

Canadian Cooperative Wildlife Health Centre



Annual Report 2006-2007

Message from the Chair, Board of Directors
Charles Rhodes

It is my pleasure to present to you the Annual Report of the Canadian Cooperative Wildlife Health Centre (CCWHC) for the fiscal year 2006-07. This Report has been reviewed and approved by the CCWHC Board of Directors, and gives a full account of the year's activities.



This has been a dynamic year in which the CCWHC has continued to break new ground, forge new partnerships and set high standards for the public practice of veterinary medicine. These achievements are built on the foundation of wildlife disease surveillance and monitoring, and use of the results to inform public policy and support public programs. In 2006-07, as in previous years, the CCWHC has worked on many fronts to help Canadian society meet the challenges presented to it by diseases in wildlife.

Climate change already is measurably affecting the Canadian north, and one manifestation is changing patterns of disease. This year, the CCWHC became a partner in International Polar Year projects aimed at documenting and understanding climatic effects on northern people and animal populations through studies of caribou and of diseases in wild animals that can affect people. The Centre also assembled substantial partners and resources to move forward with implementation of Canada's *National Chronic Wasting Disease Control Strategy*, assuming a leadership role for CWD in PrioNet Canada and collaborating closely with scientists of the Alberta Prion Research Institute. New partnerships were formed with Fisheries and Oceans Canada and with the new aquatic animal health section of the Canadian Food Inspection Agency in programs to track Viral Hemorrhagic Disease in fish in the Great Lakes and to assess the potential impact on fish pathogens, and related policy implications, of discharges of water from Devil's Lake in North Dakota into the Red River system. The Centre participated in cutting-edge studies in the foothills of the Rocky Mountains on the predictive relationships between wild animal health and environmental quality, opening up new possibilities for assessment and management of the health of whole ecosystems. Across the whole of Canada, the Centre organized and managed Canada's Inter-agency Wild Bird Influenza Survey.



The resources managed by the CCWHC in 2006-07 amounted to \$4,726,132 in total. This represents an increase in activity of almost 100% in just the past 4 years. Such rapid growth is a challenge to any organization. It is thus fitting that 2006-07 also has been a year of strategic planning for the CCWHC in which all aspects of its organization and function, and its future direction, were reviewed in a 3-day workshop. A strong consensus on direction, goals and means to move forward was achieved in this workshop. Partners and stakeholders in the CCWHC can have confidence that the organization is looking both inward and outward, and seeking the path forward that will best serve Canadian society.

Sincerely,

A handwritten signature in black ink that reads "Charles Rhodes". The signature is written in a cursive, flowing style.

Charles Rhodes
Dean, Western College of Veterinary Medicine
Chair, Board of Directors of the CCWHC

About the CCWHC

A University-based Partnership

The Canadian Cooperative Wildlife Health Centre (CCWHC) is a university-based, inter-agency partnership through which Canada's Colleges of Veterinary Medicine, government agencies at all levels and non-government agencies pool their resources and expertise to reduce the economic and ecological costs and impacts of wild animal diseases in Canada



Partners

The CCWHC partnership was established in 1992 with leadership from Environment Canada and the Canadian Wildlife Directors, and with additional financial assistance from the Max Bell Foundation.



In 2006-2007, the CCWHC partnership included four Government of Canada agencies; Environment Canada, the Public Health Agency of Canada, Parks Canada, and the Canadian Food Inspection Agency. The partnership also included all provincial and territorial governments, representing Fish & Wildlife, Environment, Agriculture and Health. Additional partners include the host Universities: the University of Saskatchewan, the University of Guelph, the University of Montreal, the University of Prince Edward Island, and the University of Calgary, as well Ducks Unlimited Canada, the Canadian Wildlife Federation and Syngenta Crop Protection.



Locations

The CCWHC has four long-standing university locations, each serving a large region of Canada. These include the Atlantic Regional Centre situated at the University of Prince Edward Island, the Quebec Regional Centre, situated at the University of Montreal, the Ontario and Nunavut Regional Centre situated at the University of Guelph, and Western and Northern Regional Centre situated at the University of Saskatchewan, which also hosts the CCWHC Headquarters office.

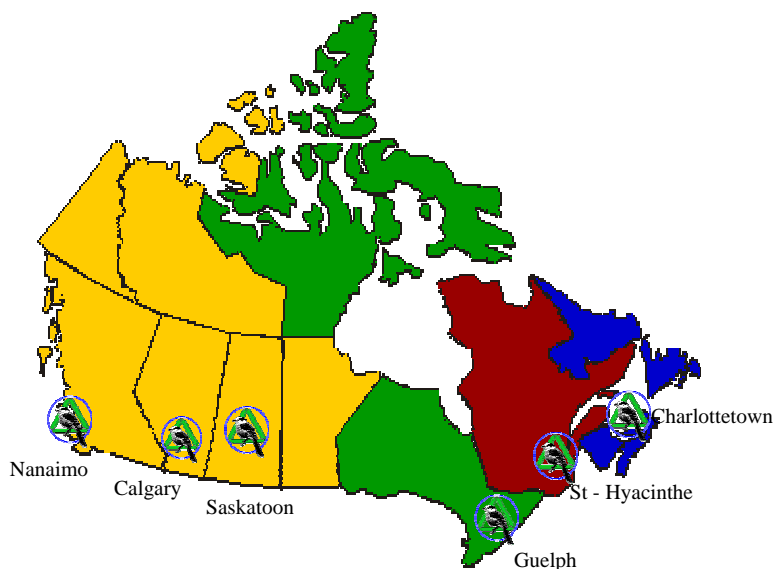
The CCWHC is a university-based, inter-agency partnership situated at each of Canada's five Colleges of Veterinary Medicine

West coast activities are carried out through the Centre for Coastal Health (CCH) in Nanaimo, BC. The 2006-2007 fiscal year saw the continued expansion of CCWHC activities delivered through the CCH.

A Regional Centre of the CCWHC is being established at the new Faculty of Veterinary Medicine at the University of Calgary. In 2006-2007, most elements of the CCWHC core program for Alberta were provided by the Western and Northern Regional Centre. As the Calgary Centre develops, each of the three Centres in western Canada will collaborate in delivering the CCWHC program in the region.



UNIVERSITY OF CALGARY



Four Business Lines

The CCWHC has four separate business lines, each carried out on regional and national scales. The first three business lines are supported by annual contributions from CCWHC partner agencies and the universities, and constitute the CCWHC's core program. The fourth business line—Wildlife Disease Response and Management—is supported by separate funding arrangements for each project and program.

Disease Surveillance

Disease surveillance integrates four separate activities into a cohesive program: 1) Detection of diseases, 2) Identification of diseases (diagnosis), 3) Disease information management and 4) Communication. Disease detection is achieved through engagement and support of wildlife personnel across the country. Disease identification is achieved through medical examination of specimens in fully-equipped veterinary diagnostic laboratories, primarily by CCWHC professional staff at the veterinary colleges but also elsewhere through collaboration with government laboratories. Disease information management is done through the CCWHC Information Technology Centre, which includes a national database for all surveillance data. Communication is achieved through a range of instruments: regular reports to the CCWHC Board of Directors and the Canadian Wildlife Directors Committee, web site, newsletter and special program reports.

The CCWHC has four separate business lines;
1. Disease Surveillance,
2. Information Services,
3. Education,
4. Response and Management.

