

**A Collaborative Approach to Assessing
Regional Cumulative Effects
in the Transboundary Crown of the Continent**

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Abstract

The report focuses on results of a research project for creating and assessing a regional framework to examine cumulative effects within the Crown of the Continent Ecosystem, a shared region of the Rocky Mountains between Alberta, British Columbia and Montana. A coalition of public land managers, the Crown Managers Partnership (CMP), has recognized the need for assessing cumulative effects as part of an ecosystem-based approach to sustainable development. A survey instrument was administered to the membership of the CMP to determine level of interest as well as drivers and barriers to collaborative transboundary approaches to ecosystem management and cumulative effects assessment. A collaborative modeling approach to assessing regional cumulative effects is presented. The cumulative effects assessment framework being developed by the CMP includes the use of a computer model known as ALCES[®] (A Landscape Cumulative Effects Simulator). The use of the model and collaborative process are evaluated and recommendations for further research and development are provided.

Executive Summary

The most significant environmental issues facing society today (e.g., climate change, loss of biodiversity, declining quality and quantity of freshwater) are the result of cumulative effects, the complex additive and synergistic effects in time and space of repeated and multiple actions. Sustainable development, adaptive ecosystem-based management and the emergence of other holistic planning, policy and management paradigms echo the need for novel approaches to strategically address these cumulative effects in order to achieve the goals of ecological integrity, economic sustainability and social equity.

The theory and practice of considering cumulative effects in the assessment of individual project proposals has advanced significantly over the past two decades. The experience and insight gained from project-based cumulative effects assessment (CEA) points to the need for the consideration of cumulative effects at a more strategic level. Higher-level assessment of cumulative effects could result in the availability of more and better strategic information to aid in planning and to provide a more comprehensive context for the assessment of individual project proposals. However, the assessment of cumulative effects of policies, plans and programs over large geographic areas and long time frames requires the development of new collaborative approaches.

This study reports on a demonstration research project to create a regional framework for assessing cumulative effects within the Crown of the Continent Ecosystem, a Rocky Mountain region managed by a myriad of public and private interests in Alberta, British

Columbia and Montana. The report focuses on the experience of a group of public land managers participating in an informal, inter-agency, international working group known as the Crown Managers Partnership (CMP).

The CMP is comprised of representatives from more than 20 government agencies. A third party, neutral organization, the Miistakis Institute, provides the secretariat and research support to the CMP. The overall goal of the CEA project is to develop an educational and analytical tool that will assist land managers in developing a strategic framework to consider the cumulative effects of current and future land uses in the region. The objectives of the research project were to:

- identify drivers and barriers to develop a multi-jurisdictional, international framework for regional cumulative effects assessment,
- develop a process to facilitate ongoing, collaborative data collection and harmonization for modeling regional cumulative effects,
- assess the value of both the process and model and make recommendations regarding the ongoing development of the framework and its implementation.

The size and complexity of the task requires long-term commitment to the process. The findings reported herein should therefore be considered a work-in-progress.

A Web-based survey was administered to members of the CMP in an effort to determine the level of knowledge and interest regarding CEA and to identify the most significant drivers and barriers to pursuing a complex regional CEA. Survey respondents were supportive of pursuing a regional CEA program and recognized the value of such an

initiative to their individual mandates. Participants indicated that the most important characteristics of effective collaborative CEA initiatives were: 1) clearly defined and shared goals and objectives, 2) shared commitment for long-term involvement, 3) adequate commitment of resources, 4) common issues and pressing need for response, 5) frequent and effective communication, and 6) mutual respect and trust among participants. Conversely, participants identified the most important barriers to effective collaboration initiatives in resource management as: 1) lack of resources, 2) lack of shared agency mandates and philosophies, 3) lack of agency support, 4) inter-agency barriers and “turf” issues, and 5) lack of continuity of participating members

The fundamental components of the CEA framework are: project management (includes shared issues identification), data collection, base case modeling, scenario modeling, and the development of communication products for decision support. The process is iterative and adaptive with the goal of continuous improvement.

The CEA framework being developed by the CMP includes the use of a computer model known as ALCES[®] (A Landscape Cumulative Effects Simulator). ALCES[®] is a stock and flow (systems dynamics) model constructed in a STELLA[®] modeling environment. The model operates by establishing relationships (pathways and rates of flow) between entities (stocks) of interest (e.g., land-use and land-cover types) and then simulates the changes in the entities over time. ALCES[®] enables resource managers, industry, society and the scientific community to explore and quantify the cumulative, dynamic effects of human land-use practices and existing natural disturbance regimes. ALCES[®] contributes

to a strategic cumulative framework through its use as an exploratory tool to identify emerging regional issues and opportunities, and by examining the potential implications of trends and policy choices under a range of future scenarios. This model is driven through a collaborative visioning process that ultimately contributes to planning regional sustainability. The benefits of building collaborative institutions, predicated on a shared understanding of issues and a high level of communication, extend well beyond the model results.

Modeling complex phenomena at the landscape level is data intensive. There are three types of data required for ALCES[®] modeling: spatial, metric, and trend. Spatial data exist in a variety of formats and scales and thus create challenges of harmonization across the study area. Metric data (non-spatial, non-trend parameters describing land use) and trend data (projections of future trends) describe and characterize the ‘flows’ – the factors that influence the changes in those stocks. As with spatial data, values of metric and trend data vary tremendously across the study area, are neither uniformly collected nor standardized, and (in the case of trend data) are conjectural. In many cases, the data simply do not exist in a published format. This requires convening workshops of subject experts who can work through a consensus-based process of determining, vetting and substantiating all metric and trend values.

Maintaining multiple agency involvement in a complex, multi-year project has been difficult, despite there being high support repeatedly expressed by those agencies for a regional, cumulative effects project. Agencies are operating under challenging conditions

characterized by tight budgets, shifting priorities, changing governments, and limited human resources. The result that many of the participants have been hard-pressed to provide funding, time and personnel. However, a core group of participating agencies has continued to provide the necessary support for the initiative.

In order to ensure the sustainability of the project, it is recommended that: 1) the CMP should continue to explore the potential mechanisms and appropriate timing for attaining higher level recognition and support for the partnership and the cumulative effects project; 2) the goals and objectives of the project be revisited with CMP members through a series of small group meetings; 3) CMP members secure long-term financial and human resource commitments to the project through communicating the benefits of leveraging; 4) better and more frequent communication tools be developed for internal use; 5) the activities and benefits of the CMP be communicated to the general public and relevant interest groups; 6) the CMP make a commitment to monitoring, feedback and continuous improvement of the cumulative effects project; and 7) participating agencies should look for opportunities to explicitly incorporate the data, tools and model outputs from the cumulative effects project into existing agency programs in order to demonstrate the benefits of participation.

1. Introduction

1.1 Setting the Stage

The environmental effects of concern to thinking people are, simply put, **not** the effects of a particular project; they are the cumulative effects of everything. Hence, it is essential logically to address cumulative effects if one wishes to consider the environmental effects of development projects. This, and not the regulatory requirement, is the intellectually defensible reason for requiring cumulative effects assessment (Ross, 1994, p.6-7).

... CEA is both essential and possible, as long as our objectives are modest, our science sharp, and our tolerance of uncertainty substantial. CEA, in my view, is merely EIA done right, thus bearing results that are both useful and defensible (Duinker, 1994, p. 11).

The most significant environmental issues facing society today (e.g., climate change, loss of biodiversity, declining quality and quantity of freshwater), exist not because of effects arising from any individual action, but because of the complex additive and synergistic effects in time and space of multiple human actions and natural change. “The reality is not single stressors creating significant impacts, but multiple causality, interacting processes and populations of both past and present human activities affecting a number of valued resources in a geographic area” (Shoemaker, 1994, p. 95). The proliferation of cumulative effects has been attributed to the incremental and disjointed nature of decision-making (tyranny of small decisions) that characterizes many contemporary institutional structures and regulatory approval processes (Creasey, 2002; Kahn, 1966; Kennett 1999; Odum 1982). Sustainable development, adaptive ecosystem-based management and the emergence of other holistic regional planning, policy and

management paradigms echo the need for novel approaches to strategically address cumulative effects in order to achieve the goals of ecological integrity, economic sustainability and social equity (Cocklin et al. 1992; Court et al. 1994; Noble 2002; Piper, 2002; Prato, 2003; Slocombe, 1994; Stinchcombe and Gibson, 2001).

While cumulative effects assessment at the project review level is still evolving, the past decade has been witness to significant advances in theory and practice (Baxter et al. 2001; Damman, 2002; Griffiths et al. 1998; Ross 1998). However, the development of methods and approaches for assessing regional cumulative environmental effects earlier in the planning process and in a more proactive manner, has been significantly more modest (Kennett 1999, McLaughlin 2001).

1.2 Purpose and Objectives

The purpose of this study is to report on a demonstration research project to create and assess a regional framework, for proactive examination of cumulative environmental effects, within the Crown of the Continent Ecosystem. In particular, this report focuses on the experience of a group of public land managers in the transboundary Rocky Mountain environs of Alberta, British Columbia and Montana. The managers are participants in an informal, inter-agency, international working group known as the Crown Managers Partnership (CMP; see Appendix A for participating agencies). The shared landscape of interest is called the Crown of the Continent (Crown). The initiative is an ambitious attempt to consider the cumulative environmental effects of land-use within the region.

The overall goal of the cumulative effects assessment (CEA) project is to develop an educational and analytical tool that will assist land managers, in the development of a strategic framework, to consider the effects of current and future land uses decisions across jurisdictions. Such an approach would also allow land managers to assess the environmental impacts of specific projects against a developed cumulative effects baseline.

The objectives of the current research project are to:

- identify drivers and barriers to developing a multi-jurisdictional, international framework for regional cumulative effects assessment,
- develop a process to facilitate ongoing, collaborative data collection and harmonization for modeling regional cumulative effects,
- assess the value of both the process and model and make recommendations regarding the ongoing development of the framework and its implementation.

The size and complexity of the task requires long-term commitment to the process. The findings reported herein should, therefore, be considered a work-in-progress.

1.3 Cumulative Effects: Towards a Regional Approach

In order to provide a proper context for the assessment of cumulative environmental effects of specific projects cumulative effects would have to be addressed at other more strategic levels of decision-making e.g., policy and program development, land use and integrated resource planning, conservation or sustainable development strategies. These processes are better suited than those for project-level decision-making to accommodate broader temporal and spatial scales and considerations of the interactions between multiple stressors and effects (Drouin and LeBlanc, 1994, p.35).

The accumulation of past, current and future impacts, resulting in additive or synergistic influences on the environment, are referred to as cumulative effects (Hegmann et al. 1999; CEQ, 1997). Cumulative effects may be the result of a single activity occurring repeatedly, such as industrial discharge into an aquatic system, or from multiple activities of related and/or unrelated sources, such as reductions in river flow as a result of irrigation, municipal and industrial water withdrawals (Hegmann et al. 1999; Bonnell and Storey, 2000; Cocklin et al. 1992a,b). Cumulative effects result from activities that persist over time and transmit over space, leading to direct and indirect environmental effects (Barrow, 1997; MacDonald, 2000; CEQ, 1997). Cumulative effects arise from a variety of situations and activities, such as large, impact generating projects, that produce significant environmental change, to numerous small, individually insignificant projects, that in combination have a compounding and degrading effect on the environment (Kennett, 1999; Piper, 2002). Frameworks for understanding cumulative environmental effects generally consider the sources, pathways and effects of environmental change (Cocklin et al., 1992a,b; Contant and Wiggins, 1991; Sonntag et al. 1987).

Cumulative effects are identified and assessed through CEA (Sears and Yu, 1994; Spaling and Smit, 1993). CEA is the antithesis of site-specific, linear cause-and-effect analysis. CEA is a process that provides proponents and stakeholders with a set of tools to systematically evaluate the impact of proposed actions on the environment and social-economic systems (Griffiths et al. 1998; Bonnell and Storey, 2000). CEAs allow stakeholders to address environmental impacts from a single activity as well as the additive and synergistic effects of multiple impacts. The purpose of CEA, as defined by the Canadian Environmental Assessment Act (the Act), and summarised by Hegmann et al. (1999) is to:

- assess effects over a larger (i.e., "regional") area that may cross jurisdictional boundaries (including effects due to natural perturbations affecting environmental components and human actions);
- assess effects during a longer period of time into the past and future;
- consider effects on Valued Ecosystem Components (VECs) due to interactions with other actions, and not just the effects of the single action under review;
- include other past, existing and future (i.e., reasonably foreseeable) actions; and
- evaluate significance in consideration of, other than just local, direct effects.

The U.S. Council on Environment Quality (CEQ, 1997) states that the purpose of cumulative effects assessment is to “inject environmental decision consideration into the planning process as early as needed to improve decisions” (p. 3). The CEQ (1997) also

states that CEA, under the National Environmental Policy Act (NEPA), provides a mechanism for addressing sustainable development.

Two different approaches to CEA have been developed: 1) project-based; and 2) strategic (Davey et al. 2002; Noble 2000). In practice, this distinction should be considered more a spectrum of approaches rather than two completely different ideas, but we shall employ the “project-based” and “strategic” labels to discuss the differences and similarities.

