A STRATEGY TO HELP RESTORE MOOSE POPULATIONS IN BRITISH COLUMBIA

RECOMMENDATIONS

Prepared for the Ministry of Forests, Lands and Natural Resource Operations
Fish and Wildlife Branch

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FOREWORD

Many people in British Columbia know and care about moose. In the course of preparing these recommendations, practicality prevented me from connecting with all of them. However I was able to hear from nearly 300 people representing a wide cross-section of interests. In addition to receiving numerous emails and dozens of documents, I had the opportunity to participate in 30 teleconferences; 18 in-person meetings and two symposia. I heard from First Nations, wildlife user groups, industry stakeholders, members of the general public, and government staff from all of the regions moose inhabit.

I wish to express my thanks to all of the individuals who contributed to the discussions. Viewpoints were often expressed with passion, and always with a sincere interest in moose and wildlife generally. People shared their personal observations, perspectives on the state of moose populations, and ideas about what needs to be done. I particularly appreciated the constructive approach taken by nearly every participant in the dialogue. Uncertainty about the causes or solutions to population decline is almost universal, but there is a common sense that we need to do something.

My report does not include every comment or idea I received, but I have attempted to bring together the essence of all the input under a number of recommendations and implementation suggestions. In many circumstances, people's good ideas went beyond moose, and apply to enhancement of wildlife management generally. Where I have not captured those ideas in my recommendations on moose population management, I will summarize them separately for further consideration by the government.

A challenge in all of this is to remember that moose, despite their iconic and charismatic nature are but one of many values we hold in our wild landscapes. A strategy to restore and enhance moose populations can only succeed in the context of the choices we make about balancing and integrating those values – both in space and time.

Al Gorley

TABLE OF CONTENTS

INTRODUCTION

Moose are an icon of the Canadian landscape and are highly valued as a big game species to be seen, and to be hunted for food. Populations have declined significantly in the central interior regions of British Columbia during the last decade, and stakeholders are concerned in other areas as well. The recommendations in this report are aimed at helping restore the most seriously depleted populations and increasing moose numbers generally across the province.

The reason for lower numbers of moose is complicated and likely varies between regions. Even where surveys have not shown significant declines, First Nations and stakeholders frequently report fewer moose encounters than in the past. This is a threat to the food supply and economic well-being of some communities, and a serious concern to many British Columbians. There is uncertainty about the underlying causes, which are likely a combination of altered habitat, hunters and predators, and perhaps even climate change. Many people point to a need for the province to modernize the way it manages for wildlife, taking a more integrated, ecosystem-based approach. Although this report is focused on the immediate matter of moose, it could be a first step toward more holistic change.

The current approach to managing for moose is largely passive – a derivative of other management activities such as timber harvesting, energy development, or other industrial land uses. As a result, controlling hunting under the *Wildlife Act* is often the only tool directly available to wildlife managers – this is not proving to be enough. In fact, the province's ability to proactively manage for greater moose abundance is seriously constrained by some aspects of the legislation governing other resources. Public sentiment may also be a constraining factor, particularly where predator management is concerned. It will be necessary to make a conscious effort to ensure managing for moose is approached as a key aspect of integrated resource management at every stage. Several of the recommendations can be implemented under existing conditions. However to succeed, any sustainable effort to restore and maintain moose numbers will have to occur in conjunction with changes to public policy.

Wildlife is a public resource in British Columbia and must be understood in context with the full range of public interests in the land.

Not all change will occur easily or quickly, and the moose population response is not guaranteed – a dedicated, sustained effort will be required. Coordinated, collaborative leadership by the province and First Nations will be an essential component for success. This will have to be supported by teamwork and amongst stakeholders, better information, and a commitment to adequate resources.

The recommendations in this report complement and build on the Provincial Framework for Moose Management in British Columbia (2015).

STRATEGIC OVERVIEW

It will not be easy. Surveys tell us that significant declines in moose numbers during the last decade have occurred in the some regions of British Columbia, often corresponding with widespread habitat alteration caused by salvage harvesting of beetle-killed timber. Experts suggest that in time, salvage logging could benefit moose through increased forage production. In the short-term however the higher density of roads and cutblocks can increase hunting and predator pressure, and disadvantage moose.

Government estimates also show that provincially the licensed moose harvest has fallen from about 14,000 in the late 1980s to less than 6,000 in 2014, while hunter effort (average days hunted) has remained relatively constant. First Nations and stakeholders across the province are concerned about these trends, and have encouraged adoption of a moose population enhancement initiative. This report makes 21 recommendations that complement the provincial framework for moose management (2015), collectively providing a strategy to help restore the seriously depleted moose populations in some parts of the province, and enhance numbers elsewhere. The effectiveness of various methods will differ depending on local circumstances, and it will take some time to achieve results.

RECOMMENDED STRATEGY FRAMEWORK

Work with First Nations and stakeholders to:

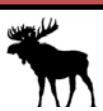
- Establish provincial and local objectives.
- Plan and implement restoration and enhancement projects.
- Communicate goals and accomplishments.

Employ a full range of scientifically sound approaches in alignment with objectives:	**Set implementation priorities for key areas:**	**Improve information concurrent with implementation:**
• Access management. • Predator management. • Licensed hunting. • First Nations hunting. • Compliance and enforcement. • Habitat protection. • Habitat recruitment. • Habitat enhancement.	• Focus incremental effort and investment where it is most likely to provide the greatest return.	• Inventories and monitoring. • Health and factors affecting population change. • Use of local observations and knowledge. • Habitat quality, quantity and distribution. • First Nations harvest numbers. • Reporting of mortality due to train and vehicle collisions.

FEEDBACK / ADAPTIVE MANAGEMENT

Improve integration of moose population objectives and management activities with other land uses.

Provide sustained effort and funding.



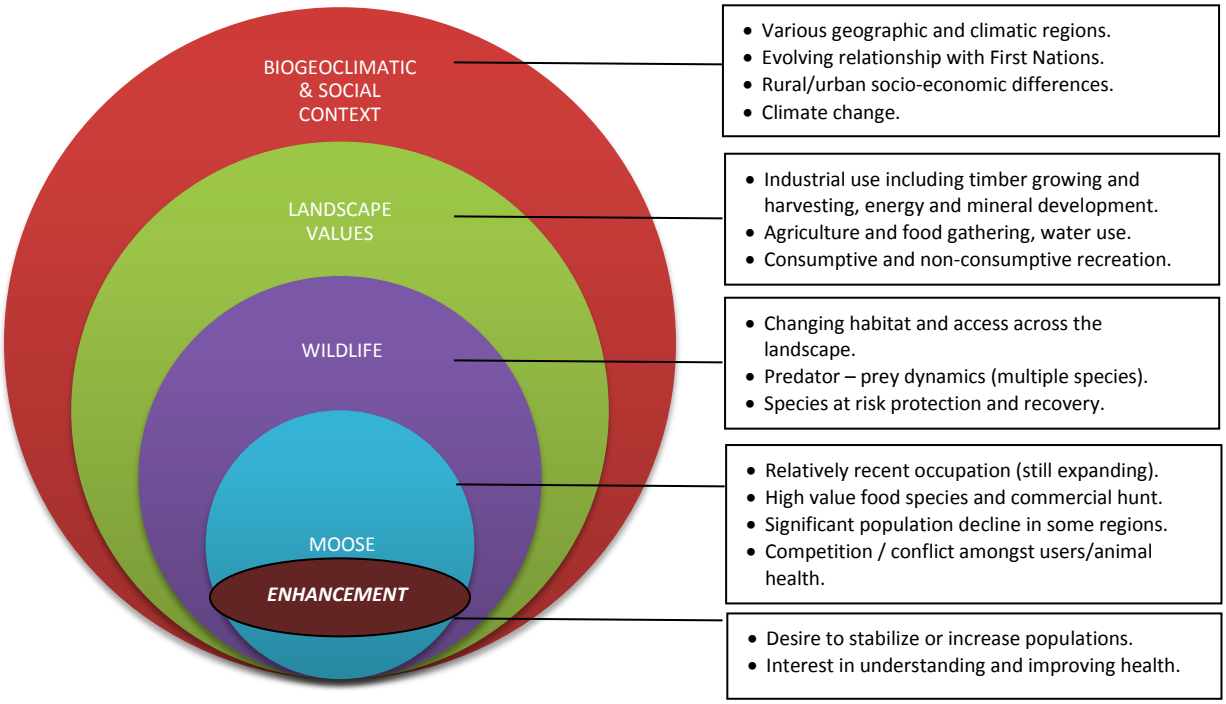
PART 1 – POLICY & OBJECTIVE SETTING

RECOMMENDATION:

1. **Adopt a clear overarching public policy goal that recognizes the importance of moose to British Columbians for their contribution to biological diversity, sustenance, cultural, recreation, and economic benefits.**

REASONS:

Moose do not exist in a vacuum, nor can a population enhancement strategy. The ecological conditions and processes in British Columbia are enough to create a high level of complexity, and when the social and economic dynamics are included; our attempts at management are even more challenging. While this should not dissuade British Columbians from managing for moose enhancement, success demands that we do our best to understand and work within this context.



Examples of the complexities of managing for moose abundance include changes happening with other species on the landscape. For example, biologists are concerned that high moose numbers in caribou recovery project areas could confound work to achieve a prey-predator balance. In other areas, in-migration of elk and whitetail deer present new challenges and opportunities for wildlife managers and users. It is important to recognize that temporal population fluctuations are normal for all species, while also being alert to the impacts of climate change, habitat alterations and other factors.

