A National Plan to Manage White Nose Syndrome in Bats in Canada

16 February 2012

Prepared by the Management Plan Drafting Subcommittee of Canada's Inter-agency White Nose Syndrome Committee

Reporting to the

Canadian Wildlife Directors Committee

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Preface : The objective of the drafting subcommittee was to adopt and adapt the US Fish and Wildlife Service document, *A National Plan for Assisting States, Federal Agencies, and Tribes in Managing White-Nose Syndrome in Bats May 2011*, to fit the Canadian context and to organize Canada's responses White Nose Syndrome (WNS) to be in harmony and collaboration with US plans and actions, as much as possible. This management plan establishes intended goals and outcomes for Canada. It will be followed with more detailed actions plans for achieving each of its goals and outcomes. Development of action plans also will be done in close association with the working groups in the US established to develop action plans for theses same goals under the US WNS management plan. The Canadian plan does not include a parallel section to that found in the US plan as *Section D: Disease Management*. The subcommittee set aside this component due to increasing uncertainty as to what, if any, measures can be taken to alter the prevalence, impact or spread of WNS. The committee will continue to consider actions that may mitigate the impact of WNS and include these in action plan formulation where possible.

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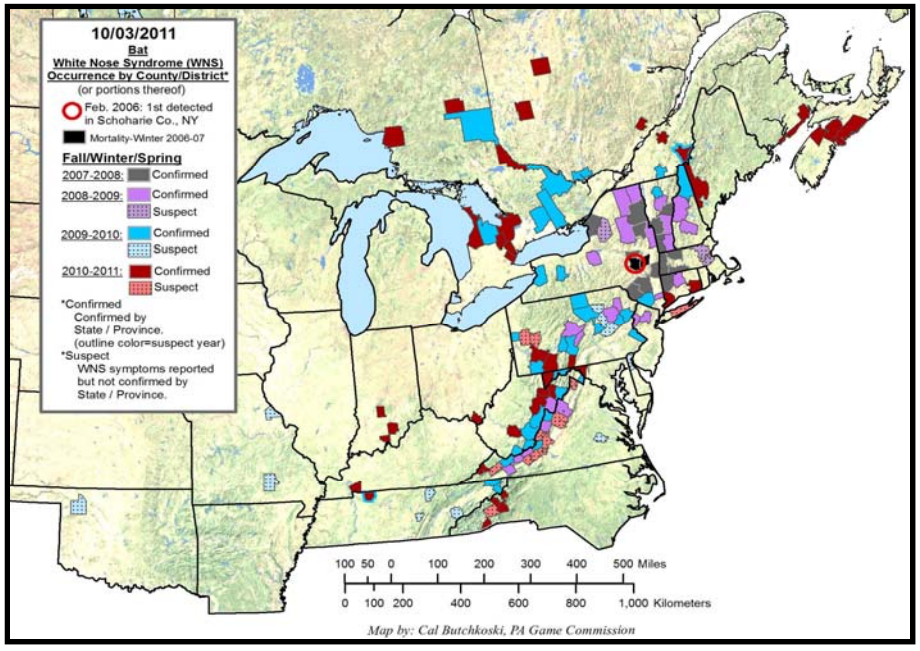

A. Communications and Outreach:

Overview

Rapid, integrated communication among internal and external audiences is critical to understanding and managing WNS in Canada. An organized national program of information dissemination about WNS and affected bat populations, linked to similar United States (US) efforts, will enable those involved in WNS research, monitoring, surveillance, management, and communication across North America to work effectively together. Providing the public with timely information about WNS and its effects builds public and political support and engagement for these efforts. The following goals and actions will guide the development of a communications plan that will facilitate information flow to two broad audiences in a Canadian context:

1. Internal audiences - include Federal and Provincial/Territorial agencies, First Nations, Canadian Cooperative Wildlife Health Centre, international government partners, as well as research scientists, institutions, organizations, and individuals directly involved with WNS research, monitoring, surveillance, management, and communications in Canada.
2. External audiences - include non-government organizations (e.g. conservation organizations, bat networks), private land managers, private industry (e.g. mining industry, recreational guides), relevant stakeholders (e.g. caving organizations, recreational users), news media, and the public.