Project-based CEAs are generally conducted under statutory environmental assessment processes as triggered by the terms of provincial/territorial, state or federal legislation (Bonnell and Storey, 2000). Project-based CEAs have tended to be proponent-driven and focused on the incremental impacts of proposed projects within a limited area (Kennett, 1999; Lee and Gosselink, 1988).

The project-based approach, if applied in the absence of higher-level planning, has many limitations. In particular, the spatial and temporal scales needed to adequately meet the demanding goals of CEA are often beyond the scope of a single proponent for a proposed project (Bonnell and Storey, 2000; Davey et al. 2002). A project-based CEA does not address all possible land use changes influencing the area, but is specific to the proposed development (Spaling et al. 2000). Additionally, project-level assessments are usually restricted to the perceived buffer of influence, where the impacts may occur outside the defined study area and temporal effects beyond the defined time frame of the assessment (MacDonald, 2000). Project-based CEAs may also be limited in scope to the activities

requiring approval under the environmental assessment process. For example, an environmental assessment of a proposed pulp mill may focus on impacts related to the location, footprint and operation of the mill, but not to the timber harvesting activities that supply the feedstock.

Other shortcomings of project-based approaches include the issue of regional coordination. For instance, if a number of small projects (i.e., below the threshold to trigger an environmental assessment) occur in an area, there is typically no mechanism to coordinate the CEA process (Spaling et al. 2000). Consequently, the project-based approach may not adequately address the effects of multiple smaller projects in a region (Creasey, 1998; Kennett, 1999). Furthermore, project-based CEA is focused on the assessment and not the management of the cumulative effects as there is no mechanism to address monitoring results after the CEA has been completed.

As project-based CEAs have evolved and become more comprehensive, there has been growing dissatisfaction among proponents regarding the requirements to address cumulative effects over large temporal and spatial boundaries. In particular, insufficient information about other projects and a lack of control over management have proven to be significant obstacles (Davey et al. 2002; Therivel et al. 1992). Ross (1994) illustrates the challenges, citing examples from two recent environmental assessments in Alberta (Alberta-Pacific Pulp Mill and Cheviot Mine):

how can it be fair to expect a proponent to assess the cumulative effects of its own project as well as existing and future projects of its business competitors? Must the proponent obtain detailed (and proprietary?) information about a competitor's industrial practices...? To complicate matters further, what should one do if the

cumulative effects assessment leads to the conclusion that the responsibility for an environmental problem should properly be attributed to a project that is properly licensed and not under review? (Ross, 1994, p. 6).

Indeed the final decision of the joint federal/provincial review panel, in assessing the proposed Cheviot coal mine, compelled the creation of a regional multi-agency group to manage large carnivores, recommended greater involvement and resources for regional coordination from the government, and went as far as questioning the need for changes in the regulatory approval processes; all of which are well beyond the managerial scope and responsibility of the individual proponent.

In discussing the future of the regional carnivore conservation group, the Cheviot review panel concluded:

Clearly, the ultimate success of such a program will depend on active participation of a range of parties. The Panel notes from the evidence provided at the hearing that the level of proactive participation by companies in such processes tends to be directly tied to the degree that a program may affect either their present operations or future approvals. Government, on the other hand, while wishing very much to participate in a comprehensive manner, often has difficulty in identifying adequate resources. In order to assist CRC [Cardinal River Coal] in gaining the economic as well as the moral support of other industries in the region, the Panel believes that both the EUB [Alberta Energy and Utilities Board] and AEP [Alberta Environmental Protection] may need to re-examine the process by which new licenses are granted to other regional industry players for developments which may also have a cumulative effect on carnivores. Such changes may be timely, given the fact that both provincial and federal environmental legislation now recognize that it is no longer adequate to examine the environmental impacts of a proposed development in isolation, but rather the cumulative effects must be considered. The Panel also believes that the government agencies will very likely need to identify the specific resources they can make available for their participation in the Carnivore Compensation Program in order for it to be effective (EUB/CEAA, 1997, p. 190).

Such conclusions clearly indicate the need for better strategic and regional planning mechanisms to be in place before project-based assessments can be adequately

conducted. This is not to suggest that there should be no CEA at the project-review level, but that such reviews will be more effective and realistic if conducted within the context of higher-level guidance (Drouin and LeBlanc, 1994). To meet the comprehensive purposes of CEA requires the development of frameworks to effectively coordinate and integrate components of both approaches into a more powerful tool (Dube and Munkittrick, 2001; Spaling et al. 2000, Bonnell and Storey, 2000).

Strategic environmental assessment, the second general approach to assessing cumulative effects, emerged partly as a response to the failings of project-based assessments.

In particular, it is a response to the tendency of project-level assessments to be reactionary (examining already selected and often already designed undertakings), narrow (failing to address cumulative impacts), and poorly integrated into broader political and economic processes (Stinchcombe and Gibson, 2001, p.346).

In general, strategic environmental assessment is focused on higher-level assessment of policies, programs, plans and their alternatives.

Partidário and Clarke define strategic environmental assessment as:

a systematic on-going process for evaluating, at the earliest appropriate stage of publicly accountable decision making, the environmental quality, and consequences of alternative visions and development intentions incorporated in policy, planning, program initiatives, ensuring full integration of relevant biophysical, economic, social and political considerations (Partidário and Clarke, 2000, p.4) .

The principles that make the approach ‘strategic’ include: 1) focus on strategies for action, 2) use of backcasting and forecasting, 3) consideration of alternative means of achieving goals, 4) driven by a clear articulation of goals and objectives, 5) proactive, 6) integration of ecological, social and economic considerations, 7) broadly focused, and 8)

tiered (Noble, 2000). Strategic environmental assessment has been proffered as among the most promising approaches to advance national and international commitments to sustainable development (Brown and Therivel, 2000; Marsden, 2002; Noble 2002; Piper 2002; Stinchcombe and Gibson, 2001).

The policy, planning and program elements of strategic environmental assessment imply a chronologically and hierarchically tiered order of actions, whereby higher-level policy guides program development, which in turn provides the context for project assessment (Fischer, 1999; Therivel et al. 1992). However, although a sequential and chronological approach may be logical and attractive, Noble (2000) stresses that the actual practice is more often iterative and adaptive. Table 1 provides an example of a tiered strategic approach to assessing impacts in the energy sector. For the purposes of this paper, we will limit our discussion to the level of regional strategic planning / environmental assessment.

There are two general approaches to strategic CEA: activity-based (sectoral) and area-based (regional). Sectoral CEAs are focused on individual sectors, for example the oil sands projects in northern Alberta (Spaling et al. 2000). Although the sectoral approach does not address all possible land use changes, it does enable sectoral proponents to collaborate in data collection, share in the analysis and set regional standards and thresholds (Spaling et al. 2000; Bonnell and Storey, 2000). Furthermore, although the sectoral CEA is often driven by the proponents of development, it is often supported by multiple government agencies and results in the creation of a management team

responsible for addressing regional scale issues, such as environmental thresholds and capacity, as well as coordinating project-based CEAs within the larger context (Spaling et al. 2000).

Regional CEAs typically occur over larger spatial and temporal scales than project and sectoral-based CEAs, and activities are assessed across jurisdictional boundaries (Dube, 2003). Generally, regional CEAs are initiated outside of the statutory environmental assessment process although it is recognized that they can play an important role in project-based CEA (Dube, 2003). By definition, such approaches require significant inter-agency collaboration. “A critical component in developing a framework for the assessment of regional cumulative effects is government agencies working in partnership to develop a management strategy in areas where future development will likely occur” (AXYS Environmental Consulting Limited, 2000, p. 22).

‘Regions’, for our purposes, are spatially defined by a combination of biogeoclimatic factors and human dimensions. The delineation of boundaries draws on the concepts of landscape ecology (Forman, 1995) as well as the traditions of regional planning (Whittlesey, 1954). Regional CEAs are used in planning processes as a means to assess current conditions, thresholds and environmental and social capacity. A strategic approach to addressing cumulative effects, over large geographic areas, shares considerable conceptual overlap with the long-standing field of ‘regional planning’ (see for example: Dickinson, 1976; Soja, 1985; Wannop and Cherry, 1994; Welter 2002).

The history of regional planning in North America dates back to at least 1733 with James Oglethorpe's regional plan for Savannah, Georgia, but it did not see more comprehensive evolution until the early 20th century as advanced by such individuals as Patrick Geddes (the 'father of regional planning'; Welter, 2002) and his protégé, Lewis Mumford (Luccarelli, 1995; Mumford, 1927). Geddes, Mumford and their peers advocated an ecologically based, integrated and normative approach to planning for large geographic areas, with particular emphasis on cities in their larger regional context (Fishman, 2000). Following the rise and fall of several schools of thought, interest in regional planning waned considerably towards the end of the 20th century (Foster 2001).

However, a recent and rapidly emerging body of thought is renewing widespread interest in regional planning (Foster 2001, McKinney et al. 2002). This nascent movement is being termed 'new regionalism' and Wheeler (2002) characterizes the defining elements as:

- focusing on specific territories and spatial planning;
- trying to address problems created by the growth and fragmentation of postmodern metropolitan regions;
- taking a more holistic approach to planning that often integrates planning specialties such as transportation and land use with environmental, economic and equity goals;
- emphasizing physical planning, urban design and sense of place as well as social and economic planning; and
- adopting a normative or activist stance.

Seltzer (2003) echoes the characteristics identified by Wheeler (2002) and points out the challenges associated with the "extra-territorial dynamics" that arise "where politics and

institutions are not aligned” (Seltzer, 2003, p. 5). Furthermore, large-scale regional planning requires new approaches to implementation by “intermediaries and partners rather than through direct and comprehensive control” (Seltzer, 2003, p. 6).

The issues and concerns that gave rise to new regionalism, as well as its goals and approaches, mark a notable convergence with strategic approaches to regional CEA. McKinney et al. (2002, p. 102), in a review of regional approaches to public policy and natural resource management in the American west, suggest that “regionalism looks beyond political and jurisdictional boundaries, embracing a distinctly trans-boundary approach that recognizes the natural territory of public issues, such as watersheds, ecosystems, bioregions or other organic regions.” New regionalism is a response to the failure of existing jurisdictional infrastructure to effectively manage complex transboundary issues. The movement to consider regional planning as a large-scale design process (Calthorpe and Fulton, 2001) is congruent with the aims of identifying, considering and managing cumulative effects. Although much of the current new regionalism literature is focused on regional economies and metropolitan regions, the principles are valuable in broader application to regional land-use planning.

The Northern River Basin Study is a good example of a regional CEA that addressed multiple activities, including industrial, agricultural, municipal and other developments across jurisdictions. The study area included the Peace, Athabasca and Slave River Basins in Alberta and the Northwest Territories (Culp et al. 2000a,b). This transboundary CEA included a wide range of partners and addressed all activities and their impact on

the ecological integrity of a spatially defined system. The framework included recommendations and management suggestions to improve the health and ensure sustainability of the river systems. Notably, this process resulted in the development of thresholds for nutrient and chemical loading, it provided the foundation for future environmental monitoring and follow up, and resulted in regulatory changes in the area (Culp et al. 2000a,b; Spaling et al. 2000).

Regional CEAs however, are not common in practise, partly because they are not required by legislation. The legal and policy framework developed for environmental assessment focuses more exclusively at the project level (Dube, 2003; Kennett, 1999). Since there is no legislative mechanism for conducting a regional CEA, there is also no mechanism to sustain it (Dube, 2003). Additionally, given the plethora of activities that may be occurring on the landscape, and the potential for multi-jurisdictional involvement, CEAs are often complicated processes, requiring significant amounts of time and money (Kennett, 1999).

In summary, there are shortcomings to both the project-based and strategic cumulative effects approaches, including:

- the project-based CEA does not adequately address all land uses in the area, it is driven by the proponents and spatial and temporal scales are often inadequate to address the total impact on the environment and social systems (Kennett, 1999);
- strategic-based cumulative effects assessments are often complex in nature because of large temporal and spatial scales that require collaboration and partnership across jurisdictions (Kennett, 1999);
- strategic cumulative effects assessments lack the ownership needed to develop, implement and manage the process (Griffiths et al. 1998; Dube, 2003);

- both approaches require obtaining baseline data that can be expensive and time consuming to gather (CEQ, 1997);
- both approaches lack mechanisms to sustain the process, preventing effective long-term management (Dube, 2003).

Recent CEA literature has presented the case for an integration of the two approaches to better meet the purpose of cumulative effects assessment (Dube, 2003; Dube and Munkittrick, 2001; MacDonald, 2000; Lawrence, 1997). Integration of the approaches requires a framework for synthesis (Lawrence, 1997). Dube (2003) proposed a framework for aquatic systems that integrates components of project and regional-based CEA. MacDonald (2000) suggests that CEA should be assessed at scales that parallel management regimes. This would require a clear delineation of responsibility and the development of effective communication strategies (MacDonald, 2000). Each assessment scale would be cross-referenced with other scales to provide context and information to management agencies across the system, from specific projects to regional scale issues.