In most parts of British Columbia moose and other wildlife management occurs on multiple-use public lands. Timber harvesting, mining, oil and gas development, agriculture, water use, recreation, and other values must be managed concurrently. Land-use plans provide guidance but do not entirely resolve the competition between resource users, and some plans are outdated. The legislative regime for natural

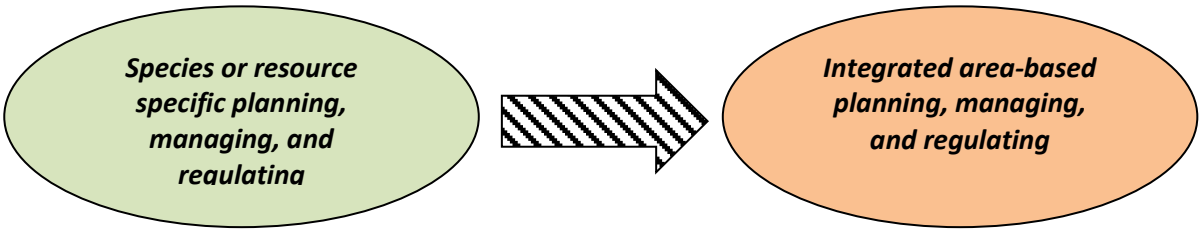
resource use tends to be activity-based, meaning that different uses of the same land fall under different legislation (e.g., timber, mineral, oil and gas, commercial recreation).

Also, the cross-jurisdictional nature of wildlife creates a challenge for management. The province has general responsibility and authority over resource management, but not over First Nations' wildlife use. This means that the province must work with First Nations governments to ensure their respective practices are complementary.

Stakeholders, particularly consumptive users of wildlife have traditionally played an important role in shaping provincial policy. Individuals and organizations demonstrate a high level of volunteerism and strong values in support of wildlife management and use. At times, the competition amongst user groups or between user groups and First Nations has risen to the point of conflict. In order to effectively enhance moose populations, governments and user groups can lead by focusing on a common purpose.

A clear public policy goal provides the compelling reason to restore depleted populations.

Several of these contextual issues can be addressed but reach well beyond a single species. In the meantime, formally acknowledging the importance of moose is an important step toward having it properly considered. The emerging provincial *Cumulative Effects Framework* identifies moose as a value important to British Columbians and sensitive to the combined effect of present, past and reasonably foreseeable actions or events.



The *Provincial Framework for Moose Management in BC* includes the following goal: ***"ensure moose are maintained as integral components of natural ecosystems throughout their range, and maintain sustainable populations that meet the needs of First Nations, licensed hunters, and the guiding industry in BC."*** Two supporting objectives are to *"**ensure opportunities for consumptive use of moose are sustainable**"* and *"**maintain a diversity of hunting opportunities for moose**"*. For this or a similar moose population goal to succeed in a multiple-resource management environment, it must be given weight, initially as a clear statement of government intent, followed by legislative reinforcement.

Confirming and communicating a clear overarching public policy goal for moose enhancement within this context sets the scene for more specific objectives, strategies, and actions at a regional or local level.

IMPLEMENTATION:

i. Confirm and communicate the above language from the provincial framework as a "working policy objective" to guide initial implementation of a population restoration and enhancement strategy.

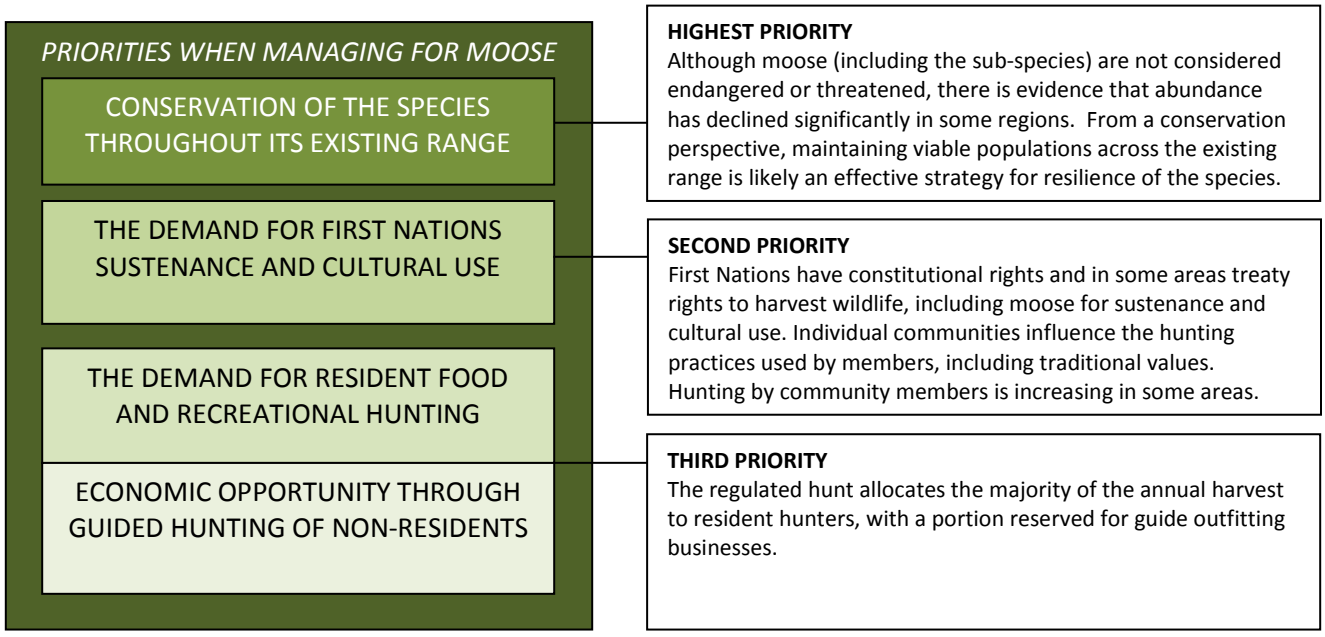
ii. Through collaborative dialogue with First Nations and stakeholders, refine and formalize the policy objective as necessary.
iii. Utilize the "management triggers" mechanism in the cumulative effects framework to help achieve population objectives by recognizing them in industrial permitting decisions.
iv. Confirm a practice of "area based" management, as differentiated from "activity based" management – integrating moose population objectives with other values and activities on the land.
v. Incorporate the objective for moose into the service plans of applicable government ministries and into the province's regulatory framework.

RECOMMENDATION:

2. **Confirm the present guidance on harvest priorities as the hierarchy to inform operational objective setting and management.**

REASONS:

The existing guidance to decision makers responsible for regulating hunting is to place the highest priority on conservation, followed by the right of First Nations to hunt. Hunting done under the *Wildlife Act* may then occur and is split (allocated) between resident hunters and guide outfitters.



This approach is well established and broadly accepted by British Columbians. Extending its application to guide moose population management provides a sound and clear basis for decisions about public investment priorities and objectives. Although there is likely no region where the moose population is low enough to be formally classified as a conservation concern, there are specific areas where First Nations report extremely low encounter rates and are concerned that the species will be lost from the local landscape.

As hunting success by residents has declined in some areas like the Cariboo and Omineca, the demand appears to have shifted north toward the Peace Region and into parts of the Skeena. This creates new pressures in those areas. Also, First Nations community members and some resident hunters are less able to be mobile, and guide outfitters are confined to the area of their licence. This suggests that there is a strong interest to satisfy all three priority levels on a regional or even a sub-regional basis. This is a primary rationale for restoring and enhancing moose populations.

IMPLEMENTATION:

i. Adopt the hierarchy as a framework and apply it provincially for prioritizing and investing in proactive management for greater abundance of moose.

RECOMMENDATION:

3. Establish a sound process for setting population management objectives.

REASONS:

Objectives provide clarity to managers and the public – they describe what we expect to achieve. They also provide the framework for management choices, resource allocation, and accountability.

Setting sound, measurable objectives for moose population management is challenging – it depends on limiting physical factors such as habitat, and societal expectations. But "it depends" is not good enough. Ultimately, this is not just a technical decision. It must be based on sound science and must also accommodate uncertainty and subjective elements. Such determinations about public resources require the rigor of clear and transparent criteria, combined with the reasonable exercise of discretion – they should not be arbitrary, nor can they be a simple calculation.

As guidance to setting harvest levels, the government's *Moose Harvest Management Procedure* provides the following default objective: "…*to maintain post-hunt numbers for each population management unit (PMU) at or near current levels*" and "*to maintain post-hunt adult sex ratios*". If achieved this would maintain current populations however it may not be enough to guide a proactive population restoration initiative.

Setting a fixed numerical target for an area is appealing for its apparent simplicity, but may be difficult to do credibly. Uncertainty about the causes of population declines and about the feasibility and efficacy of some responses makes attainability of a specific target highly uncertain. The answer appears to be in adopting a set of objectives that express quantitative and qualitative expectations; are specific enough to drive management actions; and can be objectively evaluated and adjusted periodically.

For example, work is being done in the Peace-Liard Region to set more region-specific objectives that focus on managing for a set of conditions consistent with the provincial goal and objectives: "provide for a diversity of habitat…" At a sub-regional level minimum population density (xx moose/km2) is being considered in combination with minimum bull/cow ratios. These "targets" would then be supported with specific management activity objectives for habitat enhancement, reduction of incidental mortality, increased compliance, etc.

