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# Report

on the

**Canadian Cooperative  
Wildlife Health Centre**

# National Program Workshop

**Held on 21-22 February 2008 at The Calgary Zoo**



## EXECUTIVE SUMMARY

This Workshop was held to facilitate communications among persons and organizations responsible for wildlife health and disease management in Canada, and to explore potential synergies and collaborations toward achieving common goals. The Workshop was designed to create a portrait of the total of wildlife health and disease programs and activities across the country, and then to engage participants in action-oriented discussion of future wildlife disease issues and management concerns. The first day of the two-day Workshop thus was taken up with presentations on current programs and activities. The second day consisted of small group and plenary discussions that sought to evaluate the current state of wildlife health and disease programs in Canada, and to identify areas for program improvement, particularly with respect to the program of the CCWHC itself. A total of 66 participants attended.

On Day One, presentations were made by each unit of the Canadian Cooperative Wildlife Health Centre (CCWHC), The Calgary Zoo, The Provinces of British Columbia, Alberta, Saskatchewan, Manitoba, Ontario, Quebec, and Newfoundland and Labrador, Yukon, Northwest Territories, Nunavut, Canadian Food Inspection Agency, Public Health Agency of Canada, Fisheries and Oceans Canada, Parks Canada Agency, Canadian Wildlife Federation, State of Alaska, National Wildlife Health Centre (U.S. Department of Interior) and the Wildlife Conservation Society. Day Two consisted of a review and critique of current programs for wildlife disease management in Canada for which *Canada's National Wildlife Disease Strategy* (NWDS) was used as a standard and comparative reference.

### ***NWDS Goal #1: Prevention of new wildlife disease issues of socioeconomic importance***

There was a consensus that Canada is not well prepared to prevent important disease issues associated with wild animals. With respect to importation of disease-causing agents, there is no clear connection between international intelligence regarding potential global health risks and controls that might be implemented at Canada's borders. There is a clear connection among these elements where diseases listed in the regulations of the federal Health of Animal Act is concerned, and this is managed capably by the CFIA. On the other hand, there is virtually no assessment, regulation or mitigation of the many significant health risks associated with the trade in exotic pets or with other forms of wild animal commerce, legal and illegal.

Global environmental change is occurring at speeds and scales never encountered before in human history. These greatly increase the probability of the arrival of new and significant wildlife disease events from both external and internal sources.

### ***NWDS Goal #2: Early detection of important wildlife diseases***

Early detection of important wildlife diseases is dependent on Canada's national wildlife disease surveillance program. The program currently in place is a good one, but needs further development. The program provides significant coverage of disease events in mammals and birds in areas of human settlement. Coverage of sparsely-settled areas is inadequate to provide vigilance for new disease issues. There is no general disease surveillance program for pathogens in wild fish, and both amphibians and reptiles also are poorly covered.

Other suggestions for program improvement made by participants included integration between environmental contaminants programs and wildlife disease programs, broader reporting of results of wildlife disease surveillance, a greater emphasis on analysis of disease surveillance data, establishment of some specialized diagnostic laboratory capacity specifically for important wildlife diseases, and greater outreach programs for wildlife field personnel.

***NWDS Goal #3: Capacity for rapid responses to new wildlife disease issues***

Canada has no organized capacity to respond rapidly or effectively to new important wildlife disease issues; this goal of the NWDS has not been achieved in any degree. Current response capacity is largely hypothetical, *ad hoc* and unplanned. This is a major weakness and vulnerability in Canada's overall capacity for health and disease management. Channels of communication among government agencies regarding wildlife disease issues are weak and *ad hoc*. There is no established protocol for national or regional decision-making as to whether or not to respond to potential wildlife disease issues, nor for determining which agency or agencies would lead in such responses. There are no established procedures whereby urgent responses to wildlife disease issues can gain access to emergency contingency funds.

Participants identified lack of response planning and absence of a governance structure for decision-making as key factors that jeopardize Canadian society with respect to the growing socioeconomic risks associated with wild animal diseases. Achievement of this NWDS Goal would require agreement on roles and responsibilities, identification of positions of responsibility and authority in all relevant agencies, and agreement on a decision-making process that will connect information from wildlife disease surveillance and related sources to the decision-making network and then, if and when decisions to respond are taken, to appropriate responses based on pre-planning and pre-identification of personnel and resources. While many wildlife disease discoveries will not be emergency issues requiring immediate responses, some will be, and a system for assessment, decision and action similar to those established for forest fires, chemical spills and incursions of important foreign animal diseases is required to assess new wildlife disease events and make timely decisions about interventions.

***NWDS Goal #4: Effective, science-based management actions***

Scientific research on wild animal diseases takes place in Canada at many different institutions. The total amount of such work is quite small, however, relative to Canada's size and wild animal populations. Furthermore, there is no impetus or process whereby wildlife research relevant specifically to the most important knowledge gaps faced by wildlife disease managers is either prioritized for funding by Canadian research scientists or reviewed and incorporated into guidelines for management responses to disease issues. Workshop participants noted that a Procedures Manual for wildlife disease management that offers procedural options to achieve specified disease management outcomes based on the best currently available wildlife and biomedical science really is a pre-requisite to effective wildlife disease management and the international acceptance of Canada's capacity in this regard. No such manual exists. Participants also cited the need for a national body that could set national priorities for scientific research in support of wildlife disease management, and disburse funds for such studies.

**NWDS Goal #5:      *Education and training of personnel required to manage wildlife disease issues***

There was broad consensus that basic training and continuing education at both technical and professional levels is essential to Canada's capacity to manage wildlife disease issues. While there now are some opportunities for such continuing education, the participants felt that it would be of great benefit to establish a more coordinated national system. For professional staff, short courses on specified topics taught at a rigorous and applied level are needed. To aid in recruiting into future professional positions, externships, practicums or cooperative learning placements within agencies should be developed. For technical staff, it was suggested that a short course of standardized curriculum on wildlife health and disease that would include important aspects of zoonotic disease risks, new information and technologies, and occupational health and safety considerations is needed. The participants urged that regular national workshops for wildlife health professionals across Canada, such as the current Workshop, have enormous educational and communications values, and that these should occur regularly, perhaps every two years.

**NWDS Goal #6:      *Establishing active communications systems to assure the function of the total national program and all of its many components***

There was broad consensus that a fully functional and actively-maintained communications program is essential to the achievement of any and all of the six NWDS goals. There also was consensus that communications among agencies on wildlife disease issues currently are fragmented, incomplete and *ad hoc*. A functional national program of wildlife disease management will require an active physical hub for communications that will link prevention and early detection (surveillance) components with the governance structure established for decisions and the planning and priority-setting associated with application of the best science to disease management issues. Communication pervades all parts of wildlife disease management and can only be achieved through sound planning, dedicated personnel and constant operation.

**Action Items for the Canadian Cooperative Wildlife Health Centre (CCWHC)**

One objective of the Workshop was to determine whether, and, if so, how, the CCWHC could alter its program to better assist its partner agencies to deliver their wildlife health and disease programs, or to achieve regional, national or international objectives not attainable by any one or a few of these partner agencies alone.

Although enhancements would improve all aspects of the CCWHC program, the current program is highly valued by the Workshop participants. The CCWHC was urged to continue to serve as a central coordinating hub for the network wildlife disease programs and personnel across Canada. The status of the CCWHC as a university-based scientific and educational organization, outside of government and without legal authority, but serving and supported by government agencies responsible for wildlife and environment, agriculture and public health, is a key strength of the organization.

A strong consensus among Workshop participants was that Canada's first priority for wildlife health and disease management should be full implementation of its internationally-acclaimed *National Wildlife Health Strategy*. The CCWHC could then assume a central coordinating role in the management of this expanded national program. Pending full implementation of the NWDS, the CCWHC was asked to consider implementing a list of possible program enhancements.

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## **Canadian Cooperative Wildlife Health Centre National Program Workshop**

Held on 21-22 February 2008 at  
The Calgary Zoo

### **INTRODUCTION**

This workshop was held to facilitate communications among persons and organizations responsible for the many aspects of wildlife health and disease in Canada, and to explore potential synergies and collaborations toward achieving common goals. The workshop was organized by the Canadian Cooperative Wildlife Health Centre (CCWHC), a partnership among Canada's federal, provincial and territorial governments, its five veterinary colleges and several non-government groups, which carries out Canada's national program of wildlife disease surveillance, education, research and management. All CCWHC partners were invited to send participants to the workshop, and a total of 66 attended (participants are listed in Appendix A). The workshop was hosted by The Calgary Zoo, the Faculty of Veterinary Medicine of the University of Calgary, and the CCWHC.

The workshop was designed to create a portrait of the total of wildlife health and disease programs and activities across the country, and then to engage participants in action-oriented discussion of future wildlife disease issues and management concerns. The first day of the two-day workshop thus was taken up with presentations on current programs and activities (the workshop schedule is in Appendix B). The second day consisted of small group and plenary discussions which sought to evaluate the current state of wildlife health and disease programs in Canada and to identify areas for program improvement, particularly with respect to the program of the CCWHC itself. For this day of discussion, the six goals of *Canada's National Wildlife Disease Strategy* (Appendix C) were used as the central theme.

### **CANADA'S PROGRAMS IN WILDLIFE HEALTH AND DISEASE**

#### **1. The Canadian Cooperative Wildlife Health Centre**

##### *Program Overview:*

The CCWHC has four main activities: wildlife disease surveillance, information services to partner agencies, education and wildlife disease research and management. Disease surveillance is the central activity that supports and informs all the others. It consists of a coordinated national program of disease detection, disease diagnosis, storage and retrieval of surveillance data in a national database and use of surveillance information to inform decisions and actions by responsible authorities in the general areas of environment and wildlife management, agriculture and domestic animal diseases, and public health and food safety. The CCWHC also participates in international activities. It is a Collaborating Centre of the OIE (World Organization for Animal Health), participates in representation of Canada in Canada-US-Mexico tri-lateral discussions on wild animal diseases, and assists several countries to build their wildlife health and disease management capacities.

The CCWHC consists of seven separate units: Regional Centres at each of Canada's five veterinary colleges and at the Centre for Coastal Health (see below), and a Headquarters Office, located at the Western College of Veterinary Medicine, University of Saskatchewan, charged with overall administration, information technology, and coordination of national and international programs. Professional staff in the Headquarters Office also participate directly in surveillance, information services, education, and research and management components of the CCWHC program, including major participation in the Foothills Model Forest Grizzly Bear Research Program and Canada's Inter-agency Wild Bird Influenza Survey. The CCWHC maintains an informative website at <[www.ccwhc.ca](http://www.ccwhc.ca)>.

The engines of the CCWHC program are its six Regional Centres. Each Regional Centre carries out all aspects of the CCWHC program within the geographic area each serves, and there are many inter-regional collaborations among Regional Centres as well. The program in each Region emphasizes the priorities of that region as well as participating in CCWHC activities that are coordinated nationally and internationally.