2. Background

2.1 Crown of the Continent

In 1885, the editor of *Forest and Stream*, George Bird Grinnell (1849-1938), received an article for publication entitled ‘To the Chief Mountain’ wherein James Willard Schultz chronicled his adventures in the mountains of northern Montana. The article so captivated Grinnell that he immediately made arrangements to see the area for himself. Grinnell’s inaugural 1885 exploration and hunting expedition was repeated in 1887 and then almost annually for the rest of his life (Diettert and Greer, 1992). Grinnell was no stranger to the budding North American conservation movement, having been instrumental in the founding of the first Audubon Society, the American Ornithologist Union and the Boone and Crocket Club. He was also active in the protection of Yellowstone as the first national park in 1872 and was an advisor to Theodore Roosevelt. Following publication of a 15-part account of his adventures, Grinnell wrote a piece for *Century Magazine* entitled ‘Crown of the Continent’ (Grinnell, 1901). The article marks the birth of a fitting appellation that continues to be used as a label to this day (Van Tighem, 1990). Grinnell’s catalytic efforts to raise the profile of the Crown were a significant factor in the eventual establishment of Glacier National Park in 1910.

Today, the ‘Crown of the Continent’ has come to refer to a region bounded on the south by the Bob Marshall Wilderness complex in Montana, on the north by the Highwood River in Alberta, west to the Elk and Flathead Valleys in British Columbia and Montana,

and east to the foothills of Alberta. The area comprises approximately 42,000 km² (Figure 1). Near the centre of the Crown, in Glacier National Park, arises Triple Divide Peak. The flanks of this mountain give rise to the headwaters of three major river systems: Pacific Creek flows west to the Flathead River and then on to the Columbia River and the Pacific Ocean; Atlantic Creek flows southeast into the Marias Fork of the Missouri-Mississippi and eventually to the Atlantic Ocean; Hudson Bay Creek begins on the northeast side of the peak and flows to the Saskatchewan River system which drains into Hudson Bay and, eventually, the Arctic Ocean.

The Crown is accepted as a functionally defensible ecological unit at the scale of a greater ecosystem (see, for example, Darrow et al. 1990; Long 2002; Pedynowski 2003; Stanford and Ellis, 2002). Internationally recognized, for its ecological and geological uniqueness, the region constitutes one of the most ecologically diverse areas on the continent (Long, 2002). The ecological significance of the region is perhaps best indicated by the occurrence of eight large carnivore species and their associated prey; the only area remaining in the lower 48 States where such a fully intact assemblage exists. The valleys of the Crown serve as important wildlife movement corridors, connecting metapopulations of various species throughout the Rocky Mountain cordillera. Many small mammals, birds, reptiles, amphibians, fish and a wide diversity of plants punctuate the ecological importance of the Crown (Flathead Transboundary Network, 1999; Long, 2002).

The transboundary Crown of the Continent region is characterized by complex jurisdictional fragmentation. The lands of the Crown fall under the jurisdiction of more than 20 agencies, including administrations from two provinces, one state, and two federal governments, along with First Nations, municipal governments and a large number of private interests (Figure 2). The Waterton-Glacier International Peace Park, designated as the world's first International Peace Park in 1932, protects the core of the area. International recognition of the region's significance also exists by way of UNESCO World Heritage Site and Biosphere Reserve designations in and around Waterton Lakes and Glacier National Parks.

Recent interest in developing a more collaborative, ecosystem-based approach to landscape management in the Crown was catalyzed by a set of recommendations from the International Joint Commission (IJC) under the Boundary Waters Treaty of 1909 (IJC 1988). In 1985, the governments of Canada and the United States requested the IJC examine transboundary water quality and quantity issues pursuant to a proposal for a coal mine on Cabin Creek, a tributary to the Flathead River on the British Columbia side of the border. The IJC recommended against approval of the mine as proposed. The primary determining factor in the IJC recommendation was the predicted negative effects on Bull Trout, a transboundary migrant, and the consequent impact on the fishery. The report also recommended the development of new approaches to alleviate transboundary resource management conflict:

Mindful that the broad purpose of the Boundary Waters Treaty to settle and prevent disputes can make possible the identification and formulation of creative, binational approaches beyond the specific provisions of the Treaty, the Commission encourages Governments to consider an undertaking such as those

contained within the Skagit Environmental Endowment Fund [result of a 1984 agreement ending a 40-year dispute between City of Seattle and Province of British Columbia on managing the environmental and amenity values of the Skagit River] and the proposed International Conservation Reserve [reference to a proposal from the Governor of Montana to establish an international protected area in the transboundary Flathead Valley]. The principles upon which such creative structures are based - binational studies, fact finding and planning, and mutually acceptable use of resources - are, the Commission concludes, worthy of pursuit (IJC, 1988, p. 10).

The IJC (1988) report endeavoured to consider the cumulative effects of human activity in the area of interest, but reported that there were significant deficiencies in the available information leading to a high level of uncertainty about potential effects. The call for more formal and better bi-national collaborative approaches and for more detailed and integrated transboundary data has been a significant driver in subsequent discussions between the interested parties.

2.2 The Crown Managers Partnership

if the right people come together in constructive forums with the best available information, they are likely to shape effective solutions to shared problems
(McKinney et al. 2002)

The Crown is currently facing an increase in human activity, primarily manifested by urban and rural residential expansion, recreation, and resource extraction. In order to maintain essential ecological processes and manage human presence within this landscape, land managers have recognized the importance of making land use decisions within a regional cumulative effects framework. There is, however, no such framework currently available in the region.

Political, financial and technical barriers impede landscape-level collection of information necessary for trans-jurisdictional ecosystem management and cumulative effects modeling. These barriers are magnified when political borders divide a landscape (Parris, 2004). No single agency has the mandate or the resources to focus upon the entire region. Recognizing the above, a group of resource agency managers launched a new partnership initiative; the CMP.

In February 2001, government representatives from over 20 agencies gathered in Cranbrook, B.C. to explore ecosystem-based ways of collaborating on shared issues in the transboundary Crown of the Continent. Participation included federal, aboriginal, provincial and state agencies or organizations with a significant land or resource management responsibility within the Crown. The aim was to involve a blend of senior and middle managers with technical and professional staff that have a role in management at the ecosystem scale (e.g., conservation biologists, land use planners). The Miistakis Institute for the Rockies, a non-profit research organization affiliated with the University of Calgary, was invited to help facilitate the process and act as a neutral third party. The highly successful founding workshop, hosted by the Waterton-Glacier International Peace Park, resulted in a commitment by all participants to move forward collaboratively on regional management. The objectives of the CMP are to:

- build awareness of common interests and issues in the Crown of the Continent region,
- build relationships and opportunities for collaboration across mandates and borders, and

- identify collaborative work already underway and opportunities for further cooperation.

The founding meeting also resulted in consensus around five strategic issues of importance to the participants. Emphasis was placed on the identification of issues that should best be addressed at the larger regional scale. They were:

1. address cumulative effects of human activity across the region;
2. address increased public interest in how lands are managed and how decisions are reached;
3. address increased recreational demands and increased visitation;
4. collaborate in sharing data and standardizing assessment and monitoring methodologies; and
5. address the maintenance and sustainability of shared wildlife populations.

In order to advance progress on the above priorities, the CMP struck a Steering Committee. The Steering Committee, comprised of volunteer representatives from participating agencies, developed a work plan to address the priorities identified by the CMP. The Steering Committee has continued to meet on a regular basis and has made some progress on all of the priorities. The focus of this report is to discuss progress on the first priority; addressing cumulative effects of human activity across the region.

3. Relevance of the Research to Environmental Assessment Practice

The land-uses and associated infrastructure in the Crown interact in space and time resulting in additive and synergistic effects on wildlife populations, habitat, communities, and ecosystem processes. A CEA for the region could function as part of a strategic, regional planning approach allowing agencies and land managers to make informed planning decisions in a complex, multi-jurisdictional context. Including environmental considerations more explicitly and earlier in the planning process, would alleviate some of the environmental stressors and management discordance in the region as well as provide a template for policy making and legislative amendments. Furthermore, regional CEA would provide a clearer context for subsequent project-based environmental assessments.

To date, most CEAs in the Crown region have been conducted for project-based studies with specific reference to localized environmental threats. Some notable exceptions to project-based approaches include a cumulative effects review conducted for petroleum interests in Alberta's eastern slopes (Sawyer et al. 1997) and a project coordinated by Alberta Environment (Integrated Resource Management), to assess cumulative effects within the Oldman River basin (Alberta Environment, 2002). Alberta Environment is also engaged in a very large-scale CEA as part of the Southern Alberta Sustainability Strategy (Alberta Environment, 2003). These nascent efforts to consider cumulative effects are largely bounded by jurisdictional authorities. There are a limited number of

frameworks that transcend multiple jurisdictions, but none are currently operating in the transboundary Crown.

There are, however, several international agreements, to which Canada and the United States are bound, that compel consideration of transboundary environmental effects, including cumulative effects. The aforementioned *Boundary Waters Treaty* has already been called upon in the region. Additionally, Section 10.7 of the *North American Agreement on Environmental Cooperation* (a side agreement to the *North American Free Trade Agreement*) required the development of an agreement on the assessment of transboundary environmental effects. Subsequently, the parties developed the *Draft North American Agreement on Transboundary Environmental Impact Assessment* (North American Commission for Environmental Cooperation, n.d.). In response, the CEQ issued a statement of guidance concerning application of the NEPA wherein it concludes that “NEPA requires agencies to include analysis of reasonably foreseeable transboundary effects of proposed actions in their analysis of proposed actions in the United States” (CEQ, 1997, p. 1).

In addition, “within their respective EIA frameworks, [British Columbia and Alberta] have requirements for transboundary environmental impact assessment, either through provincial legislation or through bilateral agreements with neighbouring American states” (Seguin, 1997, p.1) and the Canadian Environmental Assessment Act requires that transboundary effects be included where necessary. Another relevant international agreement is the Economic Commission for Europe *Convention on Environmental*

Impact Assessment in a Transboundary Context, signed in Espoo, Finland in February, 1991 and brought into force 10 September 1997 (ratified by Canada in 1998 and not yet ratified by the United States). This agreement entrenches the obligations and principles for conducting environmental impact assessments for projects that could potentially cause significant environmental effects to a state neighbouring that where the proposed action is to occur.

Notwithstanding the international agreements, jurisdictional fragmentation characterizes the Crown, with multiple entities exercising mandates, rights or interests in the land and its resources. This jurisdictional fragmentation results in a wide range of policies and legislation regulating CEA. For example, the Act requires CEA to be applied to projects that involve the federal government (Bonnell and Storey, 2000). In addition, there is provincial legislation in Alberta and B.C. (*Alberta Environmental Protection and Enhancement Act* and the *Environmental and Assessment Act* in B.C.) that includes provisions for CEA (Griffiths et al. 1998). The *Montana Environmental Policy Act* (MEPA) governs state environmental reviews and includes requirements to consider cumulative effects. Finally, NEPA applies to decisions made by the U.S. federal government and also requires cumulative effects be included in environmental impact assessments (Mundinger and Everts, 1998; Mac Donald, 2000).

However, while individual jurisdictions may have regulations that contain provisions for CEA of individual projects, most jurisdictions do not have a legislated strategic level process that includes regional consideration of cumulative effects (Kennett, 1998). In the

absence of legislation to mandate regional CEA, there is no governing body to take ownership of such processes and subsequently, no delineated budget, human resources or the required financial resources dedicated to the process. As a result, cumulative effects analysis largely remains a process of estimating single-project effects and incremental additions to the cumulative effects in one jurisdiction.

Together with the CMP, the Miistakis Institute for the Rockies and the University of Calgary have undertaken a project to generate a collaborative approach to assessing cumulative effects in the transboundary Crown of the Continent ecosystem. Unlike other regional frameworks that have focused on impacts of single large resource base developments (Damman, 2002), the current framework integrates the effects of multiple land-uses and natural disturbance regimes across a landscape using a multi-stakeholder and multi-sectoral, iterative approach.

In contrast to project-level CEAs that are largely reactive exercises, the framework addresses cumulative effects early in the decision-making process allowing proposed developments to be assessed, in relation to an overall landscape plan. This approach engages regional stakeholders in collaborative visioning, identification of barriers and drivers to advancing cumulative effects, acceptable threshold establishment, shared data management and modeling exercises. The progress reported herein and the ongoing work of the CMP should help to make significant advances in the professional practice of environmental assessment.

4. Research Methods

4.1 Drivers and Barriers Survey

A survey instrument was designed for administration to the CMP members. The primary aims of the survey were to determine the:

- 1) level of interest, awareness and knowledge of cumulative effects assessment,
- 2) resource management and land-use issues of greatest importance to the region, and
- 3) drivers and barriers to a successful collaborative approach for assessing cumulative effects in the Crown of the Continent.

