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613.569.7226

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June 6, 2016

Dear Minister McKenna, Mr. Perry and Mr. Jones,

Thank you for your leadership on the topic of climate change and for the opportunity to submit our thoughts on what should be included in a Pan-Canadian climate change framework.

CPAWS is a not-for-profit group that works on public land and marine conservation, and sustainable resource use issues across the country. As such, many of us have already experienced the impacts of climate change on ecosystems and seen how the impacts, like the melting permafrost, affects the communities we work with.

Our submission focuses on two topics presented as part of the public consultation process:

- How and where to reduce emissions, and
- Preparing for the impacts of climate change

Given the current and likely increases of impacts from climate change on Canadian terrestrial and marine biodiversity and ecosystems in the future, greenhouse gas (GHG) emissions must be reduced immediately in all sectors. We are supportive of Canada adopting ambitious emission reduction targets and actions to achieve the global goal of not exceeding 1.5 degree Celsius temperatures, and of actors proactively taking action to reduce emissions.

From our perspective, one opportunity for reducing emissions in the near term is to reduce emissions from land and seascape degradation, and ensure that the significant carbon stocks in our more intact landscapes remain stored. A longer-term solution is to restore degraded ecosystems so that they can sequester and store more carbon. Both these actions need to be achieved in a manner that does not lower the overall ambition around reducing fossil fuel emissions[1] and recognizes the multiple benefits these ecosystems provide in feeding people, purifying air and water, protecting biodiversity, and also providing livelihoods. Recognizing the rights of indigenous peoples also so needs to be central to the designs of any programs to achieve these goals.

In our submission we discuss in more detail the importance of keeping these emissions stored, some of the needs on the GHG accounting side, and how integrating these considerations into regulatory processes could result in immediate changes on the ground. As these are complex topics we look forward to having further opportunities to discuss these issues with you.

With regard to preparing for the impact of climate change, CPAWS believes an important step will be to implement the nature conservation measures –e.g., creating large and connected protected areas, limiting new industrial footprint in our land and seascapes, and implementing sustainable land

[1] For example, if these emissions are not capped, but used only as offsets, they may undermine action taken to reduce fossil fuel emissions unless the overall cap is made more stringent.

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management practices such as maintaining wide buffers around riparian areas – that will help maintain healthy ecosystems over time. These types of measures will give our ecosystems, and the species they contain, the best chance of adapting to climate change over time. Functional ecosystems with full complement of native species will more likely be able to adapt and shift with climate change, than stressed ecosystems where species populations have undergone significant declines.[i]

Nature conservation measures will not only help our species and ecosystems adapt, but will also have multiple benefits for Canadians, including climate mitigation benefits. Our submission provides more details on this suggestion and the opportunity we have to help our ecosystems, and as a result, ourselves adapt to climate change, including by promoting nature-based or ecosystem-based adaptation strategies, which are being increasingly adopted by jurisdictions across Canada and the world.

In addition, we believe that all our recommendations should be considered in a context of fulfilling Aboriginal and Treaty Rights and Titles. The climate discussions occurring across the country are an opportunity to build better relationships and work towards reconciliation, and where they intersect with land and seascape management, questions of rights and titles will be especially pertinent.

Thank you for the consideration of these issues.

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Recommendation 1. Develop high level principles for the Pan-Canadian Climate Change Strategy on protecting biodiversity, indigenous peoples' rights, and good governance

We think a number of high-level principles should be included in the Pan-Canadian climate change strategy to help guide decision makers across the country as they consider different options for mitigating and adapting to climate change. These principles would reinforce Canada's commitment to the Paris Agreement and in particular those related to protecting the integrity of ecosystems and the protection of biodiversity. These should include language recognizing that mitigation and adaptation strategies need to:

i. Be consistent with the conservation of natural ecosystems and biological diversity, incentivize the protection and conservation of natural ecosystems and their ecosystem services, and enhance other social and environmental benefits;
ii. Recognize indigenous peoples' rights and traditional knowledge; and the need to fulfill Aboriginal and Treaty Rights and Titles. The need to respect indigenous peoples' rights is part of the Paris Agreement and in Canada should be a high priority;
iii. Promote good governance principles related to transparency, accountability, and participation.

