

Report of the Ontario Woodland Caribou Science Review Panel: The Path Forward



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Executive Summary

The Woodland Caribou Science Review Panel (Panel) was charged with reviewing the scientific basis for the recommendations in the *Recovery Strategy for the Caribou (Rangifer tarandus caribou) (Forest-Dwelling Population) in Ontario (Strategy)*.

The *Strategy* contains most of the important elements essential to achieving boreal woodland caribou (caribou) recovery in Ontario and is consistent with the current understanding of caribou biology. The Panel commends the authors for emphasizing broad caribou-centred spatial and temporal scales, desiring land use planning, recognizing synergies with other species at risk, understanding the costs and impediments to caribou recovery, acknowledging the necessity of engaging stakeholders, and supporting a recovery program extending over multiple years. The *Strategy* is a solid foundation on which to start investing in caribou recovery

The Panel also recognizes several aspects of the *Strategy* that could be better articulated or emphasized.

The Panel recommends a revised goal as well as several revised objectives:

Goal: Self-sustaining populations of forest-dwelling woodland caribou should be maintained wherever they exist in Ontario, declining populations should be strengthened, and woodland caribou should be re-established on strategically chosen ranges.

Objective 1: To protect and manage caribou habitat.

Objective 2: To reduce known threats associated with range recession and population decline of caribou, consistent with the precautionary principle.

Objective 3: To develop legislation, policies, and plans with the protection of caribou as an overarching consideration.

Objective 4: To integrate caribou conservation efforts and planning processes across jurisdictions (federal, provincial, municipal, and First Nations).

Objective 5: To increase understanding of caribou ecology as well as threats to their habitat and survival through monitoring and research in the context of adaptive management¹.

Objective 6: To generate support and partnerships for recovery implementation by promoting education and awareness of caribou and boreal forest ecosystems.

¹ from Anonymous 2005

Likewise, the *Strategy*'s recovery approaches and actions should be amended as detailed in this report. Our major recommendations are:

- Adopt comprehensive broad-scale land use planning on caribou ranges in the far north and in The Area of the Undertaking (the area allocated to commercial forestry as defined in the class EA¹), in contrast to the current piecemeal development approach, which is bound to result in failure to recover caribou populations and prevent further loss of range. Planning should recognize all development and should designate areas where no development will be permitted on caribou range.
- Base caribou recovery on the guiding principles of: (1) ecosystem-based management; (2) the precautionary principle; (3) adaptive management; (4) sustainability; and (5) commitment to maintain caribou range.
- Confront the management and policy constraints that compromise the realization of the *Strategy*'s goal and objectives and develop clear and immediate priorities for action.
- Test the *de facto* hypothesis that caribou will re-occupy logged areas using a properly resourced, rigorous program of (1) scientific research and (2) consistent, directed monitoring of caribou populations and population processes (including hunting mortality) and of caribou habitat in an adaptive management framework (a list of research needs is included in this report).
- Address the inadequacies of the *Ontario Environmental Assessment Act*, especially its exemption of the mining sector.
- Engage First Nations, focusing on the long-term mutual dependency of caribou and people and engage a broad spectrum of other stakeholders.
- Adopt range-based management rather than ad-hoc recovery zones.
- Appoint a Provincial Caribou Technical Committee to oversee the management of caribou ranges rather than the Recovery Implementation Groups proposed in the *Strategy*.

The paradox of caribou recovery is that it not only needs a long-term vision but also necessitates immediate action, thus:

- The province should act immediately to (1) begin comprehensive land use planning; (2) delineate population-based caribou ranges; (3) commence expert-guided habitat regulation (the description, delineation, and protection measures that are necessary for caribou habitat to recover); (4) develop and implement a research and monitoring plan; and, (5) initiate communications and outreach concerning caribou recovery.

The *Strategy* covers difficult, urgent problems in detail but assumes the status quo and, therefore, fails to confront the central land use planning issues crucial to the success of a recovery strategy. Only a fresh path forward can achieve caribou recovery in Ontario.