#### Atlantic Region:

The Atlantic Regional Centre of the CCWHC is located within the Atlantic Veterinary College, University of Prince Edward Island, in Charlottetown, PEI., and serves the Provinces of Newfoundland and Labrador, Nova Scotia, Prince Edward Island and New Brunswick. Health and disease issues in marine animals and in threatened and endangered species are a current emphasis. This includes field investigation and examinations of stranded marine mammals in support of the Maritime Marine Animal Assistance Network, a recent investigation of an unusual disease outbreak (avian cholera) in off-shore and on-shore marine birds, and on-site assessment of animal welfare issues. Health issues associated with recovery of the endangered Nova Scotia moose population, and with mercury and lead contamination in Common Loons, are two other topics of current activity.

#### Quebec Region:

The Quebec Regional Centre is located within the Faculté de médecine vétérinaire of the Université de Montréal at St-Hyacinthe, QC, as a major component of the *Centre québécois sur la santé des animaux sauvages* (CQSAS) within the Faculté. The Quebec Regional Centre has a strong emphasis on health and disease issues in the St. Lawrence Estuary, including the threatened Beluga population, other marine mammal strandings, avian cholera in Eider ducks and fish diseases. The Centre also works on arctic health issues, including *Besnoitia* in caribou and giant liver fluke in muskoxen. A recent incursion of the raccoon strain of rabies into the Province is an important current focus of attention. The Quebec Regional Centre is implementing a new post-graduate education program in wildlife as a veterinary specialty, and is expanding opportunities for graduate student education in wildlife health and disease.

#### Ontario & Nunavut Regional Centre:

The Ontario and Nunavut Regional Centre is within the Ontario Veterinary College at the University of Guelph in Guelph, ON. This Centre has long been engaged with health and



disease issues associated with urban wildlife and with the Great Lakes. With the creation of the Territory of Nunavut, the Centre also became directly engaged with arctic wildlife. The Centre's surveillance programs first discovered the current epidemics of Type E botulism in aquatic birds and Viral Hemorrhagic Septicemia in fish on the Great Lakes. Diseases transmissible from wild animals to people also are an emphasis, including Lyme disease and West Nile virus. At the Workshop, the Ontario and Nunavut Regional Centre drew attention to some of the weaknesses in the current wildlife disease surveillance program across Canada, drawing examples from analysis of data from the Ontario-Nunavut region. Disease detection is most intense in areas of high human population, and remote areas are under-represented. Fish, amphibians and reptiles also are severely under-represented, and most fish-kills are not investigated in a manner to permit determination of their causes.

*Western & Northern Regional Centre:*

The Western & Northern Regional Centre is within the Western College of Veterinary Medicine of the University of Saskatchewan in Saskatoon. This Centre serves the four western provinces, the Northwest Territories and the Yukon, in collaboration with the Centre for Coastal Health and the developing CCWHC Centre at the University of Calgary (see below). The emphasis of Centre activities is the prairie, boreal forest, northern mountain and arctic regions. Chronic Wasting Disease (CWD) has been a major theme for the Centre since 2000, when this disease was first discovered in Canadian wildlife. Four graduate students currently are trying to develop a better understanding of CWD transmission, and surveillance and control options. Recent discoveries include the first occurrences of two virus diseases in Canadian cervids: Malignant Catarrhal Fever in moose and Adenovirus Hemorrhagic Disease in mule deer. The Centre emphasizes incorporation of graduate students into Centre activities, and has developed a graduate program specifically on wildlife health and disease.

*Alberta Regional Centre:*

The Alberta Regional Centre is within the Faculty of Veterinary Medicine at the University of Calgary, in Calgary, AB. This Centre currently is under development, as is the Faculty, which will take its first class of veterinary students in the fall of 2008. One of the four foundational areas of emphasis of this new Faculty is Ecosystem and Public Health, with a strong focus on the interface among wildlife, domestic animal and human health. The Calgary Centre already has a number of wildlife programs underway, including community-based wildlife health assessment, and research on northern ungulate pathogens and their responses to climate change.

*Pacific Regional Centre:*

The Pacific Regional Centre of the CCWHC is at the Centre for Coastal Health in Nanaimo, BC. The Pacific Regional Centre delivers the CCWHC program in British Columbia and is a national resource to the CCWHC in epidemiology and risk assessment. In British Columbia, current programs include communication among the several agencies engaged in components of the provincial program in wildlife disease surveillance, and special projects in amphibian species recovery, First Nations health, wild fish-farmed fish health issues, risk assessments for Chronic Wasting Disease and Johne's Disease, and publication of a booklet en-

titled *Diseases You Can Get From Wildlife*, which has been widely distributed in the Province. The Centre also serves as analyst to Canada's Inter-agency Wild Bird Influenza Survey, and leads or contributes to several other national and international programs.

## **2. The Calgary Zoo**

The research focus of the Zoo is on wildlife health and conservation, with the aim to increase the success of wildlife conservation efforts with veterinary knowledge acquired through study of both captive and free ranging wildlife. The Zoo works in partnership with the University of Calgary Faculty of Veterinary Medicine, government agencies and others. Key objectives include: to develop and validate indicators of wildlife health relevant to conservation efforts, to adapt and employ innovations in husbandry, nutrition and reproductive technologies to maintain genetic diversity of wild species, and to develop, refine and adapt veterinary protocols and procedures to improve the safety of clinical interventions for wildlife and people involved in conservation efforts. Some current projects are focused on the Vancouver Island Marmot, Alberta rattlesnakes and amphibians, Wood Bison and Narwal.

## **3. British Columbia**

The Ministry of Environment is responsible for the conservation and maintenance of healthy wildlife populations within the province. A wildlife health program was established to detect, monitor, assess and mitigate emerging and endemic diseases in BC wildlife. Partnerships with provincial and federal human, domestic animal and wildlife agencies, universities and non-government groups, including the CCWHC and the Centre for Coastal Health, are key to a joint and effective delivery of the program. The priorities of the provincial wildlife health program are: monitoring of wildlife health trends and the effects of environmental conditions, such as climate change, through a BC wildlife health database that includes archiving of information and specimens; new or emerging issues such as Chronic Wasting Disease, Avian Influenza, Bovine Tuberculosis and amphibian diseases; endemic diseases in high priority species; health issues affecting BC species at risk; emergency preparation; diseases transmissible among wildlife and domestic animals; zoonotic diseases; wild animal care and welfare issues; staff training programs; staff and public education and outreach; and forensic, pathological and field immobilization support services to investigate and respond to wildlife health and related issues.

## **4. Alberta**

The wildlife health and disease activities in Alberta include the programs of three provincial Ministries and collaborations with others and with the CCWHC. Within the Ministry of Sustainable Resource Development (SRD), the Fish and Wildlife Branch has a wildlife disease group with a mandate to conserve and maintain healthy wildlife populations through programs of education, risk assessment, surveillance, management and research. Chronic Wasting Disease and diseased northern bison are issues of dominant current concern. Also within SRD,

the Foothills Grizzly Bear Research Project is evaluating the relationships among landscape conditions, long-term stress of wild animals, wildlife health and population performance, and is developing new tools to measure this relationship and manage landscapes accordingly. The Ministry of Tourism Parks and Recreation manages wildlife health and disease on provincial park lands and works collaboratively with CCWHC and SRD. The Ministry of Agriculture and Rural Development maintains capacity for animal disease diagnosis; its mandate includes diseases shared by wild and domestic animals, zoonotic diseases and food safety.

## 5. Saskatchewan

In Saskatchewan, provincial Ministries and the CCWHC collaborate to deliver the province's wildlife health and disease programs. The Ministry of Environment is responsible for wildlife health and disease as these affect management and conservation of wildlife and fisheries. Diseases that may be transmissible from wildlife to food-producing animals and affect agricultural economies or food safety are issues for the Ministry of Agriculture, and zoonotic diseases in wildlife are important to the Ministry of Health. Chronic Wasting Disease is a dominant provincial concern. The Ministry of Environment manages a major program to reduce the spread of the disease, and collaborates with the CCWHC on research to improve disease management. The Ministry also supports the programs on avian influenza and on West Nile virus led by the Ministries of Agriculture and of Health, respectively. General wildlife disease surveillance in the province is a joint program all three Ministries and the CCWHC. The Ministry of Agriculture manages the provincial CWD surveillance program in farmed cervids and covers much of the cost of surveillance for avian influenza in wild birds. The Ministry of Health carries out surveillance for West Nile virus in vector mosquitoes and in people, and also for pathogens carried by the tick *Ixodes scapularis*.

## 6. Manitoba

The wildlife health and disease program of the Province of Manitoba has developed around the issue of Bovine Tuberculosis in both wild and domestic animals, and has expanded to include Chronic Wasting Disease, Avian Influenza and West Nile virus as special concerns. There are many stakeholders in these issues, and the program thus involves collaborations with many agencies and organizations, including the provincial Ministries of Conservation; Agriculture Food and Rural Initiatives; Health; Emergency Measures; two federal agencies, the Canadian Food Inspection Agency and Parks Canada Agency, and two non-government groups: the Manitoba Wildlife Federation and the Manitoba Cattle Producers Association. The program also includes consultations with Saskatchewan, North Dakota and with Minnesota, where another focus of Bovine Tuberculosis in wild deer is also a concern.

## 7. Ontario

The wildlife health and disease program of the Province of Ontario rests on a policy base that includes Ontario's *Biodiversity Strategy* (2005), which calls for further development

and implementation of wildlife disease surveillance, prevention and response capacity supported by research on response options, the Ministry of Natural Resources' *Our Sustainable Future* (undated), which articulates similar goals, and the Annual Report (2007) of Ontario's Auditor, which recommends that provincial agencies develop stronger programs to detect and monitor wildlife diseases. Three provincial Ministries – responsible for natural resources, agriculture and human health – collaborate on wildlife health and disease issues in close association with the CCWHC and with several federal Ministries with parallel responsibilities. Issues of current dominant concern include Rabies, Avian Influenza, West Nile virus, Chronic Wasting Disease and Viral Hemorrhagic Septicemia, with climate change poised to impose markedly altered patterns of health and disease. There are multiple strong linkages among wildlife health, human health, domestic animal health and the Province's economic health. Enhanced linkages among the CCWHC and government agencies responsible for animal, human and economic health in the province must be developed in order to meet current and future provincial needs.

