Current Status of White-Nose Syndrome and Potential impacts to DoD

Eric Britzke
Research Wildlife Biologist
Environmental Lab
6 May 2016
Emerging Fungal Diseases of Wildlife

- Chytridiomycosis
  - *Batrachochytrium dendrobatidis* (Bd)
  - *Batrachochytrium salamandrivorans* (Bsal)

- Snake Fungal Disease (SFD)
  - *Ophidiomyces ophiiodiicola*

- White-nose Syndrome (WNS)
  - *Pseudogymnoascus destructans*
White-Nose Syndrome?
Innovative solutions for a safer, better world

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

Future of WNS?


Legend

- Spread by 2007
- Spread by 2008
- Spread by 2009
- Spread by 2010
- Spread by 2011
- Spread by 2016
- Spread by 2021
- Spread by 2026
- Spread by 2031
- Spread by 2036
- Spread by 2046
- Spread by 2056
- Spread by 2081
- Spread by 2106

King County
WNS in Europe

- Pd has been detected on bats and substrate
- 13 species are now confirmed with Pd/WNS

Figure by Jeffrey Foster, UNH

WNS in Asia

- Pd has been detected on bats and substrate
  - 6 bat species
  - 9 locations

Hoyt et al. 2015. Emerging Infectious Diseases.
7 Species Confirmed With WNS in N.A.

- Little brown bat (*Myotis lucifugus*)
- Northern long-eared bat (*Myotis septentrionalis*)
- Tri-colored bat (*Perimyotis subflavus*)
- Indiana bat (*Myotis sodalis*)
- Eastern small-footed bat (*Myotis leibii*)
- Big brown bat (*Eptesicus fuscus*)
- Gray bat (*Myotis grisescens*)

Photos: Merlin Tuttle, Bat Conservation International
Additional Pd Positive Species

- Southeastern bat
  \(Myotis australoriparius\)

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

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

- Silver-haired bat
  \(Lasionycteris noctivagans\)

- Eastern red bat
  \(Lasiurus borealis\)
Bat Population Declines in 2014
NY, PA, VT, VA, WV, CT, MA, MD, NC, NH, NJ, QC

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

<table>
<thead>
<tr>
<th>Species</th>
<th>Sum Pre-WNS</th>
<th>Sum Post-WNS</th>
<th>Total change 2014</th>
</tr>
</thead>
<tbody>
<tr>
<td>Little brown</td>
<td>600,595</td>
<td>76,968</td>
<td>-87%</td>
</tr>
<tr>
<td>Northern</td>
<td>4,412</td>
<td>196</td>
<td>-96%</td>
</tr>
<tr>
<td>Tri-colored</td>
<td>16,826</td>
<td>4,224</td>
<td>-75%</td>
</tr>
<tr>
<td>Indiana</td>
<td>51,744</td>
<td>34,951</td>
<td>-32%</td>
</tr>
<tr>
<td>Big brown</td>
<td>5,012</td>
<td>3,745</td>
<td>-25%</td>
</tr>
</tbody>
</table>
Why is WNS so Detrimental?

- Bat congregate during fall swarming and winter migration
- During hibernation, bats are unable to mount an immune response to invading pathogens
- Recovery will be difficult due to the low reproductive rate
Bat Maternity Colony Networks
Geographic Limitations of WNS Impact

- Differences in hibernacula temperatures
- Differences in hibernation duration
- Possibility of increased bat activity during the winter (e.g., foraging?)
- Eastern sites have large # of known hibernacula
- Eastern sites have larger hibernating colonies of bats
## Bat Species in the U.S. & Canada

