

**Assessing the impact of integrated research and monitoring communication tools in remediation efforts at Great Lakes - St. Lawrence River Basin Areas of Concern:
A case study of the Bay of Quinte Remedial Action Plan**

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ABSTRACT

In accordance with the Great Lakes Water Quality Agreement, the governments of Canada and the United States have agreed to support the remediation of 43 Areas of Concern (AOC) where “failure [to meet objectives of the agreement] has caused or is likely to cause impairment of beneficial use or of the area’s ability to support aquatic life.” A Remedial Action Plan (RAP) has been created for each AOC that outlines how impairments are to be addressed. This research report is focused on one such plan, the Bay of Quinte RAP, as a case study to explore the impact of communicating research and monitoring on realizing the aims of the policy. Research included a literature review encompassing existing works about Great Lakes RAPs and the Bay of Quinte watershed, semi-structured interviews with project leaders and community stakeholders and attendance at a research and monitoring forum. Findings indicate that tracking trends, valuing monitoring, promoting stakeholder cooperation, collaborating with other RAPs and informing management and decision making are key outcomes of shared science at the Bay of Quinte. Lessons learned are instructive for any groups conducting ecosystem restoration or management programs, particularly those involved in any of the 40 other RAPs still underway on the Great Lakes.

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INTRODUCTION

It has been 100 years since the governments of Canada and the United States signed the Boundary Waters Treaty, promising that “boundary waters and waters flowing across the boundary shall not be polluted on either side to the injury of health or property on the other.” The International Joint Commission (IJC) was founded as a direct result of the treaty to “prevent and resolve disputes along the boundary”. In 1972 the IJC authored the Great Lakes Water Quality Agreement (GLWQA), which was signed by both nations, to ensure commitment to the protection of the Great Lakes-St. Lawrence River Drainage Basin, which constitutes the majority of boundary waters. The GLWQA was re-drafted in 1978 to reflect a shift in ideology from a rational analytic approach to addressing the watershed to an ecosystem approach (Bulkley *et al.*, 1989; Bertram and Reynoldson, 1992). This is evident in the wording of the agreement, which purports to “restore and maintain the chemical, physical and biological integrity of the Great Lakes Basin Ecosystem” (GLWQA, 1978).

One outcome of the agreement was the identification of 43 highly contaminated sites, termed Areas of Concern (AOCs), where “failure [to meet objectives of the agreement] has caused or is likely to cause impairment of beneficial use or of the area’s ability to support aquatic life” (Figure 1).



Figure 1. The 43 Areas of Concern identified under the Great Lakes Quality Agreement.
Source: Environment Canada <<http://www.ec.gc.ca/raps-pas/96A7D1F1-B8E6-46F2-AD6D-FB640BED970B/aoc-web-e-aug2006.jpg>>

The Beneficial Use Impairments (BUIs) which result in an area being chosen as an AOC are:

- (i) *restrictions on fish and wildlife consumption*
- (ii) *tainting of fish and wildlife flavour*
- (iii) *degradation of fish wildlife populations*
- (iv) *fish tumors or other deformities*
- (v) *bird or animal deformities or reproduction problems*
- (vi) *degradation of benthos*
- (vii) *restrictions on dredging activities*
- (viii) *eutrophication or undesirable algae*
- (ix) *restrictions on drinking water consumption, or taste and odour problems*
- (x) *beach closings*
- (xi) *degradation of aesthetics*
- (xii) *added costs to agriculture or industry*
- (xiii) *degradation of phytoplankton and zooplankton populations*
- (xiv) *loss of fish and wildlife habitat* (GLWQA, 1987)

A protocol was added to the GLWQA in 1987 formalizing the requirement for every AOC to create a Remedial Action Plan (RAP) to address BUIs affecting the area, many of which were already unofficially underway. The RAPs are created and executed by local stakeholders including the public, commercial and industrial interests, academics and multiple levels of government. A RAP is designed to evolve through 3 key stages. First, the degree of damage and source of contaminants responsible for the beneficial use impairments are assessed. The second stage is the declaration of goals and proposed actions to restore ecosystem health. Stage three is the implementation of proposed programs and monitoring their effect on the progress toward stage two targets. Stage three is considered to be complete when targets have been met, at which time the AOC can be “delisted”.

Undertakings as significant and complex as these RAPs rely on multi-stakeholder commitment and perseverance to maintain momentum toward completion. The work to be done is dynamic, interdisciplinary and, at times, visionary in nature and is often achievable only through large scale programs. Such programs are often costly in both time and money and lend themselves to a decentralized yet collaborative approach. It is crucial for stakeholders to be informed of each other’s progress and the accomplishments, challenges and discoveries born of the process. The RAP process has been called an experiment in institutional cooperation and is described as moving toward grassroots ecological democracy (Hartig and Zarull, 1992) and is a celebrated example of using an ecosystem approach to understanding and solving environmental degradation within and across jurisdictional boundaries (Eflin, 2004). Research about RAPs has focused on the influence of an ecological approach on policy development, stakeholder relations and creation and achievement of objectives. It is implicitly understood in these studies that research and monitoring are being conducted and used within the RAP, but few studies (Hall *et*

al., 2006), have explicitly investigated how science is communicated to stakeholders and how it influences RAP progress. In this research report, I use the Bay of Quinte as a case study to assess how research and monitoring are communicated to the agencies and people involved in the RAP and what impact this communication has on RAP progress.

In this report I will describe the methods used to accumulate and analyze data. Then I will provide background on the Bay of Quinte and reasons for its designation as an AOC. The findings are then organized into 3 subsections: research and monitoring programs underway, tools used to communicate research and monitoring and outcomes of research and monitoring. Finally, I discuss lessons learned that are applicable for other ecosystem management programs followed by concluding thoughts.

METHODS

LITERATURE REVIEW

The information in this report was gathered, in part, from a literature review of books, reports and journal articles. The Queen's University library catalogue was queried for books and article databases, such as Scholar's Portal, Web of Science and JSTOR, were queried for journal articles. Search terms included, but were not limited to: "Remedial Action Plans", "Great Lakes Areas of Concern", "Bay of Quinte" and "water policy". Reports were found in the Queen's library government documents archive, the Fisheries and Oceans Canada Great Lakes Laboratory of Fisheries and Aquatic Sciences (GLLFAS) or downloaded from the International Joint Commission website and the Bay of Quinte RAP website.

INTERVIEWS

Permission was granted by the Queen's University General Ethics Review Board (GREB) to conduct interviews with stakeholders in the Bay of Quinte RAP. A letter of information was sent to potential interviewees (Appendix C) and interviews were conducted with stakeholders (over the phone or in person). Potential interviewees were chosen by means of snowball sampling, as defined by Berg (2001); the Bay of Quinte RAP implementation manager was contacted and asked for recommendations for potential interviewees. Interviewees were subsequently asked for their recommendations for further interviewees. Contact was attempted with scientists, regulators, community members and industry representatives; however contact was not successfully made with any of the industry representatives. Ultimately, seven interviews were conducted. Interviewees were provided with the sample questions prior to the interview to familiarize them with the type of information and insights being sought. Parameters of each interview are detailed in Table 1. Code numbers were assigned chronologically, and code letters

S, R and C were assigned to scientists, regulators and community leaders respectively. Interview data was transcribed, in part, using the interview log method, as developed by Merriam (1988).