Committee Mandate

The Woodland Caribou Science Review Panel was charged with reviewing, in March and April 2008, the scientific basis for the recommendations in the *Recovery Strategy for the Woodland Caribou (Rangifer tarandus caribou) (Forest-dwelling Population) in Ontario (Strategy)*. The intent was to ensure a transparent, independent analysis and to provide alternative or additional recommendations for consideration by the Ontario government.

Terminology

Unless noted, the term “caribou” refers in this report to the forest-dwelling, boreal population(s) of Ontario.

The Recovery Strategy for the Woodland Caribou (Rangifer tarandus caribou) (Forest-dwelling Population) in Ontario is termed the Strategy and refers to the unreleased version of December 2007.

The Woodland Caribou Science Review Panel is referred to as the Panel.

MNR is The Ontario Ministry of Natural Resources.

CNFER is MNR’s Centre for Northern Forest Ecosystem Research

NRVIS is MNR’s Natural Resources and Values Information System

General Appraisal

The *Strategy* is reasonably sound in that it contains most of the important elements essential to achieving caribou recovery in Ontario. The authors have given much thought to accommodating caribou conservation within existing policy and to defining new elements necessary to effect recovery. While the document could, and should, go further with regard to new elements, it is a solid foundation on which to start investing in caribou recovery.

The *Strategy* is consistent with current scientific understanding of caribou biology. The authors are to be commended for the positive aspects of the *Strategy* that include recognition of:

- the fundamentals of caribou ecology, based on a comprehensive literature review;
- the need for broad temporal and spatial scales to provide present and future habitat;
- the need for landscape-scale habitat management and broad-scale integrated land use planning;
- the likelihood of delayed population response of caribou to habitat change;
- the synergies between caribou and other species at risk in Ontario, notably wolverine (*Gulo gulo*), which is another wide-ranging species facing similar conservation challenges;

- the necessity to engage a broad spectrum of stakeholders;
- the need for a sustained commitment of staff and funding over many decades;
- the need for bio-physical and socio-economic impact assessment; and
- the costs and impediments to caribou recovery.

Conversely, the Panel believes that the following elements could be better articulated or emphasized in the strategy:

- The *Strategy* should espouse the guiding principles of ecosystem-based management (Grumbine 1994), the precautionary principle (United Nations 1992, Article 15), adaptive management (Johnson 1999), sustainability (United Nations 1987), and a commitment to maintain caribou range as listed in the *Strategy* (see p. 9 in this report).
- Although land use planning is mentioned in the *Strategy* (Strategy Table 1), its objectives and approaches are largely fitted into the existing policy and management framework. Thus, the overall approach is piecemeal and will ultimately fail. If the Ontario government truly wishes to achieve the goal of the *Strategy*, then caribou must be a paramount consideration within a comprehensive land use planning framework in caribou range (see p.11 in this report).
- The current approaches listed (*Strategy*, Table 1) should be reviewed and clarified. The numerous approaches are mostly well allocated but repetitive, and they collectively fail to organize priorities for action. A clear path for caribou recovery is promised (*Strategy*, p. 5), but, in the end, there is no clear “take home” policy message. We suggest amendments (see Appendix in this report).
- It is imperative to confront the constraints that will compromise the likelihood of the *Strategy* achieving its goal and objectives (see p. 8 in this report).
- The *Strategy* demonstrates over-confidence in the capacity of habitat management to effectively protect caribou, given that it relies on the untested hypothesis that caribou will eventually return to use industrially logged areas.
- The *Strategy* should address the inadequacies in the *Ontario Environmental Assessment Act* (for example, the Ontario Environmental Assessment Act Declaration Order MNDM-3/3 exempts the whole mining industry from environmental assessment). Large projects should not be approved in small increments.
- Engagement with First Nations should be strengthened to address their needs with respect to caribou in the short and longer term (see pp.13 and 14 in this report).
- The *Strategy* should adopt range-based management linked to the land use planning approach rather than the broad recovery zones currently proposed. Population objectives for caribou recovery and habitat management should be set at the range level.