The Omineca Region is examining a suite of possible objectives that would also combine quantitative targets (e.g., increase moose numbers to at least the number alive in 2005) with qualitative (e.g., achieve a high quality hunting experience). A number of management options were assessed for

their likelihood to achieve the objectives, leading to suggested direction for management. While on-going, this work provides the elements for a sound objective setting process that could be applied to areas selected for high priority population restoration activities. In order to support effective priority setting, resource allocation and evaluation, some consistency should apply. A guideline for objective setting would include: who is authorized and accountable to set an objective; what that person(s) must consider; and what authority the objective carries.

IMPLEMENTATION:

i. Decide who is authorized and accountable to set objectives for moose population restoration and enhancement.
ii. Determine the key considerations for setting objectives. For example:
    - The appropriate scale;
    - The capacity of habitat now and for the foreseeable future;
    - The current population and the history of changes;
    - The interests expressed by First Nations;
    - Other resource management objectives and activities;
    - Current and expected hunting demand;
    - The feasibility of options and alternative management scenarios;
    - Uncertainty and risk;
    - The management practices to be employed; and
    - Direction from the minister if provided;
iii. Utilize a blend of qualitative and quantitative targets to make objectives specific.
iv. Reevaluate objectives regularly (annually if necessary to deal with uncertainty) and adjust to accommodate the results of management, new information, or other changed circumstances.

RECOMMENDATION:

4. Make moose population enhancement objectives applicable to all industries.

REASONS:

Although many of the activities discussed in subsequent sections about habitat and access deal with the forest sector and the *Forest and Range Practices Act*, other industries can also have a significant impact. Despite being regulated through other legislative regimes and sometimes other government ministries (e.g., the *Oil and Gas Activities Act*), all sectors can affect moose, and therefore all authorizations should include conditions to avoid or mitigate the negative consequences of development – preferably in the design and development stage.

Some stakeholders suggested compensation funds, such as the BC Hydro model as a means to pay for replacement and enhancement of habitat. Work done on planned natural gas projects has also included provisions for mitigation and enhancement of moose populations.

IMPLEMENTATION:

i. Communicate moose enhancement objectives as government-wide policy and require all authorizing agencies to incorporate them into project review, assessment and authorization processes.

PART 2 – MANAGEMENT TOOLS

The application of wildlife management tools (levers) involves a variety of statutes, policies, organizations, and stakeholders, some of which are outside the direct jurisdiction of wildlife managers. Some measures are also controversial, with strongly held and diverging public opinions. As a result, controlling hunting and access under the *Wildlife Act* are often the default measures. Unfortunately this is not proving to be sufficient and use of the other levers will need to be brought into play in order to proactively restore and enhance moose populations.

The Provincial Framework for Moose Management in British Columbia states: "*Science has shown that predator management, habitat enhancement and protection, other forms of access management (e.g., road deactivation) and First Nations harvest are also important management levers that can influence moose populations, and in many cases may have a much greater impact than hunting regulation changes*". To achieve this it will be necessary to make a conscious effort to ensure managing for moose is approached as a key aspect of integrated resource management (IRM) at every stage, and that managers have access to the tools they need. Moose population response to use of some of the tools discussed in this section may be fairly quick (e.g., access control or predator management) whereas others such as habitat management may ultimately be more important but the results could take longer. Each region and Game Management Zone (GMZ) or Population Management Unit (PMU) is unique, so the mix of tools chosen should also vary.

It will be necessary to make a conscious effort to ensure managing for moose is approached as a key aspect of integrated resource management (IRM) at every stage.

RECOMMENDATION:

5. **Develop and adopt coordinated access management practices.**

REASONS:

First Nations and stakeholders frequently cite the impact of human and predator use of road access as significant factors in moose mortality. Many feel that adequately controlling access could have the single greatest positive impact on moose populations.

The methods by which people access the landscape, and the amount of roads and trails has changed significantly over the past two decades. The rapid development of logging roads for salvage harvest in the central and parts of the southern interior has certainly increased access, as has oil and gas development in the northeast, and to some extent mineral exploration and development in the northwest and elsewhere. Concurrently the growing use of all-terrain vehicles makes access control more challenging.

Access needs to be looked at from the perspective of cumulative effects – roads accumulate on the landscape over time, and even "temporary" roads can take many years to fully revegetate, especially in drier climates with poor soil. This allows humans and predators to be more mobile, while moose have fewer places to hide or escape. In some areas, especially on the interior plateau, a proliferation of interconnected networks and "loop roads" increase the efficiency of road hunting and make enforcement more challenging.

Many stakeholders and some ministry staff indicated that proactive road access management has fallen off in recent years, both from the point of view of coordinated planning and development, and the practice of road deactivation and rehabilitation. The implementation of the *Forest and Range Practices Act* placed most decisions about forestry access in the hands of licensees and the professionals who work for them. Although they are most often in full compliance with their legal and contractual requirements, it is only logical that they would adopt the least-cost approach within that framework. While exceptions may exist, this has generally led to an accelerated amount of moose range accessible by vehicles, and is undoubtedly a factor in the decline of some populations.

The government should be prepared to fully utilize the flexibility in existing regulations and where necessary change them to enable access management that supports achievement of moose abundance objectives.

In some cases, forest licensees have worked with First Nations to close roads and manage access. In others, licensees have reported that voluntarily closing roads has resulted in a negative response from some stakeholders and they would prefer government sanctioned closures.

The coordinated approach to access management will consider all types of access, but for the most part will focus on: pre-existing legacy roads; roads presently used for industrial purposes; and future development. The methods of management may cover a spectrum, for example:

- Maximum road density allowances;
- Design and construction standards;
- Regulatory restrictions (e.g., under the *Wildlife Act)*;
- Physical closures such as gates or bridge removal;
- Deactivation; or
- Site rehabilitation.

Similar to the discussion about regulating habitat protection and recruitment (recommendations 10 and 11) the government should be prepared to fully utilize the flexibility in existing regulations and where necessary change them to enable access management that supports achievement of moose abundance objectives.

IMPLEMENTATION:

i. Become more proactive in planning and coordinating access management jointly with industries, First Nations, and stakeholders, including the use of voluntary physical closure measures.
ii. Continue to use regulated (*Wildlife* Act) controls and enforce them.
iii. Identify the need to address access management in expectations for Forest Stewardship Plan replacement and any other new industrial development.
iv. If necessary make legal orders requiring and enabling access control.
    - Maximum road density.
    - Deactivation of on-block roads.
v. Provide guidance to professionals responsible for planning access regarding their responsibility to apply best practices for integrated management.
vi. Where other avenues are not available and access control is important to achievement of enhancement objectives, the government should take direct action to physically close roads.

RECOMMENDATION:

6. **Incorporate proactive predator management into moose restoration and enhancement projects where necessary and appropriate to meet objectives.**

REASONS:

Inter-species relationships can be complex and dynamic, and in the absence of human intervention find a natural balance, often cyclical. Almost without exception First Nations and stakeholders report that they have observed an increase in predators concurrent with a decline in the number of moose. Wolves are most commonly cited but black bears and grizzly bears have also been blamed for increased predation, particularly on calf moose in some regions. Although there is not data on predators for much of the province, preliminary results from the province's research into potential factors causing population change show predators as responsible for about 45% of cow moose mortality. Biologists tend to agree that this number is not outside of what they would normally expect, and have noted that up to 80% of mortality might be from predators in a natural predator/prey system.

There is not a consensus on how to manage the moose-predator balance, but there is widespread recognition amongst user groups that hunters are competing with wolves and bears for moose. There is presently no targeted or structured approach to managing the moose-predator balance in British Columbia. Predators are hunted or trapped in their own right, but both these activities appear to be declining, perhaps in part due to the influence of public sentiment.

Many stakeholders have made suggestions for predator management practices: enforce full utilization of traplines; pay a subsidy to trappers; reintroduce a bounty; encourage more hunting; and reduce or eliminate bag limits, for example. Others have expressed a concern that these measures constitute an ad-hoc approach that could have unintended consequences – splitting a wolf pack and worsening the situation was often cited. The link between predators' hunting efficiency and access was widely identified as a concern – linear corridors create a disadvantage for moose, allowing predators to move more quickly.

Some First Nations have indicated that they have a tradition of predator management and would be willing to undertake programs aimed at increasing moose numbers. Others would not participate for cultural reasons, but may not object to others doing it.

The management imperative is that meeting the public-policy-supported demand for harvesting moose in any consistent fashion requires relatively robust and stable populations. This may mean taking the "peaks and valleys" out of prey-predator population cycles. It may also mean attempting to move from a relatively stable but low moose population to stability of a larger population.

One example of multi-species management is found in areas targeted for population recovery, where the province is taking measures to reduce wolves and moose in order to tip the balance in favor of caribou. The long-term success of this approach is not yet known. There are also some wolf reduction programs aimed at protecting livestock that may benefit moose as well. Historical experience in British Columbia suggests that reducing predator numbers will lead to increased moose numbers, all other things being equal. Work in other jurisdictions suggests that any approach should be carefully planned, monitored and long term.

IMPLEMENTATION:

i. Clarify or adjust provincial policies to allow predator population management to take place where:
   - A moose population restoration project area has been designated or moose population enhancement objectives have been otherwise established;
   - There is agreement with First Nations;
   - Predator population management is part of a broader package of moose population enhancement strategies for the area (e.g., adjusted hunting; habitat, access, etc.);
   - The measures taken are scientifically appropriate and technically sound; and
   - Effectiveness can be measured.

ii. Where a First Nation is willing and able to take a lead role in implementation of an agreed-upon predator harvest in order to help achieve moose population enhancement objectives, provide adequate support.

iii. Where necessary to achieve objectives and feasible, the province should implement the program, as has been done for caribou recovery.

iv. At a local level, include livestock producers and trappers in planning and implementation to exploit possible synergies.