QUESTIONNAIRE

Interviews were conducted in a semistandardized manner, wherein core questions were asked of

ID #	Interview Type	Record Type	Affiliation of Interviewee
S1	Telephone	Digital	Scientist
R2	Telephone	Digital	Regulator
S3	Telephone	Digital	Scientist
S4	Telephone	Notes	Scientist
C5	Telephone	Digital	Community leader
R6	In person	Digital	Regulator
S7	Telephone	Digital	Scientist

each interviewee and different follow up questions were asked of interviewees based on their responses (Berg, 2001). The core questions were designed to gain an understanding of the interviewee’s background with the RAP; their awareness of science, research and monitoring being conducted at the Bay of Quinte; the way in which data is communicated to or by the interviewee and the interviewee’s impression of the influence and importance of research and monitoring in the RAP (Appendix D). These themes were informed by the literature review and an analogous study, which focused on the role of research and monitoring in the Hamilton Harbour RAP (Hall *et al.*, 2006).

EXPERIENTIAL LEARNING

This study was inspired by two summer work placements; one at an organization affiliated with the Hamilton Harbour RAP and one at an organization affiliated with the Cornwall RAP. In Hamilton I was a community outreach intern, disseminating information about the RAP and its related projects to the public through publications and outreach events. In Cornwall I developed a field campaign for a research project investigating mercury contamination in fish. Through

these work placements I became familiar with two very different aspects of a RAP, public participation and scientific research, and I bring that background to this research.

In addition to my work experience, I became involved with the Bay of Quinte RAP process through the course of this research as a volunteer note-taker and assistant facilitator at the Bay of Quinte Research and Monitoring Forum. The purposes of the forum were:

To provide updates on the status of beneficial use impairments (BUIs) and evaluation criteria (measures). The draft Bay of Quinte Beneficial Use Impairment Status Report Card will be used as a guide for the presentations and breakout sessions.

To provide updates on the status for completion of relevant 2006-2011 workplan deliverables including Stage 2 recommendations.

To bring the various scientists and practitioners together to improve communication and resource sharing for the goal of moving toward a change in AOC status. (BQRAP ICO, 2009)

The forum consisted of scientific and policy presentations given over 2 days followed by facilitated breakout sessions. See Appendix A for a list of presentations. The purposes of the facilitated breakout sessions were:

To determine the status of BUIs and prepare the basis/rationale for that decision.

To Identify what information is required to complete a BUI status assessment leading to delisting:

- *who can do the work (i.e. workgroups),*
- *when can the data collection be undertaken,*
- *when will the report be prepared, etc.*

To form the basis of a work plan for the next three years.

To identify limitations and opportunities (i.e. partnerships) to complete work. (This could involve the assessment of the current suite of criteria for a particular BUI.)

To provide an update on the status of achieving deliverables identified in the 2006-2011 workplan.

To provide an update on the status of achieving Stage 2 Recommendations. (BQRAP ICO, 2009)

Four separate breakout sessions were held addressing different themes: eutrophication and lower food web; chemical contaminants; biological contaminants and protection, planning and management; fish and wildlife populations, communities and habitats and monitoring, modelling and data management. Participants in the forum were assigned to groups by the relevance of their background or were allowed to choose the group to which they most wanted to contribute. Questions addressed by the groups are attached as Appendix B. I was the note taker and assistant facilitator in the biological contaminants and protection, planning and management session.

BACKGROUND

GEOGRAPHY OF THE BAY OF QUINTE

The Bay of Quinte is Z-shaped and runs approximately 100-kilometres in length, almost entirely separating Prince Edward County from the rest of Ontario. A small canal, the Murray Canal, completes the separation, connecting the west end of the Bay of Quinte with Lake Ontario. The watershed which drains into the bay is one of the largest in southern Ontario, almost 18 000 square kilometres, reaching east to Frontenac County, west to Durham County and north to Haliburton Country and Algonquin Park (Figure 2). Four major tributaries drain into the bay: the Trent, Moira, Salmon and Napanee rivers. The watershed extends through several landscapes and landforms including the Canadian Shield, the Oak Ridges and Drummer Moraines, the Peterborough Drumlin Field and the Napanee Plain (BQRAP CC, 1993). Settlement in the watershed is mostly rural with urban centres clustered along the rivers or by the bay itself. Belleville, Quinte West, and Napanee are the largest urban centres on the shore of the bay with populations of 49000, 42 000 and 15 000 respectively. Peterborough is the largest city in the watershed with a population of 75 000 (Figure 2).

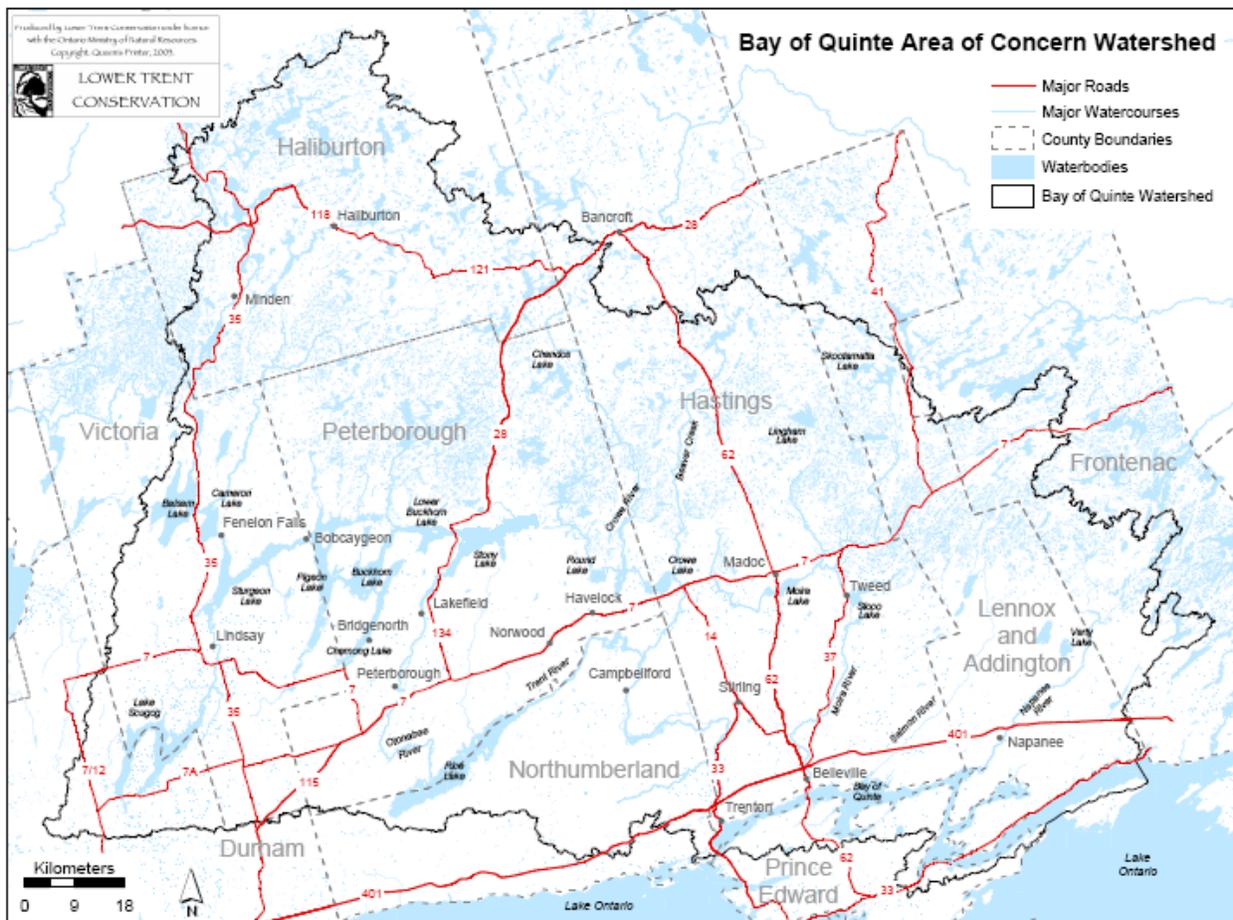


Figure 2. Map of the Bay of Quinte watershed showing major roadways, major settlements, county boundaries and extent of the drainage basin.