Goals and Action Items

Goal 1: Communicate research, monitoring, surveillance, management, and conservation activities among internal audiences within Canada and the US to facilitate an effective Canadian response to WNS.

Actions:
(1) Designate points of contact for each Canadian jurisdiction and primary Canadian bat research group and a Canadian national WNS coordinator to coordinate work with internal Canadian audiences on a broad range of communications issues, including when and how proprietary data would be shared among internal audiences. Provide this information to the US National WNS Coordinator.

(2) Communicate about activities and distribute products to internal Canadian audiences in a timely manner (e.g. via the Canadian National WNS Working Group teleconferences). Keep US counterparts (via the US National WNS Coordinator) updated on research, monitoring, surveillance, management and conservation activities within Canada.

Goal 2: Communicate about WNS as an unprecedented North American wildlife disease event with devastating consequences, with an alarming rate of spread, and with no obvious means of control.

Actions:
(1) Disseminate information that is responsive to a broad range of frequently asked questions regarding WNS. Tailor this information so that it is specific to Canadian external audiences.

(2) Deliver and update products customized to convey key information about WNS and the response actions occurring in North America. Tailor this information so that it is specific to Canadian internal and external audiences.

Goal 3: Communicate about the importance of bats to people, ecosystems, biodiversity, and economies.

Actions:
(1) Disseminate information to internal and external audiences that is responsive to a broad range of frequently asked questions regarding the importance of bats in a Canadian and North American context.

(2) Create, deliver, and update products that can be customized to convey key information to external audiences about the important ecological and economic role of bats in Canada, particularly as it relates to northern ecosystems and industrial activities.

Goal 4: Communicate about the efforts of partner agencies and organizations involved in WNS investigations to control and manage WNS.

Actions:
(1) Disseminate information that is responsive to a broad range of frequently asked questions about the collaborative effort to control and manage WNS within Canada and North America.

(2) Distribute recommended standard practices and procedures that reduce the risk of geographic spread of WNS in North America. Coordinate these communication activities with the US National White-Nose Syndrome Coordinator.

(3) Provide a public source of contact for information to help interested public and media easily find up-to-date, accurate information about WNS efforts in partner agencies and organizations in Canada.

Goal 5: Establish mechanisms by which the Canadian public can report observations of bats relevant to identifying hibernacula and occurrences of WNS.

Actions:
(1): Publicize the need for public reporting and establish telephone and on-line mechanisms for reporting.

B. Data and Technical Information Management:

Overview

Management and dissemination of scientific and technical information is critical to Federal – Provincial/Territorial (F/P/T) agencies, researchers, and other groups involved in the investigation and management of WNS. The creation of uniform standards for data collection and transfer will facilitate research and management of WNS. A unified system will allow economies of scale for the proposed activities to be undertaken at a national level. A strategy to effectively incorporate national data standards with existing local data systems and newly developing systems will enhance efficiency and the effectiveness of data management at multiple scales. These data standards should be compatible with data standards established for similar work in the US to facilitate data exchange. Further, data and information from all parties will be securely handled to assure appropriate intellectual property rights and confidentiality concerns are addressed in accordance with applicable legislation and sensitivities. A secure, Internet-based WNS database will be established to effectively accomplish the efforts outlined in this plan. The WNS database will be designed to provide timely access to biological data and geospatial information specific to the investigation and monitoring of WNS. Planning for the implementation of an initial stage of such a database will make use of available mapping and data-management capacities such as the Canadian Cooperative Wildlife Health Centre (CCWHC) National Wildlife Disease Database. It is anticipated that the majority of the data will be provided by F/P/T agency biologists and academic partners. The database is intended to explicitly support researchers and managers in addressing WNS data needs, and will allow F/P/T agencies, researchers and the public to obtain near real-time data on WNS in forms appropriate to the needs of each.

A protocol for exchange of specified information with US WNS management personnel will be included in the database to promote continental management of the disease and affected species.

Goals and Action Items

Goal 1: Provide a database system that can be used by all Federal/Provincial/Territorial agencies, and serve as a central repository for nationwide analyses and specific projects.