RECOMMENDATION:

7. Ensure decisions about management of moose hunting are consistent with population enhancement objectives and are transparent.

REASONS:

Hunting, except that done by First Nations People, is regulated by the *Wildlife Act* and regulations. A synopsis of the regulations is published every second year to inform hunters about current requirements, including changes from the previous year. The Big Game Harvest Management procedure (2010) describes its purpose as: "to establish a transparent and consistent method by which regional staff will develop, maintain and modify big game hunting regulations to meet management objectives". The procedure goes on to describe how management objectives are to be set and how regulations will be developed and reviewed. A review is to take place at least once every five years. The procedures provide for provincial and regional advisory committees, through which stakeholders provide input to the regulations. It also recognizes the need for consultation with First Nations.

There are many strongly held views about how to regulate licensed hunters and guide outfitters. Some feel their views are heard and incorporated into decisions by the province, others do not. Many spoke of "not knowing" what is happening to the moose population or how to address it through the regulations. Others spoke of "not knowing" why certain decision are made that to them, are counter-intuitive. In areas where moose populations have recently declined significantly questions arise as to whether the provincial priorities (as described in Recommendation 2) are actually reflected in the Annual Allowable Harvest (AAH). Some First Nations talked about the concept of creating "community hunting areas" through regulation. The purpose would be to close certain areas to licensed hunting in order to increase the encounter rate for the First Nations' members, and thereby ensure the priorities are reflected.

"to establish a transparent and consistent method by which regional staff will develop, maintain and modify big game hunting regulations to meet management objectives"

According to the Big Game Harvest Management procedure and the Moose Harvest Management procedure, the AAH will be set to be compatible with achieving management objectives. Unless alternate objectives have been identified, the primary population management objective for big game populations will be to maintain post-hunt numbers for each population management unit (PMU) at or near "current" levels. Regional section heads may recommend to the wildlife manager that the harvest be managed for a higher or lower population based on the advice regional staff in consultation with the appropriate provincial species specialist. A secondary objective for moose is to maintain post-hunt adult sex ratios. Regions employ a variety of harvest strategies in combination (e.g., constant effort, age and sex restrictions, antler point restrictions, etc.). Implementation practices vary somewhat between regions, and it is not always clear why, nor how well, they are coordinated.

Over time the regulations have been used to address area-specific concerns, pressures and opportunities, sometimes resulting in a confusing array of requirements across the landscape. This can cause problems for compliance and enforcement, and call decisions into question – what are we trying to accomplish? Some people pointed to a need to harmonize or rationalize rules in adjacent management units. This includes restrictions on the use of all-terrain vehicles (mentioned particularly in comparison to Alberta). While neither First Nations nor stakeholders would likely support a "one size fits all" approach to regulation, there is a need to ensure the right balance between consistency and flexibility, particularly when implementing a proactive strategy to enhance moose populations.

In designated population restoration areas, the AAH will have to reflect the project objectives and current conditions if harvest management is to play a meaningful and replicable role. This includes a higher level of confidence in actual population numbers and trends (as discussed in Part 4) at the project area scale.

IMPLEMENTATION:

i. In population restoration or enhancement areas ensure the AAH clearly supports achievement of the project objectives.
   - If necessary establish a new AAH at the start of the project. If information is poor or outdated, take a conservative approach.
   - Where necessary to achieve objectives, support measures to temporarily reduce or curtail harvest in all or portions of an area, consistent with the hierarchy of interests described under Recommendation 2. Inform stakeholders well in advance of such decisions.
   - Revisit and revise the AAH and harvest strategies as new monitoring information becomes available.

ii. Through the provincial coordinating team (Recommendation 13) ensure there is a high level of consistency and transparency in the setting and monitoring of the AAH and harvest strategies in project areas.
   - If necessary consolidate the decision responsibility.
   - Any differences in harvest strategies should be part of the project design, and the results closely monitored to support adaptive management.

iii. Generally for the province, review implementation of the Moose Harvest Management Procedure and ensure decision making is reasonably consistent across all regions, defensible, and supportive of population objectives.

iv. Ensure that implementation of regional moose management action plans (per the Provincial Framework for Moose Management in British Columbia – 2015) are consistent with a strategy and objectives for population restoration and enhancement.

v. As changes occur, look for opportunities to harmonize practices and restrictions in adjacent management units, particularly those with common access.
vi. Require a publicly available written rationale for AAH and harvest strategy decisions (see also implementation advice under Recommendation 16).

RECOMMENDATION:

8. Support First Nations' harvest management initiatives.

REASONS:

First Nations communities self-manage their moose harvest to varying degrees. Depending on the individual community, the season of harvest, age and gender selection may be guided by family tradition, informal community guidelines, or more formal community policies. Enforcement is usually through community persuasion and influence, with some First Nations having more structured processes.

Some First Nations expressed frustration at the inability to deal with non-conforming members or individuals from outside their own community. They also acknowledged that some hunters are becoming less discriminating in what moose they harvest because of scarcity and the need for sustenance. For example they may shoot a cow moose despite it being contrary to traditional practice. This potentially compounds population declines.

For many of the reasons discussed under Recommendation 18, it is important that First Nations take an active role in any effort to increase the moose population. In a sense, two government jurisdictions (the province and the First Nation) have responsibility for the same moose. In order for collaborative management to succeed some harmonization of controls is needed, and both partners require the authority, capacity, and procedural tools to do their part. Approaches will vary according to local circumstances – inside and outside treaty areas for example, or based on joint stewardship or collaboration agreements.

There are examples of the Conservation Officer Service working at the invitation of First Nations to enforce community hunting laws, and several First Nations are developing guardian programs to encourage compliance. Examples need not come just from areas with moose – the hunt for elk on central Vancouver Island is tightly regulated in parallel for First Nations and non-aboriginal hunters.

Recommendations 13 and 18 speak to the importance of First Nations involvement and information in population enhancement projects. Without this, efforts will be severely handicapped.

IMPLEMENTATION:

i. Actively support information sharing about successful models across all regions.
ii. Incorporate First Nations management commitments into jointly developed project charters and procedures.
iii. Where necessary to achieve objectives, support measures to temporarily reduce or curtail harvest consistent with the hierarchy of interests described under recommendation 2.
iv. Continue and increase cooperative compliance and enforcement arrangements supported by:
    - Additional conservation officer capacity.
    - Additional guardian program capacity.
    - Cross-training and mutual support agreements.

v. Prioritize resources to achieve identified moose population restoration and enhancement objectives.

RECOMMENDATION:

9. Utilize compliance and enforcement as a strategic tool to achieve moose population enhancement objectives.

REASONS:

It is unlikely that non-compliance is the cause of population declines however it may be a contributing factor in some areas, and offers an opportunity to complement population enhancement activities.

Many stakeholders believe that there is a high level of voluntary compliance with regulations amongst resident hunters and guides. However this view was not universal and the fact is that in some cases we just don't know for sure. For example, doubts exist in areas where large numbers of resident hunters converge on an area for a short period and in areas where recent timber salvage operations have left extensive road networks with few control points.

A relatively small number of conservation officers serve a very large area, and over the last few years the emphasis of their work has expanded and shifted. Dealing with complaints and human-wildlife conflicts have become nearly all-consuming in some areas, leaving little time for proactive "boots on the ground" activities. The Report All Poachers and Polluters (RAPP) program provides a mechanism for the public to support enforcement staff by reporting suspected violations.

Formal enforcement is a specialized activity requiring a high level of training and should not be assigned lightly. However other staff and volunteers can play a role to support enforcement activities and to proactively encourage compliance. The mere presence of identifiable compliance staff in the field can serve not only as a deterrent to unauthorized activity, but creates an opportunity to inform and educate the public. Field presence and information gathering may also be enhanced by the use of aerial reconnaissance, or perhaps even through new technology such as drones if used prudently.

IMPLEMENTATION:

i. Continue to use the biennial Regulations Synopsis, and through signage and web sites, inform hunters of the objectives for moose population enhancement and the reasons for measures taken.
ii. In conjunction with other measures such as access restrictions, increase the number of conservation officers available to carry out proactive compliance and enforcement activities in population restoration and enhancement project areas (also see Recommendation 8).
iii. Utilize natural resource officers to supplement compliance and education activities in the field.
iv. Look for opportunities to share compliance resources with First Nations, including cross-training and synergies with wildlife guardian programs.

RECOMMENDATION:

10. Protect existing habitat necessary for achievement of population objectives.

REASONS:

Subject to discussions under Recommendation 12 there is little to be done about legacy impacts on habitat by industrial development or other causes. However, on landscapes where development is continuing, or is projected to occur soon, there is the opportunity to protect habitat needed to achieve moose population objectives.

Under the *Forest Planning and Practices Regulation* which applies to most forestry operations, the government has set a legal objective for wildlife:

> *7(1) The objective set by government for wildlife is, without unduly reducing the supply of timber from British Columbia's forests, to conserve sufficient wildlife habitat in terms of amount of area, distribution of areas and attributes of those areas for (emphasis added)*
>
> *a) The survival of species at risk,*
> *b) The survival of regionally important wildlife, and*
> *c) The winter survival of ungulate species.*

On landscapes that have experienced salvage logging, a concern now is that remaining areas of green timber will be liquidated to keep mills running. While the value of the remaining green timber is enhanced due to scarcity, so is its value as habitat – for the same reason. Therefore hard choices will have to be made, and trade-offs will occur. That is why it is important to identify the landscapes on which moose population management will take a high priority, and then ensure it is factored into resource management decisions.