Information Services

CCWHC personnel respond to requests from partner agency staff for information, advice, representation on committees, participation at meetings, review of documents, scientific planning and other matters related to wild animal diseases and their interactions with public health, agriculture and wildlife conservation. The CCWHC also responds to inquiries from the public and the news media.

Education

The CCWHC furnishes educational programs to its agency partners and to its host universities. Agency personnel are offered presentations and short courses on a range of topics related to wild animal health and disease. CCWHC staff participate in courses offered to undergraduate and post-graduate students at its host universities. The CCWHC also furnishes teaching material, research projects and graduate student supervision to each university. Special courses in wild animal health and disease are offered to veterinary students at each of the veterinary colleges.

Wildlife Disease Response Management

Disease surveillance regularly identifies disease issues requiring more extensive assessment, research or management responses. Targeted special programs to pursue these health issues have become an ever larger proportion of total CCWHC activity, as disease surveillance has accumulated information and as wildlife disease issues of socioeconomic importance have multiplied.

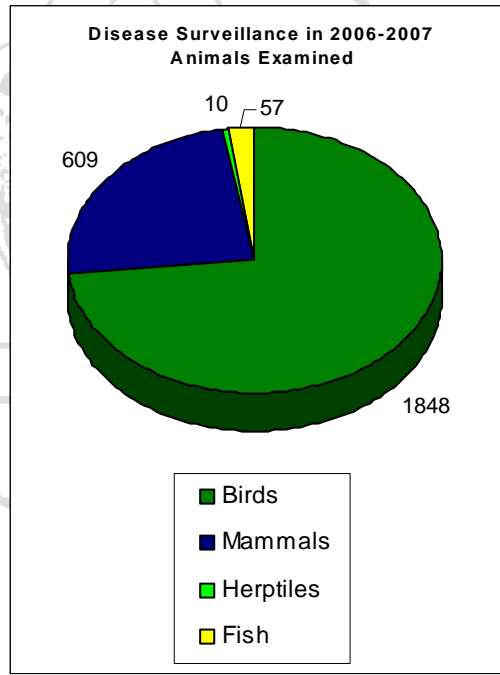
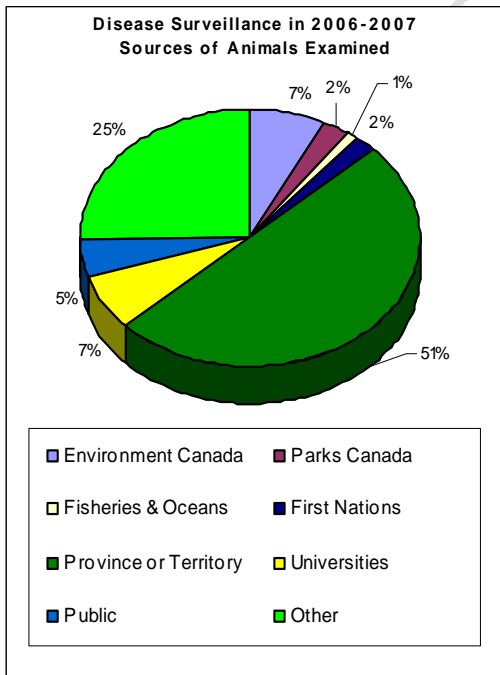
Wildlife Disease Surveillance

Disease Surveillance

Disease surveillance is the foundation for all aspects of Canada's national wildlife disease program. It includes the detection and identification of diseases and their causes, central recording of information in a national database, information analysis, and communication of findings to managers and other stakeholders.

Increased Submissions

The core wildlife disease surveillance program received 16% more specimens for examination in 2006 than in the previous year; a total of 2,525 specimens were received and examined. Of these specimens, 73% were derived from wild birds and 24% from wild mammals; the remaining 3% were derived from herptiles and fish.



In 2006, the CCWHC Program examined 2,524 Wild Animal Specimens.

Agency	Western & Northern	Ontario & Nunavut	Quebec	Atlantic	Total
Environment Canada	16	50	89	29	184
Parks Canada	30	8	1	24	63
Fisheries & Oceans		1	6	19	26
First Nations	1	15	37		53
Province or Territory	199	203	505	359	1266
Universities	166	3	5		174
Public	43	52	22		117
Other	54	435	152		641
Total	509	767	817	431	2524

Number of wild animal specimens received by each CCWHC region, and their sources. "Other" is a broad category comprised mostly of municipalities and cities/towns.

Avian Cholera Outbreaks in Atlantic Canada, Quebec, and Nunavut

In January 2007, sick and dying gulls were observed on the Hibernia oil drilling platform approximately 315 km offshore east of St. John's, Newfoundland. The cause turned out to be Avian Cholera, which is an infection with the bacterium *Pasteurella multocida*. This is the first time an Avian Cholera die-off has been observed in North American pelagic seabirds. Since the original diagnosis, the CCWHC has been working closely with the Canadian Wildlife Service, the Provincial Veterinarian of Newfoundland and Labrador, and the Nova Scotia Department of Natural Resources to document the geographical extent of the outbreak, the species affected by the disease and the extent of mortality. The USGS National Wildlife Health Centre is collaborating by performing genetic analysis of the bacterial isolates to better understand the ecology of this outbreak



Significant Avian Cholera outbreaks were also documented during the summer of 2006 among three populations of Common Eider (photo by Francis Bélanger). This disease was associated with mortalities in eiders nesting on islands in the St. Lawrence Estuary and in northern populations both in Nunavik (Northern Quebec) and Nunavut. Recent reports suggest that mortality caused by Avian Cholera may be increasing in Northern populations of eiders. The CCWHC is working in collaboration with Environment Canada, l'Université du Québec à Montréal and the US National Wildlife Health Center on the ecology and significance of this disease for this species of sea duck.

Only through vigorous general, or "scanning" disease surveillance can Canada detect and monitor new or emerging diseases.

Large Scale Mortality of Amphibians in Ontario

A large mortality event affecting Mudpuppies (*Necturus maculosus*) on the lower reaches of the Detroit River in Ontario was observed in late June 2006. Upon collection and examination of specimens by the CCWHC in Guelph, it was determined that the cause was infection with *Edwardsiella tarda*, an opportunistic bacterial pathogen that has been most strongly associated with mortality in a variety of species of fish. This bacterium is known to cause disease in humans and in birds, but has not previously been described as a cause of mortality in Mudpuppies, or other amphibians.

Fox Rabies Outbreak in the Northwest Territories

Rabies is an endemic disease in Arctic Fox populations. However, periodically, larger outbreaks of rabies do occur. The winter of 2006-2007 witnessed such an outbreak among Arctic Foxes in the Northwest Territories, with the disease eventually spreading southward to infect Red Fox populations in the central barrens region. The CCWHC confirmed rabies in these Red Foxes. Although rabies is a serious zoonotic disease, heightened public awareness triggered by disease surveillance helped to prevent human exposure.



Emerging Virus Diseases in Wild Cervids

In the summer of 2006, the CCWHC discovered adenovirus infection in mule deer fawns in southern Alberta. This is the first time that Adenovirus Hemorrhagic Disease (AHD) has been diagnosed in free-ranging deer in Canada, although the disease has been reported in the western United States. The disease affects young deer and is known to cause respiratory difficulty, weakness, seizures and death in some instances. There is no evidence that AHD represents a risk to traditional livestock or humans.