- The proposed Recovery Implementation Groups add extra bureaucracy to the recovery. We prefer a Provincial Caribou Technical Committee that is composed of wildlife experts (scientists and managers).
- The *Strategy* can be more succinct with clearer structure. It should emphasize the main points, remove background information to appendices (the appendix at the end of this report offers suggestions), and highlight immediate priorities for action. If and when revised, the *Strategy* should be updated to include considerable, recent progress on caribou conservation across Canada, notably incorporating guidance regarding range management from the federal Critical Habitat exercise currently being undertaken by Environment Canada and slated for public release in May 2008.

Revised Goal and Objectives

We recommend a clearer goal for the *Strategy*:

Goal: Self-sustaining populations of forest-dwelling woodland caribou should be maintained wherever they exist in Ontario, declining populations should be strengthened, and woodland caribou should be re-established on strategically chosen ranges.

Likewise, the objectives can be shortened and clarified:

Objective 1: To protect and manage caribou habitat.

Objective 2: To reduce known threats associated with range recession and population decline of caribou, consistent with the precautionary principle.

Objective 3: To develop legislation, policies, and plans with the protection of caribou as an overarching consideration.

Objective 4: To integrate caribou conservation efforts and planning processes across jurisdictions (federal, provincial, municipal, and First Nations).

Objective 5: To increase understanding of caribou ecology as well as threats to their habitat and survival through monitoring and research in the context of adaptive management².

Objective 6: To generate support and partnerships for recovery implementation by promoting education and awareness of caribou and boreal forest ecosystems.

² from Anon 2005

Woodland Caribou: Challenge and Opportunity

Due to their broad distribution, sensitivity to disturbance, wide-ranging habits, dependence on old forests, and loss of former range, caribou are the most formidable conservation challenge in Ontario's northern forests. Recognizing the issues and constraints is pivotal to recovery. Unfortunately, this species' biological attributes invite delay. Caribou are rarely seen, their declines are hard to detect, and they succumb to habitat loss only over decades.

Scale is at the heart of these challenges. Recovering caribou requires a far-sighted vision that matches the habitat needs of caribou, leading to management strategies spanning decades as well as encompassing entire landscapes. Science must also inform Ontarians about the uncertainties, probable outcomes, and important trade-offs related to recovery.

Scale also underlies societal needs and expectations. A decade ago, the Senate Subcommittee on the Boreal Forest (1999) emphasized "competing realities" about boreal forests—resource conservation, the maintenance of community lifestyles and values, and the extraction of economic wealth—which were a wide range of functions failing to be met. Such contradictory views can also be traced to scale. Jane Lubchenko (1998) writes:

The false assertion that society must choose between the economy and the environment is often made. In reality, this "jobs versus the environment" choice is a false dichotomy: the real choice is between short-term gain and long-term, sustained prosperity ... Economic development and prosperity hinge upon maintaining an adequate flow of essential services provided by natural ecosystems.

Hence, while caribou may be regarded as an obstacle to short-term economic gains, they also represent a valuable opportunity. This indicator species (a sentinel of forest connectivity) and umbrella species (enhancing the conservation of other species) is likely to strengthen community resilience and sustainability in the long haul.

If Ontarians adopt a long-term perspective, caribou recovery becomes a starting point for partnerships—a rapprochement of diverse views, a means to unify interests, and a basis for building the future. Nevertheless, recovery will likely require substantially tempering the societal expectation for resources from the boreal forest, especially in the short term.

