Canada's Inter-Agency Wild Bird Influenza Survey 2007

BACKGROUND

In 2005, Canada initiated a national inter-agency survey for influenza A viruses in healthy live wild ducks. This survey was stimulated, in the first instance, by a major outbreak of influenza in the Canadian poultry industry in 2004, and subsequently by the spread of the Asian H5N1 highly pathogenic strain from SE Asia to Europe an Africa in 2004-05. The Survey objectives were to identify strains of influenza viruses present in Canada's wild bird reservoir, to acquire information needed to assess the biosecurity of Canada's poultry industry, and to monitor viral genes of concern to human and animal health. Some 4405 samples were obtained from ducks in six different regions of the country, and 4268 of these were successfully linked to field data. Of these samples, 37% were found to contain one or more Influenza A viruses, and H5 viruses were found in 5% (208). All H5 strains detected were North American in origin and not disease-causing (all were "low pathogenicity" strains). There was wide variation among the six different regions in the proportion of ducks infected and in the apparent prevalence of different virus strains. For example, no H5 virus strains were found in 779 ducks sampled in Alberta, while 25% (161), of 640 ducks sampled in British Columbia carried H5 virus strains. Infection rates with influenza viruses varied from 10% in Alberta samples to 49% in samples from Quebec and 55% in samples from British Columbia.

In 2006, the wild bird influenza survey was continued, with both live bird and dead bird components. The objectives of the live bird survey were to monitor year-to-year variation in viruses present in the wild duck population, to sample in the eastern Canadian arctic to which trans-Atlantic migrant birds might carry the virus from European or African wintering grounds, and to sample additional species of aquatic birds to better understand the wildlife reservoirs of influenza A viruses. The objective of the survey based on birds found dead was vigilance for highly pathogenic virus strains and careful assessment regarding whether or not influenza viruses had caused the death of the birds. In total, over 12,000 birds were sampled in the 2006 survey. As in 2005, approximately 37% of healthy live wild ducks sampled in 2006 were infected with one or more avian influenza viruses. However, infection rates in each region often were very different from the rates detected in 2005. Urban-nesting Canada Geese were found to be free of influenza viruses, while there was a low rate of infection in various populations of arctic-nesting geese. Low rates of infection also were detected in several other species.

The 2005 and 2006 Surveys were highly successful. The importance of wild duck populations as reservoirs for avian influenza viruses, particularly compared with other related bird species, was clarified. Canada's national *Avian Influenza Virus Laboratory Network* was greatly strengthened through the conduct of the Surveys. New communications challenges associated to responses to important disease occurrences were identified and protocols were

established to overcome them. Collaborations among federal, provincial and territorial agencies responsible for animal health, public health and wildlife, and with Canada's veterinary college wildlife health expertise, were greatly advanced through the planning and conduct of the Surveys, and new tools and methods for complex data management on a national scale were developed, tested and improved.

On 11 January 2007, the Executive Committee of the Inter-agency Wild Bird Influenza Survey met by teleconference to review survey options for 2007. The Committee considered it essential that Canada continue its vigilance and surveillance for Avian Influenza viruses in wild birds in Canada in 2007. Highly pathogenic H5N1 influenza has remained active in Asia. Recent published assessments of the relative roles of wild birds and of commerce in the spread of H5N1 across Asia, Europe and Africa in 2005-06 conclude that movement of virus took place by both mechanisms. Risk assessments for arrival of H5N1 in North America attribute greater risk to commerce than to intercontinental bird migration. However, arrival of H5N1 in western Europe in winter 05-06 was first detected by vigilant surveillance based on dead wild birds. Wild birds appear to have the potential to transport highly pathogenic virus from points of arrival in North, Central or South America to Canada, and also to act as sentinels in Canada for the presence of highly pathogenic viruses irrespective of the manner of their arrival. Canadian agriculture already has benefited from the background information provided by the wild bird influenza survey. It has reduced the intensity of trade sanctions and has been the major platform for testing and improving Canada's laboratory networks, communications systems and response plans for major epidemic disease outbreaks, including diseases potentially transmissible to people.