In September 2006, a moose in southern Saskatchewan died from Malignant Catarrhal Fever, a sporadic disease caused by a herpes virus of domestic sheep. This is the first report of this disease in a free-ranging moose in North America. Moose are now widely distributed on agricultural lands in the prairie provinces.

Diversity of Information Provided

The CCWHC responded to a wide range of requests for information and advice from partner agencies in 2006-2007. This included participation in regional, national and international meetings, participation on committees, and reports on specific issues. The CCWHC also provided information to the public by responding directly to inquiries, publishing a semi-annual Newsletter, providing numerous media interviews, and maintaining an informational website: <http://wildlife.usask.ca>.

Regional

- West Nile Virus Surveillance Regional Committees
- Nova Scotia Mainland Moose Recovery Team
- Parks Canada Eastern Animal Care Task Force
- Eastern Canada Piping Plover Working Group
- Maritime Marine Animal Assistance Network
- Expert Witness for the Crown – wildlife related-litigation
- Ontario Rabies Advisory Committee
- Ontario Avian Influenza Working Group
- Southern Ontario Bald Eagle Recovery Team
- Canadian Food Inspection Agency, Annual Update Course (Guelph Ontario)
- Ontario Aquaculture Working Group
- Réseau québécois d'urgence pour les mammifères marins
- Quebec committee for the enhanced surveillance of raccoon rabies
- Réseau d'observation des poissons d'eau douce
- Regional Chronic Wasting Disease Surveillance and research planning committees
- Northwest Territories Wildlife Care Committee
- Working Group for the Access to and Use of Ketamine by Wildlife Professionals (Ontario Ministry of Natural Resources)

National

- National consultation on research needs regarding Avian Influenza (CFIA)
- Federal/Provincial/Territorial Avian Influenza Workshop (PHAC)
- National Steering Committee on West Nile Virus (PHAC)
- National Non-enteric Zoonotic Diseases Committee Issue Group (PHAC)
- Advisory Committee on Avian Influenza (CFIA)
- National Avian Biosecurity Advisory Council (CFIA)
- Aquaculture Association of Canada Conference
- National Aquatic Animal Health Committee
- Animal capture drug advice, acquisition and distribution to wildlife agency personnel
- Animal Determinants of Emerging Disease (ADED); National Zoonoses Seminars
- National Animal Health Strategy
- PrioNet: Network Centre of Excellence on TSEs – CWD Theme Leadership
- National Wildlife Disease Occurrence Report to the OIE – 2006 (CFIA)
- Lyme Borreliosis Consultation Committee (PHAC)
- Working Group on Climate Change and Lyme Borreliosis (PHAC)
- Inter-Agency Wild Bird Influenza Survey – Executive and Steering Committees.
- Canadian Animal Health Surveillance Network (CFIA)
- Canada Animal Health Consultative Committee (CFIA)

In 2006-2007 members of the CCWHC collectively participated in 42 committees & conferences relating to wildlife disease and animal/human health, developed 9 Scientific/technical reports and published over 40 scientific papers.

International

- OIE-World Organization for Animal Health-Working Group on Wildlife Diseases
- Harp Seal Hunt: presentation to European journalists, joint observations with European veterinarians.
- Wildlife Disease Association (WDA) Long Term Vision Committee
- US-Canada Devils Lake Fish Pathogen Workshop
- Participation to the First International Workshop on beluga whale research, husbandry and management in wild and captive environments
- Chair of the examination committee of the American College of Zoological Medicine
- Third International Workshop for Arctic Parasitology
- Canada-US-Mexico Tri-lateral Planning Committee for wild bird influenza surveillance
- CircumArctic Rangifer Monitoring and Assessment Network
- National Conference on West Nile Virus in the United States



Data mapping in cooperation with the Public Health Agency of Canada

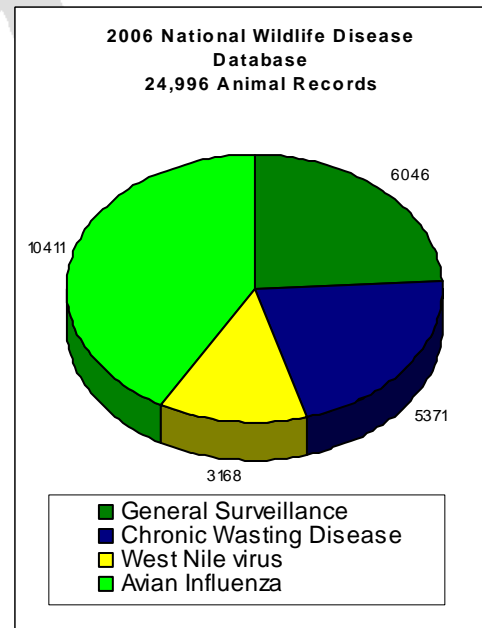
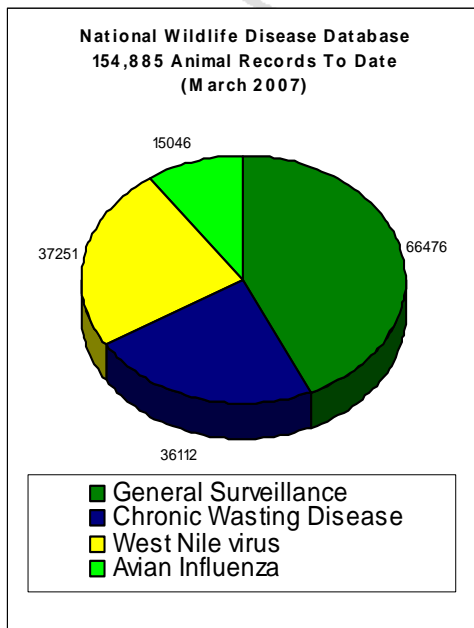
25,000 records were added to The CCWHC Wildlife Disease Database in 2006

CCWHC Information Technology Centre

The CCWHC Information Technology Centre links together and supports the entire CCWHC program. The Centre maintains Canada's National Wildlife Disease Database, which allows for Internet-accessible data input and reporting, to ensure remote access by all CCWHC partners. As noted below, the National Database now holds nearly 155,000 records of wildlife disease occurrences in Canada. Implementation of a new database design mounted on a stronger platform is now underway, and will increase the capacity, flexibility and security of the information management system.



The CCWHC website home page



Education

Education Mandate

Education is a key activity for the CCWHC. Education supports disease surveillance through instruction and engagement of wildlife field personnel and the public, and creates wildlife health specialists through university programs. Instruction in a wide range of topics related to wild animal health and disease was provided to community groups and to partner agency personnel in 2006-2007.

Training in Chemical Immobilization of Wildlife

The CCWHC provides training in wildlife chemical immobilization to field staff of sponsor agencies through a 4-day presentation of the Canadian Association of Zoo and Wildlife Veterinarians' *Chemical Immobilization of Wildlife Course*. In many agencies, field staff must re-certify by formally updating their knowledge of chemical immobilization on a 3-5 year cycle. For recertification, the CCWHC provides a 2-day course tailored to the specific requirements of each agency. Location and timing of courses are arranged to meet agency needs. In 2006-2007, 4 courses were held for Alberta Community Development and Saskatchewan Environment personnel, with 73 participants in total.



