Ecosystem Based Management Challenges to EBM for Alberta and Saskatchewan Forests

Section B: High Level Frameworks

fRI Research Healthy Landscapes Program

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Richard L. Bonar

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B. High Level Frameworks

This section covers the initial level of translation of our values and subsequent natural resource management paradigms into policy. This section will focus on related provincial and federal policies. Although values and paradigms are being translated, this level still largely deals with how natural resource management is organized, managed, and regulated.

B1. Governance

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The current approach to managing forests in Alberta and Saskatchewan is organized around disconnected human values and interests. With few exceptions we do not actually manage whole forest landscapes for shared and reconciled ecological and human wellbeing outcomes. We manage values and pieces separately, and we have different institutions that manage the values and pieces. Governments control human activities through regulation, but the regulation framework follows the same fractured system that produces the disparate outcomes and activities that are being controlled. The governance framework itself is one of the biggest EBM challenges because it is also the EBM implementation framework and has many obstacles for EBM elements and aspects.

The underlying structure of the current values-based approach management framework (Box B1 and Figure B1) has been in place for at least seven decades. Current management of forests lands and ecosystems in Alberta and Saskatchewan is divided by:

- Land use designations that define boundaries, priority uses, and allowed and disallowed activities. Examples are protected areas, municipalities, private land, etc.
- Land ownership and rights held by governments, Indigenous, and private owners. Examples are federal crown lands, provincial crown lands, Indigenous treaty lands and Indian Reserves, private lands, etc.

Box B1. Values-based Approach to Management (from Andison 2020)

The value-based approach (VBA) is represented largely by having a single primary value as the foundation of every management plan. The planning process usually considers a longer list of other values as filters that affect decision-making. Filters are usually combinations of environmental, economic, and social values and can be represented by regulatory requirements, technological and economic feasibility, and social norms and desires to change them.

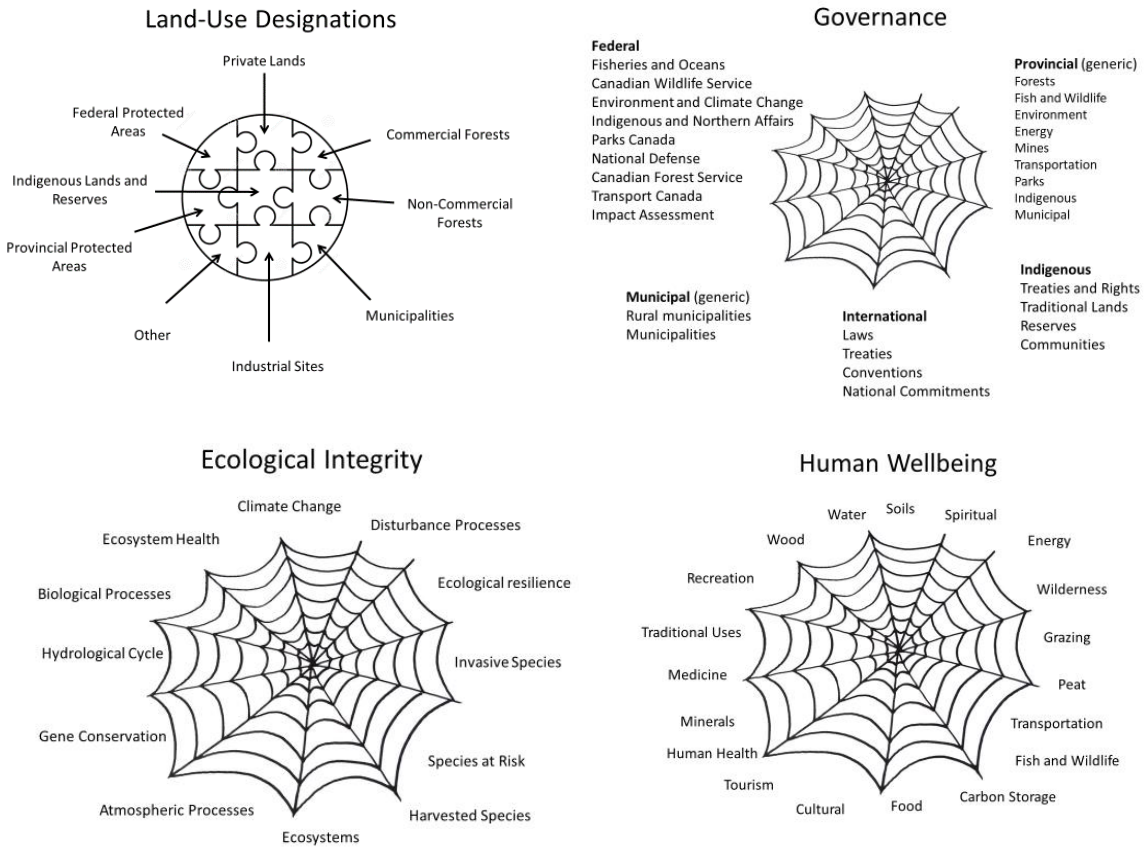

Figure B1. Representation of the values-based approach to forest management.

- Administrative units that relate to human uses and interests. Examples are industrial tenures and sites, fish and wildlife management units, and Indigenous traditional lands.
- Legislation and other regulatory instruments are primarily designed around individual values and Government departments and agencies are responsible for specific values and aspects of land and resource management. Examples are energy, timber, fish and wildlife, minerals, and water.
- Authorities (contracts, licences, authorizations, etc.) held by organizations and individuals. Examples are Forest Management Agreements (FMAs), mine permits, water licenses, trapping licences, and road dispositions.
- Interests held by local and external stakeholders and interested parties. Examples are recreation, commercial businesses, water conservation, visual and aesthetic, social justice, and environmental aspects.

Forest lands are divided into administrative units organized around land use designations. Governance is divided among multiple levels of government and their separate agencies, with Indigenous governance remaining a largely-unresolved work in progress. Most aspects of ecological integrity are either not purposefully managed or they are managed through a divided system of regulatory command and

control instruments that are loosely integrated and largely disconnected. The values-based approach focusses on human uses of the environment and biological resources, again through disconnected oversight and independent governance and human actions.

The VBA result is division of natural ecosystems and their management, with multiple governance agencies and their clients each with unique institutions and rules to maximize the values they have responsibility for. All of these divisions operate in the same space and time. When new knowledge, pressures, and societal norms arise, they are typically incorporated into the same basic system by adding to the pile of those already in place (Box B2; Government of Alberta 2018a). Governance agencies may attempt to reconcile values and control erratic or surprising ecosystem responses by introducing and increasing commands and controls designed to prevent or reduce the effects of other uses or activities on particular values (Holling and Meffe 1996).

> *"EBM is being held-back by continuing with status quo arrangements rather than adapting. Governments and industry are both guilty of cherry-picking the things they like."* (Anonymous SME).

Box B2. Regulations Tend to Increase Over Time — An Alberta Commercial Forests Example

The first Operating Ground Rules in 1958 were 4 pages double spaced (Bott et al., 2003). The Alberta timber harvest planning and operating ground rules framework for renewal (Government of Alberta, 2016) is 91 pages. Other requirements such as the 114 page Forest Management Planning Standard (Government of Alberta 2006) and the 376 page Reforestation standard of Alberta (Government of Alberta 2018b) had no

Exploitation of renewable resources generally operates on a model of sustainability with management designed to maintain the underlying capacity of environments and biodiversity to continue to provide over time the benefits humans use. Some values involve removals of products from the natural world for human use, and others involve conservation in the natural world. Management then usually aspires to maximize the sustainable and stable exploitation or protection of each value, and the process is separate for each value. Different organizations separately attempt to maximize sustainable wood, fish, wildlife, water, recreation, tourism, spiritual amenities, etc. on the same land area at the same time.

The framework for non-renewable uses is similar, except the goal is usually to exploit the non-renewable use to maximize economic value while accommodating considerations for other values through command-and-control imposition of constraints. Exploitation of non-renewable resources is governed by permission (whether or not they can be exploited with full regulatory compliance) and economics (whether or not they can be economically exploited).

> *"For a long time, Alberta operated under a model of maximizing everything everywhere all the time, and there would be no consequences. Now we have to face the music and try to fix the mess."* (Anonymous SME).

Application of the VBA model works reasonably well where human populations and uses are relatively low and pressures to exploit the natural world for human benefits are relatively few. The non-commercial forest zone in northern Saskatchewan is an example of such a landscape. There are relatively few people and most ecological processes and conditions are reasonably intact. That is not to say that there are not challenges — there are and they are significant (e.g., Quiring 2004; Zahara 2020)

The situation in more southern forests with multiple uses close to large population centres is very different. Demand for forest values and inability of the divided governance system to effectively reconcile societal pressures leads to conflicts and crises. Discourse that continues to focus on individual values may lead to changes in priorities between values but changes often don't resolve the VBA shortcomings and set off further rounds of conflict discussions between values.

Challenges associated with the VBA are continuing to expand in degree and extent with increasing pressures from population growth and economic growth and increasing regulation intended to address pressures, especially for environmental protection.

CHALLENGES

- Population and *per capita* consumption growth both increase pressures in the face of a finite natural environment. Economic uses each try to maximize extraction and minimize costs to capture highest economic value. This tends to inefficiently skew estimates of the balance between human use and ecological integrity, which challenges both ecological integrity (biodiversity, ecological services, etc.) and human wellbeing (inefficient, costs increasing, low adaptive capacity, etc.).
- Present governance systems are driving Canada towards failing to achieve a sustainable boreal zone (Marshak et al. 2017; Creed and Serran 2019).
- Integrated analyses of the possible cumulative future effects of the current management approach show a number of very significant risks (Schneider et al. 2003).
- Governments have difficulties implementing their programs (e.g., Agrawal et al. 2008; Beland Lindahl et al. 2017). Governments that fail to improve performance face a future of increasing fiscal stress, rising scrutiny, and declining legitimacy and public trust (Centre for Public Impact 2020). The challenge is to improve integration and resilience, which is a major objective of EBM.
- Weak processes to make trade-offs, uneven power relations, and dominating eco-modernistic ideas result in politics that largely maintains the *status quo*, and lack of coordination, flexibility and steering hamper the development of long-term and dynamic responses (Beland Lindahl et al. 2017).
- Command and control regulation is dependable and enforceable but also inflexible and inefficient (Vertinsky and Luckert 2010; Ring and Schröter-Schlaack 2011).

- Properly implemented constraints are important to protect ecological values but constraints do not guarantee the continuance of functioning ecosystems (Dodds 1994). Constraints should be oriented towards targets and regularly reviewed and revised to ensure they are effective.
- The net effects of regulations developed independently for different purposes can include:
    - Gridlock, when there is no feasible or cost-effective way to meet all regulatory requirements and implement the planned actions.
    - Ineffective in that they do not achieve their objectives.
    - Inefficient by duplicating efforts and increasing compliance costs.

> "*First Nations are probably the only ones who know what's going on because everyone goes to them for input. Unfortunately, they don't have the capacity to engage with everything that comes their way.*" (Anonymous SME).

- Divided responsibilities and priorities among governance agencies and those who must implement regulations means that:
    - Important aspects such as cumulative effects may be missed or inadequately addressed.
    - Aspects such as species at risk recovery may not be effectively managed.
    - Governance may be uneven and inconsistent.
    - Internal referral processes intended to achieve integration can be time-consuming and may require negotiations between internal agency priorities.
- There are few governance agencies with the task of obtaining the best overall outcome that balances all values and considerations.
- The disconnected planning processes overlap each other in space and time, and there may be no implementation processes for aspects that overlap. For example, watershed plans don't mesh with FMPs, which don't mesh with fish management plans, etc.
- Important values tend to fall through the cracks of the governance system, which leads to more regulation and processes to fill the cracks, or alternatively increases future risks such as fire, climate change, etc.
- VBA management often underestimates consequences or dependencies on other parts of ecosystems (Delacámara et al. 2020). Some instruments reduce each other in their efficiency and effectiveness. Irrespective of the context, inherently counterproductive or suboptimal instrument combinations negate or dilute the effect of another instrument (Gunningham and Sinclair 1999). For example, Alberta direction to "use existing access" was well-meaning but proved to be inappropriate where existing access (often, seismic lines) was suboptimal for the intended use and protection of ecological values. This led, for example, to considerable unnecessary construction of all-weather roads across extensive wetlands.

- Focus on individual values and division of governance tends to suppress opportunities for innovation by exploring alternatives that could provide better outcomes for individual values when compared to the separated conflict-based command and control process in the VBA.
- Different rules for different uses can lead to sub-optimal outcomes. For example, planning and approval of Alberta industrial roads differs between the forest and energy sectors, even though both operate in the same space and time and often share road use. This leads to unnecessary proliferation of roads, suboptimal location and design standards, and increases in costs and environmental impacts.
- Applying a technical, tame solution to a VBA problem that is actually a wicked problem is a trap that may not solve the problem or alternatively creates other unintended problems (DeFries and Nagendra 2017).
- Conventional approaches tend to discount the inherent uncertainties of social-ecological systems and adopt mostly deterministic approaches to future challenges when modelling the consequences of future scenarios (Delacámara et al. 2020).
- The benefits of biodiversity conservation mainly accrue at national and global levels but the costs are often borne at local and regional levels, are unequally distributed between economic sectors, and unevenly spread across administrative units (Ring and Schröter-Schlaack 2011). Unequal distribution of costs and benefits is a challenge because it is perceived to be unfair.
- Regulatory compliance increases costs substantially for often uncertain outcomes. Many regulations control activities rather than outcomes. Activity compliance does not necessarily achieve desired outcomes, especially if the outcomes are not clearly specified. Alternatively, outcomes may be achieved but the methods may not be the most cost-effective options.
- Regulations intended to resolve problems or achieve outcomes often fail to meet their intended purpose, or meet the intended purpose but have unintended consequences on other values.
- Requirements are often inflexible and are either not workable or not the most effective solution in multiple situations. Procedures to approve alternatives through variance requests may be costly and take considerable time, and there is no guarantee they will be approved.
- Regulatory frameworks are relatively insensitive to and slow to react to external factors such as markets, international treaties, changing social norms, and market campaigns. Changes may overshoot and introduce unnecessary costs, or undershoot leading to more changes to correct deficiencies. A general challenge is the delay in getting the latest knowledge into government policy and practices (VanDamme et al. 2014).
- Social norms are trending towards environmental protection and away from economic development (Robinson et al. 2001). At the same time there is increasing pressure to cut development costs to remain competitive (Vertinsky and Luckert 2010). The VBA is based on

competition and trade-offs between values and is not well suited to resolve conflicts. Governments have resorted to touting "strict environmental regulations" as a virtue and a rationale for maintaining existing development and proposing new development. This perpetuates the VBA perception problem of management being about trade-offs rather than shared outcomes.

