

# ECOSYSTEM-BASED MANAGEMENT IN CANADA: TRENDS FROM A NATIONAL SURVEY AND RELEVANCE TO PROTECTED AREAS

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## **SUMMARY**

We conducted a nation-wide survey to assess the state of ecosystem-based management (EBM) in Canada. Detailed interviews were completed with at least 10 individuals in each region of Canada, representing government, industry, non-government environmental, and municipal agencies. Some significant results include: 1) EBM lacks explicit definitions in most jurisdictions; 2) explicit adoption of EBM terminology in policy and legislation occurs mainly at the federal level (especially in national parks); 3) provinces and territories have a wide disparity in the level of adoption of EBM; 4) the forest industry has been an enthusiastic sector with respect to advancing EBM, especially with respect to the emulation of natural disturbances; 5) development of research related to human dimensions lags far behind ecological dimensions; 6) some notion of an EBM approach is widely accepted between agencies, but the details of meaning differ significantly. A portion of the survey was designed to be comparable with a similar project completed in the United States so that trans-national comparisons could be made. Of note is that EBM in Canada has fewer grassroots initiatives and less formal institutional commitment than in the United States. Protected areas managers need to understand the different conceptions and definitions of EBM, as well as the values underlying the definitions, in order to work towards effective ecosystem-based approaches that are consistent with the operational goals of protected areas in the landscape.

## **1. INTRODUCTION**

Ecosystem-based management (EBM) is a promising new paradigm in the interdisciplinary fields of natural resource policy, planning and management [1-4]. The ideas associated with EBM are now widely discussed in the scientific literature, the rhetoric of environmentalism, the policy of natural resource management, and even in courts of law [5]. Although agreement is lacking for a single operational definition, there is considerable consensus for a core set of EBM principles [6]. Common elements in discussions of EBM include: a systems approach that integrates the complexity of social and ecological elements, focus on long-term sustainability rather than on short-term outputs, ecologically derived boundaries, commitment to adaptive management in the face of uncertainty, recognition of temporal and spatial scales and a dedication to collaborative management processes [7-16]. In this paper, we define EBM as an approach to guiding human activity using collaborative, interdisciplinary and adaptive methods with the long-term goal of sustaining desired future conditions of ecologically bounded areas that, in turn, support healthy, sustainable ecological and human communities [17].

An ecosystem approach to integrated land and water management has a relatively long history in Canada, but the first formal adoption of the terminology did not occur until the Great Lakes Water Quality Agreement of 1978 [18]. Ecosystem management is recognized in Canada as being a key tool contributing to the persistence of ecological integrity [19] and sustainable development. In a recent submission by the federal government to the United Nations Commission on Sustainable Development, the ecosystem approach in Canada was described as being:

based on the idea that if humans subscribe to and apply an appropriate set of values and are equipped with the required knowledge and tools, they can protect and

maintain ecosystems, derive a quality existence from them, and simultaneously ensure that opportunities for future generations are retained. An ecosystem approach is an adaptive process that employs a suite of integrated programs to care for the earth's natural assets by managing our relationship with other components of ecosystems and ensuring that our perceptions, values, and behaviours work in support of ecosystem function. It is an encompassing process that captures the range of social, economic, and ecological values that ultimately define human-ecosystem relationships [20].

Despite the history of EBM approaches in Canada, much of the literature published on the topic of ecosystem management is focused on experience in the United States. The purpose of this paper is to summarize trends in EBM arising from a survey of relevant agencies across Canada. Characteristics, enabling factors, and barriers of ecosystem management in Canada will be summarized and contrasted with literature from the United States.

