

**Global Climate Change and Wetlands:**

**Issues and Awareness**

**by**

**Kenneth W. Cox and Liza Campbell**

**for**

**The Global Air Issues Branch  
Environmental Protection Service  
Environment Canada**

**March 31, 1997**

*North American Waterfowl  
Management Plan*



*Plan nord-américain de  
gestion de la sauvagine*

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## TABLE OF CONTENTS

	<u>Page</u>
<b>INTRODUCTION</b>	<b>2</b>
<b>GLOBAL CLIMATE CHANGE</b>	<b>2</b>
<b>The Global Climate Change Debate</b>	<b>2</b>
<b>What is Global Climate Change?</b>	<b>2</b>
<b>WETLANDS</b>	<b>3</b>
<b>Why Wetlands are so Important</b>	<b>3</b>
<b>Wetland Characteristics</b>	<b>4</b>
<b>The Impact of Global Climate Change on Wetlands</b>	<b>4</b>
<b>Key Issues - Ecological/Biological</b>	<b>4</b>
<b>Policies/Programs</b>	<b>5</b>
<b>SURVEY RESULTS - Description &amp; Summary</b>	<b>6</b>
<ul style="list-style-type: none"><li>• <b>Awareness of global climate change issues</b></li><li>• <b>Key scientific wetland issues/concerns</b></li><li>• <b>Level of awareness among constituency</b></li><li>• <b>Awareness of potential economic impacts</b></li><li>• <b>Policies/Programs</b></li><li>• <b>Awareness of Environment Canada's Climate Change, Education and Outreach Program</b></li><li>• <b>Awareness of other education/awareness initiatives</b></li><li>• <b>Suggestions regarding how to raise awareness</b></li><li>• <b>Interest in receiving information on climate change</b></li><li>• <b>Interest in distributing information on climate change</b></li></ul>	
<b>Interview Summary</b>	<b>13</b>
<b>NEXT STEPS</b>	<b>14</b>
<b>Setting the Stage/Creating an Image</b>	<b>15</b>
<b>Goals/Barriers/Opportunities and Recommendations</b>	<b>15</b>
<b>APPENDIX</b>	
<b>List of Organizations</b>	<b>22</b>
<b>Referenced Material</b>	<b>23</b>

# **GLOBAL CLIMATE CHANGE AND WETLANDS**

## **INTRODUCTION**

Commissioned by Environment Canada (EC), this paper provides a preliminary overview of the nature of climate change issues related to wetlands; an assessment of the awareness level among the wetlands constituency of those issues (based on interviews), and recommendations which include the feasibility of EC pursuing alliances within the wetlands conservation sector through which information on climate change could be disseminated. The list of organizations contacted is contained in the Appendix.

## **GLOBAL CLIMATE CHANGE**

### **The Global Climate Change Debate**

Over the past few decades, global attention has been drawn to the broad issue of global change and specifically, global climate change. It is the complex and uncertain nature of this issue which has spurred considerable debate at national and international levels, as well as a quest for scientific data or “proof”.

The debate revolves around questions concerning the extent to which global climate changes presently occurring are part of a natural trend that has been taking place over the millennia, or to what extent these changes are the result of anthropogenic activities. It is important to assess to the best of our ability to what extent such changes are natural and/or anthropogenic - as this will shape how society will deal with the issue. For example, if it were assumed that global change is a cyclical phenomena, people may assume that they merely need to adapt to the result. If, however, it is demonstrated and accepted that human activities are largely responsible for the current trend in climate change - then the onus is on humankind to not only deal with the impacts, but also take steps to prevent further interference with the natural system. To do either requires an awareness and understanding of the causes and impacts of global climate change. Herein lies the challenge!

### **What is Global Climate Change?**

The term global climate change conjures up different images to each of us, depending on a variety of factors such as our geographic location and our lifestyle. There are however, a number of initiatives underway to define the issues and develop scenarios based on a variety of complex models.

One such initiative is the Intergovernmental Panel on Climate Change (IPCC) - a panel jointly established in 1988 by the World Meteorological Organization and the United Nations Environment Programme. The purpose of the IPCC is to: (i) assess available scientific information on climate change, (ii) assess the environmental and socio-economic impacts of climate change, and (iii) formulate response strategies.

Based on its research, the IPCC concludes that “human activities, including the burning of fossil fuels, land-use change and agriculture, are increasing the atmospheric concentrations of greenhouse gases (which tend to warm the atmosphere) and, in some regions, aerosols (microscopic airborne particles, which tend to cool the atmosphere), are projected to change regional and global climate and climate-related parameters such as temperature, precipitation, soil moisture and sea level.”

The Panel's First Assessment Report, completed in 1990, provided a scientific and technical base for the United Nations Framework Convention on Climate Change (UNFCCC). The UNFCCC's objective is the:

...stabilization of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system. Such a level should be achieved within a time-frame sufficient to allow ecosystems to adapt naturally to climate change, to ensure that food production is not threatened and to enable economic development to proceed in a sustainable manner”.

The IPCC states that “potentially serious changes have been identified, including an increase in some regions in the incidence of extreme high-temperature events, floods and droughts, with resultant consequences for fires, pest outbreaks and ecosystem composition, structure and functioning, including primary productivity.” Some researchers suggest that a higher number of these extreme events are expected in Northern latitudes which would be characterized by more intense rainfall and an increase in winter storms.

Also, some suggest that even a small variation in temperature will trigger a much greater and varied ecological change, that the response will be much greater than the temperature difference would imply, particularly with respect to the melting of permafrost in the Canadian North.

