

**A SUMMARY OF THE  
STATE OF THE MINAS BASIN FORUM**

**WOLFVILLE, N.S.  
OCTOBER 28TH, 2003**

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*"Study nature, love nature, stay close to nature. It will never fail you."  
~ Frank Lloyd Wright*

## ACKNOWLEDGEMENTS

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- Environment Canada, Department of Fisheries and Oceans and the Canadian Hydrographic Service
- Graham Daborn for facilitating the session, keeping an eye on the clock and offering good cheer.
- The group of presenters who enlightened the forum with their accounts of the ecological and social diversity within the Minas Basin region... *Barry Jones, Robin Musselman, Reg Newell, Jon Percy, Peter Strain and Peter Wells.*
- The working group facilitators and rappateurs who led and documented our activities... *Jocelyn Hellou, Hank Kolstee, Maxine Westhead, Justin Huston, Patricia Hinch, Mark TeKamp and Lisa McCuaig*
- Alison Evans for offering her guidance as well as helping to solicit community participation in the forum.

## INTRODUCTION

On October 28th 2003, a forum on the State of the Minas Basin (SOMB) was held in Wolfville, Nova Scotia. The purpose of this meeting was to bring together a diverse group of resource users, scientists, managers, and individuals with knowledge of the local environmental characteristics to discuss the health and quality of the Minas Basin watershed.

The Minas Basin Working Group, a subgroup of the Bay of Fundy Ecosystem Partnership, sponsored and organised the Minas Basin Forum. The Working Group's objective is to develop "*community-based management plans for the sustainable future of Minas Basin resources and watershed communities*". Recognizing the need for new planning methods, the Working Group has already facilitated four community forums to highlight issues and concerns with the health of the Minas Basin watershed.

This process (of community based discussion and analysis) has highlighted areas of concern within our study area in an effort to further our understanding of the Minas Basin. The results from this forum will feed into similar initiatives taking place in each watershed throughout the Gulf of Maine, culminating in a Gulf of Maine Summit in the fall of 2004, which will produce a comprehensive "state of the environment" report for the entire Gulf of Maine region.

The outputs from this particular forum include the completion of a series of matrices. This information is compiled and presented in this report for further analysis. In addition, the matrices are supplemented with background notes that further explain the justification for many of the assessments. A participant list, matrix instructions and forum agenda are also included within the appendices.

An interesting point that was informally discussed during the forum was the importance of having such a diverse group of people, representing many facets of use within the Minas Basin watershed, collaborating on the SOMB forum. This capacity for co-management is an essential component of successful environmental preservation and protection.

## STUDY AREA

As mentioned earlier, these community forums feed into a larger process of assessing the environmental health and quality of the greater Gulf of Maine region. The particular area that was specified for this session was the Minas Basin watershed.

The Minas Basin watershed is a significant area of Nova Scotia. Located in the central part of the province, the Minas Basin watershed encompasses approximately 17 % of the land area in Nova Scotia and hosts almost 18



% of the provincial population.<sup>1</sup>

For the most part, the landscape is predominately rural with a number of denser urban settlements throughout the region. There are a number of people, groups and agencies involved in the study of the Minas Basin. As a result, there is a high recognition of the value of the local biological and geological phenomenon. However, despite this knowledge very little of the land and marine environment is protected by local and/or regional plans.

The regional economy has historically relied largely on traditional resource based industries (agriculture, fishing, forestry and mining). Recently, there has been a growing interest on the part of manufacturing firms locating in the watershed. In addition, the Minas Basin and surrounding watershed is becoming quite well known among outdoor enthusiasts and as such is evolving into a popular ecotourism destination.

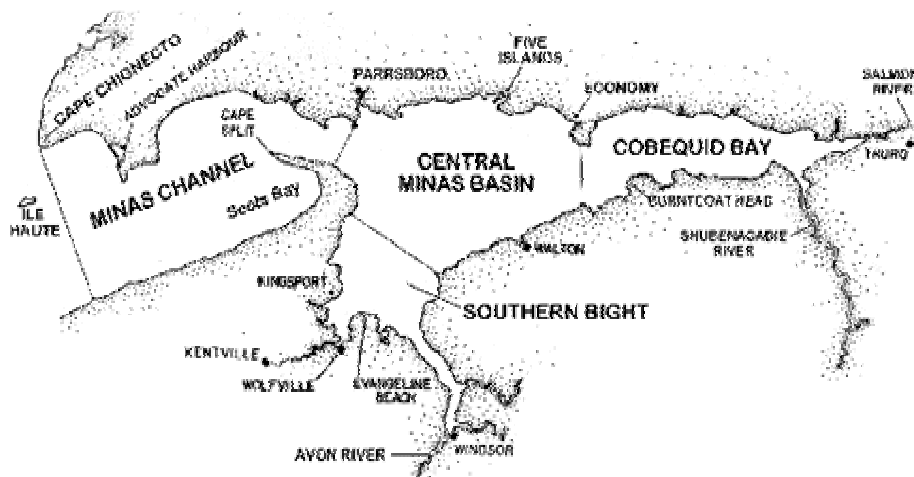
With a diverse user base combined with uncertainty regarding the health and quality of the marine and land environments, the creation of a "state of the environment" report that is based on the accounts of local resource users and managers becomes an important task.

For the forum to maximize the limited time available on October 28th, 2003, there was a need to organise and focus our efforts into geographically specific regions. Earlier Minas Basin Working Group forums showed that the issues within the watershed were not only complex and variable, they had a tendency to differ spatially. Furthermore, the Minas Basin Watershed covers approximately 10,700 square kilometres with almost 875 km of coastline<sup>2</sup> and to simply generalize about the environmental characteristics would be ineffectual.

As a result, the SOMB forum used four distinct sub-regions: the Minas Channel, the central Minas Basin; the Southern Bight; and Cobequid Bay, at the eastern edge of the Minas Basin.

### ***Minas Basin Sub-region Boundaries<sup>3</sup>***

The Minas Channel is found at the most western end of the Minas Basin. The tip of Cape Chignecto to the north and Harbourville to the south commonly defines the western boundary of the channel.