Recommendation 2. Mitigation: Include emissions from terrestrial and marine ecosystem degradation into GHG accounts and regulatory programs across Canada

Canada's ecosystems store significant carbon assets. Scientists calculate the Boreal forest to store as much or more carbon per hectare than the Amazon forest, much of it in the soils of wetlands and peatlands.[ii] Equally, our marine ecosystems are significant as well. Seagrass ecosystems have been found to store up to 2 to 4x more carbon per hectare than terrestrial forests.[iii] This carbon is released when the ecosystems are degraded by industrial activity, e.g., cleared for coastal developments or filled in, or ultimately by the impacts of climate change (e.g., permafrost melting). Once these systems are

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degraded, it can take decades, and in some cases centuries to return to the same levels of carbon storage, if they can be restored at all.

In order to reach the global target of not exceeding 1.5 degrees Celsius agreed to in Paris, a primary strategy in the short term would be to not degrade these ecosystems. A secondary strategy would be to allow Canadian ecosystems that once stored more carbon to return to those carbon storage levels. For example, in the Acadian forest where 100 year-old trees would have once been considered middle aged and common, now are rare. These young and rapidly harvested tree landscape store less carbon than their historical counter parts, in addition to being less biodiverse. They could, with time store that carbon again.

In order for these emissions to be included in the regulatory systems needed to reduce these emission, the emissions and storage potentials need to be accounted for properly. Otherwise, we risk taking insufficient and ineffective action to reduce these sources of emissions, which in turn will result in more climate change impacts. Further warming will cause further the degradation of our ecosystems – such as permafrost melting – which will cause even further emissions. Modeling different warming scenarios suggests, for example, that "the permafrost region will become a carbon source to the atmosphere by 2100 regardless of warming scenario, but that 65%–85% of permafrost carbon release can still be avoided if human emissions are actively reduced [from RCP 8.5 to RCP 2.6]."[iv] As the Arctic tundra and Boreal forest have "accumulated a pool of organic carbon twice as large as the atmospheric carbon pool and three times as large as the carbon stored in all living thing,"[v] the release of this carbon into the atmosphere will have a devastating impact.

Some specific ideas for next steps include:

a. Improve GHG accounting rules to better capture and regulate emissions caused by ecosystem degradation

Accurate and complete accounting of emissions, emission reductions, sequestration and carbon storage from terrestrial and marine ecosystems is important for national and international governance and monitoring. How these accounting rules are implemented will make a difference in whether appropriate solutions are recognized.

In particular, there are two important considerations:

i. If the emissions from different terrestrial and/or marine activities are not included in national and provincial accounts, the incentive to address these emissions in regulatory processes is reduced and will result in inadequate mitigation (or adaptation) solutions.
ii. If we assume that ecosystems will return to their former levels of carbon storage after they have been disturbed by industrial activities over a certain period of time, as we currently do in some situations, we may also underestimate the cost of these activities from a climate change perspective. For example, the forests of New Brunswick today store much less carbon than they did historically due to their overall age class and species distribution resulting from intense harvesting practices. Calculating the emissions from harvesting the trees today, would not capture the full carbon cost compared to what the ecosystem could be storing. Nor will it capture the fact that unless active restoration of the ecosystem is undertaken to return the

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forest to its previous age class and species composition, the carbon stored in the future is likely to be even lower.

We are not starting from scratch. Canada, in its annual reports on land use, land use change and forestry emissions to the United Nations Framework Convention on Climate Change (UNFCCC), quantifies its annual GHG emissions from ecosystem degradation on the terrestrial side, such as in "managed forest" ecosystems and where there is land use change. These were reported to represent the equivalent of about 10% of Canada's annual GHG emissions in 2014, though there is significant annual variation.[vi] Also some climate programs have looked at ways to include LULUCF activities into their GHG mitigation programs (e.g., in Alberta). However, there are still specific gaps in all jurisdictions; for example, with regards to the quantification of the emissions from draining wetlands and peatlands. This is a new UNFCCC reporting requirement. Carbon resulting from the degradation of marine ecosystems is not being counted at all.

