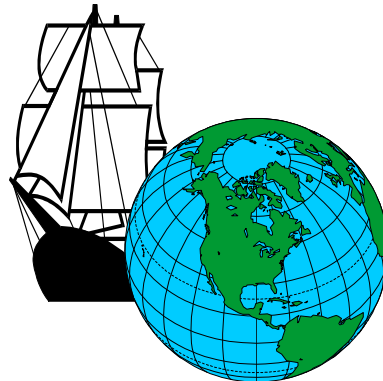


Casting the Bottom Line on the Blue Planet

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In search of a safe passage.....

*A ship's supremacy on the sea is not always set
By the might of her cannons,
Or by the mass of her sails,
But by the skills of those who guide
her through.*



The Blue Planet

It isn't until you stand back and view the world from space that you understand why so many people call the Earth the *Blue Planet*. The Seven Seas of antiquity embrace much of the world's surface. Canada's land mass ends at the margins of three of these great seas: the Atlantic Ocean in the east; the Pacific Ocean in the west, and the Arctic Ocean in the north.

The coasts, islands, fjords and inlets against which these ancient seas roll are enormous. At over 243,000 kilometres, no other country in the world has more coastlines. As a result, Canada is known the world over as a Maritime Nation. But large numbers of Canadians have never seen the oceans, smelled the salt air, nor dealt with the fortunes and perils of a maritime navigation.

500 years ago, brothers John and Sebastien Cabot, sailed across the North Atlantic for King Henry VII of England. They didn't know that the Vikings had already abandoned these shores 500 years before them. Equally, they would not know that many European



nations would come after them to further explore and exploit the bays, rivers, coves and channels that surround Canada. And yet it was the navigational skill of the Cabot Brothers -- their ability to sail the seas and sound the shoals in uncharted waters--that set the stage for 500 years of settlement, exploration, and exploitation of the very land so many of us take for granted today.

Charting a different course

The theme of this year's conference of the Canadian Council on Ecological Areas is "**Protected Areas and the Ecological Bottom Line**". We all know that the bottom line is commonly thought of as an accounting term. It essentially means the real cost of producing something - after we subtract the expenses. However, there is another meaning to the bottom line that has some significance as a metaphor for what we do at this conference.

Casting a bottom line was a common practice on early sailing ships. An ordinary seaman would go to the forward position on the ship's bow. From there, he would be responsible for looking ahead for obstacles as well as casting his lead-weighted line into the depths. Soundings from his bottom-line combined with his intuition and observations were vital forms of information that were conveyed to the ship's captain and helmsman to direct the ship's course through unknown waters, reefs and shoals.

The use and understanding of that information kept the ship off the rocks, and helped to ensure the safety of the crew and delivery of the cargo goods. The waters' depth, the occurrence of shoals and the location of sandbars were features of nature that needed to be recognised and acted upon. They were fundamental characteristics of navigation that had to be considered. Ignoring them often meant trouble or disaster—from a hole in the ship to a lost ship.

Land and sea

Although the Seas of Antiquity were the "information superhighways" of their day, TERRA FIRMA -- the land that we live on -- is what captures and keeps most people's day to day attention. For centuries, we have been exploring and exploiting our ecosystems, soils, forests, wildlife, and natural resources. In recent years, we have started to understand how our behavior over the decades has affected terrestrial and aquatic ecosystems, sometimes for better and sometimes for worse.

But we have yet to discover a bottom line --- a depth sounder if you like ---that will help us find safe passage to a haven of sustainable resources and life sustaining systems. What is the bottom line reading on our scientific knowledge and assessment skills? What is the bottom line reading on resource use, protection and conservation? What is the bottom line reading on ecosystem health and integrity? These questions are complex and progress in answering them is tasking and burdensome on us all.



For centuries, we believed that the wilderness, seascapes, landscapes and resources of Canada or, indeed, elsewhere were inexhaustible. It was admittedly a comfortable thought for most but perhaps lucrative conceit as well. In Canada, we saw land and forests that stretched beyond imagination. Incomprehensible amounts of fresh water. Fish we could scoop out of the sea in baskets. People could not believe that too many trees could be cut, too many fish could be harvested, too much land could be converted to farms and urban areas or too much water could be diverted! After all, we literally had more natural resources than we knew what to do with.

Today, Canada is still acknowledged for its magnitude and diversity. But we Canadians can no longer take this wealth for granted. Our one time conceit and confidence about the boundlessness of resources, natural areas and healthy ecosystems are unravelling.