<table>
<thead>
<tr>
<th>Species name</th>
<th>Common name</th>
<th>Species name</th>
<th>Common name</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>MIGRANTS OR SPECIES NOT KNOWN TO HIBERNATE</strong></td>
<td></td>
<td><strong>SPECIES THAT HIBERNATE</strong></td>
<td></td>
</tr>
<tr>
<td>1 Mormoops megalophylla</td>
<td>Ghost-faced bat</td>
<td>1 Myotis auriculus</td>
<td>Mexican long-eared bat</td>
</tr>
<tr>
<td>2 Choeronycteris mexicana</td>
<td>Mexican long-tongued bat</td>
<td>2 Myotis australoriparius</td>
<td>Southeastern bat</td>
</tr>
<tr>
<td>3 Leptonycteris nivalis</td>
<td>Greater long-nosed bat</td>
<td>3 Myotis californicus</td>
<td>California bat</td>
</tr>
<tr>
<td>4 Leptonycteris yerbabuenae</td>
<td>Lesser long-nosed bat</td>
<td>4 Myotis ciliolabrum</td>
<td>Western small-footed bat</td>
</tr>
<tr>
<td>5 Macrotus californicus</td>
<td>California leaf-nosed bat</td>
<td>5 Myotis evotis</td>
<td>Western long-eared bat</td>
</tr>
<tr>
<td>6 Lasionycteris noctivagans</td>
<td>Silver-haired bat</td>
<td>6 Myotis griseus</td>
<td>Gray bat</td>
</tr>
<tr>
<td>7 Lasius blossevillii</td>
<td>Western red bat</td>
<td>8 Myotis leibii</td>
<td>Eastern small-footed bat</td>
</tr>
<tr>
<td>8 Lasius borealis</td>
<td>Eastern red bat</td>
<td>9 Myotis lucifugus</td>
<td>Little brown bat</td>
</tr>
<tr>
<td>9 Lasius cinereus</td>
<td>Hoary bat</td>
<td>10 Myotis occultus</td>
<td>Occult bat</td>
</tr>
<tr>
<td>10 Lasius ega</td>
<td>Southern yellow bat</td>
<td>11 Myotis septentrionalis</td>
<td>Northern long-eared bat</td>
</tr>
<tr>
<td>11 Lasius intermedius</td>
<td>Northern yellow bat</td>
<td>12 Myotis sodalis</td>
<td>Indiana bat</td>
</tr>
<tr>
<td>12 Lasius seminolus</td>
<td>Seminole bat</td>
<td>13 Myotis thysanodes</td>
<td>Fringed bat</td>
</tr>
<tr>
<td>13 Lasius xanthinus</td>
<td>Western yellow bat</td>
<td>14 Myotis velifer</td>
<td>Cave bat</td>
</tr>
<tr>
<td>14 Eumops floridanus</td>
<td>Florida bonneted bat</td>
<td>15 Myotis volans</td>
<td>Long-legged bat</td>
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<tr>
<td>15 Eumops perotis</td>
<td>Greater mastiff bat</td>
<td>16 Myotis yumanensis</td>
<td>Yuma bat</td>
</tr>
<tr>
<td>16 Eumops underwoodi</td>
<td>Underwood’s mastiff bat</td>
<td>17 Nycticeius humeralis</td>
<td>Evening bat</td>
</tr>
<tr>
<td>17 Molossus molossus</td>
<td>Pallas’ mastiff bat</td>
<td>18 Parastrellus hesperus</td>
<td>Canyon bat</td>
</tr>
<tr>
<td>18 Nyctinomops femorosaccus</td>
<td>Pocketed free-tailed bat</td>
<td>19 Perimyotis subflavus</td>
<td>Tricolored bat</td>
</tr>
<tr>
<td>19 Nyctinomops macrotis</td>
<td>Big free-tailed bat</td>
<td>20 Corynorhinus townsendii</td>
<td>Townsend’s big-eared bat</td>
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<tr>
<td>20 Tadarida brasiliensis</td>
<td>Brazilian free-tailed bat</td>
<td>21 Corynorhinus rafinesquii</td>
<td>Rafinesque’s big-eared bat</td>
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<tr>
<td>22 Eptesicus fuscus</td>
<td>Big brown bat</td>
<td>23 Antrozous pallidus</td>
<td>Pallid bat</td>
</tr>
<tr>
<td>24 Euderma maculatum</td>
<td>Spotted bat</td>
<td>25 Idionycteris phyllotis</td>
<td>Allen’s big-eared bat</td>
</tr>
</tbody>
</table>

Source: Paul Cryan, USGS
A Glimmer of Hope?

Bat Banding effort in NE

1. Adult recaptures across years
2. Successful reproduction
WNS Species Impacts

- Northern long-eared bat
  - Listed as threatened with 4d rule in April 2015
- Little brown bat
  - FWS is currently conducting a status review
- Tri-colored bat
  - FWS is currently conducting a status review
Recent Capture Locations at Fort Drum, NY

Indiana bat

Northern long-eared bat
Implementation: WNS Executive Committee

Wendi Weber                      USFWS
Anne Kinsinger                   USGS
Peter Boice                      DoD
Elaine Leslie                    NPS
Ruth Welch                      BLM
Tom DeLiberto                   APHIS
Leslie Weldon                    USFS

Karen Waldrop                    AFWA - Kentucky
Bob Duncan                       (SE)    Virginia
Mark Reiter                      (MW)  Indiana
TBD                              (W)
Patricia Riexinger               (NE)  New York

Mike Lavoie                     Eastern Band Cherokee Indians
Trudy Ecoffey                    Oglala Sioux
Adam Ringia                     Pueblo of Laguna
## Implementation: WNS Steering Committee