Source: Bay of Quinte RAP Website <<http://www.bqrap.ca/downloads/AOC%20map.pdf>>

HISTORY OF THE BAY OF QUINTE

United Empire Loyalists arrived in the area in the late 1700s and began land clearing and logging which led to erosion and increased nutrient input into the bay. The Trent Canal was built for energy production and navigation in 1830. Most of the watershed was deforested and converted to agricultural production by the end of the 1800s. The Bay of Quinte was also used as a commercial fishery since the early 1900s. Land use practices intensified through the next century as population increased and urban centres developed, bringing industry with them. By the time the RAP was underway there were three paper mills, one wood preserving operation, one chemical plant and a distillery established within 10km of the Bay of Quinte. Today the bay

is still used for drinking water, waste water disposal (both municipal and industrial), sport fishing and limited commercial fishing (BQRAP CC, 1993).

SELECTION AS AN AREA OF CONCERN

The Bay of Quinte was identified as a “problem area” by the IJC in 1975; this designation was a forerunner to the AOC designation introduced in 1987. Ten of the 14 BUIs outlined in the GLWQA were observed at the Bay of Quinte (Table 2) (BQRAP CC, 1990). The Bay of Quinte Remedial Action Plan Coordinating Committee (BQRAP CC) attributes each BUI to habitat destruction and ecosystem instability, eutrophication, bacteriologic contamination and/or toxic contamination (Table 2) (BQRAP CC, 1993).

Table 2. Summary of Beneficial Use Impairments and their sources at the Bay of Quinte as observed in 1987. Adapted from the Bay of Quinte Remedial Action Plan Stage 1 and 2 Reports (BQRAP CC, 1990; BQRAP CC, 1993).

Beneficial Use Impairment	Significance to Bay of Quinte	Bay of Quinte Ecosystem Problem			
		Habitat Destruction & Ecosystem Instability	Eutrophication	Bacteriological Contaminants	Persistent Toxic Contaminants
1. Restriction on fish and wildlife consumption	Fish consumption of some large size classes of certain species of fish restricted.				!
3. Degradation of fish and wildlife populations	Fish populations are not diverse; a collapse of one or more species could translate into lost angling opportunities and an imbalanced ecosystem	!	!		
6. Degradation of benthos	Based on scientific evidence, the Bay of Quinte benthic communities are degraded.	!	!		
7. Eutrophication or undesirable algae	Bay eutrophic and highly productive; nuisance algae blooms have been reported. Algal growth has limited submergent macrophyte growth and may impair swimming, boating, aesthetics and ecosystem diversification.	!	!		
8. Restrictions on drinking water consumption, or taste and odour problems	Taste and odour problems reported. The problem is caused by excessive algal growth, and is compounded by the degree of chemical treatment.		!		

9. Restrictions on dredging activities	Dredging of Bay sediments is restricted because some heavy metal levels exceed dredge spoil guidelines.				!
10. Beach closings	Beaches throughout the Bay of Quinte periodically are closed because fecal coliform counts exceed 100 in 100 mL of water. Recreational opportunities are lost, health risks are increased and tourism revenue is forfeited.			!	
11. Degradation of aesthetics	Degraded aesthetics have been reported (eg. algal blooms).	!	!		
13. Degradation of phytoplankton and zooplankton populations	The phytoplankton community is dominated by the diatoms <i>Melosira</i> and <i>Stephanodiscus</i> , and nitrogen fixing blue-green algae. Desired zooplankton species are suppressed by food chain impacts.	!	!		
14. Loss of fish and wildlife habitat	An estimated 12 000 hectares of wetland has been converted to other uses. Historical modification of the shoreline can be attributed to the degree of eutrophication. Man's activities include growth pressure, no available management policy, no concept or process of ecosystem management and/or changes in water levels.	!	!		

CREATION OF THE BAY OF QUINTE REMEDIAL ACTION PLAN (RAP)

The RAP officially began in 1986, though a monitoring program and phosphorus abatement campaign were already underway. A series of 16 technical reports and a discussion paper were issued throughout the rest of the decade, followed by the Stage 1 Report completed in 1990 by the Bay of Quinte RAP Coordinating Committee with the help and advice of Bay of Quinte RAP Public Advisory Committee (PAC). The Bay of Quinte RAP Coordinating Committee had representatives from Environment Ontario (MOE), Fisheries and Oceans Canada (DFO), Ministry of Natural Resources (MNR), Environment Canada (EC) and the Ministry of Agriculture and Food; The PAC has representatives from Hastings and Prince Edward Counties Health Unit, Domtar Packaging, Trent Valley Paperboard, Bakelite Thermoset, Ault Foods, Sidney Township, City of Belleville, Town of Picton, Town of Napanee, Belleville and District Fish and Game Club and the Mowhawk Bay Trailer Park. The coordinating committee has since evolved to become the Bay of Quinte Restoration Council (BQRC), comprised of mostly the same representation.

The technical reports focused on assessing the state of the environment and potential contaminant sources and will be discussed further as part of the results. The Stage 1 Report was entitled “Environmental Setting and Problem Definition” and provided a thorough inventory of all that was known about the physical nature of the Bay of Quinte.

The discussion paper was entitled “A Time to Decide”, co-authored by the coordinating committee and the PAC. “A Time to Decide” coupled summaries of what was known about nutrient enrichment, bacteriological and toxic contamination and habitat destruction with

proposed goals and actions. The Stage 1 Report and the discussion paper provided the groundwork for the Stage 2 Report entitled “Time to Act”.

The purpose of the Stage 2 Report, issued in 1993, was to delegate tasks to appropriate stakeholders to bring about the desired improvements in the bay. The strategy for implementation begins with this statement:

“The Bay of Quinte Remedial Action Plan is forwarded jointly by the Quinte RAP Coordinating Committee and the Public Advisory Committee as a comprehensive plan to restore and maintain the Bay of Quinte ecosystem. It is founded on sound scientific evidence, supported by several years of intensive public consensus building that leaves no doubt about the desire of Quinte area residents to cooperatively restore this immensely valuable resource.” (BQRAP CC, 1993)

The report outlines 80 recommended actions. Each is accompanied by a proposed schedule (either Immediate – 0 to 3 years, Short term – 0 to 5 years, Medium term – 0 to 10 years or Long term – 0 to 15 years), a proposed implementer, proposed partners and an estimated total cost.