Informal interviews were conducted with five members of the CMP steering committee to assess their preferences on the style, content and delivery of the survey instrument. Input from the initial interviews, combined with logistic and budget limitations, resulted in the development of a Web-based instrument for self-administration. Web-based surveys are a rapidly emerging research method that allow for cost-effective and efficient collection of data (Couper, 2000; Couper et al. 2001; Dillman, 2000). The method was ideally suited to the type of information sought in the current survey and enhanced accessibility to very busy respondents from a wide geographic area. Research on self-administered surveys suggests that the design of the instrument may be extremely important in obtaining unbiased answers from respondents (Sanchez, 1992; Schwarz, 1995). Therefore, careful attention was paid to designing an instrument that incorporated color, graphics and interactive features that enhanced readability, simplicity and ease of

response entry (Magee et al. 2001; Ware, 2000). The survey was designed using proprietary software (SurveyMonkey.com) and hosted on the owner's Web site (Gordon, 2002). The instrument combined Likert-type and general choice questions with open-ended questions. The survey instrument was pre-tested with six knowledgeable individuals. The final design included 35 questions, several of which had multiple parts. The survey text is included in Appendix B.

Survey respondents participated with informed consent in an entirely anonymous and voluntary manner. The web-based design permitted respondents to complete the survey at their leisure and included the ability to return to the survey as many times as desired before final submission. The University of Calgary Conjoint Faculties Research Ethics Board granted ethics approval for survey administration to the principal investigator.

Potential participants included all agency managers and practitioners identified through their involvement in the CMP. An e-mail message was sent to 65 individuals, inviting their participation in the survey. A draw for five modest prizes (books) was used as an inducement for participation. The Web site was available for a period of 30 days, after which the data were downloaded for analysis. Potential respondents were sent an e-mail reminder part way through the sampling period in an attempt to boost the sample size. The data were downloaded in spreadsheet format and summarized for presentation. The small sample size limits statistical hypothesis testing, but provides useful summary statistics.

4.2 Modeling and Framework Development Approach

The framework for a transboundary, collaborative approach to assessing cumulative effects in the Crown was first discussed at the inaugural meeting of the CMP in 2001. The ensuing workplan identified CEA as a top priority. The CMP concluded that the type of CEA desired for the Crown would require robust landscape-scale modeling. Successful application of landscape modeling in a management context requires that the model: “address appropriate questions, include relevant processes and interactions, be perceived as credible and involve people affected by the decisions” (Fall et al. 2001, p. 67). Preliminary discussions within the CMP resulted in a desire to examine available CEA models.

The CMP was introduced to the ALCES[®] model in 2001 and began to explore the potential for its application within the Crown. CMP members were provided with demonstrations of ALCES[®] that included sample runs using data from Alberta. Sample output from hypothetical scenarios was generated to demonstrate the function and utility of the model.

ALCES[®] is a stock and flow (systems dynamics) model constructed in a STELLA[®] modeling environment. The model operates by establishing relationships (pathways and rates of flow) between entities (stocks) of interest (e.g., land-use and land-cover types) and then simulates the changes in the entities over time. The model basically functions as a sophisticated accounting system. ALCES[®] enables resource managers, industry,

society and the scientific community to explore and quantify the cumulative, dynamic effects of human land-use practices and existing natural disturbance regimes. ALCES[®] assists resource managers in identifying environmental and industrial problems, and in determining mitigation strategies for issues related to flows of natural resources.

The ALCES[®] model is not spatially explicit, but spatially stratified. That is, resultant simulations calculate a projected value for the amount of the landscape that might be in a particular land cover type (e.g., foothills fescue, lodgepole pine forest), but it will not indicate how that land cover type is spatially distributed on the landscape.

ALCES[®] was eventually selected for the Crown CEA due to its proven applicability for regional CEA in nearby areas (i.e., Alberta), its validation and verification by independent experts (Hudson, 2002; Van Laake, 2002), and the familiarity of several CMP participants with the function of the model. CMP Steering Committee members were not aware of any other CEA models that would be as well suited to the Crown context.

Hudson's (2002) independent review of ALCES[®] as a strategic (comprehensive, long-term, large spatial scale) land-use planning tool concludes:

ALCES fills a vacant niche among natural resource management models in providing a comprehensive framework to study cumulative effects among a wide variety of land uses ranging from human settlement, protected areas, recreation, agriculture, forestry and energy. It is an exploratory tool for strategic analysis and complements more detailed and focused models used for tactical analysis and operational planning (Hudson, 2002, p. iv).

Likewise, in a comprehensive review of cumulative effects models for the Cumulative Effects Management Association (CEMA), the authors state:

The A Landscape Cumulative Effects Simulator (ALCES) developed in Alberta by Forem Consulting Ltd. is the most comprehensive model reviewed. This aspatial landscape simulator integrates all four model classes (habitat availability, population, land use, and natural disturbance). Unlike other integrated models, it also considers all land use activities likely to occur in the Wood Buffalo region. It includes both aquatic and terrestrial indicators and is able to incorporate stochasticity. Its greatest strength is its ability to rapidly incorporate user-defined changes so that the effect of various development scenarios and management options on future habitat availability and populations can be visualized (Salmo Consulting et al., 2001 cited in Hudson, 2002, p.14).

The CMP is confident that the selected model will provide valuable utility to the overall regional landscape assessment process. The utility and value of model outputs will be assessed when the first complete “runs” have been conducted.

Before ALCES[®] can be employed to generate scenarios, the model must be populated with spatial, non-spatial descriptive, and trend projection data. More specifically, the following are the types of data required by the model:

- current land uses, such as forestry (e.g., cut-blocks, forested land cover), energy sector (e.g., well sites, coal mines, seismic lines), agriculture (e.g., feedlots, pasture, crops), human (e.g., towns, campgrounds);
- natural processes, such as fire (and the effects of fire suppression), vegetation growth and yield, and insect outbreak;
- existing land cover, such as forests (e.g., boreal, mountain) and hydrology (e.g., lakes, rivers); and

- sector specific development projections (e.g., future forest harvesting, energy production).

ALCES[®] can then be used to project future landscape changes through the consideration of cumulative environmental effects, arising from anthropogenic activities and natural processes, and their interactions. This enables land managers to look at the possible outcomes of various land use options under a range of future scenarios for the region, and consider the trade-offs that might be made between competing uses. ALCES[®] compares ‘what-if-scenario’ outcomes to thresholds established through multi-stakeholder processes.

The employment of ALCES[®] to examine potential future conditions makes it function as a virtual adaptive management tool. Modeling a variety of scenarios and monitoring the output provides decision support, based on a consideration of regional cumulative environmental effects. ALCES[®] used in this way provides strategic level guidance, but also provides a more sound foundation and context for evaluating project level cumulative effects. ALCES[®] can be used to help evaluate new land-use proposals against regional thresholds, thus providing a nested hierarchy of decision support through the provision of appropriately-developed regional context.

Since ALCES[®] is based on an initial land-base and associated land-uses for a regional landscape, project level CEA can be nested within this framework, reducing duplication of efforts in regard to collection of baseline data. MacDonald (2000) states that both effectiveness and efficiency of CEA are maximized when different levels of assessment

are nested and cross-referenced, alleviating the need for all CEAs to address regional scale issues. This approach also addresses the most common critique of conventional cumulative effects paradigms that include overly restrictive spatial and temporal parameters of project-based assessments (Kennet, 1998). ALCES[®] allows a continuum of both spatial and temporal scales to be addresses within the same framework.

Several CEA researcher practitioners have suggested that environmental ‘bottom-lines’ or thresholds for key environmental indicators need to be specified and assessed on an on-going basis for CEAs to be effective (Rees, 1995; Hegmann et al. 1999). ALCES[®] integrates multiple environmental and economic indicators providing opportunities to evaluate changes over time and to determine acceptable levels of impact to the environment.

In summary, ALCES[®] contributes to a strategic cumulative framework through its use as an exploratory tool to identify emerging regional issues and opportunities, and to examine the potential implications of trends and policy choices under a range of future scenarios. Moreover, the model simulates the cumulative effects of all modelled landscape activities and processes. The model is driven through a collaborative visioning process that ultimately contributes to planning for regional sustainability.

The framework being developed for employing ALCES[®] in the Crown is expected to provide significant benefits beyond the model output. Fall et al. (2001) have aptly concluded that such modeling exercises result in a suite of benefits that include:

“improved understanding, communication and cooperation among stakeholders and designers; conflict resolution and consensus building; and an opportunity to influence the decision-making process” (Fall et al. 2001, p. 69). Likewise, McKinney et al. (2002) surveyed participants from 46 collaborative, regional initiatives in the American west and reported mostly procedural indicators of project success (i.e., improved communication and shared understanding). The advancements made in trans-institutional capacity building are necessary precursors to meaningful landscape-scale CEAs.

Since selecting the model in 2001, the CMP has met annually to discuss progress on the workplan and the cumulative effects project has been a particular focus of attention. In addition, the CMP Steering Committee has met on a monthly basis to provide guidance and direction on the project. Other activities that have been undertaken in advancing the regional cumulative effects project include:

- development of a regional cumulative effects project concept paper for agency consideration and discussion,
- preparation of funding proposals to support the project,
- a multi-agency workshop to identify research needs and data gaps,
- a technical meeting to discuss ALCES[®] modeling and data requirements,
- advanced ALCES[®] training and model upgrades,
- development of communication products to educate and keep CMP members up-to-date with the project,
- collection of foundational spatial data to populate the ALCES[®] model,
- collaborative consultation on potential indicators to be modeled,

- selection of focal land-uses to be modeled,
- preliminary identification of key sector representatives, and
- development of the overall framework for the project.

The Miistakis Institute for the Rockies was selected as a neutral third party facilitator for the CMP. Miistakis provides the project management and technical modeling expertise to the regional cumulative effects project. The details of the approach and framework are provided in section 5.2 below.

5. Research Findings

5.1 Drivers and Barriers Survey

Invitations to participate in the Web-based survey were sent by e-mail to 65 individuals associated with the CMP. Three of the initial e-mails were “bounced” back due to incorrect or changed e-mail addresses. Two potential respondents declined to participate due to lack of direct knowledge of the area or the CMP. Two others reported technical difficulties with accessing the survey and were unable to participate. From the remaining pool of 58 potential respondents, completed surveys were received from 36 individuals (effective response rate of 62%). The 36 respondents identified themselves as being from Alberta provincial agencies (9, 30%), Montana state agencies (3, 10%), U.S. federal agencies (6, 20%), Canadian federal agencies (5, 16.7%), and other (e.g., non-government organizations and universities; 7, 23.3%). There was no representation from British Columbia provincial agencies.

There may be some non-response bias in interpreting the results of the survey. For example, it might be expected that those participants choosing to respond might have a higher level of personal interest and knowledge in the CMP or cumulative effects. Hence, of the 36 total respondents, 26 (72.2%) indicated a moderate or higher level of personal understanding of the CMP. Twenty-nine (82.8%) survey participants were from agencies that had attended at least one CMP annual forum. Respondents indicated a high

level of personal interest in the CMP with a median score of 5.5 on a scale from 1 to 7, where 1 represents low personal interest and 7 indicates very high personal interest. Overall, the level of agency support was reported to be lower than individual support with a median value of 5 (Figure 3).

Eight respondents indicated interest in expanding the number of agencies participating in the CMP. Specific recommendations for expanding the membership included: Alberta Sustainable Resource Development, more First Nations representation, and local/municipal agencies. Suggested methods for engaging new participants and increasing the level of participation of current members focused on: 1) communicating demonstrable benefits and results that provide a clear linkage to agency mandates, 2) reaching higher levels of authority, and 3) having current CMP participants actively communicate the goals and objectives of the group.

Respondents were asked to rank the importance (scale of 1/low to 5/high) of activities currently identified in the CMP work plan. All of the identified activities resulted in median values of 3.5 or higher, indicating overall support for the work plan. The activities with the highest median scores were: ‘build awareness of common issues and interests’ (median = 5), and ‘provide a forum for interagency networking and collaboration’ (median = 5). Of the 12 activities identified from the workplan, ‘facilitate a cumulative effects assessment for the region’ scored in the top half with a median value of 4. The activity identified as having the lowest priority was: ‘address increased recreational demands and increased visitation in the region’ (median = 3.5) and identify

region-wide needs. Twenty-seven (77.1%) respondents indicated that there were no other activities that the CMP should be engaged in. The seven (20%) respondents that recommended expansion of CMP activities identified hosting a transboundary research conference, developing better understanding of participating agency mandates (e.g., First Nations), and updating and communicating data and progress on a regular basis to the CMP membership.

Survey participants clearly indicated the growth of regional human populations and concomitant increases in human-use pressures were significant issues, both now and for the future. The top five most significant resource management issues identified through the survey were: landscape connectivity, access management, recreation/tourism pressure, increasing linear disturbance and rural residential subdivision. Agricultural issues were identified as being of lesser significance to the focal area (Table 2).

Out of 30 participants who responded to the question, 20(66.67%) indicated they were currently involved in effective collaborative initiatives. When asked to describe the most important characteristics of effective collaborative initiatives, respondents most often identified: a) clearly defined and shared goals and objectives, b) shared commitment for long-term involvement, c) adequate commitment of resources, d) common issues and pressing need for response, e) frequent and effective communication, and f) mutual respect and trust among participants (Table 3). Conversely, participants identified the most important barriers to effective collaboration initiatives in resource management as: 1) lack of resources, 2) lack of shared agency mandates and philosophies, 3) lack of

agency support, 4) inter-agency barriers and ‘turf’ issues, and 5) lack of continuity of participating members (Table 4).

