

FINAL REPORT

White-nose Syndrome Grants to States SC-E-F16AP00833

South Carolina Department of Natural Resources

December 1, 2016 – December 31, 2017

Project Title: South Carolina WNS State Support

The purpose of this grant was to provide eight months of salary, fringe and indirect costs to continue to fund the temporary grant Biologist II (Jennifer Kindel) hired to complete work dedicated solely to WNS surveillance and research, and conservation of bat populations in South Carolina. This grant also facilitated (partially funded) the travel and participation by our temporary grant Biologist II (now also known as WNS Biologist) at the 2017 National White-Nose Syndrome Workshop meeting in Nashville, TN (May 23 – May 25, 2017).

Objective 1: Continue to ship fall, winter, and spring bat samples from non-rabid bats submitted to SCDHEC, “cave” bat species acquired from the public and samples from winter surveys to SCWDS for WNS testing.

Accomplishments:

SCDNR shipped 10 rabies-negative bats from the SCDHEC rabies testing lab to SCWDS for *Pseudogymnascus destructans* (*Pd*) testing. SCDNR also submitted an eastern red bat (*Lasiurus borealis*, or LABO) found at a private residence in Union County that was not yet tested for rabies. Two shipments of these bats occurred (7 in winter, 4 in early spring) and included the following species: eastern red bat (1), evening bat (*Nycticeius humeralis*, or NYHU, 3), northern yellow bat (*Lasiurus intermedius*, or LAIN, 1), big brown bat (*Eptesicus fuscus*, or EPFU, 3), tricolored bat (*Perimyotis subflavus*, or PESU, 2), and silver-haired bat (*Lasionycteris noctivagans*, or LANO, 1). These bats came from 8 different counties: Charleston, Dorchester, Greenville, Hampton, Richland, Sumter, Union, and York. Rabies was detected in the eastern red bat, so *Pd* testing was not conducted on that specimen. However, *Pd* was not detected on any of the 11 other bats submitted.

SCDNR also submitted swabs for *Pd* testing from 9 concrete bat towers across the state, and the eaves of a building where bats had been roosting at Musgrove Mill State Park, to SCWDS. We also collected swab samples at 7 sites for Anne Ballman at the National Wildlife Health Center (NWHC) while conducting winter counts, in addition to Southeastern Cooperative Wildlife Disease Study (SCWDS) testing of swabs and whole-body samples. Those results are included in Table 1 below.

Significant deviations: There were no significant deviations.

Objective 2: Conduct winter bat counts and WNS surveillance at six or more hibernacula in March 2017 and collect substrate swab samples from nine concrete bat towers. This objective includes adding limestone mine records to our map of potential mine sites for future survey opportunities.

Accomplishments:

SCDNR completed 21 winter counts from December 12, 2016 to March 23, 2017 (Table 1), for a total count of 20 PESU and 45 Rafinesque's big-eared bats (*Corynorhinus rafinesquii*, or CORA). No bats surveyed during this time had obvious clinical signs of WNS. Sites included 1 building, 3 natural caves, 2 mines, 2 rock shelters, 9 bat towers, and 1 historic railroad tunnel. All but 3 sites were tested for *Pd* through either the NWHC or SCWDS. Element of Occurrence Records were completed for each site where bats were present, and entered into the Heritage Trust database. Results from WNS testing indicated that *Pd* was present in 4 new counties: Greenville, Lancaster, Laurens, and Union. Following the NWHC definition, these counties are now considered WNS suspect since no bats had obvious clinical signs of WNS.

The Stumphouse Middle Tunnel that tested positive for WNS in 2014 has shown a 97% decline in hibernating PESU populations compared to the previous 2012 count (down 387 bats from 401), with an 88% decline between 2014 and 2017 (down to 12 bats from 119). Since the last survey in 2012, Ledyard 1 had a 22% increase of PESU (up 18 bats from 14), but an 80% decline of CORA, down to 20 from 100).

Concurrently, a collaborator, Dr. Susan Loeb, collected swab samples and conducted the winter count at the main Stumphouse Tunnel, an old railroad tunnel in Oconee County owned by Clemson University and managed by the Walhalla Recreation Department (results reported in Table 1). That tunnel is used as a special research area by Dr. Loeb. Dr. Loeb's swab samples were sent to Winifred Frick at University of California Santa Cruz (UCSC). We report only the winter count information above; Dr. Loeb's project is funded by another grant and WNS results will be reported elsewhere. Bats in the Stumphouse Main Tunnel have shown an 89% decline in hibernating PESU populations compared to the 2014 count (down to 287 bats from 321), with an average 53% decline per year from 2015 to 2017. The decline in PESU from 2016 to 2017 was 49% (down to 34 bats from 67). During the same time frame at this site, there was a decrease of 4 EPFU and an increase of 11 CORA.

We added 18 limestone or calcite mine records to our map of potential mine sites for future survey opportunities from the online spatial data of USGS Mineral Resources at <https://mrdata.usgs.gov/>.

