

A Plan for Assisting States, Federal  
Agencies, and Tribes in Managing White-  
Nose Syndrome in Bats

**DRAFT FRAMEWORK**

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## **I. INTRODUCTION**

White-nose syndrome (WNS) is a disease responsible for unprecedented mortality in cave-hibernating bats in the northeastern U.S. This previously unknown disease has spread very rapidly since its discovery in January, 2007, and poses a considerable threat to cave-hibernating bats throughout North America. As WNS spreads, the challenges for managing the disease continue to increase. Given the complexity of the problems facing state and federal wildlife agencies, a highly coordinated effort is required to effectively manage WNS and conserve bat species. The plan proposed herein details the elements that are critical to the investigation and management of WNS, identifies key action items to address stated goals, and outlines the role(s) of agencies and entities involved in this continental effort.

## **II. ELEMENTS OF THE PLAN**

- A. Communications
- B. Scientific and Technical Information Dissemination
- C. Diagnostics
- D. Disease Management
- E. Research Coordination
- F. Disease Surveillance
- G. Conservation and Recovery

### **A. Communications:**

A.1. The purpose of this group is to create an effective mechanism for making scientific information accessible to all parties dealing with the WNS issue. DOI, USDA, and other Federal and State agencies have been engaged in ongoing communications efforts as part of their WNS activities. The communications plan is not meant to reflect all the activities of all the entities involved in this issue, but to outline a national program of outreach on this disease and its management to significant target audiences.

#### A.2. Goals

- Goal 1* — Increase awareness of Federal and State WNS efforts.
- Goal 2* — Educate target audiences about bats and WNS.
- Goal 3* — Provide accepted and updated scientific information.
- Goal 4* — Provide updates on advances in WNS management and control, as well as status of affected bat populations.
- Goal 5* — Provide scientific and technical training information to State, Federal, and Tribal employees on WNS management and surveillance methods.
- Goal 6* — Provide information about any potential impacts of WNS on human health

#### A.3. Actions

- Action Item 1* — *Production of Informative Materials*
- Action Item 2* — *Events and Distribution of Information*

## **B. Scientific and Technical Information Dissemination:**

B.1. The purpose of this group is to provide a mechanism for making WNS information accessible, in a timely fashion, to all State and Federal agencies, and others, involved with the investigation and management of WNS. The plan calls for the creation of uniform standards for WNS data collection and transfer, making available hardware, software, and data management support to States, and providing for information sharing among all State and Federal groups dealing with WNS.

### **B.2. Goals**

*Goal 1* — Provide a database system that can be used by all agencies for their own local use, as well as serve as a central repository for nationwide analyses.

*Goal 2* — Integrate WNS data from State and Federal agencies, Tribal and land managers, and other sources into a centralized system.

*Goal 3* — Create data standards and data-sharing agreements that will allow interoperability with existing WNS data and among stakeholders, while providing confidentiality of data to data providers as needed.

*Goal 4* — Provide wildlife managers and researchers with near real-time access to WNS data and other critical information.

### **B.3. Actions**

*Action Item 1 — Data Storage:* Establish or utilize an existing robust database.

*Action Item 2 — Integrated Information System:* Conduct a thorough literature review focusing on WNS.

*Action Item 3 — Long-term Activities:* Maintain databases and services described above.

## **C. Diagnostics:**

C.1. The purpose of this team is to provide reliable information on the disease and infection status of individual animals or colonies, epidemiological investigations, and means to assess treatment options as possible control measures. This requires laboratory capacity sufficient to run a meaningful number of validated, standardized assays relative to the sampled population, in a useful timeframe.

### **C.2. Goals**

*Goal 1* — Development and validation of reliable tests for rapid diagnosis of WNS in individual bats or bat populations.

- Goal 2* — Identify current laboratory capacity for processing WNS samples and a projection of necessary capacity to support the various objectives of WNS programs.
- Goal 3* — Establish a consensus standard on how laboratories are to conduct and interpret WNS testing so that results are comparable between labs and provide a mechanism for dissemination of these standards/protocols to network labs.
- Goal 4* — Timely reporting of diagnostic test results to submitters to allow for implementation of management decisions and to a centralized database for disease tracking on a national scale (see Section B).

### C.3. Actions

*Action Item 1* — Diagnostic tests already in existence for WNS include histopathology, polymerase chain reaction (PCR), and fungal culture. Histopathology is considered the “gold standard” for diagnosing WNS and is considered specific for *Geomyces destructans* only if characteristic conidia are observed.