Thus, the Committee confirmed the need to continue the program in 2007. There has been no diminution in risk to Canada from Avian Influenza viruses between 2006 and 2007. The Committee considered a range of Survey activities that might be undertaken, and sent a prioritized list of these on to the Survey's larger Steering Committee for discussion by teleconference on 22 January. The Steering Committee concurred with the Executive Committee's top priorities for 2007: - Surveillance for highly pathogenic strains based on dead birds, building on the capacity to organize and manage such surveillance achieved in 2006; - large-scale surveys of healthy live ducks to further improve knowledge and methodologies for this principal reservoir of avian influenza viruses, and -further sampling of wild geese to build on initial data secured in 2006. In addition, it was proposed that plans to sample several other species groups should be established to ensure that all critical groups will be covered over the next 2-3 years.

RATIONALE FOR AVIAN INFLUENZA SURVEILLANCE IN WILD BIRDS IN CANADA IN 2007:

Surveillance for Avian Influenza in wild birds serves several important purposes.

- Protection of Canada's export trade in poultry and poultry products
  - Mitigation efforts to minimize the socioeconomic impact of the most recent occurrence of Avian Influenza in poultry in BC (domestic ducks, fall 2005) benefited greatly from background information on virus strains in wild ducks generated in the 2005 survey. It is predicted that current, credible data on Avian Influenza strains in wild birds in Canada will similarly reduce the socioeconomic impacts of future outbreaks of Avian Influenza in commercial poultry in Canada. Conversely, absence of such data is an important risk factor for larger socioeconomic impacts.

- Early detection of highly pathogenic Avian Influenza (HPAI) strains
  - Surveillance based on wild birds found dead is the most sensitive surveillance method available for detection in wild birds of HPAI strains, such as the Eurasian H5N1 strain, irrespective of how these strains may arrive in Canada. Detection of such strains as early as possible upon their arrival or evolution in Canada is one of the most critical mitigation factors in reducing their human health and socioeconomic impacts.

- Maintenance and improvement of national laboratory and surveillance capacity for Avian Influenza viruses
  - Rapid analysis of wild duck samples in 2005 identified many weaknesses in Canada's national capacity to manage Avian Influenza in any species, but the survey also produced many solutions and improvements to national capacity. These were further tested in the 2006 survey and were further improved. Continuation of the wild bird survey will play a critical role in maintaining and improving overall national Avian Influenza surveillance capacity, including field, laboratory, and communication components, and contributions to government policy.

- Risk analysis and risk communication
  - The risk factors posed by Avian Influenza viruses in wild birds in Canada to human health, human economies and natural resources can only be assessed on the basis of correct and detailed information about the range of Avian Influenza virus strains, their distribution among species and regions, their variation among years, regions and species, and the extent of interchange with pools of virus strains in Asia, Europe, Central and South America. Wild bird Avian Influenza surveillance is the only means of obtaining this information.

- International contributions and obligations

  - In the current climate of concern regarding potential pandemic Avian Influenza, Canada has an obligation to contribute to the global understanding of Avian Influenza virus strains in wild birds since wild birds represent the ultimate global reservoir of the Avian Influenza gene pool. Canada is geographically situated such that early detection of foreign virus strains arriving in the Americas via transatlantic bird migration can best be achieved by surveillance conducted in Canada. Canada also must consider potential routes of virus transfer from the Americas northward into Canada and from Canada southward into the Americas.

OBJECTIVES OF THE 2007 SURVEY

1. To achieve a high level of vigilance for the early detection of highly pathogenic (HP) strains of avian influenza virus, particularly the Asian/European/African strains of highly pathogenic H5N1 virus, through enhanced detection, collection and examination of wild birds found dead in all parts of Canada, including the Arctic. The national target for this part of the Survey is to examine and test 6400 dead birds between 1 April 2007 and 31 March 2008.

2. To sample 800 healthy live wild ducks in each of the six regions sampled in 2005 in order more fully to document this immense reservoir of avian influenza viruses in Canada, to meet expectations of the international flyway councils and of American federal agencies, and further to measure year-to year variations by comparison with results from 2005 and 2006.

3. To sample up to 600 Arctic-nesting Greater Snow Geese and 300 fall-migrant Greater Snow Geese, as in 2006, in order to assess year-to-year in infection rate in this species that had the highest infection rate among geese sampled in 2006.

4. To sample two inter-America migrant species in Canada to determine the infection status and virus strains in species that have the capacity to transport viruses between South and Central Americas and Canada, in both directions. Specifically, to sample up to 400 Franklin's Gulls (*Larus pipixcan*) and 600 Blue-winged Teal (*Anas discors*).