One current opportunity to influence habitat protection is through the replacement of Forest Stewardship Plans (FSPs). Over the next two years, nearly every FSP in British Columbia will be replaced. Although it cannot legally be required, district managers could express an expectation to licensees that they commit to protection of habitat necessary to meet moose population enhancement objectives. Further, if critical habitats can be identified (e.g., under Recommendation 17) then the Government may make a legal order for protection under the *Government Actions Regulation* however it is unclear how much flexibility exists to support objectives to increased abundance (as compared to ensure survival).

While the value of the remaining green timber is enhanced due to scarcity, so is its value as habitat – for the same reason.

Another, more general opportunity is through the timber supply review process. As is already occurring in some areas, modeling and quantifying habitat requirements can provide important input to a determination of allowable timber harvest – the chief forester must consider "constraints" for purposes other than timber production, and the economic and social objectives for the area as expressed by the minister.

It is fully recognized that additional constraints on an already diminished mid-term timber supply could have implications for the timber sector. However it entirely possible that small strategically placed choices to protect wetland and riparian buffers and maintain connectivity corridors could, when combined with other measures generate a large benefit for moose with a publicly acceptable impact on timber supply. An effort must be made to do this.

In the short term the government will have to fully utilize the legal tools it has. In the longer term, for reasons beyond just moose, the law will have to change.

IMPLEMENTATION:

i. Where habitat critical to the achievement of moose population objectives may be subject to loss through other resource uses, require proponents to describe how they will minimize or mitigate the impact, and make implementation a condition of development.
ii. In advance of FSP replacement, inform forest licensees that they will be expected to address habitat protection requirements that support moose population management objectives. If this voluntary approach is unsuccessful, create the power to make it a legal requirement.
iii. In designated project areas, make legal orders to protect sufficient habitat to meet population objectives. Make full use of the provisions of the *Government Actions Regulation* where necessary to require protection of important habitat.
iv. If the objective for wildlife under the *Forest Planning and Practices Regulation* prevents requiring protection of habitat to achieve moose abundance objectives, then amend the regulation.
v. In providing advice to the chief forester on allowable annual cut decisions, provide quantifiable information and modeling about the amount and type of habitat necessary to meet moose population objectives.
vi. The minister, in expressing the economic and social objectives of the government to the chief forester, should refer to the need to meet integrated resource management objectives, including those for moose population.
vii. Where BC Timber Sales is operating in moose population enhancement areas, the government can and should show leadership in harmonizing timber and moose management objectives.

RECOMMENDATION:

11. Harmonize silviculture practices with moose population management objectives.

REASONS:

Fire and timber harvesting create opportunities to recruit moose habitat. The law requires forest licensees to establish a new stand of commercially viable trees after logging. Licensees carry liability until the trees are "free to grow" – meaning that they have outgrown competing vegetation and are likely to make a commercial crop without further intervention. Many stakeholders raised concerns about the practices followed to establish new timber crops. In particular, the tendency to fully occupy a harvested site with commercial timber species (e.g., pine) at a density that quickly shades out the deciduous browse species. In some cases this involves the application of herbicides to deter vegetation that competes with commercial tree species, and may reduce the biodiversity of the site.

The province sets standards that licensees must achieve. Where these standards are in conflict with management objectives for moose, flexibility is required to reconcile requirements. At a landscape or strategic level, clear balanced objectives are required for both timber and moose. At a site (e.g., cutblock) level, practices should be aimed at achieving the balanced landscape objectives.

Although timber harvesting is the more predictable disturbance on many landscapes, wildfire and insect infestations can also be significant. The government's response to these should also incorporate wildlife (moose) objectives. The spruce beetle outbreak in the Omineca Region is a current example of where this is necessary.

The province has silviculture strategies for most areas, and is continually refining or updating them. Habitat objectives can be incorporated into those strategies and then monitoring can ensure they are implemented.

IMPLEMENTATION:

i. Treat natural disturbances such as wildfire and beetle-kill, as well as salvage logging, as an opportunity to recruit habitat, and manage accordingly.
ii. Review and update applicable silviculture strategies to enable habitat recruitment where needed – place a high priority on population restoration project areas.
iii. Where requirements for achievement of "free to grow" are incompatible with habitat recruitment needed to meet moose objectives, amend them.
iv. Provide guidance to professionals responsible for planning timber harvesting and silviculture regarding their responsibility to accommodate habitat objectives.

RECOMMENDATION:

12. Undertake targeted habitat enhancement opportunities where it supports achievement of moose population objectives.

REASONS:

Although most of the opportunity for habitat management is incidental to other disturbances, in some areas there will be opportunity to proactively prescribe treatments. Due to cost and logistics these opportunities may be limited to small high-value habitats in some parts of the province (e.g., a particular wetland or wintering area). In other areas, particularly the north, prescribed fire has been used for habitat enhancement on a larger scale with some success. The province currently allocates a portion of the funds raised through hunting licences to the Habitat Conservation Trust Foundation to support these activities, and recently announced an additional allocation.

Many stakeholders supported the idea of letting wildfires burn where they will improve habitat without undue cost or risk to other values. This is consistent with recent changes to wildfire management in the province. Many also felt the decline in prescribed burning following logging has been a lost opportunity for habitat enhancement. The liability associated with prescribed fire is most often cited by the industry as the reason for this trend.

Earlier this year the province established the Forest Enhancement Society to fund projects aimed at mitigating the risk of damaging wildfires. Incorporating habitat management into fire management projects has been specifically recognized in the Society's mandate and provides another potential avenue to support moose abundance objectives.

IMPLEMENTATION:

i. Identify opportunities for moose habitat enhancement to meet population objectives and encourage the Habitat Conservation Trust Foundation to place a high priority on funding for these areas.
ii. Encourage the Forest Enhancement Society to place a high priority on projects that include benefits to moose habitat, particularly in population enhancement project areas.
iii. Incorporate moose habitat requirements into fire management plans as they are updated and refined.

iv. Examine the opportunities to reintroduce prescribed fire as a post logging treatment where it would benefit moose habitat, including addressing the liability concern (e.g., the province limit or accept a proportional share of the liability).

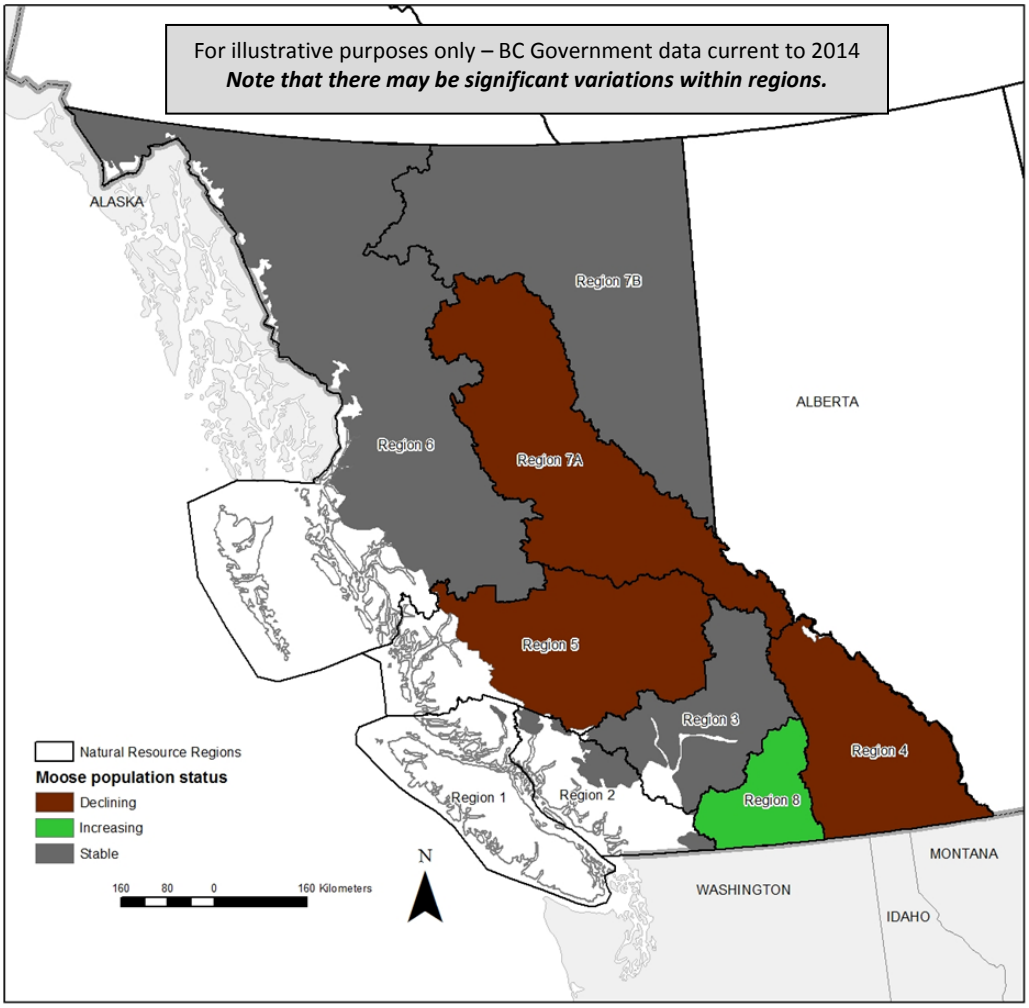
PART 3 – INVESTMENT PRIORITIES

RECOMMENDATION:

13. **Focus incremental effort and investment to apply management tools where they are most likely to provide the greatest return.**

REASONS:

Except for a few areas on the coast, moose populate most of the province to some degree. Even if there was a desire to increase abundance everywhere, the circumstances and opportunities for success are variable. For example the map below shows the estimated population trend by region in 2014 (based on BC government information). The trends may vary at a sub-regional level.