Management and Policy Constraints

The *Strategy* does not directly confront the considerable constraints that will affect the likelihood of achieving its goal and objectives. Many of these constraints relate to policy and land use decisions outside of the strategy framework. The consequence is a failure to provide adequate context to the challenging environment in which caribou recovery must occur. Though ostensibly designed to point out such challenges, Table 3 of the *Strategy* falls short by including only challenges *to* other interests as a consequence of caribou recovery. A complete and balanced

table must also confront the challenges of implementing caribou recovery *by* those other interests.

Decisions affecting habitat for species at risk are customarily divorced from recovery strategies. In the case of caribou, these involve socio-economic issues, including wood supply, road building, hydroelectric development, mining, and mining exploration. Their negative effects on caribou are well documented. A plethora of untested assumptions exist at the habitat management level: In particular (1) the quality and extent of caribou habitat can be accurately assessed from forest resource inventory maps; (2) caribou habitat is being successfully managed to be reoccupied in the future; (3) the habitat guidelines are being successfully implemented and enforced; and (4) climate and fire regimes will be constant. Cumulative errors from multiple assumptions may easily compromise caribou populations just as they have in the past. Lack of acknowledgment of such assumptions implies considerable confidence in a habitat management approach that is an untested hypothesis. In Ontario, the magnitude of the failure to learn from years of caribou habitat management is overlooked. This problem relates to inadequate monitoring and is a constraint to management and the persistence of caribou.

Proper adaptive management for caribou requires a significant, sustained investment in research, monitoring, and planning, and such commitment will be a strong indicator of Ontario's willingness to manage the landscape sustainably.

Guiding Principles

In response to the above dilemma, the Panel offers the following principles that are essential to the recovery of caribou in Ontario.

Ecosystem-based Management

Maintaining the structure and function of boreal forest ecosystems (for example, food chains) is essential. The cumulative effects of human factors affecting caribou must be addressed through broad land use planning that addresses the ultimate causes of caribou decline and not just the symptoms.

Precautionary Principle

Scientific uncertainty, or information gaps, must not be a reason or an excuse to delay actions that are essential to achieving caribou recovery. One must err on the side of caution when dealing with caribou conservation since unknown factors and interactions can have negative and unforeseen effects. Successful forest management means not foreclosing on future options.

Adaptive Management

A commitment to adaptive management addresses the challenges and indicates a determination to manage landscapes sustainably. New information, knowledge, and technologies must inform

research, management, and conservation practices. This approach includes, critically, a continual assessment of actions for managing caribou range and the research to understand key uncertainties. Adaptive management differs from “muddling through” by using a feedback loop of regular directed monitoring, continuous review and assessment, and research to guide management practices (Figure 1). While management actions need to be regarded as experiments, resource extraction should never be justified under the guise of research.

Sustainability

Range management should be sustainable over the long term so that the future does not become a debtor to the present. A sustainable approach can include the recognition that human activities will continue to occur on caribou range in Ontario.

Commitment to Maintaining Woodland Caribou Range

Government departments, crown corporations, industries, First Nations, municipalities, and individuals must share responsibility for, and be committed to, the goal of the *Strategy*. Furthermore, Ontario has a responsibility to contribute positively to the national and international status of caribou. These responsibilities are outlined in Environment Canada (2007).