- The VBA does not effectively consider and resolve long-standing and rapidly changing challenges:
    - Unresolved equity and governance such as Indigenous rights and uses, reconciliation, consultation, co-management, co-ownership, etc.
    - Increasing risks related to fire, floods, over-allocation and shortage of water supplies, species at risk, invasive species, insects and disease outbreaks, climate change, etc.
    - Recognition and integration of new ecological values and opportunities for new developments or human uses. For example, Environmental Impact Assessment requirements are typically process-heavy and arbitrary one-off exercises influenced more by political considerations and values conflicts than they are by objective, transparent, and consistent decisions.
- Governance is still largely based on a dichotomy between human uses of ecosystems and protected ecosystems which sets humans apart from the natural world, the so-called wilderness ethic (Cronon 1996; Youdelis et al. 2020). Many people consider protection from a particular human use to be sufficient to conserve environmental values and their related human interests. These views do not account for risks that accompany a management model of simple protection over time. This may be because people associate protection with stable, static environments and ecological conditions, or a view of letting nature take its course.
- A related challenge is low recognition that change will occur with or without human management, and that managed change may be a superior alternative to some aspects of natural change (e.g., forest fires when they threaten human wellbeing) when considering both the ecological and human wellbeing sides of EBM. In this sense, EBM is about risk management and aims to reduce both ecological and wellbeing risks.
- Most forest governance models include some attempts to respond to challenges in ways that are more dynamic and long term but they tend to primarily rely on short-term responses prioritizing stability and struggle to deliver meaningful change (Beland Lindahl et al. 2017).
- Overcoming inaction related to overwhelming complexity is a challenge (DeFries and Nagendra 2017).
- When challenges are low but policy change is difficult, change is likely to be through layering, where change proponents attempt to work around institutions that have fostered powerful

vested interests by adding to the pile instead of reinventing the pile (Rayner and Needham 2009).

Recommendations

- Governments and others could look for opportunities to move from a fragmented approach to an integrated and coordinated systems approach across landscapes that can harmonize policies both vertically and horizontally (Beland Lindahl et al. 2017; Creed et al. 2019).
- The most promising innovations tend to have environmental, economic, and social benefits, making their implementation more likely (Burton et al. 2006).
- Moving to an integrated systems approach provides opportunities to review existing approaches and requirements to see if they still fit with new EBM approaches. Carefully considered removal of some major operational constraints is likely to increase efficiency with little impact on objectives (Vertinsky and Luckert 2010). There are probably opportunities to reduce red tape and be less prescriptive and more flexible.
- Look for better ways to ensure that outcomes are achieved. Redistributing costs rather than increasing total costs and the potential for cost savings are opportunities.
- Feasible use of results-based regulation and decentralized enforcement may increase both the efficiency and effectiveness of regulation (Vertinsky and Luckert 2010).
- The inherent complexity of ecosystems requires policy decisions under uncertainty that require adaptive management approaches to address.

B1.1 Political Governance

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Management of Alberta and Saskatchewan forests is governed primarily by the provincial governments with roles from the federal government, Indigenous governments, and provincial districts and municipalities. Political leadership tends to swing somewhat over election cycles between preference for command-and-control governance and greater reliance on markets and more of a hands-off approach. Politicians are motivated by ideology, economics, local constituent views, risk avoidance and controversy, and above all, prospects for maintaining power through re-election.

Challenges

- EBM will not happen at large scale without strong and integrated government leadership that starts at the political level.
- Few elected representatives have much knowledge about forests in general and EBM in particular. The challenge is to increase their awareness and understanding through trusted and powerful voices.
- Electoral cycles are relatively short and this makes it difficult to think and act strategically and maintain momentum for implementation of longer-term initiatives such as EBM.

- Former Alberta Minster of Sustainable Resource Development Ted Morton said: "*Politicians come and go, bureaucrats don't*." (Morton 2020). Political direction does not necessarily get implemented, especially when implementation takes significant time:
    - Political leadership or emphasis changes fairly often through elections and changes within administrations.
    - Resistance within some of the public service may delay action until political leadership changes.
    - External opposition or events alters political direction before implementation is completed.
    - "*Where complication appears, political puck ragging invariably follows*" (Maclean's Editor 2021). As complexity and conflicting views increase so do political tendencies to delay decisions indefinitely, or at minimum put them off until political circumstances are favourable.
- Ministries responsible for forest management have comparatively narrow mandates and are not as politically powerful as some others.
- Historical power imbalances continue to shape the current dialogue and spaces for change and foster lack of trust in political processes (Budny 2014; Miller and Nadeau 2017).
- Extensive administrative and political negotiation and compromises are necessary to pursue policy integration (Candel 2021). This requires leadership from both the public service and politicians, and also external voices that support improved governance integration through EBM.

RECOMMENDATIONS

- Political support starts with powerful actors such as government Ministers who must be willing to spend political capital to champion EBM. Building EBM understanding with key Ministers is a necessary precursor to gaining their support. The opportunity is to develop compelling value propositions and external support so that politicians will be willing to champion.
- Political timing is a key aspect of gaining political support for EBM, because politicians are always considering the pros and cons of any potential initiative at any given moment. Considerations such as the party in power, the timing of the electoral cycle, alignment with other political priorities, the economy, internal and external events, alignment of provincial and federal politics, political polls, etc. may provide opportunities for EBM that might not be available at other times.
- One opportunity pathway to gaining political support is value propositions for improvements through EBM, in simple terms that people understand, that gain widespread societal support and thus earn political support.
- Partnerships and respected voices promoting EBM as an improvement to the status quo are potential pathways to success. An EBM institution consisting of key organizations and individuals advocating for EBM is one opportunity that could be explored.

- Ongoing initiatives to improve relationships between federal, provincial, and Indigenous governments provide EBM engagement and discussion opportunities. The Indigenous Circle of Experts report and related cooperation toward the Canada Target 1 Challenge is an example.
- External think tanks and organizations that have public discourse presence could be powerful supporters of EBM if they become convinced of the benefit promise from EBM. The opportunity is to engage key players to explore interests and opportunities. Organizations such as the Canada West Foundation, Canadian Centre for Policy Alternatives, Fraser Institute, Pembina Institute, and others could be good places to start.
- In Alberta, external and internal criticism of the status quo situation and pathways for the future is leading to a convergence of interests amongst key players to increase integration through institutional change to promote the goals of sustainable development (Budny 2014). Convergence of interests also provides EBM opportunities.
- Improved land use planning processes, which already have wide public support in principle, are implementation opportunities that should be politically supported. In British Columbia Premier John Horgan (2019) sent a letter to forest companies inviting them to participate in collaborative planning initiatives. This led to three active initiatives as of April 2021. Alberta and Saskatchewan could start similar initiatives on an invitational basis, and include the energy sector.
- Innovative pilots and demonstrations at multiple levels are significant opportunities. High-profile demonstrations that feature partnerships and leverage are politically attractive and have relatively low political risk.
- There may be opportunities to piggy-back EBM into ongoing initiatives, for example the Pan-Canadian Approach to Species at Risk (Government of Canada 2018a).
- Another possible EBM opportunity change pathway is through response to events. In B.C. international boycotts and market campaigns catalyzed implementation of EBM in Clayoquot Sound and the Great Bear Rainforest. Alberta is currently in the midst of market campaigns against the energy sector and recently endured several natural catastrophes in the form of devastating forest fires and floods. Saskatchewan too has seen large natural events that generated controversy in their wake. Both provinces are looking for opportunities to improve reconciliation and engagement with Indigenous peoples. The economic viability of the forest sector in Saskatchewan may also be a change catalyst and so could the imperative to complete and implement integrated caribou range plans in both provinces.
- Communication of political commitment to throughout government institutions and to external audiences is a key EBM opportunity.

B1.2 Institutional Governance

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The institutional governance system consists of agencies and institutions and their clients with differing levels of political power and authority that they tend to use to either resist change or promote change according to what they believe is in their best interests.

Clearly defined roles and responsibilities are needed for all who are involved in each *defined forest area* where EBM is to be implemented. These include regulators, managers, and others who have defined EBM roles and responsibilities, plus others who may be directly affected by EBM (stakeholders) or have an interest in EBM (interested parties). The first group in the others category includes those that have some level of legal accountability (governments, Indigenous, holders of legal tenures or licenses, private land owners, etc.) for EBM and the second includes those that have some form of interest in defining EBM implementation and outcomes.

Regulatory agencies involvement tends to be specific to the category of land use processes being followed. Where regulatory agencies have the lead responsibility for producing plans (park management plans, Alberta LUF Regional Plans, some FMPs) typically one agency leads the process and seeks participation from other agencies as relevant and required. Where industry has lead responsibility (FMPs for area-based commercial tenures) government agencies participate to varying degrees. The lead government agency usually collects input from other agencies and brings that to the process, although some agencies may choose to participate directly.

CHALLENGES

- Forest governance in Alberta and Saskatchewan is a complex patchwork of federal and provincial legislation, policies, tenures, and delegated authorities designed to achieve multiple (and often conflicting) economic, ecological, and social objectives (Fuss et al. 2019).
- Moving from the long-established VBA to forest management to a fundamentally different EBM approach that fosters collaboration and integration is a formidable challenge (Price et al. 2009; Rayner and Howlett 2009).
- A related EBM challenge is to move from command and control toward results-based regulation and smart regulation that embraces flexible, imaginative and innovative forms of social control (Gunningham and Sinclair 1999).
- EBM success requires government agencies to work together toward common goals, and they are not set up to do that well. Most agencies have established relationships with a particular clientele and act on their behalf in competition with other agencies and their clientele. The clienteles along with their regulatory agencies represent powerful political lobbies that have proven to be very difficult to overcome (Rayner and Howlett 2009).
- Governance structure is the means by which policies are carried out or subverted and all political actors advocate for structures and processes that give them the greatest likelihood of achieving policy outcomes that reflect their interests (Hoberg 2019).
- The entrenched governance system is therefore a monumental challenge to EBM, because powerful actors can always resort to political end-runs if they do not like the way processes are going. Changing governance structure is likely beyond the scope of EBM and its supporters. The more tractable challenge is to improve process integration and ecological resilience, which are major EBM objectives.

- Government agencies need structural reform to allow implementation of EBM, but a larger political and economic vision and commitment is also necessary (Burda et al. 1997).
- Healthy ecosystems and sustainable human uses are frequent government goals but there are no regulatory agencies with EBM mandates.
- Rayner et al. (2013) noted the presence of dispersed capacity and weak coordination between national and provincial governments in relation to climate change adaptation. This configuration also applies to many forest management aspects within provinces where different agencies work independently and have inadequate levels of coordination.
- Canadian forest tenure systems impose tight and inflexible constraints on forestry practices and operations (Vertinsky and Luckert 2010) that are not consistent with EBM.
- Political competition between agencies is widespread and revolves around government-as-environmental-trustee versus government-as-resource-developer (Burton et al. 2003). This is an example of the difficulties in finding a balance between ecological integrity and human wellbeing.
- Where regulatory agencies have management responsibility, they are still subject to external requirements administered by other agencies.
- Regulatory agencies may be disinclined to participate in EBM because their mandate requires all available agency resources and they do not have additional participation capacity.
- EBM has so far been introduced by layering of new goals and instruments on top of the already complex governance mix. This is partially because policy legacies are protected from more substantial change by powerful elements of the policy community (Thielmann and Tollefson 2009). Political and bureaucratic aversion to risk and uncertainty and adverse public reaction are also factors. This “nibbling around the edges” is a challenge because it increases many of the existing problems (complexity, cost, integration, etc.) rather than resolving them.
- Individual worldviews and inclinations affect the professions and careers people choose. They tend to have an inclination toward their choices and the values they represent or manage. This makes a difference and is a barrier to overcome when asking people to make changes they may not agree with.
- Government personnel interviewed for this project collectively identified time and resources limitations as a major challenge that hinders their consideration and development of EBM concepts. Many recognized that strategic thinking, working across and between agencies, and building relationships with other agencies and their clients and citizens was valuable, but they didn’t feel they had enough support or time to invest in integration over and above their other duties. Several people pointed out that EBM progress was being made, although not at rates sufficient to keep up with demands. It should be noted that this challenge is not limited to government and applies generally to most organizations for whom EBM is a means to an end and not top priority for day-to-day activities.

- Political ideology and leadership churn results in constant shuffling, reorganization and downsizing of ministries and agencies, which creates much suspicion and skepticism regarding organization restructuring and makes internal and external integration much more challenging.
- Government authority is clear at the highest levels but it is subdivided among multiple government agencies and levels. This increases challenges related to governments and their agencies working together to deliver EBM.
- EBM is not a shared management goal among all applicable government agencies. In the absence of political and policy direction agencies and individuals are free to pursue non-integrated mandates and agendas. This is a challenge to EBM.
- Government oversight is usually organized by human activities and specific natural values and many government agencies do not participate in area-based EBM.
- Individual self-interest related to change: loss or change of job, loss of influence and prestige, loss of future prospects, etc.
- Local integration innovation an Alberta has been limited by the inability of government agencies and individual actors to come to agreement, leading to widespread planning fatigue and demands for more systematic strategic integration (Demulder and Thorp 2007).
- Innovation in Saskatchewan was often unnecessary because there were few internal and external pressures to drive it (Rayner and Needham 2009). The recent challenges associated with caribou range planning have exposed internal Saskatchewan government divisions similar to those that occur in Alberta (Anonymous SME).

RECOMMENDATIONS

- Policy integration has come to be known as the Holy Grail of public policy and governments are constantly engaged in efforts to achieve better integrated governance (Candel 2021). The opportunity is to identify and promote EBM as part of policy integration initiatives.
- To be implemented, political support for EBM must effectively be disseminated across all elements of the government apparatus. The opportunity is to develop clear communications delivered by key ministerial and bureaucratic actors who are committed to implementation because they believe it is the right thing to do. This is not simply an internal government initiative and it would be aided by outside support and voices of respected people in positions of thought leaders and influence.
- Managers may feel they are too busy to learn a new approach or invest in integration outside their direct responsibilities (SME interviews). The opportunity is to seek out and work with well-placed EBM champions who will accept challenges if they understand the resulting benefits (Murray and Marmorek 2003).
- Anticipatory governance is ‘‘*a system of institutions, rules, and norms that provide a way to use foresight for the purpose of reducing risk, and to increase capacity to respond to events at early rather than later stages of their development*.’’ (Fuerth 2009). This requires the public service to

recognize current, emerging, and potential events and recommend strategic initiatives to address them. This provides an EBM opportunity.

