White-Nose Syndrome:
Current Status of the Disease and the Collaborative Response

Christina Kocer, Jeremy Coleman, Jonathan Reichard, & Rich Geboy

US Fish and Wildlife Service
New England Chapter of The Wildlife Society
Annual Spring Workshop
April 16, 2015
Overview of WNS

- A fungal disease of hibernating bats that continues to spread through North America
  - 26 states and 5 provinces confirmed
  - Evidence of causative fungus found in 2 additional states

- Disease caused by fungus *Pseudogymnoascus destructans* (Pd)
  - Grows at cold temperatures
  - Invasive pathogen, likely of foreign origin

- Mortality exceeds 90% for many sites and species

- Research continues to drive response

- Management:
  - Actions focused on containment and conservation
  - Multiple treatment options under investigation
Current Spread – 26 states, 5 Canadian Provinces

2006 - 2007

BAT WHITE NOSE SYNDROME Occurrence by County/District (or portions thereof)

First detected Feb. 2006 Schenectady Co., NY

Fall/Winter/Spring

Confirmed: Solid color
Suspect: Solid color with dots

Map by: Lindsey Heffernan, PA Game Commission
Current Spread – 26 states, 5 Canadian Provinces

2007 - 2008
Current Spread – 26 states, 5 Canadian Provinces

2008 - 2009

Map by: Lindsey Heffernan, PA Game Commission
Current Spread – 26 states, 5 Canadian Provinces

2010 - 2011

2010-11
BAT WHITE NOSE SYNDROME
Occurrence by County/District
(or portions thereof)

First detected Feb. 2006
Schoharie Co., NY

Fall/Winter/Spring

- 2006-10
- 2010-11

Confirmed: Solid color
Suspect: Solid color with dots

Map by: Lindsey Heffernan, PA Game Commission
Current Spread – 26 states, 5 Canadian Provinces

2011 - 2012
Current Spread – 26 states, 5 Canadian Provinces

2013 - 2014
Current Spread – 26 states, 5 Canadian Provinces

2014 - 2015

04/09/2015

BAT WHITE NOSE SYNDROME
Occurrence by County/District
(or portions thereof)

First detected Feb. 2006
Schomarie Co., NY

Fall/Winter/Spring

- 2006-14
- 2014-15

Confirmed: Solid color
Suspect: Solid color with dots

Map by: Lindsey Heffernan, PA Game Commission
Seven Species Confirmed with WNS

(In North America)

Little brown bat *(Myotis lucifugus)*

Northern long-eared bat *(Myotis septentrionalis)* *(Perimyotis subflavus)*

Tri-colored bat *(Myotis sodalis)*

Indiana bat *

Eastern small-footed bat *(Myotis leibii)*

Big brown bat *(Eptesicus fuscus)*

Gray bat *

Photos: Merlin Tuttle, Bat Conservation International
Additional species on which *Pd* has been detected

(In North America)

- **Southeastern bat**
  
  (*Myotis austroriparius*)

- **Virginia big-eared bat***
  
  (*Corynorhinus townsendii virginianus*)

- **Rafinesque's big-eared bat**
  
  (*Corynorhinus rafinesquii*)

- **Silver-haired bat**
  
  (*Lasionycteris noctivagans*)

- **Eastern red bat**
  
  (*Lasiurus borealis*)
WNS in Europe

- 13 species confirmed with the disease
- No mass mortality documented
- Long-term presence
- Considerable genetic variation
- North American Pd may have originated in western Europe

<table>
<thead>
<tr>
<th>Species</th>
<th>Total change 2011 (Turner et al.)</th>
<th>Pre-WNS</th>
<th>Post-WNS</th>
<th>Total change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Little brown</td>
<td>-91%</td>
<td>600,595</td>
<td>76,968</td>
<td>-87%</td>
</tr>
<tr>
<td>Northern</td>
<td>-98%</td>
<td>4,412</td>
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<td><strong>Total</strong></td>
<td>-88%</td>
<td>681,677</td>
<td>124,442</td>
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Bat Populations in NY, PA, VT, VA, WV from 42 hibernacula w/ 2+ yrs of mortality/WNS

**increase of ~1,300 MYLE at a single site in NY**
## Bat Populations in NY, PA, VT, VA, WV, CT, MA, MD, NC, NH, NJ, QC

from 42/149 hibernacula w/ 2+ yrs of mortality/WNS

<table>
<thead>
<tr>
<th>Species</th>
<th>Total change 2011 (Turner et al.)</th>
<th>Sum Pre-WNS</th>
<th>Sum Post-WNS</th>
<th>Total change 2014</th>
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**increase of ~1,300 small-footed at a single site in NY**
### Bat Populations in the Midwest
from hibernacula w/ 3 yrs of mortality/WNS*