Twenty-six respondents provided their own definition of cumulative effects, indicating a general awareness of the term. Furthermore, 22 (75.9%) of 29 respondents to this question indicated that their agencies currently participate in some form of CEA. Sixteen of 28 (57.1%) participants said that their agencies were developing or implementing specific landscape objectives and/or ecological thresholds at a regional scale. When asked to comment on the value of cumulative effects approaches to regional planning and ecosystem management, the 28 respondents who answered the question suggested such approaches were desired and necessary. The following quotes from three different participants are representative of the responses:

It is fundamentally the only way to raise awareness that each choice made by any jurisdiction, with respect to the landscape, fundamentally affects the other landscapes and jurisdictions in the ecosystem;

I think CEA as a regional planning/ecosystem management tool is very applicable in the Crown. We have to get beyond one-off assessments.

The use of CEA for projects is necessary but problematic in that winners and losers have already been established. Our interest is in having CEA document changes and predict potential futures depending on societal expectations. In other words, it should be a tool to support society in land use planning and decisions that are not project-based.

In addition to the comments of support, 5 respondents communicated the need for caution with respect to: 1) a requirement for clear goals and expectations, 2) understanding and communicating limitations of the approach and supporting models, and 3) the need for equal participation from the CMP membership.

The primary motivations for agency participation in a regional cumulative effects initiative for the Crown were intrinsic (e.g., leverage benefits of collaboration, information essential to achieve agency mandate, fill current information gaps) rather than extrinsic (e.g., legislative requirement, public pressure) (Table 5). Respondents identified a wide range of benefits associated with pursuing a regional cumulative effects approach (Table 6). The most frequently identified benefits were: 1) improved interagency coordination, 2) the creation of data, analysis and modeling for decision support, 3) improved transboundary management, and 4) education within the participating agencies and to other stakeholders.

The barrier that ranked as most important to pursuing a regional cumulative effects approach in the Crown was ‘lack of financial and human resources’. The next most important barriers were: lack of support from senior management, lack of clarity in project goals, lack of political support, lack of entity willing to drive process, and lack of framework for integrating results into agency planning (Table 7). When asked in an open-ended question to identify the most significant barriers, respondents generally echoed the barriers listed above, but also added concerns about data availability, quality and compatibility, and issues related to the selection of the computer model and methodology (Table 8).

5.2 Modeling and Framework Development Approach

The following section describes the approach and framework for assessing cumulative environmental effects in the Crown. The process of developing this framework has been incremental with adjustments being made through consultation with the CMP membership. The fundamental components of the framework are: project management (includes shared issues identification), data collection, base case modeling, scenario modeling, and the development of communication products for decision support. The process is iterative and adaptive with the goal of continuous improvement. The modeling approach is highly participatory and thus requires shared understanding of contexts and issues. Frequent and high quality communication is essential for project success.

5.2.1 Project Management

A Steering Committee constituted by representatives from the participating agencies oversees the activities of the CMP. The Steering Committee is currently comprised of 12 volunteers representing provincial, state and federal agencies along with academic representation from the Universities of Calgary and Montana. The CMP Steering Committee provides the management direction for the regional cumulative effects project. Specific roles of the CMP Steering Committee with respect to the project are:

- works with upper management/political levels to encourage agency participation, engagement of their data holders and managers, support for training, and financial commitment,

- works with the Project Team to identify and prioritize land uses to be modeled,
- connects the Project Team with potential Sector Representatives and Modeling Team members (see ‘Data Collection’, below),
- assists in defining scenarios for cumulative effects modeling,
- directs communication of modeling results to the CMP.

The Project Team (led by the Miistakis Institute for the Rockies as the Project Manager) is responsible for the delivery of the regional cumulative effects modeling and analysis and ensuring that the overall vision for the project is realized. Miistakis has designated a project facilitator whose primary responsibility is the regional cumulative effects project. Miistakis reports to the Steering Committee, and directs the work of the other teams. The Project Team also includes a Data Collection Team and a Modeling Team to direct the data collection and modeling processes described below.

5.2.2 Cumulative Effects Assessment Modeling Software

Though the chosen modeling software cannot drive the strategic CEA, the model is a fundamental component of the framework, and significantly influences the type of data to be collected, and the scenarios generated. The modeling software chosen for this CEA (ALCES[®]) is characterized by ‘stock and flow’ architecture. Simply put, the model monitors the changes in stocks (i.e., land cover types) over time as a result of various interacting flows (i.e., land-use patterns and natural processes).

The framework developed for the regional CEA in the Crown consists of three parts (see Figure 4): data collection, ‘base case’ modeling, and scenario modeling. The framework is designed to produce results that can then be incorporated into decision-making by individual agencies.

5.2.3 Data Collection

Working under the direction of the Project Team, the Data Collection Team coordinates the collection of data for the modeling phase (see Figure 5). The collection of the spatial, metric and trend data that constitute the inputs to the ALCES[®] model represents the greatest proportion of both the time and effort in the project.

The strategic, cross-sectoral nature of regional CEA necessitates inclusion of knowledgeable participants beyond the Data Collection Team. The small group of people that comprise the Data Collection Team simply will be unlikely have expertise in the full range of land uses and ecological disciplines represented on the landscape. Furthermore, to facilitate eventual acceptance of the modeling results, it is essential to use data that each sector considers most appropriate. For each land-use (or ‘sector’), at least one Sector Representative is recruited. For example, representatives from the petroleum industry in each major jurisdiction will be approached to provide and discuss data relevant to their land use patterns and projections. It is the job of these people to provide the bridge between their sector and the regional cumulative effects project. They are called upon to identify the location and accessibility of relevant data for their sector.

Additionally, they are interpreters, explaining the specific needs of their sector to the Project Team, and explaining the assumptions underlying the modeling process back to individuals within their sector.

At the Crown Managers Forum in Pincher Creek, AB (April 2003), participants were led through a ‘Sector Representative’ exercise, where they indicated those people within their geographic area who were potential candidates.

The first step in assessing the cumulative effects of various land uses on a landscape is to establish a baseline landscape description. The ‘initial landscape’ description for the focal area includes the various cover types (e.g., vegetation, waterways, rock and ice) overlain by the various land-use types (e.g., transportation infrastructure, residential development, well pads). To retain the strategic focus, cover and land-use types are limited to approximately 25 each.

The description of the initial landscape relies heavily on the collection of spatial data sets. For the entire region, spatial data sets of base features (e.g., roads, towns, industrial facilities), vegetation and other cover types, are collected from agency and industry sources.

Data sets collected from multiple jurisdictions (e.g., Alberta, British Columbia and Montana) are, unfortunately, not harmonious. The different jurisdictions have varying resolutions, degrees of completeness, and vegetation and base feature classification

schemes, so the data must be standardized and converted to a form usable by the ALCES[®] model.

In consultation with area foresters and other relevant ecologists, the vegetative cover types (and non-vegetative cover types) representative of the focal area are selected, and condensed to approximately 25 categories. The collected data layers are then translated or ‘cross walked’ into these common categories or ‘canisters’ based on standardized and well-documented protocols regarding re-classing vegetation types. Likewise, standard land-use canisters are chosen, and relevant spatial data are converted and reclassified.

To facilitate the otherwise time-intensive task of translating the spatial layers into the numeric format required for ALCES[®], a companion program, called DataGrabber[™], is used to automate the process. DataGrabber[™] was built using ESRI MapObjects[®] technology to summarise complex landscape scenarios generated from multiple criteria into a format directly useable by the ALCES[®] model (GAIA Consultants Inc., 2004).

Perhaps the largest and most challenging data collection task is acquiring data related to the full spectrum of land uses active within the focus area. In the case of the Crown region, the human activity on the landscape has been classified into the following land-use types, and data collection will be focused in these areas:

- forestry,
- energy and mining,
- agricultural and livestock,

- transportation,
- humans and their settlements,
- protected areas,
- general industry and electrical, and
- tourism, recreation, hunting and trapping.

The data required for the modeling comes in three types: spatial, metric, and trend.

Considering the stock and flow character of the model, spatial data collected from GIS databases can describe the initial ‘stocks’ – what we have now. However, metric data (non-spatial, non-trend parameters describing land use) and trend data (projections of future trends) describe and characterize the ‘flows’ – the factors that influence the changes in those stocks. For example, the ALCES[®] model requires information regarding how much land is in a particular crop type (spatial data), but it also requires data on such factors as the average herbicide application rates for that crop type (metric data), and whether the landbase in that crop type is projected to grow or shrink in the future (trend data).

Metric data and trend data are the most difficult data types to assemble. Values vary tremendously across the study area; are neither uniformly collected nor standardized; and (in the case of trend data) are conjectural. In many cases, the data simply do not exist in a published format. The metric and trend data are gathered through a combination of consulting published data, and a series of expert workshops for each land use. This requires the gathering of experts in each field who can represent the various geographic

and jurisdictional areas, and working through a consensus-based process of determining, vetting and substantiating all numbers. In essence, these are the parameters that the model utilizes to project future landscapes.

For each land use sector, data collection workshops employ a four-stage process:

1. as much data as possible are collected from published sources and known experts prior to convening workshops;
2. a First Expert Workshop is convened to present modeling assumptions, increase general understanding and comfort with the Framework, and identify data gaps and further data contacts;
3. based on the work of the first workshop, follow-up data collection is pursued through identified individuals and sources; and
4. a Second Expert Workshop is convened to validate and reach agreement on sector data inputs.

Following the data workshops, the ALCES[®] model is updated with the consensus-derived metric and trend data. Where lack of agreement or a high degree of uncertainty characterize metric or trend data, the model has the capacity to represent a range of values.

The natural processes that affect the landscape are also tracked and incorporated into the cumulative effects modeling. Data related to these processes are collected in much the same way as they are for the land uses, that is, published data and reports are consulted

first, then expert opinion (via consultation or consensus-based workshops) is used to fill any data gaps.

Data related to meteorological and hydrological influences such as precipitation, reservoirs, water demand, inflow, run-off, sedimentation, and pollutants are collected and included in the modeling. Likewise, fire return rates, fire suppression rates, burn characteristics, residential fire losses, insect mortality and crop loss rates are determined and incorporated. When simulations are run, meteorology, fire and insect regimes can be applied stochastically or deterministically, and can include defined climate change scenarios.

A selected suite of wildlife species (or guilds or communities) are chosen to act as indicators of ecological health in the region. The process for collecting the data is very similar to that used with the land use types: a combination of published data and expert opinion is used to derive metrics related to the chosen species.

Participating expert biologists first choose the species to be used in the model based on those species' ability to represent regional ecological health, relation to predominant land uses, and availability of data. Individual species or species guilds or communities may be chosen. Depending on the species chosen, measurements of the change in those species' habitats as a result of various land use patterns may be based on Habitat Suitability Indices, Resource Selection Functions, or Community/Species Richness metrics.

5.2.4 Modeling

The role of modeling is to generate plausible representations of future land use dynamics and implications based on the inputs and assumptions provided to the model, and to then allow the user to explore mitigative scenarios. The main outputs of the model are a series of user-defined graphs showing various parameters and relationships over the simulation time period, and spatially stratified descriptions of potential future landscapes. The model addresses cumulative effects because it considers the interactions between modeled components in the stock and flow architecture.

Some of the tools that the ALCES[®] model provides in support of this task are:

- simulation of future landscape composition, or future anthropogenic edge,
- simulated impacts of various land use patterns on biological/economic/other indicators,
- user-defined monitoring panel of thresholds and targets for indicators, landscape and footprint types,
- ability to turn on/off specific land use or disturbance regimes during simulations,
- ‘backcasting’ to pre-settlement landscape composition which enables approximations of range of natural variation,
- iterative scenario generation, comparing mitigative strategies to ‘base case’,
- choice of habitat suitability, resource selection, or species richness for functions for wildlife response simulations,
- stochastic or deterministic application of disturbance regimes during simulations, and

- comparative graph output.

Once the data have been collected, validated and entered into the model, the model is tested and a baseline established against which potential scenarios can be measured (see Figure 6). A modeling team is assembled whose responsibility is coordinating the ALCES[®] model runs based on input from the CMP. The modeling team is comprised of individuals from the CMP who have the ability to bridge the operational / tactical level and the strategic level of resource management in the region. Each member receives advanced training in the ALCES[®] model.

Testing involves multiple runs and output by the modeling team, which are then assessed for any apparent inconsistencies they might indicate in the model. Those inconsistencies are then addressed.

A base case, which provides output based only on the initial trends and metrics gathered for the model, is the model's first run. Results of future modeling, based on proposed mitigations and alternate scenarios, will be compared to this base case. As new research and work provides improved data, the base case can be modified on an on-going basis.

Individual agencies or sub-regions of the Crown can choose to run simulations on limited geographic areas. However, the spatial data will need to have been collected in such a way that the sub-region data can be 'clipped' to the desired boundaries. More

importantly, trend and metric data values, which have been determined for the entire region, will have to be revisited to ensure they are still valid for the sub-region.

As mentioned above, the primary outputs of the model are a series of line graphs describing changes in the landscape and land use parameters, and the future landscape composition. However, this information does not immediately illustrate, for middle to upper level managers, the regional, strategic-level issues that may need to be addressed through policy and management action.