The public policy objective (Recommendation 1) is intended to be provincial in scope. Therefore many activities that contribute to restoring, maintaining or increasing abundance are applicable in all regions inhabited by moose. In fact, this is already occurring at some level as managers attempt to improve information, better estimate the unregulated mortality, and structure the licensed hunt.

Success may depend largely on effective cooperation between the province and First Nations. The province is responsible for stewardship of natural resources, including wildlife, and has jurisdiction to regulate most land-based activities. The province does not have power to regulate hunting by First Nations, each of whom have a unique approach to stewardship and self-regulation. Evolving government-to-government relationships typically include approaches to harmonizing wildlife management and harvest practices. Any significant investment aimed at increasing moose populations will have a greater chance at success if undertaken in partnership with the First Nation(s) in whose traditional territory it is planned.

Partnerships between the province and First Nations will be a key to success.

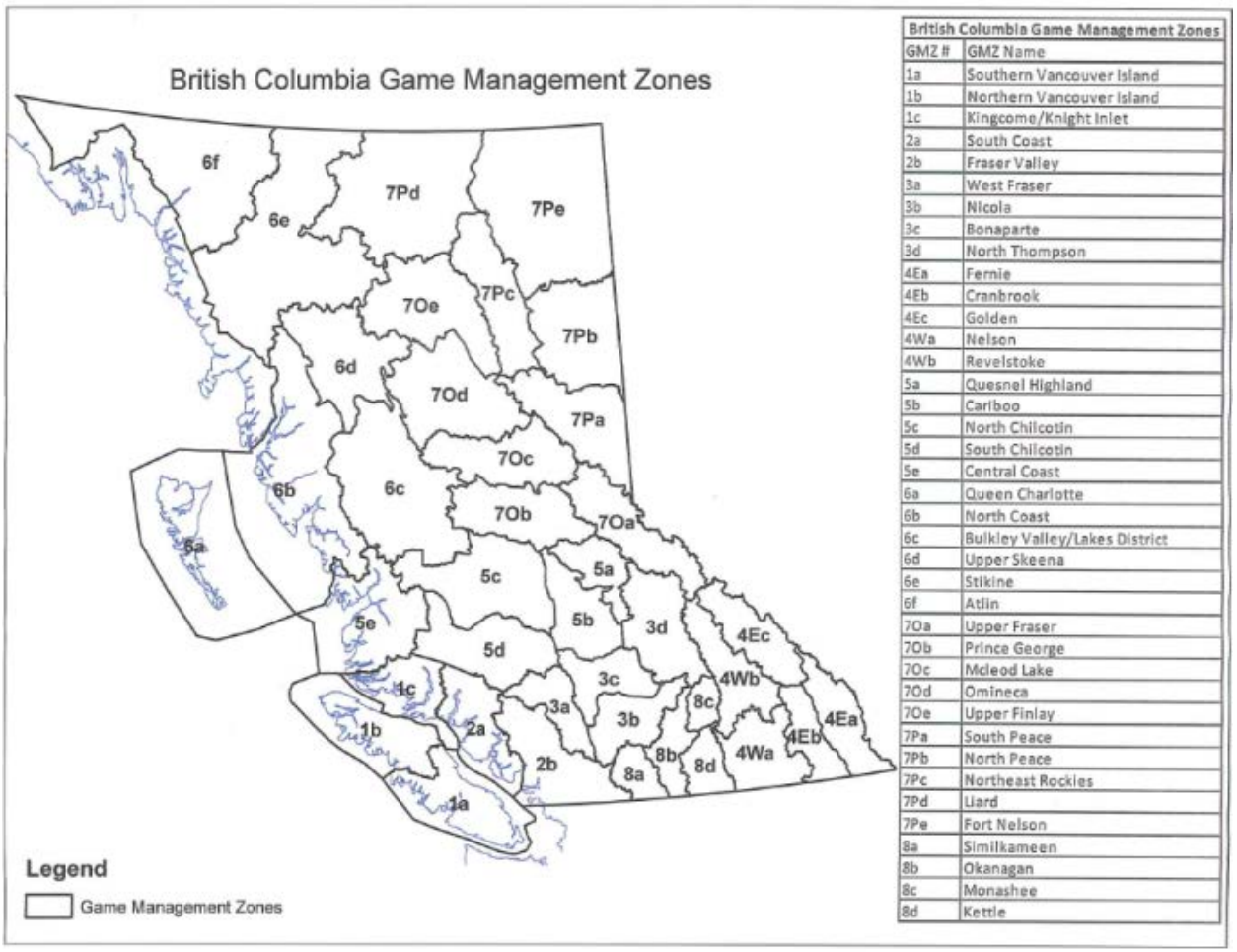
Also, some of the challenges related to managing for moose are not so much about abundance, but arise from circumstances such as: changing distribution across the landscape; competition amongst hunter groups; changes to the hunting experience; lack of confidence in information; or perceived mismanagement. It is important to address those concerns where they arise. The *Provincial Framework for Moose Management in BC* proposes "regional moose action plans" to guide management, and some regions have or are developing these. However many of the potential "management levers" identified in the framework are challenging to implement, either for social or economic reasons, or because it will take some time for policy changes. Therefore the use of some levers should be focused primarily on the areas where they are most needed – at least for the first few years.

Maximizing moose populations provincially may not meet regional needs – a balance is required.

It is important to set clear criteria for prioritizing public investments. If the objective is to maximize return on investment at a provincial level (i.e., as measured by total moose population) then any new resources would likely be directed to areas where the greatest population increase could be achieved with the least effort – not necessarily where populations have declined the most. However that approach is inconsistent with the views of many First Nations and stakeholders who see the need to achieve provincial objectives at a regional level. In other words, using the objectives stated in the framework, *"ensure opportunities for consumptive use of moose are sustainable"* and *"maintain a diversity of hunting opportunities for moose"* apply at a regional or sub-regional level as well as province-wide. The practical solution is a balanced approach, whereby some resources are allocated to reverse further loss (most need - restore), while some are aimed at incremental opportunity (best gain - enhance).

Finding the balance requires recognizing that some demand for moose is transient and can be satisfied almost anywhere in the province, but some is not. Also some of the demand for moose may be relatively soft, where alternatives (options for substitution) exist and much harder where they do not.

This leads to suggesting that new investment be targeted first in areas where there is an opportunity to mitigate and reverse significant population declines. As success is achieved and appears sustainable (e.g., 3-5 years) resources may be shifted to optimize provincial opportunities. The most suitable scales for management of restoration projects are likely the existing Population Management Units (PMU) or Game Management Zones (GMZ) individually or grouped.



British Columbia Game Management Zones	
GMZ #	GMZ Name
1a	Southern Vancouver Island
1b	Northern Vancouver Island
1c	Kingcome/Knight Inlet
2a	South Coast
2b	Fraser Valley
3a	West Fraser
3b	Nicola
3c	Bonaparte
3d	North Thompson
4Ea	Fernie
4Eb	Cranbrook
4Ec	Golden
4Wa	Nelson
4Wb	Revelstoke
5a	Quesnel Highland
5b	Cariboo
5c	North Chilcotin
5d	South Chilcotin
5e	Central Coast
6a	Queen Charlotte
6b	North Coast
6c	Bulkley Valley/Lakes District
6d	Upper Skeena
6e	Stikine
6f	Atlin
7Oa	Upper Fraser
7Ob	Prince George
7Oc	Mcleod Lake
7Od	Omineca
7Oe	Upper Finlay
7Pa	South Peace
7Pb	North Peace
7Pc	Northeast Rockies
7Pd	Liard
7Pe	Fort Nelson
8a	Similkameen
8b	Okanagan
8c	Monashee
8d	Kettle

IMPLEMENTATION (Immediate):

i. Make an initial commitment of resources sufficient to get work underway in 2016 and confirm longer term funding by March 2017. The priority to be on designated moose population restoration project areas (most need).

ii. Put in place a team to manage the moose population initiative and oversee implementation of the provincial strategy.
- Province of British Columbia management participation.
- First Nations participation.
- Technical support and advice.
- Stakeholder advice (see also Recommendation 21).

iii. Conduct a technical review to identify and rank candidates for designation as proactive population restoration (most need)projects based on:
- Identifiable area of sufficient scale to have population level effects (likely a Population Management Unit or Game Management Zone).
- High resource use.
- Declining or reduced population.
- High demand for hunting opportunities.
- High habitat capability.

iv. Undertake a management assessment of candidate areas to determine whether:

- Existing government-to-government plans and processes support sustained cooperative action by the province and the local First Nation(s).
- Stakeholders are generally supportive.
- There would be irreconcilable competing objectives (e.g., caribou recovery).
- Capacity exists to begin activities this fiscal year.

v. Based on the technical ranking and management assessment designate the first few project areas.
   - Assign project management and technical support teams and leadership.
   - Allocate an initial (2016/17) budget.
   - Develop a project charter, including preliminary objectives and incorporating an adaptive management approach to allow periodic incorporation of new information and performance feedback.
   - Develop an implementation and performance plan including activities and schedules.
   - Utilize all suitable management tools (levers).

vi. Allocate a portion of moose enhancement resources outside designated project areas where restoration of moose abundance is not the immediate or primary concern, but where government managers, First Nations and stakeholders see specific opportunities to better address local and provincial interests relative to moose management.

