable cups, plastic bottles, garbage bags and bait containers. These items were largely observed along the banks of the river and less frequently in the water. The amount of litter observed in the St. Clair River was no different than that in other water bodies and its presence is not considered an issue specific to AOCs. Any location in the Great Lakes Basin that facilitates recreational opportunities can be subjected to litter.

Small amounts of foam were noted at all sites at some point during the monitoring period. Of the 29 monitoring days between 2009 and 2012, foam was observed most frequently at Cathcart Park (14 times or 48%) and less frequently at Guthrie Park (2 times or 7%). Generally, foam was observed on a greater number of days in 2012. In 2012, monitoring days tended to corresponded with high wind velocities and more frequent observations of foam (Figure 4.9). Foam development is associated with breaking waves during windy periods and swift currents (Severn Sound Environmental Association, 2012). Foam occurred when wind speeds were greater than 10 km/hr based on the Environment Canada (EC) climate database (EC, 2012). On occasion, velocities reaching 30 km/hr were recorded. To put these velocities into perspective, speeds were compared to the Beaufort scale; a scale that relates wind speed to conditions observed on land or sea (Met Office, 2010). According to this scale the wind speeds observed along the St. Clair River in 2012 were sufficient to produce small to large waves and frequent white caps. These conditions foster the development of foam. Monitoring conducted in 2010 saw foam at Reagan Park. The foam was brown-coloured and located among vegetation and other organic material. These observations are characteristic of natural foam. The occurrence of foam similar to that observed in the AOC has been

documented in other areas of the Great Lakes Basin outside of AOCs (e.g., Severn Sound and areas in Lambton County outside the AOC boundaries; Figure 4.10). A more detailed account for each monitoring location is provided in Appendix H.



Figure 4.9: Foam observed in the waters at Branton-Cundick Park on April 27, 2012.



Figure 4.10: Foam on Brown Creek located at Rokeby Line. Brown Creek is a tributary of Sydenham River and foam observed on this water body is similar to foam observed along St. Clair River.

4.2.2. Unnatural Colour or Turbidity

In general, the water colour observed in the middle channel of the St. Clair River was the characteristic blue-green/blue-grey (Figure 4.11). In the more natural locations (e.g., Reagan Park) the water was typically brown due to mixing organic material and sediment (Figure 4.12). Observations on colour and

turbidity were qualitative for both the surveys and the monitoring and can be very subjective. Monitoring results suggest that turbidity is associated with rain events or windy days, as would be expected in non-AOC riverine systems. In 2011, Stantec Inc., an international consulting firm, measured the water quality of the St. Clair River just above the outlet of Talfourd Creek in order to monitor the effect of pipeline maintenance. Mean turbidity readings ($n = 22$; measured over two weeks in January and February 2011) ranged from 7.1 Nephelometric Turbidity Units (NTUs) to 13.3 NTUs (Table 4.6). Health Canada recommends a maximum recreation and aesthetic guideline of 50 NTUs for public health at beaches (Health Canada, 2012). The turbidity values reported by Stantec were well below this threshold. Turbidity issues in the St. Clair River AOC typically follow rain events and as such, are outside the delisting criteria definition which refers to persistent aesthetic problems.



Figure 4.11: Typical blue colour of the St. Clair River, as seen at the Blue Water Bridge in Point Edward, Ontario.



Figure 4.12: Typical water colour observed at Reagan Park along the St. Clair River.

Table 4.6: Stantec turbidity monitoring locations and results.

Drift	Depth	Upstream -100
A	Top	11.8
	Middle	12.6
	Bottom	13.3
B	Top	10.3
	Middle	10.7
	Bottom	11.5
C	Top	8.9
	Middle	8.7
	Bottom	8.3
D	Top	9.3
	Middle	7.9
	Bottom	7.9
E	Top	9.6
	Middle	7.8
	Bottom	8
F	Top	7.6
	Middle	7.1
	Bottom	7.2
G	Top	7.7
	Middle	7.7
	Bottom	8.9

SAMPLING LOCATIONS

Position	UTM X	UTM Y
-100 A	380551	4752161
-100 B	380641	4752145
-100 C	380731	4752128
-100 D	380821	4752112
-100 E	380911	4752096
-100 F	381001	4752080

The evaluation of colour proved difficult as colour can be influenced by either natural (e.g., disturbed sediment along the shoreline, cloud cover) or anthropogenic processes (e.g., eutrophication caused by the

unnatural input of nutrients into the system). Aesthetic monitoring results suggest there is no evidence that the colour of the St. Clair River is unnatural. Refer to Appendix H for more site-specific and detailed information.

4.2.3. Unnatural Odour

There were no persistent odours detected during the three years of monitoring. A weak fishy smell was reported on a few occasions. Other odours could be tied to local onshore conditions (e.g., the smell of creosote at the Mooretown Boat launch from treated railway ties used in landscaping). No odour associated with faulty septic systems of sewage was detected during the monitoring period.

4.2.4. 2011 Lambton County Community Health Services Department Aesthetics Monitoring

Throughout the summer of 2011, the Lambton County Community Health Services Department (LCCHSD) conducted aesthetics monitoring in conjunction with their beach management program. While collecting water samples for *E. coli* analysis at beaches within the St. Clair River AOC, the department recorded aesthetic observations such as foam, water colour and other basic chemical and physical water attributes.

The LCCHSD visited ten sites during their 2011 beach management program on a weekly basis between June and September. White or brown foam was recorded 30% of the time (20 of 67 observations) but was not persistent. On August 10, 2011, foam was observed at seven stations, a day that experienced the largest waves of all sampling dates. Wave intensity was not as intense on other sampling dates. No oil of any kind (sheen, slick, film, etc.) was reported. Staff at the LCCHSD observed green, murky, or cloudy water occasionally (22%, 12% and 1% of the time, respectively). There were no other observations that would be considered an aesthetic impairment.

The monitoring conducted by the LCCHSD suggests that generally the St. Clair River water was devoid of anthropogenic substances at levels that produce a persistent objectionable deposit and/or odour. These results are in agreement with the conclusions reached through the aesthetics monitoring carried out by the SCRCA.

4.3. Application of the Rouge River Aesthetic Quality Index

The Rouge River, a tributary of the Detroit River in Southeast Michigan is designated as one of the original 43 AOCs in the Great Lakes Basin. Qualitative information pertaining to the aesthetic state of the river was

collected in 1994. In response to the need for quantifying aesthetic information together, a numerical index of aesthetic conditions was developed. The indicator, referred to as the Rouge River Aesthetic Index (RRAI; Heidtke & Tauriainen, 1996), assigns a value to the observed condition of the river (at a given time and location) that reflects the quality of four aesthetic parameters: water clarity, water colour, odour, and visible debris. Each parameter is weighted based on its perceived importance in contributing to the aesthetic nature of the environment. These values are multiplied by the assigned aesthetic value and summed, producing an index value ranging from zero to ten. A value of zero represents the worst possible state of aesthetics while a value of ten represents the best possible aesthetic conditions (Heidtke & Tauriainen, 1996).

The RRAI index can be applied to the data collected by SCRCA in 2010 and 2012. During visits to each location, field personnel recorded the aesthetic condition of the St. Clair River at that particular time. The worksheet used follows the methodology outlined in Heidtke and Tauriainen (1996; Appendix F). The condition of the four major aesthetic parameters (water clarity, water colour, odour and visible debris) was recorded based on the descriptions in Table 4.7. The observed condition of the St. Clair River for each parameter was defined by circling one (or more) of the possible descriptors.

"I grew up on the banks of the St. Clair River in the late 60's and 70's – during that time, it wasn't uncommon to observe oil sheens, rubber, floating mats of dead aquatic weeds entangled with rotting fish carcasses and various forms of floating garbage, debris and sewage. To me, as a kid at the time, these observations seemed like normal events, which in later years I came to realize should not have been the case! Since my youth, I've seen a gradual and notable improvement in the aesthetic quality of the river, where such past observations have become non-routine events and socially unacceptable to folks like myself that live and play on the St. Clair River."

Tim Moran, B.Sc., President, Pollutech EnviroQuatics Limited

Table 4.7: The four aesthetic parameters and descriptions recorded on field sheet to apply the Rouge River Aesthetic Index to the St. Clair River Area of Concern.

Aesthetic Parameter	Possible Descriptors
Water clarity	Clear, cloudy, opaque
Water colour	Clear, green, brown, gray, black
Odour	None, musty, sewage, anaerobic
Visible debris	None, oil film, sewage, trash, natural

As was done in the Rouge River, for the St. Clair River AOC each parameter was assigned a value between 0 (worst) and 10 (best) depending upon the observed aesthetic condition. In addition, an overall weighting factor was assigned to each parameter with the constraint that the sum of the weights is equal to 1. The index values and weighting factors used in the St. Clair River AOC assessment are presented in Table 4.8. The values are similar to the application of the aesthetic index in the Rouge River report but values associated with water colour and water clarity have been slightly modified to properly relate and represent natural characteristics of the St. Clair River.

Table 4.8: Test index values and parameter weights applied to the aesthetic index assessment in for the St. Clair River Area of Concern.