University enhancement

The CCWHC continues to provide education and training to future wildlife disease experts within its host Universities. This goal is achieved by the provision of hundreds of wildlife specimens for education purposes, the instruction of University graduate and undergraduate courses relating to wildlife health and disease, and the supervision of graduate students, and, in some cases, the funding of their projects. An example of this commitment is the introduction of a post-graduate training program in wildlife health management at the CCWHC Quebec Regional Centre at the University of Montreal. The goal of this 36-month residency program is to offer advanced training for veterinarians who wish to pursue a career in the field of wildlife health research and management, within government or non-government wildlife agencies. The resident is involved in various projects in disease investigation, including both clinical and research settings. The program itself has received the approval of the American College of Zoological Medicine.

In 2006-2007 the CCWHC provided over 100 hours of instruction to partner agencies, supervised 14 graduate students, taught 8 graduate and undergraduate University courses and made over 30 scientific presentations

Community Outreach

A large component of CCWHC educational activities is directed at public education pertaining to wildlife disease and animal health. This includes the operation of toll-free national and regional telephone lines available to the public should they have concerns regarding such diseases as Avian Influenza, West Nile virus and Chronic Wasting Disease, or should they wish to report/submit a specimen for testing. Outreach activities also include provision of information and interviews with the media and journalists.

In addition to these activities, CCWHC personnel are engaged in attending and providing information at community town hall meetings, presentations to high school and grade school students and interested or concerned community groups.

The community-based program of health monitoring carried out in the Sahtu Settlement Region (<http://wildlife1.usask.ca/Sahtu/>) is another format for community outreach with educational goals. Formal and informal educational opportunities permit the communities to educate participating scientists, and scientists to reciprocate with presentations to schools, hunters and elders. Health monitoring is achieved through the collective engagement stimulated by these exchanges of information.

Key Activities in 2006-2007

In 2006-2007, the CCWHC responded to several important wildlife disease issues with targeted programs of enhanced surveillance, research and participation in disease management actions of partner agencies. CCWHC personnel also participated in research to extend the knowledge of wildlife health and welfare in Canada. Many of these targeted programs also enhance the capacity of the CCWHC core program (business lines 1-3).

Disease Response and Management activities in 2006-2007 were centered around Avian Influenza surveillance in wild birds, West Nile Virus surveillance and research projects, as well as Chronic Wasting Disease Surveillance and Research. The CCWHC also was involved in wildlife health research within the Foothills Model Forest Grizzly Bear Research Program, surveillance and monitoring of fish pathogens, development of a risk analysis framework regarding the release of waters from Devil's Lake North Dakota and in several International Polar Year projects.

Examples of Response and Management Activities in 2006-2007

Total Financial Resources For Disease Response and Management in 2006-2007: \$3,193,657

- National Animal Health Strategy
- Canada's Inter-Agency Wild Bird Influenza Survey
- Exposure Levels for Pesticides in Birds of Prey
- Analysis of Stress in Woodland Caribou and Arctic Hare Populations
- CircumArctic Rangifer Monitoring and Assessment Network
- Resilience of Caribou and Reindeer Populations: Validation and Application of the Filter Paper Technique to Assess Exposure to Pathogens
- British Columbia Environment and Occupational Health Research Network
- Habitat Conservation Trust Fund
- Invasive Alien Species Partnership Program
- Health Assessment of Beluga Whales from the St. Lawrence Estuary
- Measures of Long-term Stress and Ecosystem Health
- Chronic Wasting Disease Surveillance and Research in Saskatchewan
- Species at Risk Health Management Plan
- Devil's Lake Risk Analysis Framework and Fish Health Survey
- Health Assessment of Fish Near an Electric Power Plant—Quebec
- National West Nile Virus Surveillance Program in Wild Birds
- West Nile Virus House Sparrow Research Project
- Health Assessment Protocol for a Ring-necked Pheasant Live Trapping and Transfer Proposal for the PEI Department of Environment Energy and Forestry.
- Viral hemorrhagic septicemia virus type IV surveillance in the Great Lakes
- Tuberculosis, Elk and Wolves in Riding Mountain National Park
- Evaluation of the Role of Climate Change in the Emergence of Pathogens and Diseases in Arctic and Sub-arctic Ungulate Populations.
- Salmonellosis Monitoring in Songbirds
- Disease Monitoring of Common Eiders on the St. Lawrence River
- Bison and Anthrax Surveillance —Data Project
- Ontario Double-Crested Cormorant Status Report

Wildlife Disease Response and Management Highlights

Canada's Inter-Agency Wild Bird Influenza Survey

The CCWHC organized and coordinated Canada's Inter-agency Wild Bird Influenza Survey in 2006, as it had in 2005. The leading objective of the 2006 Survey was to maintain a high level of vigilance for the possible arrival in Canada of the disease-causing Eurasian H5N1 strain. Surveillance based on birds found dead was carried out in all regions, while samples were collected from live birds particularly in eastern Canada and the eastern Canadian arctic. Surveys of healthy live wild ducks were carried out in four regions in order to compare with survey results from 2005, and a special survey of ducks was carried out near the mouth of the Fraser River in British Columbia. A wider range of species was included in the 2006 Survey than in 2005 in order to expand knowledge of the range of wild birds that may serve as reservoirs of avian influenza viruses.

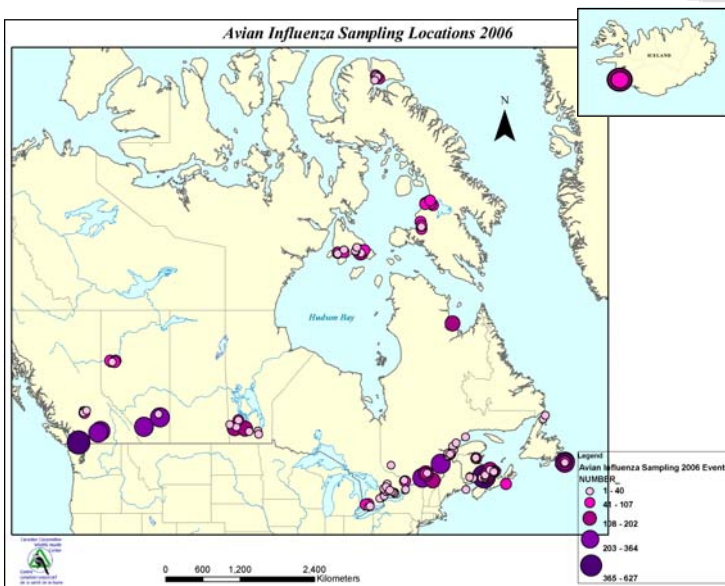


In total, 13,024 birds were sampled and tested for influenza in the 2006 Survey through the coordinated efforts of a very large cadre of federal and provincial-territorial wildlife and animal health personnel. All of the 2006 Survey objectives were met. The Survey created new opportunities to test and improve the operation of Canada's Avian Influenza Virus Laboratory Network and other key elements of national disease preparedness. New relationships were established with similar surveys in the United States and Mexico such that planning for further surveys in 2007 is taking place on a continental level.

A total of 13,024 samples were collected and analyzed in 2006, 9986 from live wild birds and 3038 from dead wild birds. All avian influenza strains found were non-pathogenic North American Strains.