IMPLEMENTATION (One year+):

i. Allocate budgets, fine-tune objectives and implement activities in designated project areas.
ii. Subject to the ranking discussed above, designate additional project areas and allocate start-up funding.
iii. Continue to support specific opportunities outside designated project areas.
iv. Assess success against population restoration objectives.
v. As implementation in designated project areas nears completion, consider a shift of resources to opportunity (best gain) areas.

PART 4 – INFORMATION

Information was the topic that arose most frequently in discussions with stakeholders and First Nations. Concerns about the accuracy, timeliness, and scale were common; however, none suggested not acting while we wait for better information. We already have a lot of knowledge, and despite any gaps there is enough to begin action on high priorities while making improvements and gathering more data. The uncertainty about moose population decline and restoration calls for an adaptive approach to management. Information gathering will need to take place concurrent with operations, and activities will need to be continually evaluated and adjusted based on new information and performance feedback.

RECOMMENDATION:

14. **Immediately accelerate and stabilize investment to update and improve inventories and monitoring programs for moose.**

REASONS:

Moose populations can fluctuate, and trends can change in 5-10 years, yet staff have indicated that the formal information on moose numbers is outdated in some areas. Many First Nations and stakeholders are very critical of the situation.

"*The history of inventory and monitoring in BC, with some notable exceptions, has largely been ad hoc and reactive to management issues and concerns. A more structured, adaptive approach that connects inventory and monitoring to decision making through management objectives will help to resolve this"* (Draft: Strategic Big Game Inventory and Monitoring Plan). The provincial framework for moose management describes how priorities are set for monitoring.

There may be some need to look at modified survey methods as an adaptation to climate change – several projects were constrained by lack of snow, delaying the capture of new information for a year or more and inhibiting the efficient use of resources.

Some First Nations and stakeholders expressed skepticism about the survey methods used. This may be a lack of understanding, as suggested by some biologists, or due to the perception gap discussed under Recommendation 16. The inventory methods most used throughout the province adhere to the generally accepted standard for several jurisdictions. First Nations community members are being included in some surveys and this appears to help. The Skeena Region has produced short video explanations of wildlife survey methods; however they alone are not sufficient to allay concerns.

Provincial population estimates are determined every three to five years using a combination of survey data and expert opinion. Since 2000 they have been expressed as a range (120,000 – 205,000 in 2014). This number is useful to show general trends, but does not provide sufficiently specific information to make operational decisions. The confidence level is higher at the regional and sub-regional level, but there will be variations between game management zones. Adequate estimates will be needed at a relatively fine scale to inform population enhancement activities.

The Province's draft Strategic Big Game Inventory and Monitoring Plan (2016), if completed and adopted, will establish a framework and direction consistent with what appears to be needed. Ministry

staff have cautioned against large (e.g., "issues driven") fluctuations in inventory and monitoring but indicate that the capacity exists to do more if the funding is available. For example, more regular aerial surveys over a broader geographic area.

IMPLEMENTATION:

i. Commit to stable and adequate long-term funding for inventory and monitoring programs. If necessary allocate additional funds this fiscal year and in the 2017/18 budget to support management activities aimed at restoring populations (see Recommendation 13).
ii. Complete and implement the draft Strategic Big Game Inventory and Management Plan with moose as the priority for implementation.
iii. Continue to communicate with First Nations and stakeholders about the methods used.
iv. Support work to improve and adapt methods to changing conditions (e.g., lack of snow).

RECOMMENDATION:

15. Provide a better understanding of the factors affecting moose health and population change in British Columbia through continued and expanded research.

REASONS:

During the winter of 2013/14 the government conducted 20 moose population surveys. The results, when combined with work done the previous two winters showed a 50-70% decline in number in some parts of the province, while in other areas the populations were stable or growing. The observed declines were consistent with observations by First Nations and stakeholders, but there was little consensus on why.

Many suspected that the accelerated harvest of salvage Mountain Pine Beetle (MPB) killed timber was the root cause however whether it was through habitat loss, access, hunting pressure, predation or something else was unclear. This remains a topic of intense speculation and strongly held beliefs amongst many stakeholders, and it does not explain declines in areas where the MPB was not a factor. In response the government initiated a five-year study to better understand the factors affecting moose population changes in the province. That study is now in its fourth year and is beginning to provide some insight. It would be useful to continue that work to cover a longer time period, and to extend it beyond only cow moose.

Many of the management levers available to enhance moose populations involve significant direct or indirect costs. For example: removing roads to limit access has the direct cost of deactivation, as well as the possible indirect cost to trappers, prospectors or others who might use the road. These costs may be warranted if there is confidence that access is a causal factor. Similarly, the expense of habitat enhancement or the opportunity cost of habitat protection may be good value if habitat is shown to be a limiting factor to moose numbers. However it would not be prudent to impose these costs on the public based on speculation or untested belief. What appears obvious is not always so in a complex and dynamic system.

Direct or indirect public investment should be based on a reasonable chance of return. That requires adequate information.

Much of this type of work requires a high level of expertise and information collection over a sufficient spatial and temporal scale to be credible and useful for decision making. Given the amount of

uncertainty, better information is one of the best investments we can make in the short-term, provided we act on it. Despite that, there is no need to wait for more information before taking some action – a high degree of urgency has been expressed in some areas, especially by First Nations. Strategies can be refined as information is gathered and knowledge improved. Also, we are not alone. Many other jurisdictions with moose are dealing with similar issues and attempting to respond. Sharing experiences can accelerate our learning and help build a common understanding about our situation and what we need to do.

IMPLEMENTATION:

i. Complete the cow moose survival analysis (years 1-5) relative to the landscape change hypothesis, concurrent with extending the study.
ii. Assure continuity of funding ($250,000/year) and extend the current research program for at least five years beyond its present end-date of March 2018, and preferably on-going.
iii. Expand the current research to allow study of calf moose and yearling survival and fund the expansion (estimate $350,000/year).
iv. Support research and monitoring of moose health (see also Recommendation 16).
v. Work with First Nations, stakeholders, academic organizations, and potential funders (e.g., trusts) to host a "moose summit" aimed at sharing and documenting the latest science, including the traditional and social aspects.

RECOMMENDATION:

16. Strengthen the use of local observations and knowledge through structured processes.

REASONS:

A common concern expressed during First Nations and stakeholder engagement discussions was the credibility of information used for decision-making. Typically the focus was on information used to regulate the hunt, although it is not uncommon to also hear worries about animal health. The concern arises when information gathered through government inventory and monitoring does not appear to be consistent with local observations and experience. Government biologists acknowledge that populations can change quickly and a survey done two or three years ago may not reflect the current trend. Since some may be up to a decade out of date, the difference can be significant.

As the formal survey information is a primary source of input to management decisions, people question the validity of the decisions and are frustrated by what is perceived as a poor management practice. They often acknowledge that they are seeing only a specific part of the landscape that may not be reflective of the region as a whole, thus part of the issue may be related to distribution of the population. Even so, they report that they "do not feel listened to" and their information is "dismissed as anecdotal".

This situation creates a serious challenge for government decision-makers. On the one hand the government's policy is that decisions are informed by science, and sound decision-making does not include information that is not relevant. On the other hand, the courts have shown us that a decision-maker can assign more or less weight to the information he or she uses, thus recognizing the rigor with which it was collected or its inherent bias. That would suggest that the information could be better used even in its present form.

Many people reported that they do not feel listened to, or their information is dismissed as anecdotal and not considered by decision makers.

Transparency of decisions was frequently raised as a concern. People spoke of providing input and later learning of a decision, but with little or no explanation about what information was considered, how it was considered, or reasons for the final result. Some ministry staff also recognized this as a problem. When this occurs it is a missed opportunity to inform or educate; breeds mistrust; and is inconsistent with pubic expectations for government openness.

First Nations point to another dilemma, whereby community members do not wish to share information as they consider it proprietary or do not trust the government. Lack of access to this information leaves a significant gap in knowledge and constrains the collective ability to manage for moose. Some attempts are being made to bring First Nations' community knowledge into formal decision making through jointly developed agreements and protocols.

Science has also found ways to deal with information that is hard to quantify by developing defensible qualitative research and information gathering methods. Many First Nations and stakeholder groups have indicated a willingness to contribute to better decision support information. An example of this approach is being examined in conjunction with planning for moose management in the Peace-Liard area. The intent is to develop a community-based moose health monitoring program that is led by First Nations. The proposed program would be designed to meet the needs of First Nations about animal health, observations, and harvest while also informing provincial wildlife managers.

Another example is the Winter Tick Surveillance Program. Previously there was considerable anecdotal information but little formal documentation about the distribution, severity, and impacts of ticks on the moose population. A pilot study engaged professionals, wildlife user groups, and the public to report observations through structured survey processes.

Some stakeholders suggested more compulsory inspection, a return to the tooth collection program and more emphasis on hunter surveys as a means to gathering information about moose health. The advantages cited were not only a greater data base for scientists to access, but the benefits of participation by and education for hunters that comes from being involved in the science. While there is fairly widespread support for more and better information, about 70% of hunters already submit survey data and it is mandatory for guides.