*Action Item 2* — *Establish sufficient testing capacity*: Identify suitable labs and establish jurisdictions for lab participation based on capability and geography.

*Action Item 3* — *Determine time requirements for various WNS assays*: Describe the time requirements for obtaining results from histopathology, PCR, and fungal culture tests.

*Action Item 4* — *Assure Sample Quality and Comparable Results among participating labs*: Make available through peer-reviewed publications, seminars, on-site training opportunities, etc. validated WNS diagnostic assay standards developed by the National Wildlife Health Center (NWHC) to other laboratories that choose to become involved with WNS testing.

*Action Item 5* — *Identify and Develop Improved Testing Methods*: Development and validation of an in-situ tissue hybridization probe specific for *G. destructans* for use in tissue samples collected from live or dead specimens has been funded.

*Action Item 6* — *National reporting of laboratory confirmed WNS*: Develop a centralized laboratory database reporting system where network labs can post WNS diagnostic test results.

### D. Disease Management:

D.1. The purpose of this group is to: 1) prevent the introduction of WNS into new areas, 2) prevent WNS spread to WNS free sites within infected areas, 3) attain sufficient control of the disease in affected areas so that we maintain genetic and regional diversity and the potential for recovery to pre WNS abundance, 4) be sufficiently cost effective so

that the management efforts can be sustained as long as necessary, 4) secure the future of bats without affecting other natural systems beyond acceptable levels, and 5) collaborate with public health officials to determine whether a human health threat is associated with WNS, and to determine a course of action if the WNS agent poses such a threat.

#### D.2. Goals

*Goal 1 — Prevent/slow expansion into new areas:* Attempt to maintain existing WNS free zones and WNS free sites within the infected zone.

*Goal 2 — Contain WNS within existing areas:* Keep WNS from spreading outside of the infected zone.

*Goal 3 — Eliminate outbreaks:* To remove WNS from outbreak sites in the WNS free zone that are likely to be isolated events, and prevent its reintroduction to those sites.

*Goal 4 — Mitigation:* To minimize the effects of WNS on affected populations, and maintain sufficient diversity to allow the future restoration of all species to their geographic and genetic abundance.

*Goal 5. — Limit adverse impacts of management actions:* Ensure that any adverse impacts of WNS control activities on bats and their associated ecosystems are within acceptable limits.

#### D.3. Actions

*Action Items 1 and 2 — Disease Containment:* This focuses on work within the WNS-free zones to prevent the immigration of the disease, and within the WNS infected zone to prevent its emigration.

*Action Item 3 — Develop Management Techniques to Eliminate the Disease in Outbreak Areas:* This action will require close surveillance of vulnerable sites far beyond the current zone of infection.

*Action Item 4 — Mitigation:* Keeping mortalities associated with WNS to within acceptable levels and assuring adequate numbers and distribution of all species for complete recovery will involve multiple actions.

*Action Item 5 — Limit Adverse Impacts of Management Actions:* Emergency development of treatment strategies will likely involve the chance of such management options having unintended consequences for bats or the ecosystems they inhabit.

#### **E. Research Coordination:**

E.1. The purpose of this group is to identify and prioritize critical research needs in areas such as: disease causality, transmissibility, live-animal tests, bioassays, genotyping, and population monitoring; and to assess surveillance and management action plans. The group will work to identify methods to detect the presence and persistence of the causative agent in the environment and to develop methods for decontamination and

minimizing mortality. The group will also address epidemiology, disease management, disease ecological modeling, risks posed to other wildlife species (e.g., other hibernating mammals, and ectotherms such as reptiles, amphibians, insects), and the human dimensions of WNS. The goals of the Research Coordination group will deliberately overlap with those of some other groups, and approaches that recognizes the synergy between research and management will maximize the chances of successful results.

## E.2. Goals

- Goal 1— Thoroughly and critically review previous and current research projects to allow knowledge gaps to be properly identified.*
- Goal 2 — Establish Causal Agent(s):* Continue to investigate the role of *G. destructans* as the primary causal agent of WNS, and increase our understanding of other potential contributing factors.
- Goal 3 — Develop Rapid Diagnostics:* There is an urgent need for research to establish rapid diagnostic techniques in live animals, carcasses, and environmental samples.
- Goal 4 — Enhance Understanding of WNS Biology, Pathogenesis, and Epidemiology:* Little is known about the biology and pathogenesis of the WNS agent, including its optimum environmental growth/viability conditions, how it enters the animal, how it causes mortality, and how it is transmitted.
- Goal 5 — Investigate Interactions of Disease and Host Ecology:* There is a need to understand the interactions between host species ecology and WNS dynamics, and the implication of these interactions for disease management.
- Goal 6 — Assess Human Dimensions:* A better understanding of the attitudes of impacted publics is needed to develop effective communication/education strategies and disease management programs.
- Goal 7 — Guide the use of Citizen Science Initiatives:* The value of citizen science contributions to WNS research and monitoring can be maximized by engaging NGO and public partners.