These changes are expected to have a significant impact on wetland ecosystems, given that climate plays a key role in their functioning, location, and distribution. According to the National (Canada) Wetlands Working Group (NWWG), wetland ecosystems are generally stable, gradually adjusting to changes brought about by the development of wetlands, barring “catastrophic” external interferences such as climate change.

## **WETLANDS**

### **Why Wetlands are so Important**

Healthy wetland ecosystems have a wide range of functions such as: climate regulation - carbon cycling; absorption of toxins; flood control/erosion reduction; genetic and biological diversity; provide a critical refuge and breeding ground for many species; often contain a high diversity of species; maintain groundwater levels; and play a large role in water purification (particularly in urban and agricultural areas).

Wetlands are important to society as subjects of scientific research and educational initiatives as well as recreational activities such as photography, birdwatching and art. In terms of products, they are a source of peat, fish crops, wild rice crops, berries and game animals.

Wetlands are already at risk, their ecological, economic and socio-cultural value having not been fully appreciated. It is estimated that more than half of the world's wetlands have disappeared during the last century. This figure is expected to increase.

## **Wetland Characteristics**

Wetlands cover approximately 4-6% of the Earth's land surface. Canada has about 24% of the world's wetlands, and 14% of its surface area is covered with wetlands. Inland wetlands include areas such as fens, bogs, swamps, marshes, and shallow open water.

The distribution of wetlands in Canada is determined chiefly by the climate (through the amount of water received through precipitation) and by the morphology of the land surface, alone or in combination. The morphology of the land exerts an influence on the distribution of surplus water and therefore the location of wetlands, NWWG (1988).

In some areas the presence of wetlands depends on a supply of water from external sources (floodplains or coastal areas). Other influencing factors include the physical and mineralogical characteristics of surface materials. The texture of the surface material determines the porosity of the soil and therefore the proportion of water that can percolate into the soil, NWWG (1988).

“The development of wetlands in a given location is influenced and determined by several interacting biotic and abiotic factors. Abiotic components include hydrology, soil material, landform, local climate and permafrost. Each of the abiotic and biotic components influences the others and is influenced by them. Changes in climate may radically disrupt and alter the ecosystems as climate provides energy to the ecosystem and influences moisture availability,” NWWG (1988).

According to NWWG, the dependence of wetlands on climate and landform is illustrated by the fact that they are distributed according to broad climatic zones across Canada. The seven wetland regions including arctic wetlands, sub-arctic wetlands, boreal wetlands, prairie wetlands, temperate wetlands, oceanic wetlands and mountain wetlands - the greatest concentration of these occurring in a belt across Northern Ontario, Central Manitoba and Saskatchewan, Northern Alberta, and the Mackenzie Valley. Further concentrations of wetlands occur in the Pacific and Atlantic coastal areas of Canada.

The consumptive public uses of wetlands has been estimated to provide \$10 billion in economic benefits, NWWC (1988).

## **The Impact of Global Climate Change on Wetlands**

### **Key Issue - Ecological/Biological**

While it is certain that climate plays an important role in the health, functioning and distribution of wetlands, how variations to it such as global warming will impact wetlands is difficult to assess given the multitude of causative variables and their interplay over time. Further complicating the issue is the fact that wetlands are diverse entities and have varying degrees of vulnerability, for example, to changes in timing and amount of precipitation, and will therefore exhibit impacts differently. The following however, highlights some of the potential issues that have emerged.

In 1988 Bardecki stated that wetland ecosystems “may be profoundly affected by relatively minor climatic changes”, such as changes in hydrology. Put simply, where there is an increase in precipitation, wetlands will be more abundant, and where moisture levels fall, they may disappear. Research is also pointing to not only changes in precipitation levels, but its timing - such as increases in the amount of precipitation per storm yet drier periods in between events.

M.G. Oquist and B.H. Svensson's (1996) research supports Bardecki's perspective as they are "highly confident" that climate change will have its greatest effect on wetlands by altering their hydrologic regimes. "Any alterations of these regimes will influence biological, biogeochemical, and hydrological functions in wetland ecosystems, thereby affecting the socio-economic benefits of wetlands that are valued by humans." Because of the differing hydrologic conditions across wetlands, the impacts of climate change on these ecosystems will be site specific.

The composition and geographic distribution of many ecosystems including wetlands is expected to shift as individual species respond to changes in climate. This will likely cause a reduction in biological diversity and in the subsequent goods and services that ecosystems provide society, IPCC (1996). Alternatively, some species may migrate into new areas having a positive impact on the structure and composition of the wetland area, Bardecki (1988). However, migratory species may suffer from loss of breeding, staging and wintering habitat.

Coastal ecosystems have been identified as being particularly at risk, including saltwater marshes, mangrove ecosystems, and coastal wetlands. Bardecki states that there are three major ways by which a rise in sea level can disrupt wetlands; inundation, erosion and saltwater intrusion. He suggests that sea level rise will tend to result in a landward movement of these wetlands, yet notes that a major issue is the capability of coastal wetlands to move inland. Changes to these ecosystems could have major impacts on urban centres, tourism, freshwater supplies, and fisheries.

From a global perspective, wetlands play a key role in the carbon cycle. Oquist and Svensson state: "We are highly confident that climate change will affect the cycling of carbon in wetlands: some carbon-sequestering wetlands will change from CO<sub>2</sub> sinks to sources due to a lowering of the water table or increased temperature."