Since 1993 a workplan and an updated workplan have been issued (Murray German Consulting, 2006) that follow a similar format to the recommendations section of the Stage 2 Report. The RAP implementation coordinating office is the focal point for RAP stakeholders involved in executing the workplan. There are 5 thematic implementation working groups that meet on an ad-hoc basis to advise the coordinating office. A representative from the office sits in on BQRC meetings, which are held to keep implementation activities on track (Figure 3).

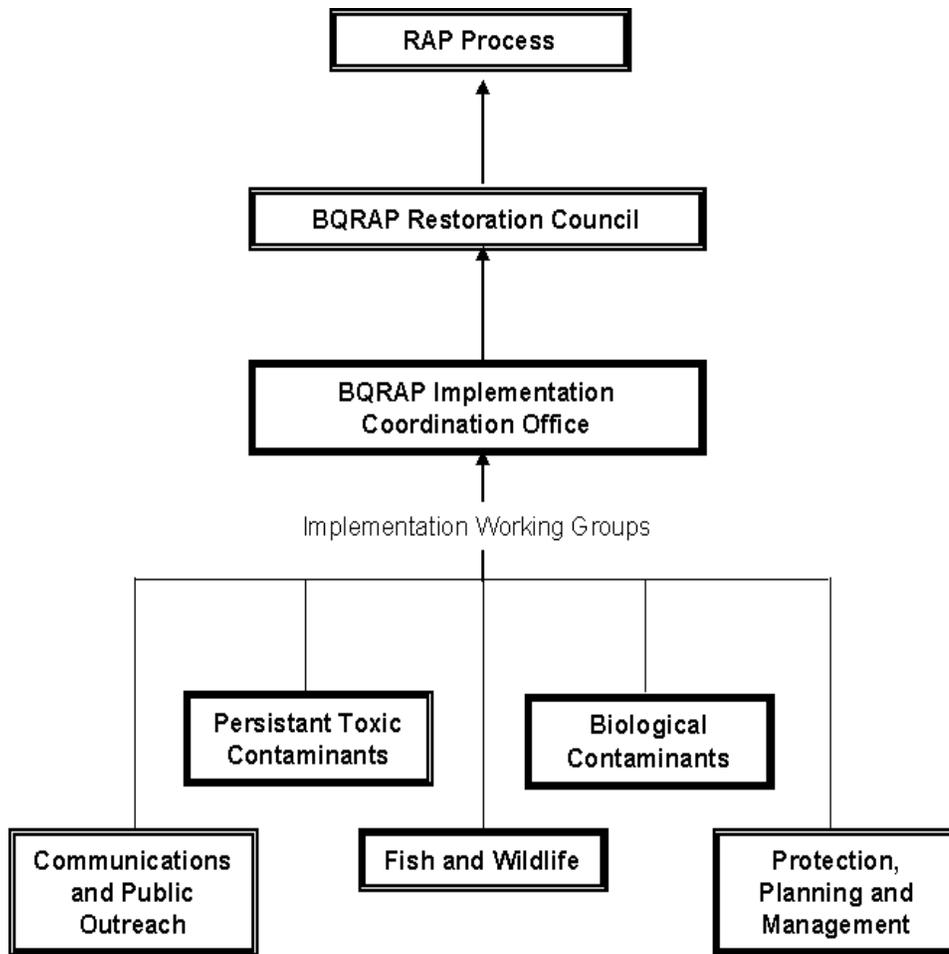


Figure 3. BQRAP implementation management structure. Updated from 1993 model (BQRAP CC, 1993)

RESULTS: REMEDIAL ACTION ON THE BAY OF QUINTE

RESEARCH AND MONITORING

“We are pretty lucky with the Bay of Quinte because we do have a lot of research.” (R2)

The Bay of Quinte has been a focal point for research and monitoring since 1972 when Project Quinte, a monitoring program, began. Since the creation of the RAP, research questions have evolved to reflect policy goals (R2, S3, C5, S7). Research and monitoring objectives are also guided by new issues as they arise, such as invasive species and climate change (R2, R6), and the interests and expertise of the researchers involved (S7). The emphasis on the ecosystem approach invoked by the RAP program has also guided the nature of research and collaborations (S3, R6, S7).

“Topics of study have changed quite profoundly. At the beginning it was all about eutrophication. Gradually it became apparently invasive species were having dramatic effects so the focus shifted a little. Now in recent years there is increased attention to the whole ecosystem.” (S7)

The Project Quinte sampling program is at the centre of monitoring reports and the majority of the research, but numerous other programs have been conducted on the bay throughout the course of the RAP.

Project Quinte

Project Quinte was developed in response to a recommendation from the IJC for “further reduction, as a matter of urgency, of the remaining phosphorus in municipal and industrial waste effluent discharging to Lake Erie, Lake Ontario and their tributaries and to the International Section of the St. Lawrence River, with a view to achieving at least 80 percent reduction by 1975 and thereafter additional reduction to the maximum extent possible by economically feasible processes” (IJC, 1970). The Bay of Quinte was chosen by limnologists and fisheries scientists

from MNR, MOE, EC, University of Guelph and Queen's University for a multi-year study of ecosystem response to phosphorus reduction programs (Johnson and Hurley, 1986). Temperature profile, Secchi depth, and light extinction are all measured and integrated water samples, zooplankton, rotifers and sediment have been sampled biweekly from 1972 to the present (S7). Bay of Quinte was considered an ideal site for such an experimental management scheme because it closely resembled conditions in Lake Erie at the time and because there was significant background fisheries data (Johnson and Hurley, 1986). Currently, Project Quinte is managed by GLLFAS at DFO, with financial assistance and technical sponsorship for investigations and research provided by DFO, EC, MOE, and MNR (PQ, 2008).

Project Quinte provides an extremely valuable data set which is analysed to answer a plethora of research questions as well as providing a basic monitoring temporal and spatial profile. Currently, data are used by the researchers at GLLFAS to create ecosystem models, conduct fish habitat classification and mapping, fish population monitoring, macrophyte assessment, invasive species studies and benthos studies which constitutes the majority of research that is used by the RAP decision makers (S3). The Project Quinte scientists have also partnered with other researchers from universities and government agencies to create models and conduct hypothesis-based research.

Other Major Programs and Studies

The other major research and monitoring studies currently underway at the Bay of Quinte are listed in Table 3.

Table 3. Major research and monitoring studies currently being conducted on the Bay of Quinte.

Name of Program	Agency or Researcher	Notes
Coastal Wetlands Monitoring Program	Quinte Conservation Authority	
Sport Fish Contaminant Program	MOE	
Fish Trap Netting	MNR	
Beach Monitoring	Hastings and Prince Edward County Health Units	
Trent River Mouth Investigation Study	Environment Canada	
BEAST: Benthic Assesment of Sediments	Environment Canada	
Contaminants Modelling	Laboratory of Miriam Diamond, U of T	See Diamond <i>et al.</i> , 1996. 2007 model as yet unpublished.
Community Wildlife Monitoring	Quinte Conservation	

REPORTING AND COMMUNICATION OF RESEARCH AND MONITORING

The way in which RAP scientists, regulators, industry and public stakeholders stay up to date on research and monitoring at the Bay of Quinte has varied over the course of the RAP. Listed and described below are the most commonly used communication tools today.