Parameter	Descriptor	Index Value
Clarity (weight = 0.2)	Clear	10
	Cloudy	7
	Natural Opaque	7
	Unnatural Opaque	0
Color (weight = 0.2)	Clear, Natural, Blue-Green, Blue-Gray or Green	10
	Green (unnatural only)	7
	Brown	5
	Gray (unnatural only)	2
	Black	0
Odor (weight = 0.3)	None	10
	Musty	6
	Sewage	2
	Anaerobic	0
Debris (weight = 0.3)	None	10
	Natural	8
	Oil Film	3
	Trash	2
	Sewage	0

The index values identified in Table 4.8 more appropriately represent the natural conditions of the St. Clair River. The colour descriptors outlined in the Rouge River assessment did not account for the natural “blue-green” colour of the St. Clair River. In addition, “green”, “blue-green”, and “blue-grey” colours are considered natural in this waterway and not attributable to pollution or unnatural organic growth. As such, “green”, “blue-green”, or “blue-grey” observations were given the same value as clear water (index value of 10). In addition, due to the natural opaque characteristic of the St. Clair River and the subjective nature of assessing water clarity, opaque water clarity observations were assigned an index value of 7. Opaque conditions clearly associated with anthropogenic inputs were assigned an index value of 0.

To account for the presence of limiting conditions, control thresholds outlined for the Rouge River were applied to the St. Clair River AOC (Table 4.9). A control threshold represents the descriptor value at or below which the aesthetic condition of the river is considered limited, independent of all other parameters (Heidtke & Tauriainen, 1996). If a parameter descriptor value is at or below its associated control threshold,

the overall aesthetic index is set at that value; if more than one parameter exhibits values below control thresholds, the aesthetic index is set to the lowest control threshold.

Table 4.9: Control thresholds applied in the aesthetic index assessment for the St. Clair River Area of Concern.

Parameter	Control Threshold	Interpretation
Clarity	0	Unnatural opaque color
Color	2	Unnatural Grey or black color
Odour	2	Sewage or anaerobic smell
Debris	3	Oil film, trash, sewage

Table 4.10: Test index ranges and categories for aesthetic conditions in the St. Clair River Area of Concern.

Aesthetic Condition	Index Range
Excellent	$RRAI \geq 9$
Good	$8 \leq RRAI < 9$
Fair	$6 \leq RRAI < 8$
Poor	$RRAI < 6$

Calculated indexes for each site were compared to index ranges that rank aesthetic conditions (Table 4.10). The results indicated that six of the eight stations ranked good to excellent, having mean aesthetic indices above eight. The Blue Water Bridge location (at the exit of Lake Huron) ranked excellent. Fair was obtained for Reagan Park and Branton-Cundick Park locations (Table 4.11; raw data available in Appendix A). The major aesthetic impairment that contributed to lower index values was trash floating in the water (e.g., coffee cups, plastic bottles). The removal of these trash values would increase the aesthetics index to “good” or “excellent” at many of the monitoring locations. Foam, also a contributing factor to lower aesthetic scores, was attributed to natural processes. The results from the application of the aesthetics index support the re-designation of the “degradation of aesthetics” BUI to “Not Impaired”.

Table 4.11: Mean aesthetic index values calculated for monitoring stations along the St. Clair River Area of Concern.

Site	Mean Aesthetic Index Value	Aesthetic Index Ranking
BLW-10	9.4	Excellent
GTH-10	8.3	Good
BCP-10	7.7	Fair
MBL-10	8.9	Good
CWP-10	8.6	Good
CAP-10	8.2	Good
RPW-10	7.5	Fair
MRC-10	8.7	Good

5.0 Status of the Degradation of Aesthetics Beneficial Use Impairment on the Michigan Side of the St. Clair River

The “degradation of aesthetics” BUI was officially re-designated on the American side of the St. Clair River in September 2012. The removal criteria developed by US agencies stated that this BUI would be considered restored “when monitoring data for two successive monitoring cycles indicates that water bodies in the AOC do not have any of physical properties in unnatural quantities which interfere with any designated use” (MDEQ, 2008). These physical properties included: turbidity, foams, colour, settleable solids, oil films, suspended solids, floating solids and deposits. Aesthetic conditions were assessed in August and October of 2011, following a statewide aesthetics protocol developed by the MDEQ in early 2011.

MDEQ staff visited five sites between Port Huron and Algonac, Michigan along the St. Clair River. The presence of any objectionable deposits on the surface was recorded and photographs were taken. In addition, water was collected in clear jars to assess turbidity. Any use of the river for recreational purposes was also documented.

Results of the monitoring indicated that the aesthetic impairments present on the St. Clair River when it was designated as an AOC, no longer exist and recreational uses of the river are no longer inhibited. Evidence of fishing was observed along the shorelines of the monitoring locations along with large numbers of shorebirds. No odours were detected or oil sheens. It was the opinion of MDEQ staff therefore, that this BUI be re-designated to “Not Impaired” for the American side of the St. Clair River (Riley, 2012).

6.0 Conclusions

The “degradation of aesthetics” BUI was originally identified as “Impaired” due to floating debris, scums and oil sheens associated with industrial and municipal discharges. The ongoing regulatory framework for continued vigilance in managing spills, discharge and CSOs is similar across the province for both AOCs and non-AOCs. Over the last twenty years implementation of municipal and industrial discharge regulations (MISA, Effluent Monitoring and Effluent Limits, e.g., O. Reg 760/93, 537/93, 63/95, 214/95, 561/94, and 215/95, Spills Prevention and Contingency Plans Regulation, O. Reg 114/07), improvements to municipal wastewater infrastructure, significantly reduced CSO volumes, and significant reductions in spills have generally addressed the original Stage 1 aesthetic conditions.

These stricter regulations and infrastructure improvements are reflected in the positive responses to questions posed in the aesthetics surveys and improved appearance of the St. Clair River. Results of the aesthetic surveys circulated to water users in the AOC indicate that 90% of the respondents believe the appearance of the St. Clair River is “fair”, “good” or “excellent”. The surveys and monitoring indicate that foam and oil sheens continue to be present but in minor amounts compared to the volumes reported in the 1991 Stage 1 RAP Report. The colour and characteristics of foam on the St. Clair River and its association with natural organic material and wave action suggests that it is naturally occurring. Small amounts of litter was reported in the aesthetics surveys and monitoring (mostly food and drink packaging) but was considered no different than the amount observed at other non-AOC parks and beaches.

“I remember sheets of foam, rubber and oil sheens floating down the river. After a swim we had to remove tar balls with turpentine from our feet. We weren’t allowed to swim if the smell of sewage was present. We called it the pre swim ‘sniff test’.

Now on a beautiful summer’s eve, we are able to bring friends down to the shore and not be embarrassed about the appearance of the water. It is so much better than the past.”

Don Lee, St. Clair River resident since 1950’s

7.0 Recommendation

The 2012 Revised Delisting Criteria for the “degradation of aesthetics” BUI in the St. Clair River states that “this BUI will be considered restored when the waters are devoid of anthropogenic substances at levels that

produce a persistent objectionable deposit and/or odour". Based on the lines-of-evidence presented in this report, it is recommended that the "degradation of aesthetics" BUI be re-designated to "Not Impaired" in the Canadian portion of the St. Clair River AOC.

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Appendix A - Rouge River Aesthetic Index Adapted for St. Clair River Area of Concern

St. Clair River Aesthetics Index											
Date	Code	Odour	Index Value	Debris	Debris Index Value	Water Clarity	Clarity Index Value	Water Colour	Colour Index Value	Aesthetic Index	Mean Site Aesthetic Index
23-Aug-10	BLW-10	none	10	none	10	opaque	7	brown	5	8.4	
17-Aug-10	BLW-10	none	10	none	10	clear	10	clear	10	10	
09-Aug-10	BLW-10	none	10	none	10	cloudy	7	clear	10	9.4	
03-Aug-10	BLW-10	none	10	natural	8	clear	10	clear	10	9.4	
19-Jul-10	BLW-10	none	10	none	10	cloudy	7	clear	10	9.4	
12-Jul-10	BLW-10	none	10	none	10	opaque	0	clear	10	8	
05-Jul-10	BLW-10	none	10	none	10	cloudy	7	clear	10	9.4	
28-Jun-10	BLW-10	none	10	none	10	clear	10	clear	10	10	
14-Jun-10	BLW-10	none	10	none	10	clear	10	clear	10	10	
27-Apr-12	BLW-12	none	10	none	10	opaque	7	brown	2	7.8	
10-May-12	BLW-12	none	10	none	10	clear	10	green-blue	10	10	
17-May-12	BLW-12	none	10	foam (natural)	8	cloudy	7	green-grey	7	8.2	
25-May-12	BLW-12	none	10	none	10	clear	10	green-blue	10	10	
8-Jun-12	BLW-12	none	10	none	10	clear	10	green-blue	10	10	
15-Jun-12	BLW-12	none	10	none	10	clear	10	green-blue	10	10	
29-Jun-12	BLW-12	none	10	none	10	clear	10	green-blue	10	10	
12-Jul-12	BLW-12	fishy	10	none	10	clear	10	green-blue	10	10	
16-Jul-12	BLW-12	none	10	none	10	clear	10	blue	10	10	
1-Aug-12	BLW-12	none	10	none	10	clear	10	clear/green-blue	10	10	
17-Aug-12	BLW-12	none	10	foam (natural)	8	clear	10	clear/green-blue	10	9.4	
31-Aug-12	BLW-12	none	10	natural/foam (natural)	8	clear	10	clear/blue	10	9.4	
14-Sept-12	BLW-12	none	10	none	10	cloudy	7	brown/blue	7	8.8	
26-Sept-12	BLW-12	none	10	none	10	clear	10	clear/blue	10	10	9.4
23-Aug-10	GTH-10	none	10	none	10	cloudy	7	clear	10	9.4	
17-Aug-10	GTH-10	none	10	none	10	clear	10	clear	10	10	
09-Aug-10	GTH-10	none	10	none	10	cloudy	7	clear	10	9.4	
03-Aug-10	GTH-10	none	2	trash	2	clear	2	clear	2	2	
19-Jul-10	GTH-10	none	10	none	10	cloudy	7	clear	10	9.4	