At that point, the channel is 24 kilometres wide. Its eastern boundary is represented by a boundary between Partridge Island (near Parrsboro) and Cape Blomidon. At that point, the channel narrows to approximately 5 kilometres wide.

The Southern Bight is essentially an estuary of rivers

<sup>1</sup> Musselman, Robin. *Minas Basin Watershed Profile*. BoFEP, 2003.

<sup>2</sup> Musselman, Robin. *Minas Basin Watershed Profile*. BoFEP, 2003.

<sup>3</sup> Percy, Jon. *Fundy's Minas Basin: Multiplying the Pluses of Minas*. Fundy Issues # 19. Spring 2001.

flowing into the central Minas Basin (Avon, Cornwallis, Gaspereau, St. Croix and the Kennetcook Rivers). The boundary between the Southern Bight and the central Minas Basin is not defined precisely. This threshold is generally considered to be a line from the midpoint of Cape Blomidon to Red Head.

Cobequid Bay is seen as the eastern edge of the Minas Basin. Rivers that flow into the Bay include the Shubenacadie, Stewiacke, Salmon and North rivers to name a few. The boundary between Cobequid Bay is shown as the line between Economy Point on the north shore to Burntcoat Head on the south shore.

## M E T H O D O L O G Y

The SOMB was organised in a manner whereby interested participants could review background materials (mailed out prior to meeting date), arrive at the forum prepared to participate in informal discussions, be briefed on relevant trends and issues in the Minas Basin watershed through a series of short presentations and cluster themselves in a working group that best suits their familiarity with the watershed. These working groups were formed quickly and participants could easily sign on to join a group that was working on their particular area of interest.

The main idea; however, was that with the working group materials at hand, facilitators leading discussions and rapporteurs recording comments, a dialogue between participants could easily take place. A type of discourse whereby resource users, managers, community organisations, governmental representatives, conservation groups and the like could actively participate in the forum simply by sharing experience and knowledge with those who have similar interests. This informal process allows for maximum user participation. There are no wrong answers, only opinions offered, justified and documented.

With the guidance of a facilitator, participants discussed a matrix table detailing various indicators of environmental quality specific to the Minas Basin Watershed. As a result, participants evaluated the region based on five main categories:

1. **Water quality** (i.e. bacteria, nutrients, sediments, toxic contaminants)
2. **Presence and status of critical habitats or natural areas** (i.e. benthic habitat, wetlands, nesting foraging areas)
3. **Changes in species** (i.e. populations, diversity, dominance, invaders)
4. **Changes in use and integrity of riparian and water zones** (i.e. clearing and development of natural areas, replacement of traditional uses, erosion and deposition changes)
5. **Changes in resource use** (i.e. shift in targeted species, species introductions, shift from resource extraction to recreational or tourism)

These five indicators of environmental quality were then cross-referenced to geographical sub-regions. These geographical areas conveniently include the four sub-regions described in the *Study Area* section of this report (Minas Channel, Central Minas Basin, Southern Bight and Cobequid Bay), the freshwater/terrain component and the complete Minas Basin summary itself. The freshwater/terrain category is included in the matrix table as an added element of clarity. This inclusion addressed a definite need to further explore land-based impacts as well as separate freshwater ecosystems from more saline environments. The Minas Basin summary describes the entire area being covered in the forum.

	Mid-Atlantic Region	Chesapeake Bay		Delaware Estuary		Coastal Bays		
		Mainstem	Tributaries	Upper	Lower	DE	MD	VA
Water quality: nutrients	Green	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow
Water quality: phytoplankton	Green	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow
Water quality: dissolved oxygen	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow
Sediment contamination	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow
Habitat: coastal wetlands	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow
Habitat: submerged aquatic vegetation	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow
Living resources: benthos	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow
Living resources: shellfish harvest (oyster)	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow
Living resources: shellfish harvest (crab)	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow
Living resources: shellfish closures	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow
Living resources: fish stock	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow
Living resources: contaminants in fish/shellfish	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow
Living resources: disease (fish)	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow
Living resources: disease (shellfish)	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow
Living resources: waterfowl	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow
Living resources: threatened/indangered species	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow

**The Matrix**

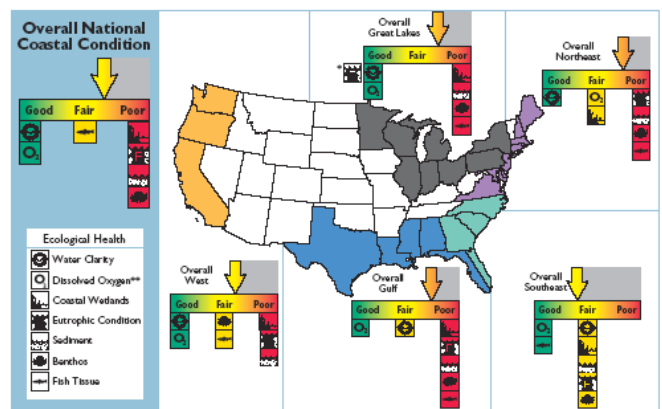
As mentioned above, a major component of this forum was the completion of a coloured matrix chart, prepared by the Global Programme of Action Coalition (GPAC), measuring key environmental indicators. The SOMB forum used this matrix approach to relate the environmental indicators to the sub-regions.

This method is commonly referred to as the “traffic light” approach. The traffic light methodology is an effective way of ranking the general health and quality of the Minas Basin by using three main colours (red, yellow and green) and associating each colour with a specific meaning. For example:

- Green ~ very few problems associated with that particular indicator
- Yellow ~ moderate problems with the condition of a particular indicator
- Red ~ definite, or severe, problem(s) with that indicator

This process allows for examination of both the number of stresses affecting an ecosystem of the watershed and the positive/negative extent of each scenario.

The traffic light methodology was made popular for the usage of watershed evaluation by the United States Environmental Protection Agency for their *National Coastal Condition Report*. In the two figures included in this section, one can see how the "traffic light" methodology was used firstly in the matrix format and secondly, by the USEPA to detail issues associated with the state of their coastline.



