



**Forest  
Practices  
Board**

## **Cumulative Effects: From Assessment Towards Management**

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*Special Report*

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# Executive Summary

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The Forest Practices Board has had growing concerns about the cumulative effects of resource use on the British Columbia (BC) land base for a number of years. In our work examining forest and range practices, it was often apparent that other activities were impacting the land and water; activities that were not regulated under the *Forest and Range Practices Act*.

The Board decided to undertake a cumulative effect assessment case study in the Kiskatinaw River watershed near Dawson Creek, looking specifically at effects of resource development on drinking water, soil and caribou habitat. The Board also reviewed current literature relevant to the subject of cumulative effects assessment. At the same time, the Board reviewed a project-specific cumulative effects assessment as part of the investigation of a public complaint about an independent power project.<sup>1</sup> This summary report is about the learning gained from these separate but related processes:

- Cumulative effects assessments are often required to obtain approval for major projects, but there are significant structural impediments that limit the utility of those assessments. These include problems collecting baseline information, limited external guidance about the significance of effects and the incremental nature of decision making about individual project approvals.
- There is no requirement to assess the cumulative effects of the myriad of minor activities that are continually authorized on the land. The result is that cumulative effects of the natural resource development remain largely unknown and unmanaged. A commonly proposed solution to this problem is to conduct broad scale assessments (e.g., regional strategic environmental assessments). These solutions meet with limited success because there are no institutional mechanisms to use the results of the assessments—that is, there is no one to tell.
- Cumulative effects assessment methods have some inherent difficulties because there is a need to consider human values in the assessment. Deciding what people value is a social—or political—process, while determining how those values are affected by human activities should be a scientific process. For a variety of reasons, this distinction is difficult to make. Once made, the assessment can be problematic because we can rarely, if ever, directly examine the effects of activities on human values so we choose indicators that represent those values. In order for those indicators to be useful we need specific and measurable objectives for them. Those objectives must include the notion of limits. The Board found that methods exist for resolving these issues.
- A fundamental requirement for cumulative effects assessment is a solid base of information about the real world. Unfortunately our information base is relatively poor and is deteriorating in some cases.

The issues the Board has identified with cumulative effects assessment are not primarily about the methods of assessment; they are about the need for a comprehensive land management framework in which those methods could be used. It is clear to many that, “making marginal improvements in a seriously flawed cumulative effects assessment system is unwarranted.”<sup>2</sup>

The Board believes that progress can be made if cumulative effects assessment methods are appropriately embedded in a land management framework that is designed to meet the objectives society has for values on the land. Such a framework requires the following elements:<sup>3</sup>

1. Government has an ongoing process for developing and articulating broad strategic direction about society's values for the land and natural resources.
2. Structures exist to ensure that decisions are made, at appropriate spatial and temporal scales, about the kinds and amounts of human activities that should take place on the land. At a minimum this requires mechanisms for setting specific and measurable objectives for the values articulated by government.
3. Private rights (and responsibilities) are issued to public land and resources within the limits imposed by objectives. This is meant to ensure that values held by society, for example cultural rights and duty to future generations, are respected.
4. Some proposed activities may be assessed to ensure that they will have the minimum negative effect and maximum positive effect on values. This function also serves as a check on whether objectives will be met.
5. Regular monitoring of actual activities and effects is done to ensure that objectives are being met. Feedback, both positive and negative, would be provided. This monitoring includes the need to continuously improve inventories of natural resources.

# 1.0 Background

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The Forest Practices Board is aware of growing concern about the need to assess and manage cumulative effects. This concern has been expressed formally as part of a complaint from an environmental, non-government organization; and through presentations to the Board from the forest industry and Aboriginal peoples. The concern has also been expressed informally by a variety of people on numerous occasions to Board members and staff.

The Board began an investigation of the issue in September 2008. The bulk of the investigation involved completion of a sub-regional cumulative effects assessment case study for the Kiskatinaw River watershed near Dawson Creek, BC (an area of some 2800 km<sup>2</sup>) looking specifically at effects of resource development on drinking water, soil and caribou habitat. The intent of conducting the case study was to provide the Board with the kind of insights that can only be gained through firsthand experience. The results of the case study can be found at [http://www.fpb.gov.bc.ca/SR39\\_CEA\\_Case\\_Study\\_for\\_the\\_Kiskatinaw\\_River\\_Watershed.pdf](http://www.fpb.gov.bc.ca/SR39_CEA_Case_Study_for_the_Kiskatinaw_River_Watershed.pdf). Examples from the case study are used here to illustrate points.

This document provides general conclusions on the topic, garnered from the case study and a broader investigation by Board staff that involved:

- a review of published literature and policy documents with a focus on information relevant to BC;
- extensive formal and informal discussions with natural resource managers and stakeholders; and
- an investigation of a complaint to the Board about the East Toba-Montrose hydroelectric facility, including a consideration of whether cumulative effects were adequately addressed (results to be published as part of a separate complaint investigation).