12-Jul-10	GTH-10	none	10	none	10	opaque	7	clear	10	9.4	
05-Jul-10	GTH-10	none	10	none	10	opaque	7	clear	10	9.4	
28-Jun-10	GTH-10	none	10	natural	8	opaque	7	clear	10	8.8	
14-Jun-10	GTH-10	none	10	none	10	clear	10	clear	10	10	
27-Apr-12	GTH-12	none	10	none	10	cloudy	7	grey-brown	2	7.8	
10-May-12	GTH-12	none	10	none	10	clear	10	brown	2	8.4	
17-May-12	GTH-12	other	6	natural	8	cloudy	7	brown	2	6	
25-May-12	GTH-12	fishy	10	natural	8	cloudy	7	brown	2	7.2	
8-Jun-12	GTH-12	none	10	natural/foam (natural)	8	cloudy	7	brown	2	7.2	
15-Jun-12	GTH-12	fishy	10	natural	8	clear	10	brown	2	7.8	
29-Jun-12	GTH-12	none	10	natural	8	clear	10	brown	2	7.8	
12-Jul-12	GTH-12	none	10	natural	8	cloudy	7	brown	2	7.2	
16-Jul-12	GTH-12	none	10	natural	8	cloudy	7	brown	2	7.2	
1-Aug-12	GTH-12	fishy	10	natural	8	clear	10	brown	2	7.8	
17-Aug-12	GTH-12	none	10	none	10	clear	10	brown	2	8.4	
31-Aug-12	GTH-12	none	10	natural/foam (natural)	8	cloudy	7	brown/blue	7	8.2	
14-Sept-12	GTH-12	none	10	none	10	clear	10	clear/blue	10	10	
26-Sept-12	GTH-12	none	10	natural	8	clear	10	clear/blue	10	9.4	8.3
23-Aug-10	BCP-10	none	10	none	10	opaque	7	brown	5	8.4	
17-Aug-10	BCP-10	none	10	none	10	cloudy	7	green	10	9.4	
09-Aug-10	BCP-10	none	2	trash	2	cloudy	2	brown	2	2	
03-Aug-10	BCP-10	sewage	2	natural	2	clear	2	clear	2	2	
19-Jul-10	BCP-10	none	10	natural	8	opaque	7	clear	10	8.8	
12-Jul-10	BCP-10	none	10	none	10	opaque	7	clear	10	9.4	
05-Jul-10	BCP-10	none	10	none	10	opaque	7	brown	5	8.4	
28-Jun-10	BCP-10	none	10	none	10	opaque	7	clear	10	9.4	
14-Jun-10	BCP-10	none	10	natural	8	opaque	7	brown	5	7.8	
27-Apr-12	BCP-12	none	10	foam (natural)	8	cloudy	7	blue-grey	10	8.8	
10-May-12	BCP-12	none	10	none	10	cloudy	7	brown	2	7.8	
17-May-12	BCP-12	none	10	natural	8	cloudy	7	green/brown	5	7.8	
25-May-12	BCP-12	none	10	natural	8	cloudy	7	brown	2	7.2	
8-Jun-12	BCP-12	none	10	foam (natural)	8	cloudy	7	brown	2	7.2	
15-Jun-12	BCP-12	none	10	natural	8	cloudy	7	brown	2	7.2	
29-Jun-12	BCP-12	none	10	none	10	cloudy	7	brown	2	7.8	
12-Jul-12	BCP-12	none	10	none	10	cloudy	7	brown	2	7.8	

16-Jul-12	BCP-12	none	10	natural	8	clear	10	brown	2	7.8	
1-Aug-12	BCP-12	none	10	natural	8	cloudy	7	brown	2	7.2	
17-Aug-12	BCP-12	none	10	natural/foam (natural)	8	clear	10	brown	2	7.8	
31-Aug-12	BCP-12	none	10	natural	8	clear	10	clear/blue	10	9.4	
14-Sept-12	BCP-12	none	10	none	10	cloudy	7	brown/blue	7	8.8	
26-Sept-12	BCP-12	none	10	natural/foam (natural)	8	clear	10	clear	10	9.4	7.7
23-Aug-10	MBL-10	none	10	none	10	cloudy	7	clear	10	9.4	
17-Aug-10	MBL-10	none	10	none	10	clear	10	clear	10	10	
09-Aug-10	MBL-10	none	10	none	10	cloudy	7	clear	10	9.4	
03-Aug-10	MBL-10	none	10	natural	8	clear	10	clear	10	9.4	
19-Jul-10	MBL-10	none	10	none	10	cloudy	7	clear	10	9.4	
12-Jul-10	MBL-10	none	10	none	10	opaque	0	clear	10	8	
05-Jul-10	MBL-10	none	10	none	10	cloudy	7	clear	10	9.4	
28-Jun-10	MBL-10	none	10	natural	8	opaque	7	clear	10	8.8	
14-Jun-10	MBL-10	none	2	trash	2	clear	2	clear	10	2	
27-Apr-12	MBL-12	none	10	foam (natural)	8	cloudy	7	green-blue	10	8.8	
10-May-12	MBL-12	none	10	foam (natural)	8	clear	10	green-blue	10	9.4	
17-May-12	MBL-12	none	10	foam (natural)	8	clear	10	green-blue	10	9.4	
25-May-12	MBL-12	none	10	natural/foam (natural)	8	clear	10	green-blue	10	9.4	
8-Jun-12	MBL-12	none	10	foam (natural)	8	cloudy	7	green-blue	10	8.8	
15-Jun-12	MBL-12	none	10	none	10	clear	10	green-blue	10	10	
29-Jun-12	MBL-12	none	10	natural/foam (natural)	8	clear	10	green-blue	10	9.4	
12-Jul-12	MBL-12	none	10	natural	8	clear	10	green-blue	10	9.4	
16-Jul-12	MBL-12	none	10	none	10	clear	10	green-blue	10	10	
1-Aug-12	MBL-12	none	10	natural	8	clear	10	green-blue	10	9.4	
17-Aug-12	MBL-12	none	10	natural/foam (natural)	8	clear	10	green-blue	10	9.4	
31-Aug-12	MBL-12	none	10	natural/foam (natural)	8	clear	10	blue	10	9.4	
14-Sept-12	MBL-12	none	10	foam (natural)	8	clear	10	blue	10	9.4	
26-Sept-12	MBL-12	none	10	natural/foam (natural)	8	clear	10	blue	10	9.4	8.9
23-Aug-10	CWP-10	none	10	none	10	clear	10	clear	10	10	
17-Aug-10	CWP-10	none	10	none	10	cloudy	7	clear	10	9.4	
09-Aug-10	CWP-10	none	10	none	10	cloudy	7	clear	10	9.4	
03-Aug-10	CWP-10	none	2	trash	2	clear	2	clear	10	2	
19-Jul-10	CWP-10	none	10	natural	8	opaque	7	clear	10	8.8	
12-Jul-10	CWP-10	none	10	none	10	opaque	7	clear	10	9.4	