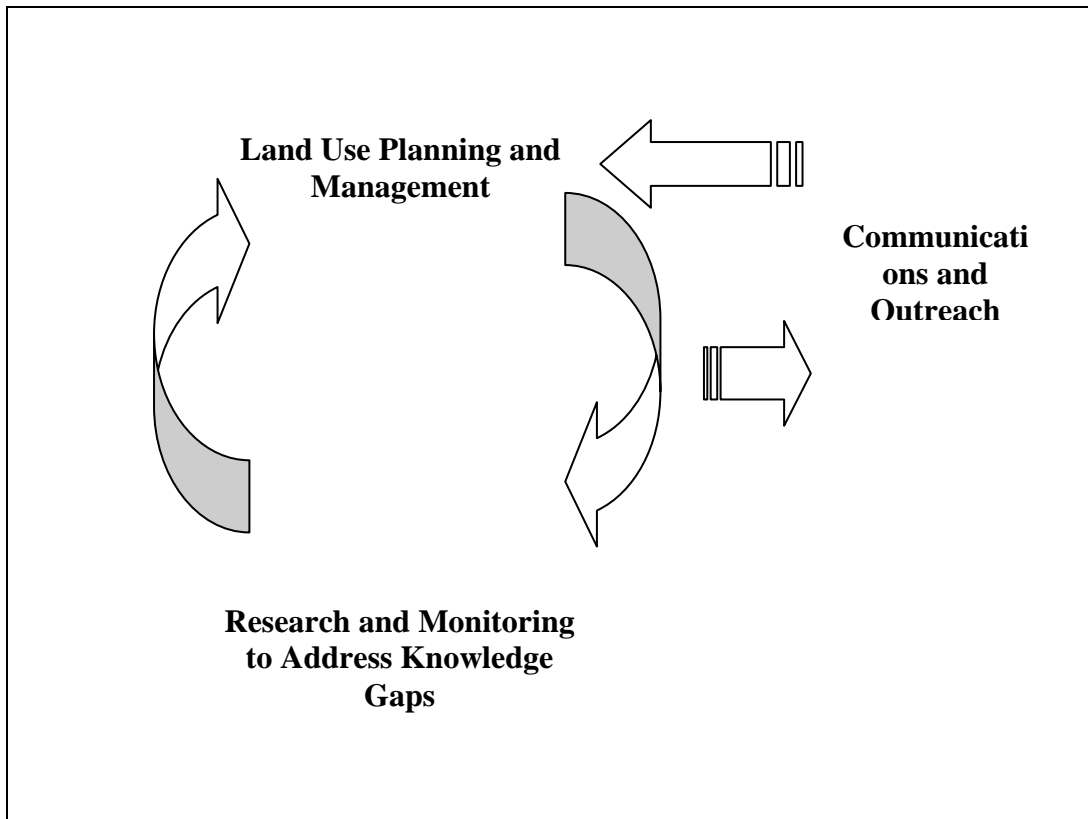


Figure 1. The Essential Elements of Caribou Recovery, based on Adaptive Management.

The Path Forward

The following paragraphs outline our vision to achieve caribou recovery. The Panel has emphasized and elevated certain elements of Table 1 of the *Strategy*. These points are essential to the path forward.

Woodland Caribou Management in an Adaptive Framework

When combined with public outreach, adaptive management represents the very foundation for caribou recovery (*Strategy*, Figure 1). Major uncertainties remain, especially about maintaining caribou on managed landscapes, and adaptive management entails their identification and reduction through research and monitoring while simultaneously implementing action plans. The central point is to regard management prescriptions for caribou as hypotheses to be tested as experiments. In this way, we may gain more reliable knowledge, improve future management, and enhance the likelihood of success.

Land Use and Management Planning

The Panel agrees with the *Strategy* concerning cumulative effects of resource developments on caribou and its characterization of “land use planning and management” as an over-arching approach to recovery. Land should be allocated in broad-scale, comprehensive plans that entail a structured decision-making process informed by science. Such plans are vital to maintaining caribou as pressures for resource extraction increase. In contrast, current land use decisions on crown land in Ontario are piecemeal and have been made on a project-by-project basis. Their cumulative effects are seldom confronted or forecast, whether concerning caribou or other impacts. The division of resource interests (for example, forestry, mining, tourism, roads, and energy development) into disparate ministries in Ontario exacerbates this problem.

The land use planning process must have the following elements, most of which are mentioned in Table 1 of the *Strategy*. It should:

- encompass the caribou ranges in both the far north and in the Area of the Undertaking, consistent with the goal of the *Strategy*;
- be governed by an overarching strategy for all road types, which considers caribou conservation at appropriate scales before development;
- include all types of human development (such as roads, hydro-electric development, peat and mineral exploration and development, and tourism);
- ensure consistency for the protection of caribou and their habitat;
- designate areas where roads and other development will not be permitted;
- engage and consult regularly with First Nations and the neighbouring provinces that share Ontario caribou populations and ranges;
- be accompanied by monitoring that assesses the effectiveness of the plan over time; and
- be guided and continually improved by the best science about effects on caribou.