## 8. Quebec

The wildlife health and disease program of the Province of Quebec is organized as a partnership among three provincial Ministries – Natural Resources and Wildlife (MRNF), Health and Social Services (MSSS), and Agriculture, Fisheries and Food (MAPAQ) – the Québec Wildlife Health Centre (CQSAS/CCWHC-Québec) and the Makivik Corporation, which provides animal and human health management and services for the Inuit regions of Northern Quebec. In 2005, a wildlife network was created among agencies to enhance wildlife disease surveillance and the dissemination of information about wildlife health and disease. Disease surveillance includes general surveillance for all diseases in wildlife and programs targeted specifically on the raccoon strain of Rabies, Avian Influenza, Chronic Wasting Disease and the Lyme Disease bacterium in its vector tick species. The Makivik Corporation program includes research on zoonotic diseases and safety of foods derived from wildlife, diseases of significance to wildlife management, and dissemination of information on animal and human health to the largely Inuit population of the Nunavik region. Of predominant concern currently are *Trichinella* in walrus and Inuit traditional marine foods, *Toxoplasma*, *E. coli* O157:H7 and *Salmonella* sp. in traditional foods, *Besnoitia* in caribou, Anasakid nematodes in fish and marine mammals, and *Giardia* and *Cryptosporidium* in mussels and muskox tissues.

## 9. Newfoundland and Labrador

The wildlife health and disease program involves three Ministries: Natural Resources (including agriculture), Environment and Conservation, and Health and Community Services. In addition to general wildlife disease surveillance, the program has a number of specific issues of concern, including Aleutian Disease in farmed and wild mink, with possible implications for the endangered Pine Marten, declining caribou populations, intestinal disease in moose of unknown cause, the nematode *Angiostrongylus vasorum* in wild foxes and coyotes, and surveillance for Avian Influenza virus in wild birds, all on the Island of Newfoundland.

## 10. Yukon

The wildlife health and disease program of the Yukon, a responsibility of the Department of Environment, recognizes and is preparing for rapid changes in the immediate future. Climate change is a predominant concern. It will influence the types and numbers of host species and the intensity of some diseases. It is making the Yukon more attractive for livestock production, with consequent conversion of wildlife habitat to farm land and increasing interactions between wild and domestic animals. There is increasing transportation of livestock to the Yukon and through the territory to Alaska. New wild species are extending their ranges into the Yukon, for example White-tailed Deer, Cougar and bats. Another concern is environmental contaminants. Climate change may bring new patterns of deposition of industrial chemicals and greater availability of natural mercury sources and chemicals from abandoned mines. The Yukon program monitors major zoonotic diseases, the safety of country foods, and the general health of wildlife populations in partnership with the CCWHC, regional federal, provincial and state agencies, and strong First Nations support.

## 11. Northwest Territories

The wildlife health program of the Northwest Territories is managed by the Department of Environment and Natural Resources in collaboration with federal and territorial agencies, wildlife co-management boards, and community wildlife organizations. The program has four main components: disease surveillance, provision of information to the public and to territorial decision-makers, education for various target audiences, particularly with respect to zoonotic diseases and human health, and wildlife disease response and management. General disease surveillance relies heavily on subsistence hunters and trappers, commercial wildlife harvests and the general public to detect disease problems and provide information and samples to the Department. Targeted surveillance is conducted on specific diseases or species of concern. Response and management activities rely on investments and collaborations in research on specific disease issues of concern, such as anthrax, brucellosis and tuberculosis in bison, rabies in foxes, changes in caribou populations, and new and emerging diseases. Current program priorities are to enhance wildlife disease surveillance, to detect, predict, prepare for and manage the effects of climate and other environmental changes, the northern diseased bison issue and Wood Bison recovery, and full implementation of *Canada's National Wildlife Disease Strategy*.

## 12. Nunavut

The wildlife health and disease program of Nunavut is being developed. Nunavut became a territory of Canada in 1999 and much of its civil infrastructure is being created for the first time, including its wildlife programs. Nunavut has a challenging demography, with a population of 31,000 people living in 26 widely-separated communities spread across an expanse of 1.93 million square kilometers. The Nunavut program of wildlife disease surveillance depends on the participation of hunters and trappers for disease detection, and on Conservation Officers in each community to receive information and samples from hunters, forward these to the

CCWHC, and receive and disseminate laboratory results and other information back to the hunters and their communities. The program also includes research projects on specific diseases such as current studies on Brucellosis in Caribou on Southampton Island in Hudson's Bay. Staff turnover, community isolation and decentralized governance have slowed the development of the Nunavut program. At the same time, community interest and concern about wildlife health are very high, and this provides a sound basis for further program development.

### 13. Canadian Food Inspection Agency

The Canadian Food Inspection Agency (CFIA) has broad responsibility for animal health in Canada, and special responsibility for managing a list of diseases specified in the regulations associated with the federal Health of Animals Act. Seven of these diseases currently are present in Canadian wildlife: Anthrax, Bovine Tuberculosis, Brucellosis, Chronic Wasting Disease, Avian Influenza (H5 and H7 strains), Newcastle Disease and Rabies. Canadian wild animal species are known to be susceptible to an additional 15 of these diseases, most of which currently are not present in Canada. Current priorities for the CFIA with respect to diseases that do or may affect Canadian wildlife are Bovine Tuberculosis, present in some northern Bison herds and in Elk and White-tailed Deer in the area of Riding Mountain National Park, Chronic Wasting Disease, which was eradicated from farmed cervids in Canada but which persists and is spreading in wild cervids in Saskatchewan and Alberta, H5 and H7 strains of Avian Influenza, which occur in wild birds in Canada and which may be the source of virus strains that have become highly pathogenic to chickens after undergoing genetic alterations within poultry flocks, and Foot and Mouth Disease, which might become established in Canadian wildlife if it were to arrive in Canada through some breach of import controls.

### 14. Environment Canada

The wildlife health and disease program of Environment Canada (EC) involves participation from both the Canadian Wildlife Service (within the Environmental Stewardship Branch) and the directorates of Landscape and Wildlife Science and of Water Science and Technology (within the Science and Technology Branch). Wildlife diseases have implications for EC's mandates under five different federal Acts. The EC program includes maintaining a strong science interface with policy development associated with wildlife health and disease issues, wildlife disease surveillance and monitoring, research on specific wildlife health issues within the EC mandate, and outreach and communication on these same issues. Current policy issues include development and implementation of the *Canada's National Wildlife Disease Strategy* and the developing *National Animal Health Strategy*, planning responses to the possible discovery of highly-pathogenic avian influenza in migratory birds, revision of more general bird mortality responses, and health and safety policies for personnel handling wild birds. Surveillance programs include monitoring the levels and affects of contaminants in migratory birds, major engagement in Canada's Inter-agency Wild Bird Influenza Survey, and regional surveillance for avian botulism and avian cholera. Research is a major component of the EC wildlife health and disease program. Much of this is done collaboratively with the CCWHC and other university-based groups. Recent projects include the ecology of avian influenza viruses and of

avian cholera, type E and type C avian botulism, chytrid fungus and ranavirus diseases in amphibians, parasites in fish and in birds as indices of environmental stresses, and interactions among pathogens, environmental contaminants and host reproductive success and immune function. EC maintains a broad research program also on a wide range of environmental contaminants and their effects on wildlife population parameters.

## 15. Public Health Agency of Canada

The wildlife health and disease program of the Public Health Agency of Canada (PHAC) is oriented toward wild animals as monitors and as reservoirs for diseases that can affect people (zoonotic diseases). PHAC is a new government agency derived from Health Canada with a long historic legacy of public health and zoonotic disease work in Canada. The Dominion Laboratory of Hygiene, established in the 1930s, began such work. The major laboratory component now resides in the National Microbiology Laboratory in Winnipeg, which includes high security biosafety level 3 and level 4 laboratories, as well as in some other specialist laboratories in Lethbridge, Guelph, Ottawa and St. Hyacinthe. There also is extensive epidemiological support associated with zoonotic diseases. Initial concern about wildlife zoonoses was focused on rodent-borne infections such as plague, Rocky Mountain spotted fever and tularemia. The list of diseases of concern now is much longer and includes other diseases endemic to Canada, such as leptospirosis, hantaviruses, encephalitis viruses, and *Bartonella*, emerging pathogens such as West Nile virus, Lyme disease and human anaplasmosis, and wildlife pathogens from other parts of the world, such as Ebola and Nipah viruses, which PHAC must be prepared to identify quickly should they arrive in Canada by some means. PHAC also is active in trying to bring together practitioners, scientists and institutions devoted to animal or to human disease in order to share information and seek new methods to apply the “one health” paradigm to reduce the risks of illness to Canadians. PHAC has been and remains a strong supporter and participant in the CCWHC.

## 16 Fisheries and Oceans Canada

The wildlife health and disease program of Fisheries and Oceans Canada (DFO) addresses a variety of health and disease issues in a wide range of species, including fish, shellfish and marine mammals. In all programs, issues of importance include sustainable harvests, food safety, zoonotic diseases, and conservation of species at risk. The National Aquatic Animal Health Program is a recent initiative with a broad focus on health issues for which DFO has responsibility. It includes close collaboration between DFO and the Canadian Food Inspection Agency. The DFO marine mammal program includes general monitoring of diseases and research focused particularly on species at risk and zoonotic diseases. Current priorities are - species at risk: St Lawrence Estuary beluga, right, bowhead, blue, and northern bottle-nose whales, and certain stocks of Pacific killer whales; priority species for commercial & subsistence harvest: harp, hooded, and ringed seals, walrus, beluga, narwhal and bowhead whale; and priority diseases: brucellosis, morbillivirus diseases, toxoplasmosis, verminous pneumonia, anisakiosis, trichinellosis, giardiasis, leptospirosis, sealfinger, influenza A, sealpox, phocine herpesvirus, and new emerging diseases, including zoonoses.

## 17. Parks Canada

The wildlife health and disease program of the Parks Canada Agency encompasses activities in line with each of the six goals of *Canada's National Wildlife Disease Strategy*. Parks Canada's program is restricted to national parks and other federal lands for which the Agency is responsible. Parks Canada seeks to prevent new wildlife disease issues through proactive programs and health risk assessments for new initiatives, such as introduction of Black-footed Ferrets into grasslands National Park. Early detection of diseases is done primarily through participation in the national surveillance program operated and coordinated by the CCWHC. Parks Canada is considering use of disease surveillance data as one measure of the ecological integrity it is mandated to maintain in national parks. The Agency has used the occurrence of Bovine Tuberculosis in the area of Riding Mountain National Park to develop a new collaborative paradigm for assessing disease problems and formulating responses to them that serve the needs of all sectors. It also participates directly in scientific research aimed at developing best methods to achieve disease management goals and in applying and testing these in the field. Bovine Tuberculosis, Brucellosis and Anthrax are diseases of considerable importance on park lands, and affect recovery planning for Wood Bison. Parks Canada achieves educational goals through in-house training of field personnel and uses a range of communications approaches and opportunities both to facilitate its collaborative disease response and management actions and to inform outside groups and the public about its programs.