To facilitate this, the modeling team converts the model output into plain language ‘issue statements.’ These summary statements make no judgments about the changes in management action that may be required; they simply identify areas where the model has indicated that conflicts may occur in the future. Where possible, the modeling team will also identify the primary aggravating activities underlying the issue.

Scenario modeling allows CMP managers to engage in virtual adaptive management (see Figure 7). Rather than enacting resource management initiatives on the ground, monitoring their effect and then adapting management regimes as necessary, this process allows managers to test management adaptations in a ‘virtual’ environment.

The modeling team communicates the issue statements developed from the base case to the CMP through mechanisms such as the annual Crown Managers Forum. The CMP

collectively identifies which of the issue statements represent issues of the highest priority, and thus which should be investigated through further modeling.

Working with the modeling team, a sub-committee of the CMP identifies mitigative strategies that may address the issues, as well as thresholds for certain parameters that must not be exceeded in the simulations when modeled. From this, guidelines regarding alternate management scenarios that are to be investigated through modeling are developed and passed on to the modeling team.

The modeling team develops the instructions from the CMP into workable scenarios that can be modeled. As required, individual mitigations, or multi-faceted management scenarios are modeled in *ALCES*[®], and compared back against the base case.

The results of the scenario investigations, and an assessment of their potential for success, are reported back to the CMP. In addition, any new issues that may have arisen are summarized into new issue statements, and presented to the CMP.

This iterative process continues, with new scenarios being created, tested and analyzed in an ongoing fashion. Information from the scenario exercises are extracted as needed, and incorporated by individual agencies into policy and management activity, as they see fit. The power of this modeling approach lies in the ability to examine cumulative effects of multiple sectors and land-uses at a regional scale.

6. Lessons Learned and Implications for EA Practice

6.1 Lessons and Implications from the Survey

The survey sample size of 38, with an effective response rate of 62%, allows for meaningful trends to be derived from the data. However, the absence of any response from one provincial jurisdiction is a significant data gap. In addition, there is potential in the results for non-response bias. The trends, lessons and implications reported herein should be treated with caution, but based on our experience with the CMP, the authors feel comfortable that the trends, lessons and implications reported herein are valid and representative of the CMP.

6.1.1 Interest, Awareness and Knowledge of Cumulative Effects Assessment

The activities of most importance to CMP members are linked to providing a collaborative forum for exchange of transboundary information and ideas. The value of the CMP as a forum for communication among regional resource managers has been reinforced through the survey and through informal discussions with members of the partnership. The development of a cumulative effects process rated as a lower priority in the survey, but was still of significant interest to the group. Managers clearly communicated their concerns about growing regional resource pressures and the need for new approaches to understand and manage complex systems in the face of great uncertainty. Furthermore, there was clear recognition of the linkages and cumulative

effects arising from isolated sectoral approaches to resource management. Participants expressed recognition and concern that the cumulative effects of land-use were unmistakably transboundary.

Respondents indicated a high level of familiarity with project-based cumulative effects processes and expressed the need for larger-scale regional approaches to considering cumulative effects. The majority of participants in the survey reported that their agencies were engaged in the establishment of thresholds and/or regional landscape objectives. More work is required to ascertain whether or not these initiatives can be used to formulate landscape objectives and thresholds for the entire Crown. These findings establish that there is an adequate base of understanding and knowledge to advance a larger-scale cumulative effects process. Furthermore, there should be direct and immediate use for the results by participating agencies. In summary, managers enthusiastically embrace the desire for more collaborative approaches to regional landscape management, including consideration of cumulative effects. The primary factors preventing realization of this managerial desire include: 1) lack of appropriate methodologies; and 2) a political and institutional context that is not currently conducive to transboundary, collaborative initiatives.

6.1.2 Effective Collaboration

Collaborative approaches in natural resource management are proliferating across North America. The utility and value of such approaches have been summarized by

Wondolleck and Yaffee (2000, p. 18; see also Appendix C):

- building understanding by fostering exchange of information and ideas among agencies, organizations, and the public and providing a mechanism for resolving uncertainty;
- providing a mechanism for effective decision making through processes that focus on common problems and build support for decisions;
- generating a means of getting necessary work done by coordinating cross-boundary activities, fostering joint management activities, and mobilizing an expanded set of resources; and
- developing the capacity of agencies, organizations, and communities to deal with the challenges of the future.

The CMP is a diverse group of individuals representing a variety of agencies, jurisdictions and mandates, but survey respondents clearly understood the benefits of collaboration identified above. By definition, regional CEAs require the transcendence of political boundaries through the establishment of new collaborative structures. The formation of *ad hoc* organizations such as the CMP is a reflection of the desire for more collaboration at the operational level. However, the effectiveness of such initiatives is limited by the degree of higher-level support from policy and legislative levels.

Collaborative approaches to regional planning and management require the development and articulation of shared goals and objectives. Of particular importance to large-scale regional processes is the need to establish such goals at a strategic rather than operational

or tactical level. These goals and objectives provide the foundation for all future activity and the significance of their development should not be underestimated. The formulation of such goals is best facilitated in an atmosphere of respect and mutual understanding. The success of goal formulation is enhanced through the establishment of personal relationships among participants. In order for people to get to know and trust each other, there is a need for shared commitment to the process and a high level of continuity among participants.

In addition, it is necessary for participants to develop a working knowledge of the mandates and constraints of other participation agencies. For example, the vagaries of electoral and budgeting processes across multiple jurisdictions create conditions of constant flux whereby agencies are rarely in synchrony with respect to their readiness and capacity for full collaborative engagement. This necessitates a requirement for patience, understanding and flexibility among participants and the recognition that the annual level of contribution by individual agencies may vary. A variety of regular and effective communication pieces must be used to keep all participants ‘up to speed.’ We suggest that large, complex collaborative initiatives be viewed as dynamic equilibriums wherein the total level of support remains relatively constant over time, but different individuals and agencies participate to the capacity dictated by their own internal organizational cycles.

The shared leadership approach that potentially emerges from the dynamic equilibrium described above can be a tremendous asset to the long-term success of collaborative

initiatives. In particular, this approach can help to avoid the perception and/or reality that an initiative is being driven by the agenda of one agency or a small subset of the partnership. This is of direct relevance to the CMP because the Waterton-Glacier International Peace Park has been a key facilitator of the process. Participants have expressed some concern, both in and outside of the survey, that the CMP not be seen as a 'parks' project. Again, this underscores the critical need for developing shared goals and objectives at the outset.

Notwithstanding the value of a shared leadership model, CMP participants communicated the value of having both a strong core leadership group (champions) and a process facilitator. These themes are strongly reinforced by collaborative resource management case studies in the published literature (Selin and Chavez, 1995; Wondolleck and Yaffee, 2000; see also Appendix C) and have long been espoused by the business community (DeGroot et al. 2000; Kumar and Van Dissel, 1996; Lorange and Roos, 1991; Markham and Aiman-Smith, 2001, Peters, 1982; Pinchot, 1985). The CMP has benefited from a core group of champions, especially evident in the steering committee.

6.1.3 Barriers to Collaborative, Transboundary, Cumulative Effects Assessment

The most significant barriers to the collaborative cumulative effects initiative can all be traced back to a lack of dedicated support from more senior levels within the participating agencies. The initiative is not currently a priority for any of the agencies and this is manifested in a dearth of financial and human resources available to the project. A small number of agencies have carried the financial burden of the project during the formative years. The successful future of the CMP and the cumulative effects project will require more equitable and stable financial and human resource contributions. However, the competition for scarce agency resources has been exacerbated in recent years by the overall contraction in agency staff and budgets as well as by considerable organization restructuring across the region. In addition, severe wildfire seasons have drawn heavily on agency resources. In order to achieve the allocations required to support the CMP, participating agencies need to demonstrate the added value of participation to their existing priorities. The shared data and analysis arising from the regional cumulative effects project should help in this regard, but it takes an initial investment of time and effort before useful products can be produced.

The results of the survey are consistent with another survey of public land managers in the Crown (Pedyowski, 2003; Table 9). However, there are two differences in the findings that should be highlighted. The first is that Pedyowski (2003, p. 1256) states that “interviewees stated repeatedly that the public was suspicious of international

initiatives” and that managers would require unambiguous public support for pursuing transboundary collaboration. This theme was not manifested in any way in the survey reported here. In fact, respondents indicated that public pressure and public opposition (82% of respondents indicating this was not important) were the lowest rated barriers to participation in the CMP (82% of respondents indicating this was not important). The other conclusion in Pedynowski (2203, p. 1265-6) that does not concur with our findings is “Canadian jurisdictions are less supportive of international collaborative efforts in the [Crown of the Continent Ecosystem]”. There was no evidence for this finding in the current survey. It is difficult to explain these significant discrepancies given that the surveys were conducted within two years of each other and included many of the same participants.

6.2 Lessons and Implications from the Framework Development

6.2.1 Modeling

It was clear at the outset that a robust modeling process would be required to handle the complex land-use and natural process data that would need to be incorporated into the cumulative environmental effects assessment. ALCES[®] was familiar to a number of CMP participants and has a proven record of supporting CEAs within the region. The membership of the CMP made a commitment to proceeding with the model, although, as the survey shows, there are still questions about other potential models and methods. Before commencing with any use of the model, the CMP recognized the need to bound the area of interest.

Demarcation of a widely agreed upon boundary for the region was critical for setting spatial limits on which government jurisdictions would be involved, and from where data would need to be collected. The Crown is an ecologically defensible area, and recognized unit for research (Darrow et al., 1990; Stanford and Ellis, 2002; Pedynowski, 2003). However, the boundaries of spatial demarcation for the Crown have usually been loosely defined and vary significantly among sources. The CMP participated in a workshop to get input on the actual boundary line to be used. In some cases the boundary identified by the group had to be modified slightly, based on the available spatial information used for modeling purposes.

Prior to the availability of ALCES®, computer models for regional cumulative assessment have had two significant and related limitations. Available models have not been capable of incorporating the complete spectrum of land uses and natural processes (Stelfox, pers. comm.). And, until recently, desktop computers have not been capable of running a highly complex CEA models (Fall et al. 2001, Maxwell and Costanza 1997).

One of the most significant challenges to effectively employing the model is acquiring the data to populate it. As described above, three types of data are required: spatial, metric and trend. Spatial data are required from numerous agencies and industry sources across the region. The participating members of the CMP have made a commitment to providing or facilitating the collection of required data. In some cases data sets are proprietary, and availability is limited due to sharing agreements, industry confidentiality,

homeland security concerns, or other issues. The sale by the Alberta government, of its spatial data to a private interest, creates on-going challenges related to cost and ease of access. The initial base feature and vegetation data, acquired from Alberta, British Columbia and Montana, had then to be harmonized by ‘re-canistering’ incompatible data into common categories appropriate for the model. The creation of this ‘seamless’, transboundary, and ecological data set is a significant value-added project of the modeling exercise.

Metric and trend data were collected from published sources, wherever possible. However, tremendous gaps remain, especially relative to trend projections. Filling these gaps will be accomplished through the expert workshop process described above. There is a high degree of uncertainty with most trend data and it is essential that the assumptions and sources of the projections be made transparent to all participants. Furthermore, a commitment to adaptive management of the model is required to continually adjust predicted future trends.

A particular challenge exists in the choice of ecological indicators to be used in the model. The choice of indicators has to be inclusive and well informed. Ecologists and other experts from throughout the Crown are being consulted to choose the indicators to be used, and will later help provide the needed parameters regarding the chosen species.

No specific socio-economic indicators have been chosen. However, the trend data incorporated into the model related to human land-uses is underlain heavily by socio-

economic data. For example, information gathered regarding oil and gas well site establishment, timber harvest rates, population growth, and related metrics constitute socio-economic rather than ecological data. Thus, outputs from the modeling are based on socio-economic information. The CMP and other collaborators will need to assess the output of ALCES[®] modeling and consider the need for additional socio-economic approaches.

6.2.2 Agency Engagement

Because the regional cumulative environmental effects assessment was conceived as a strategic tool for land management agencies in the Crown, developing ‘buy-in’ from those agencies is critical if the modeling outputs are ever to be employed for meaningful decision-support. Additionally, gathering data would be next to impossible without the engaged participation of the agencies. This necessitates accommodating multiple agency circumstances, developing a shared understanding of the goals, having buy-in for the process in general, and acquiring the right political support at the right time.

The commitment on the part of the participating agencies to a strategic, regional cumulative environmental effects assessment evolved over a period of time, and did not begin with a concrete goal or specific objectives. The CMP started as a meeting to discuss needs and possibilities for collaborative research and management, with the partnership eventually choosing to take on the cumulative effects project.

Maintaining multiple agency involvement in a complex, multi-year project has been difficult, despite there being high support expressed repeatedly by those agencies for a regional cumulative effects project. Agencies are operating under difficult conditions in terms of sparse budgets, shifting priorities, changing governments, and limited human resources. The result is that many of the participants are hard-pressed to provide funding, time and personnel – all of which has had a detrimental effect on the ability to maintain engagement. For example, numerous agency personnel changes and departmental reorganizations presented constant challenges.