Addressing Research and Monitoring Knowledge Gaps

The *Strategy* (section 19.0 and Table 1) clearly acknowledges the need to incorporate adaptive management through research and long-term monitoring. This approach appropriately steers research towards questions with a direct bearing on caribou management and conservation.

Key uncertainties, assumptions, and knowledge gaps about caribou were identified in the *Strategy*, and at the Ontario research meetings in November 2006 (Rodgers et al. 2007) and in November 2007 (personal communication with A. Rodgers, CNFER).

Research needs can be divided into: (1) improving methods and (2) addressing uncertainties about habitat, population ecology, and processes threatening caribou.

(1) Improving Methods

The main tools that require development include:

- ways to delineate ranges: population structure (local populations) and ecotype boundaries in Ontario;
- survey/monitoring techniques: improved and standard approaches to count caribou;
- local knowledge: engaging First Nations communities and individuals concerning naturalized knowledge (traditional ecological knowledge) about caribou and establishing a compendium of such knowledge;
- characterization of caribou habitat through a predictive niche model for use in forest management and possibly for stratifying inventories;
- ways to document hunting mortality; and,
- development of a provincial database to follow (and model) population change.

(2) Addressing Uncertainties

Key uncertainties about caribou ecology can be expressed as a function that links caribou populations and/or habitat to the main hypothesized drivers.

Caribou population = function of (roads and other disturbance) + (predation and hunting mortality) + (habitat quality [that is, disturbance, composition, and patches])

Thus, key activities should include:

- evaluating cumulative landscape disturbances on caribou populations and ecology;
- determining the mechanisms driving caribou population dynamics in natural and human-modified landscapes
- evaluating disturbance thresholds at which caribou abandon previously occupied habitat.

Other uncertainties for investigation include:

- caribou response to past management (for example, caribou harvest and silviculture);
- caribou feeding ecology related to site productivity in all seasons;
- predicting the long-term effects of climate change on caribou; and
- the role of parasites/diseases, notably brainworm (*Parelaphostrongylus tenuis*), in the decline of caribou.

Much of this research would lead to the development of population viability models predicting the capability of caribou to persist on a managed landscape through understanding habitat use, survival, and reproduction. It would also aid in the evaluation of thresholds of habitat disturbances that can be tolerated without precipitating population declines and of conditions under which re-colonization of habitats is likely. As caribou are affected by the state of landscapes, forest management units, and individual sites, a research program must provide an understanding of key processes at relevant scales. This research will be experimental and will require multiple investigators and partners over decades.

Monitoring

Much uncertainty surrounding Ontario caribou populations has resulted from insufficient monitoring and research over the past thirty years. In an adaptive management framework, monitoring can permit assessment of the effectiveness of management actions and of the suitability of range identification.

However, monitoring is extremely vulnerable to cuts in funding and the exigencies of new government priorities. Arbitrary changes in support can seriously impair, or ruin, the stream of management information. The scale of caribou recovery necessitates long-term data from a monitoring program that is carefully designed at the outset.

Communications and Outreach

We endorse the communications and outreach components articulated in the *Strategy* (Approaches 36–41 in Table 1).

Immediate Priorities

Paradoxically, caribou recovery not only necessitates a long-term view but also demands urgent action. The current recovery effort in Ontario belies this urgency because recovery planning has been underway for more than eight years, with an initial version of the *Strategy* appearing more than five years ago and the current strategy lying dormant for at least a year. Repeated experiences from previous resource collapses (for example, the northern cod) demonstrate that conservation issues are more readily resolved and at less cost when promptly addressed.