## 18. Canadian Wildlife Federation

The Canadian Wildlife Federation (CWF) is a national non-government organization which addresses issues that affect wildlife populations, habitat and the environment. Its goal is healthy, sustainable wildlife populations and healthy habitats. A major aspect of CWF activity is its Education and Awareness Programs, which contribute to conservation through school and public education. CWF also works directly with government on various programs and issues. It participated in the development of *Canada's National Wildlife Disease Strategy*, and is a member of the CNGO-DFO Steering Committee established to achieve better conservation of fish and fish habitat. It is a Standing Observer at meetings of the Committee on the Status of Endangered Wildlife in Canada (COSEWIC), contributed information to Canada's Expert Panel on Groundwater, and advocated that ecological and conservation values form the foundation of Canada's Forest Strategy for 2008 and Beyond. CWF opposes game farming in part because of inherent disease hazards such as Chronic Wasting Disease. CWF is concerned about the impact of wind turbines on birds and bats and, while supportive of development of wind-driven generating facilities as long as environmental impact assessments are carried out, sought national standards to minimize negative impacts. CWF also is concerned about negative impacts on wildlife from aquaculture, and advocates for more scientific research on the environmental impacts of aquaculture.



## 19. State of Alaska

The wildlife health and disease program of the State of Alaska falls largely under the jurisdiction of the Alaska Department of Fish and Game (ADFG), Division of Wildlife Conservation. However, this responsibility is shared with the Office of the State Veterinarian in the Department of Environmental Conservation, which is responsible for farmed animals, and with the Department of Health and Social Services, which manages human risks from zoonotic diseases. The University of Alaska also is an important player, with research projects on wild animal diseases and educational programs in collaboration with ADFG. A number of federal agencies also carry out wildlife disease surveillance and related activities in Alaska. The goals of the State's wildlife disease surveillance program are to detect the introduction of new pathogens in domestic animals that might have an impact on wildlife, detect wildlife pathogens not currently present, such as West Nile virus, winter tick, *Parelaphostrongylus tenuis* and highly-pathogenic avian influenza, and to detect changes in pathogen distribution among hosts and geographically, for example, rabies, *Brucella suis* biotype 4, and the louse *Trichodectes canis*. Surveillance methods include opportunistic sampling and active collection programs, *post mortem* examinations and serology.

## 20. National Wildlife Health Centre of the U.S. Geological Survey (Department of Interior)

The mission of the National Wildlife Health Center (NWHC) is to serve the nation and its natural resources by providing the best available science and technical support, and to disseminate information to promote science-based decisions affecting wildlife and ecosystem health. The NWHC provides information, technical assistance, research, education and leadership on national and international wildlife health issues. The NWHC was established in 1975 and is one of 17 Biological Science Centers of the USGS. The NWHC carries out wildlife disease surveillance on federal lands and in collaboration with State agencies. This includes field investigations and diagnostic assessments for which the NWHC has a full range of capacities and laboratories maintained at biological safety level 3. Surveillance data are maintained in two computerized databases, and extensive collections of reference biological materials also are maintained. In 2007, specimens were received by the Center from 542 disease occurrences, nationwide. In addition to disease surveillance, research is a major component of the NWHC mandate. Recent and current projects include West Nile virus studies, special surveillance for avian influenza viruses, pathogenesis and vaccination against plague, and amphibian diseases. Communication also is a key activity. The NWHC maintains an information-rich website, including on-line textbooks and manuals about wildlife diseases, participates in initiatives to identify and share wildlife health information, and provides both national and international education programs to build wildlife health management capacity and expertise.

## 21. The Wildlife Conservation Society - Field Veterinary Program

The mission of the Wildlife Conservation Society (WCS) is to save wildlife and wild lands through science, conservation and education. WCS currently is engaged in over 60 pro-

jects in the Americas, Africa and Asia. The Field Veterinary Program of WCS uses the health sciences to meet conservation challenges through research, building wildlife health science capacity locally, and providing scientific understanding to inform and influence relevant government policies. The Global Avian Influenza Network for Surveillance (GAINS) is a current example of a WCS Field Veterinary Program initiative. GAINS is building capacity to carry out surveillance for avian influenza in areas without such capacity, and is creating database and communications tools needed to make surveillance data available to any and all potential users. GAINS is active in 34 countries in Asia, Africa and the Americas. Tools and networks developed through GAINS can serve as a foundation for more general wildlife disease surveillance or for special programs for other emerging diseases of international significance.

## **REVIEW AND CRITIQUE OF CANADA'S CURRENT WILDLIFE HEALTH AND DISEASE PROGRAMS MEASURED AGAINST THE GOALS OF CANADA'S NATIONAL WILDLIFE DISEASE STRATEGY.**

### **Background**

Day two of the workshop was dedicated to a critique of Canada's overall activities and capacity for wildlife health and disease management. While there is no absolute gold standard for national preparedness and capacity to manage disease issues associated with wildlife, *Canada's National Wildlife Disease Strategy* (NWDS) (Appendix C) sets out Canadian government policy (federal-provincial/territorial) in this area. Therefore, in these discussions, the NWDS was used as the standard against which to measure current programs.

The day began with a brief overview of *Canada's National Wildlife Disease Strategy*, the impetus for its development, and planning carried out for its implementation up to October 2005, when the NWDS was endorsed by federal-provincial /territorial Resource Ministers. The NWDS was developed to replace a chaotic and incomplete legal and regulatory environment associated with management of wildlife disease issues with a clearly defined national policy. The NWDS sets out a series of principles for the inter-jurisdictional collaborations required to manage wildlife disease issues, and identifies six goals to be achieved in order to position Canada as a nation recognized internationally to be well prepared and capable of managing these disease issues. The goals are directed at 1) Prevention of new wildlife disease issues of socioeconomic importance; 2) Early detection of important wildlife diseases; 3) Capacity for rapid responses to new wildlife disease issues; 4) Effective, science-based management actions; 5) Education and training of personnel required to manage wildlife disease issues; and 6) Establishing active communications systems to assure the function of the total national program and its many components.

The NWDS was developed through a widely consultative process between 2003 and 2004, and detailed Action Plans for its implementation were drafted in 2004 by six teams with expertise appropriate to each of the six goals. The final implementation plan was generated at a workshop sponsored by Environment Canada and attended by approximately 80 people from

government and non-government sectors. At that workshop, the draft Action Plans were reviewed, discussed and finalized. Although the NWDS itself became Canada's policy through its endorsement by Resource Ministers in October 2005, formal implementation of the NWDS through its Action Plans has not yet been undertaken.

### Organization of the Discussion and Critique

The objectives established for this discussion and critique of current wildlife health programs were:

- To identify the strengths, weaknesses, opportunities and threats pertaining to wildlife health and disease planning, operations and management in Canada at regional (east, west) national and international levels and scales. How are we doing? What is working and what is not? Where are we doing a good job and where are we failing? This pertained to all programs and activities collectively across Canada, not just to those of the CCWHC itself.
  
- To identify where and how improvements might be made with approximately current resources, and/or what the priorities for improvement should be, irrespective of resources.
  
- To learn whether, and, if so, how, the CCWHC could alter its program to better assist its partner agencies to deliver their wildlife health and disease programs, or to achieve regional, national or international objectives not attainable by any one or a few of these partner agencies alone.

The six goals of the NWDS were employed as a useful, but not limiting, checklist for discussion. The point was to discuss wildlife health and disease programs, and not to discuss the NWDS itself.

To facilitate discussion and to ensure that all voices were heard, participants were divided into four discussion groups, and each was assigned one of four geographical and organizational scales within which to frame its discussion:

- Western Canada (BC, AB, SK, MB, YT, NT)
- Eastern Canada (ON, QC, NB, PE, NS, NL, NU)
- Canada Nationally
- Canada Internationally

Each group held discussions from 0900h to 1100h and then made a 15 minute report to the participants as a whole from 1100h to 1200h. The discussion at each group was facilitated by a designated discussion leader and notes were taken on a laptop computer by a designated recorder. From 1330h to 1500h, a general discussion was held among all participants, moderated by Ted Leighton of the CCWHC.

In the following paragraphs, a synthesis of the discussions held by all groups is presented. This synthesis was made from the notes taken during each group discussion, from the presentations made by each group, and from notes taken during the general discussion among all participants that followed the small group presentations.

**NWDS Goal #1: Prevention of new wildlife disease issues of socioeconomic importance.**

There was a consensus that Canada is not well prepared to prevent important disease issues associated with wild animals. With respect to importation of disease-causing agents, there is no clear connection between international intelligence regarding potential global health risks and controls that might be implemented at Canada's borders. There is a clear connection among these elements where diseases listed in the regulations of the federal Health of Animal Act is concerned and this is managed capably by the CFIA. On the other hand, there is virtually no assessment, regulation or mitigation of the many significant health risks associated with the trade in exotic pets or with other forms of wild animal commerce, legal and illegal.

Canada is similarly vulnerable with respect to new wildlife disease issues arising within the country. While this is, in part, due to lack of knowledge regarding the processes and risks of disease emergence, other sources of disease risks, such as absence of health inspection for wildlife-derived foods and weak regulations associated with the transport and release of animals for wildlife management and rehabilitation purposes, are well-known but generally are not addressed by current programs. Baseline information about wild animal pathogens is incomplete, and there are no organized national archives of wild animal sera and tissues for retrospective analysis, making it difficult to recognize truly new pathogens with confidence.

Global environmental change is occurring at speeds and scales never encountered before. These greatly increase the probability of the arrival of new and significant wildlife disease events from both external and internal sources.

**NWDS Goal #2: Early detection of important wildlife diseases**

Early detection of important wildlife diseases is dependent on Canada's national wildlife disease surveillance program. The program currently in place is a good one, but needs further development. The program of general wildlife disease surveillance, covering any and all diseases, currently provides significant coverage of disease events in mammals and birds in areas of human settlement. Coverage of sparsely-settled areas is inadequate to provide vigilance for new disease issues. Targeted surveillance programs for specific pathogens such as West Nile virus and avian influenza may provide better national coverage.

There is no national or regional general disease surveillance program for pathogens in wild fish, and both amphibians and reptiles also are poorly covered. Coverage in the national general surveillance program should be extended to these species, and gaps in geographic and species coverage with respect to mammals and birds need to be filled.

Environmental contaminants are not systematically included in the national wildlife disease surveillance program. Although there are some collaborative programs of specimen procurement with federal contaminant programs, these linkages should be strengthened with respect to specimens, data sharing, and co-analysis of data sets for infectious and non-infectious disease-causing agents. No structure currently exists to facilitate such analysis.

Communication of findings and analysis of data from general wildlife disease surveil-

lance need to be developed further. Information about disease occurrences in wildlife should be made more widely available, particularly to scientists and managers in wildlife, agriculture and public health agencies, but also to the public.