The Board is primarily interested in the effects of forestry and range management in BC. Until recently these activities usually were the dominant human activities causing change on Crown land in BC. In the context of forestry, the issue of cumulative effects was rarely discussed, *per se*; partly because the legislation governing forestry includes the concept of sustainability,<sup>4</sup> but also, because there were usually few, if any, other activities to consider. More recently, in many parts of the province, forestry has come to be seen as only one of many human activities that are having effects on the landscape.

For example, in the Board's case study area (the Kiskatinaw River watershed upstream of the water intake for the City of Dawson Creek at Arras) there are more than 1,200 explicitly authorized activities, including:

- 15 forest licences (including forest licences, small business timber sale licences, woodlot licences, and occupant licences to cut)
- 24 range use permits
- 33 water licences and 13 licensed waterworks authorized by the Ministry of Environment and temporary water withdrawal permits granted for 25 locations by the Oil and Gas Commission
- 200 oil and gas exploration and development permits
- 29 coal mining tenures
- 96 licences, leases and permits granted under the *Land Act* for activities ranging from quarrying to wind power
- 802 *Land Act* right- of-ways, primarily for pipelines and utilities
- 16 registered traplines
- 3 guide/outfitter territories
- 20 recreational tenures

Note: This summary does not include any unauthorized activities. It is also important to know that there is no consolidated source of information about actual activities that are being conducted under these authorizations, and in some cases there is no information at all (e.g., most water licences).

These activities have been authorized within their respective legal and policy environments, more or less in isolation. The recently created Ministry of Natural Resource Operations may be effective in consolidating the authorization and regulation of natural resource activities. That is necessary, but not sufficient, to adequately manage cumulative effects.

## 1.1 What are Cumulative Effects?

Cumulative effects assessment has a long tradition in the field of environmental impact assessment. This has resulted in many definitions of cumulative effects in published literature, and various governments' policy documents and laws. Over the years, practitioners of cumulative effects assessment have proposed different classifications of cumulative effects<sup>5</sup> in an effort to explain how to assess them. The utility of these classifications has been called into question because, "they imply that cumulative effects somehow represent a special class of effect, when the critically important point is quite simply the need to assess the aggregate stresses acting on environmental values."<sup>6</sup> That is, all effects are cumulative effects simply because all effects accumulate—through time and over space.

There are two important aspects about cumulative effects that we must be aware of. First, a series of individually insignificant effects can accumulate to result in a significant overall effect. For example, each water licence on a stream may only withdraw a small amount of water, but a large number of small licences may withdraw enough water to negatively affect fish habitat near the mouth of the stream. Secondly, it is possible that the cumulative effect of stressors on the environment may be more than the simple sum of the individual stressors. For example, a fish population may be able to cope with an industrial pollutant when there is plenty of water to dilute it and they may be able to cope with low water levels resulting from an industry that withdraws water but the fish are unable to cope with the combined effects of both stresses.

The above discussion expresses one specific perspective on cumulative effects; that is the issue of cumulative effects of past and potential future human activities on the environment. This perspective represents the typical concerns of practitioners of environmental impact assessment and members of environmental organizations and the lay public. However, there are other perspectives on the issue, notably among those with existing tenures or cultural rights who perceive that the cumulative effects of the activities of others are compromising their ability to exercise their rights.<sup>7</sup>

## **2.0 Issues with Current Approaches to Cumulative Effects Assessment and Management**

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In BC, cumulative effects assessments are only formally conducted in the context of environmental assessments for major projects; industrial activities like mines and pipelines. Well respected practitioners and observers of the field of environmental assessment have been saying for many years that project-specific environmental impact assessment is not well suited to the consideration of cumulative effects. Peter Duinker and Lorne Grieg have gone so far as to say that, in the context of project-specific assessments:

...the promise and the practice of cumulative effects assessment (CEA) are so far apart that continuing the kinds and qualities of CEA currently undertaken in Canada is doing more damage than good.<sup>8</sup>

Project level assessments are focused determining what the potential residual impacts of a project are on the environment, society and culture, the economy and human health. Based on that assessment, a decision is made whether a proposed project should be approved.<sup>9</sup> However, project proponents are focused on obtaining project approval; doing only what one must to get that approval usually means minimizing effort concerning cumulative effects.<sup>10</sup> Beyond this, there are structural problems often encountered when applying CEA methods in project-specific assessments:<sup>11</sup>

- When considering any given project, the values of interest and the sum of effects on those values usually go well beyond the spatial and temporal scale of the effects of the project itself. Collecting and interpreting complete contextual baseline information may be impossible or at least an unreasonable expectation, particularly for smaller projects.
- For most values (other than water and air quality) there is rarely any explicit external guidance about objectives that can be used to adequately assess the significance of the effects of a project.
- The incremental nature inherent in project specific environmental assessment can result in land use patterns based on historical use and the sequence of project applications rather than conscious decisions about the best use of the land.