T. Clair (1996) explains that "carbon dioxide is taken up by plants which eventually die, some of the organic matter is converted to peat, some of it goes back into the atmosphere as carbon dioxide, some of it goes up as methane, and some of it leaves the wetland in the water that is flowing out, in the form of dissolved organic carbon. The last sink is an ecologically significant component of the water chemistry." However, when precipitation and temperature changes, the way and amount of time in which water leaves the wetlands is altered along with the amount of gaseous carbon and dissolved organic carbon. This in turn impacts on the global atmosphere.

Consequently, where wetland ecosystems have been weakened, global climate change, particularly the increase in incidence and intensity of rain, wind, and storms can wreak havoc on already degraded ecosystems such as some riverine and coastal systems. Examples of this have already been demonstrated during the mid 1990's with tremendous flood damage on the Mississippi River system, and in 1997, on the Red River system. Past and latent resource management practices have effected the impact of such severe weather phenomena. However, it is through such disasters that awareness of the importance of wetlands and their role in softening the more severe impacts of global climate change can be highlighted.

### **Key Issue - Policies/Programs**

While there are policies and programs at the provincial/territorial, national and international levels pertaining to the conservation of wetlands, there are none that address the climate change/wetland scenario.



## SURVEY RESULTS - DESCRIPTION & SUMMARY

As mentioned, 32 members of the wetland constituency (Appendix A) were interviewed to assess their awareness of global change and its proposed impacts on wetlands, and determine if they were interested in receiving and/or distributing information on climate change. The following outlines each question and highlights their responses.

### **Question 1. When you think of global climate change, what issues come to mind?**

<b>ISSUE</b>	<b># OF TIMES IDENTIFIED</b>
increase in greenhouse gases	4
global warming	11
changes /variability in temperature	5
increased droughts in arid areas	4
regional changes	1
higher evaporation rates	2
drying/loss/impact on wetlands	3
changes in precipitation -	5
increased snowfall in Northern Canada	1
persistent organic pollutants that effect climate	2
damage to/reduction of ozone layer	9
increase in C02	3
changes to sea levels - flooding	9
increased drought in areas prone to precipitation	1
changes to forest fire regimes	1
changes to water habitat & breeding habitat	2
habitat loss	1
greater frequency of extreme events	4
uncertainty	2
global circulation models, predictions	1
changes in landscape, watersheds	1
erosion problems	1
melting of icebergs/glaciers	4
negative impact on species due to changes to habitat	2
increased pressure on water supply, particularly in agricultural areas	1
human mitigation/adaptation to climate change	1
carbon sequestering	2
energy use - burning of fossil fuels	2
interprovincial and international agreements	2
changes to ecosystem dynamics and biodiversity	3
changes in way people use coastal resources	1
pressure on food supply	1
increased pollution and contaminants due to water treatment facilities proximity to sea	1
impact on global security - environmental refugees	1
UVB	1

The interviews revealed that, as expected, global climate change means different things to different people. When asked question # 1, the majority highlighted negative impacts as opposed to positive impacts or causes, identifying the possibility of global warming, reduction of the ozone layer, consequent rise in sea level and increase in flooding as key issues that came to mind. Changes in precipitation and temperature variability were also frequently mentioned.

Those interviewees that mentioned causes of climate change identified the burning of fossil fuels and its impact on ecosystems, concern over the biosphere's ability to absorb greenhouse gases, and the lack of commitment on behalf of the Canadian government to fulfill its international obligations or take a preventative approach.

A minority were sceptical saying that there was no evidence to support the current theories about global climate change and that changes were part of a natural cycle.

**Question 2. What are the key scientific/environmental wetland issues/concerns facing your organization?**

ISSUE	
wetland conservation/continued loss of wetlands - due to agriculture, drainage, urban expansion, rising coastlines, reduced precipitation	19
lack of awareness of value of wetlands	2
loss of seasonal & temporary wetlands	1
distribution of wetlands	1
water demand which decreases aquifer levels and H2O tables	1
stream alterations - leading to downstream flooding & degradation	1
wetland degradation	3
water quality and quantity	3
issues relating to function & value of wetlands	1
extreme events - subsequent increase in flooding and loss of nesting habitat	1
drought	2
alterations/loss of habitat - impact on waterfowl	4
cumulative impact of agrochemicals on wetlands	1
role of snow in relation to small wetlands	1
land use conflicts - population & agricultural pressures on wetlands	3
lack of enforcement of existing policies to conserve wetlands - need for incentives - tax breaks	3
infilling of saltwater marshes due to rising sea levels	1
the impact of impoundments on floodplains in PEI vs. natural wetlands	1
loss of native prairie	1
changing water levels in the Great Lakes	1
policy implications of climate change from a legal standpoint	1
endangered species - management of	1
working with N. American partners to ensure migratory species have healthy habitats	1
riparian management areas	1
the transmittal of toxic chemical to wetlands from airborne sources	1
variability in temperature and impact on wetlands	1
the public's perception of the impacts of peat harvesting on wetlands	1

As per the table, the majority cited wetland loss/alteration/degradation as their major concern as well as the subsequent impact on waterfowl and wildlife. Key contributors to this loss include the perception that wetlands have little value and are consequently converted for agricultural purposes. Land use pressures including population growth and urbanization were also considered key factors in wetland loss. A number of interviewees expressed concern that if, under the global warming scenario, temperatures were to rise and precipitation fall, then more small and marginal wetlands would be lost to agriculture.