5. To determine if foreign strains of avian influenza viruses are carried to the Americas by transatlantic migrant wild birds by means of collection of oro-pharyngeal and cloacal swab samples from Europe-wintering Eastern High Arctic Brant (*Branta bernicla hrota*, up to 400 samples) and Red Knots (*Calidris canutus,* up to 400 samples) passing through Iceland on spring migration to the Canadian High Arctic.

6. To resolve methodological issues in avian influenza surveillance that have arisen from the surveys in 2005 and 2006. Specifically 1) to determine differences and similarities in viruses detected in cloacal versus oro-pharyngeal swabs taken from healthy live wild ducks. This will be done in collaboration with scientists from the US Department of the Interior (US Geological Survey); and 2) to determine if method of capture of healthy live wild ducks affects the apparent infection rate of those ducks

7. To establish a three-year plan to ensure the Survey has covered the species groups of major interest and concern by the end of fiscal year 2009-2010. Specifically, this plan will cover peri-agricultural birds, shorebirds, coastal marine birds and passerine birds.

8. To maintain and expand Canada's national archive of avian influenza virus strains, to characterize these as fully as possible, to place information regarding these viruses in the public domain in a timely fashion, and to make these virus strains available to legitimate scientists for research purposes.

9. To collect and analyze samples from up to 800 ducks and 800 geese of the Central Flyway in late summer and fall in Saskatchewan, in collaboration with the US Department of Agriculture (APHIS)

ANTICIPATED PARTICIPANTS:

It is intended that this Survey will continue to build and enhance health management capacity in Canada through collaboration among public health, agriculture and wildlife agencies within federal and provincial/territorial governments, and with universities.

Primary Federal Participants:
- Canadian Food Inspection Agency
- Environment Canada
- Public Health Agency of Canada

Primary Provincial Participants:
- Provincial/Territorial Departments responsible for Agriculture (animal health)
- Provincial/Territorial Departments responsible for Wildlife
- Provincial/Territorial Departments responsible for Public Health

Primary Non-government Participants:
- Canadian Cooperative Wildlife Health Centre (Canada's veterinary colleges)
- Centre for Coastal Health (Malaspina University, Nanaimo)

- Ducks Unlimited Canada

International Participants:
- Government of Iceland
- Government of the United States

SURVEY GOVERNANCE

Steering Committee: All participating groups and agencies will be members of the Survey Steering Committee. This Committee met by teleconference on 22 January 2007 to discuss the Survey in 2007. The Steering Committee will receive and comment on all relevant documents and will meet by teleconference as necessary.

Executive Committee:
This Committee will consist of members representing primary federal and provincial/territorial participant groups. There will be one member each from the Canadian Food Inspection Agency, the Public Health Agency of Canada, Environment Canada, from each of the provincial/territorial committees of Chief Veterinary Officers, Chief Medical Officers of Health, and Wildlife Directors, and the CCWHC.

Survey Coordination:
The Canadian Cooperative Wildlife Health Centre will coordinate program design, and will implement and coordinate the surveillance program itself, in accordance with direction from the Steering Committee and the Survey Executive Committee.

Communications: - Policies on communications will be established by the Survey Executive Committee.

- Regular updates on the status of the 2007 Survey in terms of samples collected and analysed will be provided to the Survey Executive Committee and to others as directed by the Survey Executive Committee.

- All communications surrounding detection of avian influenza viruses classified as H5 or H7 will be managed by the Canadian Food Inspection Agency in consultation with the Provinces and Territories.

- Survey results for viruses that are not classified as H5 or H7 will be reported routinely on the public website of the CCWHC.

(See also Section 6.3, below)

CONSULTATION WITH THE UNITED STATES AND MEXICO

On 6 March 2007, a meeting was held in the United States among representatives of the US Fish and Wildlife Service, the U.S. Geological Survey, the U.S. Department of Agriculture, the Laboratorio Medicina de Conservacion, Escuela Superior de Medicina, Instituto Politecnico Nacional de Mexico, Environment Canada and the Canadian Cooperative Wildlife Health Centre to discuss continental surveillance for avian influenza in wild birds in 2007. The surveillance program described in this document was presented as the tentative plan for Canada in 2007, and presentations of the tentative plans for 2007 also were made for by the United States and Mexico. Representatives from the United States and Mexico stated that the general plan proposed by Canada was very satisfactory as a contribution to continental surveillance, and harmonized well with the other national plans. The primary focus on birds found dead for possible early detection of highly pathogenic strains of virus, including strains which might arrive in North America through trans-Atlantic migration, was considered appropriate, as was the proposed further sampling of apparently health ducks and geese, a new focus on inter-American migrants, and continued sampling in Iceland. All three countries plan to take both oro-pharyngeal and cloacal samples from birds in 2007. It was proposed and agreed that in 2007 Canada and the United States will undertake a collaborative study of the relative contributions of oro-pharyngeal and of cloacal samples in surveillance for avian influenza viruses (Objective 6, above). Canada also will collect and analyse samples from ducks and geese in late summer and fall in Saskatchewan in collaboration with the US Department of Agriculture.