Diagnosis of diseases in wild animals includes some specialized tests and procedures not typically available in veterinary or public health diagnostic laboratories. Diagnostic tests for pathogens that do not commonly affect humans or domestic animals generally are not available in these laboratories. Furthermore, some diagnostic tests used in medical and veterinary laboratories are invalid when applied to species for which they were not designed. For this reason, Canada requires some degree of laboratory diagnostic capacity specifically for pathogens of importance to wild animals. No such capacity currently exists in Canada in an accessible, organized form.

Wildlife disease surveillance requires the constant vigilance and participation of Canada's entire work-force of wildlife field personnel, assisted by the public. Regular and direct contact between field personnel and the disease surveillance program managers is crucial to the adequacy of disease surveillance. Communication and direct interaction with field personnel should be enhanced.

The absence of a national archive of animal tissues and sera – a national tissue and serum bank – was identified as a significant gap in Canada's surveillance and disease management program. Many individual archives exist, but there is no directory of their content and no systematic prospective collection is made from the flow of specimens through the laboratories which participate in wildlife disease surveillance. Such archives can be used to determine whether a pathogen, newly-discovered in Canada, is indeed new, and to evaluate the risk posed by pathogens from outside of Canada for which no records exist in national surveillance data.

### **NWDS Goal #3: Capacity for rapid responses to new wildlife disease issues**

Canada has no organized capacity to respond rapidly or effectively to new important wildlife disease issues; this goal of the NWDS has not been achieved in any degree. Current response capacity is largely hypothetical, *ad hoc* and unplanned. This is a major weakness and vulnerability in Canada's overall capacity for health and disease management. The Foreign Animal Disease Eradication Support (FADES) plans, negotiated or pending between the CFIA and the provinces and territories, do not include diseases in wild animals to any significant extent. Channels of communication among government agencies regarding wildlife disease issues are weak and *ad hoc*. There is no established protocol for national or regional decision-making as to whether or not to respond to potential wildlife disease issues, nor for determining which agency or agencies would lead in such responses. There are no established procedures whereby urgent responses to wildlife disease issues can gain access to emergency contingency funds.

Participants identified lack of response planning and absence of a governance structure for decision-making as key factors that jeopardize Canadian society with respect to the growing socioeconomic risks associated with wild animal diseases. Yet, Goal #3 appears fully achievable, perhaps even with existing resources. Achievement would require agreement on roles and responsibilities, identification of positions of responsibility and authority in all relevant agencies, and agreement on a decision-making process that will connect information from wildlife disease surveillance and related sources to the decision-making network and then, when decisions to respond are taken, to appropriate responses based on pre-planning and pre-identification of personnel and resources. While many wildlife disease discoveries will not be emergency issues requiring immediate responses, some will, and a system of assessment, decision and action similar to those established for forest fires and chemical spills is required to assess new events and make timely decisions about whether or not to intervene.

Participants suggested that the inclusion of wildlife components in some planning and table-top disease occurrence and response exercises, as carried out by CFIA, PHAC and their provincial/territorial counterparts, might be a way to begin identifying the personnel and required nodes of the communications and decision-making network required to achieve NWDS Goal #3. Another, complementary, approach would be to assemble smaller regional investigative and response teams which might begin the process of making some generic plans for responding to wild animal diseases if and when such responses are required.

#### **NWDS Goal #4: Effective, science-based management actions**

Scientific research on wild animal diseases takes place in Canada at many different institutions. The total amount of such work is quite small, however, relative to Canada's size and wild animal populations. Furthermore, there is no impetus or process whereby wildlife research relevant specifically to the most important knowledge gaps faced by wildlife disease managers is either prioritized for funding by Canadian research scientists or reviewed and incorporated into guidelines for best approaches to management responses to disease issues. Workshop participants noted that a Procedures Manual for wildlife disease management that offers procedural options to achieve specified disease management outcomes based on the best currently available wildlife and biomedical science really is a pre-requisite to effective wildlife disease management and the international acceptance of Canada's capacity in this regard.

Participants also cited the need for a national body that could set national priorities for scientific research in support of wildlife disease management, and disburse funds for such studies. Partnership with the federal granting councils (NSERC, SSHRC, CIHR, Industry Canada's Networks of Centres of Excellence) was suggested as one path forward, but might require a pool of funds to bring to this partnership. Participants also noted that more could be done to share the results of research already done and which may have application beyond its immediate purpose. While research that is published in scientific journals is readily accessible, many studies, such as risk analyses carried out by government agencies or their consultants, often are much less widely distributed and are not indexed in scientific literature databases. An active program to identify and share such studies and to make them accessible seemed to be

an achievable goal worth attempting. In addition, agencies and their staff who carry out disease management programs could be more diligent in reporting on the methods and outcomes so that all those involved with wildlife disease management in Canada can learn from these experiences. Such reports also must be made widely available.

**NWDS Goal #5: Education and training of personnel required to manage wildlife disease issues**

There was broad consensus that continuing education at both technical and professional levels is essential to Canada's capacity to manage wildlife health and disease issues. While there are now various opportunities for such continuing education, the participants felt that it would be of great benefit to establish a more coordinated national system. For professional staff, short courses on specified topics taught at a rigorous and applied level are needed. For technical staff, it was suggested that a short course of standardized curriculum on wildlife health and disease that would include important aspects of zoonotic disease risks and occupational health and safety considerations is needed. This might well result in issuance of certificates that could become an expectation of wildlife field personnel, in a manner similar to the CAZWV course on chemical immobilization.

The participants urged that regular national workshops for wildlife health professionals across Canada, such as the current Workshop, have enormous educational and communications values, and that these should occur regularly, perhaps every two years. Two additional suggestions were made regarding this educational goal. One was that graduate students destined for careers in wildlife health and disease be given opportunities to include, either within or as supplements to their programs, significant experience working within one or more wildlife agencies. It was felt that such opportunities would benefit both the students and the agencies, and that they should be explored and piloted. Another was that middle and upper managers in agencies need to be educated about the significance of wild animal diseases within their areas of responsibility. No clear process to achieve this goal was proposed, but it was noted that if continuing education for agency staff is implemented effectively, this will eventually result in a better informed management structure as personnel move upward within their organizations.

**NWDS Goal #6: Establishing active communications systems to assure the function of the total national program and all of its many components**

There was broad consensus that a fully functional and actively-maintained communications program is essential to the achievement of any and all of the six NWDS goals. There also was consensus that communications among agencies on wildlife health issues currently are fragmented, incomplete and *ad hoc*. A functional national program of wildlife health and disease management will require an active physical hub for communications that will link prevention and early detection (surveillance) components with the governance structure established for decisions and the planning and priority-setting associated with application of the best science to disease management issues. Communication pervades all parts of wildlife disease

management, and can only be achieved through sound planning, dedicated personnel and constant operation.

Communication includes the development of effective communications tools to serve both the internal needs of the national program and the information needs of the media and the public. Web sites, newsletters, reports, alerts – all these were seen to be important. Special consideration should be given to remote areas and specific cultural and linguistic groups such as Inuit, Metis and First Nations communities. Most agencies have their own communications units, and mechanisms need to be established so that agencies providing information on the same issue provide correct and consistent information and messages.

The many programs described during day 1 of the Workshop include communications activities that are essential to their functions, and there also are lines of communication that link these programs with each other in various ways. Each of the options put forward during the Workshop to move closer to achieving the goals of the NWDS implies an element of improved communication. Achievement of Goal #3 – the capacity for timely responses to important wildlife health issues – most fundamentally requires a new and effective communications system supported by agreements among agencies on processes for decision-making.

## **ACTION ITEMS FOR THE CANADIAN COOPERATIVE WILDLIFE HEALTH CENTRE**

One objective of the Workshop was to determine whether, and, if so, how, the CCWHC could alter its program to better assist its partner agencies to deliver their wildlife health and disease programs, or to achieve regional, national or international objectives not attainable by any one or a few of these partner agencies alone.

Although enhancements would improve all aspects of the CCWHC program, the current program is highly valued by the Workshop participants. The CCWHC was urged to continue to serve as a central coordinating hub for the network of wildlife health and disease programs and personnel across Canada. The status of the CCWHC as a university-based scientific and educational organization, outside of government and without legal authority but serving and supported by government agencies responsible for wildlife and environment, agriculture and public health, is a key strength of the organization. Some participants felt that upper management in government agencies is unaware of the quality, cost-efficiency and effectiveness of the CCWHC program, and that steps should be taken to make this exceptional program better known and valued at these levels.

Various actions that the CCWHC might take to enhance wildlife health and disease management in Canada were identified during the Workshop discussion, in association with each of the NWDS goals. A strong consensus among Workshop participants was that Canada's first priority for wildlife health and disease management should be to implement its internationally-acclaimed *National Wildlife Health Strategy*, in full. The CCWHC would then assume a central coordinating role in the management of this expanded national program. Pending full



implementation of the NWDS, the CCWHC was asked to consider the following program enhancements.

- Goal #1:** - Develop science-based expert evaluations of major topics associated with prevention of new wildlife disease issues in Canada, to highlight risks and inform government policies.
- Goal #2:** - Incorporate wild fish fully into Canada's national programs of general and targeted wildlife disease surveillance.
- Establish a Directory of reference collections of wildlife sera and tissues across Canada.
- Establish a Directory of sources of diagnostic tests for wildlife pathogens across Canada.
- Establish the capacity within the CCWHC to provide certain key diagnostic tests for pathogens which otherwise would not be available in Canada and which are required for adequate national diagnostic capacity.
- Goal #3:** - Assist government agencies to achieve full implementation of *Canada's National Wildlife Disease Strategy*.
- Goal #4:** - Assemble an Internet-accessible library of existing health risk analyses, disease management report documents, wildlife health strategy documents and similar publications.
- Goal #5** - Develop and provide to agency personnel a standardized short course on wildlife diseases, perhaps in both full-length and refresher course formats.
- Organize annual educational programs for wildlife health professionals on specific topics.
- Hold additional national Workshops for continuing education and national coordination and communication, perhaps in alternate years.
- Goal #6:** - Create an updated Wildlife Disease Expertise Directory for Canada
- Develop and use a broad list of recipients for electronic messages relevant to wildlife health and disease issues in Canada.
- Enhance the information regarding disease surveillance results available on the CCWHC website.

## International Engagement

Participants discussed whether or not the CCWHC should undertake projects outside of Canada. The broad consensus was that the CCWHC should accept a limited amount of international engagement. Designation of the CCWHC as a Collaborating Centre of the OIE is a significant credit to Canada internationally. As a Collaborating Centre, it is expected that the CCWHC will provide its expertise to OIE member countries in various ways. Doing so makes a positive contribution to Canada's place in the world and to its reputation for excellence in animal health management. International projects also bring experience and expertise back to Canada to strengthen its internal programs and sharpen its preparedness for emerging diseases. At the same time, there is an endless need for such international assistance, and the CCWHC risks diminishing its strengths and effectiveness in Canada if it becomes over-committed to international projects. A moderate level of international engagement should be pursued, with projects selected that draw on CCWHC expertise in disease surveillance and management, national networks, and working with indigenous people.