## **2. METHODS**

The intent of the project was to obtain a representative sample of EBM initiatives from across Canada. The aim was to obtain a selection of responses from federal, provincial, municipal, industry and non-government environmental organizations. Literature and web-based searches were conducted for each province or territory to identify potential agencies and individuals for participation. Criteria for identification of potential participants included agency literature with the presence of terminology that included "ecosystem approach," "ecosystem-based management" or "ecosystem management." If one of these terms did not appear within the literature of an agency or jurisdiction, other natural resource management terms that implied a holistic management approach were identified. Senior-level managers were then contacted by phone or e-mail to invite participation. Participation was entirely voluntary, anonymity of respondents was insured, and all procedures were consistent with the ethics approval granted by the University of Calgary.

A survey instrument was developed to be comparable with a similar effort conducted at the University of Michigan for ecosystem management in the United States [21]. The instrument was comprised of both open and closed-ended questions and was delivered via a telephone interview. The survey focused on identifying specific characteristics of the ecosystem management initiative familiar to the respondent (e.g. history, size, participation, issues, etc.) as well as general trends in ecological management. All respondents were contacted to schedule an interview and were sent a copy of the instrument so that they would be better prepared to respond. Interviews were completed in 30 to 60 minutes with all responses recorded by the interviewer. Respondents were also given the option of providing additional information by e-mail or FAX. All data were transcribed into a spreadsheet or text file for quantitative and qualitative analyses. The results presented in this paper provide an overall thematic and trend analysis.

## **3. RESULTS AND DISCUSSION**

### **3.1 Sample**

Seventy-six interviews were completed in the winter of 1999. Figure 1 illustrates the geographic distribution of the sample. The distribution is roughly proportional to the number of ecosystem-based management initiatives and size of province/territory. However, we did not have the interview translated into French and this limited the number of respondents that we were able to identify and interview in Quebec. The sample reflects a wide distribution of responses across the primary sectors engaged in EBM (Figure 2).

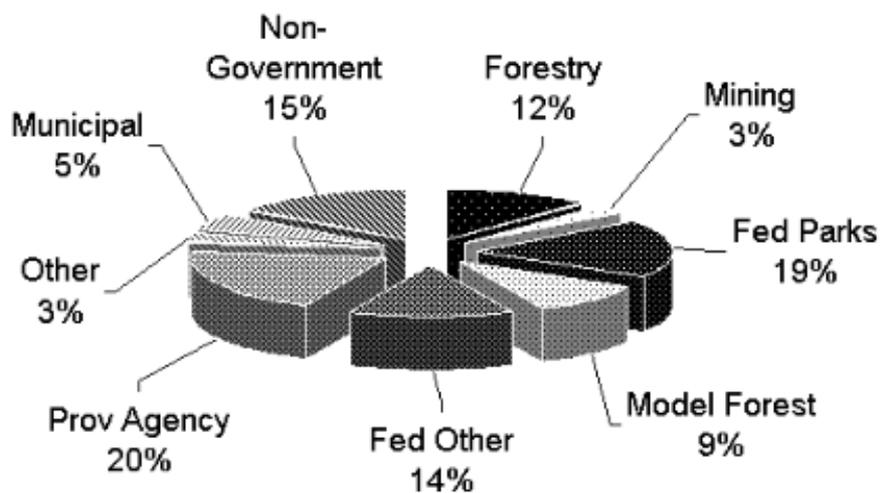


Figure 1. Geographic distribution of completed surveys (n=76)

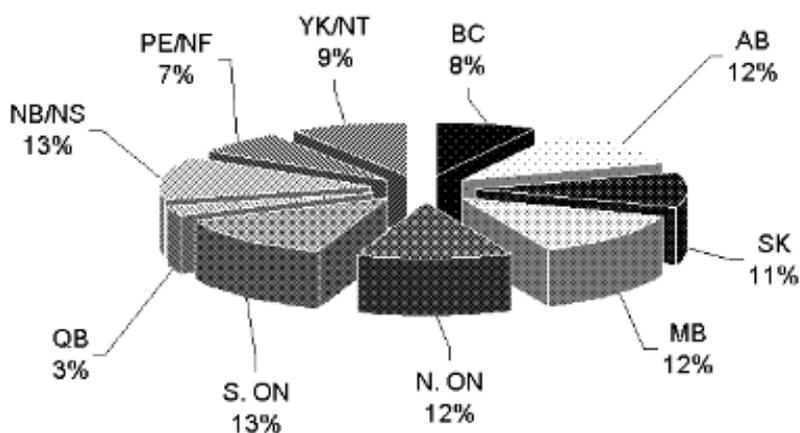


Figure 2. Sectoral distribution of completed surveys (n=76)