Complimenting the matrix evaluation and traffic light methodology, the MBWG assigned rapporteurs who were responsible for recording the many comments and opinions of the participants. These background notes are included in this report as an added element of depth for our matrices. If the reader wonders about the reasoning for a particular variable then the

the reasoning for a particular variable then the

supplementary notes that follow each matrix are available. For additional details on the matrix and its usage, please refer to Appendix C and D.

## FORUM HIGHLIGHTS

The results from the SOMB forum arise from the completed matrices. These matrices are presented in this section. In addition, the background notes from each SOMB forum working group, as prepared by the pre-arranged rapporteurs, are also included. These summaries follow each matrix and are organised in a manner where the comments match each sub-region.

As mentioned earlier, each matrix has a column where the watershed as a whole was discussed and analysed. The following table is prepared below as a summation of the general “watershed” assessments that were part of each working group matrix. This table offers a preliminary idea of the main environmental concerns, and positive results within the watershed. Some of the key findings are:

### **Multiple showings of “severe problem” indicators**

As detailed in the matrices, there are numerous findings of severe environment stress, issues and/or problems. These include:

- *Presence of Critical Habitats or Natural Areas:* Benthic habitat, Beach & intertidal areas, Tidal barriers, dams and dykes
- *Water Quality:* Bacteria, Nutrients (Inshore)
- *Changes in Species:* Populations
- *Changes in Resource Use:* Shift in targeted species (pelagic, groundfish, clams)
- *Changes in Use & Integrity of Water & Riparian Zones:* Clearing and development of natural areas, erosion (select regions)

### **Multiple showings of “few known problems” indicators**

In a number of occurrences, the working groups found the sub-regions were not in at any immediate risk of significant environmental harm. As such, the green designation (few known problems) was used. Some of these findings are found in the categories below:

- *Presence of Critical Habitats or Natural Areas:* Nesting and foraging areas
- *Water Quality:* Bacteria, Nutrients (Offshore), levels of dissolved oxygen
- *Changes in Resource Use:* Shift in targeted species: lobster; Species introductions: Marine
- *Changes in Use & Integrity of Water & Riparian Zones:* Erosion (select regions)

### **Multiple showings of “not enough data/knowledge”**

In addition to other findings, research can just as importantly highlight what we don't know. These working groups often choose to leave categories blank as opposed to placing inaccurate judgements. This option highlighted a number of areas that our participants were unable to comment on:

- *Presence of Critical Habitats or Natural Areas:* Spawning and nursery areas
- *Water Quality:* Inshore sediments, organic contaminants, acidification
- *Changes in Species:* Diversity
- *Changes in Resource Use:* Shift in targeted species: agricultural species, forestry species; Species Introductions: freshwater species, land species
- *Changes in Use & Integrity of Water & Riparian Zones:* Clearing and development of natural areas, erosion (select regions)



**Summary of Entire Minas Basin Watershed**

Category	Indicator		Overall Summary	
<b>Presence of Critical Habitats or Natural Areas</b>	• Benthic habitat		Yellow	Red
	• Wetlands		Yellow	
	• Nesting and Foraging Areas		Green	Yellow
	• Spawning and Nursery Areas		~	
	• Presence of protected areas		Yellow	
	• Beach & Intertidal		Yellow	Red
	• Tidal Barriers, dams & dykes		Red	
<b>Water Quality</b>			Inshore	Offshore
	• Bacteria		Red	Green
	• Nutrients		Red	Green
	• Sediments		~	Green
	• Toxic Contaminants	Metals	Yellow	Yellow
		Organics	~	~
	• Dissolved Oxygen		Green	Green
• Acidification		~	~	
<b>Changes in Species</b>	• Populations		Red	
	• Diversity		~	
	• Dominance		Yellow	
	• Invaders		Yellow	
<b>Changes in Resource Use</b>	Shift in targeted species	• Pelagic	Red	
		• Groundfish	Red	
		• Elasmobranchs	Yellow	
		• Lobster	Green	
		• Clams	Red	
		• Baitworms	Yellow	
		• Agricultural species	~	
		• Forestry species	~	
	Species Intro.	• Marine	Green	
		• Freshwater	~	
		• Land	~	
• Shift from resource extraction		Yellow		
<b>Changes in Use &amp; Integrity of Water &amp; Riparian Zones</b>	• Clearing and development of natural areas		Yellow	Red
	• Replacement of traditional uses		Yellow	
	• Erosion and deposition changes		Green	Yellow

**CHANGES IN SPECIES WORKING GROUP**

	MINAS CHANNEL	COBEQUID BAY	SOUTHERN BIGHT	CENTRAL MINAS BASIN	FRESHWATER /TERRAIN	MINAS BASIN WATERSHED
<b>CHANGES IN SPECIES</b>	Populations	~	~	~	~	~
	Diversity	~	~	~	~	~
	Dominance	~	~	~	~	~
	Invaders	~	~	~	~	~
	Other:	~	~	~	~	~

RED	severe problem	YELLOW	moderate problem	GREEN	little problem	~	not enough data/knowledge
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# CHANGES IN SPECIES WORKING GROUP

**Facilitator: Mark TeKamp**

**Rappateur: Lisa M. McCuaig**

## INTRODUCTION

Mark reviewed outline of populations, diversity, dominance & invaders with definitions. Expect that there will be some overlap between changes in species & changes in resource use. Intended to be inclusive – with broader categories. Question re: brown trout whether an invader vs. manmade. Discussion re: fresh water small mouth bass, crab, lemon weed – important what do we do about it? Corophium – theory – shrimp introduced from Europe – Bay of Fundy – San Francisco Bay. Review of Boundaries: Minas Channel, Cobequid Bay, Southern Bight, Central Minas Basin, & Minas Basin Watershed.

## POPULATIONS

### *Minas Channel*

- Herring stocks – issue of fleet – use herring as a bait for lobster – anecdotal – yellow
- Fish stocks over time – business operations have good info - fisherman saying that
- Dogfish – green – may not have anything to do w/ state of environment

### *Cobequid Bay*

- Yellow – loss of salmon – concern over salmon & decline of fish stocks
- Do not know much about Cobequid Bay
- Inner Bay of Fundy Salmon – declined significantly
- Paul Saunders lives near Hantsport – history of fishing – redfish – tommy cod
- Shad fishery, sturgeon, alewives – declined drastically
- Question re: How do you determine whether category is red, yellow, or green?
- Collapse in shad fishery result of dams built in New England – migration
- Question – has Windsor Causeway reduced species? Small opportunity to open gates - 20,000 – 40,000 Gaspereau died @ causeway
- Do not know much about Cobequid Bay – no specific species
- Weirs disappeared – policy – licensed not renewed – concern over salmon

### *Southern Bight*

- No smelts above causeway
- Corophium #'s – way down – serious situation
- Blood worm harvesting – worms #'s down & rotating closures
- Mud snail & corophium
- Clams – Cheverie Salt Marsh restoration – clams filter sediments – mercury problem?