Research and Monitoring Forums

Research and Monitoring Forums have been held on and off bearing different names throughout the course of the RAP (S1, R2, S3, S7). The Research and Monitoring Forum held this year was the first gathering of scientists of its size since 2004 (S3), drawing over 60 scientists and managers. This type of face-to-face communication is an extremely important way to communicate findings. Personal contact with other researchers is central to the research process of many scientists (S1). Regular gatherings are critical to maintaining contact, the importance of which is expressed by S7; “there is a lot of merit in maintaining contacts, particularly between the management groups and research groups.” The Forum this year was specifically geared

toward soliciting informed opinions and advice from scientists regarding upcoming management decisions. Many participating indicated the Forum was valuable because the focus was on decision making (S3, S4, R6). Where research and monitoring is conducted by multiple groups there is bound to be significant staff turnover from year to year, the forum is a way to ensure new staff learn and become engaged (C5). As the Bay of Quinte RAP moves toward its next stage managers are planning to hold a Research and Monitoring Forum every year, which is seen as a key requirement to stay on course for de-listing (C5, R6, S7).

Presentations at Bay of Quinte Restoration Council Meetings

In the interval between Research and Monitoring Forums researchers have been invited to BQRC meetings to present findings. This is often the case when research has been conducted on a contract issued by the council (R2, R6). Members of the council then share the material that was presented with other members of the organizations they represent (C5).

Public Information Sessions

Public information sessions have been held alongside Research and Monitoring Forums in the past (R2, S3), and they are planned for the short and long term (R6).

“Ultimately we have to show it to the public and say ‘here’s what we are using to measure and on our most recent attempt here is what we found’ or ‘here is what we have to do to tell you more.’” – R6

The last public forum to present research and monitoring related material was about 3 years ago (R6), but Quinte Watershed Clean-up, a community group that fulfils the public advisory role of the RAP, holds public meetings approximately once a year (C5). Meetings are not always focused specifically on the RAP or directly related programs, but encompass positive action for environmental stewardship around the bay area. There is some concern that these meetings are not well attended (C5).

As an effort to overcome the challenge of getting the public engaged, Quinte Watershed Clean-up intends to pair up with the BQRAP Implementation Coordination Office to make short presentations to community groups, such as the Rotary association, as well as the planned public information sessions (C5).

Project Quinte Annual Reports

The primary scientific document consulted by the BQRAP Implementation Office and Restoration Council is the Project Quinte Annual Report (R6), which compiles all monitoring data collected at the Bay of Quinte in a given year and any new studies or models based on Project Quinte data (S3; PQ, 2008). These reports are tailored specifically to RAP needs. They begin with this editor's note: "this report does not constitute publication. Many of the results are preliminary findings. The information has been provided to assist and guide the BQRAP. ... Individual authors should be contacted prior to any other proposed application of the data herein" (PQ, 2008).

Technical Reports

Though not issued anymore, a series of technical reports published by the BQRAP Coordinating Committee in the early years of the RAP remain important reference material. These technical reports provide a thematic overview of the scientific findings that were the basis on which the Stage 1 and 2 Reports were created (Table 4).

Table 4. Titles of Technical Reports issued from the Bay of Quinte RAP.

Date	Title
Jan. 1988	Technical Report No. 1 – An Evaluation of Persistent Toxic Contaminants in Bay of Quinte Ecosystem
Mar. 1988	Technical Report No. 2 – An Evaluation of Point Source Discharges to the Bay of Quinte Ecosystem
Nov. 1987	Technical Report No. 3 – The Feasibility of Increasing the Hydrologic Flushing Rate of the Upper Bay of Quinte
Sep. 1988	Technical Report No. 4 – Analyses of Agricultural Diffuse Source Loadings to the Bay of Quinte
Jan. 1989	Technical Report No. 5 – 1987 Bacteriological Water Quality at Trenton, Deseronto and Picton – Bay of Quinte
Nov. 1989	Technical Report No. 6 – Bay of Quinte Ecosystem Based Analyses of Remedial Options
Jun. 1989	Technical Report No. 7 – Feasibility of Decreasing Bay of Quinte Sediment Nutrient Flux
Dec. 1989	Technical Report No. 8 – Evaluation of Landfill Sites and Potential Sources of Toxic Inputs to Bay of Quinte
Dec. 1989	Technical Report No. 9 – Distribution, Species Composition and Biomass of Macrophytes in the Bay of Quinte – A comparison of Methodologies
Sep. 1993	Technical Report No. 10 – Feasibility of Re-establishing Macrophytes in the Bay of Quinte
Dec. 1990	Technical Report No. 11 – Socio-economic Assessment of Proposed Remedial Measures
Sep. 1990	Technical Report No. 12 – 1988 Toxic Contaminants Survey
Mar. 1991	Technical Report No. 13 – A Mass Balance Model of the Fate of Toxic Substances in the Bay of Quinte
Mar. 1992	Technical Report No. 14 – A Geographic Information System Based Model of Aquatic Vegetation and Piscivore Habitat in the Bay of Quinte
Sep. 1992	Technical Report No. 15 – Modelling the Fate of Toxic Substances in the Bay of Quinte
Nov. 1992	Technical Report No. 16 – Effects of Zebra Mussels, <i>Dreissena polymorpha</i> , on Summer Phosphorus and Algae Biomass of the Upper Bay of Quinte: Implications for Remedial Scenarios

Guide To Eating Ontario Sport Fish

Though not specifically focused on the Bay of Quinte the Guide to Eating Ontario Sport Fish, published by MOE presents the findings of the Sport Fish Contaminant Monitoring Program. Two of the sampling areas designated by the monitoring program together make up almost the full extent of the Bay of Quinte. This guide is used by RAP managers as a reference to track trends in fish contamination (R6).

Publications in Academic Literature

Researchers on the Bay of Quinte regularly publish their work in academic journals (S1, S7).

The journals that most regularly feature work that comes from the Bay of Quinte are: the *Canadian Journal for Fish and Aquatic Sciences* and the *Journal for Great Lakes Research*.

The Big Clean Up Annual Progress Report, Community Newsletters and Bulletins

The Bay of Quinte RAP Implementation Coordination Office publishes an Annual Progress Report, intended for all audiences, that provides a summary of the year's highlights in research and monitoring as well as in implementation programs. Since 2006, the Annual Report has also included a list of all scientific products created that year along with their authors.

The Implementation Office also publishes 2 newsletters a year, and monthly news bulletins geared specifically to the community to draw attention to interesting findings, program success stories and milestones achieved. The bulletins have helped draw attention to RAP related research and have generated local newspaper articles on numerous occasions (S4, R6)

Big Clean Up Website

The Bay of Quinte RAP website has been identified as a communication tool that is not, at the moment, reaching its fullest potential (S6). Currently progress reports, newsletters, bulletins, some presentations and a collection of some major reports (such as the Stage 2 report) are available on the website. In the future it is hoped that the website will catalogue all research and monitoring publications that are available about the Bay of Quinte (S6).

OUTCOMES OF SHARED RESEARCH AND MONITORING

The sharing of scientific findings through meetings and publications has benefited RAP implementation in many ways. Key outcomes have been tracking trends, valuing monitoring, promoting stakeholder cooperation, collaborating with other RAPs and informing management and decision making. Despite differences in research and monitoring programs and the tools used to communicate them, these outcomes are similar to those observed at Hamilton Harbour where adaptive management and trend tracking were also identified as valuable consequences of shared science (Hall et al., 2006).