**Question 3. Could these issues (identified in #2) be affected by climate change - in 10 years, 25, 50 years. If so, how?**

The responses to this question were as diverse as the issues being addressed by the wetland constituency. All surveyed indicated that climate change would impact on wetland ecosystems to varying degrees, - depending on whether precipitation and temperatures would increase or decrease. A number noted the lack of scientific proof and the multitude of variables as obstacles to projecting changes. There were however, some respondents who believe that they are already observing climate induced changes to hydrology, temperature, precipitation and increases in greater weather variability.

It is important to note that climate change was not seen universally as global warming since some regions of the country are already experiencing a cooling effect that interviewees attribute to climate change. Some interviewed preferred the term climate variability.

The following, while not direct quotations are comments heard which summarize interviewees responses to question # 3 (the apparent disjointedness of the bullets reflects the range of perspectives given in response to the question).

- ◆ Along the North Hudson Bay coastline and around James Bay, temperature decreases have resulted in ice cover later in the season forcing the migratory birds to wait in wetland areas nearby, where due to their threefold increase in numbers, they are degrading the resource;
- ◆ Increased temperatures would create a higher demand for water, thereby reducing aquifer levels and water tables effecting wetland ecosystems. Irrigation and stream alterations to satisfy the demand may lead to increased water degradation and downstream flooding. Combined with increased demand for water there would be an increase in evapotranspiration causing a drying of wetlands - particularly seasonal and temporary wetlands. The biochemical composition of wetlands would also be effected, impacting on wetland dependent species;
- ◆ Many species in Northern Canada would have a longer, warmer season possibly leading to increased biological productivity;
- ◆ Farmers may benefit as they would be able to cultivate formerly marginal and small wetlands which would be lost under the warming scenario;
- ◆ Snow is a key factor in the health of small wetlands. Should a decrease in snowfall and increase in rain occur, the reduction in snowdrifting and packing could lead to shallower wetlands. Already some farmers redistribute snow which is altering wetland hydrology;

- ◆ Higher UVB radiation associated with global warming could negatively affect wildlife that depend on wetlands. It is important to note that wetlands provide an important food source for non-resident species;
- ◆ While events such as severe flooding and prolonged droughts are already taking place resulting in a loss of nesting habitat, some contend it is difficult to attribute these occurrences to climate change as similar events have happened in the past;
- ◆ A temperature increase would cause melting of glaciers, permafrost and icebergs triggering changes in the composition and distribution of coastal wetlands, particularly saltwater marshes. Biodiversity would also be effected;
- ◆ The key issues in climate change, rather than being biological, ecological, are ultimately social issues, which need to be addressed.

**Question 4. Do you think, among your constituency, that there is a high, medium, or low awareness of the issues relating to climate change and wetlands?**

HIGH	MEDIUM	LOW
5	6	18

The majority felt that there was a low awareness among their constituency of issues relating climate change to wetlands. This lack of awareness was explained in part, by the prevalence of more immediate wetland issues requiring solutions. As well, some felt their constituency were generally aware that climate change would impact wetlands, yet they did not believe people were familiar with specifics effects. In other cases, a low awareness level was due to scepticism about climate change. Interviewees felt that a high awareness was primarily found among the prairie farming community and wetland biologists. A medium to high level categorization was often attributed to specific research activities or events such as workshops or conferences.

One reason why the linkages between wetlands and climate change are not being made is that for many, wetland conservation is seen as a local issue being managed through grass roots programs. Conversely, climate change is viewed as a long-term global issue deserving international action. As a result of this perception, people have difficulty understanding how the two issues are related, from both a scientific standpoint and from the perspective of “who should do what about it”.

**Question 5. Are you aware of the potential impacts of global climate change on the economy and society as a result of alterations to wetland ecosystems?**

SOCIO-ECONOMIC IMPACTS	TIMES CITED
tourism	4
waterfowl hunting	5
agriculture	14
recreation e.g. birdwatching	6
fisheries	5
water - watersheds, hydrology, quality & quantity	6
urban centres	1
impact on aboriginal communities	2
peat harvesting industry	1
wildlife viewing	3
loss of wildlife habitat and health	2
landscape diversity	1
forest industry	1
changes in land use	1
overall monetary benefits of wetlands would decline	1
flood reduction	1
increased biological activity - positive for economy	2
do not believe there will be a big impact	1

The following bullets, though not direct quotes, highlight interviewees responses: (it was left to interviewees to determine if they felt the effects would be positive or negative).

- ◆ changes to water quality and quantity due to global warming would have a significant impact on all aspects of the economy including urban centres, fisheries, and agriculture;
- ◆ people anticipate that climate induced changes to wetland functions will directly and indirectly effect many socio-economic activities;
- ◆ if precipitation increases, resulting in more wetlands, agricultural productivity will decrease and result in selection of different crops;
- ◆ if precipitation decreases as part of a warming trend, the consequent reduction in water quantity will create a need to build more dams and diversions. In the case of agricultural production, the cost per unit produced would increase significantly. However, agriculture could also be positively effected as the amount of land available for cultivation would increase with smaller wetlands drying up. This, combined with a longer growing season, would enable farmers to increase their crop diversity;
- ◆ alterations to wetland ecosystems will effect the harvesting of migratory waterfowl by aboriginal communities;

- ◆ if precipitation increases, peat production would likely fall as there would be fewer rain free days in which to harvest the resource;
- ◆ with increased wetland loss due to a warmer climate, the social benefits of landscape diversity would be gone;
- ◆ if temperatures rise and lakes become warmer their biological productivity may increase benefiting the recreational fishery;
- ◆ people living in valleys and along coastal estuaries will be negatively impacted if water levels rise;
- ◆ economic costs would occur if wetlands which play a key role in flood reduction are lost.