<table>
<thead>
<tr>
<th>Species</th>
<th>Ohio (36,541 bats, 2 sites)</th>
<th>Indiana (100,766 bats, 15 sites)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Little brown</td>
<td>-97%</td>
<td>-80%</td>
</tr>
<tr>
<td>PESU</td>
<td>-98%</td>
<td>-45%</td>
</tr>
<tr>
<td>MYSE</td>
<td>-90%</td>
<td>-60%</td>
</tr>
<tr>
<td>MYSO</td>
<td>-49%</td>
<td>-16%**</td>
</tr>
<tr>
<td>EPFU</td>
<td>-41%</td>
<td>+4%</td>
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**Winter of 2013-2014, preliminary analyses**

Data Courtesy: ODOW & IDNR, Jennifer Norris & Scott Johnson

* Decline estimated from winter of first WNS confirmation to most recent population count in sites with ≥3 years of WNS

** Biennial population census of larger caves not conducted in winter 2013 – 2014.
A Glimmer of Hope?

MYLU Recaptures in MA, NH, and VT

New Research

Dynamics of fungal infection and transmission

- 6 bat species, 30 sites
- Peak transmission in the fall
- Peak fungal loads at end winter
- Infection cleared in the summer

Management Implications – best time to apply a treatment is in early winter, when transmission rates are the highest

New Research

Treatments and Other Conservation Measures

Treatment and preventions under investigation:
- Probiotics
- Microbial derived compounds
- Mycovirus
- Vaccine development
- Other fungicides…

WNS Treatment Strategy Workshop – 2015

Other Conservation Measures:
- Cave advisory & Decontamination guidance
- Guidance Documents
  - NWCO, Rehab, Forest Management, & Bats and Bridges guidance documents
  - Captive management recommendations
- NABat report & implementation - baseline in non-WNS areas, trends over time in WNS areas
Managing WNS: A Tale of Two Plans

**US National Plan**

**Purpose:**
To guide the response of Federal, State, and Tribal agencies, and partners to WNS

**Canadian National Plan**

**Purpose:**
To organize Canada’s response to WNS, in collaboration with the US plan
Canadian WNS Organization Structure

Inter-agency WNS Committee

- Bat Population Monitoring T. W. G.
- Surveillance & Diagnostics T. W. G.
- WNS Mitigation T. W. G.
- Communications and Outreach W. G.
- Data Management W. G.
- Stakeholders
- US Action Plan
- Steering Committee
- Working groups

WNS Response Management Organization
**US Working Groups**

**Diagnostics** – Anne Ballmann, USGS NWHC
- Diagnostics protocols & case definitions

**Disease Surveillance** – Eric Britzke, DoD
- National Surveillance Plan

**Communications and Outreach** - Catherine Hibbard, USFWS
- National Communications Plan, Outreach, EduBat

**Data and Technical Information Management** – Laura Ellison, USGS FORT
- Bat Population Database, Disease Tracking Database

**Disease Management** – Jonathan Reichard, USFWS (interim)
- Decontamination, Cave Management Guidance, Treatment/Control

**Etiological and Epidemiological Research** – Sybill Amelon, USFS, NRS
- Environmental Manipulations

**Conservation and Recovery** – Robyn Niver, USFWS
- NaBat, Species and Habitat Recovery, Captive Management
## Budget for WNS

- **Agency spending, FY07-13:** ~$40 million  
  (USFWS, USGS, NPS, BLM, USFS, APHIS, DoD, ~40 states)

- **USFWS total allocation, FY07-14:** ~$27 million  
  - USFWS grants through FY14: >$20 million

- **USFWS research and state support in FY2015**  
  - $3.4 million  
  - 4 grant opportunities

*Wibbelt et al. 2010*
USFWS Funding & Support – FY2014

- $1.6 million for 8 Federal agency research projects
  Matched with $1.6 million by USGS, USFS, & NPS
- $1.9 million for 9 Research projects
- $1.3 million to 30 states for WNS capacity

Research targets:
- $d$ surveillance
- Treatment and control of $d$
- Understanding bat populations, pre- and post-WNS
- Bat physiology and immunology
- $d$ genetics, ecology, and pathogenicity
- Population monitoring, NABat
- Ecological Impacts
- Communications and Outreach
ESA-Related Actions

Assessment status:

1. Eastern small-footed bat
   - Petition 2010, not warranted

2. Northern long-eared bat
   - Threatened, 2015

3. Little brown bat - under assessment

4. Tri-colored bat - under assessment

COSEWIC emergency listed 3 species in Canada
Future of WNS?

- Models predict continued spread
- All hibernating bat species potentially at risk
- Long-term impacts to bat population dynamics uncertain

Maher et al. 2012
## Thank You!

| Region          | Coordinator            | Email                          | Location        |
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