## ACKNOWLEDGMENTS

The success of this workshop was due entirely to the many participants from government and non-government organizations who presented their programs and joined in the critical discussions. In each case, the cost of participation was borne by the agency or organization represented. The Workshop could not have taken place without this high level of support. The Workshop was organized in Calgary with the assistance of the Faculty of Veterinary Medicine at the University of Calgary. The Calgary Zoo donated the spectacular meeting space and was a welcoming host in a hundred different ways.

## PREPARATION OF REPORT

This report was written by the Headquarters Office of the CCWHC, with Ted Leighton, Executive Director of the CCWHC, serving as senior author and editor. The summaries of program presentations provided in the report were reviewed, edited and approved by each presenter. The entire report was made available to all participants for review and comment prior to final editing. Thus, while this report does not represent the official views or policies of any of the agencies and organizations which participated in the workshop, it is an accurate representation the material presented and discussed at the Workshop.

### Appendices:

A - Workshop participants; B - Workshop Schedule; C - NWDS

**APPENDIX A****CCWHC WORKSHOP PARTICIPANTS**

Argue, Connie	Kutz, Sue
Artsob, Harvey	Lair, Stephane
Baker, Carla	Lanthier, Clement
Barker, Ian	Leighton, Ted
Barreda, Dan	Lelievre, Frederick
Beckmen, Kimberlee (Alaska)	Lumsden, John
Black, Sandy	McBurney, Scott
Bollinger, Trent	Measures, Lena
Bridger, Kim	Merchant, Phiip
Brown, Kevin	Munger, Catherine
Brook, Ryan	Murphy, Nicola
Buck, Peter	Neimanis, Aleksija
Buntain, Bonnie	Nielsen, Ole
Campbell, Doug	Parmley, Jane
Cattet, Marc	Pybus, Margo
Cribb, Alistair	Reid, Terri-Lee
Crichton, Vince	Renwick, Shane
Curry, Pat	Rogers, Laura
Dallaire, Andre	Salb, Amanda
Daoust, Pierre-Yves	Schuler, Krysten
De Bruyn, Nathan	Schwantje, Helen
Elkin, Brett	Seguin, Guylaine
Findlay, John	Shury, Todd
Fuentealba, Carmen	Simard, Manon
Graham, Catherine	Soos, Cathy
Hanna, Dave	Stenhouse, Gord
Hauer, Gerald	Stephen, Craig
Hwang, Yeen Ten	Stetson, Deb
Illanes, Oscar	Toy, Martha
Joly, Damien	Welch, Kate
Jones, Darlene	Whiteside, Doug
Kehler, Helen	Wicklum, Dan
Kitching, Paul	Zimmer, Patrick

## APPENDIX B

<b>CCWHC Program Workshop 21-22 February, 2008</b>			
<b>CALGARY ZOO</b>			
<b>Time</b>	<b>Thursday</b>	<b>Time</b>	<b>Friday</b>
0800h	Continental Breakfast	0800h	Continental Breakfast
0820h	<b>Intro A. Cribb (FVM), C. Lanthier (Zoo)</b>		
0840h	1 - CCWHC - Introduction and Headquarters	0830h	Orientation: The NWDS and Discussion Objectives
0905h	2 - CCWHC - Atlantic Region	0900h	Geographic Group Discussions
0930h	3 - CCWHC - Quebec Region		1. BC-AB-SK-YT-NT    3. National
0955h	4 - CCWHC - Ontario/Nunavut		2. ON-NU-QC-Atlantic    4. International
1020h	Break	1000h	[Refreshments, Continue Group Discussion]
1050h	5 - CCWHC - Western & Northern Region	1030h	Discussion Group Reports to Plenary - 15 Minutes Each
1115h	6 - CCWHC - Alberta & BC		
1140h	7 - Calgary Zoo	1100h	
1200h	Lunch		
1300h	8 - British Columbia	1215h	Lunch
1310h	9 - Alberta		
1320h	10 - Saskatchewan		
1330h	11 - Manitoba		
1340h	12 - Ontario	1330h	General Discussion: Consolidation of Ideas, Implications for Actions and Future Activities
1350h	13 - Quebec		
1400h	14 - Newfoundland & Labrador		
1410h	15 - Yukon		
1420h	16 - Northwest Territories		
1430h	17 - Nunavut		
1440h	18 - Canadian Food Inspection Agency		
1450h	19 - Environment Canada		
1500h	Break	1440h	Workshop Format - Future Iterations?
1530h	20 - Public Health Agency of Canada	1500h	<b>Finish: 1500h</b>
1540h	21 - Fisheries & Oceans Canada		
1550h	22 - Parks Canada		
1600h	23 - Canadian Wildlife Federation		
1610h	24 - Alaska		
1620h	25 - National Wildlife Health Centre - USGS		Zoo Visit
1630h	26 - Wildlife Conservation Society		
1640h			
1650h	Questions & General Discussion		
1700h			

APPENDIX C

# Canada’s National Wildlife Disease Strategy

Draft 9  
April 2, 2004

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## Introduction

The rapid pace of disease emergence in Canada and around the world at the beginning of the 21<sup>st</sup> century has created new challenges to public health, livestock health, wildlife management and national and regional economies. Canada's National Wildlife Disease Strategy is a policy framework through which governments at all levels will seek to minimize the harmful effects of wild animal diseases on Canadian and international societies. The objectives of this Strategy will be achieved through a series of Action Plans developed for each strategic goal, and implemented collaboratively among the responsible jurisdictions. Each Action Plan will have immediate, medium and long-term objectives. There will be regular progress reports and updates for each Action Plan.

### *International Context*

Diseases originating or reservoired in wild animals<sup>1</sup> are having an increasingly serious impact on human health, agricultural production, biodiversity and economies worldwide. Avian Influenza, SARS, HIV-AIDS, West Nile Virus, Chronic Wasting Disease, Tuberculosis and Lyme Disease are examples. Canada's international obligations within the United Nations, World Health Organization, World Trade Organization, World Organization for Animal Health (OIE) and the Food and Agriculture Organization, among others, require vigilance and transparency in detecting, identifying, reporting and containing important wild animal diseases.

### *National Context*

Canada's capacity to manage important disease issues has been challenged in recent years by the number, complexity and magnitude of high-impact disease occurrences and the threat of bioterrorism. Major assessments of national disease response capacity were carried out in 2003 by Health Canada, Canadian Food Inspection Agency and Fisheries and Oceans Canada for human health, livestock health and aquacultural animal health, respectively. Many of the diseases of greatest concern to human and domestic animal health are infectious diseases acquired from wild animals, either within Canada or elsewhere in the world. Approximately 70% of new or newly important diseases affecting human health and human economies worldwide are believed to have a wild animal source. National capacity to manage wild animal diseases was evaluated in 2001 and 2002 by the Canadian Wildlife Directors Committee, and this evaluation initiated the National Wildlife Disease Strategy process.

### *National Process*

Collaborative management of wild animal diseases in Canada began in 1992 when Federal, Provincial and Territorial governments formed a partnership with Canada's four colleges of veterinary medicine and established the Canadian Cooperative Wildlife Health Centre, a national program of wildlife disease surveillance, research and response. In 2001, the resources, performance and capacity of this university-based, inter-agency partnership were reviewed. The review highlighted limited national capacity and recommended a range of enhancements. The scale and direction of these recommendations were endorsed by the federal-provincial/territorial Wildlife Ministers Council of Canada in

#### **Canadian Wildlife Directors Committee (CWDC)**

The CWDC consists of the directors of wildlife of each province and territory, the five regional directors and Director General of the Canadian Wildlife Service, and one representative each of Fisheries and Oceans Canada and the Parks Canada Agency. The role of the CWDC is to provide leadership in the development and coordination of policies, strategies, programs and activities which address wildlife issues of national concern and contribute to the conservation of biodiversity.

<sup>1</sup>Definitions of terminology are in Annex 1.

September 2002. Development of a national policy framework for strategic expansion of capacity and coordination of wildlife disease management among governments was approved at a meeting of federal, provincial and territorial Ministers responsible for wildlife, forests, and fisheries and aquaculture in September 2003.

### *National Consultations*

This Strategy was developed under the leadership of the federal-provincial/territorial Canadian Wildlife Directors Committee, in consultation with Health Canada, Agriculture and Agri-Food Canada, Canadian Food Inspection Agency, Parks Canada Agency, Fisheries and Oceans Canada, the Canadian veterinary colleges, and provincial and territorial ministries representing health, agriculture, fish, wildlife and environment. Action Plans arising from the National Strategy will be developed through similar iterative consultations among jurisdictions.

### **Canadian Cooperative Wildlife Health Centre**

The Canadian Cooperative Wildlife Health Centre undertakes national wildlife disease surveillance, provides scientific information to partner agencies, teaches university and agency personnel, and responds to major wildlife disease issues. The Centre thus both supports government agencies to carry out their mandates and serves as a scientific centre of excellence on wildlife disease based at all four Canadian veterinary colleges.

The Centre is managed by a Board of Directors consisting of the Canadian Wildlife Directors Committee, the veterinary college deans, and representatives from Health Canada, Parks Canada Agency, the Canadian Food Inspection Agency, the Canadian Wildlife Federation and Ducks Unlimited Canada. CCWHC offices are in Charlottetown, St-Hyacinthe, Guelph and Saskatoon.

### **Overview**

Many of the important health issues of the past 50 years have involved infectious diseases of wild animals that have been transmitted to humans and domestic animals, or diseases with adverse effects on human society because of their direct impacts on wildlife. Canada's National Wildlife Disease Strategy will establish a coordinated national policy and a disease response and management framework that aims to minimize the negative impacts of wild animal diseases on human and livestock health, biodiversity, the environment and the economy.

The National Wildlife Disease Strategy will be concerned primarily with important emerging diseases (diseases that are newly-recognized by science or were previously known, but have acquired a new importance) that originate, or are reservoir, in wild animals. The Strategy does not aim to prevent or eradicate all diseases in wild animals as some diseases are an integral component of natural ecosystems. The Strategy will apply only to diseases that have been identified as having sufficient potential to cause significant socio-economic or ecological harm and management options will include a range of options, including no change in status quo, a reduced rate of transmission, containment in a geographic area and eradication.