**Question 6. What policies or programs does your organization have that relate to wetlands, and/or the impact of climate change on wetlands?**

Many organizations have wetland conservation policies or programs though none directly address the issue of climate change. Interviewees were in agreement that it is too early to identify whether policies would be necessary to address the impact of climate change on wetlands or if there would be a more appropriate mechanism. The following is a brief summary of the policies and programs mentioned by those interviewed. (It was not feasible to get a full list and title of each organization's policies and programs given the time it would have taken to do so in the interview process, therefore some of the references may not reflect the exact title).

The Preservation and Reclamation Policy (Canadian Sphagnum Peat Moss Association); Policy to Conserve and Enhance Wetlands (Ducks Unlimited); Policy on the Movement of Storm and Other Water Going into Wetlands (Ducks Unlimited); Conservation Agreements with Private Property Land Owners (Ducks Unlimited); Buck for Wildlife Program (Alberta); Habitat Steward Program (Alberta); Stewardship Program (P.E.I.); Covenants; (P.E.I.); Wildlife Act (P.E.I.); and Prairie Shores Program (Saskatchewan Wetland Conservation Corporation).

**Question 7. What policies or programs exist in your jurisdiction that relate to wetlands, and/or the impact of climate change on wetlands? Are they adequate? If not, what would you suggest?**

Those interviewed were generally aware of the range of policies that relate to wetlands with the following mentioned (the following lists policies and programs based solely on what people said and is not meant to be a complete list).

The Canada Water Act; the Fisheries Act; the Planning Act of Ontario; the Navigable Waters Act; the Federal Policy of No Net Loss of Wetlands; the Canadian Environmental Protection Act (CEPA); the Canadian Environmental Assessment Act (CEAA); the Federal Policy on Wetlands; the Prince Edward Island Wildlife Act; and the Saskatchewan Wetland Policy.

Programs identified include: the North American Waterfowl Management Plan (NAWMP), the New Brunswick Bird Areas Program, and the Heritage Marsh Program (Manitoba).

There were suggestions regarding a) the need for awareness and enforcement of existing policies  
b) support for a stronger commitment by the federal government to address the causes of climate change  
c) the need for changes to policies that conflict with the objectives of wetland policies and d) increased use of incentives to reduce wetland degradation and loss.

**Question 8. Are you aware that Environment Canada has a Climate Change, Education and Outreach Program?**

While none of the interviewees were familiar with this program specifically, some indicated that they were aware that Environment Canada is doing considerable work on climate change.

**Question 9. Are you familiar with other awareness or education initiatives on climate change and wetlands?**

Only a few respondents were familiar with other domestic and international initiatives, such as; the Canadian Global Change Program, the Symposium on the “Impact of Climate Change to Inland Wetlands: A Canadian Perspective” held in April 1997, the United Nations Convention on Climate Change, and the Biodiversity Convention.

**Question 10. Do you have any suggestions as to what would be an effective way of raising the awareness of climate change/wetland issues at the local, provincial or national levels?**

Responses:

- ◆ You need people to become involved in a way that they will appreciate what climate change means to them, perhaps situating it in a context such as impact on hunting, recreational activities, agriculture;
- ◆ Pamphlets (audience specific);
- ◆ A television show with short 20 second information items on climate change;
- ◆ National symposium/conference/workshop(s) to exchange information;
- ◆ Feature show on the Discovery Channel;
- ◆ Incorporate into National Wildlife Week;
- ◆ Newsletters to public libraries;
- ◆ Posters;
- ◆ Use Green Links;
- ◆ Public Talks;
- ◆ Articles which highlight the ecological and economic value of wetlands;
- ◆ Fellowships to hire graduate students to do research;
- ◆ Need sound data to be able to show how climate change is impacting on the environment which could be used to raise awareness of public and policy makers;
- ◆ Send information through existing organizational networks - societies, conservation groups, business;
- ◆ Internet;
- ◆ Undertake research that will raise an understanding of the issue;
- ◆ Focus on awareness at the local level and outline specific impacts;
- ◆ Tailor awareness program to landowners as they control the majority of wetlands;

- ◆ People are not very receptive to government documents, therefore literature might be better received if it were produced by a broader group with input from the target audience;
- ◆ Target wetland managers first (as they already have a strong interest in the health of wetlands) in terms of raising awareness as they could then relay information to other members of their constituency;
- ◆ Articles in Equinox, Canadian Geographic, McLean's, scientific magazines;
- ◆ Articles in newspapers;
- ◆ Develop a newsletter on climate change;
- ◆ Submit a paper on climate change and wetlands to the Atlantic Fish and Wildlife Society (audience is field biologists)
- ◆ Could have displays at agricultural conventions;
- ◆ Prepare and distribute resource materials through the school system;
- ◆ Develop a documentary similar to/or that could be featured on David Suzuki's The Nature of Things;
- ◆ Develop instructional videos;
- ◆ Go through NAWMP;
- ◆ Prepare a publication on the issue as part of North American Wetlands Conservation Council (NAWCC) series;
- ◆ Develop a grassroots awareness program;
- ◆ Create an appropriate postage stamp;
- ◆ Have exhibits at nature museums;
- ◆ Build on existing educational initiatives aimed at school-age children such as "Project Wild" and "Project Learning Tree";
- ◆ Information sessions/briefings/presentations to individual organizations.