The horizon and beyond

Many agreements have been reached and principles set on less restrictive approaches to bottom lines. Dialogues, critiques and assessments have been important in this process. Progress has been achieved neither by conservation groups alone nor by industry or governments alone. Governments, NGOs and industry have merged more closely owing to common needs and ground. In the last decade this has been exemplified by the principles behind agreements such as:

- the National Forest Accord;
- World Conservation Strategies;
- Protected Area Systems Plans;
- North American Waterfowl Management Plan; and
- Biodiversity Conventions

They have all pointed to the growing realization that some other form of harmony must be reached.

Finding the ecological bottom line is a challenge. It can:

- help us understand the diversity of ecosystems which we have;
- show us where and how to establish limits; and
- guide us about how we can be more careful about what we do.

Perhaps most importantly, understanding the bottom line in the realm of ecology can help us prevent problems which we might not wish to live with neither today nor in the future. An overriding concern is often the impacts on “future generations”. This is not restricted to just people. It applies to impending generations of other species, of existing and emerging types of ecosystems, and of basic resources like air, water and soils. By studying how we interact within and rely on natural and human-modified ecosystems -- we can help predict what our ecological impacts may be. Understanding the bottom line in ecology can help us understand what we must do to attain and retain sustainability.



With sustainable resource use, ecosystem integrity and ecosystem management, many organizations and people currently see the attraction behind these notions but not the achievements. The passageways for them have not been mapped that clearly. We do not have charts showing every reef and rock nor every safe channel. We need constructive contributions from many disciplines, agencies and individuals. **So welcome to the CCEA's New Brunswick conference!**

Seamen, helmsmen and captains

Seamen, helmsmen and captains—these are orders of rank but not of importance. This is a subtlety that many have missed. We have expected the CEOs of industry, the ADMs of government departments and Chancellors of universities to be the captains of the fleet and command ships like HMCS Ecology and HMCS Sustainable Development. This is an odd expectation when we intuitively know that the success of a voyage is very much dependent of the entire crew. Many of us attending the conference, in effect, fulfil the roles of seamen—some ordinary seaman and some leading seamen.

We have all been exposed to different experiences. Assessing and reporting on ecosystem degradation and depletion in Canada's oceans, arctic, grasslands and forests have been essentially negative experiences. We have seen parallels in countries like the United States, Mexico and Africa. A refreshing counterbalance of sorts has been initiatives like model forests, new commitments to protected area plans, ecological science centres, state of the environment reporting and integrated regional planning. They have provided a better foundation for applying and ensuring an ecological approach. Unfortunately while resource/ecosystem degradation and depletion continue in both different and rather wide spread forms, the positive initiatives 'come and go' without any sustained and wide spread application. This situation is a problem!

Finding the ecological bottom line is of mutual interest. It isn't a case of just setting aside protected areas but rather acknowledging the total value and importance of our ecosystems, terrestrial or aquatic. Some view protected areas as the anchoring points or safe havens of the ecosphere. Between these spots are the seaways of commerce, the ports providing traditional goods and services, the tour boats and recreation ventures, and everything else necessary for our well being.

“How good are our navigational skills on this blue planet and its seas, our charts that we employ, and our sense of directions?” Answers to these types of questions will determine what the ecological bottom line is.

(The attached paper is more of a technical perspective of some of the basic facts and figures concerning Canada's three main ocean territories. For many citizens, these oceans waters are commonly 'forgotten' as being territories that belong to Canada. For many Canada ends at the ocean coastlines but in reality the other one third of the country starts at these shores.)



Canada's Marine Ecosystems: Basic Geographical Measurements and Protected Area Considerations

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Marine and terrestrial ecosystems in Canada

Usually, we speak of 'land' or 'sea' rather than 'land and sea'. Land is far easier to understand as it is typically all around us and we can more readily view the parts and differences of terrestrial ecosystems. For the sea, this is not so. There are many barriers to scientific investigations. The vastness of Canada's sea areas makes it inconvenient for most of us to travel to different surface locations. Our ability to study and monitor the basic ecological character of marine systems is obscured by the fathoms of water which mask the depths. Beyond obstacles like this however, what are some of the fundamental land/sea differences?

At the macro scale, we have twenty major ecosystems in Canada. Fifteen are associated with the land and five with the sea (Figure 1). In a legal and territorial sense, Canada's land area is 9 215 430 square kilometres (Table 1); this is in effect a figure that really covers land as well as freshwater bodies like rivers, ponds and lakes. How large is the seascape in comparison? It is surprisingly about 60% as large, being 5 543 913 square kilometres. This marine area is over ten times the size of France or five and a half times the province of Ontario.

