Date: July 28-30, 2015

Location: Grand Rapids, MI

Hosts: Michigan Department of Natural Resources and Grand Valley State University

Support: U.S. Fish and Wildlife Service

Vision: Advance treatments for WNS to implementation in the field.

Purpose: The White-Nose Syndrome National Response community has prioritized research and development for treatments to reduce the impacts of WNS on bats. Treatments, in this case, are broadly defined as interventions, tools, strategies or actions at the population level. As a result, numerous potential treatments have demonstrated efficacy and safety, and some are available for more advanced trials in the field. The purpose of the WNS Treatment and Disease Management Strategy Workshop is to assess the current status of various projects, identify and establish pathways and considerations for compliance with regulatory agencies, discuss options for next steps of treatment development, and to prepare a strategy for field testing and implementation of treatment and disease management options for the immediate future.

DAY #1: Tuesday, July 28

8:30  Welcome, Introductions, and Agenda Review

8:45  Goals and Objectives of the Session and Context Setting
   • Goals and objectives of this effort
   • Current status of bats and white nose syndrome
   • How this workshop came about and how it fits in the overall effort
   • White Nose Steering Committee Position Statement on White Nose Research – Steering Committee member

9:15  Research Presentations and Discussion
   Goals and Outcome for this section
   • Review of what we know about the disease?
   • Scanning the state of the science to date on white nose treatments
   • Identifying the key kinds of research: who is doing what (biological, chemical, etc.), where and at what stage (early lab, bench test, small scale field trial, etc.)?
- **Outcome:** A summary of current status of the development of and the possible outcomes for potential treatments for WNS.

9:20 Hazel Barton, Decontamination; Environmental growth of Pd; Virginia big-eared bat epidermal secretions

9:50 Sudha Chaturvedi, *Trichoderma polysporum*-A Biocontrol Agent

10:20 Jeffrey Lorch, Skin fungi or fungistatic soils or other

10:50 Diana Northup, Investigating Bat Actinobacterial Microbiota and Natural Defenses Against White-nose Syndrome

11:20 Sybill Amelon and Chris Cornelison, *Integrated disease management strategies*

11:50 Winifred Frick, Probiotic *Pseudomonas*

12:30 Lunch

1:30 Marilyn Roossinck, Viruses in *Pseudogymnoascus destructans*

2:00 Daniel Lindner, Gene silencing

2:30 Barrie Overton, *Evaluation of Polyethylene Glycol (PEG-8000) treatment on the fungal microbiome found on bat wings naturally infected with Pseudogymnoascus destructans*

3:00 Maarten Vonhof, Testing the Efficacy of Chitosan to combat growth of *Pseudogymnoascus destructans* on Experimentally-Infected Little Brown Bats.

3:30 Break

3:45 Tonie Rocke, Potential vaccines against WNS that could be delivered orally to bats

4:15 DeeAnn Reeder, Pharmaceutical treatments and ecosystem considerations

4:45 **Wrap-up of presented disease management strategies**
- Discussion of proposed WNS-management strategies including objectives (prevention, control, or eradication) and direction (disease agent, host, or environment) – Jonathan Sleeman, FWS, and David Blehert, USGS
- Strategies will be assigned to a management matrix (below) to assess balance of current research portfolio.

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<th>Agent</th>
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<th>Environment</th>
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5:15 **Communicating Research**
- *Catherine Hibbard, FWS, kick-off of the discussion*
• Discussion on how we effectively and accurately communicate research and its possibilities and limitations to the “outside” world to avoid hyperbole, inaccuracies, and mistaken public/media conclusions?
• What is needed among our community of researchers, NGOs, and agencies to do this as well as possible?

6:00  Adjourn

DAY #2, Wednesday, July 29

8:30  Reflecting on Day 1
• What did we learn overall?
• What are missing research gaps or areas?
• If we were to think “outside the box” what other approaches or research might you imagine to “break the mold”?

9:30  Identifying the fundamental organizational management objectives: what do we collectively and as individual organizations need and want to accomplish?
• Discussion

10:00  Identifying Success: Goals for Treating WNS
• Successes, failures, and challenges of wildlife disease management, Jonathan Sleeman, USGS
• Host Response to WNS Likely Drives Potential Impacts of Treatment
• Brooke Maslo, Rutgers University
• Population Genetics, Maarten Vonhof, Western Michigan University

Discussion Questions
• What are the goals for treating WNS: eradication, containment, manage spread of new infection, maintain abundance, ensure present distribution, etc.?
• What modeling is required or recommended to understand the basic effectiveness via the population and timing for treatments (1% of the population, 5%, etc.)?
• What levels of improved survival (for populations, subpopulations, etc.) do we need to achieve, or what results can we anticipate from various levels of treatment effectiveness and how they can help us achieve (or not) our goals?
• How should genetics inform implementation of treatments?