As GHG accounting of emissions from activities degrading land and marine ecosystems are still being investigated, part of this strategy requires Canada to improve its land use, land use change and forestry accounting, taking a lead on improving our understanding of the carbon stored in marine ecosystems and developing GHG accounting methodologies to systematically capture the emissions due to their degradation and loss. Some of the areas where there are gaps that need more research, better inventories and data, and/or new accounting methodologies include:

a. Peatlands and wetlands
b. Harvested wood products
c. Carbon stored and released after forest fires
d. Marine ecosystems
e. Moss and lichen

Capturing the value of the stored carbon and recognizing any emissions in national and provincial accounts from all these ecosystems will be an important starting point for guiding decision-making and improving regulatory frameworks. Also, understanding and monitoring the extent to which carbon storage is returned to previous levels and the time it takes to achieve that level of storage will be important in making decisions around the cost of disturbing stored carbon in the first place. This issue for example can be important when doing life cycle carbon assessments.

If we recognize the need to reduce emissions from terrestrial and marine ecosystem degradation in the Pan-Canadian climate change framework, and take steps to incorporate those emissions more systematically in GHG accounting frameworks domestically and internationally, regulatory programs and other initiatives to reduce the release of stored carbon in our terrestrial and marine ecosystems will follow.

Including these emissions and sequestration from ecosystems in a way that does not reduce the ambition of our overall climate change targets will also be vital and should be a discussion when designing targets and developing climate programs.

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b. Include emission reduction and biodiversity conservation goals into Environmental Impact Assessments, Strategic Environmental Assessments and/or Cumulative Effect Assessments

Many decisions about whether and how development will proceed requires doing an assessment of the implications of such projects on various values. These assessments do not always include GHG emission considerations emanating from ecosystem degradation, including whether or when the carbon will ever be stored to the same levels again. Nor do they sufficiently capture the consequences of degraded biodiversity. For example, the cost of open pit mining in peatlands, with all its associated ecosystem degradation, is not recognized to be any worse than in places where the environmental impacts are less.

It should be clear to project developers in Canada that they must always aim to reduce emissions (including from terrestrial and marine sources) and have a net benefit to biodiversity. The project and strategic assessments themselves should include:

i. An assessment of carbon emissions/storage/sequestration, including emissions from the degradation or loss of terrestrial and marine ecosystem resulting from the activity.
ii. An assessment of the impact on biodiversity, including special attention to any impacts that would effect biodiversity in areas identified for protection in protected area or connectivity plans (see recommendation 3).

Climate projects (both mitigation and adaptation projects) should also be required to undertake such assessments to ensure a complete assessment of project activities. These assessments should generate interest in, and adoption of, nature-based projects that improve biodiversity (see recommendation 4).

c. Adjust subsidies that drive unnecessary land and marine use emissions, and instead use this funding to promote sustainable management practices and protect ecosystems

Across Canada, decision makers have put in place numerous subsidies that may drive unnecessary land use emissions, for example road building in areas where there are no communities and no planned timber harvesting activities. In marine ecosystems, subsidies related to shipping and fishing as well as coastal infrastructure should be reviewed.

A close review of subsidy policies with a focus on GHG emission and biodiversity impacts could not only improve performance on these metrics, but also free up funding for more GHG and biodiversity-friendly investments.

d. Do not assume carbon neutrality when looking at biomass for energy

The merits of using of biomass for energy as a climate mitigation policy has been debated in numerous domestic and international contexts. However, in the Canadian context numerous scientists have published papers concluding that there are many situations where using biomass is a highly inefficient strategy in trying to offset energy emissions.[vii] Such studies do not even consider the potential carbon storage lost over time as a result of increased biomass harvesting. The implication of removing biomass for this new use may also have significant impacts for biodiversity. Using biomass to displace other forms of energy production is not carbon neutral and must be assessed on a case-by-case basis to avoid having a negative impact on both GHG emissions and biodiversity.