Setting all of this aside, an overriding issue is that the environmental assessment process in BC is only applied to major projects.<sup>12</sup> There is no process for considering the cumulative effects of the myriad of individually insignificant activities that are continually authorized on the land. The result is often referred to as ‘the tyranny of small decisions’ or ‘death by a thousand cuts.’ It involves the progressive nibbling loss of valued resources through activities such as building well sites and roads, forest harvesting, water withdrawals and non-point source pollution. For this reason it seems clear that cumulative effects assessment has little practical value unless it is in relation to the overall capacity of an area or region to sustain resource values in the face of all human activities.<sup>13</sup>

Attempts to deal with this overriding issue have spawned a variety of assessments that go beyond the project level, variously known as strategic environmental assessments, regional strategic environmental assessments, and sustainability assessments. Unfortunately, Canadian examples of regional scale cumulative effects assessments are falling far short of their potential.<sup>14</sup> A fundamental challenge seems to be the lack of appropriate decision-making frameworks.<sup>15</sup> Assessment alone, no matter how well founded, is of no value unless it is used to inform decision making. Unfortunately, there are virtually no institutional mechanisms for using the results of regional scale assessments to guide policy development, objectives setting exercises or project/activity level decisions.<sup>16</sup>

In BC, there is no broadly applied cumulative effects assessment process but, more importantly, there is no broadly applied framework for managing cumulative effects. The cumulative effect of natural resource development remains largely unknown and unmanaged. The Board is concerned that, to the extent that there is an issue, there is no one to tell – there is no decision maker in the context of cumulative effects.

### **3.0 Towards a Land Management Framework**

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What might such a land management framework look like? There is no shortage of examples specifying the answer to this question.<sup>17</sup> In broad strokes, what is required is:

- a process for deciding what to do and specifying how to do it;
- mechanisms for implementing those decisions; and
- methods for evaluating the results and providing feedback.

In BC, the recent creation of the Ministry of Natural Resource Operations represents the potential for a significant advancement in the mechanism for implementing decisions about what to do on the land. This ministry should be able to make rapid progress in this endeavor because of the work already done through the resource management coordination project.<sup>18</sup> There are also programs in place for evaluating the results of natural resource management actions, although those programs have limitations, as will be discussed later.

What seems to be missing is a well structured, transparent process for deciding what to do and specifying how to do it. We have legal tools such as the *Environment and Land Use Act* that could provide over-arching guidance,<sup>19</sup> although the committee enabled by this act has been effectively inactive for many years (the Board notes, with some optimism, that the recent restructuring of the natural resource sector in the BC government has resulted in a re-energization of this committee). Provisions are made, under *Land Act* sections 93.1 and 93.3, for “balancing multiple natural resource uses” and “resolving land use conflicts.” However, there are no regulations to bring these provisions into force. Some guidance for decision making can obviously be obtained from existing land use plans. This is particularly true in those areas of the province where the plans were completed recently with the benefit of government-to-government discussions with affected Aboriginal peoples.<sup>20</sup> Unfortunately, in much of the rest of the province the existing land use plans are woefully out of date. In general, the plans did not thoroughly consider activities other than forestry, they were developed without the participation of Aboriginal peoples and they did not incorporate considerations of recently emerging issues such as climate change. These factors seriously limit the utility of the plans when considering the management of cumulative effects. Existing programs like the BC Conservation Framework<sup>21</sup> and objectives enabled by regulations of the *Forest and Range Practices Act* could be part of a toolbox and the government continues to work on developing additional tools (e.g., the proposed Environmental Mitigation and Offsetting Policy<sup>22</sup> and Water Sustainability Act).<sup>23</sup> However, the existing elements are insufficient as a framework for making decisions about cumulative effects management.

The Board believes that there are at least four important lessons to be learned from the methods of cumulative effects assessments that would be useful in making progress towards a framework for cumulative effects management. As discussed below there is a need to:

- separate discussions about what people value from evaluations of effects on those values;
- explicitly recognize that we can rarely, if ever, assess effects on human values themselves; we must choose surrogates that indicate those values;
- create specific and measurable objectives that include the notion of limits; and
- recognize that good decisions require good information; that information must be fed back to the decision makers.

### 3.1 Separating Value Discussions from Assessment Methods

People's concern about sustainability is a concern about the effects of human activities on their values. People's values are individually held but must be expressed collectively through a process of discussion. What is important in this context is that:

- Deciding what people want for the values they confer on the land should be almost entirely a political exercise,<sup>24</sup> tempered by what is possible. This topic is mainly in the domain of politicians, policy makers and interested members of the public.
- Methods of assessing whether people's aims for their values will be met if we engage in some activity on the land should be a technical or scientific exercise. This topic is mainly in the domain of natural resource scientists and managers.