**Question 11. Would you or your organization be interested in receiving information on climate change?**

YES	NO
27	1

**Question 12. Would you or your organization be interested in distributing this information ?**

YES	NO	MAYBE
20	4	3

### **Interview Summary**

Overall, there was a low level of awareness of the potential impact of global climate change on wetlands and visa versa. Variations existed as well depending on where people live and the nature of their work/research.

However, a sincere interest was expressed by all in learning more about the issues and many provided suggestions as to how awareness could be raised. Interviewees noted that it is important that the information they receive is relevant and specific to their interests. Interviewees suggested that people need to see how this information could be used. They need to know what it means for them.



For example, farmers may be more interested in climate change if the information helps them identify different farming methods which would increase productivity or save money, while at the same time, enabling them to address the impacts of climate change on wetlands.

The complex nature of climate change/wetland issues suggests that many opportunities exist for raising awareness, and that a communications strategy be flexible enough to take into account the range in audiences and geographic differences.

## **NEXT STEPS**

This paper is based on the assumption that the ultimate goal of this exercise (following an awareness campaign) is the preservation and conservation of wetland ecosystems by preventing or mitigating the impacts of global climate change. It is also assumed that increased education and awareness among the wetland constituency of wetland and climate change issues is a key means to achieving this goal.

The following analysis and recommendations are based on preliminary research, on interviews with the “wetland constituency” and on observations at the symposium on the Impact of Climate Change to Inland Wetlands: A Canadian Perspective, held at Oak Hammock Marsh in April 1997. It is important to note that due to the complex nature of the issue, an effective communications plan needs to be created through a series of steps or building blocks. The reason for the broad scope is that climate change and wetland conservation cannot be addressed in isolation of the broader natural and socio-economic environments. Therefore, an effective communication plan must reflect the multifaceted nature of this issue.

This paper is guided by the questions; a) What are people aware of? and b) What do we want people to be aware of? A subsequent question (not part of the scope of this paper) is: What do we want people to do about the impact of climate change on wetlands?

If it were an ideal world, development would take place sustainably - within the carrying capacity of the ecosystems upon which life depends - and the issue of human induced climate change would not exist. However, the reality is that population growth and associated socio-economic activities are interfering with the healthy functioning of the natural environment. As a result, the cause-effect relationship is coming full circle, with degradation and depletion of the natural environment having a profound impact on human health, and economic and social development.

Global climate change is expected to have a profound and negative impact on wetland ecosystems. How wetlands will respond to these climatic influences will vary depending on many factors such as geographic location, hydrology, morphology, vulnerability, and current and future socio-economic influences.

## **Setting the Stage/Creating an Image**

It would be wise to consider the creation of an image for global climate change through which the Canadian program (and perhaps a continental and/or global program) could be outlined. Perhaps a symbol (such as the NAWMP logo, NIKE✓, Acid Precipitation “STOP SIGN” etc.) could be created to portray to all age groups the need for action concerning global climate change. Under such a symbol, the following goals could be addressed.

**GOAL # 1: To increase awareness of climate change issues among the wetland community and corresponding increase in collaborative scientific research to broaden the understanding of the impact of climate change on wetlands.**

Audience: The Wetland Constituency - Scientists, Habitat Managers, Coordinators

Overall, the wetland constituency is generally familiar with climate change scenarios and are in agreement that there will be impacts on wetland ecosystems. However, the majority are preoccupied with immediate threats to wetland loss - singling agriculture out as the primary cause. There exists a strong interest and concern about the ecological and socio-economic impacts of climate change on wetlands. Some interviewed believe that they are already seeing significant changes while others state that there are too many factors at work to be able to attribute what they are observing to global climate change.

For the wetland constituency to be able to effectively mitigate the impacts of climate change on the resource, they need to work closely with those studying climate change as well as with the broader community. As noted, the complex nature of climate change and wetlands warrants a multifaceted, coordinated approach to exploring the issue - which is currently not taking place.

### **Barriers**

From preliminary research, it appears that scientific research into climate change, its impact on wetlands and visa versa, is in the early stages. Overall, current and past research activities on wetlands have predominantly been micro-focused and site-specific while global climate change has been examined from a broad trend/scenario based perspective - with little research into the interface between the two.

Where the two have been linked, the focus has most often been on changes in a specific climatic variable, such as decreased precipitation and the projected impact on wetland hydrology, as opposed to consideration of the complex mix of variables (climatic and wetland). However, the site-specific research on wetlands that has been done, if collated, would provide an excellent starting point for determining the current status of wetlands, which is a necessary first step if projections are to be effective or have any credibility. The same would apply to climate change research. By pulling it together and achieving some consensus on scenarios, a more realistic link could then be made between the two research fields.

As it stands, research is proceeding on parallel tracks when it should be pursued in an integrated manner - one which is ecosystem based, and goes beyond the physical sciences and takes into account the broader socio-economic realities which shape the resource.

## **Opportunities**

Given the fiscal environment and priority being given to climate change, research activities, in support of the goal identified above, should be complementary and take into account Canada's regional diversity. Northern wetland/climate change issues differ considerably from those along the Atlantic coast.

Subsequently, communication about the research is critical a) within the wetland constituency, b) within the climate change constituency, c) between the two groups, and d) with the larger group of stakeholders. This may sound like an arduous task, but it can be done.