SURVEY COMPONENTS AND PARTICIPANT RESPONSIBILITIES

1. Surveillance in Birds Found Dead

Collection of Dead Birds:

In general, *provincial and territorial agencies will take the lead* in each province and territory in establishing protocols to assure collection of dead birds and shipment of these to participating laboratories. The *Canadian Wildlife Service* also will be a major participant.

- Each Province and Territory will establish protocols for communications with communities, the public and participating agencies in order to achieve the best possible levels of detection, collection and shipment of dead birds to participating laboratories of dead wild birds.

● All species of birds found dead will be included in the survey. Experience with H5N1 in Europe has found that it is not possible to determine, in advance of examination and testing, whether or not a bird found dead is of value to the Survey. The public will be asked to be vigilant and report all dead birds. If the number of dead birds detected significantly exceeds the Survey target numbers, triage of specimens to be examined will be done at the level of the provincial/territorial call centre (where such exist), at agency offices where dead birds are received for transhipment to laboratories, or at the laboratories themselves.

In the event that such triage is required, priority for examination and testing will be given to:
- Bird species which use aquatic or wetland habitats
- Mortality events that appear unusual in some way for the region and location
- Mortality events involving more than one species
- Mortality events involving notable numbers of birds

● Government wildlife agencies (Federal, Provincial and Territorial), non-government wildlife organizations (such as Ducks Unlimited Canada) and other field-oriented groups participating in the Survey will urge field staff to be particularly vigilant for dead wild birds during routine field operations, and to collect such dead birds for inclusion in the 2007 Survey, as part of their regular field work. If mortality occurs in remote areas where shipment of dead birds to laboratories is impossible, then, whenever feasible, field personnel will collect oro-pharyngeal and cloacal swabs in virus transport medium and will assure their proper handling and transport to a participating laboratory.

- Vigilance is required in all regions of Canada and at all seasons of the year. In summer 2007, particular vigilance is sought in the Eastern Canadian Arctic among water-associated birds and on colonies of marine birds that include trans-Atlantic migrants, such as Arctic Terns.

● Wildlife rehabilitation stations often are the first to receive reports of dead wild animals from the public. These stations also often function after hours and on weekends, when many calls from the public will be received. As a consequence, these stations will certainly receive notifications and inquiries from the public regarding dead birds and the Wild Bird Influenza Survey, and, thus, each will require specific information on the Survey protocols to be followed in their province or territory. It is recommended that these rehabilitation centres be fully integrated into planning for the dead bird component of the Wild Bird Survey in each province and territory.

Specimen Examination

Veterinary diagnostic laboratories which participate in Canada's national wildlife disease surveillance program will receive and examine the dead birds collected as part of the 2007 Survey. These laboratories are the CCWHC Regional Laboratories at Charlottetown PEI, St-Hyacinthe QC, Guelph ON and Saskatoon SK, the Animal Health Centre in Abbotsford BC (Ministry of Agriculture, Food and Fisheries), the Alberta Veterinary Surveillance Network (Alberta Agriculture and Food) and the Veterinary Services Laboratory in Winnipeg (MB Ministry of Agriculture, Food and Rural Initiatives). If required or requested, the Western and Northern Regional Centre of the CCWHC in Saskatoon will assist with examination of dead birds from Alberta and Manitoba.

- Each bird, or a sub-sample of birds from large-scale mortality events from which many specimens are sent to the laboratory, will be examined to determine cause of death and each will be tested specifically for Influenza A viruses, regardless of cause of death. When the number of birds received exceeds the capacity of the diagnostic laboratory to examine them on a priority basis, swab samples for influenza assessment will be taken and processed, and the carcass then will be frozen and examined for cause of death at a later date.