### 3.2 The Changing Nature of Natural Resource Management in Canada

Based on personal experience, interviewees were asked to identify the most significant changes in natural resource management approaches in the last decade. The following is a consolidated list of themes from the responses:

- holistic/ecosystem approach,
- increased public involvement,
- increased interagency cooperation,
- better educated public,
- more accountability,
- increased perception that humans are a part of the ecosystem.

Managers were consistent in their opinions that their activities have become more externally focused and subject to scrutiny. Nearly all respondents mentioned the increased level of public sophistication and interest in resource decisions leading to a greater

requirement for accountability. Respondents were also clear in articulating a changing philosophy of management toward more holistic, integrated approaches. Some specific examples include a shift away from a single-species focus and a greater interest in landscape-level patterns and processes.

### 3.3 Terminology

When asked if the term “ecosystem management” was formally used to describe the mandate and/or activity of their agency, 35 (46%) interviewees responded positively. Another 10 (13%) respondents indicated the use of “ecosystem based management” or “ecosystem approach”. Other labels used by agencies to describe their activities and approaches included: sustainable development/use (10.5%), watershed management (8%), and integrated resource management (5%). All respondents expressed some familiarity with ecosystem management concepts, although few agencies had accepted formal definitions. Despite the fact that many agencies did not label their initiative as EBM, the elements/characteristics/themes generally associated with EBM were strongly reflected by all respondents (Table 1).

**Table 1. The presence of specific ecosystem elements identified by respondents as being part of their programs. (Responses reflect a Likert scale where 1 = strongly disagree and 5 = strongly agree).**

Ecosystem management element / characteristic	Median	Mean
The desired outcome is to maintain biodiversity and ecological processes	5	4.69
The concept of ecological integrity is a component of the project	5	4.63
The role of humans as part of the ecosystem is acknowledged	5	4.63
Project issues are addressed at more than one scale	5	4.54
Communication between participating agencies is a central goal	5	4.49
Ecological health is a concept that is addressed in your program	5	4.47
The project crosses administrative or political boundaries	5	4.32
Monitoring is part of your program	5	4.28
Monitoring will be used to support adaptive management	5	4.27
The project focuses on sustaining the ecosystem rather than the outputs	5	4.19
Public involvement is included in your management	5	4.08
The overall effectiveness of the program is being monitored and evaluated periodically	4	4.04
The project includes special consideration of endangered species	4	3.97
Ecological research is central to your management program	4	3.87
Public involvement is meaningful and effective	4	3.63
Social science research is being conducted as part of your management	4	3.38
Computer modeling is used to predict future ecological states	4	3.19
Economic gain is a central goal of the project	2	2.48

### 3.4 Goals

Respondents to the survey provided a wide array of EBM goals associated with their initiatives. The most prevalent goals mentioned (in decreasing order of frequency) were:

- the maintenance of ecological integrity/health,
- education & communication,
- sustainable resource extraction,
- biodiversity maintenance,
- restoration,
- economic viability.

The dominance of ecological integrity is partly a reflection of the number of national parks in the sample. Ecosystem integrity is now entrenched in the National Parks Act, parks policy and individual park management plans. However, similar terminology is being adopted provincially and by the private sector as well. The goals identified above show some bias

toward the ecological side of the EBM equation. Outside of economic viability, notions of sustainability of human communities were largely absent from the responses. This may be a function of emphasis of natural resource managers in the sample, but it does point out the need for further development of the human dimensions elements of EBM.