05-Jul-10	CWP-10	none	10	none	10	cloudy	7	clear	10	9.4	
28-Jun-10	CWP-10	none	10	natural	8	clear	10	clear	10	9.4	
14-Jun-10	CWP-10	none	2	trash	2	opaque	2	clear	2	2	
27-Apr-12	CWP-12	none	10	foam (natural)	8	cloudy	7	green	5	7.8	
10-May-12	CWP-12	none	10	natural/foam (natural)	8	clear	10	green-blue	10	9.4	
17-May-12	CWP-12	none	10	none	10	clear	10	blue	10	10	
25-May-12	CWP-12	none	10	natural	8	cloudy	7	green-blue	10	8.8	
8-Jun-12	CWP-12	none	10	natural/foam (natural)	8	clear	10	green-blue	10	9.4	
15-Jun-12	CWP-12	none	10	natural	8	clear	10	green-blue	10	9.4	
29-Jun-12	CWP-12	none	10	natural	8	clear	10	green-blue	10	9.4	
12-Jul-12	CWP-12	none	10	natural	8	clear	10	green-blue	10	9.4	
16-Jul-12	CWP-12	none	10	natural	8	clear	10	green-blue	10	9.4	
1-Aug-12	CWP-12	none	10	none	10	clear	10	blue	10	10	
17-Aug-12	CWP-12	none	10	foam (natural)	8	clear	10	green-blue	10	9.4	
31-Aug-12	CWP-12	none	10	natural/foam (natural)	8	clear	10	blue	10	9.4	
14-Sept-12	CWP-12	none	10	foam (natural)	8	clear	10	blue	10	9.4	
26-Sept-12	CWP-12	none	10	foam (natural)	8	clear	10	clear-blue	10	9.4	8.6
23-Aug-10	CAP-10	none	10	none	10	opaque	7	clear	10	9.4	
17-Aug-10	CAP-10	none	10	natural	8	clear	10	clear	10	9.4	
09-Aug-10	CAP-10	none	10	none	10	cloudy	7	clear	10	9.4	
03-Aug-10	CAP-10	none	10	natural	8	clear	10	clear	10	9.4	
19-Jul-10	CAP-10	none	2	trash	2	opaque	2	clear	2	2	
12-Jul-10	CAP-10	none	10	none	10	cloudy	7	clear	10	9.4	
05-Jul-10	CAP-10	none	10	natural	8	opaque	7	clear	10	8.8	
28-Jun-10	CAP-10	none	10	natural	8	clear	10	clear	10	9.4	
14-Jun-10	CAP-10	none	10	none	10	opaque	7	brown	5	8.4	
27-Apr-12	CAP-12	none	10	foam (natural)	8	cloudy	7	blue-grey	10	8.8	
10-May-12	CAP-12	none	10	natural/foam (natural)	8	opaque	7	brown	2	7.2	
17-May-12	CAP-12	none	10	natural/foam (natural)	8	cloudy	7	brown	2	7.2	
25-May-12	CAP-12	none	10	natural/foam (natural)	8	cloudy	7	brown	2	7.2	
8-Jun-12	CAP-12	none	10	natural/foam (natural)	8	clear	10	green-brown	5	8.4	
15-Jun-12	CAP-12	none	10	natural	8	clear	10	brown	2	7.8	
29-Jun-12	CAP-12	none	10	none	10	cloudy	7	brown	2	7.8	
12-Jul-12	CAP-12	none	10	natural/foam (natural)	8	clear	10	brown	2	7.8	
16-Jul-12	CAP-12	none	10	natural/foam (natural)	8	cloudy	7	green-brown	5	7.8	

1-Aug-12	CAP-12	none	10	natural/foam (natural)	8	clear	10	green-grey	5	8.4	
17-Aug-12	CAP-12	none	10	natural/foam (natural)	8	clear	10	green-brown	5	8.4	
31-Aug-12	CAP-12	none	10	natural/foam (natural)	8	clear	10	brown-blue	7	8.8	
14-Sept-12	CAP-12	none	10	foam (natural)	8	cloudy	7	green-brown	5	7.8	
26-Sept-12	CAP-12	none	10	natural	8	clear	10	brown	2	7.8	8.2
23-Aug-10	RPW-10	none	2	trash	2	opaque	2	clear	2	2	
17-Aug-10	RPW-10	none	10	none	10	cloudy	7	clear	10	9.4	
09-Aug-10	RPW-10	none	2	trash	2	opaque	2	clear	2	2	
03-Aug-10	RPW-10	none	10	natural	8	clear	10	clear	10	9.4	
19-Jul-10	RPW-10	none	10	none	10	cloudy	7	clear	10	9.4	
12-Jul-10	RPW-10	none	10	natural	8	opaque	7	clear	10	8.8	
05-Jul-10	RPW-10	none	10	none	10	cloudy	7	clear	10	9.4	
28-Jun-10	RPW-10	none	10	natural	8	opaque	0	clear	10	7.4	
14-Jun-10	RPW-10	none	10	natural	8	opaque	7	brown	5	7.8	
27-Apr-12	RPW -12	none	10	natural	8	cloudy	7	blue-grey	7	8.2	
10-May-12	RPW -12	none	10	natural	8	cloudy	7	brown	2	7.2	
17-May-12	RPW -12	none	10	natural	8	cloudy	7	brown	2	7.2	
25-May-12	RPW -12	none	10	natural	8	cloudy	7	brown	2	7.2	
8-Jun-12	RPW -12	none	10	natural/foam (natural)	8	cloudy	7	brown	2	7.2	
15-Jun-12	RPW -12	none	10	natural	8	clear	10	brown	2	7.8	
29-Jun-12	RPW -12	none	10	natural/foam (natural)	8	cloudy	7	brown	2	7.2	
12-Jul-12	RPW -12	fishy	10	natural	8	cloudy	7	brown	2	7.2	
16-Jul-12	RPW -12	none	10	natural/foam (natural)	8	cloudy	7	brown	2	7.2	
1-Aug-12	RPW -12	none	10	natural	8	clear	10	brown	2	7.8	
17-Aug-12	RPW -12	none	10	natural/foam (natural)	8	cloudy	7	brown	2	7.2	
31-Aug-12	RPW -12	none	10	none	10	cloudy	7	brown/blue	7	8.8	
14-Sept-12	RPW -12	none	10	natural	8	cloudy	7	brown/blue	7	8.2	
26-Sept-12	RPW -12	none	10	foam (natural)	8	clear	10	clear	10	9.4	7.5
23-Aug-10	MRC-10	none	10	none	10	clear	10	clear	10	10	
17-Aug-10	MRC-10	none	10	none	10	cloudy	7	clear	10	9.4	
03-Aug-10	MRC-10	none	10	none	10	clear	10	clear	10	10	
19-Jul-10	MRC-10	none	10	natural	8	cloudy	7	clear	10	8.8	
12-Jul-10	MRC-10	none	10	none	10	cloudy	7	clear	10	9.4	
05-Jul-10	MRC-10	none	10	none	10	cloudy	7	clear	10	9.4	
28-Jun-10	MRC-10	none	10	natural	8	clear	10	clear	10	9.4	

14-Jun-10	MRC-10	none	10	none	10	clear	10	clear	10	10	
27-Apr-12	MRC-12	none	10	natural/foam (natural)	8	cloudy	7	green-blue	10	8.8	
10-May-12	MRC-12	none	10	natural/foam (natural)	8	cloudy	7	green-blue	10	8.8	
17-May-12	MRC-12	none	10	none	10	clear	10	green-blue	10	10	
25-May-12	MRC-12	none	10	natural	8	clear	10	brown	2	7.8	
8-Jun-12	MRC-12	none	10	natural	8	clear	10	green-blue	10	9.4	
15-Jun-12	MRC-12	none	10	natural	8	clear	10	brown	2	7.8	
29-Jun-12	MRC-12	none	10	natural/foam (natural)	8	clear	10	brown-blue	5	8.4	
12-Jul-12	MRC-12	none	10	natural	8	clear	10	brown	2	7.8	
16-Jul-12	MRC-12	none	10	natural/foam (natural)	8	clear	10	green-brown	5	8.4	
1-Aug-12	MRC-12	none	10	natural/foam (natural)	8	clear	10	clear	10	9.4	
17-Aug-12	MRC-12	none	10	natural/foam (natural)	8	clear	10	clear-blue	10	9.4	
31-Aug-12	MRC-12	none	10	natural/foam (natural)	8	clear	10	clear	10	9.4	
14-Sept-12	MRC-12	none	10	foam (natural)	8	clear	10	green-brown	5	8.4	
26-Sept-12	MRC-12	none	10	natural/foam (natural)	8	clear	10	clear-blue	10	9.4	8.7

Appendix B - Article on Aesthetics Surveys at Walpole

St. Clair River Area of Concern: Tainting of Fish & Wildlife Flavour, and Aesthetics

February 2010

by Naomi C. Williams, Environment Officer Assistant



In 1985, the St. Clair River was identified as an Area of Concern (AOC) due to impacts from contaminated sediment, pollutants, discharges, and run off. This has resulted in impairments to the ecosystem, habitats, and degraded conditions for the organisms, fish and wildlife. **When beneficial**

uses are no longer impaired the St. Clair River will be delisted as an Area of Concern. Beneficial uses are the features of the river that people, fish and wildlife value. This includes uses like drinking water, taste/odour; fish and wildlife habitat; fish tumours or other deformities; bird or animal deformities or reproductive problems. In total 13 Beneficial Uses have been identified (not all listed here).

To restore and maintain the chemical, physical, and biological integrity of the Great Lakes System is a goal set out under the Canada-US Great Lakes Water Quality Agreement where government agencies, industries, and stakeholders work towards achieving this. First Nations people have a direct relationship with the natural environment which ties us culturally, spiritually, socially, and economically to our waters. This is why unimpaired use of the river is important to us.

Two Surveys to be Conducted

Currently, one beneficial use that requires our input is the 'Tainting of Fish and Wildlife Flavour' within the St. Clair River Area of Concern. So, what is the tainting of fish flavour? Substances such as oil (petroleum products) and chemicals entering the river as a result of human activity can change or impair the flavor of fish. For years the residents of Walpole Island First Nation have reported noticing unusual differences in the taste, odour, and appearance of fish meat. There were several surveys in 1995, 1997, and 2007 that targeted fishermen along the St. Clair River but did not include Walpole Island First Nation specifically. Now we have the opportunity to determine if the tainting of fish flavor remains an issue.

The second beneficial use that requires our input is the 'Degradation of Aesthetics' for the St. Clair River. What

is aesthetics? Aesthetics relate to the appearance of the river. Aesthetics are considered impaired if the water clarity, water colour, odour, and floating scum/materials are unnatural. For example, some community members have noted seeing oil sheens.