The factors that allowed the project to maintain the support of those agencies included a forum (the CMP), which gives all agencies formal access and input to the process, a Steering Committee of their peers to help generate support, a handful of champions who maintained the process when it faltered, and the ability to leverage finances to fund the project.

A key challenge has been the lack of a specific mandate on the part of any agency to actually pursue a regional CEA, and a lack of any legislative or policy mechanisms to support such an initiative. However, many middle to high-level managers are able to interpret their policy direction to include support for transboundary and assessment initiatives. It has been recognized and communicated by CMP participants that a key precursor to higher levels of engagement is the unambiguous articulation that this regional CEA will be directly helpful for them in their work.

Participants needed a shared understanding of both the goals of the regional CEA, and of the process that would be followed. Perhaps because most agency experience with CEA is project-based, there was a range of beliefs regarding the goals of the project. Some thought it would create a solid picture of the future, and others that it would be grist for a scenario-building exercise; some saw it as a the strategic-level tool that it was, others as another operational level-tool; some recognized that it would be a multi-year effort, while others hoped for utility within a few months.

Through discussions at the annual forum, the dissemination of the survey results, and information passed on via the Steering Committee and a project newsletter, project team members worked to develop a shared understanding of how the processes would unfold, the features of this approach to CEA, and how the results might be used by the various agencies.

The model itself (ALCES[®]) was the subject of a significant amount of misunderstanding and concern. As a central element of the project, the model has to be accepted by the agencies as a legitimate tool. Furthermore, direct participants and other stakeholders require a shared level of confidence that the relevant land-uses and sectors have been adequately reflected in the model. Understanding the capabilities and limitations of the model has varied significantly: some were frightened the model would usurp their decision-making ability; others were overly excited that it would predict the future for them; still others were frightened that the output would be considered predictive by the

public who would then force managers into ill-advised directions based on false interpretations.

Participants in the CMP, middle- to high-level managers, continually expressed interest in seeing the CEA completed. However, support at higher, more political levels continues to be unenthusiastic or absent, largely because of the agency circumstances described above, but also due to political concerns regarding pursuing activities outside specific mandate and jurisdictional boundaries. This has ultimately led to a significant delay in advancing the project to the formal modeling stage. The CMP Steering Committee, clearly recognizing the need for higher-level support, is discussing the potential for a tour of meetings with senior managers, and perhaps politicians, to generate support for the project.

6.2.3 Project Coordination

Ross (1994) proposes that project proponents are not able and should not be expected to address issues at the temporal and spatial scales necessary in regional CEAs. Dube (2003) has suggested that this has led to a strong limiting factor in strategic CEA (vs. project-based CEA), namely that there is the lack of ‘responsible owner.’

In the case of the CMP regional cumulative environmental effects assessment, that issue was resolved by establishing a Steering Committee from within the CMP, and then retaining a third party entity (the Miistakis Institute) to manage the project. The

Miistakis Institute is a non-profit research institute with experience in CEA, but has the benefit of not representing any one agency, or any individual land-use sector.

The logistical challenges that fell to Miistakis were considerable, but not unpredictable. These centred around coordinating logistics for data gathering and meetings across a 42,000 km² international transboundary region, and accommodating the schedules, time frames and budgets of 23 government agencies over multiple fiscal years. The challenges are being addressed through the development and promotion of the Framework described in this report.

As mentioned above, a primary challenge is securing sustainable funding for the project. Agencies initially committed to the project on the understanding that funding would be highly leveraged: if each agency contributed a relatively small amount, it could be pooled, and then leveraged further through the charitable sources to which the Miistakis Institute would have access. As a result of misaligned agency budgeting processes (e.g., the State of Montana budgets on a two-year cycle), ever-present agency downsizing and budget trimming, the lack of agency mandates for regional cumulative effects to drive budget priorities, and weak support at high levels, agencies have repeatedly been unable to fulfill their commitments. It is hoped that the current concerted effort to market the project to higher levels within the agencies will cause a trickle-down of support that will allow agencies to contribute the necessary dollars. The bottom line is that the CMP in general and the cumulative effects project in particular, are currently not funded at sustainable levels.

The long-term future of the program will be predicated on a regular budgetary commitment of all participating agencies to facilitate the logistics of member involvement (e.g., out-of-jurisdiction travel and time allocation). In addition, a mechanism for agencies to secure and transfer funds to the program facilitation organization is essential. Such budgetary commitment requires higher-level agency support and the clear identification of the CMP on agency workplans.

One advantage of the lack of budget priority for this sort of strategic, regional CEA is that it is not time-restricted. The few regional, strategic CEAs that have been conducted were generally time-limited, subject to the time frame of the broader initiative under which they were conducted.

6.2.4 Agency Decision-Making

A detailed process for incorporating the results of the Crown regional CEA into agency decision-making is not a part of the Framework we have developed. However, that is the end goal, so it is worth briefly describing some of the findings which emerged from designing the Framework to facilitate that next step in an effective manner.

Output from the model must be understandable and usable in order to create circumstances conducive to agencies being comfortable using model outputs. Currently,

there is no set process for converting model (ALCES[®]) output to policy. The Framework does, however, include a step whereby graphical outputs are converted by the Modeling Team into ‘issue statements’ which are relayed to the participating agencies, and which form the basis of the mitigative scenarios which participants will ask ALCES[®] to investigate.

It was an intentional step to involve agencies in analyzing and translating output, and in identifying simulations and scenarios to run, but not creating final recommendations or suggested management strategies. It is critical both to agency involvement, and to the tenets behind the model itself, that agencies have the flexibility to incorporate the modeling results into their management strategies as they so choose, combining that output with the myriad other ecological, social and political factors that must drive their plans and policies.

The downside, one that we view as outweighed by the risks of a more aggressive approach, is that it is an open question whether modeling output will in fact be used in agency decision-making.

7. Conclusions

7.1 Summary of Findings

The Crown Managers Partnership is an important initiative to promote collaborative transboundary approaches to ecosystem management in the Crown of the Continent. The partnership is currently comprised of government agency representatives and provides an effective forum for communication and information sharing. The interest in shared project development has resulted in an evolving framework for a regional cumulative environmental effects assessment. A strategic-level approach employing ALCES[®] has been selected and the group is moving forward with populating the model. The intent is to model ‘what –if’ scenarios that focus on issues and resources of shared regional concern. A process to select indicators and establish thresholds has been developed, but not yet implemented. Results of the process are not meant for direct application at the tactical or operational level, but are aimed at the development of higher-level regional strategies.

Individual representatives to the CMP have a shared understanding and commitment to a regional CEA, although ‘fine tuning’ of project goals and objectives is required. A variety of competing pressures for resources have resulted in a lack of adequate financial and human resources being available to the project. The project has reached a stage where specific strategies are required to overcome current barriers.

7.2 Recommendations for Sustainability and Improvement to the Regional Cumulative Environmental Effects Project

The following is a list of recommendations arising from the survey and from the authors' experience with the CMP. The list is not provided in any particular order of priority, but the items are considered to be the most important identified by this research project.

1. Higher Level Support. The CMP should continue to explore the potential mechanisms and appropriate timing for attaining higher level recognition and support for the partnership and the cumulative effects project. It is clear from the results of the current research that without a stronger commitment for financial and human resource support, the cumulative effects projects is not likely to be sustainable. Multilateral agreements in the international arena are obviously complex endeavours. We recommend that a subcommittee be struck to explore the topic further. Ideally the group would include individuals who have been involved in the establishment of high-level international agreements. This effort would be catalyzed by the identification and cultivation of a political champion from each of the major participating jurisdictions.

2. Clear Articulation of Project Goals and Objectives. Although the cumulative effects project has already commenced, the results of our research suggest that the membership of the CMP lacks a clear understanding of detailed project goals and objectives. The cumulative effects model and approach have been presented at all of the annual forums, but this is evidently not enough to adequately create the level of

engagement required for meaningful participation of all members. One mechanism that is being discussed by the CMP Steering Committee is a small delegation that would visit participating agencies to discuss and describe the project in more detail. It is predicted that these smaller ‘face-to-face’ meetings will generate a greater level of understanding and commitment for the project.

3. Shared Approach to Dedicated Resource Allocation. The potential to leverage contributions through a multi-agency initiative, such as the CMP, is a strong incentive for participation. For example, a \$5,000 annual agency commitment to the CMP, multiplied by 20 participating agencies, results in \$100,000 of core support. The program facilitator, in this case the Miistakis Institute, can then seek matching contributions from other government and private sector sources. However, the ability for agencies to commit resources to transboundary, international initiative creates administrative challenges that must be overcome. The authors are convinced that the benefits of the initiative justify the effort required to overcome these administrative obstacles.

4. Development of Internal Communication Products. Communication with CMP participating agencies must be increased between the annual forums. Furthermore, the materials should be developed and distributed to individuals beyond the delegates to the annual meetings. Individual agency representatives should be contacted to develop a list of targets to receive communications pieces. The CMP is in the process of finalizing a Web site and a suite of presentations that can be used by participating agencies to

communicate the activities of the partnership. Communication products should focus on issues of shared interest, the benefits of collaboration and the demonstrable outcomes of CMP initiatives.

5. Development of External Communication Products. To date, the CMP has operated relatively quietly with little external outreach to the general public or to potentially interested non-governmental interest groups. Now that the initiative is well established it seems appropriate to communicate the ideals and benefits beyond the current participants. Such public outreach may also help to develop the higher level support identified above. Generating an increased understanding of the CMP may also result in expanded participation in the activities of the CMP.

6. Monitoring, Feedback and Continuous Improvement. The CMP should ensure that there are well-established mechanisms to evaluate the regional CEA framework and outcomes. The ALCES[®] model should be subject to continuous refinement as more and better information becomes available. Model predictions should be tested and assumptions revisited.

7. Explicit Incorporation of Results into Agency Activities. The long-term development of the regional CEA will be predicated on its usefulness to participating agencies. The CMP should endeavour to use the modeling results in planning exercises as soon as possible in order to evaluate and promote the benefits of the process. The

CMP should also endeavour to use the regional cumulative effects process to provide a better context for the evaluation of local development proposals.

8. Appendices

Appendix A Participating Agencies in the Crown Managers Partnership

Appendix B Crown Managers Partnership – 2003 Survey

Appendix C Lessons Learned from Regional Conservation Planning Efforts

Appendix A Participating Agencies in the Crown Managers Partnership

CANADA

First Nations

Ktunaxa Kinbasket Treaty Council
Blood Tribe

Government of Canada

Parks Canada – Waterton Lakes National Parks

Province of Alberta

Alberta Sustainable Resource Development (Forest Service)
Alberta Sustainable Resource Development (Fish & Wildlife)
Alberta Sustainable Resource Development (Public Lands)
Alberta Environment
Alberta Community Development: Protected Areas Division

Province of British Columbia

Ministry of Sustainable Resource Management
Ministry of Water, Land and Air Protection (Wildlife)
Ministry of Water, Land and Air Protection (Parks)
Ministry of Forests

UNITED STATES OF AMERICA

First Nations

Blackfoot Tribe
Confederated Salish & Kootenai Tribe

Government of United States

U.S. Forest Service (Flathead and Lewis & Clarke National Forests)
U.S. National Parks Service – Glacier National Park
U.S. Bureau of Indian Affairs
U.S. Fish & Wildlife Service

State of Montana

Department of Fish, Wildlife and Parks
Department of Natural Resources and Conservation
Flathead Basin Commission
Stillwater/Swan State Forest

* Agencies that have sent representatives to at least one CMP forum.

Appendix B Crown Managers Partnership - 2003 Survey

Please note: this is the survey text only, the survey was delivered in graphical HTML format.

Consent for Research Participation

Assessing Regional Cumulative Effects For the International Crown of the Continent:
A Crown Managers Partnership Initiative

Investigator: Dr. Michael Quinn, University of Calgary

This consent letter which is being provided to you is only part of the process of informed consent. It should give you the basic idea of what the research is about and what your participation will involve. If you would like more detail about something mentioned here, or information not included here, you should contact Mike Quinn (403 220-7013 or quinn@ucalgary.ca). Please take the time to read this carefully.

The purpose of this research is to collect information to assist in the development of a Cumulative Effects approach to land-use management in the Crown of the Continent. The research is being conducted in conjunction with the Crown Managers Partnership. I am particularly interested in identifying the drivers and barriers that might be associated with a collaborative, cumulative effects approach to managing the Crown of the Continent. Your participation in this research is desired because of your professional knowledge of these issues as manager and/or practitioner in regional land-use/natural resource management.

I do not expect any risk to you in participating in this study. Your participation would involve completing a web-based survey, which will require about 30 minutes. Your participation is voluntary and you may withdraw from the study at any time.

All responses to these questions will be kept confidential. The questionnaires will be identified by number only and no identifying information will be collected. If you choose to withdraw from the study at any point, simply exit the website.

If you would like to receive a summary of the research results an option will be provided when you submit your completed survey. Please note that to insure anonymity, the information collected to send you a summary will not be connected with your survey response.

By selecting the "I AGREE" button below, you are indicating your consent to participate. In no way does this waive your legal rights nor release the investigators, sponsors, or involved institutions from their legal and professional responsibilities.

If you have any questions or issues concerning this project that are not related to the specifics of the research, you may also contact the Research Services Office at 220-3782 and ask for Mrs. Patricia Evans.