- For Influenza assessment, two swabs – one from the cloaca with its content, and another from the oropharynx (caudal extremity of the oral cavity beyond the base of the tongue and around the larynx or opening of the wind pipe, and including a pass across or into the choanal cleft) – will be collected in 2.5 ml of virus transport medium, and either passed immediately to a participating virology unit within the laboratory or frozen (-70C preferred when feasible, but -20C is acceptable) and shipped immediately to a participating virology laboratory. Frozen samples will not be permitted to thaw and will be delivered to the virology laboratories in a fully frozen state.

- A complete record of each examination, and all findings with respect to cause of death, will be entered into the national wildlife disease database by the participating diagnostic laboratory on a priority basis, as soon as these data are known.

- The participating virology laboratories will be the same laboratories of the Avian Influenza Virus Laboratory Network which will analyse swab samples collected in the 2007 Live Bird Survey (see below), and will follow the same protocols for immediate PCR analysis for Matrix Protein gene sequence, followed by PCR for H5 and H7 protein gene sequences if positive for Matrix Protein. (See virology section for live bird survey, below).

- Because examination and testing of dead birds is the component of the 2007 Survey through which highly pathogenic strains of influenza are most likely to be detected if

present, *virology laboratories will give first priority for Matrix, H5 and H7 PCR analysis to samples received from dead birds.*

2. Samples from Live, Healthy Wild Birds and from Hunter-Harvested Birds

1. Sample Collection:

- Samples will consist of <u>two</u> *(2) swab samples taken from each bird, one a swab of the* <u>oropharynx</u> *(back of the mouth/throat, including a pass through or across the choanal cleft) and a second of the* <u>inside of the cloaca</u> *(feces). These two swabs from each individual bird will be placed together in a single sample vial and thereafter analysed as a single sample.* Immediately upon collection, the swab tips will be placed in vials containing virus transport medium. Fisherbrand Cryovials® (or equivalent), 3 ml in volume, and filled with 2.5 ml of virus transport medium will be used. Swabs and transport medium will be supplied by the CCWHC. Once collected, the sample vial will be frozen as soon as possible, preferably at -70C or colder, when feasible (-20C is acceptable). When required for logistical reasons, samples may be kept cold (≤ 5C) but unfrozen for up to 2 days before being frozen. Once frozen, samples will not be permitted to thaw and will be delivered to participating laboratories in a fully frozen state.

- Complete field records will be kept for each sample, including all data required by the Survey database. These records will be entered immediately into the Survey database or will be sent immediately, by FAX or overnight courier, to the CCWHC for entry. *The database should contain these data by the time samples are delivered to the regional laboratories for analysis.*

- Samples collected from live and from dead birds will be shipped or delivered to laboratories at the earliest possible moment. *It is a major objective of this Survey that the time between collection of a sample and preliminary analysis by PCR be a short as possible.*

- The *Canadian Wildlife Service/Environment Canada* will take the lead in obtaining samples from wild ducks trapped for banding or other purposes as part of its on-going waterfowl management programs.

  - The field sampling protocol used in the 2005 and 2006 Surveys will be repeated as exactly as possible (same sites, same target numbers of species: <u>500 Mallards</u>, <u>300 other duck species</u>, emphasis on hatch year birds) in 2007, in Interior BC, Alberta, Manitoba, Ontario, Quebec and the Atlantic Provinces. Because of the excessive collection effort required to secure 500 samples from Mallards in Atlantic Canada, 500 samples will be obtained from <u>Black Ducks</u> instead, in the

Atlantic region only.

- CWS/Environment Canada and the CCWHC will work together to assess certain procedures used in the Surveys to date. This will include assessment of the difference in viruses detected in oral-pharyngeal versus cloacal swabs (all regions - special protocol to be developed), and the effect that congregation of ducks around certain styles of trap may have on the infection rates measured in these ducks (Atlantic Region).CWS also will collect samples from up to 800 dabbling ducks and 800 geese (mixed species) in Saskatchewan as part of the Survey collaborations with US federal agencies.

● *The Canadian Wildlife Service/Environment Canada*, in collaboration with others as appropriate, also will take the lead in securing samples in several other settings: - from Atlantic Brant (up to 400) and Knots (up to 400) on spring migration to Canada during staging in Iceland, - from up to 300 Greater Snow Geese live-trapped in Quebec, - from up to 600 Greater Snow Geese sampled on Bylot and Ellesmere Island, - from up to 400 healthy live Franklin's Gulls and 600 Blue-winged Teal in Saskatchewan (inter-America migrants).