Only preliminary results are available at this time for the 2006 Survey. Samples have been collected and analysed from a total of 9986 live birds and, to date, 1607 (16%) have tested positive by matrix PCR, indicating infection with an avian influenza virus (no Highly pathogenic strains were discovered). Sampling began in May in Iceland and ended in December in British Columbia. The proportion of positive ducks detected by matrix PCR in 2006 was similar to that seen in 2005. In the first year of the survey, 37% of ducks sampled tested positive for avian influenza by matrix PCR (BC = 55%, AB = 10%, MB = 18%, ON = 44%, QC = 49%, Atlantic Canada = 42%). Of those regions sampled again in 2006, 39% of ducks sampled tested positive (BC = 38%, AB = 29%, QC = 39%, Maritimes = 51%).

Dead bird sampling has been ongoing since April of 2006. In total, 3038 samples were collected and analysed from birds found dead and, to date, 98 have tested positive by matrix PCR (3.23%).



Sampling locations in 2006 for live wild birds

	Region	Species	Number tested	Matrix PCR positive (%)
Ducks	British Columbia Interior	Ducks	797	304 (38)
	British Columbia Delta	Ducks	627	33 (5)
	Alberta	Ducks	815	235 (29)
	Quebec	Ducks	947	372 (39)
	Maritime Provinces	Ducks	656	335 (51)
	Total		3842	1279 (33)
Other wild birds species sampled in 2006	Iceland	Eastern High Arctic Brant	179	0
		Red Knot	184	1 (1)
	Nunavut	Cackling Goose	400	27 (7)
		Ross' Goose	400	2 (1)
		Eastern High Arctic Brant	123	0
		Snow Goose	811	2 (<1)
		Common Eider	60	0
	Ontario	Urban Canada Geese	600	0
	Quebec	Common Eider (St Lawrence)	210	0
		Common Eider (Arctic)	153	0
		Urban Canada Geese	300	0
	New Brunswick	Semipalmated Sandpipers	618	20 (3)
		Arctic Tern	21	4 (19)
	Nova Scotia	Arctic Tern	89	10 (11)
	Newfoundland and Labrador	Herring Gull	296	48 (16)
		Great Black-backed Gull	168	11 (7)
		Leach's Storm Petrel	287	17 (6)
Black-legged Kittiwake		143	9 (6)	
Atlantic Puffin		12	1 (8)	
Total		5044	152 (3)	
Hunter-killed species	Manitoba	Cackling Goose	300	21 (7)
		Snow Goose	300	21 (7)
	Quebec	Snow Goose	300	116 (39)
		PEI	Canada Goose	201
Total		1101	176 (16)	

Total number of live bird samples collected, and results

Measures of Long-term Stress and Ecosystem Health



Resource managers must understand the impacts of human-caused landscape change on wildlife populations in order to make informed decisions concerning resource utilization and conservation. This research project is determining relationships between landscape structure and change, and the health of grizzly bear populations in the Rocky Mountain foothills to inform and enable management of the landscape. The working hypothesis is that negative effects of landscape change on grizzly bear populations arise largely as a consequence of long-term physiological stress in individual bears. Understanding the underlying mechanisms is critical for resource managers to ensure the conservation of this species at risk. Research objectives are to: (1) enhance geospatial tools for the monitoring of landscape structure, with particular emphasis on detecting changes likely to cause adverse health effects to resident grizzly bears, (2) develop a technique for detecting long-term physiological stress in grizzly bears, (3) determine relationships between long-term physiological stress and other measures of health (longevity, growth, reproduction, immunity, and activity) in grizzly bears, and (4) establish linkages between the health profiles of individual grizzly bears and the landscape structure and change within their home ranges along a gradient of human use. Detailed maps linking landscape structure with grizzly bear occurrence and health are being developed. Combined with predictive models of the effects of landscape change, these maps will provide resource managers with a better understanding of grizzly bear health and resource selection, and grizzly bear response to human activities in order to implement appropriate land management decision-making. Although this research concentrates on a single species and its environment, the significance and application of the research is much broader. The research team is pioneering a new approach to evaluating and monitoring the effects of landscape change on wildlife population health. Both the approach and the tools being developed hold promise for future application to other species at risk and, more generally, better conservation of wildlife populations.

In 2006-2007 the CCWHC tested 4,150 wild cervids for Chronic Wasting Disease in Saskatchewan; 46 new cases were identified.

Chronic Wasting Disease Surveillance and Research

Since December 2004, the CCWHC has been pursuing the development of new and effective methods to control Chronic Wasting Disease (CWD) in wildlife. The recent creation of two major research networks in Canada, each with a focus on prion-associated diseases, has permitted the CCWHC to participate in a large-scale collaborative program to address important knowledge gaps that impede CWD control.

In 2005, the CCWHC helped create PrioNet Canada, a new Network Centre of Excellence for research on prion diseases. CCWHC now leads the CWD Theme in PrioNet Canada, with Trent Bollinger, of Western and Northern Region, serving as the lead scientist in a large study aimed at understanding key features of CWD-transmission on the Canadian prairies. The Alberta Prion Research Institute (APRI) also has funded a program of CWD research; these two programs now are tightly integrated and work in collaboration with the CWD surveillance and control programs of Alberta and Saskatchewan. In total, \$1,214,000 for this research was allocated in 2006-2007. In addition, studies to develop methods to detect prion proteins in the environment, on vaccination against prion diseases and on the human dimensions of prion disease occurrences and their control are underway with APRI and PrioNet support. Taken together, these research programs are making major advances in the implementation of the Action Plans for Goals 3 and 4 of Canada's *National Chronic Wasting Disease Control Strategy*.

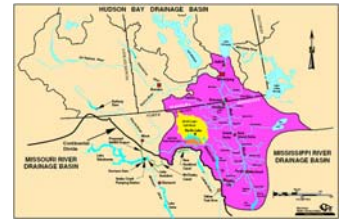
Surveillance for CWD in Saskatchewan continued in 2006. In total, 4,150 wild cervids were tested, 46 of which proved to be positive for CWD: 24 Mule Deer and 22 White-tailed Deer. This brings to 148 the total number of CWD positive wild deer that have been detected in Saskatchewan since the year 2000.



Wildlife Disease Response and Management Highlights

Devil's Lake Pathogen Survey and Risk Framework

In June 2006, the CCWHC was asked by Environment Canada to become an active participant in joint Canada-US studies to assess the risks to the Red River drainage system posed by pathogens that may be present in Devil's Lake (North Dakota) and thus may be discharged into the Red River system if waters from Devil's Lake are released. In Canada, the commercial fishery on Lake Winnipeg, worth about \$30M annually, substantial First Nations harvests and an important sport fishery all potentially are at risk from pathogens introduced into the Red River system. Thus, the Ecosystem Committee of the International Red River Board has organized a survey of fish parasites and pathogens within the Red River system, Lake Winnipeg and Devil's Lake. In Canada, the survey is being carried out cooperatively by Fisheries and Oceans Canada, the University of Manitoba and the CCWHC, and in the United States by the US Fish and Wildlife Service. In addition to the actual survey, the CCWHC and the Centre for Coastal Health established a risk analysis framework to guide the survey in 2007 and 2008, and to determine the process of assessing fish pathogen risks.



Red River System

International Polar Year

International Polar Year (IPY) was officially launched on March 1, 2007. IPY will be an intensive, internationally coordinated campaign of research that will initiate a new era in polar science. It will include research in both polar regions and recognise the strong links these regions have with the rest of the globe. It will involve a wide range of research disciplines, including the social sciences, but the emphasis will be interdisciplinary and involve broad international participation. IPY also aims to educate and involve the public, and to help train the next generation of engineers, scientists, and leaders.