- Freeing up time and resources may be aided by further development of EBM value propositions that identify efficiency and effectiveness opportunities to be found through EBM compared to current practice. EBM has more value and may attract more support if it is presented as a more effective alternative rather than another thing to add to the current pile.
- Governments can assign an agency to be the area-based EBM manager for each DFA, and that agency can be responsible for coordinating input and activities of other government agencies to define and implement EBM. In many cases there is already a government agency with responsibility for DFAs, these could be used as a starting point.
- Governments could lead a review within their agencies to discuss and set their respective EBM roles and responsibilities.
- Sharing or devolving governance responsibilities and increasing ability to learn from experience are among the emerging trends in environmental management (Berkes 2010). There is an opportunity to initiate dialogue to explore opportunities for cooperation and partnership improvement through EBM.
- In the case of "multi-aspect" environmental problems, the Tinbergen Rule suggests a combination of several instruments, because a first-best optimum cannot be reached with any one single instrument (Tinbergen 1952; OECD 2007). EBM encourages variation in both ecological systems and social systems and can contribute to a combination approach to develop solutions.
- Governments and others are understandably concerned about moving away from a command-and-control management system to one that is results-based, especially where it is difficult to clearly define and measure results (Vertinsky and Luckert 2010). Use of multiple rather than single policy instruments, and a broader range of regulatory actors, will likely produce better regulation. An opportunity is EBM implementation of complementary combinations of instruments and participants tailored to meet the imperatives of specific environmental issues. (Gunningham and Sinclair 1999)
- An opportunity to bridge the difference and build improvements over time would be for governments to offer clients choices to either implement the status quo command-and-control governance or propose results-based or other EBM alternatives with as good or better performance. Risks that alternatives may be turned down or fail in application can be minimized by:
    - Comparing the status quo and alternative to build a value proposition for the alternative, including clear indicators and targets.
    - Building partnerships with others including governments.
    - Phasing in approval and implementation through trials and demonstrations.
    - Incorporating active adaptive management.
    - Building strong communications programs to build trust and support.

- Forest management is very complex and EBM offers a unifying, integrating way to comprehensively deliver complex responses (Delacámara et al. 2020). Government endorsement and leadership to update and implement regional and subregional land use plans that define and plan EBM is an opportunity.
- EBM promotes transparency, inclusiveness, a good knowledge base, appropriate ecological and spatial scale, policy and planning coordination, and active adaptive management, etc. Delivering these requires adapting institutions and policy-making processes to enable and support political support (Delacámara et al. 2020).

Governance Silos

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The current governance structure is set up so that forests and associated ecosystems and resources are managed by different agencies. These "silos" are long-established and each tend to do their own thing, with insufficient interagency cooperation.

Challenges

- The organizational structure within each level of government is characterized by sectoral silos with weak linkages across sectors and among decision-making processes (Rayner and Howlett 2009).
- There is perennial debate over which level of government should have the principal authority to define and implement policy solutions (Clarke and McCool 1996). Provinces have primary responsibility for forest management, but the federal government has jurisdiction over migratory birds, fish, and species at risk, and also has interests in environmental impact assessment, climate change, and management of federal lands. This means that the federal and provincial governments must work together to deliver comprehensive EBM. This has proven to be difficult and has hindered EBM implementation.
- Strained relationships between governments and between agencies with different mandates and multiple and often conflicting policy requirements contribute to the inability of governments to endorse and implement EBM.
- Institutional territoriality is a challenge because institutions and individuals may resent what they see as outside intrusion into aspects they consider to be their domain and prerogative. This can lead to defensive reactions and refusal to consider or accept valuable contributions from outside institutions and individuals.
- Tyranny of small decisions resulting from lack of interagency coordination and agency fragmentation (Clarke and McCool 1996). In some cases, this comes down to individuals in key positions that exercise autonomous authority to prevent or hinder EBM progress. This can lead to strained relationships between organizations and individuals which prevents or hinders identification and implementation of EBM opportunities (Butler and Koontz 2005; SME interviews).
- Internal disconnections and disputes between agencies are common because of the silo organization, narrow mandates, and tendencies to look inwards of most regulatory agencies.

- Silo organization and decision-making limits opportunities to recognize and manage multiple ecosystem services (DeFries and Nagendra 2017).
- Silos are not just a government challenge. Most, larger organizations have internal silos that create integration challenges.

> "*Silos exist at all levels within organizations. I've been through 14 reorganizations in 16 years. Reorgs are awful and inefficient but ironically they help to break down silos for a while before new silos develop*". (Anonymous SME).

RECOMMENDATIONS

- Collaboration is credited with producing a variety of ecological and social benefits, including conflict resolution, better decision making, and improved chances that natural resource decisions will be implemented (Stern and Coleman 2015).
- Collaboration is defined by the concept that problems need to be managed holistically (Margerum 2011) and participants constructively explore differences and possibilities to go beyond what might have been possible working alone. Collaboration between government agencies and institutions and between governments and others is an important EBM opportunity. Margerum's (2011) "seven C's" of collaboration (communication, consultation, conflict resolution, consensus building, cooperation, and coordination) each provide opportunities to break down silos and improve EBM integration.
- Policy efforts at subsystem levels should be coordinated by procedural instruments at system-level (Jochim and May 2010). Communication of clear policy objectives can help to ensure front-line personnel have directions to ensure consistent implementation while retaining the flexibility to support local innovation. It is also useful to help identify and resolve accountability challenges associated with individuals who diverge from institutional policy directions.
- A research paper with the objective of identifying major EBM integration needs and recommendations, perhaps one for each province and the federal government. These could provide context for internal organization-specific assessments of their current governance framework including activities where collaboration with others would improve outcomes.
- Good governance includes three dimensions of equity: recognition, procedure and distribution (Government of Canada 2018b).
    - Recognition acknowledges and respects the rights and diversity of identities, values, knowledge systems and institutions of rights holders and stakeholders.
    - Procedure refers to inclusiveness in decision-making.
    - Distribution implies that costs and benefits should be equitably shared among different actors.

- Governance may be by a single authority and/or organization or through collaboration among relevant authorities and provides the ability to address threats collectively. Collaboration between and within governments and between governments and others is an EBM opportunity.
- There are opportunities to better-align institutions to spatial, temporal, and functional scales of their role in an integrated system and develop policies that shift institutional interactions toward negotiated agreements and systemic change (DeFries and Nagendra 2017).

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Lowest Common Denominator

The expression "lowest common denominator" is used to describe something that is deliberately simplified or set to a specific standard so as to appeal to the largest possible number of people. In forest management LCD is typically expressed as “a minimum standard” by governments. LCD is also present within forest companies and other organizations.

Challenges

- Minimum standards may be set deliberately low by governments because some of their client organizations may not be able to comply with higher standards for reasons of capability, capacity, cost, etc.
- Minimum standards are often viewed by those who must implement them as acceptable targets without further examination, especially if exceeding minimum standards would increase costs or reduce resource access, or don’t have clear organizational benefits to justify doing more. In other words, minimum standards may actually discourage “doing more”.
- Minimum standards are usually developed externally to forest management planning processes and there is little opportunity to explore alternative ways to achieve objectives that the standards are putatively intended to achieve.
- Governments may be reluctant to approve proposals to exceed minimum standards because of their desire for standardization, keeping things simple for government staff to administer and reinforcing the public impression that minimum standards are sufficient and governments are therefore demonstrating due diligence and credibility.
- Governments may be reluctant to approve alternatives to minimum standards, especially if there’s a perception of “you can’t do that because others can’t/won’t and we can’t be seen to treat companies differently” and “we don’t want to give the public the impression that our minimum standards are inadequate”. This second challenge of course only applies until the government decides to change their own standards, in which case there is an opportunity to communicate the benefits of the new standard and take credit for bringing it in.
- Governments also monitor standards in other jurisdictions to ensure their own standards don’t unduly alter competitiveness, market access, and investment.
- Organizations that may want to do more may be discouraged by others including their peers who are not in position to do the same, don’t want to lose competitive advantage, or philosophically disagree with the proposed actions.

- Value-based directions are often expressed as minimum standards which tend to operate as constraints and may conflict with other constraints or EBM objectives.
- Fixed requirements usually reduce the short-term profitability of the operation they are applied to (Boyd and Hyde 1989; Vertinsky and Luckert 2010). Adding requirements eventually makes things too expensive to continue.
- Value-based directions often lack an implementation component (e.g., road density, see Box B3; Government of Alberta 2016a).
- Minimum standards, especially those with no option for variance, tend to result in compliance responses where a standard is viewed as a maximum allowed and there is no incentive to do better. For example, a maximum road density standard (Box B3) provides "permission" to have roads up to that level even if fewer roads could do the job.
- Minimum standards don't incorporate variation and may not have been developed after consideration of NRV.
- Minimum standards may or may not result in conservation of the intended values.
- No opportunity to integrate the area-based aspects of value-based directions for specific areas.
- Reduced ability to innovate integrated solutions where area-based and value-based directions clash.

Box B3. Road Density Standard (Alberta Grizzly Bear Recovery Plan, Government of Alberta, 2016a)

Objective: *To reduce human-caused grizzly bear mortality, which is associated with higher levels of road density and human use.*

Logic: *Fewer open roads will reduce vehicle-supported human encounters with bears.*

Minimum standard: *Open road density targets ≤ 0.6 km/km^2 in core zone and ≤ 0.75 km/km^2 in secondary zone.*

Challenges:

- *Roads are "owned" through disposition and managed by multiple organizations.*
- *There is no process to monitor and manage all roads for specific areas.*
- *Only Alberta can approve roads and close roads to motorized human traffic.*
- *Roads are approved one-at-a-time, so there is no workable target implementation process. In areas with fewer roads the target is likely to create a race to approve roads before the target is reached and no more roads are approved. In areas where road density already exceeds the targets there is no process to close or reclaim roads.*

Recommendations

- *Access plans provide a process to plan for all roads and achieve the best outcomes for the uses supported by roads and grizzly bear conservation.*
- *Revise the minimum standard to an aspirational target and implement access planning on a priority basis determined by, among others, grizzly bear priorities.*

Recommendations

- Minimum standards can be qualified with opportunities to replace or revise them based on more detailed analysis of acceptable alternatives. For example, the Saskatchewan FMPS (Government of Saskatchewan 2017) allows forest companies to conditionally adjust some minimum standards. The opportunity is to add more discussion of objectives and desired outcomes to increase understanding of minimum standard intent, and to provide opportunities for alternative proposals developed locally based on, for example, better information and evidence.
- An alternative to minimum standards is plan-based targets. For example, a minimum standard for maximum road density (Government of Alberta 2008) could be implemented with access plans that design a road network to support approved uses and achieve road densities lower than the minimum standard, or road densities that are higher with additional mitigation actions to achieve acceptable outcomes. Once the plan has been integrated and approved, the planned density replaces the nominal standard.
- Look for opportunities to overcome LCD challenges by finding better outcomes that cost the same or less than minimum standards, to increase the ability of organizations to improve.
- A research project to identify minimum standards and fixed requirements, discern their purpose (intended outcomes), and identify potential alternatives that achieve outcomes for effectively for less cost. This would also identify requirements which are no longer relevant.

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Fish and Wildlife Management

The original purpose of fish and wildlife management was to manage human exploitation of game species, including recreational angling and hunting, commercial fishing, trapping, guiding, enforcement and related wildlife activities. Revisions over time added non-game species and eventually species at risk and biodiversity. The contemporary priority for fish and wildlife management is still on population management for exploited species, with increasing emphasis in the last 15 years on species at risk identification and recovery. Fish and wildlife habitats (ecosystems) are primarily managed through a series of protections and restrictions added as conditions to other human activities approvals. Government fish and wildlife management agencies are still largely focussed on management of individual species or species groups (sport fish, big game, waterfowl, etc.). There are some examples of multi-species and ecosystem approaches.

Challenges

- Government fish and wildlife agency focus is mainly on managing populations for exploited species and species at risk (fine filter biodiversity).
- Population targets for exploited species are oriented toward maximum sustained yield, similar to objectives for timber management policies.

- Government fish and wildlife agencies are divided internally between sections that manage terrestrial and aquatic ecosystems and species[1]. This increases difficulty of coordination is difficult on areas of common interest (watershed-scale disturbance, riparian areas, wetlands, etc.).
- Species population targets tend to not be linked to changing habitat over time. Periodic adjustments are made to manage populations but usually in response to short-term changes and trends.
- Population distribution and density information sufficient to estimate trends and NRV is difficult to obtain and expensive, so it is not commonly done. Managers recognize that populations vary within NRV over time but rarely incorporate NRV considerations into management plans.
- Government Fish and wildlife agencies define habitat for individual species as part of species management plans, and then the externally-developed habitat requirements are added to other planning processes as constraints (e.g., critical habitat provisions of the Species at Risk Act). This is not consistent with EBM and reduces EBM integration and innovation opportunities.
- Habitat management is mainly focussed on protection (protection and setbacks around wildlife sites, fish habitat protection, etc.), or improvement (better habitat conditions for species at risk, game species, etc.). Habitat focus and management based on natural dynamics is uncommon.
- Although government agencies talk about the advantages and need to adopt and implement EBM approaches to conserve biodiversity, actual EBM initiatives and projects are uncommon. A primary reason appears to be that while agencies have clear mandates to manage species and in some cases habitat, they usually do not have direct responsibility for or decision-making access to forest land management. Their authority is usually limited to management by constraint of other activities, which reduces opportunities for integration and innovation.
- Ecosystem NRV is related to habitat NRV, but habitat models often require fine-scale information or ecosystem attributes that are not contained in available spatial inventories (e.g., vegetation inventories). Managers are forced to use surrogates or estimates derived from sampling ecosystem populations.

Box B3. Alberta Government Habitat Targets

In 2017, the GOA introduced new guidance into the forest management planning process for commercial forest tenures (Government of Alberta 2017b) for cover types, seral stages, patch sizes, interior forest, water yield assessment, fine filter species selection, and modelling. The guidance describes the process to follow to set targets for all aspects except fine filter species, which are managed using a risk reduction approach. The guidance was developed internally without peer review and external consultation and has still not been officially published even though it is now mandatory for

[1] For example, at the federal level, the Canadian Wildlife Service mandate is largely for terrestrial species and the Fisheries and Ocean Canada mandate is for aquatic species.

- Habitat NRV is rarely estimated, and most habitat targets do not have the benefit of NRV to inform decisions.
- Managers may set targets with allowable variation from current conditions instead of variation within NRV (Government of Alberta 2017a). This is inappropriate because current condition may be anywhere within, or even outside, of NRV and in some cases using it as a baseline could be ecologically inappropriate and/or unachievable.
- Government fish and wildlife agencies do make efforts to participate in external management plans that plan future forest habitat, but participation is usually with single-species and single-value focuses and promotion of pre-determined external restrictions and practices such as critical habitat requirements, site-specific protection (around mineral licks, raptor nests, bear dens, etc.), seasonal activity requirements, etc.
- In some cases, population targets for species are in direct opposition to each other. For example, grizzly bear and woodland caribou are both designated as Threatened under the Alberta Wildlife Act. They have different habitat associations and where they overlap in distribution the needs of each species are not easily reconciled. Should a given area have more mature forest for caribou or more young forest for grizzly bear?