Cedric Isaac will be out in the community conducting two (2) surveys related to the beneficial uses for the tainting of fish flavour and aesthetics. If you are interested in participating in these surveys please contact the Heritage Centre or stop by to fill one out. Your feedback is very important in determining if these beneficial uses are impaired.



Contact Us . . .

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Appendix C - Results of the 2007 St. Clair River Area of Concern Angler Survey

(1) Residency	(5b) Reasons why	(6) Changes to the St. Clair River	(7) River Aesthetics	(8) River Appearance	(9a) Deposits	(9b) Description	(9c) Location	9(d) Frequency
Canada		bigger fines on plants for spills	don't know	good	no			
Walpole		clear, clean water	no	fair	yes	green and brown goo	middle	1-3 times per year
Canada		less spills	no	poor	yes	blue/yellow oily deposit	middle	always
Canada		less spills	don't know	good	no			
Canada		more reports on testing	yes	good	no			
Canada	chemical spills		don't know	fair	yes	oil	upper, middle, lower	always
Canada		no changes	yes	excellent	no			
Canada	sewage plant south of bridge	sewage plant near Port Huron	yes	fair	yes	scum floating		4-6 times
Canada		less chemicals	don't know	fair	no			
Canada		no changes	don't know	excellent	no			
Canada		no changes	yes	good	no			
Canada		no changes	yes	good	no			
Canada			yes	good	no			
Canada			don't know	good	no			
Canada			yes	good	no			
Canada			yes	fair	no			
Canada	plants	water quality promotion, bottom floor tests	yes	good	yes	foam	upper	1-3 times
Canada	chemical Plants		no	poor	yes		lower	1-3 times
Canada			yes	good	yes	not natural foam	upper	always
US		avoid spills at all costs, keep foreign species out	yes, less floating debris	good	no			

US		closure of Dunn Paper Plant	yes	excellent	yes	paper particles from Dunn Paper plant		for last 40 years
Walpole		less chance of chemicals		fair	no			
Canada		less sewage	don't know	fair	no			
US		less sewage, less chemicals	yes	good	no			
Canada		less spills	yes	excellent	no			
Canada		less spills	yes	good	yes	Sarnia sewage	upper	4-6 times
Walpole		less spills	don't know	good	yes	garbage, dead fish	all areas	more than 10 times per year
Canada		less spills	yes	excellent	no			
US		less spills	yes	excellent	no			
Canada		more fishing spots	yes	excellent	no			
Canada		more water testing	yes	excellent	no			
Canada		more fish	yes	good	yes	gas	middle	less than one
Canada		no changes	yes	good	no			
Canada		no changes	don't know	fair	no			
Canada		no changes	yes	good	no			
Canada		no changes	yes	good	yes	every time it rains	upper	4-6 times
Canada		no changes	yes	excellent	yes	oil	middle	less than one
Canada		no changes	yes	good	no			
Canada		no changes	yes	good	yes	oil	upper and middle	4-6 times
Canada		restrict percery fish	yes	good	no			
US		stock more fish	yes	excellent	no			
US		stock more fish	don't know	good	no			

Canada		stop accidental spills	yes	good	no			
Walpole		zero pollution	no	good	no			
Canada			yes	good	no			
Canada			yes, clarity of water	excellent	no			
Canada			yes	good	no			
Walpole			don't know	good	yes	foam & garbage	all areas	always
Aamjiwnaang First Nation			yes	excellent	no			
Canada			yes	excellent	no			
Walpole	access to lower river only	monitor both sides	no	fair	yes	beige foam, bilge water	lower	1-3 times per year
Canada				good	yes	turbidity with brownish scum		2 times last year
US		plant discharges, it is improving	don't know	good	yes	grey foam, light oil	upper	7-10 time per year
Canada	sewage in water	stop releasing sewage	yes	good	yes	brown sewage	upper	7-10 times
Canada			yes	good	no			
Canada	plants		yes	fair	no			
Canada		continued efforts to improve	yes	good	no			
Canada			yes	excellent	no			
Canada			yes	good				
Canada			yes	good	no			
Walpole		less pollution	yes	poor	no			
Walpole	lower river too dirty	cleaner water	yes	excellent	yes		lower	1 time per year
Walpole	you don't want to know!!		no	fair	yes	dark beige foam	middle	less than one time per year
Canada		less fishing	yes	excellent	no			

Canada		less spills	yes	good	no			
Aamjiwnaang		less spills	no	fair	yes	foam		1-3 time per year
Canada		more fish	yes	good	yes	condoms	upper	always
Canada		more fish	yes	good	yes	sewage	upper	always
Canada		no spills	yes	good	no			
Canada		no changes	yes	excellent	no			
Canada		no changes	yes	good	yes	Floating scum from Black river		1-3 times
Walpole		stop chemical dumping	no	good	yes	oil sheen	lower	1-3 time per year
Walpole			no	good	no			
Canada			don't know	good	no			
Canada		more fish	don't know	fair	yes	scum	upper	less than one
Canada	oily fade	no changes	yes	excellent	yes		lower	4-6 times
Canada	oily taste	stop changing the environment	yes	fair	no			
Canada	plants		yes	good	no			
Canada			don't know	fair	no			
Canada				good				
Canada			yes	good	yes	oily	middle	
Canada		cleaner water	yes	good	no			
Canada		no changes	yes	good	no			
Canada		no changes	don't know	good	no			
Canada			yes	good	yes	sheen	upper	1-3 times
Canada			yes	fair	no			

Canada				poor	no			
Canada		chemical control	yes	fair	yes		lower	less than one
Canada	smells gross	filter water	don't know	fair	yes	cloudy water	middle	1-3 times
Canada		less spills, less sewage	no	fair	no			
Canada		more weeds	yes	good	no			
Canada			yes	good	no			
Walpole		less spills, dredging	no	poor	yes	brown foam	middle	1-3 times in summer months
Canada		colder, cleaner water	don't know	good	yes	oil	upper	1-3 times
Walpole		less industry	no	fair	yes	green muck		1-3 times per year
Walpole		less pollution	no	degraded	yes	scum, oil sheen	all areas	always
Canada		no changes	yes	good	no			
Walpole		stop pollution	don't know	good	yes	dead fish	middle	1-3 times per year
US	plants	less sewage	yes	good	no			
Canada	oily taste	less spills	yes	good	yes	scum	lower	1-3 times
Canada	oily taste in fish	less spills, stop plants from ruining the water	no	fair	yes	oily substance	lower	4-6 times
Canada	plants	no changes	yes	good	no			
Canada	power plant	stricter controls on emissions and release	yes	fair	yes	personal refuse	middle	always
Canada		100% water retention	yes	fair	yes	sewage	lower	4-6 times
Canada		clean up the sewage	yes	excellent	no			
Canada		cleaner water	yes	fair	no			
US		cleaner water	yes	good	yes	sewage	upper	1-3 times
Canada		cleaner water	yes	fair	no			

Walpole		cleaner water	no	fair	yes	algae	upper	4-6 times per year
Canada		dam up black river	yes	good	no			
Canada		keep water clean	don't know	good	no			
Canada		keep water clean	don't know	good	no			
Canada		less pollution	yes	good	yes	bubbles that don't stop	middle, lower	1 time per year
Canada		less pollution	yes	good	yes	oil	middle	less than one
Walpole		less pollution	don't know	good	yes	foamy scum		1-3 times per year
Canada		less sewage	no	good	no			
US		less spills	don't know	fair	yes	oil	lower	1-3 times
US		less spills	yes	good	no			
Canada		less spills	yes	good	no			
Canada		less spills	no	good	no			
Canada		less spills		good	no			
Canada		less spills	yes	good	no			
Canada		more natural structure	yes	good	no			
Canada		more pollution control	yes	good	no			
Canada		more fish	no	fair	no			
Canada		no changes	yes	excellent	no			
Canada		no changes	yes	good	no			
Canada		no changes	yes	excellent	yes	grass and leaves	middle	always
US		no changes	yes	excellent	yes	grass and leaves	middle	always
Canada		no changes	yes	good	no			
Canada		no changes	yes	good	no			

Canada		no changes	no	good	yes	oil	middle	less than one
Canada		no changes	yes	good	no			
Canada		no changes	yes	good	no			
Canada		no changes	yes	good	no			
Canada		sewer discharge	no	poor	yes	brown sewage	upper, middle	
Canada		sewer separation	yes	good	yes	foam, sewage	middle	always
Canada		stop dumping sewage	yes	good	no			
Canada			yes	good	No			
Walpole			don't know	good	no			
Canada			yes	good	yes	dark coloured material, upper river		1-3 times
Canada			yes	good	no			
Canada			yes	fair	no			
Walpole			no	fair	yes	foam & garbage	all areas	greater than 10 times per year
Canada			yes, clear water	good	yes	oil sheen	upper, middle	1-3 times per year
Canada			don't know	good	no			
Canada			don't know		no			
Canada			yes	good	no			
Canada			yes	good	no			
Canada			don't know	good	no			
Canada			yes	good	no			
Canada			yes	good	no			
Canada			yes	good	no			
Walpole	sores on fish	tough laws for discharges	no	degraded	yes	scum, tumours	all areas	always
Canada	sewage		don't know	fair	yes	black river	upper, middle	always