Actions:

(1) Establish or utilize an existing robust database that can accommodate test results as well as monitoring and surveillance data from F/P/T agencies and academic researchers as resources become available.

(2) Develop a data import system to allow agencies to enter their current and archival data.

(3) Develop data collection and management standards in cooperation with F/P/T agencies, academic and international partners.

(4) Incorporate a system for tracking WNS samples from collection through laboratory testing.

(5) Create data-sharing agreements that will allow inter-operability with existing WNS data and among stakeholders, while providing confidentiality of data to data providers, as needed.

(6) Develop protocols to support the sharing of information between agencies and researchers in Canada and the United States.

Goal 2: Integrate WNS data from F/P/T agencies, land managers, and other sources into a centralized system.

Actions:

(1) Assemble information on biology and management of bats and any other wildlife species at risk for developing WNS in Canada.

(2) Collect and assemble F/P/T and other pertinent bat and WNS-related data.

(3) Create a Web-based system that will integrate information collected above.

(4) Catalog and provide Internet links to WNS information resources maintained by F/P/T and non-government organizations in Canada and to WNS centers in the US.

C. Diagnostics

Overview

Accurate, reliable diagnosis of the presence of *G. destructans* and WNS in bats is a foundation for sound, effective disease management decisions by resource agencies. This requires laboratory capacity sufficient to run a meaningful number of standardized assays relative to the sampled population, in a useful timeframe.

Primary diagnostic priorities include detecting WNS in new species, new locations, and at biologically significant sites that may harbor vulnerable bat populations.

Secondary diagnostic priorities include supporting research and surveillance at previously confirmed WNS positive locations.

Testing may be done at provincial, university or private laboratories with a minimum of Biosafety Level-2 (BSL-2) status that are willing to test samples and report WNS status results, following established, peer-reviewed methods endorsed by the network of WNS diagnostic laboratories.

Goals and Action Items

Goal 1: Develop consensus standards for WNS testing and interpretation.

Actions:
(1) Make WNS diagnostic assays available through peer-reviewed publications, protocol summaries, workshops/conferences, and on-site training. This information would be available internationally. Communication among participating laboratories assures consistent assay application, interpretation, and diagnoses.

(2) Provide case definitions for suspected and confirmed cases of WNS, and classification criteria of contaminated hibernacula.

Goal 2: Establish sufficient laboratory testing capacity.

Actions:
(1) Assess laboratories currently involved in WNS diagnostics for sample processing capacity by the various assay methods (histology, PCR, fungal culture, light microscopy).

(2) Survey resource agencies for their projected short-term and long-term WNS diagnostic needs.

(3) Assist agencies in identifying suitable diagnostic laboratories to help meet their disease-management needs.

(4) Assess funding requirements based on the projected diagnostic needs of resource agencies.

Goal 3: Ensure that samples submitted to diagnostic laboratories are suitable for WNS testing.

Action:
Provide protocol descriptions of ideal sample quality and sample storage requirements needed for the available WNS assays to resource agencies and other researchers to ensure that samples collected are suitable for diagnostic evaluation.

Goal 4: Assist with timely reporting of WNS testing results to inform the appropriate resource management agencies for release to the broader WNS community.

Action:
Work with the Data and Technical Information Management Group to develop an accessible but secure database for tracking sample results and disease progression.

Goal 5: Support WNS research in areas such as epidemiology, treatment/management options, improved diagnostic assay development, etc.

Actions:
(1) Work with US colleagues to critically review current knowledge of WNS diagnostic methods to identify gaps in knowledge and need for further research.

(2) Set priorities on possible diagnostic research topics and estimate costs and possible sources of funding.

(3) Help coordinate laboratory assistance with other WNS research projects requiring testing of samples, and ensure that this support does not negatively affect the budgets of the diagnostic laboratories doing this work.