## E.3. Actions

- Action Item 1 — Conduct research into the biology and pathology of WNS.*
- Action Item 2 — Evaluate existing diagnostic tests for accuracy and utility;*
- Action Item 3 — Conduct research into disease management and host ecology.*
- Action Item 4 — Conduct research into the human dimensions of WNS.*  
Prioritized research needs include: 1) determining the attitudes, perceptions of risk, and information needs of stakeholders; 2) determining willingness of stakeholders (e.g., landowners, recreational cavers) to participate in disease management programs; 3) determining the impact of WNS and WNS

management on the economy and the social fabric of human communities; and 4) assessing communication and education strategies.

## **F. Disease Surveillance:**

F.1. The purpose of this group is to develop consensus standards for adequate surveillance in affected and non-affected areas, and describe best practices and techniques for targeted surveillance.

### F.2. Goals

*Goal 1 — Develop Sampling Plans:* Develop a sampling design that specifies number of sites to be sampled by area and year, and assist agencies with surveillance strategies.

- a. Prioritize areas for monitoring and surveillance
- b. Development of state-specific plans outlining timing of surveys, number of sites to be surveyed, etc.
- c. Select methodology: invasive, non-invasive, passive

*Goal 2 — Establish Early Detection System:* For bat populations in which no infection has been detected, the primary surveillance objective is early detection of new WNS foci.

*Goal 3 — Support Epidemiological Investigations:* Conduct surveillance to support research investigations and trace-back (tracing movement into the population) or trace-forward (tracing movement out of the population) efforts for the purpose of identifying transmission mechanisms.

- Determine of Prevalence Rates: For bat populations in which infection has been detected, estimate WNS prevalence over time and space

### F.3. Actions:

*Action Item 1 - Develop Effective Surveillance Strategies:* These strategies will identify risk factors, enhance early detection, and support management programs.

*Action Item 2 - Collect Samples for Disease Surveillance:* The number of samples needed for such monitoring will be estimated on the number of affected bats per site.

*Action Item 3 – Management of WNS Sites:* For areas with known WNS infections, estimates of disease prevalence can be used to judge the effectiveness of management actions and to evaluate disease dynamics in the context of ecological research questions.

## **G. Population Monitoring and Recovery of Affected Species:**

G.1. The purpose of this group are to develop standards for determining if and when to monitor population numbers of bat species affected by WNS, establish criteria for prioritizing conservation and management activities, and describe best practices and techniques for the recovery of bat populations of greatest conservation concern.

## G.2. Goals

*Goal 1 — Develop Monitoring Plans:* Develop rapid-assessment population monitoring techniques that specify which species can and should be effectively monitored, the number of species to be sampled by area and year, and assist agencies with monitoring strategies.

*Goal 2 — Establish Criteria for Prioritizing Conservation Activities:* Develop criteria for determining whether non-listed species warrant monitoring and conservation action, thresholds of population size at which conservation actions are taken for particular species, and which species are of greatest conservation concern.

*Goal 3 — Determine Best Practices for Maintaining and Recovering Populations:* Develop techniques and protocols for assessing and mitigating the population effects of WNS. Assess variation in susceptibility among individuals and determine whether some individuals survive exposure, as this will help gauge the level of necessary intervention. Initiate captive propagation efforts for critically endangered species. Restore habitat and mitigate anthropogenic sources of mortality that have additional detrimental influences on population growth.

## G.3. Actions:

*Action Item 1 — Initiate Coordinated Population Monitoring:*

*Action Item 2 — Identify Species of Greatest Conservation Concern:*

*Action Item 3 — Determine Survivorship of Affected Species:*

*Action Item 4 — Establish Captive Propagation Program:* The US Fish and Wildlife Service has drafted a plan for Virginia big-eared bats (*Corynorhinus townsendii virginianus*) that may be implemented starting fall, 2009.