SCDNR also completed installation of a bat-friendly gate on a tricolored bat occupied, WNS-positive mine (Clemson University-2) in the Clemson University Experimental Forest.

Table 1. Winter bat counts in South Carolina (winter 2016-2017). Type: B = building, C = cave, M = mine, RS = rock shelter, TOW = concrete bat tower, T = Tunnel. Bat Count: CORA (Rafinesque's big-eared bat) = *Corynorhinus rafinesquii*, EPFU (big brown bat) = *Eptesicus fuscus*, PESU (tricolored bat) = *Perimyotis subflavus*. Lines highlighted in gray are new counties considered WNS suspect in 2017.

Type	Date	Site	County	Bat Count	Previous Count	<i>Pd</i> testing	Ownership
B	3/7/17	Musgrove Mill SP	Union	0	NEW	SCWDS	State
C	3/6/17	Cave Hall	Calhoun	5 PESU	NEW	NWHC	Private
C	3/14/17	Cline Cave	Cherokee	1 PESU	NEW	NWHC	Private
C	3/16/17	Master's Kiln	Laurens	3 PESU*	NEW	NWHC	Private
M	12/12/16	Ledyard 1	Oconee	18 PESU, 20 CORA	1/4/12: 14 PESU, 100 CORA	-	Federal
M	12/12/16	Soapstone 107A	Oconee	6 PESU	3 PESU	-	Federal
M	12/12/16	Soapstone 107B	Oconee	0 PESU	12/13/95: 0	-	Federal
M	3/9/17	Un2B	Union	2 PESU*	1/8/10: 15 PESU; 2017: collapsed	NWHC	Private
M	3/23/17	Parson Mtn1	Abbeville	0	12/12/91: 4 PESU; 2017: Caved in	NWHC	Federal
RS	3/2/17	Camp Old Indian	Greenville	5 PESU*	NEW	NWHC	Private
RS	3/10/17	Forty-acre Rock HP	Lancaster	2 PESU*	NEW	NWHC	State
TOW	2/1/17	Sassafrass Tower	Pickens	1 CORA	12/6/13: 0	SCWDS	State
TOW	2/8/17	Hamilton Ridge Tower	Hampton	5 CORA	12/6/11: 1 CORA	SCWDS	State
TOW	2/28/17	McCrary Tower 1	Richland	1 CORA	No prev hib count	SCWDS	Federal
TOW	2/28/17	McCrary Tower 2	Richland	5 CORA	No prev hib count	SCWDS	Federal
TOW	2/28/17	McCrary Tower 3	Richland	1 CORA	No prev hib count	SCWDS	Federal
TOW	2/28/17	McCrary Tower 4	Richland	3 CORA	No prev hib count	SCWDS	Federal
TOW	2/28/17	McCrary Tower 5	Richland	1 CORA	No prev hib count	SCWDS	Federal
TOW	3/6/17	Ashmore HP Tower	Greenville	0	12/6/13: 0	SCWDS	State
TOW	3/8/17	Silver Bluff Tower	Aiken	27 CORA	No prev hib count	SCWDS	Private
T	1/12/17	Stumphouse Middle	Oconee	12 PESU, 1 CORA	12/15/14: 119 PESU, 1 CORA	-	State
T	2/27/17	Stumphouse Main	Oconee	34 PESU, 11 CORA	2/29/16: 67 PESU, 4 EPFU	UCSC	Private

*Swab of 1 PESU positive for *Pd* per NWHC report

Significant deviations: There were no significant deviations.

Objective 3: Conduct some summer and fall netting or trapping on state-owned or conservation partner-held properties; emphasis will be on sites not previously sampled, sites with NLEBs but no known roost locations, and/or on sites slated for acquisition.

Accomplishments:

Mist Netting Surveys

The best and most probable locations for bat captures were netted at 4 properties in the projected area of the potential range of the Northern long-eared bat (*Myotis septentrionalis*, or MYSE) between 5/30 and 8/2/17. Two sites (Chestnut Ridge Heritage Preserve and Watson-Cooper Heritage Preserve) are located in the historic, previously known range for that species in the Blue Ridge ecoregion. The other two sites (Victoria Bluff Heritage Preserve and Tom Yawkey Heritage Preserve) are located on the coastal plain, a recently discovered area for Northern long-eared bats.

We decided to net on the coastal plain because in November of 2016, 2 MYSE were captured by Jason Robinson of Biological Systems Consultants at Palmetto Bluff Conservancy in Beaufort County, 200 miles south of their previously known range. Also in 2016, MYSE were found to live year-round on the northern coastal plain of North Carolina. Then in the summer of 2017, 9 MYSE were captured by Dottie Brown and Kristi Confortin of Ecological Solutions in coastal Charleston and Berkeley counties in the Francis Marion National Forest.