Thus, the Panel has identified the following five priorities, which are realistic and must be implemented concurrently and without any delay.

Ranges

Caribou local ranges need to be delineated as the basis for caribou management and conservation.

Broad-scale, Comprehensive Land Use Planning

Comprehensive broad-scale land use planning across the distribution of caribou in Ontario is critically important. Hence, planning activities relating to caribou need to be a central component of far north planning and must be extended into the Area of the Undertaking. While acknowledging that arriving at such a process will be challenging, we urge the Ontario government to undertake this exercise without delay. Government must act while there is still time to provide protection for caribou ranges in advance of development and to buttress the caribou range from further recession within forest management units.

Expert Guided Habitat Regulation

As caribou conservation moves to the next phase, a species-specific habitat regulation is required by 30 June 2009 under the new provincial *Endangered Species Act*. Creation of this habitat regulation must include description, delineation, and protection measures for caribou habitat necessary for recovery, must involve members of the recovery team and other wildlife experts, and must be explicitly linked to the goal and objectives of caribou recovery.

Research and Monitoring

Development and implementation of a research program and a monitoring program should be in place and properly resourced by the next fiscal year (that is, 1 April 2009). Monitoring should be designed not just to acquire vital information but also to continue under difficult fiscal circumstances. To this end, Ontario should bear in mind that Alberta and British Columbia have invested about \$2 million annually on caribou research for more than a decade, and Newfoundland and Labrador recently announced an investment of \$15.3 million over five years.³

Communications and Outreach

Formal and informal relationships with First Nations and First Nations individuals and communities in caribou range should be priorities in outreach activities related to caribou recovery. Relationship-building efforts should be strengthened considerably and fostered to develop joint conservation activities where possible (see Petsch 2002 as an example).

³ Funding announcement on 8 February 2008 by the Province of Newfoundland and Labrador, <<http://www.releases.gov.nl.ca/releases/2008/env/0207n06.htm>>. (retrieved 8 May 2008)

Conclusion

The *Strategy* addresses difficult and urgent problems in detail. It covers many science-based problems in caribou conservation and suggests valuable approaches to management. However, the *Strategy* does not confront with sufficient vigour the central land use planning issue that is critical to the success of a recovery strategy for caribou.

Effective caribou management demands that society replace the status quo with a fresh approach that we characterise as holistic, proactive, far-sighted, timely, decisive, inclusive, grounded in the best science and other knowledge, and adaptive in the face of new understanding.

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Appendix: Comments and Recommendations on “Approaches” (Strategy, Table 1)

The Panel emphasizes that this appendix resulted from a detailed analysis that was the basis of higher-level recommendations in the body of the report.

The Panel is in complete agreement with the authors of the *Strategy* concerning the items in the list that are marked “endorsed.” As noted in the main document, the Panel shares concerns about the length and complexity of the *Strategy*, and the changes recommended below should ameliorate this issue.

Approach 1: Defining the caribou problem in terms of road development is appropriate but entirely insufficient. Approach 1 should be amended to include a much wider range of actual and potential stressors on caribou as follows: “Develop provincial, regional and landscape scale strategies for land use and resource planning in northern Ontario that include, but are not necessarily limited to, seasonal and all-weather roads, rail lines, utility corridors, hydroelectric development, mining and mining exploration, forest management and forest management planning, and resource-based tourism. The caribou strategy should be integral to such planning activities.”

Approach 2: This approach should be combined with Approach 23. Remove the second half of the approach statement (“consistent with ... Steering Committee”). The Approach should include wording: “consistent with the regulation requirement under the 2007 Ontario Endangered Species Act and with the forthcoming national approach to critical caribou habitat.”

Approaches 3, 4, and 5: These three approaches should be amalgamated. This should be a high priority as *Approach 4* potentially intersects with jurisdictions beyond the Ontario Ministry of Natural Resources.

Approach 6: Endorsed.