### 3.5 Strategies

The most prevalent strategies mentioned for achieving EBM goals were:

- interagency cooperation,
- increased public and other stakeholder participation,
- ecological research.

There was significant convergence around the key strategic themes. Respondents clearly indicated that, by definition, EBM requires efforts and participation beyond conventional boundaries. The strategies listed above illustrate the recognized requirement for more and broader input, both social and ecological, into ecological management and decision-making. The theme of collaboration was consistent throughout the entire survey. It was noted that some agencies, particularly federal, were better able than others to generate greater degree of interagency cooperation and stakeholder participation, possibly because such external collaboration was considered to be a primary management goal. In contrast, the forest industry was more focused on the application of EBM principles to their operations through the incorporation of ecological parameters, such as through the adoption of guidelines to emulate natural disturbance patterns, than on engagement in broad collaboration and education processes. There was also a consistent theme regarding the need for more ecological understanding, especially related to large-scale ecosystem dynamics.

### 3.6 Barriers and Constraints

Respondents provided a list of many factors that acted to constrain EBM efforts and effectiveness. The list of themes, in descending order of frequency, included:

- insufficient resources (money, time, human),
- lack of common vision and goals,
- inter and intra agency conflict,
- lack of ecological knowledge,
- lack of public “buy-in” and participation.

In an era of having to do “more with less”, it is not surprising that respondents mentioned lack of resources as a primary barrier to EBM. To develop the goals and strategies identified in the previous sections, agencies clearly feel they require more time and more capacity than currently exist. Perhaps of more interest is the recognition that a lack of common goals and values between agencies is a significant barrier to EBM. For effective EBM clear articulation of socially desired ecological conditions and means of achieving them is required. Ecological science is necessary, but not sufficient in this process. Moving directly into details of ecological management without first developing a clear foundation of socially defined objectives is recognized as a recipe for failure in collaborative EBM processes [22]. This is not to suggest that managers should expect, or even desire, consensus on value-based positions, but providing a forum for visioning and values articulation will result in social learning [23] and a more open forum for conflict resolution. Such approaches can help to identify “common ground” and areas of agreement about what is good for society [24]. In a review of collaborative EBM processes, researchers concluded:

The people involved in many collaborative processes we have studied cannot afford the luxury of believing in collaboration as an abstract “God-and-motherhood” notion in which the story ends with all parties walking hand-in-hand into the sunset. Their goals were to improve the on the ground situation, not to achieve some imagined state of bliss [22].

Many of the ideas reflected in the discussion of barriers with respondents indicate the presence of institutional impediments. The compartmentalized and single purpose “silos” in

which most managers find themselves result in difficulties and disincentives to engaging in integrated, ecosystem-based approaches. Institutional structures need to be examined for their effectiveness in dealing with EBM approaches [25]. Change is required to promote more horizontal integration within and between agencies as well as more capacity for shared decision-making with citizens [26]. However, such change is needed precisely when many individuals and agencies are feeling the demoralizing effects of “reorganization fatigue”. The constant shuffling, reorganization and “downsizing” of ministries and agencies that has characterized the last two decades in Canadian resource management has resulted in much suspicion and skepticism regarding organization restructuring. Finally, the legal and policy structures that were developed without an integrated EBM approach in mind are also contributing significantly to the challenges of effective EBM [27].

### **3.7 Enabling Factors**

When asked to provide the single most important factor that helped to enable EBM initiatives, respondents provided the following themes:

- key leadership of one individual,
- agency support,
- effective partnerships,
- public/stakeholder involvement,
- resources (primarily funding).