Canada	LGS water temperature		yes	good				
Canada	plant effluent		yes	good	yes	oil	middle	1-3 times per year
Canada		less spills	yes	fair	yes	green slime	upper	always
Canada		less spills	yes	fair	yes		upper	1-3 times
Canada	plants	less spills	yes	good	no			
Canada	plants	more fish	no	good	yes	oil	lower	less than one time
Canada	too many chemicals	tougher regulations		good	yes	Walpole Island dumping old oil into river		
Canada		less spills	yes	good	no			
Canada	plants	keep up the cleaning up of river	yes	good	yes	oil by grain elevators	upper	4-6 times
Canada	plants	less oil spills	yes	good	no			
Canada	water is warm, plants	less oil spills	yes	fair	yes	scum	lower	1-3 times
Canada	plants	less pollution	yes	fair	no			
Canada	plants	less spills, less sewage, more 4 stroke engines to decrease emissions	yes	excellent	no			
Canada	plants	less spills, more regulations	yes	good	no			
Canada	fear of contamination	remove plants	yes	excellent	yes	sewage	upper	1-3 times
Canada	Canada Hydro and Brander Park	high fine to plants that pollute	no	fair	yes	green scum, water breaking on beach	middle	1-3 times
US	don't trust the fish	less sewage, less spills	yes	good	yes	raw sewage in upper, oil in lower	upper, lower	7-10 times
Canada		boat traffic	yes	good	no			
Canada		fewer spills	no		yes	floating material, turbidity	upper, middle, lower	greater than 10 times per year

Canada		more bait fish	yes	good	no			
Canada		no changes						
Canada								
Canada			yes	good	no			
Canada			yes	good	no			
Canada		less industry	yes	fair	yes	foam	middle	1-3 times per year
US			don't know	good	no			
Canada			yes	good	yes	crud	upper	1-3 times
Canada			don't know	fair	no			
Canada		no changes would improve the river	no	poor				

Appendix D – Aamjiwnaang First Nation Survey Results, May 2008

7. Would you say that the aesthetics/appearance of the St. Clair River has improved over the last 10 years?

11 respondents have indicated “no”

1 respondent has indicated yes

1 respondent did not provide an answer

What is this based on?

- I was living in Toronto
- I see what fish people are catching
- The amount of fish has decreased as well as other aquatic wildlife
- I've seen not improvement and spills are still happening
- 10 years ago I could see 10 feet down, 10 year after that's over
- No naturalization of the river has occurred
- Transparency
- Not being able to see to bottom, not clear

8. How would you rate the appearance of St. Clair River water?

Responses ranged from “fair” to “good”

3 respondents have indicated “degraded”

3 respondents have indicated “poor”

3 respondents have indicated “fair”

2 respondents have indicated “good”

1 respondent indicated both “degraded” and “poor”

1 respondent did not provide an answer

9. Have you noticed any objectionable deposits, unnatural colour or turbidity, unnatural odour or unnatural scum/floating material in the last two years?

- 11 respondents indicated “yes”
- 1 respondent indicated “no”
- 2 respondents did not provide an answer

If YES, what was the appearance of this substance?

- not as much natural seaweeds (good) filters
- brownish/white foam along the banks sometimes, oil slick
- foamy, oily sheens
- white foam, shiny oily glaze
- colour of water is not the same as when growing up
- constant odour and unnatural floating material
- I can't see the bottom of 10 feet of water anymore
- odour (oily smell), floating scum was very brown
- oily sheen
- foamy, oily sheens
- foam
- sewer

Where did it occur?

- 3 respondents indicated “upper” only
- 2 respondents indicated “middle” only
- 1 respondent indicated “lower” only
- 3 respondents indicated “upper, middle and lower”
- 2 respondents did not provide an answer

How often does it occur?

- 1 respondent indicated “1-3X/year”
- 2 respondents indicated “4-6X/year”
- 2 respondents indicated “>10X/year”
- 5 respondent indicated “always/constantly”

- 4 respondents do not provide an answer.

Appendix E - Results of Walpole Island First Nation Survey on St. Clair River Aesthetic Quality, 2010

RESULTS OF THE WAPOLE ISLAND FIRST NATION 2010 SURVEY ON AESTHETICS (APPEARANCE) OF THE ST. CLAIR RIVER

A total of 48 responses were received from Walpole Island community members.

1. How would you rate the appearance of the water in the St. Clair River?

8 respondents have indicated "Poor"

21 respondents have indicated "Fair"

18 respondents have indicated "Good"

1 respondent has indicated "Excellent"

2. Have you noticed any of the following in the St. Clair River?

Objectionable Deposits

29 respondents have indicated "Yes"

17 respondents have indicated "No"

2 respondents did not provide an answer

If yes, can you describe its appearance, where you have noticed it, and when?

- light brown, soft
- garbage, metal pieces & shavings, cars, bottles, tarp material, bikes, fishing string, fishing tackle.
- Garbage such as cars, bottles, bikes, fishing string/tackle all around Walpole within the past few years.
- The St. Clair River & Snye River water was nice and clear sky blue in 1977. I notice it was getting more darker from all the pollution.
- I noticed in the summer it was white...and sort of green. It was by the ferry dock on the rocks.

- Garbage in the water.
- Junk, cans, etc.
- Covered in algae
- Garbage floating
- Trash, garbage
- A lot of dead fish on the shore. Seaweed green colour on the edge of the water all summer.
- Lots of garbage floating in river and around on beaches.
- I saw recyclable water bottle, tires, metal pieces from garbage, and plywood.
- Scrap metal at Canatara Park in Sarnia, I believe it was last summer.
- A tire sitting at the bottom of the river, a lot of glass
- Garbage
- I seen a car in the water before and this was about 5 to 6 years ago.
- Sludgie black deposits, willow beach cove, winter to early spring, when boating was minimal.
- Along the river where the ferry line is. It happens around the spring or summer.
- Debris from dumping sewage into the water.
- Big snakes in the St. Clair river.
- Some kind of scum.
- foamy stuff...beer bottles.
- Junk cars, bikes, different metals.
- Mostly garbage
- Parts around Walpole Island it was beer bottles and trash last three years.

2

- Dead fish and garbage sometimes

Unnatural colour or turbidity (clarity)

27 respondents have indicated "Yes"

18 respondents have indicated "No"

3 respondents did not provide an answer

If yes, can you describe its appearance, where you noticed it, and when?

- When clear, can see particles suspended end of Chiefs Road North, Snye River
- Mostly after the ice melts, spring time or after rainfall.
- Certain days its clear, sometimes its dirty. Depends on the time of year.
- Depends on time of season and the weather.
- Foamy look and bubbles along edge- brownish colour
- Weather depending.
- Depends on time of season & weather. It looks foamy & bubbles along edge of shores.
- Milky in the summer
- Snye River sometimes brown. Shallow brown in ditches.
- Snye River
- Sydenham
- Greenish colour on edge of water. Cloudy brown/blue of water.
- Appears more brown – dirty appearance. Can be noticed almost all the time.
See more of oil appearance.
- All of the above in certain areas [brown, clear, cloudy]

3

- Sometimes it looks murky anywhere down the river (Walpole→ all the way to Sarnia).
- Like a murky colour.
- Good in the cold seasons, cloudy in summer.
- I've noticed cloudiness along the shores
- Cloudy from the banks in summer
- Brown and cloudy
- It's been clear and lovely
- Sometimes you'll see dirt trails or smog flowing in the water
- Different times of seasons water changes due to boat traffic. Waves wash stuff into the water.
- Looks a little too neon to be natural
- Big patches of bubbles of pollution
- Wallaceburg
- In the summer, oil on top

Unnatural odour/smell

27 respondents have indicated "Yes"

21 respondents have indicated "No"

If yes, can you describe its appearance, where you noticed it and when?

- gasoline from the boats
- gassy smell near motors or marinas. fishy smell on hot days.
- gas and oil around boats, motors and marinas.

- gasey smell near motors or arenas. heavy fish smell on hot days or dead animal smell.
- Across at gas station, Snye River, spring time
- Gas, oil spills, people throwing cut grass and leaves in the river from people across the Snye. Can't bag up their garbage, it costs them too much to have it taken away.
- Less fishy smelling then it used to be.
- Chemical in summer
- Lots of oil and foam in summer time.
- Just like sewage in the Shimmey [Chematogan Channel]
- Smells like fish sometimes
- Oil from boats last two years
- Summer time, St. Clair
- In the summer time swimming on Lake St. Clair
- Ferry landing – always
- Chemical smell from factories
- Only in summertime
- I was swimming along the shore while it was swimming about two years ago.
- In the summer
- I didn't see anything, but I noticed it around Courtright and Sarnia around last September.
- More fishy smelling

5

Unnatural scum/floating material

38 respondents have indicated "Yes"

10 respondents have indicated "No"

If yes, can you describe its appearance, where you noticed it, and when?