### *Freshwater Terrain*

- Mammals, birds, moose, peregrine falcon
- SARA – species @ risk<sup>4</sup>
- Suggestion - fresh water category vs. land category
- Questions – Minas Basin Watershed – connections between land vs. water system – forestry sector, agriculture practice, forestry & loss of habitat impacted

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<sup>4</sup> Some of the species at risk that can be found in the Minas Basin watershed include Roseate Tern, Piping Plover, Harelquin Duck, Atlantic Salmon, Peregrine Falcon, Wood Turtle, Short-eared Owl and the Sanderling.

Musselman, Robin. *Minas Basin Watershed Profile*. BoFEP, 2003.

*Minas Basin Watershed*

- Red – whole part of land & water areas
- Severe ongoing problems regarding declining populations
- Question re: connections between land vs. water system

**DIVERSITY**

*Minas Channel*

- Not any known points offered for this category
- Lobster #'s increasing in Minas Channel
- Has anything appeared or disappeared?
- Cardinals, turkey vulture, bird census
- Tradition knowledge – tommy cods
- Flounder – jigging for in past
- Horse head creature
- Good season for striped bass
- Leave white – lack of knowledge
- Same species different opinions - need systematic sampling in intertidal zone & census of marine life
- Coho salmon present, brown trout, brook trout?
- Difficult category to summarize – difficult environment – leave sheet due to lack of knowledge

*Summary of all indicators*

- 50 odd species of fish
- Moose populations decreasing
- Deer populations increasing
- Eagles vs. falcons – requires a time series
- Outer part of Bay – Halifax – sampling for years
- Red Meyers – disappeared – salmon endangered species
- Lack of info - white

**DOMINANCE**

*Minas Channel*

- Dogfish – might be compensating for this
- Increase in #'s of skates, dogfish (rock wolf salmon)
- Proposal of yellow

*Southern Bight (Mud Flats)*

- Corophium, bloodworms – Question re: oscillations over time in outer part of Bay of Fundy
- Stock – correlation w/ tidal system e.g. corophium
- Humans over last 400 yrs have displaced a lot of species
- Yellow

*Freshwater Terrain*

- Subcategory – freshwater - herring gull dominance – feeding – impact on lower populations – increase in herring gulls have impacted on cormorants & black backed gulls

**INVADERS**

*Minas Channel*

- Green crabs – chain pickerel – into new systems – fresh water

*Southern Bight*

- Silt build up – invasion of mud build up – results in changes of resource use

*Freshwater Terrestrial*

- Small mouth bass, pickerel
- Sand stone edges – habitat – green crates
- European starling
- House sparrow
- Freshwater – purple loose strife, phragmites, elephant grass
- Agricultural – invasive species of weeds
- Pickerel

*Salt Marsh System*

- Consider ratio of male to female relationships
- Truro industrial vs. agricultural?
- Spawning grounds – indicator of changes in habitat – smelt

**OTHER CATEGORY**

- Endangered or threatened species. Digby Neck e.g. right whale
- The group discussed a need to note local/regional endangered species

## WATER QUALITY WORKING GROUP

INDICATOR	MINAS CHANNEL						COBEQUID BAY						SOUTHERN BIGHT						CENTRAL MINAS BASIN						MINAS BASIN WATERSHED						SPECIFIC WATERSHEDS			
	I		O		I		O		I		O		I		O		I		O		I		O		I		O		I		O			
	8	9	7	9	3	9	7	9	3	9	7	9	3	9	7	9	11	11	11	11	11	13	13	11	11	11	13	13	11	11				
Bacteria (coliform)	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~				
Nutrients	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~				
Sediments	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~				
Toxic contaminants	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~				
Dissolved Oxygen	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~				
Acidification	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A				

I: Inshore O: Offshore

RED	severe problem	YELLOW	moderate problem	GREEN	little problem	~	not enough data/knowledge
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# WATER QUALITY WORKING GROUP

**Facilitator: Jocelyn Hellou**

**Rappateur: Peter Wells**

## INTRODUCTION

- NOTE: This working group utilised a numbering system for their observations. A number following a comment indicates the exact position of that particular comment
- Include the rivers? Yes, very important due to dilution potential of the Basin. Data on some rivers and little data on the Southern Bight. How much exchange is there when the tidal cycle flushes the Basin?
- Good evidence for this (M. Brylinsky), re: river inputs of both bacteria and nutrients (3)
- Sediment contamination vs. sediment loading (4)
  - sediment loading (no influence)

## BACTERIA (COLIFORM)

- Based on clam fishing - closures due to elevated bacteria (7)
- Advocate Harbour - small sections closed to clamming due to elevated bacteria levels (8)
- Offshore bacteria: low levels, poor survival, dilution (9)
- Annapolis River: elevated levels, attributed to sewage/agriculture (recent CARP studies) (10)

## NUTRIENTS

- Overenrichment (11)
- Offshore: natural levels increasing. Levels higher than in lower Bay (Peter Strain), but impact is low (negligible)

### *Cobequid Bay* (12)

- Eutrophication problems on incoming rivers, streams. E.g. Stewiacke River Studies in 1970's

### *Watershed* (13)

- Inshore problems in some areas

## SEDIMENTS (erosion/loadings: how they influence water quality?)

*Offshore*: loadings are clearly natural (14)

*Inshore*: (15)

- Erosion is a problem everywhere, re: forestry and agricultural practices
- Influence of cattle on riparian edges of rivers e.g. Cornwallis
- Active discussion on the fate of sediments along rivers in the riparian zones
- "Erosion is a big problem on river banks". M. Brylinsky states, however, Hank Kolstee disagrees
- Minas Channel might be "green". Most likely, no problem
- Not enough information re. Inshore situation
- Studies ongoing at Salmon River, Truro