The presence of an individual “champion” for EBM initiatives was recognized as essential to EBM success. Associated with individual commitment is support of the agency at all levels. Several respondents indicated that more EBM-type efforts are required, but that other internal pressures and crises result in EBM being conducted as a collateral activity rather than central focus. Individuals who are able to operate in spite of such pressures are essential to effective collaborative efforts. Furthermore, senior management and political support allows for such individuals to advance EBM initiatives. Committed individuals with strong leadership abilities are able to forge partnerships with key individuals in other agencies and with public interests.

### **3.8 Changes that Would Make a Difference**

Interviewees were asked to indicate the one most valuable change that would bring about more effective EBM. The themes emerging from the responses include:

- more resources,
- more comprehensive participation,
- common vision/goals,
- shared land ethic,
- public involvement,
- greater influence and authority.

The themes reflected in this question are consistent with the messages in previous questions. Rather than being unnecessarily redundant, this reinforces the validity of the central research findings. With the exception of “more resources” all of the themes are related to the need for effective collaboration and participation.

### **3.9 Advice to Others**

Interview participants were asked to reflect on their own experience and then offer advice to a hypothetical emerging EBM initiative. The list of advice includes:

- develop and facilitate stakeholder support/involvement (early and comprehensively),
- identify common vision/clear goals,
- promote education/communication,
- think long term / be patient,
- secure funding,
- develop partnerships,

- start small and build upon successes.

Again, the themes emerging from responses to this question are consistent with the results of earlier questions. Involving all stakeholders early in a collaborative process founded on the identification of values, vision and goals is one of the strongest recurring themes throughout this research. The novel elements emerging in this question are related to long-term commitment. Several participants commented on the radical nature of the management paradigm shift encompassed by EBM. The individual, society and institutional changes required to fully embrace EBM will require time to develop and permeate society and institutions. Managers must develop approaches and measures of progress that take the long-term view into account.

### **3.10 Status and Success**

Half of the respondents identified the status of their programs as “new and emerging” and less than 20% classified their initiatives as “well established”. When asked to comment on the success of their EBM initiatives, 2/3 of respondents rated their programs as successful or very successful. However, when probed further, few had specific criteria for measuring progress or evaluating effectiveness. Continued and additional support for EBM initiatives will require that explicit measures of performance be developed and reported to the public and to senior decision-makers and politicians.

### **3.11 Significant Needs for Improvement**

Interviewees identified several specific areas of EBM requiring improvement. The list of suggestions can be summarized as follows:

- development and integration of social science methods,
- monitoring and adaptive management,
- clearer vision & goals development,
- better resource commitment,
- urban ecosystem management,
- examination of organization change.

The need for more and better social science was identified in many interviews. A unique element on the above list compared to previous questions is the emergence of urban ecosystem management. Human dominated urban ecosystems can both benefit from the knowledge gained through wildland EBM experience and contribute to our overall understanding of ecosystem pattern and process [28, 29, 30]. Protected areas can play a key role in helping people understand the critical linkages between urban and wildland ecosystems.

### **3.12 Comparison to the United States**

The general themes emerging from a review of EBM in Canada are remarkably similar to those found in an earlier survey of U.S. experience [21]. The differences in Canadian experience are primarily related to the differing history and context of EBM in each country. EBM in the U.S. emerged as a part of a powerful political agenda largely resulting from conflicts around forestry and wildlife in the Pacific Northwest [11]. The “new perspectives” [31] that were developed by the United State Forest Service acted as a primary driver for EBM in the U.S. and were thus closely associated with the forest industry. In Canada, the adoption of EBM approaches by the forest industry were certainly influenced by the U.S. experience, but the presence of EBM in the context of protected areas, especially National Parks played an equal, if not greater, role.

EBM has been adopted to a greater degree at the grassroots level in the U.S. resulting in a wide array of community and watershed-based initiatives. Such initiatives have emerged in Canada as well, but they are not as explicitly tied to EBM. In general, EBM is less of a social movement in Canada and more of a large scale management philosophy. EBM is also more entrenched in legislation and policy in the U.S. and has been the subject of more litigation.