3. Samples from Additional Species

In the period of FY2007-08 to FY2009-10, sampling should be extended to make general assessments of the avian influenza viruses present in 1) wild birds that habitually live close to farm buildings, particularly poultry farms, and/or make regular use of these farm environments; 2) additional species of migrant shorebirds that can be obtained in large numbers in Canada during northward or southward migration; 3) Migrant song birds (Passerines), in both northward and southward migration, 4) Gulls and Terns, pending H/N typing of viruses from the 2005 and 2006 Surveys. This is in addition to continued surveillance based on dead birds and to possible further assessments of the major waterfowl AI reservoirs.

● FY 2007-08:

1) Peri-Agricultural Species: Quantitative documentation of species, and numbers of each, making use of poultry farm environments in two different regions of Canada. There will be no sampling of these birds for viruses.

2) Shorebirds - Obtain samples from up to 300 Knots and up to 600 White-rumped Sandpipers (*Erolia fuscicollis)* in Quebec to benefit from the last year of a shorebird banding program. Assess options for Spring and Fall sampling elsewhere in 2008 and 2009.

3) Song Birds - No activity in 2007; monitor results from surveys in the United States and Mexico; plan sampling in Canada for Spring 2008, if warranted

4) Gulls and Terns - Sample up to 100 Boneparte's Gulls in Quebec to benefit from the last year of a banding program.
- Complete H/N typing of 2006 isolates from gulls and terns

- FY 2008-09

1) Peri-Agricultural Species: - Based on results from 2007-08, off-farm sampling of species with greatest contact with farm environments, within an agricultural area but 10 km from nearest poultry farms.

2) Further sampling of hunter-harvested wild geese in western Canada if deemed appropriate after full analysis of data from 2006

3) Shorebirds - Obtain, if possible, standard two-swab samples from each of two different species, up to 600 of each, at one or multiple sites.

4) Song Birds - If warranted, sample up to 600 song birds at each of 3 locations during spring migration and another sample of the same size at the same locations during fall migration.

5) Gulls and Terns - further sampling if warranted by H/N results from 2006-07 Survey.

- FY 2009-10

1) Peri-Agricultural Species: - Based on results from 2008-09, additional sampling of species with greatest contact with farm environments, if warranted.

2) Shorebirds - Obtain, if possible, standard two-swab samples from each of and additional two different species, up to 600 of each, at one or multiple sites.

3) Song Birds - If warranted, sample up to 600 song birds at each of 3 locations during spring migration and another sample of the same size at the same locations during fall migration.

4) Gulls and Terns - further sampling if warranted by previous results.

4. Primary Virology in Regional Laboratories

Initial testing of samples for the presence of Influenza A viruses will be done by laboratories that are participants in Canada's *Avian Influenza Virus Laboratory Network*, administered by the Canadian Food Inspection Agency:

- British Columbia's Animal Health Centre (Ministry of Agriculture, Food and Fisheries)
- Alberta Veterinary Surveillance Network (Alberta Agriculture and Food)
- Manitoba's Veterinary Services Branch (Ministry of Agriculture, Food and Rural Initiatives)
- Saskatchewan's Prairie Diagnostic Services
- The Animal Health Laboratory at the University of Guelph
- Quebec's INSA - Réseau des laboratoires (Ministère de l'Agriculture, des Pêcheries et de l'Alimentation) and the Faculté de médecine vétérinaire, Université de Montréal.
- The Atlantic Veterinary College Diagnostic Laboratory
- National Centre for Foreign Animal Diseases (NCFAD)

    - Samples received from Iceland will be analysed directly by NCFAD because these samples represent a formal international collaboration. For these samples, NCFAD will follow the protocols established for primary virology carried out in regional laboratories such that selected influenza viruses present in these samples are identified and partially characterized, whether they are of H5/H7 or of other H types.

● *Primary screening* will be via PCR. PCR analysis will be performed as quickly as possible once samples have been received by the laboratory. Although samples from wild birds found dead will be given first priority for analysis, samples taken from live or from hunter-killed birds also will be given very high priority for immediate PCR analysis.

● PCR analysis for Matrix Protein gene sequences will be done on all samples. All samples shown to contain influenza A virus(es) by this analysis will immediately be analysed by PCR for H5 and H7 protein gene sequences. All samples thus identified as containing H5 or H7 virus(es) will be shipped immediately to NCFAD for complete identification. Regional laboratories will do no further work on these H5/H7-positive samples.