Three major IPY projects are linked to the CCWHC. The first "Resilience of Caribou and Reindeer Populations: Validation and Application of the Filter Paper Technique to Assess Exposure to Pathogens" aims to evaluate the use of filter paper blood collection as a method of community-based monitoring of caribou health across the Canadian North.

The second project "Starting the clock for the CircumArctic Rangifer Monitoring and Assessment Network (CARMA): Global Change, Resilience and Human-Rangifer Systems of the CircumArctic" is an international, multidisciplinary project to establish the current status of human-Rangifer systems and to evaluate the resilience of these systems. The CARMA Network is an international network of scientists, managers, and community representatives whose goal is to better understand the impacts of changes in the Arctic on caribou and wild reindeer herds and the people who depend on them. Throughout IPY, the CARMA Network will work to improve understanding of the relative vulnerability of regional human-Rangifer systems to climate change and other changes caused by people. During the IPY years, funding from the Canadian IPY Program will allow Canada to assume a lead role in standardizing the methods used to monitor the herds, help fund coordinated monitoring of reference herds, and develop decision support tools that co-management groups can use to help understand the impacts of change in their region. As well, the results of this project will form the basis for post-secondary courses in ecology which will be developed through the University of the Arctic.

The third project, "Engaging Communities in the Monitoring of Zoonoses, Country Food Safety, and Wildlife Health," is led by the Nunavik Research Centre in Kuujuaq, Quebec, and will focus on four zoonotic pathogens in arctic wildlife.

The International Polar Year is a large scientific program focused on the Arctic and the Antarctic from March 2007 to March 2009

Publications and Reports: A Sample of Publications by CCWHC Staff

- Daoust P-Y**, GM Fowler, WT Stobo. 2006. Comparison of the healing process in hot and cold brands applied to harbour seal pups (*Phoca vitulina*). *Wildlife Research* 33:361-372.
- Desmarchelier, M, Y. Rondenay, **G. Fitzgerald, S. Lair**. Monitoring of the ventilatory status of anesthetized birds of prey using end-tidal carbon dioxide measured with a microstream capnometer *Journal of Zoo and Wildlife Medicine* (sous presse).
- Guenette, S. and **S. Lair**. Anesthesia of the Leopard Frog (*Rana pipiens*): A Comparative Study Between Four Different Agents. *Journal of Herpetological Medicine and Surgery*. 16 (2), 38-44, 2006
- Mallory, M. L., J. Akearok, N. R. North, D. V. Weseloh, **S. Lair**. Movements of long-tailed ducks wintering on Lake Ontario to breeding areas in Nunavut, Canada. *The Wilson Journal of Ornithology*. 118(4): 494–501, 2006
- Pang, D., Y. Rondenay, E. Troncy, L. Measures and **S. Lair**. The clinical utility of partial pressure of end-tidal carbon dioxide as a substitute for partial pressure of arterial carbon dioxide in harp seals (*Phoca groenlandica*). *American Journal of Veterinary Research*. 67(7); 1131-1135, 2006
- Pang, D., Y. Rondenay, L. Measures and **S. Lair**. Effect of premedication with midazolam on the anesthesia of Harp seals (*Phoca groenlandica*) with isoflurane. *Journal of Zoo and Wildlife Medicine* 37(1): 27–32, 2006
- Desmarchelier, M., Langlois, I., et **S. Lair**. L'euthanasie des espèces non conventionnelles. *La Dépêche Supplément technique n° 98*; 37-43, 2006
- Lair, S.**, E.S. Williams, K.G. Mehren and **I.K. Barker**. Renal cell neoplasms in black footed ferrets (*Mustela nigripes*) – 38 cases. *Veterinary Pathology* 43: 276–280, 2006
- Neimanis, A.**, Gavier-Widen, D., **Leighton, F., Bollinger, T.**, Rocke, T. and Morner, T. *Journal of Wildlife Diseases*. (In press) An outbreak of type C botulism in herring gulls (*Larus argentatus*) in southeastern Sweden.
- Thomas, N.J., **D. B. Hunter** and C.T. Atkinson, eds. 2007. "Infectious Diseases of Wild Birds". Blackwell Publishing, Ames, Iowa. 484 pp.
- Leighton, F.A.** and R.A. Heckert. 2007. Newcastle Disease and related avian paramyxoviruses. In: "Infectious Diseases of Wild Birds", N.J. Thomas, D. B. Hunter and C.T. Atkinson, eds. Blackwell Publishing, Ames, Iowa. pp. 3-16.
- Rocke, T.E. and **T.K. Bollinger**. 2007. Avian Botulism. In: "Infectious Diseases of Wild Birds", N.J. Thomas, D. B. Hunter and C.T. Atkinson, eds. Blackwell Publishing, Ames, Iowa. pp. 377-416.
- Samuel, M.D., R.G. Botzler and **G.A. Wobeser**. 2007. Avian Cholera. In: "Infectious Diseases of Wild Birds", N.J. Thomas, D. B. Hunter and C.T. Atkinson, eds. Blackwell Publishing, Ames, Iowa. pp. 239-269.
- Beroll, H., O. Berke, J. Wilson, and **I.K. Barker**. 2007. Investigating the spatial risk of West Nile virus disease in birds and humans in southern Ontario from 2002 to 2005. *Population Health Metrics*, In press (on line publication).
- Dubé, Caroline, K.G. Mehren, **I.K. Barker**, B.L. Peart and A. Balachandran. 2006. Retrospective investigation of chronic wasting disease of cervids at the Toronto Zoo, 1973-2003. *Canadian Veterinary Journal* 47: 1185-1193.
- Jardine, C.**, C. Waldner, **G. Wobeser**, and **F. A. Leighton**. 2006. Demographic features of *Bartonella* infections in Richardson's ground squirrels (*Spermophilus richardsonii*). *Journal of Wildlife Diseases* 42:739-749.
- Jardine, C.**, D. McColl, **G. Wobeser**, and **F. A. Leighton**. 2006. Diversity of *Bartonella* genotypes in Richardson's ground squirrel populations. *Vector-Borne and Zoonotic Diseases* 6:395-403.
- Ogden, N.H., I.K. Barker**, G. Beauchamp, S. Brazeau, D. Charron, A. Maarouf, M.G. Morshed, C.J. O'Callaghan, R.A. Thompson, D. Waltner-Toews, M. Waltner-Toews, and L.R. Lindsay. 2006. Investigation of ground level and remote-sensed data for habitat classification and prediction of survival of *Ixodes scapularis* ticks in habitats of southeastern Canada. *Journal of Medical Entomology* 43: 403-414.
- Ogden, N.H.**, M. Bigras-Poulin, C.J. O'Callaghan, **I.K. Barker**, K. Kurtenbach, L.R. Lindsay, and D. Charron. 2007. Vector seasonality, host infection dynamics and fitness of pathogens transmitted by the tick *Ixodes scapularis*. *Parasitology*, 134: 209-227.
- Yule, A.M., J. Austin, **I.K. Barker**, B. Cadieux and R.D. Moccia. 2006. Persistence of *Clostridium botulinum* neurotoxin Type-E in tissues from selected fresh water fish species: Implications to public health. *Journal of Food Protection* 69: 1164-1167.
- Yule, A.M., **I.K. Barker**, J. Austin, and R.D. Moccia. 2006. Toxicity of *Clostridium botulinum* type E neurotoxin to Great Lakes fish: implications to avian botulism. *Journal of Wildlife Diseases* 42: 479-493.
- Lumsden, J.S.**, L. Al-Hussinee, S. Russell, K. Young, A. Yazdanpanah, P. Huber, S. Lord and R.M.W. Stevenson. 2006. Viral hemorrhagic septicemia virus, type IV in the Great Lakes. *Aquaculture Canada*. Special Publication No. 13; 1-6.
- Cattet, M.**, A. Bourque, B. Elkin, K. Powley, D. Dahlstrom, and **N. Caulkett**. 2006. Evaluation of the potential for injury with remote drug-delivery systems. *Wildlife Society Bulletin* 34(3): 741–749.
- G. A. Wobeser**, 2006 *Essentials of Disease in Wild Animals*, Blackwell Publishing, Ames, Iowa, 243p.
- G.A. Wobeser** 2007 *Disease in Wild Animals: Investigation and Management*, 2nd ed., Springer, Heidelberg, Germany, 393 p.
- Lutze-Wallace, C., C. Turcotte, B. Elkin, M. Koller-Jones, J. Nishi, **G. Wobeser** 2006. Isolation of *Mycobacterium bovis* from a wood bison in a wildlife conservation project in the Northwest Territories. *Can. Vet. J.* 47317-318
- G. Wobeser**, M. Ngeleka, G. Appleyard, L. Bryden, M.R. Mulvey 2007 Tularemia in deer mice (*Peromyscus maniculatus*) during a population irruption in Saskatchewan, Canada. *J. Wildl. Dis.* 43:23-31