## **Recommendations:**

1. That Environment Canada establish an interdisciplinary Climate Change Task Force to develop, coordinate and communicate activities relating to this issue (and consider implementing aspects of the following recommendations). The Task Force should include, but not be restricted to, representatives from those sectors which the Department considers critical to getting their message out such as the North American Wetlands Conservation Council, the organized agricultural sector (Canadian Federation of Agriculture), (Canadian Cattleman's Association); the Convention on International Trade in Endangered Species (CITES); the Recreational Fisheries Institute of Canada, and others. The Task Force could oversee the following activities (with respect to wetland issues):
  - The establishment of a broad network comprised of wetland scientists, climate change scientists, economists, the public, agricultural community, land-use planners and policy makers - through which information and research results are communicated regularly;
  - The development of pamphlets, tailored to specific audiences which could be distributed through the wetland constituency network - many of whom have indicated that if the material is relevant and useful, they would happily go one step further and distribute it to their members, employees or constituencies. The Task Force could be responsible for the development of the pamphlets as membership would reflect the interests and diversity of the target audiences. The pamphlets would present the scientific facts (which could be based on the results of the collaborative pilot studies suggested below) and offer suggestions as to what people could do about the issue.
2. That research activities to examine the link between climate change and wetlands explore a "top five or ten" list of pilot studies. The Wetland Ecosystem Vulnerability Study, currently run by Environment Canada, could serve as a good starting point. The pilot studies would include not only scientists but all relevant stakeholders;
3. That research be undertaken to explore how climate change and its impact on wetlands be linked with the socio-economic interests of those effected. Causal relationships need to be identified in order to relay to the public what the issue means to them. Studies would have to break down the broader constituency into stakeholder groups/specific audiences;

4. That linkages be made with existing initiatives underway on climate change such as the Canadian Global Change Program and a Canadian chapter of the Society of Wetland Scientists;
5. That the North American Waterfowl Management Plan network be used as a communications venue.

**GOAL # 2 : To raise awareness and stimulate action (once the nature of the action needed is determined prior to the development of the communications strategy) through the dissemination of information.**

Audience: The Broader Constituency (land-owners, the agriculture community, industry, “the general public”, etc.)

The wetland constituency is comprised of not only wetland habitat managers, wetland scientists and others who deal directly with the resource, but it also includes farmers, birdwatchers, hunters, industry and the general public. Anyone impacting wetlands, or effected by the health of wetlands has a role to play within the climate change/wetland context. It is therefore important that these stakeholders are familiar with the issues and have an opportunity to develop or become involved in a process to determine what they can do about it. According to the “wetland constituency”, there is a very low level of awareness of the linkages between climate change and wetlands among the broader group.

### **Barriers**

The complex nature of global climate change is too overwhelming to most people as there are so many levels at which the subject could be explored - local, regional, national, international. The multitude of variables at those levels leave people without an understanding of what the issue means to them (and hence, why they should care). Adding to the confusion is the fact that people are presented with a range of climate change scenarios and are not sure which to believe (or what to do about it) reflecting the range of scientific studies and lack of consensus about climate change impacts. In some cases, these scenarios have been portrayed with a gloom and doom tone, which, rather than mobilizing the public, has tainted their interest in issues they perceive as “environmental” resulting in a “tuning out” of the public.

Like many ecologically sustainable issues, climate change and wetlands is multi-linkage, ecosystem based and long-term. All of these go against traditional economic (and human) thinking and the short-term/crisis management culture that has prevailed. It requires assessing cumulative impacts, looking at the dynamic interaction between ecosystems, the economy and society, and warrants taking a preventative, long term approach - which is starting to occur but will take years before the paradigm actually shifts.

A lack of knowledge and understanding about the value of wetlands has been a key barrier to their conservation and preservation. Therefore, information about the impact of climate change on wetlands must reinforce their value in order to trigger interest in the issue.

## **Opportunities**

Here is an opportunity for scientists, policy-makers, habitat managers, farmers, industry and business to work together to understand what is taking place and plan ahead. The next challenge is to communicate a clear and consistent message. People tend to be intimidated and frustrated by issues that appear overwhelming; that they do not understand; and that they do not feel they can do anything about. Despite this, there exists a great opportunity to gain people's interest and stimulate action.

### **Recommendations:**

6. NAWCC could serve as a clearing house for information on climate change and wetlands, bridging the gaps between climate change and wetlands scientists and particularly, the science, public and decision-making communities.
7. Create a documentary that could be featured on David Suzuki's The Nature of Things or the Discovery Channel;
8. Feature brief 20 second climate change information pieces on radio and television;
9. Establish a private sector/nongovernment web site on global climate change (all aspects: wetlands, fisheries, etc.) or build on an existing site. The site could serve as an up-to-date inventory of what is taking place on climate change in Canada. It could be set up so that anyone undertaking a study could prepare a one-paragraph overview of the initiative (a standardized format could already be set up on the site) which could be added to the inventory;
10. Prepare an insert for the Parliamentary Householder and other agency "household flyers";
11. Create a market for climate change/wetland products (T-shirts, posters, hats, mugs, etc.) which would feature the newly created Global Climate Change symbol;
12. Feature informative, useful articles on wetland/climate change issues in McLean's, Nature Canada, Canadian Geographic;
13. Prepare feature articles for all newspapers.

**GOAL # 3: Ensure the communications strategy and message reflects the most recent scientific data and information on the impact of climate change on wetlands.**

Audience: Government, Universities, Wetland Organizations

**Barriers**

There is currently no mechanism with which to monitor the impacts of climate change on wetland ecosystems. Without an understanding of what the real impact is of climate change on this resource, it is difficult to develop and communicate a clear and consistent message to the public. A message is needed that would convince people of the issue's importance and also help them define what they can do about it.