Tracking Trends

Tracking of trends is the purpose of most monitoring programs at the outset, and Project Quinte is not an exception. In the beginning Project Quinte was developed to track changes in physical and chemical traits of water in the bay in response to phosphorus abatement programs. Not only was the benefit of reducing nutrients shown, but the same data set has subsequently been used to evaluate the impact of aquatic invasive species and climate change (S7; Crowder *et al.*, 1991; Nicholls, 1999).

Valuing Monitoring

The value of the long term data set does not end at observing cause and effect relationships. Another major use of the Project Quinte data set has been to create ecosystem models that predict how the system will respond to a given stressor or multiple stressors (Minns, 1986; Diamond *et al.*, 1996). Quinte stands out among the RAPs when it comes to these models (S3).

“Project Quinte has grown to be much more than a system to track trends. The more you do this kind of study the more it builds on itself. Project Quinte has built on itself and has led to these modelling projects, but it also makes you look to the future and realize the value of this kind

of program. One of the outcomes [of the monitoring program] is the recognition of the value, to me that is a valuable outcome in and of itself.” – S3

S7 also emphasizes that the value of the data set extends beyond what its original purpose may have been; “it is surprising how a good core programs with relatively simple variables is so surprising agile when it comes to addressing a range of issues.” Much of the value of the Project Quinte data set comes from the fact that data collection protocols have changed little, providing consistency that is rare (S3, R6, S7).

Promoting Stakeholder Co-operation

Research and monitoring promote healthy stakeholder relationships by providing everyone with a common knowledge base on which to identify and implement their priorities (R2, C5, S7).

“Research and monitoring programs are having a huge impact on the RAP. That is the backbone of it. It is the only way you have to ‘objectively’ inform people of where things are at and where things are going. How things are working and how things aren’t. So it’s a critical piece.” – R6

Having a common knowledge base proved beneficial in the beginning of the RAP when stakeholders were coming together to identify priorities. The scientific community came to the table with the understanding that eutrophication was the biggest factor causing beneficial use impairments. Community stakeholders, on the other hand, were keen on addressing toxic contaminant issues. Scientific models were able to show the relative impacts of eutrophication and toxic contaminants on beneficial use impairments, which helped to unify the priorities of the whole group (S7). Research and monitoring continue to play a key role in promoting mutual understanding among stakeholders. R2 suggests the science has helped community members understand the importance of whole ecosystem integrity, over an individual objective.

“We have different people thinking different things; people who are only interested in fishing probably want more walleye populations and people who are interested in seeing the Bay of Quinte crystal clear with no algae probably don’t care about the fish. So it’s the science research conclusions that we have to use to convince all the users that the right combination of everything is the best thing for the Bay of Quinte.” - R2

The science has been impactful in engaging industrial stakeholders, as well. Relationships between environmental groups and industry can be fraught at times, but a scientist at the Bay of Quinte found that if you have good sound science, it is readily accepted by industry and creates an opportunity for dialogue (S4). Proper communication of research and monitoring can also avoid redundancies and promote synergistic relationships between different scientists by drawing attention to opportunities for collaboration between programs with similar goals (S3, R6).

Collaborating with other RAPs

Research and monitoring can promote cooperation and collaboration between stakeholders at different RAPs as well as those within a given RAP. Project Quinte scientists have had opportunities to compare data and share models and techniques with RAPs across the Great Lakes.

“It’s always been a really collaborative effort. We have had a good group of people involved in the bay particularly over a long period of time and there were also collaboration and interactions with scientists who were focused on different areas. There is always a lot of cross connection. Because of the Great Lakes community there was always a lot of collaboration with scientists on the US side as well.” – S7

Project Quinte has compared notes with monitoring programs at Green Bay in Lake Michigan, which has similar features (Millard and Sager, 1994). This type of comparison allows scientists to interpret what may or may not be unique to their system (S7). On another occasion, ecosystem modelling was done in collaboration with scientists from Oneida Lake in New York

because they had similar goals in mind. The two RAPs were able to acquire joint funding from the Great Lakes Fisheries Commission to develop these models (S7; Koops et al., 2006).

In addition to specific collaborations S7 believes that “the Quinte group, largely through its research, has had a lot of influence on other RAP areas... and also on how the lakes themselves are studied, Lake Erie and Lake Ontario particularly” in that “Bay of Quinte people [those involved with the RAP process] have contributed quite a lot to providing better definitions of how to measure the impairments through analytical techniques and analysis.”

Leading by example is not limited to science alone. Communication of science at the Bay of Quinte has benefited directly from observing techniques at other RAPs. The recent reinstatement of the Research and Monitoring Forum was prompted by appreciation for the value of the forums held at the Hamilton Harbour RAP (R6).

Adaptive Management

“If you are going to take an ecosystem approach you have to have research and monitoring. It is the underpinning. The knowledge in the underpinning to managing ecosystems... Without it you are managing in a vacuum.” – S3

The definition of adaptive management used by Hall *et al.* (2006) says it is “a systematic process for continually improving management policies and practices by learning from the outcomes of operational programs”. Research and monitoring are the keys to establishing what the outcomes of operational programs are and whether they are reaching their targets (C5). It is central to determining priorities for action (S1).

Research and monitoring are used to define targets and determine whether targets are reasonable. At the Bay of Quinte once the RAP got underway managers were confronted with the problem

that many of the targets were based on public perception and had no mechanism to measure them (R2, S3). Phosphorus management and fish habitat management are two topics within the Bay of Quinte RAP that have been defined through the research and monitoring as it became available. Monitoring and models continue to be instrumental in providing quantitative tools for managers to assess progress (S3). Progress toward de-listing the bay is dependent on managers' ability to evaluate the success of existing programs, identify needs for new programs and assess the validity and feasibility of targets (R2, R6).

Informing Decision Making

As managers approach their de-listing target of 2011, interpreting information based on adaptive management to determine definitive success in terms of delisting is required. R6 describes this juxtaposition:

“The criteria are put forward by experts and approved by council; they are moving targets. They move with the science, but at some point you have to draw a line in the sand and say ‘Ya, we’ve got it we’re happy.’”
– R6

Just as research and monitoring facilitate adaptive management, they are central to constructing a case for delisting. “Research and monitoring leads the way to delisting decisions. You cannot delist something without scientific knowledge about the status of the beneficial use” (S3, R2). Science based decision making is widely thought to be among the most important outcomes of research and monitoring programs within the RAP structure (R2, S3, S4, C5, S7).

LESSONS LEARNED FOR OTHER RAPs

There are valuable lessons in multi-stakeholder ecosystem management to be learned from the research and monitoring conducted at the Bay of Quinte and its role in forwarding the aims of the Quinte RAP. Administrative support, institutional memory, integration of models, consistent long term monitoring, eternal vigilance and public engagement stand out as important steps in creating a strong management program.

Administrative Support and Institutional Memory

The importance of having a central coordinating body was identified as critical (S1, R2, C5, R6, S7), and was also identified as an important lesson learned in the Hamilton RAP (Hall *et al.*). A full-time staff, dedicated to the coordination of the RAP, is the glue that keeps stakeholders together; without it there is no sense of common enterprise (S1). Many RAP participants do so on a voluntary basis (R6), or as one of many duties related to their work (S7) and often do not have the time to dedicate to the effort beyond the scope of their specific commitment. A centralized administrative office becomes accountable for maintaining contact with and between stakeholders and ensures events, such as scientific forums and public meetings, are put on and that discussions are followed up with actions (R2, C5). This role is critical for maintaining energy and momentum in projects of such long duration (S1).