The animal species of primary concern for the Strategy are wild mammals, birds, reptiles, amphibians and fish. The Strategy will complement (not replace) disease management mandates and programs of government agencies by building on existing disease management policies and programs, identifying and filling gaps, and improving integration. For instance, the Strategy will strive to establish seamless integration with animal disease management programs in all sectors, specifically with the federal aquatic

health activities/regulation of the Department of Fisheries and Oceans (DFO), the National Aquatic Animal Health Partnership (which includes DFO, provinces, territories, aboriginal groups and industry), Health Canada and the proposed Canadian Public Health Agency, the domestic animal health programs of the Canadian Food Inspection Agency and Agriculture and Agri-Food Canada and with animal disease management programs within provincial and territorial governments.

Canada's National Wildlife Disease Strategy will serve as a policy framework through which participants agree to work together to achieve the Strategy's goals. The Strategy will be implemented through a detailed Action Plan for each of the six thematic goals of the Strategy. The benefits and the costs of the actions taken to achieve these goals will be shared among the participants as negotiated for each Action Plan. The roles and responsibilities of the many participants of the Strategy will be established via formal agreements arrived at collaboratively.

This Strategy recognizes and respects the jurisdictional authorities, historic investments and legitimate interests of Federal, Provincial, Territorial, Aboriginal, Regional and Municipal governments, of universities and non-government agencies, and of the public in wild animal diseases.

### **The National Wildlife Disease Strategy: Six Goals**

#### **Goal 1:**

**Prevention** of emergence of new wildlife diseases that would have important impacts on Canadian society through epidemiological analysis, a strengthened science base, and improved interception at control points.

#### **Goal 2:**

**Early detection of new diseases** to maximize the effectiveness of control measures and minimize costs and economic losses, achieved through vigilant disease surveillance supported by improved scientific methods and facilities.

#### **Goal 3:**

**Rapid response to new diseases** achieved through integrated emergency planning among jurisdictions, and pre-determination of response options, responsibilities, resources and personnel.

#### **Goal 4:**

**Effective disease management**, achieved through scientific research and transfer of knowledge and technology to management personnel.

#### **Goal 5:**

**Education and training** of wildlife disease specialists and other personnel required to deliver the components of the Action Plans in all sectors.

#### **Goal 6:**

**Communication** to achieve the coordination and collaboration essential to realize all of the goals of the Strategy, and to inform all sectors, including the public, about human health, economic and environmental issues related to wild animal diseases and management responses to them.



## Canada's National Wildlife Disease Strategy

### Principles

The Strategy is based on the following five principles.

<b>1. Collaboration</b>	Implementation of the Strategy will proceed on the basis of full and open collaboration and communication among participants.
<b>2. Base in Science</b>	Veterinary, wildlife and biomedical sciences are central to the goals of the Strategy and must inform policies and regulations.
<b>3. Integration</b>	Participants will cross-reference their relevant policies and programs in order to integrate national wildlife disease management horizontally and vertically among jurisdictions.
<b>4. Strategic Investment</b>	Action Plans developed under the Strategy will build on existing programs, infrastructures and policies. New resources will be invested strategically, to enhance programs and fill priority gaps as required to achieve the Strategy's goals.
<b>5. Adaptive Management</b>	Implementation mechanisms will evolve through repeated sequences of planning, implementation, review and revision. Regular review of program effectiveness is integral to the Strategy.

### Challenges

Important challenges will be faced in achieving the National Wildlife Disease Strategy's goals. Among these are:

Wildlife disease issues with important impacts on Canadian society are emerging at an unprecedented rate (see Annex 2).

The socio-economic impacts of wildlife diseases can be large, affecting human health, agriculture and food safety, Aboriginal economies and cultures, nature-based industries and wildlife conservation, including species at risk (see Annex 3).

Wildlife disease issues affect multiple departments and agencies within governments, and federal, provincial, territorial, aboriginal, regional, municipal and non-government jurisdictions, simultaneously.

The number and importance of wildlife disease issues exceed the current capacity of Canada's scientific infrastructure.

Participants in the Strategy are committed to meeting these challenges and achieving the Strategy's goals.

**GOAL 1: Prevention of Emergence of New Wildlife Diseases**

Prevent importation of important disease-causing agents, and predict and mitigate conditions leading to emergence of important new disease issues from disease-causing agents already present in Canada.

**Key Components:****Importation Controls and Interceptions at Control Points**

Existing regulations, inspection and enforcement procedures will be reviewed and strengthened or augmented as necessary to minimize the risk of importation and spread of the full range of wildlife disease threats.

**International Disease Intelligence and Information Analysis**

Regular monitoring of international disease occurrences will identify wild animal diseases which are potential threats to Canada and thus inform importation control programs.

**Disease Surveillance**

Monitoring of wildlife diseases in Canada is required to differentiate foreign from internal disease threats, to ensure that breaches of importation controls are detected quickly and to identify internal diseases with potential to emerge as important issues.

**Scientific Research: Epidemiology and Disease Emergence**

Effective import controls and prevention of disease emergence require scientific knowledge that must be developed as programs of control and prevention are implemented, evaluated and improved. This includes research on the processes and prediction of disease emergence in native and introduced species.

**GOAL 2: Early Detection of New Wildlife Diseases**

A dynamic national safety net of general wildlife disease surveillance to rapidly detect new diseases, thereby maximizing response effectiveness and minimizing the human, wildlife and economic costs of emerging diseases.

**Key Components:****A National Network of Outbreak Detection and Laboratory Diagnosis**

Early detection of important diseases is essential for rapid and cost-effective disease management. An effective surveillance network coordinated among all sectors is essential to the National Wildlife Disease Strategy.

**Information Management**

Information technology will be developed to ensure rapid analysis and distribution of disease surveillance information to all participants.

**Scientific Research to support surveillance and laboratory methods**

Disease surveillance and the diagnosis of diseases through laboratory tests require active scientific support, particularly as the pace of disease emergence has increased in recent years.

**GOAL 3: Rapid Response to New Wildlife Diseases**

Rapid and effective emergency response capacity for important wildlife disease outbreaks, capable of taking immediate decisions and actions as first steps in disease control.

**Key Components:****Advance Planning for Outbreak Responses**

Advance planning will pre-define disease response objectives and methods, and identify practical limits in disease management, so that immediate responses to disease outbreaks are effective.

**Scientific Research to Close Critical Knowledge Gaps**

Knowledge gaps exist concerning infection and persistence of important pathogens in Canadian wildlife and in immediate disease control methods. Priorities will be set and programs established to close these gaps.

**Field Response Capacity**

Personnel and equipment required for a range of possible disease response scenarios will be identified, coordinated and educated, as needed, to assure national capacity to respond to important disease outbreaks.

**A Decision and Communication Plan for Urgent Responses**

Decision authority and lines of communication will be pre-defined for emergency responses to urgent wildlife disease issues over a range of possible scenarios.

**GOAL 4: Effective Disease Management**

Internationally-recognized excellence in the scientific management and mitigation of risks posed by wild animal diseases in Canada

**Key Components:****Appraisal and Selection of Disease Management Methods**

Recent advances in the wildlife and biomedical sciences will be applied to wildlife disease management objectives, ranging from no change in status quo to eradication, to derive scientifically-sound procedures to reduce the impact of wild animal diseases.

**Scientific Research on Wildlife Diseases and Management Options**

The science base for management decisions and actions is evolving rapidly. The science base will be maintained through identification of research priorities and support of priority research.

**Risk, Cost and Feasibility Analysis**

Personnel and processes to evaluate and recommend management options are needed to support management decisions. Evaluations must consider the potential negative impact of a disease, costs of management options, likelihood of success of management methods, and potential negative impacts of the management response itself.

**Post-operational Assessment of Disease Management Responses**

Adaptive management requires evaluation of disease management procedures and revision of procedures in light of these evaluations. The National Wildlife Disease Strategy will achieve progressive improvement through continuous assessment and revision.

**GOAL 5: Education and Training**

Implementation of the National Wildlife Disease Strategy programs will be carried out by personnel with education, training, experience and expertise second to none in the world. Canada will have the capacity to educate and train all personnel required to deliver the programs that implement the Strategy.

**Key Components:****Education of Wildlife Disease Scientists**

Implementation of the National Wildlife Disease Strategy requires scientific capacity in the wildlife and biomedical sciences applied to wildlife diseases. Educational capacity to create the scientists needed in these fields will be assessed and, if necessary, expanded to assure sufficiency.

**Education of Surveillance, Response and Management Personnel**

Field workers, technical staff and others who will contribute to implementation of the Strategy will require continuing education and up-grading to meet the needs and the standards of the Strategy. Educational requirements and capacity to offer programs will be assessed and sufficiency achieved.

**GOAL 6: Communication**

A robust and effective communications network to interconnect all participants in the National Wildlife Disease Strategy and to communicate responsibly and effectively with stakeholders and the general public.

**Key Components:****Communication Plan**

Communications capable of coordinating and informing all participants in the Strategy is a major challenge of implementation. A unified communications plan that incorporates all activities under goals 1 to 5 will be an essential component of the Strategy.

**Information Management**

The information technology needed to meet the communication requirements of the Strategy will be assessed and appropriate tools and capacities developed.

**Formal Agreements**

The roles and responsibilities of the many participants in the Strategy will be clearly established and agreed to through formal agreements arrived at collaboratively.

**Common and Consistent Messages**

The communications plan for the Strategy will include mechanisms to ensure that information emanating from the activities carried out under the Strategy is correct and internally consistent.

**Risk Communication**

Risk communication is the process of communicating responsibly and effectively with stakeholders and the general public about the risk factors associated with an issue (e.g. transmission of disease to humans and/or domestic animals). Participants in the NWDS will acquire an understanding of potential areas of public concern. The NWDS will address these concerns and create a shared understanding among stakeholders and the public on the nature of the relevant risk factors of wildlife diseases and the appropriate management options.

**The Path Forward**

The rapid pace of disease emergence in Canada and around the world at the opening of the 21<sup>st</sup> century has created new challenges to public and livestock health, wildlife management, national and regional economies and the environment. The National Wildlife Disease Strategy, together with complementary policies and programs in the public health, agriculture, fisheries and aquaculture sectors, establishes a framework for meeting these challenges.

Implementation of the Strategy will proceed through development and implementation of an Action Plan for each of the Strategy's six goals. Technical committees for each Action Plan will be established through a process coordinated by the Canadian Wildlife Directors Committee. These committees will move quickly to identify the appropriate government and non-government participants, resource requirements and sources appropriate to each of the Strategy's goals and to establish priorities, immediate and longer-term objectives.

Urgent and important issues demand urgent and definitive action. Canada's National Wildlife Disease Strategy is a framework for immediate action, based in science, and adaptable to the uncertainties of the future.