**DISSOLVED OXYGEN**

- High/saturated throughout the system (M. Brylinsky & Peter Strain) (16)

**CONTAMINANTS (METALS AND ORGANICS)**

*Organic (17)*

- An older study on Cornwallis (M. Brylinsky)
- Evidence of human inputs but no impacts
- Missed data - what about Persistent Organic Pollutants (POP's) and Poly-aromatic Hydrocarbons (PAH's)
- Very little recent work (M. Brylinsky)
- New studies underway at UNBSJ (J. Hellou)

*Metals*

- Cu levels area a mystery - re: lobster work
- Some other metals (Al, Fe) are elevated in mussels
- Is an area needing more study and interpretation re levels in organisms/sediments
- Two rivers have no problem (M. Brylinsky) re. elevated metals - St. Croix & Halfway River (6)

**ACIDIFICATION**

- Silver Lake, in Cornwallis River Watershed (M. Brylinsky) (18)
- Low pH, no alkalinity



## CHANGES IN RESOURCE USE WORKING GROUP

	INDICATOR	MINAS CHANNEL	COBEQUID BAY	SOUTHERN BIGHT	CENTRAL MINAS BASIN	FRESHWATER/ TERRAIN	MINAS BASIN WATERSHED
<b>CHANGES IN RESOURCE USE</b>							
<i>Shift in targeted species</i>							
	• Pelagic					~	
	• Groundfish		~			~	
	• Elasmobranchs		~			~	
	• Lobster		~			~	
	• Clams	~		~		~	
	• Baitworms	~	~			~	
	• Agricultural species <sup>1</sup>	~	~	~	~	~	~
	• Forestry species <sup>2</sup>	~	~	~	~	~	~
<i>Species Introductions</i>							
	• Marine					N/A	
	• Freshwater	~	~	~	~	~	~
	• Land	~	~	~	~	~	~
	<i>Shift from resource extraction</i>						

<sup>1</sup> E.g. Shift from animals to crops, or shift in types of animals or crops

<sup>2</sup> E.g. Shift in target tree species for forestry and shift towards monoculture crops

RED	severe problem	YELLOW	moderate problem	GREEN	little problem	~	not enough data/knowledge
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## CHANGES IN RESOURCE USE WORKING GROUP

**Facilitator: Justin Huston**

**Rappateur: Maxine Westhead**

### **SHIFT IN TARGET SPECIES**

- There is a major concern that fisheries plans and regulations are always one step behind the fishery
- Changes in fishing methods - drift net to dragging, pelagic to groundfish
- What are the commercial fisheries in the Basin? Flounder, scallop, shad, baitworms, lobster and clams. Also, weirs that catch what they can (passive fishing method)
- Minas Basin pupping ground for dogfish, which are a vulnerable species, as they are 15-18 years old before they reproduce, bear live young, and are slow growing. Dogfish is not commercially fished in the Minas Basin (but experimental fishery in the outer Bay). Fishermen have noted that the dogfish numbers in the Basin have declined. More information is needed.
- The Minas Basin flounder fishery is based on a small, localized stock. If it is overfished then it won't be replenished
- Lobster landings in the Bay have broken records in the past several years, but not sure about Minas Basin catches (assumed to be similar to the rest of the Bay). Nature of the fishery likely the cause - passive, non-invasives, no TAC which encourages cheating, and undersized lobsters survive when put back
- Also an experimental urchin fishery around Economy on the north shore
- Changes in land use in the valley area dramatic - was tobacco and apples 70 years ago, now it's more diverse and more agricultural. Not much change in the past 20 years
- Definite species shift/land use shift

### **SPECIES INTRODUCTIONS**

Marine: Green crab.

Freshwater: Chain pickerel, brown trout.

Land: Purple loosestrife, turkey vultures, coyote, human populations

- Area is not very well known, and we can only comment on what we know. Consensus that there is a potential increase in invaders, but the full impacts of these are not fully known

### **SHIFT FROM RESOURCE EXTRACTION TO TOURISM/RECREATION USE**

- Shift to less destructive recreation activities such as kayaking
- Ecotourism is an argument for preserving habitats
- Extraction to conservation is a positive trend, however, we have to be aware of limits for any given area. (e.g. whale watching vs. harassing, shorebirds, etc.)
- Ecotourism is like managing an exploitive resource, and it needs to be managed sustainably.
- Bald eagles in the valley - positive or negative change? Birds not fed year round, they feed also on flounder and eels, reliant on chicken farms, etc.
- Also must note the positive changes - e.g. Minas Pulp and Power now completely recycle their waste products. 20 years ago they had a high impact on the Avon River

**PRESENCE OF CRITICAL HABITATS AND NATURAL AREAS WORKING GROUP**

	MINAS CHANNEL	COBEQUID BAY	SOUTHERN BIGHT	CENTRAL MINAS BASIN	FRESHWATER / TERRAIN	MINAS BASIN WATERSHED
Presence of critical habitats or natural areas	Benthic habitat	~				
	Wetlands					
	Nesting and foraging areas		~			
	Spawning and nursery areas					~
	Presence of coastal or marine protected areas	~		~		
	Beach & Intertidal	~				
	Tidal barriers, dams & dykes*	North				

RED	severe problem	YELLOW	moderate problem	GREEN	little problem	~	not enough data/knowledge
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\* A distinction was made between the North (Nth) and the South (Sth) side of the Minas Channel

# PRESENCE OF CRITICAL HABITATS AND NATURAL AREAS WORKING GROUP

**FACILITATOR: MAXINE WESTHEAD**

**RAPPATEUR: JUSTIN HUSTON**

## **INTRODUCTION**

- The group could identify potential impacts, but not to what degree these activities were impacting the benthic habitat
- Under benthic habitat, we chose yellow for the channel, southern bight, the central basin with the condition that we really don't know, but we think that there is a probable impact - we just didn't know to what degree. Needs to be more closely examined
- ? under Cobequid Bay because we have no idea
- In the channel - dredging for minerals and fishing
- Southern Bight - dredging for Hantsport
- Central - fishing dredging

## **INTERTIDAL**

- Water levels are rising which results in increased turbidity and increase in water content in muds - but this is a natural process
- Southshore: increased population, increase in mud deposition, decreased energy and therefore increased accumulation
- Ecotourism impacts
- Harvest impacts - bloodworms, clams, etc.