There are many opportunities to better utilize local knowledge or "citizen science", ranging from the recent development of smartphone "apps" as a tool for individuals to report wildlife encounters to local advisory committees where stories and observations are exchanged. All can add value to decision-making. Much of the concern may also be addressed through more effective information sharing – making it easy for interested people to know what is happening and why.

IMPLEMENTATION:

i. Provide guidance to decision makers on how to better use qualitative information. This can be incorporated into the procedure manual for moose harvest management and in training.
ii. Increase the transparency of government decisions (e.g., allowable harvest) by requiring written reasons that are made available to the public (also see Recommendation 7).
iii. Ensure appropriate resources and timelines for collecting, analyzing, and using survey information provided by hunters.

iv. Continue and where appropriate expand long-term sampling programs to monitor changes and identify trends in animal health.
v. Undertake qualitative research projects and/or health monitoring programs in cooperation with First Nations, stakeholders and credible external research organizations (e.g., universities). Subject to agreement with the First Nations and capacity in the research community, begin at least three projects in 2016.
vi. Continue to take advantage of emerging technology to capture information from the public.
vii. Continue to support the use of advisory committees to provide community knowledge.
viii. Take advantage of technology to proactively share information (e.g., web sites).

RECOMMENDATION:

17. Assess moose habitat quality, quantity, and distribution to provide a basis for proactive protection and enhancement.

REASONS:

Even where there is broad agreement about the decline in moose numbers, the reasons are not as clear. Prior to about 1970, fire was the major agent of change to moose habitat, but it has since been moved to second place by timber harvesting in many regions. While different in their habitat impacts, both can be beneficial for generating early succession forests preferred by moose. One of the primary differences is the access that accompanies logging – that is discussed separately.

The Mountain Pine Beetle epidemic that began in the central interior nearly 20 years ago led to a timber salvage program of unprecedented scale. In a conscious effort to capture the value from dead timber before it rotted, logging was accelerated across a large portion of the provincial landscape. Many previously made plans and practices, including measures to accommodate wildlife, were set aside to enable the salvage.

There is some correlation between moose population decline and the areas most impacted by timber salvage operations. While the actual causes of population decline are complex, habitat must be looked at as a key aspect of restoration and enhancement. If habitat is a limiting factor to increasing moose numbers on a landscape now or in the future, it must be known so it can be addressed. One approach being developed to examine this is to analyze historic data from hunter surveys with the progression of salvage harvesting to look for correlations.

Through the provincial cumulative effects framework (under development) indicators have been identified for assessing moose habitat condition. By conducting assessments at the sub-regional / project-area level it should be possible to determine the extent to which habitat is a limiting factor to population enhancement, and to identify any critical protection or enhancement requirements.

IMPLEMENTATION:

i. Undertake habitat assessments to inform objective setting and habitat related management activities. Place a high priority on areas identified for population restoration activities.
ii. Continue to calibrate and implement the cumulative effects framework as it applies to moose across the province as a high priority.

RECOMMENDATION:

18. Improve the precision of First Nations' harvest estimates.

REASONS:

First Nations have a constitutionally protected (and in some cases treaty) right to hunt. This right is exercised within traditional First Nations territories independent of provincial wildlife management schemes. Practically speaking, infringement on this right may only occur where there is a compelling provincial objective, such as recovery of a species at risk, or a clear conservation concern (e.g., a population is at risk of falling below the threshold of viability). This means that the government does not regulate the First Nations portion of the harvest.

In order to determine an appropriate level of harvest by licensed hunters (resident and guide outfitters) wildlife managers must first account for and accommodate First Nations use. Since there is no direct reporting of this harvest, estimates must be used. Sometimes (e.g., in the Okanagan) meat-cutter records are used as the basis for an estimate, but this does not work everywhere. In other areas communities are asked to provide an estimate however this tally is often based on need rather than actual harvest, or is incomplete.

Many First Nations are working to improve information through community surveys and similar methods. First Nations and provincial government managers have acknowledged that community members are very hesitant to share information because they don't trust how it will be used. In many regions collaborative management agreements are being developed or are in the early stages of implementation, often with moose as a key component. This should provide a process for better information gathering and sharing in the future.

It is unclear how this lack of precision in harvest numbers impacts management for moose populations overall. At a minimum it introduces an element of uncertainty that must be accommodated in decisions. In areas chosen for proactive projects to increase abundance, understanding all the agents of mortality and managing them will be essential to success, meaning that this information must be available to inform decisions.

IMPLEMENTATION:

i. Place a high priority on achieving and implementing information collecting and sharing arrangements with First Nations, and treat this as a foundational requirement for undertaking area-based moose population restoration and enhancement projects.
ii. Where needed, provide capacity support for First Nations to implement information gathering and sharing protocols to manage for achievement of defined population enhancement objectives.

RECOMMENDATION:

19. Increase measures to report and reduce mortality by train and vehicle collisions.

REASONS:

Moose mortality due to train and vehicle collision along major rail and highway corridors can be high, however reporting appears to be inconsistent. There is no evidence to suggest that this factor has contributed to the declining population trend in some regions. On the other hand, in areas where a concerted effort is made to increase moose numbers, every collision death avoided is positive.

An example of initiatives established to address wildlife mortality on highways is the Wildlife Collision Prevention Program (WCPP). It was formed in 2001, as a partnership between the British Columbia Conservation Foundation (BCCF) and the Insurance Corporation of British Columbia (ICBC), in response to the increasing number and severity of wildlife vehicle collisions in BC. The mission of the WCPP is "to save human lives and prevent injuries, protect wildlife species from unnecessary death and injury, and reduce the economic losses to society caused by wildlife vehicle collisions". Some stakeholders have suggested a compensation program, whereby a fee would be paid for each animal killed and the money invested in wildlife management.

Railways are considered by many to be a significant agent of moose mortality. The numbers of moose killed on the railway are hard to confirm. According to a 2013 report prepared for the government, there has been "historical underreporting" of moose strikes along the CN corridor. The report notes that between 2007 and 2012, there were 454 to 501 moose kills on the stretch of rail between Endako and Smithers known as the Telkwa Subdivision.

Fencing, signage, underpasses, and other techniques are employed to prevent vehicle/moose collisions in high incidence areas.

IMPLEMENTATION:

i. Where major rail or road corridors transect project areas, ensure information about incidental mortality is accurate and include incremental avoidance measures in the project where feasible.

PART 5 – COMMUNICATIONS

RECOMMENDATION:

20. Accompany implementation of the moose population restoration strategy with a structured communications program.

REASONS:

Many of the recommended moose enhancement activities will be controversial with some stakeholders and members of the general public. If controversy leads to political pressure, some measures may become difficult or impossible to implement. While this risk cannot be avoided completely, clear communications about the context, objectives, and reasons can mitigate the risk.

IMPLEMENTATION:

i. Develop and execute a professionally structured communications plan to support implementation of the strategy.
ii. Focus on key messages that are understandable and supportable for the public: e.g., the importance of moose as a food source in many communities, and the need to restore depleted populations.
iii. Include a role for First Nations and wildlife stakeholder organizations in effective communications – to hunters, interest groups, community members, and others.

PART 6 – STAKEHOLDER INVOLVEMENT

RECOMMENDATION:

21. Establish a provincial stakeholder team and project-specific teams to advise the province and First Nations, and help lead implementation.

REASONS:

One of the keys to successfully fine-tuning and implementing a strategy is to involve the right people at the outset. Although the recommendations in this report draw on input from nearly 300 individuals representing a cross-section of interests, it is only the beginning. Governments will need advice and support at the policy level and project implementation level.

Existing stakeholder groups consist primarily of wildlife consumers (trappers, guides, and hunters) and provide advice to the province, mostly about the regulation of hunting. This will be an important component of moose population restoration and enhancement, but to effectively inform and support implementation of a broad provincial moose population enhancement strategy:

- The province and First Nations will need to be at the table to both participate and receive input from stakeholders.
- Participation will need to include the perspectives of those who are most affected and whose cooperation and support is most needed.
- Each project area will require a team of technical and advisory participants to plan, support on-ground implementation, and monitor results.
- Teams will require resources to be effective (e.g., secretariat, meeting space, etc.).

In some areas of the province work is already underway to develop regional moose management strategies. There are also a number of provincial – First Nations working groups working on moose management issues. These could provide a good basis for establishment of project area teams.

Protocols and techniques are being developed for effective engagement involving three tiers: amongst First Nations; provincial and First Nations government-to-government; and governments with stakeholders. This approach may offer an effective framework for moose population enhancement work.

IMPLEMENTATION: (see also implementation advice under Recommendation 13)

i. As soon as possible, the province should work with First Nations to establish a provincial moose population enhancement team.
   - Co-chaired by a senior representative from the Ministry (FLNRO) and First Nations.
   - Involving representatives of the wildlife user sectors plus other major land and resource users.
   - With access to the necessary technical expertise and support.
   - Mandated to provide advice on provincial aspects of implementation.

ii. As soon as candidate restoration or enhancement project areas are confirmed, the provincial team should work with regions to establish project-level teams. These teams should involve the appropriate provincial and First Nations staff as well as area stakeholders.
   - Where applicable, involve or utilize existing groups (e.g., access management committees, hunter and trapper advisory committees, regional moose management teams, etc.).

iii. Make optimal use of technology to engage and work with stakeholders to promote effectiveness and efficiency (e.g., internet conferencing, information sharing and discussion web sites, social media, etc.).