I AGREE I DO NOT AGREE

Select "Next" at the bottom of the page to continue. Please note that you do not have to complete the entire survey at one "sitting". If you exit the survey without completion, you can return at a later date and begin where you left off. Returning to complete a survey can only be done from the same computer.

2. How would you rate your personal understanding of the Crown Managers Partnership (CMP)

Very Low Low Moderate High Very High

3. The CMP has hosted two annual forums - How many of these have you personally attended?

0 1 2

4. The CMP has hosted 2 annual forums - How many of these has your agency attended?

0 1 2 Don't Know

5. Do you plan to attend the CMP 2003 Annual Forum in Pincher Creek, AB?

Yes No Not Certain

If no, can you please explain why?

6. Please rate the importance/value of the following potential CMP activities

1 - Less Important 2 3 4 5 - More Important

Identify and facilitate region-wide research

Pool and match funds for collaborative projects

Identify region-wide needs

Develop and disseminate information to interested publics

Facilitate the creation of transboundary agreements (e.g., MOUs or collaborative agreements)

Address increased recreational demands and increased visitation in the region

Organize an annual forum to discuss the activities of the partnership

Coordinate the collection of region-wide data

Facilitate a cumulative effects assessment for the region

Address the maintenance and sustainability of shared wildlife populations
Provide a forum for interagency networking and collaboration
Build awareness of common issues and interests

7. Are there other activities that you think the CMP should undertake or facilitate?

Yes No
If yes, please specify

8. Are there other agencies that you would like to see involved in the CMP?

Yes No Don't Know
If yes, please specify

9. Thinking specifically about an agency that is either not currently participating in the CMP or is not fully participating, what might be done to encourage their participation?

10. Please indicate your personal level of interest in the Crown Managers Partnership

1 - Not Very Interested 2 3 4 5 6 7 - Very Interested

11. How would you rate the level of support from your agency for the Crown Managers Partnership?

1 - Not Very Supportive 2 3 4 5 6 7 - Very Supportive Unable to Judge

12. What three things might make it easier/more attractive for you to participate more fully in the CMP?

1.
2.
3.

13. "Crown of the Continent" is the label being used to describe the geographic area of interest for the CMP. How prevalent is the use of this term in your agency?

1 - Not Used 2 3 4 5 6 7 - Used Regularly

14. What other labels does your agency use to describe the geographic area of interest for the CMP?

1.
2.
3.

15. In your opinion, what are the three most pressing resource management issues facing the Crown of the Continent today?

- 1.
- 2.
- 3.

16. In your opinion, what will be the three most pressing resource management issues ten years from now?

- 1.
- 2.
- 3.

17. How would rate the relative importance of the following resource management issues in the Crown of the Continent?

1 - Less Important 2 3 4 5 6 7 - More Important N/A

- Recreation/tourism pressure
- Public involvement in management activities
- Water management
- Access management
- Shifting agency organization and mandates
- Human and financial resources
- Species at risk / endangered species
- Forestry / timber harvest
- Conventional oil and gas
- Agriculture - Range Management
- Drought / climate change
- Interagency communication/collaboration
- Collaboration with private landowners
- Increasing roading
- Agriculture - Cropping
- Weeds / introduced species
- Aging infrastructure
- Coalbed methane
- Fire maintenance / suppression
- Rural residential subdivision
- Landscape connectivity
- Intensive livestock operations
- Cumulative effects modeling and management
- Aboriginal rights and titles

18. Are you currently involved in any collaborative management initiatives that you consider to be particularly effective?

Yes No

If yes, please provide the name of the initiative

19. Based on your professional experience, what are the most important characteristics of effective collaborative initiatives?

- 1.
- 2.
- 3.
- 4.
- 5.

20. Based on your professional experience, what factors act as barriers to effective collaborative initiatives.

- 1.
- 2.
- 3.
- 4.
- 5.

21. How would you, personally, define cumulative effects?

22. How familiar is your agency with the concept of cumulative effects assessment?

1 Not at all familiar 2 3 4 5 6 7 Very familiar

23. Does your agency currently undertake or participate in any cumulative effects assessment processes?

Yes No Don't Know
If yes, please specify

24. Cumulative effects assessment (CEA) has been used primarily for evaluating individual project/development proposals (e.g., Cheviot Mine CEA in Canada; Snake River Dam Management EIS in U.S.). However, CEA is also being used as a regional planning/ecosystem management tool (e.g., Banff Bow Valley Study in Canada; EPA Prairie Pothole Wetland Restoration Assessment in U.S.). In the "Crown", the intent is to develop the latter. What is your opinion on the potential use of CEA in this way?

25. How important are the following reasons in your making a positive decision to participate in a cumulative effects assessment for the "Crown"?

1- Less Important 2 3 4 5 6 7 - More Important N/A

entity willing to drive the process
leverage benefits of collaboration

public pressure
support from upper management
agency commitment to transboundary management
fill current information gaps
information essential to achieve agency mandate
legislative requirement
personal belief in the value of a CEA approach
availability of effective models

26. What do you consider to be the primary benefits of pursuing a cumulative effects analysis for the "Crown"?

- 1.
- 2.
- 3.
- 4.
- 5.

27. Please rate the importance of the following factors that might prevent you or your agency from participating in a cumulative effects analysis for the "Crown"

1 - Not Important 2 3 4 5 6 7 - Very Important

public opposition
mistrust between agencies
intimidating nature of task
lack of framework for integrating results into agency planning
lack of financial & human resources
difficulty in working across borders
lack of political support
lack of entity willing to drive process
lack of clarity in project goals
lack of understanding of process
outside of agency mandate
data gaps or compatibility issues
lack of support from senior management

28. What do you consider to be the most significant barriers to completing a meaningful cumulative effects assessment for the "Crown"?

- 1.
- 2.
- 3.
- 4.
- 5.

29. Discussions of cumulative effects assessment for regional planning often raise the importance of setting clear landscape goals and objectives. Have you or your agency worked on the development and/or implementation of ecological thresholds or landscape objectives?

Yes No Don't Know
If yes, please elaborate

30. What specifically would you hope to see come from a cumulative effects assessment in the Crown of the Continent region?

31. How might you use the products of a cumulative effects assessment in your work?

32. Do you have other comments, suggestions or questions regarding the undertaking of a cumulative effects assessment for the "Crown"?

33. Which of the following categories best describes your agency?

Provincial (Alberta) Provincial (BC) State (MT) Federal (US) Federal (Canada)
Other (please specify)

34. We would like to obtain a representative sample of resource managers in the Crown of the Continent region. Could you recommend the names (and e-mail addresses if possible) of others who you think should take this survey?

- 1.
- 2.
- 3.

35. Do you have any other comments or suggestions related to this survey or the CMP?

Thank you very much for your participation. I recognize how busy you are and I appreciate the time you took to complete this survey. You can return to this survey to edit your answers or finish incomplete sections at any time before 31 March 2003.

36. If you are interested in receiving a copy of a research summary, please provide your e-mail address below:

37. FINALLY, as a small token of appreciation, we are making a draw for five book prizes. If you would like your name entered into the draw, please provide your e-mail address below:

Appendix C Lessons Learned from Regional Conservation Planning Efforts

From: California Department of Fish and Game www.dfg.ca.gov/nccp

LESSONS ABOUT COLLABORATION:

Involve All Affected Parties

- ❑ anticipate all interests that may be affected
- ❑ bring them in early, before any commitments are made
- ❑ create an atmosphere of trust
- ❑ foster “ownership” in the process by local interests
- ❑ local land use authorities (cities, counties) must be involved

Broad Base of Support

- ❑ identify the benefits of maintaining open space
- ❑ engage the participation of organizations and people: equestrians, local parks and rec., mountain bikers, CNPS, etc.
- ❑ consider the secondary benefits/relationship of an open space system to other regional land use issues (e.g., transportation, water and air pollution, housing, quality of life, etc.)
- ❑ identify common interests/objectives

Clearly State Objectives

- ❑ as a group, create specific objectives for the process (e.g., streamlined permitting, meet recovery goals, single plan for multiple jurisdictions, etc.)
- ❑ specify what you intend to accomplish (desired products, partnerships, reserves)
- ❑ establish how you will meet these objectives (collaboration structure, timelines, funding)

Use a Facilitator

- ❑ experienced, people-skilled facilitator, someone who:
 - is trusted by everyone
 - moves the process forward
 - controls “outliers”
 - has a sense for accomplishing goals

Be Open, Honest, Straight-forward, Respectful

- ❑ no secrets; no perception of hiding anything
- ❑ don’t shy away from difficult issues; address them at the appropriate time
- ❑ be creative and open-minded; engage others with unique expertise
- ❑ respect each other’s opinions; we each have a valid role to fulfill

(LESSONS ABOUT COLLABORATION: continued)

Incentives

- ❑ provide incentives (regulatory and other) to make the effort worthwhile to participants
- ❑ complete coverage for listed species; include non-listed species
- ❑ provide assurances that “a deal is a deal”; make them clear
- ❑ a healthy, balanced diet of carrots (incentives) and sticks (requirements) will ensure the best chance of keeping everyone involved and motivated

Leadership

- ❑ every plan needs a local champion who can motivate others
- ❑ the people assigned to the project need to be given the authority to make decisions, and then be able to make them; they need to be able to “close the deal”
- ❑ focus on the “big picture” gains and not the small losses
- ❑ invest time to visit elected officials and local management at their offices to establish open communication, visit without an agenda, and keep them informed
- ❑ strong relationships between local jurisdictions (cities and counties) will be essential to plan success

Build Trust

- ❑ the regulatory way is not always the best way
- ❑ encourage creativity; think “outside the box”
- ❑ project staff must have good people skills
- ❑ build relationships among the group; get to know each other to reduce thinking only of each other in your roles; have meals together, evening socials, and field trips
- ❑ consult early and often with the wildlife agencies

Commitment

- ❑ the process is not over when the planning is completed
- ❑ training for agency staff (local, state, federal) to understand the details of the plan
- ❑ integration of the plan components into all appropriate business practices
- ❑ learning to trust each other to follow the terms of the plan (avoid excessive oversight)
- ❑ building and maintaining trust among partners is an ongoing task

LESSONS ABOUT BIOLOGICAL ISSUES:

Comprehensive Conservation Objectives

- ❑ include all natural communities and habitat features
- ❑ address multiple species (both listed and not) and ecological functions
- ❑ clearly articulate the conservation standard necessary for plan approval
- ❑ set clear, measurable biological goals

Regional Context

- ❑ identify the planning area to address a biogeographic region defined by ecosystem features
- ❑ create conservation objectives and a reserve system design to fit with adjacent conservation efforts
- ❑ spatial characteristics of biological features of interest are important

Scientific Foundation

- ❑ “front load” the process with a strong scientific foundation
- ❑ consult with independent science advisors early in the process
- ❑ identify data needs early
- ❑ “check in” with the science advice at decision points
- ❑ acknowledge realities of planning at a regional scale
- ❑ sacrifice some level of data detail for larger geographic coverage
- ❑ using “keystone” or “umbrella” species and other indicators
- ❑ general reserve design tenets increase in importance, site-by-site detail decreases
- ❑ a map-based conservation strategy is very important

Geographic Information Systems (GIS)

- ❑ conservation problems and solutions are spatial in nature
- ❑ almost all relevant data are explicitly spatial
- ❑ technology allows for virtually unlimited queries and models; “what if” scenarios can be explored
- ❑ graphic output (maps) is unsurpassed at conveying information

Monitoring and Adaptive Management

- ❑ keep monitoring and management separate, but develop an integrated approach
- ❑ begin designing a program early in plan development (don’t leave until last)
- ❑ base it on the biological goals
- ❑ collaborate across plan boundaries; standardize regionally

LESSONS ABOUT THE PROCESS:

Funding

- ❑ the availability of money dedicated to this purpose will dictate the pace and outcome of the process
- ❑ upfront funding to begin serious planning is crucial for several reasons, one of which is to maintain momentum
- ❑ create a funding “toolbox” for implementation; explore all options (development fees, tipping fees, habitat assessment districts, local bond measures, sales tax, etc.)
- ❑ land acquisition is normally a component of the process: start early and explore all options (e.g., land exchanges, raising funds through a variety of efforts, tax incentives, TDRs, etc.)
- ❑ spread the responsibility equitably

Other Important Tips

- ❑ build a common language (terminology) early and use it consistently
- ❑ begin at the end, i.e., set goals based on the specific criteria for making permit findings
- ❑ consult with the wildlife agencies together - early and often
- ❑ be mindful of local politics and timing of elections; long planning time frames and shorter political terms
- ❑ employ local consultants who are knowledgeable about conservation planning and are well-respected
- ❑ learn about tactics from other plans; read them, meet with experienced people
- ❑ be as specific as possible in writing the plans to avoid disagreements later
- ❑ craft a plan that will help the wildlife agencies let go of project-by-project review
- ❑ hire a technical editor for writing the final plans
- ❑ stay committed to the partnerships even after permits are approved
- ❑ requires ongoing interpretation of the plans - “we knew what we meant at the time...”
- ❑ seek partnerships for implementation – shared acquisitions, monitoring and management, data, regional funding

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