**Opportunities**

An opportunity exists to, once the status of wetlands is determined (to the extent possible), create a national set of indicators in conjunction with setting up or building upon an existing long-term monitoring system. Without such a system, there will be no way to effectively assess the impact of climate change on wetlands and wetlands on climate change. Such a system could monitor the "top ten" wetland ecosystems mentioned under Goal # 1. This approach would address the site-specific nature of the projected impacts of climate change on wetland ecosystems.

**Recommendation**

14. That a national set of indicators be developed and linked to a new or existing monitoring system, applied initially to the "top ten" wetlands and expanded when feasible. A broader system would allow for monitoring variability among similar wetland ecosystems. The Ecological Monitoring Assessment Network (EMAN), administered by Environment Canada, could serve as the basis for such a system.

**GOAL # 4: To raise awareness and stimulate new policy/program directions involving an integrated approach.**

Audience: Government, Business, Industry, Non-governmental Organizations

**Barriers**

In many jurisdictions (federal, provincial, territorial) policies exist which either directly or indirectly address the conservation and/or preservation of wetlands. However, enforcement of those policies has been lacking according to many interviewees. In other cases, the policies are not seen as being comprehensive enough (they only apply to federal land). It is important to ensure that jurisdictional policies are not counter-productive to each other.

Communication between the scientific and policy-making communities is also seen as barrier to the effective design and implementation of policies and programs.

Programs exist in support of Canada's goal of stabilizing greenhouse gases emissions at 1990 levels by the year 2000 and new initiatives were announced in December 1996. However, those surveyed were frustrated with the lack of commitment or action being taken by the federal government to fulfill its international commitment. They would prefer to see a greater emphasis on preventing global climate change rather than on mitigating the impacts.

### **Opportunities**

Effective policies are dependent on a number of criteria: they are based on the best information available (meaning there is a strong communication link between the scientific and policy-making communities), they complement other policies, and they are appropriately implemented or enforced.

### **Recommendations**

15. Hold a conference which would feature presentations and workshops where participants could: a) share scientific information, b) explore what the wetland and stakeholder communities can do about the cause and effect of this issue all resulting in increased awareness of the issues, c) develop some goals or next steps which participants could implement and, d) develop policy recommendations. The conference could focus on (from an ecosystem perspective); industry, outfitting, renewable resources, agriculture, fisheries, forestry, water, wildlife, and tourism associated with hunting and fishing.
16. That a specific communication venue be established to link the scientific community (wetland and climate change) to policy makers (if a Task Force were struck, it could perform this function.) Also, if a conference were held, recommendations could be developed and put forth to the policy community.
17. Politicians and senior government managers (federal, provincial, municipal) could be provided with briefings on the issue;
18. Foster the support of the Senate and House Committees for Environment (and others related to agriculture and economic development) and propose they initiate a review of global climate change including wetlands;
19. Establish a link with the Commission for Environment and Sustainable Development, Auditor General's Office.

**Goal # 5: To increase involvement in international activities by i) raising issues of importance to Canada at the international level and ii) ensuring that Canada is tapped into the most recent international research activities.**

Audience: The International Scientific and Policy-making Communities

## **Barrier**

Canada is not able to prevent or mitigate the impacts of global climate change in this country without coordinated action to address the issue at the international level.

## **Opportunity**

An opportunity exists for Canadian organizations, scientists, industry, academia, and governments to play a key role in addressing the global climate change issue. Climate change is an issue which demands a strong link between national and international activities.

## **Recommendations**

The following is a preliminary list of venues where linkages could be made between domestic and international initiatives.

20. That presentations, information exchanges, collaborative research projects and communication strategies be undertaken through the following venues:

- Intergovernmental Panel on Climate Change
- Ramsar Convention
- Biodiversity Convention
- United Nations
- World Conservation Union
- Commission on Environmental Cooperation
- International Association of Fish and Wildlife Agencies (U.S./Canada)
- Wildlife Management Institute (U.S./Canada)
- North American Waterfowl Management Plan Committee (U.S., Canada, Mexico)
- North American Wetlands Conservation Councils (U.S. and Canada)



## Appendix A

### LIST OF ORGANIZATIONS \*

West Coast Environmental Law Association  
Nature Conservancy of Canada  
Canadian Sphagnum Peat Moss Association  
Clean Air Alliance of Alberta  
Principal Ecological Services for Planning Ltd.  
Alberta Fish and Game Association  
Delta Waterfowl Foundation  
Wetlands International - The Americas  
Saskatchewan Wetland Conservation Corporation  
Ducks Unlimited Canada  
Natural Resources Institute, University of Manitoba  
Wildlife Habitat Canada  
Canadian Nature Federation  
Manitoba Habitat Heritage Corporation  
Manitoba Wildlife Federation  
National Hydrology Research Institute  
Canadian Cattleman's Association  
Environment Canada/Canadian Wildlife Service  
British Columbia Ministry of Environment, Lands and Parks  
Ontario Ministry of Natural Resources  
N.B. Department of Natural Resources & Energy  
Alberta Department of Environmental Protection  
Manitoba Department of Natural Resources  
Saskatchewan Department of Environment & Resources Management  
Nova Scotia Department of Natural Resources  
N.W.T. Department of Renewable Resources

\*Please note that other organizations were contacted, however, in some cases people felt the issue was either not relevant to them or they were not interested in participating in the interview. In some cases, more than one person was interviewed from a single organization.

## **Appendix B**

### **REFERENCED MATERIAL**

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