This distinction is often blurred, in part because the scientific exercise needs to be completed in the absence of a full discussion about people's values (e.g., a cumulative effects assessment is legally required). Nevertheless, this distinction is critical because science is supposed to be an impartial evaluation of facts.

We often hear calls that, "science should prevail" in discussions about environmental issues in general and about cumulative effects assessment in particular. It is clear that we need science to aid in our deliberations about values, particularly when it comes to telling us what is possible, or even necessary, in terms of sustaining human activity in the natural world. But we cannot look to science to answer questions about what we want from, or value in, the natural world.<sup>25</sup> Rather than relying on science to provide solutions we need to employ a full suite of tools to truly engage people in making decisions about what should be done on the land.<sup>26</sup>

### 3.2 Choosing Indicators for Values

We can rarely, if ever, directly assess the effects of natural resource management on human values because human values typically do not exist in the natural world. Human values are conferred values<sup>27</sup> like satisfying obligation to future generations, enabling the continuation of a way of life, or maintaining some form of economic activity related to resource use. Achieving these values relies on things in the natural world but the values do not 'exist' there. As a result we have to choose surrogates for, or indicators of, the values themselves.

This is a well known issue in the environmental assessment process and the method of dealing with it could be generalized to fit within a broader framework for cumulative effects management. Policy makers and interested members of the public need to first engage in an exercise to determine what people value. The results of that exercise needs to become increasingly specific as the discussions move from a provincial (or global?) scale to the specific area under consideration. Subsequently, natural resource scientists have to agree with the public on a set of valued ecosystem components (VECs) that indicate those actual values. Studies would be designed to investigate potential effects on the VECs. Ideally the VECs actually are the values but this is rarely possible. In almost all cases there is a need to, "strike a

compromise between studying the valued ecosystem components and the nearest surrogate components for which useful predictions are possible.”<sup>28</sup>

For example, in the Kiskatinaw case study, the VECs chosen for the case study represent a range of possibilities:

- Drinking water quality and quantity represents a thing that is actually valuable. The people of Dawson Creek consume water and they need it to sustain their lives.
- Forest soils are of no direct value to people. However, forest soils are critical to the productivity of the forest ecosystem. That productivity is of direct value to those that extract resources from the forest.
- Winter habitat for caribou is a weak surrogate for the ability of the landscape to sustain caribou populations. Caribou populations in turn are a surrogate for different values held by different people. To many Aboriginal people in the area, sustainable caribou populations are a surrogate for their cultural right to carry on a way of life (that involves hunting caribou). To many members of the general public, and natural resource managers, sustainable caribou populations are a surrogate for sustained ecosystem function. They are seen through the metaphor of the canary in the coal mine.

An important conceptual problem is that different people confer different values on the same things in the natural world. The result is that the choice of VECs depends to a great extent on the people involved in the process at a given point in time.

For example, in the Kiskatinaw case study, there is no absolute reason why drinking water is the right VEC. While it seems unlikely, a public consultation exercise might have chosen water supply for hydraulic fracturing by the natural gas industry as a VEC.

An important methodological issue concerning values revolves around the scale at which the evaluation must be done. Issues of scale are complex and involve space and time. Questions must be answered about how big an area to consider and how long a time frame is relevant. Questions must also be considered about what level of spatial and temporal detail (or resolution) is required for a useful analysis.<sup>29</sup> These issues are pervasive topics in discussions about cumulative effects assessment and management because the scales of all of the things of interest (valued things in the natural world, human activities and authorized rights) can be different and variable.

For example, in the Kiskatinaw case study:

- Valued things
  - The caribou in the study area in the winter currently range south well beyond the study area and their range in the study area has contracted over the time period of the assessment.
  - Drinking water occurs at the pump house at Arras and varies dramatically at several temporal scales (e.g., annual, Pacific Decadal Oscillation).
- Human activities
  - Geophysical (seismic) surveys are widespread throughout the watershed and the region and are expected to cover the entire study area in the near future.
  - There are 37 stream crossings on erodible soils.
- Authorized rights
  - Treaty 8 rights have existed over the entire area for 150 years.
  - Any given *Water Act* section 8 water withdrawal authorization occurs at one point in space for one year.

We have well developed methods of dealing with scale issues in natural resource management through hierarchical modeling in space and time. The outputs of those models can be used to inform both discussions about values and objective setting exercises, as discussed below.

### 3.3 Being Specific About Objectives

Defining the full range of values of interest, and the best possible surrogates to indicate those values (VECs), is the first step in making decisions about how to manage cumulative effects. However, in order to decide on a course of action, we need specific and measurable objectives for the values against which the actions can be evaluated.