D. Disease Surveillance

Overview
Disease surveillance efforts should focus on early detection of the expansion of WNS to new areas across Canada and, when possible, documentation of the progression of WNS through time within affected hibernating bat colonies. The surveillance efforts, which target mainly the observation of physical signs of the disease in bats, should therefore provide a better understanding of where WNS persists or has spread, and its effect on the demography of the different bat species that can be affected by this disease. The implementation of a standardized, coordinated national WNS surveillance plan will therefore be crucial to effectively monitor the regions affected by this disease, provide up-to-date information to the different agencies involved in the response plan against WNS, as well as make a better assessment of the impact of WNS on bat populations throughout the country.

Goal:
Create a coordinated disease surveillance program nationwide that identifies and minimizes disturbance to bats and potential transmission risks while still enhancing early detection and providing an assessment of WNS impact on bat populations.

Actions:
(1) List all the known hibernacula and maternity colonies of bats that are or could potentially be affected by WNS for surveillance purposes.

a) When possible, the number of species present, the population size for each species, and the location of the bats within a site should be recorded.

b) Discover new sites where bats could potentially be found (e.g., hibernacula) to increase early detection of WNS, or for assessing its impact on bats (e.g. bat counts at maternity colonies from year to year).

(2) Develop and provide recommendations for coordinated disease surveillance.

a) Adopt standardized criteria and terminology to designate WNS-affected sites.

b) In known WNS-affected areas, bat populations should be monitored to assess disease progression and effects of management actions.

c) In areas outside of WNS-affected regions, surveillance should provide early detection of WNS, expansion from affected areas, and new epicentres of WNS.

d) In all areas, surveillance should provide early detection of WNS in species that have been classified as Endangered, Threatened or of Special Concern, as well as in species that do not fall under these classifications.

e) In all areas, disease surveillance should be conducted mainly in winter (hibernation) and/or early spring (emergence) to maximize the likelihood of identifying bats with evidence of fungal growth or other physical signs associated with WNS.

(3) Develop effective surveillance strategies based on disease risk and assist with implementation.

a) Provide guidance for sample collection and submission, and for prioritizing sites to optimize surveillance efforts.

b) Determine appropriate sampling frames and sample sizes required to meet surveillance objectives.

c) Incorporate appropriate protocols in sampling techniques to minimize stress on bats and the chance of transmitting *Geomyces destructans* to new animals and sites.

(4) Integrate surveillance efforts with those of other WNS working groups.

a) Samples (e.g., wing biopsies where fungal growth is observed) of specimens collected from surveillance should be kept according to most recently updated protocols to allow further investigation of WNS (e.g., genetic characterization).

Epidemiology and Ecology Research

Overview

Although government, academic, and non-government organization researchers from many countries have worked collaboratively to increase understanding of WNS since its discovery, there are significant knowledge gaps regarding the fundamental dynamics and ecology of this disease. These gaps impede the development of plans to control and mitigate the disease, because effective management requires an understanding of the interactions among the disease, its host(s), and the environment. This section identifies priority research areas in which progress must be made to better understand and respond to the threat of WNS to bats in Canada. Key to managing this disease will be the guiding principle that research must primarily address management needs, and that basic research results should be applied to adaptive management decisions.

Research is still needed on relevant aspects of bat ecology and behaviour, diagnostic methods, etiology, pathology, epidemiology of the disease, presence and persistence of the causative agent in the environment, risks posed to other species and environments, genetics of cave fungi, host immune response, limits of pathogen survival, mode of mortality, bat population structure, and differential susceptibility. This research will be conducted through partnerships among academic entities, non-government organizations, and Provincial and Federal agencies, from Canada and other countries.

New information may shift priorities and reveal new areas of investigation. Therefore, an effective process for coordinating research is also required.

Goals and Action Items

Goal 1: Critically review current knowledge of epidemiology and ecology of WNS to identify knowledge gaps and research needs.

Actions:
(1) Identify priority research questions and capacity not currently being addressed in the investigation of WNS, particularly with reference to species and habitats in Canada, in collaboration with US colleagues.

(2) Identify high-priority laboratory and field activities needed in Canada to support research priorities.

Goal 2: Establish disease etiology.

Actions:
(1) Investigate the role of *G. destructans* as the likely primary causal agent of WNS, and increase our understanding of other potential contributing factors.

(2) Investigate the origins and evolution of *G. destructans*.