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Recommendation 3. Adaptation: Protect and restore our terrestrial and marine ecosystems

The world is facing a mass species extinction. Mammals, birds, reptiles, amphibians and fish are disappearing hundreds of times faster than background rates, due mostly to habitat loss or degradation.[viii] Climate change will be an additional stressor and scientists estimate that as much as 30% of the world's biodiversity could be lost due to climate change.[ix] The loss of biodiversity has both immediate and far-reaching consequences for our life support system. Healthy ecosystems provide people with food, clean air and water, and many other important services. Maintaining the full range of native biodiversity is fundamental to ensuring that ecosystems and people, who rely on these ecosystems, are resilient to climate change.[x]

To reduce stress on species and ecosystems, and increase their resilience to climate change, we need to scale up terrestrial and marine conservation efforts dramatically. There is a scientific consensus building that at least half of our ecosystems should be protected from industrial activity in an interconnected way.[xi] In some cases this will mean protecting areas that have not yet been significantly impacted; in other cases, restoration will be key. We also think it is vital to work with Indigenous Peoples, valuing their traditional knowledge and respecting their rights to achieve these goals.

Thinking big is vital if we are to be successful. For example, the Boreal forest, which stretches across Canada, is defined by large patterns of natural disturbances, and species with extensive ranges. For these wide-ranging species like caribou, wolverine and grizzly bears to survive, they must have the ability to move unimpeded through the landscape, which requires protecting large interconnected areas of undisturbed habitat. Postage stamp conservation will be ineffective and in the face of climate change there is a need for even larger areas to be protected, and ecological connectivity becomes all the more crucial. Outside the Boreal forest, there are other important terrestrial landscapes that will be vital to ensure Canadian biodiversity is protected, such as our Acadian forests and the forests of B.C. Many of our more southern ecosystems require not only protection, but restoration. Marine ecosystems will also be vital. Climate change considerations must be incorporated into protected area planning and the development of recovery plans for species at risk. At the same time, climate change plans need to reflect the need for scaled up nature conservation efforts to enable ecosystems to adapt to climate change.

Some specific ideas for next steps include:

e. Plan and implement a well-designed, well-managed interconnected network of protected areas on land and sea to enable ecosystems and people to adapt to climate change

Currently, Canada is lagging in the amount of our land and seascape that has been protected, with only 10% of our terrestrial ecosystems and 1% of our ocean area protected to date. We need to work together on a national initiative to scale up our protected areas efforts on land and sea if ecosystems are going to be able to adapt to climate change. This requires nation-wide conservation planning efforts, based on science and Indigenous knowledge, and with a wide range of interests represented at the table.

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Having well thought out plans for how we will expand this area will require a systematic approach to conservation. These plans should incorporate:

i. Areas of particular importance for biodiversity[xii] and ecosystem services (e.g. water protection, carbon storage potential)
ii. Climate refugia
iii. Areas of importance for connectivity
iv. Sufficient size to absorb natural disturbances
v. Representation of all Canadian species and ecosystems

In addition to the value for adaptation, this links to the opportunity to move forward simultaneously on a number of important environmental commitments – such as meeting and exceed Aichi targets, and protecting critical habitat for species at risk.

Support for nature conservation, through the development and implementation of a network of protected areas that builds on traditional knowledge and respects Indigenous rights on land and sea should be integrated into Canada's climate change framework.[2]

f. Earmark adaptation funding for conserving ecosystems and creating connectivity

As noted above the establishment and management of systems of large, interconnected protected areas is essential to enable species to shift their ranges in response to climate change. This is well-recognized globally, but has not yet been discussed as often in the context of Canada's climate change strategy. Protected areas and other conservation tools are critical to halting the loss of terrestrial and marine habitat, and the degradation of intact ecosystems that are especially important for helping to buffer climate change impacts.

Given the importance of these conservation measures, we recommend that a portion of the adaptation funding be earmarked for the expansion and management of Canada's protected area system.

While there are a number of different approaches for designing such a program at all levels of government, and we would recommend that the dispersal of funding be directly linked to the development and application of systematic protected area plans based on science and Indigenous knowledge, and that consider climate change adaption needs. The funding could also support better management and restoration of protected areas for biodiversity, where gaps have been identified through rigorous "management effectiveness" assessments.