Some of the marine area figures are striking. For instance, the Pacific Marine Ecozone or B.C.'s Pacific Ocean system adds up to 8.3 percent—a figure which is much lower than most people expect. What is often forgotten is that only the lower half of British Columbia has ocean access and the upper portion of the province is really cut-off by the protrusion of the Alaskan Panhandle. In contrast to the West Coast, the arctic-based marine ecosystems (i.e. #17 & #18) are overwhelmingly high. The Arctic Archipelago Ecozone surrounding the main set of arctic islands alone amounts to nearly 40 percent of the nation's oceanic territory. In addition to being large, it is rather unique in the entire arctic ecosystem setting. Unlike anywhere else in the circumpolar arctic, the marine waters here form an extensive lattice of aquatic ecosystems in and amongst the largest set of arctic islands in the north. This land/water interface provides a favoured habitat for species like polar bears. The Arctic Basin Ecozone is the icefast oceanic barrens in



Canada's far northeast. As a wetland often represents a transition between true water bodies and land, this marine ecozone is a hybrid having attributes of landscapes and seascapes.

Ecozone Name	Area (sq. kms)	% of Canada	% of Land	% of Marine
1-Arctic Cordillera	230 873	1.6	2.3	NA
2-Northern Arctic	1 361 433	9.2	13.7	NA
3-Southern Arctic	773 041	5.2	7.8	NA
4-Taiga Plains	580 139	3.9	5.8	NA
5-Taiga Shield	1 253 887	8.5	12.6	NA
6-Taiga Cordillera	264 480	1.8	2.7	NA
7-Hudson Plains	353 364	2.4	3.5	NA
8-Boreal Plains	679 969	4.6	6.8	NA
9-Boreal Shield	1 782 252	12.2	17.9	NA
10-Boreal Cordillera	459 680	3.1	4.6	NA
11-Pacific Maritime	205 175	1.4	2.1	NA
12-Montane Cordillera	459 680	3.1	4.6	NA
13-Prairies	469 681	3.2	4.7	NA
14-Atlantic Maritimes	183 978	1.2	1.8	NA
15-Mixedwoods Plains	138 421	0.9	1.4	NA
Sub-total	9 215 430	----	100.0	NA
16-Pacific Marine	457 646	3.1	NA	8.3
17-Arctic Archipelago	2 178 998	14.8	NA	39.3
18-Arctic Basin	704 849	4.8	NA	12.7
19-Northwest Atlantic	1 205 981	8.2	NA	21.8
20-Atlantic Marine	996 439	6.8	NA	17.9
Sub-total	5 543 913	----	NA	100.0
TOTAL	14 759 343	100.0	----	----

Table 1: Comparison of land and sea areas within Canada's ecozones.

About 8 percent of the fifteen terrestrial ecozones has been protected in IUCN classes 1-6. In comparison, work to protect and conserve marine ecosystems has been rather negligible to date. Heritage Canada (Parks) and the government of British Columbia have been quite successful in initiating a variety of actions in the Pacific Marine Ecozone. Elsewhere, Environment Canada (Canadian Wildlife Service) has been the most progressive organization conserving over 2 918 891 hectares through Migratory Bird Sanctuaries and 174 673 hectares as National Wild Areas. Many of the protected areas lie within arctic ecozones. The new legislation (i.e. Oceans Act) under the Department of Fisheries and Oceans offers further opportunities for expanding a network of marine protected areas.

Twelve and two hundred mile limits

Perhaps the two most commonly cited jurisdictional areas in marine literature are the 12 and 200-nautical mile limits (Figure 2). These two areas have specific implications in regards to the mechanisms which are available to encourage the establishment and regulation of marine protected areas. Owing to historical settlements on international



borders, to resolution of boundaries through recent international disputes and to peculiar interpretations of legal definitions, the resulting tabulations according to these two jurisdictions are rather different than might be anticipated.

The split between the 12 and 200-mile limit is almost exactly 50:50 (Table 2). How can this be so? Hudson Bay, a circular body of marine water in the heart of Canada, is over 500 miles in diameter. Parts of this Bay you would assume would fall within the 12 and 200 nautical mile limits. Areas like this are considered to be part of Canada's 'internal marine waters' and thus, legally and technically, within the 12 mile limit.

Under the Canadian Wildlife Act, **National Wildlife Areas (NWA)** can be established on land and marine (within the 12-mile limit) areas. Under the same act within the 12 to 200 nautical mile limits, a different mechanism comes into place---**Marine Wildlife Areas (MWA)**. In about half of Canada's marine waters, CWS could consider protecting special and endangered wildlife areas under the designation of a NWA and as a WMA in the other half. As the 12 to 200 mile ratios indicate, the NWA mechanism likely has less importance in the Atlantic Marine and Arctic Basin Ecozones.