Approaches 7 and 8: These two approaches should be amalgamated. The Panel is concerned that caribou conservation will not be optimized until the Natural Resources and Values Information System (NRVIS) database becomes more readily available to stakeholders and others. In principle, and unless there are tangible conservation or privacy impediments, the information should be liberally available. The NRVIS is currently unwieldy and often un-sharable. This system should change in general and not just with respect to caribou.

Approach 9: This approach should be deleted from the *Strategy* as it is not a good use of resources, given the difficulty of deciding which sighting information is reliable.

Approach 10: The MNR should use its cervid management framework to formally evaluate the management objectives and guidelines for moose, deer, and wolves as they relate to caribou.

Approach 11: This approach should be a high priority, especially regarding mortality to adult female caribou. The approach to this issue should be driven by results and should not be impeded by process difficulties in consultation.

Approaches 11–15: These five approaches are dealt with in detail in the Knowledge Gaps section of the Panel report. They should be dealt with in one approach addressing knowledge gaps.

Approach 16: Endorsed

Approach 17: This approach should be combined with Approach 1. Current northern land use planning is narrowly focussed in that it tends to cover resources and economic development only, sometimes considering only a single sector at a time. Caribou should be a major wildlife focus within a comprehensive land use planning approach as articulated in this report.

Approach 18: Cumulative effects are integral to land use planning and are central to the caribou problem. They are covered disparately in Approaches 1, 3, 17, 19, and so on. Therefore, the authors of the *Strategy* should integrate the management of cumulative effects into a comprehensive land use planning approach. Consider combining this approach with Approach 1 to make a stronger statement about the need for comprehensive planning strategies.

Approach 19: This approach should be a high priority but should be amalgamated under one broad land use planning approach (see Approach 1).

Approach 20: The approach about Regional Implementation Groups (RIGs) should be eliminated. Having a provincial technical committee instead of RIGs would not only reduce bureaucratic complexity but also avoid having RIGs tied to geographic management zones that cannot presently be adequately defined. A provincial technical committee should include non-MNR members. These members should be the most effective people for the work rather than the members of a stakeholder committee. Members should comment on caribou trends and monitoring. They should continually update and review, produce, and disseminate reports and be ready to comment on the implications of development activities concerning caribou recovery when the occasion arises.

Approach 21: Integrate with Approach 31.

Approach 22: Endorsed.

Approach 23: This approach should be combined with Approach 2.

Approach 24: This approach should have high priority.

Approach 25: This approach is inherently redundant (notably with Approach 21), so it should be subsumed under other approaches. Confusion concerning “range,” “range management,” and “habitat” should be resolved.

Approach 26: This is an untested hypothesis and a knowledge gap, so that this approach should be reframed as a question to be addressed in an adaptive management framework.

Approach 27: As this approach is addressed in other approaches (especially in Approaches 3, 16, 17, 18, 19, and 22), it should be deleted.

Approach 28: Endorsed.

Approach 29: This approach is part of adaptive planning and management and should be framed so as to require hypothesis testing.

Approach 30: This approach should be integrated into Approach 1.

Approach 31: This approach confuses demographic and genetic connectivity. Reword and combine with Approach 21.

Approach 32: This approach is a monitoring question. Delete and combine it with Approach 18.

Approach 33: Endorsed.

Approach 34: This approach should be combined with Approaches 12–15 (with respect to knowledge gaps).

Approach 35: Endorsed

Approach 36: Endorsed.

Approach 37: To avoid unproductive “spin,” the *Strategy* should include: (1) the development of objective indicators of progress and (2) clear, regular, and formalized communication on caribou status and recovery.

Approaches 38–41: Endorsed.

ⁱ Forest Management Class Environmental Assessment Approval (Declaration Order MNR-71) (2003). Order made under the *Environmental Assessment Act*, <http://www.mnr.gov.on.ca/en/Business/Forests/2ColumnSubPage/STEL02_179251.html> (retrieved 5 May 2008).