In regional scale cumulative effects assessments, there is often an attempt to specify objectives based on the concept of thresholds (sometimes referred to as benchmarks or targets). It is important to note that the word threshold can have different meanings for natural resource scientists and practitioners of CEA. To scientists the word generally means, “points where even small changes in environmental conditions will lead to large changes in system state variables.”<sup>30</sup> This is congruent with the common language definition of the term as a place that marks a change. Unfortunately, while we do know that thresholds exist in nature<sup>31</sup> they can be difficult, or impossible, to identify for many VECs. Ziemer has observed that, in the context of a CEA, “often the reason to identify thresholds is a desire to allow some management action to proceed unhindered until the magnitude of the effect reaches a point at which regulation becomes necessary. That ‘threshold’ often is not physically or biologically based, but is the point at which the public becomes adequately alarmed and demands action.”<sup>32</sup>

The Board suggests that, rather than thresholds, the notion of limits is a far more useful way to approach specifying objectives for values. Steven Kennett discussed how limits can be used in cumulative effects management.<sup>33</sup> He points out that limits can be informed by science-based thresholds, where possible, but limits must also be informed by stakeholder knowledge, trade-off analysis, and explicit flexibility mechanisms including adaptive management. In addition

the Board believes that the notion of limits may usefully be informed by the precautionary principle.<sup>34</sup>

For example, in the Kiskatinaw case study the Board used the concept of limits of concern to discuss cumulative effects on the VECs. We found no true thresholds that could be applied.

- For drinking water, there was an actual water turbidity threshold, above which the pumps cannot operate, but that level is frequently exceeded. The limit we chose was that there should be no increase in the frequency over time.
- For caribou habitat there are studies that correlate the levels of industrial development with levels of habitat use by caribou and even rates of population change. However, these correlations have no 'threshold' characteristics.
- For soils, we found no science-based information about limits of acceptable soil loss at a landscape level. We had to extrapolate from site level limits and we considered a landscape level limit from a nearby area that was based on a stakeholder negotiation process.

The Board sees no insurmountable difficulty applying the methods associated with specifying indicators for values and establishing objectives for those indicators based on the notion of limits. What seem to be missing are institutional mechanisms to employ those methods to actually make decisions, at appropriate spatial and temporal scales, about the kinds and amounts of human activities that can and should take place on the land. Those mechanisms need to be attached to specific areas of land, and they need to involve natural resource scientists, managers and the stakeholders that will be affected by the decisions.

### 3.4 The Need for Good Information

Cumulative effects management must be forward looking. The effects on the environment in the past are done and are often difficult to undo. Nevertheless, a good understanding of the past is often invaluable when attempting to project:

- the short-term future (say 10 years) to estimate the incremental effect of new activities to see if there is a danger of crossing a limit of acceptable change.
- the long-term future (say 100 years) for the purpose of exploring human values and of defining objectives and limits of acceptable change.

For these reasons, a thorough analysis of baseline conditions, including the temporal sequence that leads to the present, is a required task in cumulative effects assessment.

For both these purposes, there is no shortage of methods (models) that enable us to represent our understanding of, and information about, the world in spatially and temporally explicit ways. However, one requirement to have projections of the future influence decision making is that they must be based on solid information about the real world. Unfortunately, our information base is relatively poor and, in some cases, deteriorating. The result is that considerable time and effort must be devoted to collecting and verifying baseline information. Some information of considerable value to the exercise will simply not be available.<sup>35</sup>

For example, in the Kiskatinaw case study:

- The Oil and Gas Commission provided information about permits and approvals for oil and gas activities but it did not provide any information about what has actually taken place on the land base.
- Map-based information about forest harvesting was several years out of date and road mapping for the area has not been updated since 1996.
- There was no information about actual water usage for any of the water use permits or authorizations except for the water use permit granted to the City of Dawson Creek (although the Oil and Gas Commission now requires some reporting of water usage by the natural gas industry).
- Environment Canada stopped recording any precipitation information at the Dawson Creek Airport weather station in June 2006. While they began recording total precipitation again in September 2009, they do not record the amount falling as snow or the amount of snow on the ground.

Part of what is required for decision making is the ability to focus information needs on current and, hopefully, emerging issues. That would allow expenditure of information gathering resources on need-to-know, rather than nice-to-know topics. The result would be that future iterations of the process would be better informed and better decisions might be made.

## 4.0 Conclusions

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There is a growing consensus that human activities are causing an accumulation of effects that are becoming a significant problem at a planetary scale.<sup>36</sup> Examples of global scale issues are loss of biodiversity,<sup>37</sup> climate change<sup>38</sup> and disruption of nitrogen cycling.<sup>39</sup> These global concerns highlight the need for us to live within limits that will allow future generations to have a reasonable quality of life. What that requires of natural resource managers in British Columbia is that they not only assess, but also appropriately manage, the cumulative effects of activities at provincial, regional and local scales.