<table>
<thead>
<tr>
<th>Name</th>
<th>Organization</th>
</tr>
</thead>
<tbody>
<tr>
<td>Paul Phifer</td>
<td>USFWS</td>
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<tr>
<td>Jonathan Sleeman</td>
<td>USGS</td>
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<tr>
<td>Eric Britzke</td>
<td>DoD</td>
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<td>Margaret Wild</td>
<td>NPS</td>
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<td>Brian Novosak</td>
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<tr>
<td>Colleen Madrid</td>
<td>USFS</td>
</tr>
<tr>
<td>Sunni Carr</td>
<td>AFWA - Kentucky</td>
</tr>
<tr>
<td>Megan Kirchgessner</td>
<td>(SE) Virginia</td>
</tr>
<tr>
<td>Owen Boyle</td>
<td>(MW) Wisconsin</td>
</tr>
<tr>
<td>Angie McIntire</td>
<td>(W) Arizona</td>
</tr>
<tr>
<td>Scott Darling</td>
<td>(NE) Vermont</td>
</tr>
<tr>
<td>Jordi Segers</td>
<td>Canadian Wildlife Health Cooperative</td>
</tr>
</tbody>
</table>
US Working Groups

1. Communications and Outreach - Catherine Hibbard, USFWS
2. Data and Technical Information Management – TBD
3. Diagnostics – Anne Ballmann, USGS
4. Disease Surveillance – Eric Britzke, DoD
5. Disease Management – Jonathan Reichard, USFWS
6. Etiological and Epidemiological Research – Sybill Amelon, USFS
7. Conservation and Recovery – Robyn Niver, USFWS
Latest Developments

- Revised National Cave Advisory – March 2016
- Decontamination Protocol – Spring 2016
- Disease management & treatment research
  - Workshop 2015
Revision: Recommendations for Managing Access to Subterranean Bat Roosts to Reduce the Impacts of WNS in Bats

Recommendations

- Where feasible, prevent unrestricted access to subterranean bat roosts, especially while bats are present.
- Dedicate gear to sites; do not move equipment around.
- Decontaminate after every site visit.
- Coordinate and combine, when possible, scientific and management activities, especially while bats are likely present.
- Designate “no entry” restriction for subterranean bat roosts when wintering bats are present unless access is to conduct agency-sanctioned or permitted activities.
- Partner with individuals and organizations to best conserve underground environments, and their fauna and flora.
- Work to educate visitors and local communities about WNS and conservation of bats, caves, and other subterranean habitats.
Disease Management Workshop
July 2015 - 50 experts, Grand Rapids, MI

Vision: Ensure the persistence of all bat species on the continent against the threat of WNS through effective disease treatment and management.

Meeting Objectives:
1. To assess the current status of treatment research
2. Identify and establish pathways for compliance with regulatory agencies
3. Discuss next steps of treatment development
4. Prepare a strategy for field testing and implementation
Management and Conservation

Treatments and tools under investigation:

- Probiotics
- Microbially derived anti-fungal compounds
- Vaccine
- Mycovirus
- Other fungicides
- Other

Additional Guidance:

- NWCO, Rehab, Forest Management practices
- Transportation agency guidance (bridges)
- Captive management report
- Long-term hibernaculum microclimate monitoring
National Decontamination Protocol
04.12.2016

**Purpose:**
- Provide the best available scientific information known to effectively clean and treat clothing, footwear, and/or gear that may have been exposed to Pd.
  - Know the closures, advisories, or regulations in your state
  - Develop a plan to follow recommendations for your visit
  - Do NOT transport equipment into or out of USA

**Product Use:**
- First priority is SAFETY
- Understand & use equipment labels, product registration labels, SDS sheets.

**Trip Planning/Organization:**
- Consult agency or land management specific addendums
- Prepare a strategy to remove, clean, treat, rinse, & tidy up!
What can you do now?
Get to Know Your Bat Community

- Capture techniques
- Colony counts
- Acoustics
  - Fixed point
  - Mobile transects
NABat

Coordinated bat monitoring to support multi-scale inferences about trends in bat populations & abundances

- Continent-wide sampling grid
- Acoustic Surveys - Vehicular transects & stationary points
- Colony Counts – Hibernacula & maternity
- Data Management – Bat Population Data Project (USGS)
- NABat implementation:
  Baseline in non-WNS areas, trends in WNS areas
Reasons for conducting surveillance

- Determine information on the movements of WNS
  - Does the discovery in a new place represent a “jump scenario” or gradual movement?
- Allow identification of sites early in the disease progression for sites to be used in research
  - Disease management and epidemiology groups
Surveillance efforts are hibernacula-centric

- Season when the disease manifests itself
- Provides the most efficient method to sample large numbers of bats
Additional Steps

- Utilize decontamination procedures for all bat/cave work
- Become engaged in WNS research / planning efforts with stakeholders