## Canada's National Wildlife Disease Strategy

### ANNEX 1

#### DEFINITIONS OF TERMS

- *Wildlife and Wild Animal*: In this document, these words refer to animals that are free-ranging and do not depend directly on humans for food, shelter or other essential functions. This may include wild species that are indigenous to an area as well as species that have been introduced by humans (e.g. House Sparrow and Norway Rat) or that have escaped from captivity (e.g. escaped European Wild Boar). The species of predominant concern in the NWDS are vertebrates: fish, amphibians, reptiles, birds and mammals. Captive animals in zoos or on game farms are excluded from this definition. However, the Strategy recognizes the potential of these animals, and also of livestock and other domestic animals, to exchange diseases with wildlife. The Strategy will integrate smoothly with the disease management programs established for agricultural species, pets and zoo collections.

- *Disease*: Disease includes any impairment that interferes with or modifies the performance of an individual's normal functions. Many diseases are caused by *infection* of an animal or person with a living parasitic organism such as a virus, bacterium, fungus, or worm. Other causes of disease include *physical causes* (trauma, heat, cold), *chemical poisons* (arsenic, DDT), *biological toxins* (botulism, paralytic shellfish poisoning) and *genetic or physiological causes* (diabetes). The predominant focus of the NWDS will be diseases caused by infectious organisms (infectious diseases), but it will include capacity to manage other kinds of diseases with the potential for important impacts (e.g. Transmissible Spongiform Encephalopathies like BSE and Chronic Wasting Disease, botulism, marine toxins)

- *Emerging Disease*: This term came into common use in the early 1990s to designate diseases with the potential to cause important negative affects on people, their economies or their environments, and which either are newly-recognized by science (e.g. SARS) or were previously known but have acquired a new importance (e.g. West Nile virus imported into North America). Emerging diseases may affect human health directly, domestic animals and associated economies or wild animals and associated economies. *The NWDS will be concerned primarily with emerging diseases that originate, or are reser-voired, in wild animals.* The vast majority of emerging diseases of the past 50 years are infectious diseases of wild animals that have been transmitted to humans (termed zoonotic diseases or zoonoses), to domestic and zoo animals, or to both, but some affect human society adversely through their direct impact on wild animals.

- *Biomedical*: This word refers to the total of biological and medical sciences and encompasses such fields as animal and plant biology, microbiology, toxicology, population biology, epidemiology, risk analysis, physiology, pathology, medicine, molecular biology and genetics.

## Canada's National Wildlife Disease Strategy

### ANNEX 2

#### WILDLIFE DISEASES - SOME BACKGROUND

In the first six months of 2003, wild animal diseases were second only to war in claiming attention and causing exceptional expenditure by governments around the world. Diseases originating in wild species have affected human health and food safety, agricultural production and economic viability, ecosystem integrity and biodiversity, and world economies on an ascending scale throughout the past century and into the current one.

Wildlife diseases have affected Canadian society substantially in the past decade. Eradication of Chronic Wasting Disease, a prion-associated disease of deer, from Canadian farms has cost upwards of \$40 million to governments and industries, while its emergence in wild deer in Canada in 2001 now jeopardizes those wild deer populations and associated economic activities. Bovine Tuberculosis in wild elk and deer in Manitoba is affecting international trade, has provoked conflicts and confrontations over acceptable management responses, and has the potential to spread east and west across the Canada and south into the United States. West Nile virus swept across Canada from 2001 to 2003, causing human illness, straining response capacities and demonstrating the power of introduced infectious organisms to spread widely in new environments. Type E botulism suddenly became an annual epidemic in Common Loons and other fish-eating birds on the Great Lakes in 1999. This is a new conservation concern with potential negative implications for human food safety and fishery management and, perhaps, is a manifestation of the sweeping ecosystem disruption of the Great Lakes associated with introduced foreign species of mussels and fish.

Internationally, Severe Acute Respiratory Syndrome (SARS), a new disease caused by a virus attributed to one or more small wild carnivores in Asia, was first detected in November 2002. It had cost the world economy approximately \$136 billion as of June 2003. In this same six month period, Ebola Virus killed small groups of people in west Africa and threatened remnant populations of rare gorillas, control of Avian Influenza of wild bird origin caused heavy economic losses to the poultry industry of Europe, and Monkey pox, a disease of wild African rodents, was imported into the pet trade of the United States, infected a native North American species (prairie dog), and caused disease in some 70 people at multiple locations, thereby mimicking a bio-terrorist release of Smallpox.

These wildlife health issues of 2003 are not unprecedented but, in their scale and number, they represent a new height on a rising curve of important health and economic issues linked to wild animal diseases. Some 70% of new or newly important diseases affecting human health and human economies worldwide are considered to have a wild animal source. Such emerging disease issues in Canada can be traced, with progressively increasing number and importance, from the turn of the last century to the present day. Bubonic Plague was imported into California in 1900, became established permanently in native wild animals, and had spread to western Canada by the 1930s. Bison recovery herds became infected with Bovine Tuberculosis and Brucellosis by the 1920s and these diseases were imported to Wood Buffalo National Park with diseased bison at that time. Lassa Fever arrived briefly in North America from Africa in the 1970s just as the current epidemic of the Raccoon Strain of Rabies, now affecting Ontario and New Brunswick, was beginning in West Virginia. Lyme Disease, from wild mice, suddenly emerged as a major human health issue later in the same decade. HIV-AIDS, a disease caused by viruses from African apes and monkeys, eclipsed Lyme Disease as a public health issue in the mid-1980s. Ebola virus emerged in Africa at about this same time, just as Chronic Wasting Disease was

spreading, undetected, among elk farms in the United States and Canada. *Sin Nombre* Hantavirus and the Hantavirus Pulmonary Syndrome it causes were first recognized in people and deer mice in North America in 1993, Hendra virus in horses, people and bats in Australia in 1994, Nipah virus in pigs, people and bats in Malaysia in 1998. West Nile virus came to North America in 1999, SARS emerged late in 2002. In these same years, Europe and Asia experienced costly outbreaks of Foot and Mouth Disease and Classical Swine Fever, half the Harbour Seals in Europe died in a second epidemic of viral distemper, and both Asia and Europe experienced outbreaks of wildlife-derived strains of Influenza A in poultry that were pathogenic to people and posed potential public health threats far in excess of those posed by SARS. Thus animal diseases, most of them derived from wildlife, threaten human health and human economies as never before.

While the current focus of world attention is on infectious diseases, poisonings must be included in any national strategy on wild animal diseases. Toxic industrial chemicals and natural contaminants remain a major issue with respect to foods derived from wild animals. Industrial chemicals affect wild animals (insecticides, oil, mercury, lead) and wild animals act as sentinels for potential human and domestic animal illnesses due to chemical pollution. Poisonings of people, marine mammals, birds and commercially important fish with biological toxins such as botulism, blue-green algal toxins, and marine toxins such as domoic acid, paralytic shellfish toxins and *Pfeisteria* toxins have complex ecological causes involving agriculture, waste disposal and a range of human activities.



## Canada's National Wildlife Disease Strategy

### ANNEX 3

#### SOCIO-ECONOMIC IMPACTS OF WILDLIFE DISEASES

The socio-economic impacts of wild animal diseases are very large. The principal impact of many of these diseases is on human health. *Human health* concerns directly drive societal responses to SARS, West Nile virus, Bovine Tuberculosis, and Rabies, for example. Collectively, management responses to these five diseases have cost Canadian society hundred of millions of dollars in just the past two years, in addition to the direct health care costs for affected persons. Diseases in wildlife also pose food safety hazards for the many Canadians who consume wild animals and fish or their products. Diseases such as Brucellosis, Tuberculosis, Salmonellosis, Trichinellosis and type E botulism are important food safety concerns in this context.

*Agriculture* also has been affected severely by wildlife diseases. Bovine Tuberculosis and Chronic Wasting Disease have resulted in costly trade sanctions against Canadian cervid industry. Newcastle Disease and Influenza A in wild birds constantly threatens the poultry industry and the latter also threatens the swine industry and human health. Infection of wild animals with a major foreign animal disease like Foot and Mouth Disease or Rinderpest will result in prolonged trade embargoes sufficient to cripple segments of the livestock industry.

*Economic activity based on wildlife* is very large in Canada. A study in 1996 demonstrated that such activity contributed \$12.1 Billion to the Canadian GDP in that year, equivalent to the \$12.3 Billion that was the total contribution to the GDP by all of agriculture.<sup>b</sup> Tourism has been massively affected by diseases such as SARS in Canada, Foot and Mouth Disease in the United Kingdom and Ireland, and even by BSE, which has closed many borders to meat exports from Canada, including game meat obtained by recreational and commercial hunting. If Canada fails to manage wild animal diseases effectively and visibly, it will lose its reputation for pristine environments and nature-based tourism, and the multi-billion dollar economy this reputation sustains.

#### *Environmental Impacts of Wildlife Diseases*

*Species at Risk.* Species at risk by virtue of habitat loss or other factors are particularly vulnerable to the negative impact of new diseases. Disease thus can terminate recovery programs because small populations of rare species cannot sustain sudden high mortality. The Black-footed Ferret was nearly exterminated in this manner by Canine Distemper, and Bubonic Plague in its main prey, the prairie dog, is a major impediment to successful re-introduction of this rare species. West Nile virus may pose a similar threat to the eastern race of the Loggerhead Shrike.

*Climate Change.* Many diseases are highly influenced by climate. Vector species such as mosquitoes, ticks, slugs and snails respond dramatically to small changes in climate and this can, in turn, radically alter the occurrence of the diseases they carry. Climate also affects disease occurrence through mechanisms such as crowding of animals on remnant habitat as areas become dryer or wetter or otherwise unsuited to previously resident species. Thus, disease emergence is predicted to be an important impact factor of global climate change.

<sup>b</sup>Environment Canada. The Importance of Nature to Canadians. Environment Canada Internet Site <<http://www.ec.gc.ca/nature/>>, 1996. Statistics Canada Farm cash receipts. Gross domestic Product at factor cost. <<http://www.statcan.ca/english/Pgdb/Economy/Primary/prim03.htm>>. 2002: Accessed on 5 January 2002.

*Wildlife Conservation.* Disease in wild animals normally is a positive, stabilizing influence in animal ecology, essential to ecosystem integrity. However, disease emergence is a common feature of disturbed environments in which species richness and diversity has been reduced, habitat has been fragmented and ecosystem processes of energy flow and material recycling have been simplified. New patterns of disease develop in disturbed environments. Some current examples include type E botulism among fish-eating birds on the Great Lakes and epidemic Newcastle Disease among Double-crested Cormorants on over-fished northern lakes. Furthermore, conservation management actions may themselves carry considerable risk of negative impacts from disease. In particular, the movement of wild animals from one geographic location to another for conservation or other purposes always carries the risk that diseases also will be transported and released in new areas. The current epidemic of Raccoon Rabies had such an origin, as did the occurrence of Tuberculosis and Brucellosis in Wood Buffalo National Park and the occurrence of the brain worm of White-tailed Deer in Nova Scotia with its consequent limitations on Moose and extermination of Caribou.

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