Arguably the most important role of coordinator is collecting and compiling data to create institutional memory (S1, S3). Because the RAPs are continual and on-going, having been underway for decades already, the group of people involved is always changing. Staff turns over within organizations and the relationships between stakeholders change. Individual organization's data storage methods also change and there is a danger that knowledge will be lost

within this change environment (S3). Administrative staff must make a concentrated effort to create and maintain a basic catalogue of knowledge that will last longer than any one person or organization's involvement. Without a repository of information the efficiency of the whole process is bound to suffer (S3). The IJC identifies information transfer as a key contributor to success for any RAP (IJC, 1998).

Incorporate Models into Management

While ecosystem model development shines as one of the exemplary features of the Bay of Quinte RAP (S3), the full potential of model application is yet to be explored (S1, S3, S7).

“They should be making much more extensive use of modelling for exploring policy options than they are today. There’s a whole genre of approaches that are built around models and policy development. Even though we use models quite extensively in the Quinte RAP we did not establish a culture of an ongoing use of models as a primary tool for assessing problems and evaluating options.” – S7

The biggest barrier to the use of ecosystem models was not disagreement as to the validity of a given model, but rather insufficient transfer of knowledge. S3 proposes that “part of a problem is there is a bit of a disconnect between science and management. So scientists create tools like [a phosphorus model] and managers don’t know how to use them”. Models can and should be an integral part of decision making and sufficient resources should be allocated to the training of managers to use the models to allow them to reach their full potential as an instrument (Minns, 1992).

Maintain Consistent Monitoring and Eternal Vigilance

“Quinte is an area that’s had very long investment now: 1972 to the present day; it is one of the few areas in the world that has been monitored that long. It becomes important to continue monitoring regardless what the immediate management issues are.” – S7

As discussed in the outcomes of shared research and monitoring section, the Project Quinte work has really highlighted the value of ongoing monitoring. S7 warns that “they tend to be seen as peripheral and when budgets get tight, they get cut. Once monitoring programs get cut they tend to be hard to re-established or rebuild. People are always complaining when we have new problems that we don’t have data, but it’s usually because we haven’t maintained good basic monitoring programs.” The value of monitoring may not be readily apparent or applicable at all times, but that is inherent to the nature of monitoring and does not negate its importance (S7).

In anticipation for delisting as an AOC and the end of the RAP, those involved in the Bay of Quinte are laying the groundwork for monitoring beyond the RAP (R2, S3) which is referred to by many as “eternal vigilance” (S3, S7).

“We have to keep monitoring and we have to keep doing research to make sure that it stays this way. Otherwise we end up with it back on the list 20 years from now because people forget why we were here in the first place” – R2

Engage the public

Ongoing attention to the science and monitoring must be coupled with ongoing support from the public for implementation programs to be successful. The energy of an engaged public body can be harnessed to lobby politicians to direct funding to a project (S1). Enthusiastic members of the community are often willing and able to dedicate their time and energy to implementation programs voluntarily, which is not only immediately beneficial to the project at hand but also inspires community members to take ownership of, in the case of Quinte, the water body and act as stewards and ambassadors for its welfare (R6). At the Bay of Quinte RAP, encouraging rural residents to care for the watershed by making changes to farm practices has been very successful in reducing nutrient loadings from farm run-off (R6). The program was implemented by making

door-to-door contact with landowners and providing information about steps that could be taken to make their farm more watershed-friendly and what grants are available for making the changes.

In order to engage the public, the community needs to understand how both problems and solutions can relate to them. Having a personal connection with programming is a key motivator for people to get involved (C5). Positive feedback must also be provided, often in the form of “good news stories,” to confirm for the community that their efforts are worthwhile and are making a positive impact (C5, R2). Public involvement was found to be a keystone of success during the RAP process (Hartig and Zarull, 1992; Gurtner-Zimmerman, 1995; IJC, 1998; Krantzberg, 2003; Hall et al., 2006) and in sustaining ecological gains after delisting (Krantzberg, 2005). In fact the wider the scope of stakeholder representation the more strong the RAP is likely to be (Sproule-Jones, 2002). It cannot be understated how central to the RAP process community engagement is.

CONCLUSIONS

Research and monitoring played a dynamic role in the progress of the Bay of Quinte RAR due to the many ways in which they are communicated to fellow scientists, regulators and community stakeholders. Through their promotion and application, scientific programs at the Bay of Quinte have facilitated adaptive management, informed decision making, trend tracking, appreciation of monitoring and modelling and promotion of stakeholder co-operation at the Bay of Quinte RAP. Furthermore, scientific programs created avenues for those involved to collaborate with participants in other RAPs. Lessons learned at the Bay of Quinte that are applicable at other RAPs and multi-stakeholder projects are: 1) Provide administrative support and the creation of institutional memory; 2) Integrate models as a primary tool for assessing problems and evaluating options; 3) Invest in consistent long term monitoring programs to maintain eternal vigilance 4) emphasize public engagement. Taking steps such as these strengthen and reinforce the ecosystem approach embodied by the RAP program and is the key to restoring beneficial use to the AOC on the Great Lakes.

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APPENDIX A: LIST OF PRESENTATIONS GIVEN AT THE BAY OF QUINTE RESEARCH AND MONITORING FORUM

Welcome, Introduction, Background, Purposes and Goals

Terry Murphy (Quinte Conservation and Bay of Quinte Restoration Council (Co-chair)
& Jeff Borisko (Bay of Quinte Remedial Action Plan))

Overview of Project Quinte, Ecosystem Changes, and Fisheries and Oceans Canada Science Program

Scott Millard (Fisheries and Oceans Canada (Great Lakes Laboratory for Fisheries and Aquatic Sciences) and Bay of Quinte Restoration Council)

Beneficial Use Impairment: Phytoplankton

Mohiuddin Munawar (Fisheries and Oceans Canada (Great Lakes Laboratory for Fisheries and Aquatic Sciences))

Zooplankton

Kelly Bowen (Fisheries and Oceans Canada (Great Lakes Laboratory for Fisheries and Aquatic Sciences))

Changing Benthic Fauna in the Bay of Quinte

Ron Dermott (Fisheries and Oceans Canada (Great Lakes Laboratory for Fisheries and Aquatic Sciences))

Assessment of Biological Impacts in the Bay of Quinte (Lower Trent River)

Danielle Milani (Environment Canada (National Water Research Institute))

Trent River Mouth Investigation Study

Anne Borgmann (Environment Canada (Great Lakes Areas of Concern))

Sport Fish Contaminant Program

Satyendra Bhavsar (Ontario Ministry of the Environment (Environmental Monitoring and Reporting Branch))

Options for Assessing Restrictions on Fish Consumption

Jeff Ridal (St. Lawrence River Institute of Environmental Sciences)

Submerged Aquatic Vegetation in the Bay of Quinte

Kathy Leisti (Fisheries and Oceans Canada (Great Lakes Laboratory for Fisheries and Aquatic Sciences))

The Community Wildlife Monitoring Program - Volunteers In Action!