The Board concludes that, in BC, the current methods for cumulative effects assessment are largely ineffective in contributing to the management of those effects. Where proponents are required to conduct cumulative effects assessments to obtain approval for major projects, there are structural impediments that limit the utility of those assessments. More importantly, there is no requirement to assess the cumulative effects of the myriad of minor activities that are continually authorized. Because there is no requirement to do cumulative effect assessments on the totality of natural resource development, the overall effect remains largely unknown. There are methods for assessing these effects but, to the extent that there is an issue, there is no one to tell—there is no decision maker in the context of cumulative effects.

The Board believes that the methods of cumulative effects assessment are not flawed, but they are applied, if at all, largely in isolation—outside of a well-defined framework for making decisions about cumulative effects management.

The Board proposes a potential solution by embedding appropriate methods throughout a land management framework that has the following elements:<sup>40</sup>

1. Government needs to have an ongoing process for developing and articulating broad strategic direction about society's values for the land and natural resources including setting priorities for competing (or incompatible) values. This would be done with the participation of policy makers in the public service and interested members of the public.
  - **Methods** involving community engagement<sup>41</sup> and scenario planning, as specifically adapted for natural resource management<sup>42</sup> would be useful.
2. Structures need to be developed to ensure that decisions are made, at appropriate spatial and temporal scales, about the kinds and amounts of human activities that can and should take place on the land. At a minimum this requires setting specific and measurable objectives for the values articulated by government. Institutional mechanisms for setting objectives need to be attached to specific areas of land, and they need to involve natural resource scientists, managers and the stakeholders that will be affected by the decisions.
  - **Methods** that would be useful depend largely on the scale at which the decision needs to be made. It is this part of the framework where the methods and expertise developed through regional cumulative effects assessments and similar land use planning analyses could best be applied.
3. A process is required for issuing private rights (and responsibilities) to public land and resources that will ensure natural resource development remains within limits of acceptable change. This is meant to ensure that values held by society, such as pre-existing private rights, cultural rights and duty to future generations are respected while allowing further development to occur.
  - **Methods** of ensuring that the wide varieties of private rights are issued appropriately are not well developed. In BC the recent formation of a Ministry of Natural Resource Operations represents an initial step.
4. In some cases proposed activities will need to be assessed to ensure that they will have the minimum negative effect and maximum positive effect on values. This function should also serve as a check on whether objectives will be met.
  - **Methods** like those used in project specific environmental impact assessments would be appropriate.

5. Regular monitoring of actual activities and effects needs to be done to ensure that objectives for values are being met. Feedback needs to be provided to appropriate parts of the framework.
  - **Methods** for monitoring most activities and effects are well established. The utility of those methods depends on two things that are currently problematic in natural resource management in BC, namely that specific and measurable objectives must exist, and there must be an institutional will to conduct sufficient inventory and monitoring both in space and time.

It is clear that, “making marginal improvements in a seriously flawed system for cumulative effects assessment is unwarranted.”<sup>43</sup> The Board believes that progress can be made if cumulative effects assessment methods are appropriately used in a process of continuous improvement of a land management framework that is designed to meet the objectives society has for values on the land.