(3) Continue to consider evidence for other potential synergistic, predisposing, and/or causative agents for the suite of WNS signs observed in bats.

Goal 3: Enhance understanding of WNS pathogenesis.

Actions:
(1) Investigate the life cycle of *G. destructans*, including optimum environmental growth/viability conditions relevant to WNS management in Canada.

(2) Identify the mechanisms of transmission and infection of *G.destructans*.

(3) Investigate species differences in pathogenesis and susceptibility.

(4) Investigate whether other animal taxa are associated with WNS epidemiology.

Goal 4: Understand interactions of pathogen, host ecology, and environment.

Actions:
(1) Obtain basic epidemiological information (e.g., distribution, prevalence, incidence, case-fatality rates).

(2) Investigate critical control points in WNS dynamics.

(3) Collect baseline information on species presence, population sizes, and hibernacula in unaffected areas.

(4) Collect information on movement dynamics and population structure of bats in Canada to better understand the movement dynamics of the disease.

(5) Collect information on other biota at affected and unaffected hibernacula.

(6) Continue long-term monitoring efforts in affected areas to identify changes over time in disease infection, mortality, and population demography.

(7) Design and implement studies to identify and parameterize variables for disease models of transmission routes and rates, as well as species-specific infection, mortality, and carrier rates, and the impact(s) of bat density and species composition.

(8) Identify and employ appropriate disease models to evaluate and predict the spread and impact of WNS.

Goal 5: Evaluate the ecological and economic consequences of WNS.
Action:
Assess the ecological impacts that result from the dramatic loss of insectivorous bat populations, with an emphasis on impacts to forestry, agriculture, public health, and cave ecosystems

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Conservation and Recovery of Affected Bat Species:

Overview

Populations of several species of bats are declining because of WNS. Because species affected by WNS range across provincial/territorial and international boundaries, conservation and recovery efforts need to be closely coordinated across Canada and with the United States to be effective. Monitoring WNS-affected bat populations is necessary to determine which species may be most at risk of local extirpations and extinction due to WNS, and where conservation and management activities would be most effective. Coordination will be critical to this effort as dramatic losses from WNS, added, perhaps, to other sources of mortality, can rapidly affect the conservation status of affected populations. Population monitoring differs from WNS surveillance in that it concerns the status of entire species or genetically important populations, rather than the distribution and dynamics of the disease. Until the threat of WNS has passed or has been mitigated, best practices are needed for the maintenance and recovery of bat populations of greatest conservation concern.

G.2. Goals and Action Items

Goal 1: Develop and validate rapid-assessment monitoring plans to determine differences in susceptibility among species, and to identify which species are most vulnerable to extinction due to WNS.

Actions:

(1) Seek consensus on feasible monitoring techniques and protocols that will gauge impacts of WNS on bat species.

(2) Develop and implement monitoring plans to establish the degree to which different species of bats in Canada are vulnerable to WNS.

(3) Collaborate across Canada and with the US to establish best practices for monitoring populations on a range-wide scale for species of greatest conservation concern.

Goal 2: Establish criteria for prioritizing conservation activities

Actions:

(1) In association with the Committee on the Status of Endangered Wildlife In Canada (COSEWIC) and US planners, develop criteria for determining which species affected by WNS warrant conservation action, which may include identifying proportions of populations affected or thresholds of population size at which conservation actions should be taken.

(2) Develop contingency plans for implementing conservation actions if populations of greatest conservation concern decline and approach the threshold of population viability (e.g., extirpation or extinction).

Goal 3: Determine best practices for maintaining and recovering populations

Actions:

(1) Identify or develop techniques and protocols for assessing and mitigating the population effects of WNS.

(2) Prioritize monitoring and recovery efforts based on analysis of species vulnerability.

(3) Determine the feasibility and role for captive management for species of conservation concern. These actions could include translocation, temporary captivity, propagation, and cryopreservation.

(4) Protect or restore summer and winter habitat to ensure that quality habitat is available for bat populations before and after exposure to WNS.

(5) Should proven environmental treatments for WNS become available, establish methods for restoring hibernation sites to provide refuge for surviving and non-affected individuals.