RECOMMENDATIONS

- The biggest opportunity is to use EBM plans to assess and forecast habitat and inform habitat and population targets for species and groups. Include both coarse and fine filter habitat aspects and all species of management interest in area-based EBM plans.
- Explore options to bring fish and wildlife agencies to EBM planning initiatives as interest-based partners rather than disconnected external regulators with separate planning processes.
- Incorporating habitat into an integrated EBM planning processes that chooses the best overall scenario enables explicit innovation and trade-off decisions between habitats (ecosystems), between species, between other EBM aspects. This is an efficient and effective way to ensure habitat is considered and it provides an explicit implementation pathway.
- Specify and coordinate habitat management actions with long-term forecasts developed for EBM plans.
- Ensure that practices to protect and conserve important wildlife sites protect the environmental parts and incorporate disturbance and variation into the biotic parts (e.g., protect a spring and consider how to incorporate variation into management of surrounding vegetation).
- Incorporate the habitat aspects of EBM plans into species and community/ecosystem management plans. These could be incorporated into EBM plans and also into higher-level plans such as species recovery plans that overlap multiple DFAs.

B2. EBM Legislation and Policy

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This section summarizes the major SFM/EBM legislation and policies related to forests of the federal and provincial governments, the forest sector, Indigenous peoples, and the ENGO sector. Policies related to individual EBM aspects are discussed in subsequent sections.

Considering the lack of widely-understood and agreed definitions of EBM, it is not surprising that higher-level EBM legislation and policy is incompletely and unevenly developed in Canada. At the national level the CCFM (1988) policy is to "*Manage Canada's natural forest using an ecosystem-based approach that maintains forest health, structure, functions, composition and biodiversity*". This confirms overall direction to manage using EBM and many EBM or EBM-inspired elements and aspects have been woven into provincial, federal, corporate, and other policies in a disconnected patchwork with multiple levels. The most prominent policy statements relate to agreement with the overall EBM goal of ecological integrity, which is a goal shared with SFM. The CCFM (2019) continues to emphasize the global benefits of maintaining forest ecosystems.

B2.1 Alberta Gov't Legislation and Policy

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The 1949 Alberta *Forests Act* required *sustained yield management* and authorized commercial forest tenure allocations to forest companies (Mayer 2012). The first major forest development was a pulp mill that started up in Hinton in 1956. A second pulp mill started up in 1972 along the Wapiti River south of Grande Prairie. In response to opportunity and incentives provided by the GOA, the Alberta forest industry rapidly expanded from about 3 million ha under FMA disposition in 1986 to about 19 million ha in 1995.

The Government of Alberta began adding new policies relating to SFM and EBM, building on recommendations from *Forest Management in Alberta: Report of the Expert Review Panel* (EPFMA 1990) and the *Report of the Alberta Round Table on the Environment and Economy* (ARTEC 1991). In 1993 the GOA initiated a three-year process towards an Alberta Forest Conservation Strategy (AFCSSC 1997), which contained strong direction towards EBM but was not adopted (Fuller 2001). Instead, the GOA released the *Alberta Forest Legacy* (Government of Alberta 1998), a nine-page *implementation framework* which recognized *ecological integrity of the forest*, *ecological management*, and *adaptive management* as priorities. An NRV approach was also implicitly endorsed: *"…the importance of maintaining forest structure and age class in a way that perpetuates the patches and structure left after wildfire. Ecosystem flows between protected, intensive, and enhanced forest landscapes are integrated to ensure the maintenance of inherent disturbance, and/or its approximation by human activity*."

The 1998 *Interim Forest Management Planning Manual Guidelines to Plan Development* (Alberta Environmental Protection 1998) said: "*Alberta is now embracing the concept of sustainable forest management*", and noted that the government and many forest companies were already incorporating an SFM approach. Specific to EBM, the document said: "*Goals related to biological aspects of the area consider those attributes contributing to ecosystem integrity. Biodiversity conservation is one of the*

more important attributes to consider in this regard. One approach to conservation of biodiversity focuses on the management of landscape pattern and structure. This "Coarse Filter" approach, as it is commonly known, is fundamental to ecological management. Other forest values may require special management and/or protection (e.g., endangered, threatened and rare species) via "Fine Filter" techniques. A combination of Coarse and Fine filter strategies is recognized as a sound approach to sustainable forest management."

The *Alberta Forest Management Planning Standard* (AFMPS; Government of Alberta 2006) continued the SFM/EBM direction and aligned with the CAN/CSA Z809-02 (Canadian Standards Association 2002) management system framework including a list of standardized VOITs. The VOITs described in AFMPS Annex 4 were specified as a minimum set to be addressed and supplemented with other specific to the Defined Forest Area (DFA) (usually an FMA or FMU) being managed. The VOITs included EBM aspects such as ecological classification, forest landscape pattern, structure, disturbance, and succession, fire regime analysis, and species (at risk, noxious plants, management concern) conservation. EBM was not specifically mentioned as a management direction but a central tenet of EBM was required: "*The maintenance of forest conditions within the range of natural variability (NRV) is the primary mechanism to be employed*." (Government of Alberta 2006).

The AFMPS (Government of Alberta 2006) summarized the limitations and constraints on full EBM implementation. These include limitations related to the rights and responsibilities of tenure-holders and aspects specifically reserved for the GOA. Some aspects are potentially contradictory. For example, recent direction (Government of Alberta 2018b) to provide habitat for species of management concern within 20% of current conditions may conflict with maintaining forest conditions within NRV.

The GOA prepares FMPs for FMUs that have non-FMA licensees. The Alberta forest management policy framework also applies to non-commercial FMUs that haven't been allocated through tenure. In these cases, the GOA has responsibility to prepare FMPs should the need arise.

In summary, higher-level GOA policy is generally supportive of both SFM and EBM and, although not specifically stated, appears to consider EBM to be part of SFM. The overall policy framework contains many directions to implement specific EBM aspects and actions.

CHALLENGES

- The forest management policy framework does not directly define and discuss the related concepts of SFM and EBM and how Alberta views them as foundations for forest management, particularly for EBM.
- The forest management policy framework supports and directs SFM and generally EBM but exists in many different policies and places, making it difficult to determine and understand.
- The forest management policy framework contains required aspects and directions that may contradict or impair EBM implementation.
- The Alberta Forest Management Planning Standard hasn't been significantly updated since 2006 and its EBM content and direction are incomplete and out-of-date.

- Alberta forest management policy is oriented toward commercial forests and is more or less silent regarding non-commercial forests external to and within (passive landbase) forest management tenures. Legislation and policy related to protected areas is separate and distinct and is managed through different government institutions.
- Alberta legislation and responsibilities related to forests is divided between Acts and agencies, and different legislation and policies apply to different land use designations (e.g., protected forest areas versus commercial forest areas versus non-commercial forest areas.). There is no unifying policy related to forest management overall.
- Alberta forest management policy has not been updated for many years.

RECOMMENDATIONS

- The Alberta Land Stewardship Act (ALSA; Government of Alberta 2009) has four purposes: "*to provide a means by which the Government can give direction and provide leadership in identifying the objectives of the Province of Alberta, including economic, environmental and social objectives; to provide a means to plan for the future, recognizing the need to manage activity to meet the reasonably foreseeable needs of current and future generations of Albertans, including aboriginal peoples; to provide for the co-ordination of decisions by decision-makers concerning land, species, human settlement, natural resources and the environment; to create legislation and policy that enable sustainable development by taking account of and responding to the cumulative effect of human endeavour and other events.*" The ALSA provides the authority for approved Regional Plans to override other legislation and policy and is a powerful tool to define and implement EBM through land use plans. There are opportunities to engage with land use planning processes to promote EBM.
- The South Saskatchewan Regional Plan (Government of Alberta 2017b) says that: "*The Alberta Forest Strategy, currently under development, will describe the government's commitment to sustainable management and the economic, social and environmental responsibility for Crown forested lands. The strategy will describe an innovative and systematic approach detailing the intent and the actions needed to sustain healthy, resilient forests on public land in Alberta for generations to come.*" Concurrent development of "Alberta's Biodiversity Strategy and Biodiversity Management Frameworks" was also proposed. This policy development, should it continue under the new government elected in 2019, provides a significant opportunity to incorporate EBM.

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B2.2 SASKATCHEWAN GOV'T LEGISLATION AND POLICY

The first Saskatchewan Forest Act was in 1931. For many decades the industry operated with small sawmills for local consumption and small-scale pulpwood exports. The first large-scale forest industry development was a pulp mill at Prince Albert in 1965 with a Forest Management Licence Agreement signed in 1968. Further major developments occurred at Meadow Lake and Hudson Bay in 1990.

Beginning in the mid-1980s, FMAs and area-based TSLs transferred reforestation responsibility from the government to the forest industry (Government of Saskatchewan 2019a).

The *Conservation Strategy for Sustainable Development in Saskatchewan* (Saskatchewan Round Table on Environment and Economy 2002) updated Saskatchewan policy related to sustainable development (Brundtland 1987). Updated forest management policy endorsed SFM (and, indirectly, EBM) through the *Saskatchewan Long-Term Integrated Forest Management Plan* (Government of Saskatchewan 1995), which said that "*The Government of Saskatchewan is committed to the sustainable management of all the province's forest resource*" and "*Forests must be viewed and understood as ecosystems performing a variety of interrelated functions that can only be sustained if the integrity of the ecosystem is protected.*" The policy direction was called Integrated Forest Resource Management, defined as "*…managing the whole forest ecosystem, including soil, water, trees, animals, and plants, to meet a variety of objectives*." (Government of Saskatchewan 1995).

The purpose of the Forest Resources Management Act (Government of Saskatchewan 1999) was to: *"…promote the sustainable use of forest land for the benefit of current and future generations by balancing the need for economic, social and cultural opportunities with the need to maintain and enhance the health of forest land.*"

By 2002 the GOS had adopted EBM as a forest management policy. The policy included "*Work with the forest industry to adopt ecosystem-based forest management planning*", and "*Use natural disturbance patterns in planning forest and grassland management to maintain ecosystem processes, functions, and structure*." (Saskatchewan Round Table on Environment and Economy 2002). The *Fire and Forest Insect and Disease Management Policy Framework* (Government of Saskatchewan 2003) included using wildfire to maintain biological integrity where feasible, primarily in the non-commercial forest zone.

The *Forest Management Planning Document - Forest Planning Manual* (Government of Saskatchewan 2007) and the *Saskatchewan Forest Management Planning Standard* (SFMPS; Government of Saskatchewan 2017) continued the development of SFM/EBM policy and implementation by providing detail for individual aspects. The Forest Planning Manual included requirement to identify 38 indicators of sustainable forest management (Government of Saskatchewan 2007). The 2017 SFMPS was aligned with the CAN/CSA Z809-02 (Canadian Standards Association 2002)management system framework including a revised list of standardized VOITs. The VOITs described in Table 1 were specified as a minimum set subject to approval of alternative proposals. The VOITs included EBM aspects such as ecological classification, forest landscape pattern, structure, disturbance, and succession, fire regime analysis, and species. The 2017 SFMPS also included a detailed procedure to define logging events.

The *Saskatchewan Environmental Code* (Government of Saskatchewan 2014) consolidated environmental chapters from *The Environmental Management and Protection Act* (Government of Saskatchewan 2010) and *The Forest Resources Management Act* (Government of Saskatchewan 1996). The forest management planning chapter contains specific commitments to use an EBM approach.

Saskatchewan Provincial Parks are also managed using an EBM policy approach (Government of Saskatchewan 1999, 2000, 2020).

In summary, higher-level Saskatchewan policy is supportive of both SFM and EBM. In recent years EBM has been emphasized. Saskatchewan considers EBM to be part of SFM. The overall policy framework contains many directions to implement specific EBM aspects and actions.

Challenges

- Saskatchewan EBM policy is oriented to specific land use categories and planning processes. There is inconsistency between these.
- Saskatchewan government agencies appear to have different perspectives on EBM policy and how it is to be applied.
- With the exception of protected areas and possibly the non-commercial forest zone, EBM policy is not being applied in an integrated process for whole landscapes. EBM is required for FMPs, but FMPs are not comprehensive because they don't include all ecosystems and all human uses.
- The land use planning process, which could be used to implement EBM, appears to be inactive.
- Saskatchewan is still using non-integrated planning processes. For example, caribou range planning is separate from FMP planning, and FMP plans are then expected to incorporate caribou range plans.
- Saskatchewan does not have legislation similar to the Alberta Land Stewardship Act, which could be used to integrate governance and planning activities and implement EBM.

Recommendations

- Update the Saskatchewan EBM policy to make it applicable to all forest lands and ecosystems, and include an implementation strategy.
- Consider ways to align the governance system to ensure all agencies and institutions have a common understanding of EBM and how it fits within agency mandates.
- Consider reinvigorating the land use planning process as an EBM implementation process.
- Look at opportunities to revise FMPs and park management plans to more completely incorporate EBM through partnerships.

B2.3 Shared Provincial Policy: Forest Tenure

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Alberta and Saskatchewan are the owners and regulators of provincial public forest lands. Each province has broadly similar processes to designate and allocate commercial public land forest tenures and retains the rights and responsibility to manage forest resources in the best interest of the public. This is called the public land model. The tenure rights on public lands are strong enough to provide security to companies or individuals seeking to invest, but weak enough to enable the government to adjust or cancel them (Murphy and Luckert 2002; Aumann et al. 2007).

The Alberta and Saskatchewan provincial governments have long recognized the need for forest policies and tenure arrangements that encourage forest industry capital investment and global competitiveness.

Alberta passed its first Forest Act in 1949 and Saskatchewan followed in 1959. The legislation established the authority for the respective provincial government to allocate forest tenures, which are rights granted by the Crown to log timber from Crown (public) land, subject to the terms and conditions of the document containing the grant and the governing legislation (Ross 1997).

Each province has slightly different tenures but both have area-based Forest Management Agreements where the company holding the tenure is responsible for preparing FMPs, and volume-based tenures where the province prepares FMPs. In return for renewable access to timber companies invest capital in mills and take on responsibilities including building access, planning, and reforestation.

Challenges

- The tenure system divides the landbase into active (will be logged) and passive (will not be logged) categories. Forest companies are responsible for establishing, growing, and logging timber on the active landbase. Government agencies are responsible for the passive landbase and non-timber resources, values, and other human uses on the active landbase. This divided responsibility model makes EBM difficult because it requires integration towards a whole landscape approach. Typically, this does not occur, or only partially occurs.
- Granting separate resource tenures to different companies on the same landbase tends to maximize utilization of all resources, but private companies are focussed on their business and not socially valuable forest resources for which there are no markets (environmental benefits, wildlife, recreation, etc.). This is used as an argument for the government to retain the rights to these resources (Vertinsky and Luckert 2010) but it creates changes related to full integration and planning for all values.
- The legislation that is used to allocate commercial forest tenures is oriented toward economic development and is administered by government agencies that approve forest management plans to maximize logging rates. Forest companies can lose access to timber if they fail to use their allocated and approved logging levels.