12:15  Lunch

1:15  Stages of Research and Development, Marm Kilpatrick, University of California - Santa Cruz, and Technical Team
• Brief presentation and discussion

1:45  State of Regulation, Permitting, and Licensing
• Summary of the regulatory approvals processes and issues, Jeanette O’Hare, USDA - APHIS

Discussion Questions and Desired Outcome
• What are the approvals, processes, and steps for studies at the state and federal levels, among such agencies as USDA, FDA, EPA, and FWS and also with NEPA, state environmental assessment requirements, and regulations for the practice of veterinary medicine?
• What are the regulatory hurdles for various kinds of treatment or approaches and what might be done about them?
• **Outcome:** Written overview of regulatory steps and processes for permitting of appropriate field research.

2:45  Kick-Off Work Groups

3:00  **Work Groups (see details further below)**
• *Powerpoint Projector and screen in each room*
• Work Groups
  o Refining the Goals of WNS Treatment Research Program
  o Building a “Systems” Map of Disease/Bats and Possible Treatment Intervention
  o Stages of and Prioritizing the Research for Funding
  o Guidance for Matching Resources and Researchers

6:00  Adjourn for Day

**Day #3: Thursday, July 30**

7:30  Work Groups meet for breakfast, finalize work and prepare for presenting to full group

8:45  Report Out from:
• Work Group on guidance and framework for disease system model
• Discussion and honing of draft approach
• **Outcome:** Draft disease/bat systems model with research intervention points

9:30  Report Out from:
• Work Group on goals, indicators and metrics of success for treatment efforts.
• Discussion and honing of draft approach
• **Outcome:** Honed goals, indicators and metrics of success for treatment efforts.

10:15  Break

10:30  Report Out from:
• Work Group on guidance and framework for prioritizing research for funding.
• Discussion and honing of draft approach
• **Outcome:** Honed guidance and framework for prioritizing research for funding.

11:15  Report Out from:
• Work Group on matching resources and researchers
• Discussion and honing of draft approach
• **Outcome:** Honed guidance for matching resources and researchers.

12:15  Lunch
1:00 A Strategic Research Plan: Putting it All Together
• Given our two days of discussion, what is our overall research approach or strategy to advance treatment research?
• What kinds of overall “portfolio” of research would balance risk, feasibility, and innovation?
• Has our work over the last three days resulted in a coherent strategy?

2:30 Summarizing Next Steps, Actions, and Timelines

3:00 Adjourn

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**WORK GROUPS AND ASSIGNMENTS**

**Identifying Success: Goals for Treating WNS**
• *Outcome: Goals, indicators and metrics of success for treatment efforts.*
• Refine goals, indicators and metrics of success for various species, both listed and non-listed from earlier full group discussion
• What constitutes success for: 1) individuals; 2) populations (and at what scale, regional, sub-regional, continental, etc.); 3) various species
• Given the “far gone” state of some species, are better off focusing elsewhere, earlier in the disease spread of other species? Can we assign different priorities to different species, and under what criteria or conditions?
• What modeling do we need we haven’t done to give us a greater sense of levels of effectiveness needed?
• Understand how genetics should inform implementation of treatments.

**Building a “Systems” Map of Disease/Bats and Possible Treatment Intervention**
• *Outcome: Draft disease/bat systems model with research intervention points*
• Building on early discussions, refine the model or influence diagram for the disease, identifying where various treatment and other strategies intervene with the disease
• Identify where further research may be missing given the model and what we have in the works for intervention to date.

**Advancing Research and Development**
• *Outcome: Guidance, criteria, and framework for understanding and prioritizing stages of research for funding.*
• Build off of Marm Kilpatrick’s draft White Paper (2014), stages of R&D
• What criteria should we use within key stages in treatment development to evaluate studies (i.e., past experience of researcher, links to similar efforts in other species, etc.)?
• What criteria across key stages should we use to evaluate choices (i.e., costs, operational requirements, efficacy, toxicity, risk/benefit, scalability, etc.)?
• How should these criteria be used to evaluate developing treatments to evaluate funds and natural resources (bats, caves, etc.)?
• What kind of balance should we seek across supporting lab versus small field trials versus “scaling up” research?
• How do we prioritize stages of research in conjunction with treatment techniques as they relate to our understanding of the disease model/system?

Matching Researchers to the Resource
• **Outcome:** Options and ideas for matching resources (bats and bat roosts) with appropriate and effective actions for development and implementation of treatments.
• Sunni Carr, State of Kentucky, will open with a draft overall framework/topics for this conversation
• What are the ways we can connect researchers and states/populations in a useful, practical, and efficient way? How might we handle participation agreements and intellectual property, data confidentiality, etc.?