Financial Report for 2006-2007-Statement of Revenues and Expenses

(All Business Lines 1-4)

Canadian Cooperative Wildlife Health Centre		Statement of Revenues & Expenses		
				2006/2007
REVENUES	General	Restricted	Endowment	Total Revenues
Environment Canada	443,600	170,229		613,829
Public Health Agency of Canada	240,000	570,108		810,108
Parks Canada	121,500	1,846		123,346
Canadian Food Inspection Agency	100,000	1,437,650		1,537,650
First Nations and Inuit Health	4,700			4,700
Fisheries and Oceans		6,696		6,696
PrioNet Canada		514,000		514,000
Alberta				
Alberta - Fish and Wildlife	7,000			7,000
Alberta - Community Development	4,000			4,000
British Columbia	30,000			30,000
Manitoba	10,000			10,000
New Brunswick		10,850		10,850
New Brunswick - Agriculture	9,344			9,344
New Brunswick - Fish & Wildlife	9,344			9,344
Newfoundland & Labrador	20,040	8,050		28,090
Northwest Territories	14,000			14,000
Nova Scotia		14,000		14,000
Nova Scotia - DNR	7,000			7,000
Nova Scotia - Agriculture	7,000			7,000
Nova Scotia - Health	7,000			7,000
Nunavut	11,246			11,246
Prince Edward Island	4,735	2,100		6,835
Ontario				
Ontario - Agriculture, Food and Rural Affairs		24,860		24,860
Ontario - Natural Resources	74,000			74,000
Ontario - Health and Long Term Care	70,000	25,604		95,604
Quebec	105,000	17,391		122,391
Saskatchewan Health		53,040		53,040
Saskatchewan Environment	37,916	240,000		277,916
Yukon	8,000			8,000
Ducks Unlimited	12,000			12,000
Syngenta	3,000			3,000
Canadian Wildlife Federation	10,000			10,000
Universities	106,000			106,000
Alberta Innovation and Science		58,914		58,914
NSERC-CRD		38,319		38,319
Saskatoon Community Foundation			202	202
Miscellaneous Income	55,848			55,848
TOTAL REVENUE	1,532,273	3,193,657	202	4,726,132
				2006/2007
EXPENSES				Total Expenditures
Salaries and Benefits	542,153	1,063,015		1,605,168
Equipment	44,781	347,905		392,686
Diagnostic Costs	135,133	684,563		819,696
Operations	126,150	187,875		314,025
Travel	51,776	34,677		86,453
Other	15,176	146,459		161,635
Overhead	151,302	600,998		752,300
TOTAL EXPENSES	1,066,471	3,065,492	0	4,131,963
Revenue less Expenditures	465,802	128,165	202	594,169

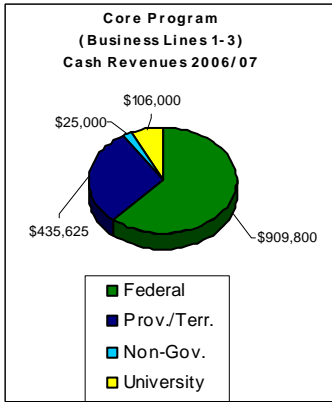
Response and Management programs (restricted funds) extend the CCWHC Core Program (general funds) by sharing in the support of the CCWHC infrastructure