Ecozone Name	Area (sq. kms + %) in 12 mile limit		Area (sq. kms + %) in 200 mile limit		12 to 200 ratio	Coastline length (kms + %)	
16-Pacific Marine	102 920	3.7	457 646	8.3	1:4	13 342	5.4
17-Arctic Archipelago	2 051 393	73.5	2 178 998	39.3	1:1	157 535	64.6
18-Arctic Basin	24 997	0.9	704 849	12.7	1:28	NA	NA
19-Northwest Atlantic	536 895	19.3	1 205 981	21.8	1:2	47 193	19.4
20-Atlantic Marine	72 144	2.6	996 439	17.9	1:14	25 725	10.6
TOTAL	2 788 349	100.0	5 543 913	100.0	1:2	243 795	100.0

Table 2: The jurisdictional areas and coastline lengths of marine ecozones.

Coastlines

Measuring coastlines is always dependent upon factors like the scale of the base map and the physical geography. The more detailed the map base becomes, the more likely it is that coastline details can be properly measured and represented. In coastal areas like Labrador, eastern Baffin Island and British Columbia, moving from 1:1 000 000 to 1:250 000 baseline map makes a marked difference. Values measured in Labrador would increase by a factor of three. On smooth, lined coasts which have few islands like southern coastline of Hudson Bay, the differences in coastline measurement may jump by just an increment of 1.5.

Measured at intermediate scales like 1:500 000 / 1:250 000, Canada has over 243 795 kilometres of coastline. The earth's circumference is a mere 12, 756 kilometres or 19 times smaller than the nation's coastline. About 65 percent of the coastline is connected with the Arctic Archipelago Ecozone; another 19.4 percent is included in the Northwest Atlantic Ecozone. The tortuous fjords and myriad of islands provide for a diverse range of coastlines in these two ecozones.



The mesh of land and freshwater bodies are integral parts of both landscape ecosystems and terrestrially based conservation areas. In the ocean setting, the coastlines and open seas are the interwoven and vital elements of marine ecosystems and protected areas. The sea cliffs, coastal islands, bays, fjords, nearshore areas and beaches are indirect synonyms for ‘coastline’. They are important in the overall life cycle of many marine organisms (i.e. birds, mammals, crustaceans) and systems. They act as sites for colonies, perching, denning, rearing of young, foraging, resting and refuge.

Ecosystems and jurisdictions

The traditional protected area programs throughout Canada are built upon different forms of intellectual scaffolding. Some emphasize ecosystem representation, some productive wildlife habitats, some forest types, some scientific reserves and so on. However in common, they tend to work through windows based on jurisdictional frameworks that are driven by legal mandates or by provincial, territorial or national boundaries. For the newer efforts which will be devoted to marine areas, the breakdown by political jurisdictions is interesting (Table 3).

ProvinceName	Length of coast (kms)	% of Total Coastline
British Columbia	25 725	10.6
Manitoba	917	0.4
New Brunswick	2 269	0.9
Newfoundland/Labrador	28 956	11.9
Northwest Territories	161 762	66.3
Nova Scotia	7 579	3.1
Ontario	1 210	0.5
Prince Edward Island	1 260	0.5
Quebec	13 774	5.7
Yukon Territory	343	0.1
Total	243 795	100.0

Table 3: Jurisdictional breakdown of coastlines.

The coastline span of the Northwest Territories dominates the figures. The largest length of coastline, the largest amount of marine waters and the relatively weak understanding of marine systems overall, places a great deal of responsibility on northern jurisdictions and ecosystems. Newfoundland and British Columbia are also tasked by their wealth of shorelines. At the federal level, departments such as Environment (Canadian Wildlife Service), Heritage Canada (Parks) and Fisheries and Oceans Canada have responsibilities which transcend all of these coastal areas.

Moving ahead

“It used to be green side up!” This expression is sometimes used to describe the state of Canada’s terrestrial ecosystems. In the southern latitudes, the expression has some sense



of truth. The Prairie Ecozone, for example, has undergone extensive alterations owing to agricultural activities (i.e. farming, ranching, feedlots,) to the point that native greenery is all but gone. Unfortunately ecosystems like this were highly valued as a farmscape long before protected areas gained wider currency as a value of equivalent status. What quote will eventually summarize our progress with marine areas?

Some of the earliest work on promoting a national and inclusive system of marine protected areas was done in the late 1980's and reported in the Council's Occasional Paper No. 9. As little has been done to strategize a system for establishing a comprehensive network of marine protected areas until recently, the diversity in organizations with capabilities to implement such a system is opportune. With the downsizing and resource reductions which seem to be universally applied across governments, a great deal of synergy will be required to have timely and meaningful actions. The CCEA as well as many other ENGOs, scientific groups and concerned individuals welcome the initiatives and leadership which federal and provincial departments/ministries have undertaken.

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