● During sample processing for PCR screening at regional laboratories, each sample will be thawed and re-frozen only once. A minimum of 1.5 ml of original sample will be re-frozen in the sample vial for further testing by NCFAD or for virus isolation by the

regional laboratories.

- Results of PCR analysis will immediately be entered into the Survey database

- Samples that are found by PCR analysis to contain one or more Influenza A viruses, but not to contain either H5 or H7 virus strains, will be retained frozen for future reference. Regional laboratories will hold these samples at -20C or colder until they can be shipped without thawing to a designated holding facility for long-term storage. No routine virus isolation procedures will be carried out on these samples in the 2007 Survey. Virus isolation will be done on samples in this category from ducks collected in Saskatchewan. These virus isolates will be sent to the avian influenza virus archive in the National Microbiology Laboratory (Public Health Agency of Canada, Winnipeg) and to the National Centre for Foreign Animal Diseases,(Canadian Food Inspection Agency, Winnipeg).

- All laboratories will follow identical PCR and virus isolation protocols. NCFAD will establish primary virology protocols and quality assurance procedures through the *Avian Influenza Virus Laboratory Network*, collaboratively with the participating regional laboratories.

5. Further Analysis:

The NCFAD will undertake the following.

- Isolation and characterization of selected H5 and H7 viruses, including pathogenicity testing if required (requirement determined by CFIA).
- H and N typing of viruses isolated in the 2007 Survey. Only H5 and H7 viruses will be typed immediately; typing of other viruses will be completed on a longer time frame.
- Immediate entry of data into the Survey database
- Establishment and maintenance of the primary virology protocols and quality assurance procedures for regional laboratories through the *Avian Influenza Virus Laboratory Network*, collaboratively with the participating regional laboratories.
- Maintenance of an archive of all viruses isolated by NCFAD from the wild bird survey.(See *Avian Influenza Virus Archive*, below)

The NML will assist NCFAD when surge capacity is required. In addition, NML will:

- Maintain an archive of all viruses isolated by regional laboratories. (See *Avian Influenza Virus Archive*, below)

- May carry out some routine virus genome sequencing to characterize virus isolates at the molecular level.

The CCWHC will coordinate activities among participating laboratories, will monitor completeness of data entry, and will check data for detectable errors. In addition, the CCWHC will:

- Seek national and international scientific collaborations to carry virological analysis as far as possible on viruses obtained from the Survey.

- Analyse and report on the progress of the survey and its major findings

6. Other General Components of the Survey

1. Avian Influenza Virus Archive

- The national archive established in the 2005 and 2006 Surveys will receive samples (3 aliquots) of each virus isolated by the limited virus isolation work conducted in the 2007 Survey (see item 4, above). The purpose of this archive is to provide scientists in Canada and elsewhere access to the full range of virus strains for research purposes.

- The Survey Executive Committee will establish guidelines for access to these samples by scientists, to assist NML in administration of the archive.

- NCFAD also will maintain an archive of viruses isolated within its biosafety level 3 laboratory and which thus can not readily be moved out of these level 3 conditions. NCFAD will work with other research scientists in various ways, as necessary, to provide access to these viruses, for example by providing RNA extracts of these viruses which can be taken from the level 3 facility.

- To enhance scientific access to viruses identified in the Survey, gene sequence data generated by NCFAD, NML and others will be deposited in GenBank, an open-access gene sequence database, as recommended by the WHO and OIE.

2. Data Management:

Data generated by all participants (sample collection data, PCR data, H and N typing data, gene sequence data, pathogenicity data, etc.) will be entered into the Survey database to which participants will have password-protected access. The database will be further developed and managed by the CCWHC, in consultation with participants and the Survey Executive Committee.

3. Communication of Results

- Policies for communication of results from the 2007 Survey will be established by the Executive Committee (see Survey Governance, above).

- For communications and citation purposes, the name of this surveillance program shall be: "*Canada's Inter-agency Wild Bird Influenza Survey* "

- The Survey Database will be the mechanism for immediate reporting of all laboratory results (by regional and federal laboratories).