- In front of Walpole
- foam
- foam from time to time
- On top and shore of water
- See more and more sheen
- I saw trash
- It was a brownish foam at Walpole Island, every year for the last 3 years
- Along the shore
- Oily sheen in the summer
- Yellow foam
- Kinda foamy and can't remember when, but I know it was a couple of years back
- foam at water intake, spring – winter
- It's along the wall and sometimes at the beaches and I notice it in the spring time and summer too.
- Foam along marshlands, St. Clair
- Foam along St. Clair shore, pump intake
- Summer time when the ships sail by.
- Foam is usually floating certain times of the year.
- Yes, foam in front of old band office

6

- I don't remember
- The floating foam, trash films above the water
- Foam and garbage
- Bacteria pollution from Sarnia, Windsor and other places.
- Where current swirls around foam appears. St. Clair river in front of old band office. Sewage from mainland houses, dumping into the Snye River.
- Oily top and foam around marinas in Snye
- Foam film – oily looking
- Trash, sewage – I have noticed it in the Snye. People use the rivers as a dumping place.
- Snye River sheens
- Foam mixed in with plants and weeds. Garbage. Oily film.
- Foam along shorelines of W.I. as well as trash. Turns different colour at times, often smells too.
- Foam mixed in with plants and weeds, garbage, oily film
- I see a lot of it whenever I go swimming in the summer [films, sheens, trash, sewage]
- foam in front of willow beach
- trash in the summer time

7

3. Would you say that the appearance of the St. Clair River has changed over the following years?

Over the past 5 years

13 respondents have indicated "Yes"

4 respondents have indicated "No"

8 respondents have indicated "remained the same"

7 respondents have indicated "Don't know"

16 respondents did not provide an answer

Over the past 10 years

14 respondents have indicated "Yes"

3 respondents have indicated "No"

5 respondents have indicated "remained the same"

12 respondents have indicated "Don't know"

14 respondents did not provide an answer

Over the past 20 years

11 respondents have indicated "Yes"

2 respondents have indicated "No"

1 respondents have indicated "remained the same"

17 respondents have indicated "Don't know"

17 respondents did not provide an answer

Over the past 50 years

7 respondents have indicated "Yes"

1 respondents have indicated "No"

No respondents have indicated "remained the same"

8

20 respondents have indicated "Don't know"

20 respondents did not provide an answer

If yes, can you explain the changes in appearance?

- Change in colour – sky blue to a blue/green. Water levels have dropped.
- The change went from nice blue to a more darker blue colour and water level changes. More objects on the bottom.
- Change in colour – turquoise blue to a dull blue/green. Water levels have dropped.
- Pollution
- There is just too much pollution in our waters seems to get worse every year.
- The colour, not as blue
- Lots of phragmites along shoreline.
- As a child we used to drink the water now you see rotting fish floating in the river.
- A lot of stuff comes to this river
- The colour is not pure blue anymore.
- The water is dirty sometimes
- Water levels going down, more algae, more cloudy, more trash in the water.
- The water just lowering.
- More oily texture on tap.
- Sort of murky, I guess.
- Not as clear, taste different
- Too much pollution.

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- The river level will usually drop by each year.
- Water is getting lower in a couple of areas and when I was young I knew there was a lot of water in those areas. And the water use to be really blue now its kinda grayish blue.
- Water level changes more then usual.
- It gets more dirty by year
- I heard stories that it used to be deeper and clearer looking.
- More sheens. Water seemed clearer when I was younger. Used to be able to look underwater when swimming when younger (about 30 years ago).
- Ugly!
- Does not freeze over any more (1980+). Does not freeze 12" thick (late 50's). Started having more particles in it (late 60's).

4. Do you have other comments that you would like to share?

- I noticed this when I moved here 1979 till now. And getting worse to swim or fish every summer.
- Would
- It's hard to pin point when and where everything has been seen or noticed with water but its been like this since I was a kid and has gotten worse.
- It seems it is an endless fight to make people stop polluting.
- Less boat traffic
- I'd like the river to be cleaner
- Would like to know what the floating foam is.

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- We need to stop Sarnia and other places from dumping trash and oil from boats.
- Factories need to be notified of their discharges in river are hurting the water.
- We don't now if U.S. side is doing their share to keep it clean.
- I do believe our waters are polluted and this problem is slowly increasing every year. I believe this pollution is due to the plants up river.
- Less boat traffic in our water.
- Sometimes I see plenty of dead fish floating beside the rocks or the wall at the beaches.
- We have to take charge of our own territory water and lay down laws, our laws to protect it
- I hope from this survey that somebody will decide it is time to clean it out.
- Cleaning of the environment / water is everybody's job. Individual, community, each level of gov't & Industry / Business.

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Appendix F - St. Clair Region Conservation Authority Aesthetic Monitoring Field Sheet, Summer 2010

St. Clair River Water Quality (SCRWQ) Site Notes

General

Name of Sampler Erin Carroll		
Sample Collection Date (dd/mm/yyyy) June 28, 2010	Temperature (°C) 30.3°C	24 hr rain (mm) June 27, 2010 - 2.1mm June 28, 2010 - 0.1mm
Other Comments: June 26, 2010 - 3.5mm		


E. coli Results

Location	Sample ID	#CFU
Bluewater Bridge, upstream of Bridge	BLW-10	4
Guthrie Park, North end near willow	GTH-10	4
Mooretown Boat Launch, between lighthouse and slip	MBL-10	8
Courtright, waterfront park, end of docks downstream of pipe	CWP-10	8
Cathcart Park, clay creek outfall	CAP-10	8
Branton-Cumtuck Branton-Cumtuck Park, downstream of boat launch near embankment	BCP-10	120
Regan Regan Park, North end of dock	RPW-10	230
Marsh Marsh Creek, upstream side of St. Clair Parkway Marshy,	MRC-10	X

1

lab could not do analysis - 748 hrs

Sample Information				
Sample Location Description				
Bluewater Bridge upstream of bridge				
Sample Code	Sample Time (hh:mm)	Water Temperature (C)	Conductivity (uS)	Cloud cover %
BLW-10	12:30	21.4	206	570
Water Observations				
Water Clarity <input checked="" type="checkbox"/> Clear <input type="checkbox"/> Cloudy <input type="checkbox"/> Opaque	Water Colour: <input type="checkbox"/> Clear <input type="checkbox"/> Green <input type="checkbox"/> Grey <input type="checkbox"/> Brown <input type="checkbox"/> Black <input checked="" type="checkbox"/> Blue	Odor: <input checked="" type="checkbox"/> none <input type="checkbox"/> musty <input type="checkbox"/> sewage <input type="checkbox"/> Anaerobic <input type="checkbox"/> fishy	Visible debris (in water): <input type="checkbox"/> none <input type="checkbox"/> oil film <input type="checkbox"/> sewage <input type="checkbox"/> trash <input type="checkbox"/> natural <input checked="" type="checkbox"/> foam-natural <input type="checkbox"/> foam-unnatural	
Notes on water clarity, colour, odor, and visible debris. Evidence of recent spills (manure or chemical)? Small amount of natural foam.				
Substrate Observations				
Organic Matter – Areal Coverage (Use 1: Abundant, 2: Present, 3: Absent)				
Woody Debris	3	Detritus	3	
Notes on substrate:				
Aquatic Macrophytes and Algae (Use: 1 (abundant), 2 (present) 3 (absent))				
Macrophytes		Algae		
Emergent	3	Floating Algae	2	
Rooted Floating	3	Filaments	2	
Submergent	3	Attached Algae	2	
Free Floating	3	Slimes or Crusts	2	
Notes on macrophytes and algae:				

Wildlife Observations (Use: 1 (abundant), 2 (present), 3, (absent)):		
Bird Species		Fish species
Avian Feces	2	Carp family
Gulls	2	Minnow family
Goose	3	Perch and Darter family
Ducks	2	Sunfish and basses family
Comorant	2	Gar family
Other		Other
Type of Use (#)		
Recreational users	1	
Swimming	1	
Boating	3	
Fishing	0	
Other <u>power</u>	20	
Wildlife notes (other evidence of animals, mussels, or other animals)		
Other Comments (e.g., obvious stressors related to land use, fish kill, angler comments?)		
<p>Anglers and snorkelers reported seeing many more lamprey than normal. (They called them eels, mistakenly, but corrected themselves)</p> <p>Also reported on unidentified deep bodied fish being plentiful - freshwater drum?</p>		
		

Appendix G - 2010 and 2012 Aesthetics Monitoring Field Notes and Notable Observations

Blue Water Bridge

The Blue Water Bridge monitoring site in Point Edward was chosen as a reference site for the aesthetics monitoring. The station was located immediately upstream of the bridge where Lake Huron flows into the St. Clair River. The shoreline is armored with large stones to protect it from the erosive forces of waves and the swift current (Figure G-1). It is upstream of the heavily industrialized area known collectively as Sarnia's "Chemical Valley." This site is used extensively for recreational purposes including walking, biking, swimming (over 20 swimmers observe on one day), eating (there are chip wagons in the vicinity of the bridge during the spring and summer) and fishing. On a nice summer day, over 100 people can be observed enjoying the area.

The water was documented as being clear on all sample dates except five during the three years of monitoring. On June 9, 2009, there was no observation regarding clarity and on August 23, 2010 wave action stirred-up sediment in the near shore making it appear brown. On June 9th, 2009 there was no observation regarding clarity. Wave action again stirred up sediment on April 27, May 17 and September 14, 2012. There were no objectionable deposits observed except for some natural foam recorded on monitoring dates in 2010 and 2012. Notable observations at the Blue Water Bridge Station are listed in Table G-1.