## 5.0 End Notes

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- <sup>1</sup> This complaint investigation is ongoing and the results will be published at a later date.
- <sup>2</sup> Duinker P. and Greig L. 2006. **The impotence of cumulative effects assessment in Canada: ailments and ideas for redeployment.** *Environmental Management*. 37(2):153–61.
- <sup>3</sup> This proposed framework is not particularly novel. It is similar to the “decision making continuum” described in Kennett, S. 2006 [Integrated landscape management in Canada: Getting from here to there. CIRL Occasional Paper #17] and many of the concepts in the framework are similar to those in the “Land-Based Management Statement” of the Association of BC Forest Professionals available at: [http://www.abcfp.ca/publications\\_forms/publications/documents/Pat\\_Bell\\_LBM.pdf](http://www.abcfp.ca/publications_forms/publications/documents/Pat_Bell_LBM.pdf).
- <sup>4</sup> Notably the determination of allowable annual cuts under section 8 of the *Forest Act*.
- <sup>5</sup> For example, additive, compensatory, synergistic and masking.
- <sup>6</sup> *Supra* note 2.
- <sup>7</sup> For example, presentation to the Board by Interfor titled, **Just one hectare and Bearing the burden: The effects of mining on First Nations in British Columbia by the International Human Rights Program, Harvard Law School.** Summary available at: [http://www.fns.bc.ca/pdf/Harvard\\_Summary.pdf](http://www.fns.bc.ca/pdf/Harvard_Summary.pdf).
- <sup>8</sup> *Supra* note 2.
- <sup>9</sup> Although that process may be fraught with its own set of difficulties as described by Haddock et. al in 2010 [http://www.elc.uvic.ca/publications/documents/ELC\\_EA-IN-BC\\_Nov2010.pdf](http://www.elc.uvic.ca/publications/documents/ELC_EA-IN-BC_Nov2010.pdf).
- <sup>10</sup> *supra* note 2. Also note that this problem is not unique to Canadian CEA. e.g. Wildesen, L. 2009. **A profound misunderstanding: Current vs. best practices in US CEA.** Presented at the IAIA Meeting Calgary AB Nov. 7 2009.
- <sup>11</sup> Kennett, S. 1999. **Towards a new paradigm for cumulative effects management.** Canadian Institute of Resources Law Occasional Paper #8.
- <sup>12</sup> As defined by the *Reviewable Projects Regulation of the Environmental Assessment Act*.
- <sup>13</sup> Rees, W. 1995. **Cumulative Environmental Assessment and Global Change.** *Environmental Impact Assess. Rev.* 15:295-309.
- <sup>14</sup> Noble, B. 2009. **Promise and dismay: The state of strategic environmental assessment systems and practices in Canada.** *Environmental Impact Assessment Review* 29:66-75.
- <sup>15</sup> Bardecki, M.J. 1990. **Coping with cumulative impacts: An assessment of legislative and administrative mechanisms.** *Impact Assessment Bulletin* 8:319-344 and *supra* note 14.
- <sup>16</sup> *Supra* note 14. and see also the Forest Practices Board report [http://www.fpb.gov.bc.ca/SR34\\_Provincial\\_Land\\_Use\\_Planning\\_Which\\_Way\\_From\\_Here.pdf](http://www.fpb.gov.bc.ca/SR34_Provincial_Land_Use_Planning_Which_Way_From_Here.pdf).
- <sup>17</sup> For example, *supra* note 11; [http://www.abcfp.ca/publications\\_forms/publications/documents/Pat\\_Bell\\_LBM.pdf](http://www.abcfp.ca/publications_forms/publications/documents/Pat_Bell_LBM.pdf); <http://www.for.gov.bc.ca/hfp/archives/amhome/amhome.htm>; [http://www.livingwatersmart.ca/water-act/docs/wam\\_wsa-policy-proposal.pdf](http://www.livingwatersmart.ca/water-act/docs/wam_wsa-policy-proposal.pdf).
- <sup>18</sup> Personal communication Charlie Western, Director, Strategic Leadership, RMCP. 2010/10/15.
- <sup>19</sup> Under this act, it is the duty of the environment and land use committee to ensure that “all the aspects of preservation and maintenance of the natural environment are fully considered in the administration of land use and resource development commensurate with a maximum beneficial land use, and minimize and prevent waste of those resources, and despoliation of the environment occasioned by that use.”
- <sup>20</sup> The Sea-to-Sky, Central Coast, North Coast, Haida Gwaii and Morice plan areas.
- <sup>21</sup> <http://www.env.gov.bc.ca/conservationframework/>
- <sup>22</sup> <http://www.env.gov.bc.ca/emop/>
- <sup>23</sup> [http://www.livingwatersmart.ca/water-act/docs/wam\\_wsa-policy-proposal.pdf](http://www.livingwatersmart.ca/water-act/docs/wam_wsa-policy-proposal.pdf)
- <sup>24</sup> In the sense of a process by which groups of people make collective decisions.

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<sup>25</sup> Scott et al. 2007 [Policy advocacy in science: prevalence, perspectives and implications for conservation biologists. *Conservation Biology* 21:29-35] present clear evidence that “value-laden language and stipulation of policy preference occur frequently in research journals in the natural resource disciplines.” Their solution is that scientists adopt value-neutral language when communicating with policy makers.

However, Sarewitz, 2004 [How science makes environmental controversies worse. *Environmental Science & Policy* 7:385-403] provides a well reasoned argument why this is not possible. He discusses three reasons “First, science supplies contesting parties with their own bodies of relevant, legitimated facts about nature, chosen in part because they help make sense of, and are made sensible by, particular interests and normative frameworks. Second, competing disciplinary approaches to understanding the scientific bases of an environmental controversy may be causally tied to competing value-based political or ethical positions. The necessity of looking at nature through a variety of disciplinary lenses brings with it a variety of normative lenses, as well. Third, it follows from the foregoing that scientific uncertainty, which so often occupies a central place in environmental controversies, can be understood not as a lack of scientific understanding but as the lack of coherence among competing scientific understandings, amplified by the various political, cultural, and institutional contexts within which science is carried out.” He concludes that “the value bases of disputes underlying environmental controversies must be fully articulated and adjudicated through political means before science can play an effective role in resolving environmental problems.”