Recommendations

- In the short term, the biggest opportunity is for the lead planning organization (a forest licensee or a government agency) to adopt a whole landscape approach to plan and implement EBM.
- In the longer term explore opportunities to define and pilot new tenure arrangements where a single organization (could be a public private partnership) is responsible for integrated EBM planning for whole landscapes.

B2.4 Federal Gov't Legislation and Policy

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The Government of Canada (GOC) has no direct role in forest management on provincial lands and works with the provinces and territories on matters of common interest through the CCFM and other joint federal-provincial initiatives. For example, the Canadian Endangered Species Conservation Council developed the *Accord for the Protection of Species at Risk* (Canadian Endangered Species Conservation

Council 1996) and the Wildlife Ministers' Council of Canada developed the *Canadian Biodiversity Strategy* (1995).

The GOC has direct management responsibility for fish (*Fisheries Act*) and migratory birds (*Migratory Birds Convention Act*) for all Canadian lands and waters. The GOC has responsibility for species at risk (*Species at Risk Act*) for federal lands and also has the authority to take over management of species at risk on provincial lands through the safety net provisions of the *Species at Risk Act*.

Through its agencies the GOC has management responsibility on federal lands, including National Parks, military lands (the Cold Lake Air Weapons Range (CLAWR) in Alberta and Saskatchewan), other federal lands, and, on behalf of and in conjunction with First Nations, Indian Reserves.

Through these and other initiatives the GOC policy framework is generally supportive of both SFM and EBM. An early example is the recommendations of the GOC-sponsored National Round Table on the Environment and Economy (National Round Table on the Environment and the Economy 1995).

Box B4. Principles for Sustainable Development – Looking After the Environment (NRTEE, 1995)

All activities on forested land should respect the intrinsic natural values of the forest environment and recognize the need to protect the integrity of forest ecosystems;

Biodiversity should be maintained within the natural range of variation that is characteristic of both the local ecosystem and the region; and

Forest land should be managed under that combination of tenure systems which balances rights with responsibilities, encourages stewardship, optimizes the sustainable supply of various values from forest lands, and contributes to fair and sustainable markets, and healthy communities.

The strongest national EBM-related policy is in the Canada National Parks Act (Government of Canada 2000): "*Maintenance or restoration of ecological integrity, through the protection of natural resources and natural processes, shall be the first priority of the Minister when considering all aspects of the management of parks.*". The Government of Canada policy related to EBM for other federal lands is less specific. For example, the author did not find any online forest management documents related to the 11,700 km^2 CLAWR. Similarly, no forest management documents were found for the many Indian Reserves in the forested areas of Alberta and Saskatchewan.

Some federal legislation partially supports EBM in concept but requirements usually do not take an EBM approach. Examples include the *Fisheries Act*, *Migratory Birds Convention Act*, and *Species at Risk Act*. These acts are discussed individually below.

Challenges

- The GOC has endorsed ecological integrity as a management goal for forests on federal lands but does not have well-developed and accessible EBM policy for federal lands other than for National Parks.

- Some federal legislation does not specifically support ecological integrity or take an EBM approach to achieve it.
- Some federal legislation specifically acts as a challenge to EBM implementation. In particular, the Fisheries Act and the Migratory Birds Convention Act have provisions that may act to prevent EBM approaches.

RECOMMENDATIONS

- Federal legislation has enabling language that could be used to support EBM if federal agencies support policy interpretations. The opportunities lie in developing concepts and proposals for partnerships to implement EBM where federal alignment and collaboration are necessary.
- The federal government could consider developing EBM policy related to federal areas of responsibility, and include an implementation strategy.
- Federal-provincial EBM cooperation on provincial lands is a significant EBM opportunity.

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FISHERIES ACT

The Fisheries Act (Government of Canada 1985) dates back to 1868 and was originally about management of commercial fishing. It applies to all Canadian freshwater and marine aquatic ecosystems defined as fish habitat, which *"…means water frequented by fish and any other areas on which fish depend directly or indirectly to carry out their life processes, including spawning grounds and nursery, rearing, food supply and migration areas, and …the quantity, timing and quality of the water flow that are necessary to sustain the freshwater or estuarine ecosystems of a fish habitat are deemed to be a fish habitat."* (Government of Canada 1985).

Fisheries Act provisions related to avoiding harm to fish, providing for fish passage, preventing pollution including sediment deposition, and in-water habitat destruction are generally consistent with EBM and maintenance of ecological integrity.

Section 35.1 (Government of Canada 1985) was added to the Fisheries Act in the late 1970s: "*No person shall carry on any work, undertaking or activity that results in the harmful alteration, disruption or destruction of fish habitat*" (HADD). Application of the HADD provision was not supported by clear definitions and guidance to assist with compliance. This started a long period of uncertainty and uneven application of the HADD process in Canada. A recent Fisheries and Oceans Canada (Fisheries and Oceans Canada 2019a) policy statement interprets "harmful alteration, disruption or destruction" as "…*any temporary or permanent change to fish habitat that directly or indirectly impairs the habitat's capacity to support one or more life processes of fish*."

Most deliberate human disturbances in riparian areas close to water are prohibited because they are considered to constitute HADD of fish habitat. Guidance about maintaining riparian vegetation (Fisheries and Oceans Canada 2019a) includes "…*maintaining an undisturbed vegetated buffer zone between areas of on-land activity and the high water mark of any water body, using existing trails, roads or cut lines wherever possible, avoiding tree removal, using methods to prevent soil compaction (such as swamp*

mats or pads), and avoiding disturbing or removing materials from the banks, shoreline or waterbody bed, such as sand, rocks, aquatic vegetation, and natural wood debris." The definition is still unclear because it does not specify how to measure an undisturbed vegetated buffer zone. In practice Fisheries and Oceans Canada generally accepts the waterside buffer provisions required in the *Alberta Timber Harvest Planning and Operating Ground Rules* (Government of Alberta 2016b) and the Saskatchewan Forest Operations Standard (Government of Saskatchewan 2012).

Fisheries and Oceans Canada says the long-term conservation and protection of fish and fish habitat is a priority and preference is to conserve and protect fish and fish habitat by avoiding harmful impacts to fish and fish habitat (Fisheries and Oceans Canada 2019b). In a conservation hierarchy avoidance is preferred over mitigation and offsets. Standards and Codes of Practice may be developed for specified activities (Fisheries and Oceans Canada 2019c) that could eliminate the need for HADD permits. These do not yet exist in relation to forest management.

The Department of Fisheries and Oceans (Fisheries and Oceans Canada 2019a) can authorize harmful impacts to fish and fish habitat and may consider

- the application of a precautionary approach and an ecosystem approach
- a risk-based approach to determine the likelihood and severity of potential impacts to fish and fish habitat
- the ecosystem context: the consideration of the state, resiliency, and natural biodiversity of the ecosystem

The Fisheries Act HADD requirements do not employ an EBM approach to management of forest riparian ecosystems. Prevention of HADD is an activity intended to achieve an undescribed fish habitat protection outcome in the short term. The outcome is not described in quantitative measurable terms, therefore compliance with HADD prevention is assumed to achieve the outcome. The role of natural disturbances and the dynamic nature of riparian ecosystems were not acknowledged in the context of maintaining ecological integrity of fish habitat over time.

There is a process to get an authorization to permit HADD (including to use disturbance as an EBM tool) but the process is arbitrary and oriented to discrete projects rather than general application. Obtaining HADD authorizations involves considerable red tape including the costs to apply, the time needed to get an authorization, and the uncertainty about whether the application will be successful. There is also implementation jeopardy should the requirements of an authorization not be closely followed.

Compliance with HADD prevention requirements is assumed to maintain ecological integrity in hydroriparian ecosystems but as outcomes are not being monitored there is really no way to tell. In the short-term excluding human disturbance probably has little effect on ecological integrity but this is not the end of the story. Current fire policies act to reduce natural fire disturbance in riparian ecosystems. Reducing fire and not replacing it with logging (as occurs in productive upland ecosystems in commercial forests) will alter the natural disturbance regime, reduce disturbance, and eventually lead to riparian ecosystems that differ from those functioning within NRV. In protected areas the situation is similar. Fire

suppression will eventually affect ecological integrity. The EBM challenge is how to maintain disturbances at rates needed to maintain ecological conditions within NRV over the long term. A related challenge is to develop improved methods to measure ecological conditions in hydroriparian ecosystems and use them to evaluate the outcomes of management activities.

In their considerations for HADD authorizations FOC says it is open to considering a risk-based ecosystem approach. This provides an opportunity to develop and propose an EBM approach to:

- ecological classification (wetland and upland ecosystems, landforms, etc.)
- inventory of hydro-riparian ecosystems
- determining NRV
- maintaining disturbance regimes
- measuring ecological conditions within NRV associated with ecological (Prichard et al. 1993; Tripp et al. 2020).

Challenges

- The Fisheries Act does not focus on ecological outcomes, rather it emphasizes and prohibits the short-term negative impacts of human activities on fish and fish habitat, unless otherwise approved.
- The Fisheries Act HADD section does not recognize the dynamic nature of aquatic ecosystems and the important role of disturbances in maintaining both short-term and long-term ecological function.
- The process to get an authorization to permit HADD (e.g., to use disturbance as an EBM tool) is arbitrary, oriented to discrete projects, and involves considerable red tape.

Recommendations

- Work with Fisheries and Oceans Canada, provincial governments, and others to develop and agree to an EBM riparian management approach. When complete and verified through demonstration and research, develop a Code of Practice.

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Migratory Birds Convention Act

The Migratory Birds Convention Act (MBCA; Government of Canada 1994) was originally passed in 1917 to implement the 1916 *Migratory Birds Convention* between Great Britain (on behalf of Canada) and the United States of America to stop uncontrolled exploitation of birds. The MBCA protects and conserves migratory bird individuals and populations, their nests, and the habitat necessary for their survival. While most bird species are designated as migratory birds under the MBCA, there are a number of species that are not protected. In general, birds not falling under federal jurisdiction within Canada include grouse, quail, pheasants, ptarmigan, hawks, owls, eagles, falcons, cormorants, pelicans, crows, jays, kingfishers, and some species of blackbirds. Many of these species are protected under other legislation, including the Alberta Wildlife Act (Government of Alberta 2000) and the Saskatchewan *Wildlife Act* (Government of Saskatchewan 1998).

The MBCA Regulations prohibit the taking, injuring, destruction or disturbing of migratory birds and their eggs and nests without a permit from the Minister. This includes *incidental take*, which is inadvertent destruction and disturbance of primarily nests and eggs incurred while conducting other activities during the bird nesting season (roughly April through August). The MBCA incidental take prohibitions represent a significant challenge to all human activity during the migratory bird nesting season. Birds nest almost everywhere and they are often very secretive in relation to nesting, making ongoing incidental take occurrences more or less inevitable. Most human activities that cause, or are likely to cause, incidental take during the nesting season are likely to inadvertently break the incidental take provisions of the law. The Government of Canada (2020a) is revising the MBCA Regulations but didn't include an incidental take permitting process in the proposed actions, which may have provided an alternative to legal jeopardy and enabled an EBM approach.

Natural disturbances during the nesting season such as fires and floods are analogous to incidental take because they have the same effect of causing loss of nests and eggs.

Challenges

- The MBCA is over 100 years old and is based on international agreements, which makes modernization and adoption of an EBM approach more difficult.
- Incidental take is not consistent with EBM because it is oriented toward individuals instead of populations and ecosystems. This is not a significant direct challenge to EBM, but it does constrain human disturbances in the nesting season, which may hinder achieving targets for rates of disturbance, for example.
- The incidental take provisions are limited to human activities and do not consider natural disturbances and other factors that cause direct and indirect mortality of birds and their nests. For example, nest destruction caused by wildfires is not considered, but nest destruction caused by prescribed burning is prohibited.
- There are no regulatory alternatives to compliance with the MBCA in relation to incidental take.

Recommendations

- Due diligence efforts to avoid incidental take require significant resources that could be better used to support migratory bird conservation through EBM.
- EBM plans developed for DFAs are opportunities to include effective conservation for migratory birds (and all birds), particularly in reference to ecosystems (habitat) but also in relation to human activities.
- EBM can be used to demonstrate supply of ecosystems needed to support bird nesting over the long term.
- Wildfire suppression and reduced logging in the nesting season (some companies primarily winter logging due to insufficient all-weather access, no logging during spring breakup, etc.) likely reduces losses of nesting birds compared to natural wildfire regimes.

Species at Risk Act

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The Species at Risk Act (SARA; Government of Canada 2002) purposes are "to prevent Canadian Indigenous species, subspecies, and distinct populations from becoming extirpated or extinct, to provide for the recovery of endangered or threatened species, and encourage the management of other species to prevent them from becoming at risk." A Designatable Unit process (Green 2005; Committee on the Status of Endangered Wildlife in Canada 2018) is used to define "species" for the purposes of the act. The SARA was enacted by the GOC as part of federal commitments made in the 1996 *Accord for the Protection of Species at Risk* between the federal, provincial, and territorial governments. The Accord and the SARA are part of the *National Framework for Species at Risk Conservation*. Alberta and Saskatchewan have complementary legislative, regulatory and policy instruments to fulfill their Accord and Framework commitments.

The key provisions of the SARA are processes related to species assessment, protection, recovery planning, recovery implementation, and monitoring and evaluation. Species assessments are conducted by the *Committee on the Status of Endangered Wildlife in Canada* (COSEWIC). Species designations are listed in *SARA Schedule 1* and trigger protections that make it illegal to kill, harm, harass, capture or take listed species and their residences. Approved *Recovery Strategies* and *Action Plans* trigger protection of *Critical Habitat* that was defined in the respective document. Critical habitat of *Endangered* and *Threatened* species may not be destroyed if the critical habitat is on federal land, the listed species is an aquatic species, or the listed species is a migratory bird protected by the *Migratory Birds Convention Act*. If a province or territory is not, in the opinion of the federal Minister that has responsibility, protecting a listed species or its critical habitat, the SARA allows discretionary federal action (the so-called "safety net") to protect a listed species and its critical habitat on all lands.

Voluntary conservation and stewardship initiatives are promoted mainly through stewardship action plans and conservation agreements described in SARA Sections 10, 11, and 12.

- Section 10 says that a Minister *"…may establish a stewardship action plan that creates incentives and other measures to support voluntary stewardship actions taken by any government in Canada, organization or person."*
- Section 11 says that a Minister may *"…enter into a conservation agreement with any government in Canada, organization or person to benefit a species at risk or enhance its survival in the wild."*
- Section 12 says that a Minister may "…*enter into an* [conservation] *agreement with any government* in Canada, organization or person to provide for the conservation of a wildlife species that is not a species at risk."
- Section 73 says that a Minister may issue a permit for activity affecting a listed species, any part of its critical habitat or the residences of its individuals that is prohibited under SARA "*if the competent minister is of the opinion that the activity meets one of three purposes:*
    - *the activity is scientific research relating to the conservation of the species and conducted by qualified persons;*

- *the activity benefits the species or is required to enhance its chance of survival in the wild; or*
- *affecting the species is incidental to the carrying out of the activity."*

- Section 73 permits "*may only be issued if the competent minister is of the opinion that the following three preconditions are met:*
  - *all reasonable alternatives to the activity that would reduce the impact on the species have been considered, and the best solution has been adopted;*
  - *all feasible measures will be taken to minimize the impact of the activity on the species or its critical habitat or the residences of its individuals; and*
  - *the activity will not jeopardize the survival or recovery of the species*."