### *Cobequid Bay*

- Lots of ecotourism, lots of development in the outlying areas of Truro and Stewiacke.
- Not quite a red, but a very strong concern

### *Southern Bight & Cobequid Bay*

- Impacts of the bloodworm industry is a huge concern

### *Central Minas Basin*

- Many closed areas for clam harvesting
- Concern with ecotourism (fossil collecting)

### *Minas Channel*

- Not a lot of impact - harder substrate, not much by way of worm/clam harvesting
- Increased development, increased marine infrastructure in the intertidal zone. Other concerns include ecotourism, sewage, harvesting, coastal access

Note - Peter Hicklin:

"Access to the coast/intertidal beach has impacted the ability for shorebirds to forage undisturbed"

"Acknowledge that ecotourism and education is important, but there is no infrastructure for dealing the increase in numbers"

## TIDAL BARRIERS AND DAMS AND DYKES

Tidally, the group relied on Dawn Duff for most of this (based on the recent findings of her tidal audit). She felt that the entire area, with the exception of a small area from Five Islands to Moose River (less than 10 kilometers). Because of the small scale it doesn't impact the whole Central Basin as red. All others red.

### *Minas Basin Channel*

- North side - Dawn has completed her audit: red
- South side - She has not been there and not enough info

### *Freshwater*

- Concerns with dams and high culverts on highway constructions (Anita Hamilton)
- High yellow overall with red hotspots. The group decided that it should be "red moving down to yellow"
- Hot spots - Gaspereau River Dam, Salmon River Dam, Avon River System/Halfway Brook, Nine Mile River, Shubiacadie

Note: Anita Hamilton

"We've really harmonized the freshwater system - it should be broken down just like the marine areas"

## WETLANDS

- In assessing the status of wetlands rather than try to envision a pristine state (which in that case everywhere would be a red due to a loss of wetlands), we decided to assess what wetlands exist now and how threatened they may be
- Look at the short term trends and projected trends for the future

### *Minas Channel*

- There is a lot of saltwash in the area. Those that exist have long been dyked
- Available habitat that could be saltmarsh has been mostly removed
- There is one river with some saltmarsh but this is an exception.

### *Central Minas Basin*

- There is great potential to recover this area but this potential is not being met, therefore this variable is a red. If the recovery potential were met it would go to green

### *Cobequid Bay*

- Yellow: little potential for reclamation of dyked land. limited threats to existing marshes and those come from increased development

### *Southern Bight*

- Red: high past impact and future as well, with little opportunity for improving

### *Freshwater Terrain*

- Plenty of pressure to develop, at least a yellow
- Forestry impacts
- There are many positive aspects that counter negative spin - some of these suggest a green colour
- Consensus on yellow

## **NESTING AND FORAGING AREAS**

Reliance on Peter Hicklin for this category

Foraging is the main activity - focused in the Southern Bight for semi-paliminated plovers

- Areas for foraging haven't decreased. High tide roosting areas on the beach have been disturbed significantly
- There are many areas that exist now for foraging & roosting, but there is concern with the future risks of growing ecotourism and development

*Freshwater*

- Land-use impacts are having an impact on terrestrial birds, animals, etc. but not enough is known to make an educated assessment

## **SPAWNING & NURSERY AREAS**

*Saltwater* - not enough knowledge but the group suggests that there are some impacts (yellow)

*Freshwater* - some spots are great, some spots are highly impacted

## **PRESENCE OF COASTAL OR MARINE PROTECTED AREAS**

*Southern Bight*

- Green to yellow due to designation as a RAMSAR sight for birds but not legally protected.
- Provincial conservation area as well
- Parrsboro - has designated areas for fossils
- Cape Chignecto - provincial park

*Freshwater*

- Not much is known, however, the group knows that there are limited protected areas

*Central Minas Basin*

- There are parks present (Five Islands and Tom's Cove) but they are actually increasing human impacts

**CHANGES IN USE AND INTEGRITY OF WATER AND RIPARIAN ZONES WORKING GROUP**

CHANGES IN USE AND INTEGRITY OF WATER AND RIPARIAN ZONES		MINAS CHANNEL	COBEQUID BAY	SOUTHERN BIGHT	CENTRAL MINAS BASIN	MINAS BASIN WATERSHED
INDICATOR						
Clearing and development of natural areas		Yellow	Yellow/Red	Red	Yellow	Yellow/Red
Replacement of traditional uses		Green/Yellow	Yellow	Red	Green	Yellow
Erosion and deposition changes		Green	Red	Red	Green/Yellow	Green/Red
Other:		~	~	~	~	~

RED	severe problem	YELLOW	moderate problem	GREEN	little problem	not enough data/knowledge
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**CHANGES IN USE AND INTEGRITY OF WATER AND RIPARIAN ZONES WORKING GROUP**

**FACILITATOR: HANK KOLSTEE**

**RAPPATEUR: PAT HINCH**

**INTRODUCTION**

- Development of natural areas means a natural area developed into a sub-division or park involving manipulation in a major or minor way

**CLEARING AND DEVELOPMENT OF NATURAL AREAS**

*Minas Channel*

- The level of forestry in Minas Channel has increased either involving clearing for forestry or development for resource uses. Cape Split and Cape Chignecto have been developed as parks. Clearcutting has occurred on North Mountain. There has been extensive forestry and private contract work along the shoreline of Scotts Bay
- During the Parrsboro Community Forum, no issues were identified. Economic activities include blueberry production and wood cutting
- A Game Sanctuary which was part of a park, was cut over
- Cottage and home development along the Minas Channel shores has raised concerns about septic system leachate
- Group members asked if these changes were acceptable and if changes in use of resources considered positive or negative. Some indicated that change is neither good nor bad. Cottage development and woodlot clearing for residential development however were considered as negative

*Cobequid Bay*

- Of concern are people driving and new construction on the floodplain. The intensity of development has changed now with intensified agriculture on lower areas and a little forestry
- Since the 1950's when the federal government rebuild the dykelands and has been maintaining them, there has been no significant change. There has been no expansion in the dykes. The amount of agricultural land remains the same in the Shubenacadie area
- Recreational use has increased throughout the Cobequid Bay area
- Subdivision development on the Stewiacke River has been insignificant. Cobequid Bay however has been heavily disrupted with development of shopping malls built on floodplains in Truro. More settlement has occurred along waterways in the airport area. Central Nova Scotia has the largest population growth in the province next to HRM and Wolfville. There has been development along the Shubenacadie River between Elmsdale and Enfield. The Salmon River has been impacted by a cheese plant but this has been remedied by installment of a septic system and the STP in Truro. The majority of homes along the Shubenacadie River have on site systems

Needs/gaps: Municipalities must consider if agricultural land can be developed into residential areas.