- Open sharing of results among Survey participants, with other government agencies, with the Canadian public and with the international community, consistent with government policies, is a communications principle for the Survey

  - Information about the detection of influenza A viruses that are not of the H5 or H7 types will be displayed on a public website as soon as those data are entered into the Survey database. Preliminary detections of H5 and H7 viruses will not be displayed on the public website until such time as these have been confirmed and the viruses identified to the satisfaction of NCFAD, and after affected agencies have completed the internal and external communications that each requires.

  - The CFIA will coordinate all communications associated with detection and characterization of H5 or H7 virus strains.

4. Public and Media Communications, Human Health and Safety Standards and Messages, and Contingency Plans for Possible Detection of Highly Pathogenic Virus Strains

Each Province and Territory, and the Federal Government, will establish and maintain lead agency designations, protocols and procedures that specify:

- The content of avian influenza-related information relevant to public health, hunter safety, Wild Bird Survey personnel safety, and other similar concerns to be disseminated in the province, territory or agency, and the mechanism and responsibilities for its dissemination.

- Contingency plans for actions and communications in response to various possible scenarios of detection of Highly Pathogenic strains of avian influenza viruses, including the Eurasian HP H5N1 strain.

- Communications with politicians, upper government management, the media and the public about the Wild Bird Survey, under routine conditions and under conditions of possible detection of Highly Pathogenic strains of avian influenza viruses in North America.

It is the shared intention among Wild Bird Survey participants that information provided to the public, mechanisms for communications, and contingency action plans be harmonized among federal, provincial, territorial and non-government agencies and groups through advanced planning and appropriate dialogue.

5. Intellectual Property

Survey participants are encouraged to analyse survey data, perform further work on the isolated viruses, and publish the results. All use of the survey data should cite and acknowledge the source as "Canada's Inter-agency Wild Bird Influenza Survey ." All use of survey data for analysis and publication must be negotiated on a bi-lateral or multi-lateral basis among those making such use of the data and the individuals and laboratories who have generated the samples and the data, following the norms of ethical scientific practise in Canada.

TARGET SAMPLE NUMBERS:

1. Surveillance of Birds Found Dead

- Target Sample Size: **6,400** (Canada-wide)

Major organizational efforts were made in FY 2006-07 to achieve a significantly enhanced flow of dead bird specimens to participating laboratories. Much of this came into place late in the year. Full and expanded use of these organizational and procedural achievements are proposed for FY 2007-08. These are optimistic targets and the Survey may achieve smaller numbers of dead birds

Province or Territory	Target Number	Province or Territory	Target Number
Yukon	100	Ontario	1500
Northwest Territories	150	Quebec	1500
Nunavut	150	New Brunswick	300
British Columbia	500	Prince Edward Island	100
Alberta	500	Nova Scotia	300
Saskatchewan	500	Newfoundland & Labr.	300
Manitoba	500	TOTAL	6400

2. Live Wild Ducks

Given below are the target sample sizes; sampling will emphasize young-of-the-year (hatch year) birds. In addition to the 500 Mallard (*Anas platyrhynchos*) samples from each location, it is anticipated that there will be access to other species of ducks during procurement of the mallard samples. Up to 300 samples from other young-of-the-year ducks will be collected and processed in addition to the mallard samples to assess species differences. 500 samples from mallards at each sampling site will permit detection of virus in at least one bird with 99% confidence if the prevalence of infection is at least 0.01 (i.e.1%). In Atlantic Region, 500 samples will be collected from Black Ducks (*Anas rubripes*) instead of Mallards, due to the predominance of this species.

Live Wild Duck Samples for 2007								
Species	Region							
	Atlantic	Quebec	Ontario	Manitoba	Sask.	Alberta	BC (Interior)	Total
Mallard/Black Duck	500	500	500	500	500	500	500	3500
Other	300	300	300	300	300	300	300	2100
Blue-Winged Teal				200	200	200		600
Total	800	800	800	1000	1000	1000	800	**6200**

3. Other Live Birds

Species	Location	Sample		Target Number of Samples
Atlantic Brant	Iceland	Swabs		400
Knot	Iceland	Swabs		400
Knot	Quebec	Swabs		300
White-rumped Sandpiper	Quebec	Swabs		400
Boneparte's Gull	Quebec	Swabs		100
Franklin's Gull	Saskatchewan	Swabs		400
Gr. Snow Goose	Quebec	Swabs	300	
Gr. Snow Goose	Nunavut	Swabs		600
Geese (mixed sp)	Saskatchewan	Swabs		800
		Total		3,900

Maximum number of Samples: **16,500**