Funding protected areas would also deliver a wide range of other benefits, including meeting international and domestic targets on protected areas (e.g. the Aichi targets and the UN Sustainable Development Goals), conserving biodiversity, and meeting species at risk obligations, such as for Boreal woodland caribou and the St. Lawrence beluga. Large core protected areas can also serve as

[2] Note, a similar recommendation can be found in the Ducks Unlimited Canada's submission to the portal.

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benchmarks to help scientists better understand the impacts of climate change in areas not otherwise disturbed, and can also act as buffer areas for working landscapes and seascapes.

Supporting and partnering with Indigenous peoples on protected areas and land use plans would also contribute to building better nation-to-nation relationships and support Indigenous cultures that in many cases are being highly impacted by climate change, particularly in northern Canada. There are many processes occurring across the country that could be finalized, and others like the Great Bear Rainforest Agreement and Marine Planning Partnership in British Columbia which demonstrate that successful intergovernmental planning processes can be achieved. The newly formed Guardian Program, whose goal is to empower First Nations leaders across Canada to ensure the cultural integrity of boreal Indigenous peoples and the ecologies of their lands and waters forever, is one example of how such support could result nation-wide benefits. The Guardian's role will be a transcendent one; they can offer the on-the-ground context for a rich discussion on management and adaptation in the places that will be the most impacted by climate change.

The funds could be available for protected areas managed by governments, indigenous communities, non-governmental organizations, and private entities that contribute directly to delivering on plan priorities.

Funds could be sourced from numerous places including: mitigation programs where there were demonstrable carbon storage and sequestration benefits; repurposed funding from the reduction of subsidies that increase emissions attributed to land or marine ecosystem degradation; or – as has been already done in some Canadian jurisdictions and in other countries – a portion of the revenues from GHG mitigation programs could be earmarked for adaptation activities focused on biodiversity and ecosystems.

g. Incorporate climate change considerations into all species at risk activities, including the development of recovery plans for species at risk, as well as other management plans for native species, and implement them.

Part of protecting our natural national infrastructure is protecting the species that comprise it from all threats, including climate change.

Considering climate change as part of species at risk discussions may require:

a) Adjusting recovery and action plans to a) recognize the impact of climate change on the species and their habitat; and b) their future needs to move to more appropriate habitat as climate change impacts increase. For example, Boreal woodland caribou require large areas of undisturbed forests to survive; however, in some parts of the Boreal increased temperatures and reduced precipitation may result in larger and more intense fires. The increase of fires will reduce the availability of critical habitat on the landscape at any given time. As a result, assessments of whether sufficient critical habitat has been left undisturbed for caribou to survive should assess not only current rates of disturbance by fires, but future rates and use a

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precautionary approach when selecting the amount of habitat in the ranges that should be set aside from industrial activity at any given time.

b) Accelerating implementation of recovery strategies and completion of action plans on non-climate change related threats to help species adapt to climate change. Here again, Boreal woodland caribou are a good example. The federal recovery strategy was released in 2012; however, across Canada few jurisdictions have implemented actions to protect critical habitat. Meanwhile pressure on habitat is increasing as industrial activities continue to further disturb and fragment the ranges. Such actions not only threaten the health of caribou, but also of the ecosystem, making both more vulnerable to climate change as its impacts get more severe. Addressing current threats urgently is vital.

Taking action now on threatened and endangered species will have multiple benefits. For example, protecting Boreal woodland caribou habitat has significant value for many species that are also part of a healthy Boreal forest ecosystem[xiii]; is important to numerous indigenous peoples' communities who value caribou as part of their cultural heritage; and is emblematic of Canada's value as a wilderness nation. Their habitat is some of the most carbon rich in the world. Protecting them from climate change will also help to protect us.

h. Improve the resilience of ecosystems and increase their adaptation and mitigation potential by keeping working land and seascapes closer to their natural conditions.

Ecosystems that are highly stressed by industrial activities are less resilient and will have a harder time adapting to the additional stresses from climate change. As a result, many scientists recommend managing working land and seascapes so that they stay as close to their natural state as possible.[xiv]

In the context of forestry, this is often termed ecosystem-based management, and in particular using natural range of variation estimates to guide harvesting activities. Some of Canada's forests have shifted significantly from their original composition of species and age class structure as the result of industrial forestry activities. These forests store less carbon and the loss in diversity of tree species, with the resulting impacts on biodiversity, puts them at greater risk from climate change. In many parts of Canada governments and companies are assessing how to better manage their forests so that they can more closely reflect their natural state or natural range of variation. Restoration of ecosystems after extensive fragmentation (e.g., from seismic lines), is another possible activity to improve resilience and restore carbon stored on land.