Terry Sprague (Quinte Conservation and Bay of Quinte Remedial Action Plan (Community Wildlife Monitoring Program))

Coastal Wetland Wildlife Habitat and Populations

Paul Watton (Environment Canada (Canadian Wildlife Service))

Bay of Quinte Fish and Fisheries

Jim Hoyle (Ontario Ministry of Natural Resources (Lake Ontario Management Unit) and Bay of Quinte Restoration Council)

What Is the Status of Nearshore Fish Assemblages in Selected Areas of the Bay of Quinte?

Christine Brousseau (Fisheries and Oceans Canada (Great Lakes Laboratory for Fisheries and Aquatic Sciences))

Bay of Quinte Fisheries Management Plan

Marc Desjardins (Ontario Ministry of Natural Resources (Lake Ontario Management Unit))

Fish Habitat Classification, Supply Analysis, and Population Modelling in the Bay of Quinte

Susan Doka (Fisheries and Oceans Canada (Great Lakes Laboratory for Fisheries and Aquatic Sciences))

Welcome, Introductions, Background, Purpose, and Goals and Review of Day One

Jim Kelleher (Lower Trent Conservation and Bay of Quinte Restoration Council (Co-chair)) & Peter Hodson (Queen's University)

Nuisance and Toxic Algae

Susan Watson (Environment Canada (National Water Research Institute))

Research investigations of fecal pollution and waterborne pathogen threats to drinking and recreational waters in Lake Ontario RAP/AOCs

Tom Edge (Environment Canada (National Water Research Institute))

Beach Monitoring

Andrew Landy (Hastings and Prince Edward Counties Health Unit)

Drinking Source Water Protection

Keith Taylor & Julie Munro (Quinte Conservation)

Integrated Pollution Prevention and Control Planning

Bryon Keene (Quinte Conservation) & Dave Barton (WaterPlan Associates)

Fish Geodatabase

Andrew Doolittle (Fisheries and Oceans Canada (Great Lakes Laboratory for Fisheries and Aquatic Sciences))

A mass-balance remediation approach towards reaching delisting targets in Areas of Concern (AOCs)

Agnes Richards (Fisheries and Oceans Canada (Great Lakes Laboratory for Fisheries and Aquatic Sciences) and Environment Canada)

APPENDIX B: QUESTIONS TO LEAD BREAKOUT GROUP DISCUSSIONS AT THE BAY OF QUINTE RESEARCH AND MONITORING FORUM

- What are the full names and affiliations of each group participant?
- Is there anyone attending the Forum that could answer questions and/or contribute to the session that is not part of this group?
- Is there anyone NOT attending the Forum that could answer questions and/or contribute to this group?
- Has the group reached a consensus on BUI status? If yes, what is the rationale? If no, what are the reasons and what needs to be done for a BUI status assessment leading to delisting?
- Have the necessary individuals and agencies been identified along with an expected timeline to complete a BUI status assessment and/or report leading to delisting? If yes, document the individuals, agencies and timeline in a proposed workplan. If no, what are the issues, opportunities, and next steps?
- Has the group provided an update on all workplan tasks and Stage 2 Recommendations? If yes, document and integrate into the proposed workplan from Question 5. If no, when will this update be available?

APPENDIX C: LETTER OF INFORMATION/CONSENT

Dear potential interviewee,

Thank you for considering granting an interview to further the study of the Bay of Quinte Remedial Action Plan (RAP). This research is being conducted by Michelle Berquist, undergraduate student in the School of Environmental Studies, at Queen's University in Kingston, Ontario.

The topic being researched is titled "Assessing the role of integrated research and monitoring tools in remediation efforts at a Great Lakes Area of Concern: a case study of the Bay of Quinte Remedial Action Plan". Basically, the main purpose of the study is to examine how scientific inquiry (in the form of research or monitoring programs) is used to develop or support projects that contribute to the clean-up of the Bay of Quinte.

As a part of the research interviews will be conducted in which you would be asked to state your knowledge or opinion on questions related to the topic under study. You would be interviewed by telephone which is expected to last for 30 - 45 minutes. There will be no follow-up studies.

There are no known physical, psychological, economic or social risks involved with the participation in the research. Participation in the research project is completely voluntary and you are free to withdraw at any point of time during the research for any reason you may deem fit. There is no compulsion for you to answer any questions that you are not comfortable with. A tape-recorder shall be used to record the interviews. Your confidentiality shall be protected by means of concealing your name and identity (unless you give explicit consent to be quoted) and the raw data will be kept on a password protected personal PC, or in a notebook secured in a locked drawer. There is no remuneration provided for participating in this research.

This research shall be part of an undergraduate thesis that will be submitted to Queen's University. The academic community and any other person interested in it shall have access to it through the Queen's University website. A copy of the final paper will be provided to each participant. It may also be published in the form of a scholarly article at a later stage and can be thus available to the general public or as a secondary source for other researchers.

Any complaints or queries regarding the nature or manner of research can be forwarded to:

Researcher: Michelle Berquist, 4mb22@queensu.ca

Co-supervisors: Dr. Linda Campbell, linda.campbell@queensu.ca, (613) 533 - 2226

Dr. Graham Whitelaw, whitelaw@queensu.ca, (613)533 - 6000 ext. 77379

General Research

Ethics Board: Chair: Dr. Joan Stevenson, chair.GREB@queensu.ca, (613) 533 - 6081

By signing below, you confirm that you have read this Letter of Information and have had any questions answered to your satisfaction and will keep a copy of this letter for your records;

Name: _____ Signature: _____ Date: _____

By initialling the statements below,

____ I am granting permission for the researcher to use a tape recorder (and/or)

____ I am granting permission for the researcher to attribute my name to any quotes

APPENDIX D: SAMPLE INTERVIEW QUESTIONS

Required verification of interview parameters:

- Have you read and understood the letter of information you were provided with prior to the interview?
- Do I have your permission to record this call?
- Do I have your permission to attribute your name to quotes in the final paper?

Questions about the interviewee:

- When and how did you become involved in the Bay of Quinte RAP?
- What is your current role and with what organization?
- How does this organization relate to other stakeholder groups involved in the BQRAP?

Questions about their awareness of science and research:

- What are the main focuses of the science conducted at the Bay of Quinte?
- How are topics of study chosen?
- How have the topics, or approach to studying them, changed over the course of the RAP?
- Have you worked with or consulted any (other) researchers in the course of your career with the RAP? In what capacity?
- What is your impression of the sphere of influence of your/their work?
- Are you aware of any research or monitoring programs that you have not been involved with directly?
- Do you feel follow-up research is done sufficiently frequently?
(Follow-up research might include studies that address questions that came up during a previous study, or trend-related research that requires repeated sampling to be done.)

Questions about the communication of science and research:

- How are scientific findings communicated to you? your organization?
- Do you or your organization have a formal plan for disseminating scientific findings to the RAP community and/or general public (such as a publication, website, or regular gathering)?
- Have you ever attended or participated in a conference or workshop concerning the RAP? (Eg. The Research and Monitoring Forum held this month in Belleville.)
- If so, how were you involved? What were your impressions and/or recommendations?

Questions about the import of science and research in the RAP process:

- What impact do you think research and monitoring programs are having on the BQRAP?
- What do you believe are the most important outcomes of research and monitoring programs at the BQRAP?
- How have scientific findings impacted your role, or the objective of your organization?
- How do you feel research programs impact the relationship between different stakeholder groups?
- Do you feel they are reaching their fullest potential?
- If no, how do you think science could be used more effectively to further the RAP goals of your organization?