While this may, in some sense, be true it does not represent a practical solution to the problem at hand. Part of this issue is that science is an institution that is thoroughly embedded in our society, it can no more be ignored than banks or religions. A proposed solution is that science (and scientists) admits to its “rationalistic neurosis” (Maxwell, N. 2004. *Is science neurotic?* World Scientific Publishing Co. Pte. Ltd. London.) and stop pretending to be more reasonable than it is (or they are). Scientists cannot help but view the world through their own sets of norms and values. As long as they realize that, and the people that are engaged in the values discussions realize that, then scientists can provide useful and appropriate contributions to decision making processes about natural resource management.

<sup>26</sup> Ashlin, H. 2004. *Towards Whole of Community Engagement: A Practical Toolkit*  
[http://www2.mdbc.gov.au/\\_data/page/1071/ToolkitFinal.pdf](http://www2.mdbc.gov.au/_data/page/1071/ToolkitFinal.pdf).

<sup>27</sup> Note that this point of view is not entirely at odds with various more-or-less biocentric philosophies that “confer” inherent value on some or all parts of the natural world, nor does it ignore the fact that human beings are part of the natural world. An extensive, recent, discussion of the topic can be found in *How Canadians Value Nature: A Strategic and Conceptual Review of Literature and Research* by CSOP Research and Consulting for Environment Canada. summary available at <http://www.biodivcanada.ca/default.asp?lang=En&n=24D8B61F-1>.

<sup>28</sup> Beanlands, G. and Duinker, P. 1983. *An Ecological Framework For Environmental Impact Assessment In Canada*. Federal Environmental Assessment Review Office.

<sup>29</sup> Eng, M.A. 1998. *Spatial patterns in forested landscapes: Implications for biology and forestry*. pp. 42-75 In Voller, J. and S. Harrison (editor). *Conservation biology principles for forested landscapes*. UBC Press, Vancouver, BC.

<sup>30</sup> Hobbs, R. and K. Suding. 2009. *Threshold models in restoration and conservation: a developing framework*. *Trends in Ecology and Evolution* 24:271-279.

<sup>31</sup> The Atlantic cod fishery provides a particularly stark example.

<sup>32</sup> As quoted in *supra* note 2.

<sup>33</sup> Kennett, S. 2006. *From science-based thresholds to regulatory limits: implementation issues for cumulative effects management*. Prepared for Environment Canada, Northern Division.

<sup>34</sup> “[w]here there are threats of serious or irreversible damage, lack of full scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation”  
<http://www.unep.org/Documents.multilingual/Default.asp?DocumentID=78&ArticleID=1163>.

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- <sup>35</sup> This problem is not specific to the study area or British Columbia. When discussing a cumulative effects assessment sponsored by the Colorado Department of Transportation, where we might expect there would be 10 times as much effort put on data collection as we do (given the size of the population and economy) the conclusion was that “relevant data, even at the regional scale, were missing altogether; or were available only in incompatible scales or formats; or were not available for the relevant time period; or were so fragmentary as to be misleading at best. The report instead became a narrative overview of regional history and resource concerns; a worthwhile contribution to scenario-building but not very helpful for on-the-ground applications.” (Reid, L. 2010 **Cumulative watershed effects of fuel management in the western United States**. USDA Forest Service RMRS-GTR-231).
- <sup>36</sup> For example, Rockström and 28 others. 2009. A safe operating space for humanity. *Nature* 461(24):472-475.
- <sup>37</sup> Reid, W. 2005. Ecosystems and human well-being: synthesis. Millennium Ecosystem Assessment. Island Press, Washington, DC.
- <sup>38</sup> IPCC. 2007. Climate Change 2007: the physical science basis. Contribution of working group 1 to the fourth assessment report of the intergovernmental panel on climate change. Cambridge University Press. Cambridge, UK.
- <sup>39</sup> Gruber, N. and Galloway, J. 2008. An Earth-system perspective of the global nitrogen cycle. *Nature* 451(17):293-296.
- <sup>40</sup> *Supra* note 3.
- <sup>41</sup> Ashlin, H. 2004. Towards Whole of Community Engagement: A Practical Toolkit [http://www2.mdbc.gov.au/\\_data/page/1071/ToolkitFinal.pdf](http://www2.mdbc.gov.au/_data/page/1071/ToolkitFinal.pdf).
- <sup>42</sup> For example, Duinker, P. 2008. Scenarios of the Forest Futures Project: Why and How We Created Them, and How to Use Them. Sustainable Forest Management Network. [http://www.sfmnetwork.ca/html/forest\\_futures\\_e.html](http://www.sfmnetwork.ca/html/forest_futures_e.html).
- <sup>43</sup> *Supra* note 2.



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