(6) Identify previously occupied hibernacula and suitable but previously unused sites that warrant continued protection for bat recovery, and clearly identify a means of justifying such protection.

(7) Mitigate sources of mortality that have additional detrimental influences on bat populations.

Goal 4: Research on most effective methods for monitoring, conserving, and recovering affected populations.

Actions:

(1) Establish and maintain a list of prioritized research needs and work closely with other working groups to see that high-priority needs are met.

(2) Regularly assess monitoring, conservation, and recovery practices in light new research findings, and refine when appropriate.

Appendix A - White Nose Syndrome – Canadian Legal Framework

The following represents a listing of statues (Federal/Provincial/Territorial) of possible relevance to the surveillance and management of White Nose Syndrome (WNS) in bats in Canada. This should not be considered an exhaustive or exclusive list nor an in depth analysis.

The management of wildlife, including diseases of wildlife, in Canada is shared across multiple jurisdictions and agencies and is governed and influenced by many pieces of legislation. In general, and by virtue of the Canadian Constitution, the provinces and territories have responsibility and "ownership" of most wildlife in Canada, including bats. Thus, the primary legislation governing bat conservation in Canada are provincial/territorial "Wildlife Acts", coming under a variety of names depending on jurisdiction, including "Wildlife Act", "Fish and Wildlife Act", "Wildlife Conservation Act", etc., but generally constituting similar provisions across all jurisdictions.

In terms of WNS surveillance and management, legislation that could have an impact on those activities outside of the wildlife-related acts are provincial/territorial "Freedom of Information and Protection of Privacy" Acts governing many confidentiality concerns as well as "Occupational Health and Safety" Acts which may restrict the ability of researchers and government employees to engage in "hazardous" activities pertaining to surveillance. This is especially pertinent in the case of WNS and bats in general, with issues of rabies and other zoonotic diseases of concern and concerns over abandoned mines, caves, etc.

Although the provinces, in general, have jurisdiction over wildlife species, there are several instances and pieces of legislation that pertain to the role of the Federal Government and it's agencies on the management of wildlife in Canada. Generally, the "Canada Wildlife Act", and the "Health of Animals Act" (if WNS is added to the regulated diseases) apply to wildlife health and activities dealing with wildlife in Canada, including inter-jurisdictional wildlife. In addition, if activities are conducted in National Parks, then the Canada National Parks Act would apply. Similarly, if activities are conducted on First Nation's lands, then the "Indian Act" would create certain unique considerations.

There are a number of additional acts that may apply to the management of WNS, dependent on particular considerations; these include the "Environmental Assessment Act", depending on the activities being undertaken and by whom (i.e. a government actor), the "Canadian Environmental Protection Act," again depending on the nature of the activity being conducted (for example the use of certain anti-fungal agents, and depending on how the fungal agent itself could be classified i.e. as a "toxic substance"). The "Wild Animal and Plant Protection and Regulation of International and Interprovincial Trade Act" may apply, depending on the transport of animals and animal tissues that may be undertaken. The "Species at Risk Act" could apply, but only if bats are assessed as "species at risk", which they currently are not. In addition many of the above acts include provisions in the management of "invasive species," which, together, comprise a suite of existing federal legislation in the management of invasive alien species: WNS would have to be categorized as such to apply (the fungus associated with WNS was recently listed as

an invasive alien species of priority concern by the Invasive Alien Species Partnership Program of Environment Canada). As was the case provincially, the Federal "Occupational Health and Safety Act" and privacy acts, such as the "Personal Information Protection and Electronic Documents Act" would or could have ramifications. As WNS is not thought to pose a human health concern, many pieces of legislation, such as the "Human Pathogens and Toxins Act" or the "Quarantine Act," would be unlikely to apply.

Given the above considerations, the management of WNS and bat conservation in general in Canada is within Provincial and Territorial jurisdiction. However, a number of considerations exist which could move the management of WNS under Federal jurisdiction. These include inter-jurisdictional considerations and bat movements, the conservation status of bat species, the nature of the fungal agent, i.e. toxic substances, invasive species, trans-boundary wildlife and the location of activities, i.e. National Parks, First Nations and other federally mandated areas.

- Photos: L. Shirose CCWHC