*Southern Bight*

- New Minas is the fastest growing area in the province as a retirement community.
- There are no concerns about water demands and sewage treatment upgrades. Building has taken place on recharge areas
- West Hants has reviewed development plans and is beginning to put development regulations in place
- A turkey barn on the Gaspereau River floods each year. The use of farm environmental management plans in which inspectors identify environmental concerns, is good but there are no regulations for barn location
- The Marsh Act was triggered by a proposal to develop a subdivision on a dykeland

*Central Minas Basin*

- Golf course development has occurred in the Cheverie area but group members weren't certain about the extent of development on the north side. They agreed that not a lot of change has occurred on the north side - there has been no housing development

Consensus: yellow(south)/white (north)

**REPLACEMENT OF TRADITIONAL USES**

- How far do we go back in time on replacement of traditional uses ? Members decided that there is no right timeframe. Within voting memory or as far back as the institutional memory of First Nations were suggested

*Minas Channel*

- Replacement of traditional uses ties into residential development and land use changes from agriculture to forestry or industry. Traditional uses include forestry, agriculture and fisheries
- Fishing industry: Within the fishing industry, resource use is the same overall but different in the kinds of fish being harvested. New fisheries have been established (e.g. dogfish). No longer are there any wild salmon and shad have no longer any commercial value
- Agriculture: In agriculture there is a tendency to move toward cash crops. Within the Minas Channel there is a change from woodland to blueberry farming. Over a thirty year period the shoreline on both sides of the Parrsboro River has been cleared for blueberry production This represents a gradual and subtle change within the agricultural sector. Impacts of spraying blueberries is of concern. In the Parrsboro area, there has not been much change in direct agriculture
- Tourism and ecotourism, have increased in the Minas Channel area. This change could be potentially negative but group members were not sure if tourism as yet has had a significant impact on the environment
- Recreational Activities: ATV use poses a major change in many areas of the Minas Channel. Fossil hunting has increased but this is considered to be a positive change

Consensus: green/yellow: In relation to tourism, the colour should be green but relative to traditional use in other areas, yellow.

*Cobequid Bay*

- Many salt marshes have been converted to farmland
- The integrity of the watercourse is of concern. Within the agricultural community the stock remains the same but there are fewer farms and these are now more concentrated. The concern is that this may lead to an overloading of the system. The intensity of farming has also changed with hog and chicken farms coming into operation. Manure, sewage disposal, and site runoff pose significant concerns for environmental quality
- Questions were asked as to whether these changes reflect a change in traditional use or a replacement of land use, and how these changes affect water and riparian zones. The response from other members of the group was that higher intensity of use has created a potential point sources of pollution
- In Truro change has brought a shift from agricultural/forestry to subdivision development in floodplains. A few new subdivisions have been built in Bible Hill. Subdivisions like those build in Cobequid along waterways, tend to have an impact on water quality
- Overall, there has been a change in resource use and the use of water. The greatest impact has come from housing development

*Southern Bight*

- Power plants in the area date back as far as 1908
- Highways 101 and 102 represent a change from agricultural use
- Development of large malls, shops and parking lots has moved commercialization away from the corner store
- Change from agricultural land use to residential housing development places more demand on water resources and increases the level of runoff. Significant change in development has also taken place along the Cornwallis River
- Overall, there has not been a replacement in traditional uses but in the proportion/type of land use in terms of the footprint and the extent of the impact. There has been a change in zoning from light to heavy commercial areas
- It is good that subdivisions have been built in concentrated areas except for the fact that building has taken place on agricultural land

Need/gap:

- Need to define what we mean by changes in use in relation to cumulative effects
- Need zoning of land as agricultural vs. commercial development areas

**EROSION AND DEPOSITION CHANGES**

*Minas Channel*

- Minas Channel is characterized by coastline and control structures.
- There have not been many changes in erosion and depositional patterns in this area. In this regard the area has remained stable
- Mudflats have however not been stable - they are still accumulating sediment but are not building
- Much effort has gone into prevention initiatives focusing on riparian edges.
- Overall, there has been little change in the Minas Channel

*Cobequid Bay*

- The integrity of water from the blowdown caused by Hurricane Juan is of concern. It is difficult to maintain a buffer zone around riparian areas. The increase in erosion in woodland areas, the need for stream bank stabilization, and the impacts on aquatic habitat/habitat quality and on infrastructure i.e. bridges etc, are of significant concern

Needs/gaps: In view of the impacts of Juan, recommendations are needed on management of anadromous fish especially with respect to salmon rivers in Cobequid Basin and Southern Bight

*Central Minas Basin*

- The concerns focused on erosion versus the need to control erosion and on the impact of the Causeway as a tidal barrier
- Between 10 and 15 foot banks along the shoreline of the Central Minas Basin are eroding  
The shoreline is falling into the Bay
- Changes within the Central Minas Basin and its shorelines, are largely human induced
- Tidal barriers have a significant impact on the coastal depositional and erosional patterns  
There has been a decrease in the number of saltmarshes and in particular the size of the Cheverie marsh
- Placement of tidal barriers have resulted in cumulative change over time. If management actions are taken to remove tidal barriers, it may be possible to regain some tidal rivers
- The North Shore is eroding naturally. If a structure is built to prevent erosion, this will result again in change to erosion and depositional patterns

*Minas Basin Watershed*

Need/gap: Need for good land use data

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## APPENDIX B: WORKSHOP AGENDA