In our ocean, overfishing of certain species has resulted in entire marine ecosystems shifting, as well as the loss of certain species entirely. The collapse of the Atlantic cod fishery has led to a long term, perhaps permanent, shift to invertebrates such as lobsters which are particularly sensitive to climate change impacts like warming oceans and acidification. Restricting fishing and establishing fully protected "no-take" areas will help exploited populations to recover, restore and maintain ecosystem balance and function. This will in turn increase resilience and adaptive capacity, allowing ecosystems to adjust to rising sea temperatures, the stresses of ocean acidification, and other climate change impacts.

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Managing our working landscapes with an eye to ensure they continue to function within their norms in terms of having health populations of all native species, etc., will likely help these working landscapes be more resilient and able to adapt to climate change.

i. Identify and incorporate support for adaption measures on working forest landscapes

Forests cover about 45% of Canada's lands. Governments oversee about 94% of this land as Crown land. Almost 56% percent of Canada's forested lands are considered commercial forests, with almost 30% being managed for timber extraction.[xv] Most of these commercial forests are our most productive and biodiverse forests and will be a vital piece of the ecosystem adaptation puzzle. While some forestry companies are working to improve their forest management practices across a range of environmental issues, these activities do have an impact on our forests' biodiversity, the long-term impacts of which are uncertain.[xvi] As a result, it will be important to identify areas within forest tenures that are vital for species movements or biodiversity conservation, such as climate refugia, and to conserve these in order to facilitate adaptation of the forest ecosystem and different species to climate change.

Canada's forestry industry and forestry workers are also vulnerable to the effects of climate change on the working forest. Recently Natural Resources Canada released a report looking at different climate scenarios and the potential for increased fires resulting from climate change impacts such as drought and increased temperatures in Canada's managed forests.[xvii] They also assessed the amount of timber volume that will be at risk as a result. Their findings raise some important questions about how to identify appropriate harvesting levels and highlights the need to value the stewardship of forests and the carbon they store in a new way an increasingly carbon constrained world.

Note: CPAWS is a signatory to the Canadian Boreal Forest Agreement, which also provided a joint submission to the climate change portal.

j. Marine industry mitigation and adaptation

Canada's marine and coastal industries are currently under represented in our national emissions statistics and climate change planning and are a priority for mitigation and adaptation planning. Canada has the largest coastline in the world and one of the largest ocean estates. Presently, less than 1% of Canada's ocean estate is designated in marine protected areas, many of which allow industrial activities to continue within their boundaries. Offshore oil and gas production occurs on Canada's East Coast and in the Northern Beaufort Sea and Mackenzie River Delta. Commercial fishing is widespread across our ocean estate, with fuel subsidies allowing fishing vessels to travel further, increasing emissions as well as growing their ecological footprint. Canadian shores are also home to some of the world's largest shipping ports, with new major shipping terminals proposed on both coasts to increase export of domestic oil and gas projects. Currently, shipping emissions (like the loss of blue carbon ecosystems) are not included in emissions statistics for any country, however a recent report by the International Maritime Organization found that shipping accounted for a considerable proportion of global GHG emissions, flagging a major problem in the current approach to calculating emissions and setting targets.

Of particular concern is the Arctic, as the effects of climate change are increasingly seen in Canada's Arctic waters, this currently inaccessible area will soon open up to industry as sea ice recedes. Canada's

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Arctic is likely to suffer impacts from climate change both more quickly and of greater magnitude than elsewhere. Arctic species and ecosystems are already under pressure, so it is imperative that safeguards are put in place now to protect them. Limiting industrial activity in the Arctic before it begins will not only serve to support resilience and adaptation of ecosystems but will serve to reduce Canada's emissions in the long-tem.