The SARA says that a Minister *"…may adopt a multi-species or an ecosystem approach when preparing the recovery strategy* [Section 41, or the management plan, Section 67] *if he or she considers it appropriate to do so*."

At the time of proclamation in 2003, the official list of wildlife species at risk (SARA Schedule 1) included 233 species. As of October 12, 2020, Schedule 1 included 642 species and there were 13 species on Schedules 2 and 3, which were listed by COSEWIC prior to the date SARA came into effect that still have not been considered for inclusion in Schedule 1.

Socio-economic factors are considered when species are proposed for addition to Schedule 1 of SARA, where the *Cabinet Directive on Regulation* requires departments to consider the benefits and costs of regulatory proposals that could affect Canadians. SARA Action Plans must include an evaluation of socio-economic costs of a plan and the benefits to be derived from its implementation.

The GOC and the provinces and territories met in 2017 and agreed to work on a Pan-Canadian Approach to transforming species at risk conservation in Canada (PCA: Government of Canada 2018a), which will shift from a single-species approach to focus on multiple species and ecosystems. The PCA includes *priority places* with significant biodiversity, concentrations of species at risk, and opportunities to advance conservation efforts. One of the 11 priority places, the Summit to Sage in southern Alberta, overlaps with forested ecosystems. Two *priority species*, wood bison (Alberta) and woodland caribou (both), occur within Alberta and Saskatchewan. *Priority sectors* include agriculture, forestry, and urban development and *priority threats* include invasive alien species, wildlife disease, and illegal wildlife trade.

CHALLENGES

- The SARA emphasizes processes to assess, list, plan, and recover individual *designatable units* of species at risk. The processes are inflexible, cumbersome, and time-consuming, and the federal government is far behind in meeting its legal process commitments (Government of Canada 2013; Ferreira et al. 2019). Alberta and Saskatchewan are also far behind in meeting their complementary species at risk process commitments.
- SARA has a number of systemic biases:

  - Taxonomic biases result in overrepresentation of some groups (e.g., birds, reptiles, and plants) and underrepresentation of others (e.g., arthropods, amphibians and logged fishes), and biases have not improved over time (Creighton and Bennett 2019).
  - Globally threatened species are not given priority over subspecies and peripheral populations of secure species (Raymond et al. 2018).
  - Available funding to implement recovery actions is unevenly applied, reflecting lack of a rigorous mechanism for prioritizing investment in species at risk management (Martin et al. 2018).
  - Low information availability for many species slows designation and recovery actions (Lukey et al. 2010) and risks significant negative consequences (Bird and Hodges 2017).
  - Designation is biased taxonomically, by major habitat type, and by lead agency (Bird and Hodges 2017).
- The SARA concept of critical habitat is problematic.
  - Critical habitat protection is based on the premise that some habitats are more important than others for species persistence and those habitats should be protected (Rosenfeld and Hatfield 2006).
  - Distinguishing between habitat and critical habitat is subjective, difficult and variable between species (Government of Canada 2015a, 2015b, 2016a).
  - Identification of critical habitat remains inconsistent with protecting sufficient habitat to support persistence and recovery of species (Camaclang et al. 2015).
  - Ecological knowledge required to identify which habitats are critical to the survival or recovery of species is rarely discussed and poorly documented and it is hard to quantitatively link habitats to population trends and individual fitness (Lemieux Lefebvre et al. 2018).
  - Habitat approaches not informed by population dynamics may undermine conservation efforts by misclassifying the value of habitats, erroneously protecting sink habitats, or failing to prioritize key source habitats (Heinrichs et al. 2010).
  - Critical habitat definition (Government of Canada 2016b) often does not take into account natural variation over time and the processes that maintain variation. Critical habitat designations almost never consider NRV as part of their definition and description of activities likely to destroy critical habitat. For example, the draft *Recovery Strategy for the Bull Trout (Salvelinus confluentus), Saskatchewan-Nelson Rivers populations, in Canada* (Government of Canada 2020b) and the accompanying guidance on identifying critical habitat (Government of Canada 2020c) notes that bull trout *"…evolved strategies to persist in variable environments."* and characterize bull trout habitat as "*cold, clean, complex, and connected*". These are conditions associated with streams that flow through landscapes that have not been recently subjected to major disturbances such as major floods and forest fires. The recovery strategy fails to

recognize that periodic disturbances are needed to produce and sustain the complex habitat that bull trout need over the long term.
    - Destruction of critical habitat is prohibited, which is problematic when critical habitat naturally changes over space and time. Relatively few definitions of critical habitat account for the need, for some species, to 'destroy' critical habitat in the short term as a prerequisite to creating conditions for future critical habitat.
    - SARA has a strong emphasis on identification and protection of critical habitat but is far behind with critical habitat requirements. Critical habitat designation has been slow, biased, and incomplete (Bird and Hodges 2017).
- Problems with processes related to defining critical habitat have resulted in problems meeting legal requirements to define critical habitat.
    - Critical habitat was not fully identified for 165 of 221 (75%) SARA-listed species listed at a level that required identification and protection of critical habitat (Favaro et al. 2014).
    - Of 234 SARA-listed species with finalized Recovery Strategies, 62.9% did not have defined critical habitat and 11.8% had fully-defined critical habitat, which was often obtained years later than the statutory requirements (Bird and Hodges 2017).
- There is little evidence to suggest that the identification of critical habitat has had much impact on species recovery (Camaclang et al. 2015).
- The number of species at risk is increasing while funding for identification, planning, and recovery have not kept up with the levels necessary to be effective to support both processes and recovery outcomes.
- The results of species at risk recovery efforts are mixed but the overall trend is falling behind.
    - Since the inception of COSEWIC in 1977 (predating SARA), species that were assessed more than once moved to a more imperiled (n = 52) status nearly twice as often as they moved to a less imperiled (n = 27) status (Mooers et al. 2010).
    - Favaro et al. (2014) found that 85% of over 350 species tracked under SARA had either not improved or deteriorated.
    - As of February, 2020[2] the GOC reported that 59 of 191 (29%) species at risk with population and distribution objectives showed progress towards their objectives. The remainder showed no progress (62 species), mixed evidence (15 species), or had insufficient evidence to categorize (55 species).
    - Off 455 species listed in SARA and evaluated more than once, 18% were worse, 64% no change, and 18% better (Westwood et al. 2019).
    - Given the poor recovery outcomes of at-risk species in Canada, it should be a policy priority to prevent species from becoming at-risk in the first place (Favaro et al. 2014).

[2] https://www.canada.ca/en/environment-climate-change/services/environmental-indicators/species-risk-population-trends.html

- As the number of designated species at risk increases so do the compliance costs, and opportunities to integrate species at risk conservation into EBM concurrently decrease.
- There are relatively few designated species at risk in Alberta and Saskatchewan forest areas but the number is expected to rise as more species are assessed. If it continues, this trend will increasingly hamper EBM implementation.
- SARA overreliance on single species processes is inefficient and will eventually lead to direct conflicts between individual species at risk in the same habitat areas but have different habitat requirements. For example, species whose critical habitat is young seral forest versus species whose critical habitat is old seral forest.
- SARA has provisions to take an ecosystem-based approach for species at risk conservation but until recently these have been little used (Versteeg 2006). The majority of process and work has focussed on designatable units for individual species. Multi-species and area-based strategies are also part of an ecosystem-based approach, see *Pan-Canadian Approach* under Recommendations below.
- Multi-species approaches are superior to single-species approaches but still fall short of EBM. For example, there are separate recovery strategies for westslope cutthroat trout (Government of Canada 2019a), Athabasca rainbow trout (Government of Canada 2020d), and bull trout Saskatchewan-Nelson Rivers populations (Government of Canada 2020e), which all use the same aquatic habitats in the Alberta foothills. The GOA is working with the GOC and others to develop the Alberta Native Trout Recovery Program (Government of Alberta 2020), which intends to coordinate recovery for the three species and other aquatic species. This is a worthwhile initiative and an improvement over the single-species recovery strategies, but the initiative is still oriented toward a portion of biodiversity (fish species), toward species rather than ecological processes and ecosystems, and the planning is not proposed to be directly integrated into comprehensive landscape and watershed-level EBM plans.
- Recovery Strategies and Action Plans are stand-alone documents prepared in isolation to other regulatory instruments and planning processes. This reduces chances that they will fit seamlessly into land and resource management frameworks and increases costs to consider and comply with requirements.
- Federal species at risk requirements and processes are entwined with their provincial counterparts, and, notwithstanding the *National Accord for the Protection of Species at Risk* (Canadian Endangered Species Conservation Council 1996), there is duplication of effort and friction between governments over jurisdiction, processes, and outcomes.
- Non-government and government to government lobbying and lawsuits for and against species at risk processes and outcomes slows down and increases costs of processes and makes it more difficult to achieve recovery outcomes.
- SARA requirements for consideration of social and economic factors are problematic in terms of scale, scope, and timing in the process. The scale and scope of socio-economic analysis conducted for listing and recovery planning should be proportionate to the magnitude and

complexity of potential impacts (Versteeg 2006) but is frequently limited to a few paragraphs in SARA documents. Socioeconomic considerations are not included in Recovery Strategies, which can be contentious (Mooers et al. 2010).

- SARA and complementary provincial species at risk processes have been criticized as inefficient and ineffective (e.g., Nixon et al. 2012; Bird and Hodges 2017).
- Over time recovery of listed species at risk in Canada has been rare (Favaro et al. 2014).
- Responses to the challenges associated with shortcomings of SARA have been dominated by calls for more of and greater diligence in applying the same approach (Westwood et al. 2019).
- In relation to EBM, DFA managers are receivers of requirements specified in recovery plans from federal and provincial governments. Each new requirement may or may not align with EBM actions managers are already implementing. Requirements that do not align may impair, end, or prevent other EBM initiatives or human uses.

Recommendations

- Area-based EBM using long-term comprehensive EBM plans offers many potential improvements over single species recovery planning and implementation (Box B5).
- Capitalize on the goodwill opportunity shown by growing numbers of organizations and researchers calling for a shift from single-species recovery actions to ecosystem-based approaches linked to land use plans (World Wildlife Fund 2017; Westwood et al. 2019; Gorley and Merkel 2020).
- The best linkage opportunity of species at risk recovery to EBM is through the area-based, multispecies, and ecosystem management clauses in SARA.
    - Area-based approaches include all species, interactions among species, habitats and processes in all ecosystems within defined areas.
    - Multispecies approaches (or better: biodiversity approaches including EBM), are superior to single species approaches, especially where multiple species occupy the same habitat areas.
    - Explore area-based ecosystem approach opportunities through Section 11 and 12 conservation agreements.
- The Pan-Canadian approach to transforming species at risk conservation in Canada (Government of Canada 2018a) aims to shift from a single-species approach to focus on multiple species and ecosystems and represents a step towards EBM. There is a good opportunity to build on the approach to pioneer EBM projects in both provinces that incorporate the PCA priorities.
    - Identify one or more forested priority places in each province that incorporate priority species (wood bison and woodland caribou), priority sectors (the forest sector), and priority threats (e.g., white-tailed deer as an invasive species in caribou range; Dawe et al. 2014; Fisher et al. 2020). For wood bison, the priority place could be Wood Buffalo National Park and the next revision of the Park Management Plan could be augmented to form the EBM plan.

- Write a discussion proposal for developing EBM plans for each selected DFA, work with all interested parties towards an agreement to implement EBM as a pilot project. The agreements could be authorized under SARA section agreements.
- Prepare EBM plans that incorporate the PCA priorities but also EBM for all ecosystems and species and all human uses, towards the dual EBM goals of ecological integrity and human wellbeing.
- Approve and implement the plans, and use them as working examples that will be improved through the process of adaptive management, and serve as templates for additional EBM plans elsewhere with the eventual goal of covering all forest areas.

Box B5. Strengths of a properly planned and implemented Ecosystem Approach [for species at risk recovery] (Versteeg 2006)

- *Promotes "holistic" thinking and solutions;*
- *Promotes efficiencies and integration in conservation planning and land-use planning and fully integrates landscape management;*
- *Reduces conflicts that can occur between listed species that occupy the same areas (e.g., the sea otter and northern abalone);*
- *Streamlines and integrates public consultation efforts;*
- *Promotes cooperation among all interested parties;*
- *Promotes a strong prevention ethic, in part by benefiting species not currently at risk;*
- *Concentrates understanding, decision-making, and actions on a whole system, rather than individual parts;*
- *Focuses on the maintenance of the capacity of a system to produce ecological goods and services by conservation of ecosystem structures, processes, & interactions;*
- *Requires comprehensive and integrated implementation of actions across the relevant social, cultural, economic, political and environmental sectors, often within a defined geography; and,*
- *Minimizes duplication of effort (human and financial resources and time) for all interested parties, particularly recovery team members. This means greater cost-effectiveness over time and greater opportunity for long term success in protecting and recovering both known and unknown species at risk AND in preventing species becoming at risk.*

- By definition, EBM manages all ecosystems = all habitat. This offers the potential to expand on critical habitat concepts and ensure that there is no need for habitat protection to become critical (Favaro et al. 2014).
- For species at risk that already have critical habitat designations, use area-based EBM plans
  - As the primary tool to protect and manage critical habitat over time for each DFA, with aggregations of appropriate DFA plans to assemble overall habitat plans for each species over the geographic extent of their designatable unit.

  - Negotiate agreements that implementing approved EBM plans constitutes protection of critical habitat. These could be in the form of agreements and permits under the appropriate SARA sections.
  - Align non-habitat recovery actions with EBM plans.
- Improve SARA through better coordination among national, provincial and Indigenous governments, and DFA managers responsible for EBM implementation.
- Companies with FMA tenures in commercial forests could explore and develop conservation agreements with the federal and provincial governments.
- Limited resources for species at risk can achieve better results by prioritizing investment in management strategies that recover the greatest number of species for the least cost (Martin et al. 2018). EBM in forest areas provides an opportunity to support species at risk conservation as part of comprehensive plans to maintain ecological integrity, which is a cost-effective and conservation-effective approach.
- Once established, EBM plans can readily be reviewed and adjusted to consider new species at risk as they are assessed and designated. They also provide default plans to manage critical habitat that can be assessed to look for improvement opportunities.
- Monitoring and adaptive management provisions in EBM plans can be used to track status and recovery of species at risk.