Figure G-1: Armored rocks along the shoreline at the Blue Water Bridge monitoring location

Table G-1: Notable aesthetic observations recorded at the Blue Water Bridge station.

Observation	Dates
Natural Foam	August 3 and June 28, 2010; May 17 and August 17, 2012
Fishy Smell	June 14, 2010; July 12, 2012

Guthrie Park

The next downstream site was located just north of Corunna at Guthrie Park. Observations were recorded at the south end of the park. The site is close to Aamjiwnaang First Nation and downstream of industry concentrated between Sarnia and Corunna. The Talfourd Creek outlet is located at the north end of Guthrie Park. Similar to the shoreline at the Blue Water Bridge, the shoreline is armored with large blocks of limestone (Figure G-2). On a typical day (depending on the weather) between 10 and 25 locals eat lunch at the park while watching the river.

Cloudy and opaque water was noted two times in 2009, seven of nine times in 2010 and eight times during the 2012 monitoring period. The photo below provides an example of the cloudy/opaque water observed at this site (Figure G-3). Small amounts of litter associated with fishing activities (i.e., lures, fishing line and bait containers) along with food and drink packaging was found along the shoreline and in the water on a few occasions. Natural foam was observed on two monitoring days during the 2012 program (Table G-2).

**Figure G-2:** Armored rocks along the shoreline at the Guthrie Park monitoring location.

Table G-2: Notable aesthetic observations recorded at the Guthrie Park station.

Observation	Dates
Fishy Smell	June 2, 2012; May 25 and June 15, 2012
Litter	June 2, June 14, June 28, July 12, August 3, 2010
Gasoline Smell	June 14, 2010
Industrial Smell	July 12, 2010; May 17, 2012
Natural Foam	June 8 and August 31, 2012

**Figure G-3:** Typical near shore clarity

Mooretown Boat Launch

Monitoring was conducted at the Mooretown Boat Launch (at the end of White Line), upstream of the lighthouse. The shoreline is a combination of steel retaining walls, large rip-rap and rusting metal debris (Figure G-4). Baby Creek meets the St. Clair River south of the station. People were observed fishing at the site along with a few cars parked for lunch in all monitoring years. Geese (up to 20) and goose feces were also noted on a few occasions. In 2010, the water was recorded as being cloudy/opaque six of nine times while cloudy water was only observed twice in 2012. Natural foam was observed several times during the 2012 monitoring period (Table G-3).

**Figure G-4:** The Mooretown Boat Launch monitoring station.**Table G-3:** Notable aesthetic observations recorded at the Mooretown Boat Launch station.

Observation	Dates
Oil Slick	July 21, 2009
Natural Foam	June 28 and July 19, 2010; April 27, May 10, May 17, May 25, June 8, June 29, August 17, August 31, September 14 and September 26, 2012
Cresol Smell	July 12, 2010


Courtright Park

The next monitoring station was located at Courtright Park. Observations were recorded from the dock that runs parallel to the shore at the end of Milton Street (Figure G-5). There is a culvert/drain pipe that flows intermittently upstream of the station. The shoreline is a mixture of naturalized land including willows and herbaceous garden escapees (e.g., buckthorn (genus *Rhamnus*), burdock (genus *Arctium*), and purple loosestrife (*Lythrum salicaria*)). Old debris including concrete slabs was also present to stabilize the shore. The water was described as cloudy to opaque on six of nine occasions in 2010 and twice in 2012 (Table G-4). Figure G-6 depicts the appearance of the water on a typical day. Litter was observed on a number of occasions, mainly on the banks and dock. In 2012, natural foam was recorded seven times (Table G-4).



Figure G-5: The Courtright Park monitoring station.

Table G-4: Notable aesthetic observations recorded at the Courtright Park station.

Observation	Dates
Cloudy/Opaque Water	
Litter	
Natural Foam	
Freighter Ran Aground – No Spill	

17, August 31, September
Figure G-6: The typical colour and clarity of water along the near shore area of Courtright Park.

Cathcart Park

The fifth monitoring site along the St. Clair River was located at Cathcart Park just north of Sombra. Observations were recorded south of the Clay Creek outlet (Figure G-7). This location was selected due to the reports of degradation due to the sedimentation identified in the 1991 Stage 1 RAP report. The park is located south of a marina. Local anglers reported catching rock bass at the sample station.

Between 2010 and 2012, shoreline restoration occurred at the monitoring location. Failing steel walls were replaced with armour stone to create enhanced aquatic habitat and protect the shoreline from erosion. Natural foam was observed on three days in 2010 and eleven times during the 2012 monitoring season (Table G-5; Figure G-8).



Figure G-7: The Cathcart Park monitoring station.

Table G-5: Notable aesthetic observations recorded at the Cathcart Park station.

Observation	Dates
Natural Foam	June 28, July 5 and August 3, 2010; April 27, May 4, May 17, May 25, June 8, July 12, July 16, August 1, August 17, August 31 and September 14, 2012
Submergent Macrophytes	August 3, 2010; August 1, August 17, August 31, September 14 and September 26, 2012
Green/Brown Water (Clay Creek)	June 14, 2010



Figure G-8: Typical foam observed at the Cathcart Park monitoring station.

Branton-Cundick Park

The next monitoring location was located at Branton-Cundick Park. Branton-Cundick Park is situated at the end of West Wilkesport Line, north of Sombra. Observations were recorded downstream of a local boat launch at an embankment. The shoreline consists of a combination of sand beach and steel retaining wall (Figure G-9). Avian feces (i.e., goose droppings) were noted at every sample point throughout the summer of 2010 and almost every site visit in 2012 (Table G-6). On August 23, 2010 approximately 155 geese were

observed (Figure G-9). It was noted multiple times on field data sheets that goose feces were difficult to avoid. Natural foam was reported in both 2010 and 2012 (Table G-6; Figure G-9).

Table G-6: Notable aesthetic observations recorded at the Branton-Cundick Park station.

Observation	Dates
Abundant Goose Droppings	June 14, August 3, August 17 and August 23, 2010; July 16 and August 17, 2012
Natural Foam	June 14, July 19 and August 3, 2010; April 27, June 8, August 17 and September 26, 2012



Figure G-9: The congregation of Canadian Geese (*Branta canadensis*) observed at Branton-Cundick Park on August 23, 2010 (left) and an example of the natural foam recorded along the on beach (right).

Reagan Park

Reagan Park is the most natural of all the monitoring sites. No obvious shoreline alteration has occurred at this monitoring location and it is one of only two stations that do not have a steel retaining wall or armored shoreline (Figure G-10). Instead, the site is a combination of relatively open sandy beach and dense invasive phragmites (*Phragmites australis*) growth. Locals use the area for lunch, and for viewing the river and shoreline wildlife. Waves stir up the sandy bottom and silty sediment giving the water a brownish-green colour along the shoreline. The site has an excellent diversity of flora and fauna. Native plants include a broad range of emergent aquatic plants such as narrow-leaved cattail (*Typha angustifolia*), arrowhead (genus *Sagittaria*) and large fruited bur weed (*Sparganium eurycarpum*). The greatest diversity of birds was

observed at this location with regular sightings of killdeer (*Charadrius vociferus*), sandpipers (family Scolopacidae), red-winged black-birds (*Agelaius phoeniceus*), common tern (*Sterna hirundo*) and turkey vultures (*Cathartes aura*). Cloudy and/or opaque water was recorded numerous times in both 2010 and 2012 (Table G-7). Common aesthetic observations included litter and natural foam (Table G-7; Figure G-11).

Table G-7: Notable aesthetic observations recorded at the Reagan Park station.

Observation	Dates
Litter	July 19, August 3, August 9 and August 23, 2010
Sheen	August 3, 2010
Natural Foam	June 14, June 28, July 12, July 19 and August 3, 2010; June 8, June 29, July 16, August 17 and September 26, 2012
Opaque/Cloudy Water	June 14, June 28, July 5, July 12



Figure G-10: The Reagan Park monitoring station.



Figure G-11: Litter (top left), natural looking foam (top right), the natural shoreline (bottom left) and garbage (bottom right) observed at the Reagan Park monitoring site.

Marshy Creek

The most southern monitoring site was located at Marshy Creek in Port Lambton. Observations were recorded within the tributary on the upstream side of the St. Clair Parkway (Figure G-12). On many occasions it was noted that the flow direction in Marshy Creek would change as indicated by the orientation of submergent macrophytes and fish along with the direction of floating objects. The flow would often reverse itself while the station was being monitored. As a result, the observations at this station are a reflection of the condition of both tributary and St. Clair River water. Water clarity was reported as cloudy in both 2010 and 2012 (Table G-8). Foam was also observed during these monitoring years (Table G-8; Figure G-13).



Figure G-12: Station MRC-10, Marshy Creek

Table G-8: Notable aesthetic observations recorded at the Marshy Creek station.

Observation	Dates
Cloudy Water	July 5, July 12, July 19, August 3, August 9 and August 17, 2010; April 27, May 10, May 17, May 25, June 8, June 29, July 12, July 16, August 17, August 31 and September 14, 2012
Natural Foam	June 28, July 19 and August 9, 2010; June 8, June 29, July 16, August 17 and September 26, 2012



Figure G-13: White foam observed at Marshy Creek.