Financial Highlights

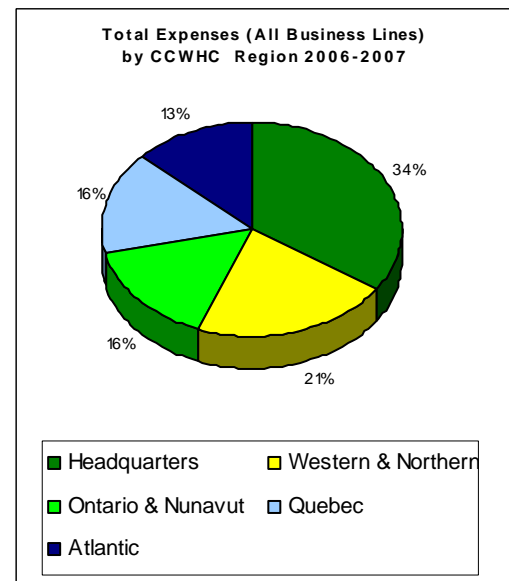
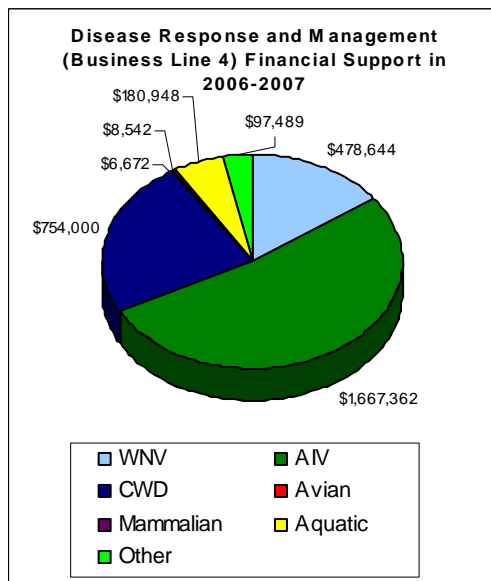
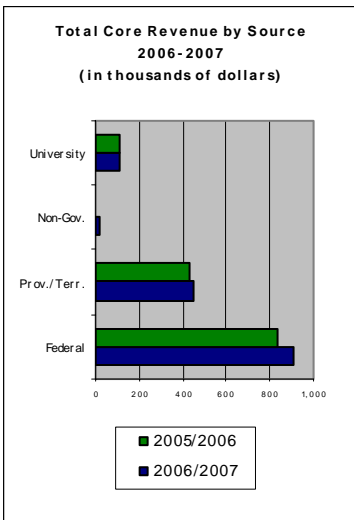
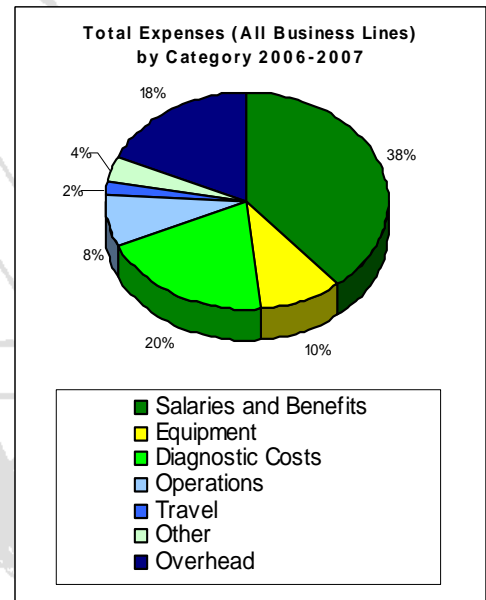
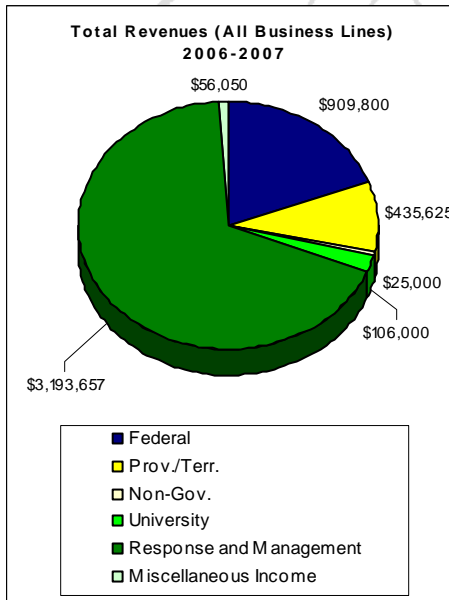
For 2006-2007 the CCWHC had total revenues of \$4,726,132, an overall increase of 35% over 2005-2006. Core Program revenues comprised \$1,476,425 or 31% of the total, representing an increase of 7% from the previous year (business lines 1-3). There was a dramatic increase in Response and Management program activities; revenues from these activities comprised \$3,193,657 or 67% of total revenue, and represented an increase of 48% from the 2005-2006 fiscal year (business line 4). Cost Recovery, miscellaneous income, and donations comprised \$56,050 representing the remaining 2% of total revenue.

Core Program revenue (business lines 1-3) from the Government of Canada accounted for \$909,800, or 62% of the total, while core revenue from the provinces and territories accounted for \$435,625 or 30%. University contributions (beyond in-kind) accounted for \$106,000 or 7%, while contributions from other non-government organizations and individuals accounted for the remaining \$25,000 or 1%.

Response and Management revenues (business line 4) are primarily comprised of federal government funding (85%), provided by the Canadian Food Inspection Agency, the Public Health Agency of Canada, PrioNet Canada (Network Centres of Excellence), NSERC-CRD, and Environment Canada. Provincial funding of Response and Management programs constitutes the remaining 15%, with major contributions from Saskatchewan Environment and Health, Alberta Innovation and Science, Ontario Ministries of Health and Long Term Care and Agriculture Food and Rural Affairs, and Atlantic provincial departments of the Environment, Health, and Agriculture.



Cash Revenues in 2006-2007 included \$1,476,425 in support of the core program, \$3,193,657 for Response and Management programs, and \$56,050 in cost recovery and donations totaling \$4,726,132.



CCWHC Staff and Associates - 2006-2007

Atlantic Region

Director	Pierre-Yves Daoust
Professional	Scott McBurney
Technical	Darlene Jones
Associates	Gary Conboy, David Gorman

Quebec Region

Director	Stéphane Lair
Professional	André D. Dallaire, Guylaine Séguin
Technical	Kathleen Brown, Judith Viau, Viviane Casaubon
Associates	Christian Bédard, Denis Bélanger, Guy Fitzgerald, Daniel Martineau, Nick Ogden, Carl Uhland, Alain Villeneuve

Ontario and Nunavut Region

Director	Ian K. Barker
Professional	Doug Campbell, M. Katherine Welch, Cheryl A. Massey, Christopher Good
Technical	Leonard Shirose, Karrie Young, Veronique LePage
Clerical	Carol-Lee Ernst, Cheryl Degagne
Associates	Dale A. Smith, Claire Jardine, John S. Lumsden, D. Bruce Hunter

Western and Northern Region

Director	Trent Bollinger
Professional	Aleksija Neimanis, Gary Wobeser
Technical	Marnie Zimmer
Associates	Lydden Polley, Judit Smits, Mark Wickstrom, Cheryl Waldner

Calgary Region

Director	Susan Kutz
Professional	Craig Stephen
Associates	Nigel Caulkett

Centre for Coastal Health

Director	Craig Stephen
Professional	Jane Parnley
Associates	Erin Fraser, Julie Ducrocq, Jennifer Dawson-Coates

Headquarters Office

Executive Director	Ted Leighton
Director of Policy, Finance and Administration	Patrick Zimmer
Director of Information Technology	Ron Templeman
Professional	Marc Cattet
Technical	Kevin Brown, Mike Elsasser, Carla Gibson
Clerical	Jacqui Brown

The CCWHC personnel included 26 staff members, 7 faculty members and 21 professional associates in 2006-2007

Ron Bjorge	Director, Fish & Wildlife, Alberta Sustainable Resource Development
Michel Damphousse	Directeur du développement de la faune, Secteur Faune Québec, MRNF
Jack Dubois	Wildlife Director, Wildlife & Ecosystem Protection Branch, Manitoba Conservation
Susan Fleck	Director, Wildlife Management Division, NWT ENR
Drikus Gissing	Director, Wildlife Services, Nunavut Department of Sustainable Development
Jim Hancock	Director, Wildlife Division, Newfoundland & Labrador
Hugh Hunt	Executive Director, Resource Stewardship Branch, Saskatchewan Environment
Harvey Jessup	Director, Fish and Wildlife Branch, Yukon Department of Environment
Kaaren Lewis	Director, Biodiversity Branch, BC Ministry of Water, Land and Air Protection
Cameron Mack	Director, Wildlife Policy Branch, Ontario Ministry of Natural Resources
Paul Mayers	Executive Director, Animal Products Directorate, Canadian Food Inspection Agency
Colin Maxwell	Executive Vice President, Canadian Wildlife Federation
Kate MacQuarrie	Director, Fish & Wildlife Division, PEI Department of Environment
Henry Murkin	Chief Biologist, Ducks Unlimited (Canada)
Frank Plummer	Director General, CIDPC, Public Health Agency of Canada
Charles Rhodes (Chair)	Dean, Western College of Veterinary Medicine, University of Saskatchewan
Barry Sabean	Director, Wildlife Division, Nova Scotia Department of Natural Resources
Mike Sullivan	Director, Fish and Wildlife Branch, NB Dept. of Natural Resources and Energy
Dan Wicklum	Director General, Wildlife and Landscape Science, Environment Canada
Stephen Woodley	Chief Scientist, Ecological Integrity Branch, Parks Canada