Species at Risk in Alberta and Saskatchewan Forests

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As of October 20, 2020, there were 642 species listed in SARA Schedule 1, including 90 in Alberta and 85 in Saskatchewan. Of these, 22 species are associated with forested areas and ecosystems of both provinces, with an additional 11 species in Alberta only. Nine species were classified as *Endangered*, 9 as *Threatened* and 15 as *Special Concern*.

Twenty-two of the 33 forested areas species at risk have relatively small distributions or narrow habitat requirements that at present do not significantly influence EBM implementation progress or opportunities. For the other 11 species, critical habitat for 10 species is not defined (gypsy cuckoo bumble bee, olive-sided flycatcher, common nighthawk, Canada warbler), partially defined (little brown myotis, northern myotis), or not required (grizzly bear, short-eared owl, yellow-banded bumble bee, wolverine).

Challenges

- Incorporating woodland caribou recovery into EBM is a substantial challenge (see below).
- EBM should be able to accommodate the habitat needs of other designated species at risk in the two provinces, but the challenge remains on the best ways to define and ensure habitat conservation.
- Preventing additional species from becoming at risk is perhaps a bigger challenge than recovering existing species at risk.

Recommendations

- With the exception of woodland caribou, there are at present relatively few designated species at risk in the forested regions of Alberta and Saskatchewan. Timely development of EBM plans offers an opportunity to address the habitat needs of all species in a planning and regulatory environment where there are comparatively few existing constraints related to critical habitat designations.

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Woodland Caribou Boreal Population

The woodland caribou boreal population, which is widespread in forested Alberta and Saskatchewan, was designated as *Threatened* in SARA Schedule 1 in 2003, but there has been a recognized conservation challenge for much longer (Box B6). The Recovery Strategy for the Woodland Caribou (*Rangifer tarandus caribou*), Boreal population, in Canada (Boreal Caribou Recovery Strategy - BCRS) was published in 2012 (Government of Canada 2012a), seven years after the two-year legislated timeframe, and updated in 2019 (Government of Canada 2019b). The 2012 BCRS identified *critical habitat* of the species in 50 of 51 boreal caribou ranges and outlined a schedule of studies needed to complete the identification of critical habitat. Work is under way to identify critical habitat in the northern Saskatchewan Boreal Shield SK1 Range (Government of Canada and Government of Canada 2019). A final action plan for the boreal caribou that focuses on federal government actions was completed and posted on the SAR Public Registry in 2018 (Government of Canada 2018c). The SARA website currently lists 33 documents related to boreal caribou.

Box B6. Caribou Conservation Constraints

Conservation concerns related to woodland caribou in west central Alberta increased in the late 1970s. Hunting was closed in 1981. Industrial land uses, primarily the forest and energy sectors, increased. Industry constraints for caribou accumulated to more than 70 by 2009 (Wayne Thorp, personal communication) and continued to increase thereafter. Many constraints had no defined objectives. Compliance was unevenly measured and effectiveness was not evaluated. Caribou continued to decline while compliance costs went up. By 2015 gridlock and uncertainty severely constrained industrial activity in caribou ranges and caribou had not recovered. The situation remains unresolved.

The definition of *disturbed habitat* within caribou ranges defined in the BCRS (Government of Canada 2012a) includes forest <40 years old[3] buffered by 500 m if it is anthropogenic origin (including logged areas) and not buffered if it is natural origin (mainly forest fires). The critical habitat target of 65% undisturbed habitat within caribou ranges was based on a correlation between undisturbed habitat and caribou population status (Government of Canada 2008, 2011) that represents a 60% chance of a self-sustaining caribou population (Government of Canada 2012a).

The BCRS used a 2-category habitat definition that classifies all habitats as either disturbed or undisturbed. The BCRS required that range plans show progress toward meeting the critical habitat

[3] *This is approximately equivalent to the definition provided in the Boreal Caribou Recovery Strategy: disturbance no longer visible on 1:50,000 scale Landsat imagery.*

target in caribou ranges. If habitat is undisturbed the BCRS considered it to be equally important to caribou regardless of where it is in the range and whether or not it has caribou biophysical life requisites or caribou use it.

The BCRS also required range plans to show how the *biophysical habitat attributes* of critical habitat will be conserved, Biophysical habitat attributes were described using coarse measures of forest type defined by leading tree species and age (50–80 years old or more depending on forest type) to represent habitats likely abundant with terrestrial and arboreal lichens, the main food of woodland caribou. Biophysical habitat attributes do not have a quantitative target and can be considered as subordinate to the critical habitat target.

The BCRS recognized that in highly disturbed ranges it may take "*50 to 100 years*" to achieve 65% undisturbed habitat and that other actions including wildlife population management may be necessary to achieve the overall goal of self-sustaining caribou populations. It also recognized the uncertainty related to the habitat target (60% probability of a self-sustaining population) and emphasized that the overall goal is to achieve self-sustaining caribou populations.

Provinces and Territories were asked to prepare range plans that *"…outline how range-specific land and/or resource activities will be managed over space and time to ensure that critical habitat is protected from destruction.*" (Government of Canada 2012a), and provided definitions of activities that could destroy critical habitat.

The Range Plan Guidance for Woodland Caribou, Boreal Population (Government of Canada 2016c) further defined Environment and Climate Change Canada (ECCC) expectations related to critical habitat. Provinces can:

- Refine descriptions of biophysical attributes required for each range, with submission of "…*the description and associated scientific evidence to Environment and Climate Change Canada*…".
- Describe and map disturbances differently if they "*explain those differences and the rationale for doing so*".
- Manage the range below the 65% undisturbed habitat threshold if there is *"…strong evidence, validated by Environment and Climate Change Canada, from population data collected over an extended period of time to support the management decision to establish a lower range-specific threshold…*".

In summary, proposals to modify the definitions of biophysical attributes, disturbance, and the critical habitat target (65% undisturbed) are acceptable but must be supported by scientific evidence that is already available or will be obtained during range plan implementation. This is consistent with an EBM approach that determines and manages functional ecological relationships that underpin the critical habitat definition and target. Environment and Climate Change Canada (Government of Canada 2016c, 2017) strongly encouraged the development of range plans based on local conditions and functional relationships.

The release of the BCRS and especially the critical habitat provisions triggered a flurry of ongoing controversy, provincial range planning, and research. Conservation voices (e.g., Canadian Parks and Wilderness Society 2016; Ecojustice 2020) decried the critical habitat targets as insufficient and called for immediate cessation of human activity in caribou ranges and prompt commencement of restoration to recover disturbed habitat. Alberta and Saskatchewan commenced new recovery planning initiatives attempting to comply with the BCRS, but both provinces were reluctant to explore alternatives to the critical habitat definition and target. Research to better understand the functional relationships behind the critical habitat target continued (e.g., DeMars et al. 2019; Stewart et al. 2020).

After seven years of provincial recovery planning (Government of Saskatchewan 2013, 2019b; Eric Denhoff 2016; Government of Alberta 2017c) responding to the 2012 federal recovery strategy it became apparent that provinces, concerned about socio-economic considerations, would have difficulty meeting the critical habitat target of 65% undisturbed habitat. Years of discussions led eventually to SARA Section 11 agreements with both provinces (Government of Alberta and Government of Canada 2020; Government of Saskatchewan and Government of Canada 2020). In keeping with federal policy (Government of Canada 2016d) the Section 11 agreements continue to use the critical habitat definition from the recovery strategy.

Although the BCRS covers the majority of caribou range in Alberta and Saskatchewan, the distribution of the *threatened* Southern Mountain Population overlaps smaller portions of western Alberta. The *Recovery Strategy for the Woodland Caribou (Rangifer tarandus caribou) Southern Mountain Population in Canada* (Government of Canada 2014) closely mirrored the BCRS and there are expectations that the agreements and recovery actions worked out in the BCRS process will similarly apply to the Southern Mountain Population.

CHALLENGES

- The continuing saga of the BCRS and how to recover caribou is an example of a wicked problem (Churchman 1967), in this case an apparent massive conflict between recovery of a species at risk (an aspect of ecological integrity), and aspects of human wellbeing, especially energy and forest sector development and the associated economic and social benefits. Wicked problems cannot be resolved with the logic inherent in the problem (Skaburskis 2008), and finding a logic and process that can work is a huge challenge. In this case the issue is with the definition of critical habitat and provincial government reluctance to explore and implement comprehensive solutions to caribou recovery that include habitat as one of multiple factors that are necessary for success, and recognize and reconcile the human wellbeing side of caribou recovery.
- One of the biggest challenges is the SARA requirement to define and protect critical habitat. For caribou critical habitat was defined using a statistical correlation and did not directly address the underlying functional ecological relationships. This led to focus on the correlation as the factor that needed to be managed, rather than the functional relationships.
    - There is little or no evidence that the critical habitat correlation is due directly and solely to disturbance as a functional ecological relationship. Multiple functional relationships

operate on individual caribou ranges (e.g., Johnson et al. 2020), and understanding and managing them is key to overall success.

- The precursor model (Sorensen et al. 2008) to the Government of Canada (2008, 2011) models were both criticized for having high variation and low predictive ability (Sleep and Loehle 2010). Sleep & Loehle (2010) concluded that "*Managers seeking to assess the condition of local caribou herds would be well-served to use the amount of area disturbed by fire and anthropogenic disturbance as a crude proxy of range condition*.". They recommended adding other measures of habitat, competition with other ungulates, and predation. To these I would add the role of human activities and the interactions among all factors relevant at a local level.
- The BCRS did not distinguish between habitat types within caribou ranges with respect to disturbance. All habitats were considered of equal quality if they were undisturbed. Caribou habitat selection is influenced by multiple factors and habitat use within ranges is not uniform. For example, lichens develop only on suitable ecosites (see Beckingham et al. 1996) and suitable successional windows. Lichen producing habitats are needed over the long term, and caribou must seek them out regardless of whether they are disturbed or not. The BCRS definition of biophysical habitat attributes partially addressed the need for conservation of important lichen-producing habitat types, but biophysical habitat was not incorporated into the critical habitat target, which was based solely on disturbance at the range scale.
- The BCRS combined forest age class (polygon disturbances) and human footprint (polygon and linear disturbances). Forest logging is a polygon disturbance more directly comparable to natural disturbances (mainly forest fires) while linear development disturbances are not directly comparable to most natural disturbances. These factors have different influences on caribou and they are typically managed through separate processes. Recent evidence suggests that they also have different influences on caribou (Stewart et al. 2020).
- The BCRS applied a uniform 500 m buffer on all human disturbances regardless of type or age. Caribou and related predator/prey response to the variety of human disturbance is not uniform and likely changes over time as disturbances recover (regrowth of reforested cutblocks, seismic lines, etc.). Responses also differ depending on ecological contexts and the density of anthropogenic features (McLoughlin et al. 2019).

- The BCRS set a single target (>65% undisturbed) for all boreal caribou ranges[4]. This does not account for regional variations in caribou ecology and limiting factors (Muhly et al. 2019; DeMars et al. 2019; Neufeld et al. 2021). When it comes to caribou, one size clearly does not fit all.

[4] *The Recovery Strategy for Woodland Caribou, Southern Mountain Population adopts the same 65% critical habitat target.*

- The >65% undisturbed target was a policy choice that the Government of Canada judged would provide a 60% chance of a self-sustaining caribou population. The choice was based on the statistical correlation and even if it was accurate there still would be a 40% chance of not achieving a self-sustaining caribou population. The choice is arbitrary and still carries considerable risk of failure.
- The >65% undisturbed target did not explicitly consider the natural disturbance regimes in boreal caribou ranges. Frequent forest fires in many boreal caribou ranges produce landscape conditions that infrequently or never achieve 65% >40 years old (outside NRV), yet caribou have persisted in these landscapes for millennia. This suggests that caribou moved to other areas at times, were extirpated and then recolonized habitat through time, or managed to persist in areas with lower levels of undisturbed habitat. Any or all of these explanations could be valid.
- Failure to acknowledge and account for the role of natural forest dynamics in setting the >65% undisturbed target could make it very difficult to achieve and maintain it. For example, in a frequently burned landscape that usually has <65% area >40 years old it may not be possible to reduce fire occurrence sufficiently to meet the BCRS target. The SK1 range in northern Saskatchewan currently has a stable caribou population and a very active natural fire regime, with current forest >40 years as 50.1% undisturbed habitat (McLoughlin et al. 2019).
- Most range planning completed to date occurred outside the mainstream land and resource planning framework, which is inefficient and increases risks of implementation challenges.
- A two-year joint caribou recovery planning exercise in British Columbia between the federal and provincial governments and the Saulteau and West Moberly First Nations that resulted in two Section 11 agreements for intergovernmental partnership (Government of Canada et al. 2020) and conservation (Government of Canada et al. 2020) was criticized for not involving others, which may make successful implementation more challenging. Inclusive and transparent processes are necessary for developing supported solutions, but they are challenging to do.
- Despite provisions in the BCRS for alternative approaches, the GOC, GOA, and GOS have not, until recently, explored the potential for alternatives and comprehensive multi-factor EBM approaches that would recover caribou and allow for continued human uses, which have good potential to resolve the wicked problem.

Recommendations

- Opportunities to use an EBM approach to contribute to caribou recovery centre around the provincial Section 11 agreements and the range planning processes. The recent Section 11 agreements with Alberta and Saskatchewan recognize: "*that achieving woodland caribou conservation and recovery will consider biological, social and economic factors; look for benefits, and consider effects, to other species; integration of woodland caribou conservation, management and recovery requirements into land and resource management plans, decisions, and actions*."

- The GOC has indicated willingness to "…*work with partners to explore the establishment of a network of designated adaptive management ranges and pilot areas where experimentation will be encouraged and carefully monitored, and where results will be shared broadly. ECCC will work closely with responsible jurisdictions to consider management trials and pilots based on current knowledge and expert assessments, in consideration of the specific circumstance of individual caribou ranges and local populations. The outcomes of these actions must be monitored and inform future recovery actions though an adaptive management framework*." (Government of Canada 2018a). This provides opportunities for provinces and others to work together to develop solutions that incorporate EBM.
- The GOC also called for analyses that are very consistent with EBM thinking: "*Mitigation of adverse effects from individual projects/activities will require a coordinated approach and management of cumulative effects within and among ranges. A cumulative effects assessment is essential to position the proposed project/activity in the context of all current and future development activities. The cumulative effects assessment will: assess the impact of all disturbances (anthropogenic and natural) at the range-scale; monitor habitat conditions, including the amount of current disturbed and undisturbed habitat (see Section 4.2.1), and amount of habitat being restored; account for planned disturbances; and assess the distribution of disturbance in large ranges for risk of range retraction in parts of the range*." (Government of Canada 2012b).

Canada National Parks Act

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The Canada National Parks Act (Government of Canada 2000) governs management of six forested National Parks in Alberta and Saskatchewan (See Section E: Intermediate Level Systems—Protected Areas EBM).

B2.5 Shared Federal-Provincial Government Policy

The federal and provincial governments have various agreements and commitments to govern their interactions on subjects of mutual jurisdiction or interest. Many directly relate to EBM.