9:00 AM to 9:30 AM	Introductions..... <i>G. Daborn</i>
9:30 AM to 9:45 AM	Preamble on GPAC process..... <i>B. Jones</i>
9:45 AM to 10:30 AM	Speakers..... <i>P. Strain, R. Musselman, P. Wells</i>
10:30 AM to 10:45 AM	Nourishment break
10:45 AM to 1:00 PM	Minas Basin assessment: working groups <ul style="list-style-type: none"><li>• Changes in species</li><li>• Water Quality</li><li>• Changes in resource use</li></ul>
1:00 PM to 1:30 PM	Lunch
1:30 PM to 2:00 PM	Speakers..... <i>R. Newell, J. Percy</i>
2:00 PM to 4:00 PM	Minas Basin assessment: working groups <ul style="list-style-type: none"><li>• Presence of critical habitats or natural areas</li><li>• Changes in use and integrity of water and riparian zones</li></ul>
4:00 PM to 4:10 PM	Nourishment break
4:10 PM to 4:30 PM	Summation.....working group facilitators <i>(Jocelyn Hellou, Justin Huston, Hank Kolstee, Mark TeKamp, Maxine Westhead)</i>
4:30 PM to 5:00 PM	Closing remarks..... <i>G. Daborn</i>

## APPENDIX C: ASSESSING ECOLOGICAL INDICATORS

The following is a broader description of what to look for when assessing the individual ecological indicators. Please remember that this is not an exclusive list. Feel free to add to this as necessary.

### ***Water Quality:***

- 1) *Bacteria-*  
presence of harmful bacteria or levels of bacteria that are harmful to shellfish and other aquatic life, etc
- 2) *Nutrients-*  
evidence of nutrient loading (i.e. eutrophication), lack of nutrients, etc.
- 3) *Sediments-*  
changes in transfer of sediments, build up of sediments in a particular area, sediment mixing, etc
- 4) *Toxic Contaminants-*  
evidence of toxic run-off (i.e. pesticides, fertilizer, etc), old or current land fill sites located nearby, industry (i.e. pulp and paper, farming, oil refineries, power generation), etc.

### ***Presence of Critical Habitats or Natural Areas:***

- 1) *Benthic Habitat-*  
loss or degradation of benthic habitat (i.e. dredging, dragging, etc), etc.
- 2) *Wetlands-*  
preservation and/or restoration of wetland areas, degradation of wetland areas (i.e. erosion, dyking, presence of industry), etc
- 3) *Nesting and Foraging Areas-*  
loss or degradation of nesting and foraging areas due to increased human activity, presence of protected nesting and foraging areas, etc.
- 4) *Spawning and Nursery Areas-*  
presence of spawning and nursery areas, exposure of these areas to human activity, destruction of these areas due to human activity (i.e. damming, road construction, dredging, dragging), etc
- 5) *Coastal or Marine Protected Areas-*  
presence of coastal or marine protected areas, presence of candidate for coastal or marine protected areas, deleterious human activity in these areas, etc.

### ***Changes in Species:***

- 1) *Populations-*  
changes in populations of native species, increases or decrease in population numbers, etc.
- 2) *Diversity-*  
increase or decrease in the number of different species/populations present, etc.
- 3) *Dominance-*  
presence of a dominant species, shift in the dominant species with a region, competition for species domination, effects of human activity on species domination (i.e. over-fishing)
- 4) *Invaders-*  
presence of natural invaders, effect of natural invaders (i.e. preying on native species)



***Changes in the Use and Integrity of Riparian and Water Zones:***

- 1) *Clearing and Development of Natural Areas-*  
removal of vegetation from riparian zones, increased industry or development in riparian zones, presence of increased erosion of riparian and water zones, etc.
- 2) *Replacement of Traditional Uses-*  
evidence of a shift in usage of riparian and water zones (i.e. shift from farming to recreational use of riparian zones), positive/negative effects of new uses of these zones
- 3) *Erosion and Deposition Changes-*  
presence of increased/decreased erosion, presence of erosion control structure (i.e. erosion wall, rock armouring), changes in long shore drift, changes in sediment deposition caused by erosion control structures, dams, causeways, etc.

***Changes in Resource Use:***

- 1) *Shift in Targeted Species-*  
changes in species being fished/harvested
- 2) *Species Introductions-*  
number and type of species introduced, positive/negative effects of introduced species, etc
- 3) *Shift from One Resource to Another*  
shift from resource extraction to recreation, fishing to aquaculture, recreation to industrial, increase in recreation and/or tourism, ecological effects of new use (positive, negative, or neutral),etc.

Summary prepared by:



Global Programme of Action  
Coalition for the Gulf of Maine

## APPENDIX D: HOW TO FILL IN THE MATRIX

Listed below are a few guidelines that were used by forum participants to complete the matrix.

1) Colour is the best way to represent the condition of each indicator. Use green if the indicator is in good condition (i.e. very few problems associated with that particular indicator). Yellow indicates that there is a moderate problem with the condition of a particular indicator. Red indicates that there is a definite problem with that indicator. Each indicator box should be filled in. If you have no information on an indicator, please put a [~] in the box to indicate the information gap. An indicator should only be left blank if it is irrelevant to your forum region. If that is the case please provide us with an explanation why the indicator is irrelevant.

2) For conditions that fall somewhere between two different conditions (i.e. good to moderate or moderate-problematic) use a gradation or "split" of colour to show the condition of the indicator.

3) In the Minas Basin matrix, there are six columns for to be filled in. The first four columns, represent sub-areas of your watershed area. The other columns are the freshwater/terrain component of the watershed and the Minas Basin watershed summary (representing the entire area of the watershed). If you would like to add an additional column or category, please feel free. There can be as few or as many as you feel is necessary. It is best to fill in the columns for each of the sub-areas first, and then decide what the overall condition of each indicator for the entire watershed area covered by your forum. This should be based on the averaged condition of the sub-sections. The sub-areas should not be lost, however, because these are likely to show hot-spots of problems that should be addressed, or high quality areas that should be maintained in good condition.

4) Feel free to add to the list any indicators that are specific to your area, but attempt to provide a classification for each of the indicators we have provided.