#### 4. CONCLUSIONS

EBM is clearly taking root and developing in Canada. EBM is beginning to be more formally reflected in the mandates of agencies at the federal, provincial and municipal level, as well as in the private sector. Federally, the notion is clearly entrenched in Parks Canada policy following the explicit inclusion of ecological integrity in the revised Parks Act [32]. Likewise, EBM terminology and concepts pervade the guiding documentation for national oceans and fisheries management (see for example the Oceans Act 1997). The Species at Risk Act, legislated in 2002, highlights an ecosystem approach as a means to protect threatened and endangered species. An ecosystem approach is also recognized as a critical national tool in moving towards sustainable development [19]. Provincially, the tenets of EBM are being used to shift the focus of resource management toward more integrated and ecosystem-based approaches. Indicators of the shift can be seen in the following examples:

- Saskatchewan Environment identifies an “ecosystem approach” as one of their strategic principles and organizes their programs and management tools under the banner of ecosystem management;
- The Northwest Territories has a designated position for an “ecosystem management biologist” in the Ministry of Wildlife and Economic Development;
- The EBM mandate for the north and central coast areas of British Columbia is resulting in new working models of EBM for regional sustainability.

Other similar initiatives can be identified in every jurisdiction across the country.

EBM is born of the recognition that reductionist approaches to “wicked problems” [33] have largely failed. The complexity of wicked problems arises not merely from the fact that they are complicated, but that they are characterized by radical uncertainty and plurality of legitimate perspectives [34]. There is, therefore, a strong normative foundation to EBM, which partly explains the difficulty in arriving at a single definition. The interests, values and knowledge of the individuals or groups developing an EBM approach will determine their definition of “the problem” and color what they think “ought” to be done. Yaffee [6] proffers a typology founded on three points along a normative EBM continuum: 1) environmentally sensitive multiple use, 2) ecosystem approach to resource management, and 3) ecoregional management.

Environmentally sensitive use takes an anthropocentric perspective that seeks to foster multiple human uses subject to an understanding of environmental constraints that goes beyond that considered in traditional multiple-use management. An ecosystem approach incorporates a biocentric view in which ecosystems are understood as a metaphor for holistic thinking requiring an expanded consideration of the dynamism and complexity of ecological systems, scale phenomena, and the need for management across ownership boundaries. Ecoregional management takes an ecocentric perspective that focuses on the management of specific landscape ecosystems defined as real geographic spaces and that shifts management focus toward ecosystem processes and away from biota (p. 713).

The continuum described above helps to provide a framework for understanding different perspectives on EBM. One end of the spectrum is more akin to tweaking existing management systems while the other end is more interested in fundamentally reframing the relationship between humankind and the rest of the natural world. However, rather than fretting about attaining consensus on a single perspective, the framework allows for progress to be measured along the continuum towards greater sustainability.

In conclusion, ecosystem-based management is clearly a dominant emerging approach to natural resource management, protected areas management, and sustainable development in Canada. Because EBM is predicated on social values and it is in a nascent stage of development, there is no general agreement on one operational definition. The value in a currently fuzzy definition is that it is broad enough to provide an umbrella for multiple

interests with overlapping objectives across the landscape. However, the values and beliefs underlying individual and agency conceptions of EBM need to be carefully examined and compared in the collaborative milieu that is the arena for EBM. It is highly unlikely that participants in EBM processes will share identical value sets so it is critical to identify the areas of convergence and divergence. Success in EBM will be dependent on dedication to an adaptive approach and a willingness to embrace change. Protected areas managers should take a lead role in moving EBM practice beyond park boundaries and into practical application at a regional or greater ecosystem level. Protected areas can help to foster an EBM that transcends a subtle alteration of business-as-usual environmental management and instead evolve new approaches that reflect the radical changes required for authentic sustainability.

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