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Convention on Biodiversity

Following the international Rio Earth Summit meeting in 1992, the international *Convention on Biological Diversity* (CBD) treaty came into effect in 1993. The main goals of the CBD are conservation of biological diversity (biodiversity), sustainable use of its components, and the fair and equitable sharing of benefits arising from genetic resources. The CBD's governing body is the *Conference of the Parties* (COP), consisting of all governments and other organizations that have ratified the treaty. The COP has held 14 ordinary meetings and the 15th meeting is scheduled for 2021. Canada was the first industrialized country to ratify the Convention in 1992 and hosts the CBD Secretariat in Montreal.

In 2000, the COP adopted the *ecosystem approach*, defined as "*a strategy for the integrated management of land, water, and living resources that promotes conservation and sustainable use in an equitable way*" (The Subsidiary Body on Scientific Technical and Technical Advice 2000), as the implementation framework for the CBD. The COP terminology variations included "ecosystem approach", "ecosystem process-oriented approach", "ecosystem management approach" and "ecosystem-based approach". The ecosystem approach included 12 principles (Box B6) that are consistent with EBM pillars and elements (Andison 2020).

Box B6. *Convention on Biodiversity Ecosystem Approach Principles* (The Subsidiary Body on Scientific Technical and Technical Advice, 2000)

1. *The objectives of management of land, water, and living resources are a matter of societal choice.*
2. *Management should be decentralized to the lowest appropriate level.*
3. *Ecosystem managers should consider the effects (actual or potential) of their activities on adjacent and other ecosystems.*
4. *Recognizing potential gains from management, there is usually a need to understand and manage the ecosystem in an economic context.*
5. *Conservation of ecosystem structure and functioning, in order to maintain ecosystem services, should be a priority target of the ecosystem approach.*
6. *Ecosystems must be managed within the limits of their functioning.*
7. *The ecosystem approach should be undertaken at the appropriate spatial and temporal scales.*
8. *Recognizing the varying temporal scales and lag effects that characterize ecosystem processes, objectives for ecosystem management should be set for the long term.*
9. *Management must recognize that change is inevitable.*
10. *The ecosystem approach should seek the appropriate balance between, and integration of, conservation and use of biological diversity.*
11. *The ecosystem approach should consider all forms of relevant information, including scientific and Indigenous and local knowledge innovations and practices.*
12. *The ecosystem approach should involve all relevant sectors of society and scientific disciplines.*

Canadian Biodiversity Policy

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The CBD is implemented at the national level through National Biodiversity Strategies and Action Plans. The *Canadian Biodiversity Policy* (Government of Canada 1995), *Biodiversity Outcomes Framework* (Government of Canada 2015c) and *2020 Biodiversity Goals and Targets* (Government of Canada 2015d) are the current joint documents adopted by the federal, provincial, and territorial Ministers.

The Canadian Biodiversity Policy is supportive of EBM: "*Ecological management (sometimes called ecosystem management or an ecological approach to management) is essential to achieving the goals of the Strategy. It is defined in the Strategy as the management of human activities so that ecosystems, their structure, composition and function, and the processes that shaped them can continue at appropriate temporal and spatial scales. Ecological management requires an understanding of*

ecosystems and the impacts and implications of human activities. impacts and implications of human activities." (Government of Canada 1995).

The Biodiversity Outcomes Framework outcomes are healthy and diverse ecosystems, viable populations of species, maintenance of genetic resources and adaptive potential, and sustainable uses of biological resources. These are to be achieved by using an ecosystem and adaptive management approach to achieve shared outcomes following a systems approach (assess, plan, do, track).

Goal A of the 2020 Biodiversity Goals and Targets (Government of Canada 2015d) is directly related to EBM: "*By 2020, Canada's lands and waters are planned and managed using an ecosystem approach to support biodiversity conservation outcomes at local*, regional and national scales." Where possible, the national targets and their indicators are aligned with the *Federal Sustainable Development Strategy* and the *Canadian Environmental Sustainability Indicators* to ensure robust reporting over time.

Canada's 6th National Report to the CBD, reporting on the 2020 Biodiversity Goals and Targets, was submitted in November 2018.

Challenges

- More effort is needed to implement the CBD principles, which are at risk of being forgotten (Waylen et al. 2014).
- The CBD principles, which are supportive of EBM, are not well referenced and incorporated into the Canadian response framework at the federal and provincial levels.
- Translating the EBM-related goals and strategic directions of the CBD-related Canadian policy initiatives into practice on the ground has been exceedingly difficult. Strong direction to use an ecosystem approach has not translated to widespread on-the ground implementation of EBM. Actions have been mostly related to the status quo fragmented management frameworks used by Canadian governments. This requires governments to overcome the governance challenges associated with their structural organization and disaggregated operating processes, which is difficult.
- The Canadian Biodiversity Strategy is now 25 years old and as a consequence it does not incorporate major knowledge improvements and developments since 1995; updates in subsequent initiatives have not been linked back to the original strategy or the CBD principles.
- The five targets associated with goal A of the 2020 Biodiversity Goals and Targets are not directly related to the goal of planning and managing using an ecosystem approach.
- Most of the 19 targets in the 2020 Biodiversity Goals and Targets are qualitative, which suggests they were not developed with measurable performance in mind, and the implementation strategies are weak or absent.
- Many indicators and related progress reported in the 6th National Report to the CBD are qualitative; phrases such as "*Based on partial indicator information and expert opinion*" are common.

Recommendations

- Revise the Canadian Biodiversity Strategy and incorporate the CBD Principles, which promote planning and decisions that take into account how ecosystem processes will be affected over space and time (Waylen et al. 2014).
- The next update of the 2020 Biodiversity Goals and Targets could reaffirm the goal of planning and managing using an ecosystem approach and create targets to update policy frameworks to implement EBM and complete EBM plans. This would transform subjective and ad hoc actions into measurable progress.

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Accord for the Protection of Species at Risk

Through the Canadian Endangered Species Conservation Council the federal, provincial, and territorial governments, developed the 1996 *Accord for the Protection of Species at Risk* (Canadian Endangered Species Conservation Council 1996). Governments agreed to establish complementary legislation and programs that provide for effective protection of species at risk throughout Canada. Perhaps the most visible achievement of the Accord and CESCC activity is production of national wild species status reports every five years.

Challenges

- The Accord for the Protection of Species at Risk is 35 years old and has not been updated.
- The federal-provincial record of cooperation on species at risk has been uneven and there have been open disagreements about federal activity in areas the provinces consider their jurisdictions.
- The Canadian Endangered Species Conservation Council is supposed to adjudicate disputes between governments but there are few related online resources and no records of activities to resolve challenges.

Recommendations

- The recent Pan-Canadian approach to transforming species at risk conservation in Canada (Government of Canada 2018a) may effectively replace the Accord and has associated opportunities (see Section B2.).

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B2.6 Forest Sector EBM Policy

Major Alberta and Saskatchewan forest companies and industry associations were early adopters of SFM and EBM as the parallel approaches developed. Many companies commenced EBM programs after an influential EBM presentation at the University of Alberta (Franklin 1992).

Many companies in both provinces also began implementing EBM elements and aspects in the 1990s. In Alberta, Alberta-Pacific initiated a stand structure retention program in 1993 (Alberta Pacific Forest Industries (Al-Pac) 1993). Weldwood supported an ecological approach in the early 1990s (National Round Table on the Environment and the Economy 1995), co-sponsored the Foothills Model Forest in 1992 and incorporated EBM-inspired analyses of seral stage and wildlife habitat supply in NRV contexts into the 1999 FMP for the Hinton FMA (Weldwood of Canada Ltd. 2000; Bott et al. 2003). Weyerhaeuser Canada Alberta released an EBM policy in 1997 (Weyerhaeuser Canada 1997) that contained strong EBM direction. In Saskatchewan, Mistik Management Inc. moved to a large-scale, natural disturbance-emulating, logging design patterns in the 1990s (Mistik Management Ltd 1997). The *Mistohay Project*, with logging commencing in 2001 and ending in 2003, is the single largest "green-tree" logging-related disturbance in the Mistik FMA area. Weyerhaeuser was also a pioneer of EBM in Saskatchewan. Other companies not mentioned in these examples had similar policies and initiatives (Box B7).

Box B7. Examples of Forest Company EBM Policy Statements

Alberta-Pacific: "*Manage for biodiversity (natural biological diversity) within the framework of ecosystem management at both the regional and landscape levels.*" "*This Forest Management Plan (FMP) illustrates the company's commitment to operate within an ecosystem-based management framework, also known as sustainable forest management.*"

Mistik Management: "*In conducting its timber harvest and renewal operations, Mistik attempts to emulate some of the features of the dominant natural disturbance regimes.*"

West Fraser: "*Our forestry practice is to maintain forest habitat within the natural variation produced by Mother Nature. It means we aim to regrow forest cover that supplies natural forest habitats in amounts and patterns similar to what would result from a natural disturbance on the landscape, such as forest fires.*"

Weyerhaeuser: "*We believe in practicing ecologically based forest management that will maintain forest ecosystems within the ranges of natural variability."*

CHALLENGES

- Most forest sector policy documents tend to focus on SFM and protection of the environment and biodiversity. EBM is often mentioned in corporate documents but companies generally do not have detailed EBM policies.

RECOMMENDATIONS

- Companies that are committed to EBM would benefit from having an EBM policy that provides sufficient detail for their own employees to follow and can be used for external communications.
- Development of a generic EBM policy concept paper with participation from multiple companies could be useful as a template for companies and as a shared vision for industry associations.

B2.7 Environmental Non-gov't Organizations EBM Policy

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Major ENGOs active in Alberta and Saskatchewan were early supporters of EBM. The *Alberta Wilderness Association Position Statement for Alberta's Forests* was originally released in 2003 (Alberta Wilderness Association (AWA) 2016). The Canadian Parks and Wilderness Society "*vision is to protect at least half of Canada's public land and water*" (Canadian Parks and Wilderness Society 2020), and CPAWS advocates for EBM for protected areas and other forest lands.

Challenges

- ENGO EBM policy tends to be organized around protected areas and contains a mix of EBM outcomes and specific positions, often in relation to activities that they like or dislike.

Recommendations

- ENGO policy statements in relation to EBM might benefit from updating to focus on outcomes and inclusion of additional EBM aspects to supplement those already in place.
- Policy statements that distinguish between land use designations and land management could provide an opportunity to clarify ENGO organizational EBM interests and direction.

B2.8 Summary

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Over approximately the last seven decades forest management policy for commercial forests has progressed broadly from *Sustained Yield Management* to *Integrated Resource Management* to *Sustainable Forest Management* to the early stages of *Ecosystem-based Management*. We are still operating on the long-standing *Values-Based Approach* with all of its inherent challenges. Provincially, EBM elements and aspects are being shoehorned into the VBA, including for provincial protected areas and non-commercial forests. The VBA is also still applicable to federal legislation and management, especially for National Parks.

Each named transition was part of an ongoing continual improvement process and each introduced new approaches and improvements. However, as management evolved from one paradigm to the next the legacy of the former paradigms accumulated, leading to a mix of older policies, responsibilities, requirements, and practices that may not be necessary or may actually get in the way of newer thinking and approaches. It may be time for a major review of the accumulated regulatory and management pile and a thinning and reconfiguration to the key aspects that are most relevant (Vertinsky and Luckert 2010). Perhaps the single best approach is to suggest that EBM is a matter of using the right mix of new and old, and appropriate tools (Slocombe 1993).

Challenges

- Overall EBM goals (ecological integrity, health, and resilience; human wellbeing) are widely accepted and incorporated into legislation and policy. Most documentation is unclear. Few

organizations have taken the time to develop clear and comprehensive legislation and policy that defines EBM and related processes to implement it to achieve ecological goals. Governments in particular have not shown leadership in establishing comprehensive policy documents that describe their EBM objectives.

- Widely understood and agreed definitions of EBM are lacking in the various contexts of forest management (commercial forests, protected areas, non-commercial forests, etc.). It's hard to work toward something that is fuzzy in definition and hard to understand and there are significant differences among interested parties about the definition and content of EBM. There is little agreement on measurable indicators and targets and how to achieve them.
- Translation of theoretical approaches into practice is a very challenging complex process for resource managers (Butler and Koontz 2005). Moving policy ambitions into practice has failure risk due to poor designs that don't adequately incorporate complexity (Howlett 2019).
- Government legislation and policy related to EBM in forests is split between levels of government, agencies, aspects, land use designations and responsibilities, and time periods. The regulatory package is unwieldy and inadequately coordinated between the various agencies and their levels. Neither province has a unified and comprehensive legislative and policy EBM framework that establishes their goals and objectives.
- Most existing regulation approaches are sub-optimal in terms of being effective (achieving policy goals), efficient (cost and time), equitable (inclusive and transparent), and politically and socially acceptable (Gunningham and Sinclair 1999). This is a challenge to EBM implementation but it also presents opportunities to improve from the status quo.

RECOMMENDATIONS

- There is broad agreement that primary EBM goals should be ecological integrity and human wellbeing, and those goals are consistent with other terms already being used. This provides opportunities to build equivalencies between existing regulatory instruments and EBM terms, to build unified and integrated policy frameworks and improve communication and cooperation about EBM.
- Policy design is ubiquitous, necessary, and difficult (Bobrow 2006). Emerging hybrid modes of governance including co-management, public-private partnerships and social-private partnerships provide opportunities (Lemos and Agrawal 2006).
- How might those who are interested in further EBM implementation work within the confines of the VBA legislative and policy framework? There are several potential pathways:
    - Undertake voluntary EBM actions while remaining in regulatory compliance. Certification standards and the Canadian Boreal Forest Agreement Forestry requirements for natural range of variation (NRV) analysis and target setting (Canadian Boreal Forest Agreement 2015) are examples of voluntary initiatives.
    - Cooperate and partner with promising examples of government-led initiatives intended to address some of the shortcomings of VBA and implement some aspects consistent

with EBM. Examples include the Pan-Canadian Approach to Species at Risk Recovery, the Alberta Land-Use Framework, and the partial embrace of EBM in the Saskatchewan Forest Management Planning Standard and the Saskatchewan Forest Operations Standard.

- Explore opportunities to trial, demonstrate, and implement EBM alternatives to regulatory requirements that can be approved through variance opportunities that are available in most regulatory instruments. Most of the legislation, policies, and standards reviewed for this report have variance clauses that are uncommonly used. The clauses typically allow alternative proposals to standard requirements that may be used only with specific review and approval as stated in the document. These clauses could be very useful tools if proponents and governments are willing to consider and apply them more often, because their use does not require revision of the supporting regulatory instruments. They could also be an important process to support adaptive management.
- Incorporate EBM into ongoing reviews and revisions of the regulatory and policy frameworks of governments and others engaged in forest management. The longer-term goal is legislation and policy that supports EBM.

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