We recommend that:

i. Blue carbon ecosystems across Canada are identified, protected and where necessary restored
ii. Calculate emissions from Canada's maritime industries by sector, including all shipping activity in and out of Canadian ports.
iii. Include estimates of emissions from blue carbon ecosystem loss and degradation in the emissions calculations for each sector.
iv. Protect ***at least*** 10% of Canada's ocean estate by 2020 in line with Canada's international commitments, with a long-term view to eventually protect at least 50%.
v. Ensure that at least 30% of each marine protected area is off-limits to any industrial extractive uses.
vi. Establish large protected areas on all three coasts with particular emphasis in Canada's Arctic Ocean.
vii. Take immediate steps to restrict future industrial activities in Canada's Arctic Ocean until the ecological and climate impacts of these activities are fully understood and mitigated.

Recommendation 4. Adaptation: Promote the use of nature-based adaptation strategies

Nature-based or ecosystem-based adaptation strategies[3] look at how natural systems and ecosystem processes can be used to help buffer communities from climate change[xviii]. These build on our natural assets, rather than degrade them. Examples of nature-based adaptation strategies are:

a. Protecting coastal ecosystems such as salt marshes to buffer communities from storm surges;
b. Protecting and restoring wetlands to reduce flooding and filter water;
c. Maintaining and enhancing riparian buffers to protect river banks from erosion due to flooding, which often degrades water quality;
d. Greening urban areas to absorb rainwater and moderate temperatures.

Such solutions have been promoted around the world, including the US and in Europe, in their climate policy documents.

Nature-based adaption strategies can respond to the needs of a community, a city, a municipality, a province, or even be of national importance. The Mackenzie River Basin's biological, hydrological and

[3] This aligns with other proponents promoting nature-based green infrastructure, such as Ducks Unlimited Canada.

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climatological properties, for example, "affect the welfare of people throughout the western hemisphere, and to some extent, globally (through climate, water and temperature regulation).[xix]"

Nature-based solutions, besides having social and environmental benefits, are often cost effective. As a result, they can be seen being promoted and developed around the world, including blue-green infrastructure projects already taking place in Canada, such as the Winnipeg Red River Greenway Plan, the Corktown Commons in Toronto, and the Terwillegar Rec Center in Edmonton.

Nature-based solutions have multiple values and high returns for the investment. For example, protecting coastal areas not only provides protection against storms worsened by climate change, but act as carbon sinks and provide habitat for declining salmon stocks. The value of such activities has been estimated in numerous reports and for different ecosystems to be in the tens of billions.[xx]

Thank you again for taking the time to review our submission. We are happy to discuss any of these issues in further detail with you, if that can be of help.

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[i] See for example, Thompson I., et al. 2009. Forest Resilience, Biodiversity, and Climate Change: A synthesis of the Biodiversity/Resilience/Stability Relationship in Forest Ecosystems. Secretariat of the Convention on Biological Diversity.

[ii] See Gautier et al. 2016. Vulnerability of timber supply to projected changes in fire regime in Canada's managed forests. Can. J. For. Res. **45**: 1439–1447 (2015) dx.doi.org/10.1139/cjfr-2015-0079

[iii] See CEC. 2016. *North America's Blue Carbon: Assessing Seagrass, Salt Marsh and Mangrove Distribution and Carbon Sinks.* Montreal, Canada: Commission for Environmental Cooperation. 54 pp.

[iv] See "Biomass offsets little or none of permafrost carbon release from soils, streams, and wildfire: an expert assessment" by Abbott, Benjamin, et al. March 7, 2016. Environmental Research Letters. doi:10.1088/1748-9326/11/3/034014

[v] SeeHugelius et al 2014, Schuur et al 2015 cited in "Biomass offsets little or none of permafrost carbon release from soils, streams, and wildfire: an expert assessment" by Abbott, Benjamin, et al. March 7, 2016. Environmental Research Letters. doi:10.1088/1748-9326/11/3/034014

[vi] Environment Canada, 2016. National Inventory Report 1990–2014: Greenhouse Gas Sources and Sinks in Canada

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National Office / Bureau national
506 - 250 City Centre Avenue
Ottawa, ON K1R 6K7
613.569.7226

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