This netting effort relied heavily on volunteer assistance. Volunteers didn't handle bats but they were essential in helping put up and move net poles, checking nets, data entry, and decontamination of equipment (in addition to being excellent company). We had 17 volunteers assist with this project, contributing 270 hours. The project was also an important opportunity for two Clemson University interns to gain bat netting experience. One intern with previous bat experience, Sheldon Davis, assisted in netting efforts with the WNS bat biologist the entire summer. SCDNR interns contributed 402 additional hours toward this survey.

The combined netting effort resulted in 181 nets deployed over 28 nights and a total of 124 bats captured representing 7 species. Table 2 summarizes the netting effort from this project. No MYSE were captured. However, we did have PESU captured at three properties, 77% of which were captured on the coastal plain. Chestnut Ridge Heritage Preserve continues to be a good site for Eastern small-footed bats (*Myotis leibii*, or MYLE), and the Seminole bat (*Lasiurus seminolus*, or LASE) captured there is considered a relatively rare species for the SC upstate.

Table 2: Mist netting survey sites and results for summer 2017. HP = Heritage Preserve. Net nights are calculated using the method in the 2017 Range-wide Indiana Bat Summer Survey Guidelines (April 2017).

Location	Dates	County	Net		Bats ^a						
			Sites	Nights	PESU	LABO	LASE	EPFU	NYHU	MYAU	MYLE
Victoria Bluff HP	5/30 - 6/13	Beaufort	7	54	6	7	4	12	14	1	
Tom Yawkey HP	6/19 - 6/27	Georgetown	6	43	4	6	4	13	2		
Watson-Cooper HP	7/5 - 7/18	Greenville	5	42		1		17			3
Chestnut Ridge HP	7/25 - 8/2	Greenville	5	42	3	7	1	14			5
Totals	28	3	23	181	13	21	9	56	16	1	8

^a PESU = *Perimyotis subflavus*, LABO = *Lasiurus borealis*, LASE = *Lasiurus seminolus*, EPFU = *Eptesicus fuscus*, NYHU = *Nycticeius humeralis*, MYAU = *Myotis austroriparius*, MYLE = *Myotis leibii*.

Acoustic Surveys

We opportunistically recorded bats calls using an Anabat Express during netting to gain a better understanding of bat activity and potential species to determine ideal net placement. Using this information daily, we netted more heavily in areas with *Myotis* species identified by Bat Call Identification Software (BCID) in hopes of capturing a MYSE.

We recorded 1,434 bat calls at a total of 26 points. Using default parameters in BCID, the species initially identified that were not captured in our nets include: little brown bat (*Myotis lucifugus*, or MYSE), Indiana bat (*Myotis sodalis*, or MYSO), CORA, LANO, and hoary bat (*Lasiurus cinereus*, LACI). However, most of these calls were not manually vetted to determine species with 100% certainty, which is required before any species can be considered present. SCDNR staff participated in a Titley Acoustic Techniques and Analysis Class at Palmetto Bluff Conservancy in April 2017 as an introductory class on how to identify bat calls. Additional practice is needed to be fluent in bat call vetting, particularly for Eastern bats in the genus *Myotis* due to their extremely similar calls. There were, however, 78 total *Myotis* calls identified by BCID – MYAU: 3, MYLE: 3, MYLU: 41, MYSE: 30, MYSO:1. Because only 1 MYSO call was detected and it did not strongly match a typical MYSO call, its presence from this data is doubtful. The calls of MYLE and MYSE are often indistinguishable even by experts, so this group should be considered MYLE/MYSE. All the calls from this group were collected at upstate sites, and we used this information to net more heavily in those areas. Ultimately, we captured MYLE where all the MYSE calls were recorded, suggesting that MYSE calls identified by BCID may have indeed been MYLE calls.

Significant deviations: There were no significant deviations.

Objective 4: Keep staff and partners current by participating in WNS partner conference calls and participating in the 2017 WNS Workshop and the 2017 SBDN / Mammal Colloquium meeting in Asheville, NC.

Accomplishments:

SCDNR participated in monthly WNS partner conference calls to stay updated about WNS related research, decontamination protocols and other WNS related issues. WNS spread maps and other important updates were shared with partners and SCDNR staff. The WNS biologist attended the 2017 SBDN / Mammal Colloquium meeting in Asheville, NC from February 15 – 17, and the 2017 WNS Workshop in Nashville, TN from May 23 – 25. A South Carolina Mammal Listing/Ranking Survey was conducted previous to the SBDN meeting via email, the results were discussed during the SBDN meeting, and final recommendations were made (Table 3).

Table 3: Final recommendations for new bat rankings in South Carolina, sorted by new state rank. Rank changes are highlighted in dark gray.

Common Name	Scientific Name	Global Rank ^a	Old State Rank ^a	State Rank (proposed) ^a	Protection (proposed) ^b	Affected by WNS ^c
Northern Long-eared Bat	<i>Myotis septentrionalis</i>	G1G2	S4	(S1)	FT, (SE)	Yes
Eastern Small-footed Bat	<i>Myotis leibii</i>	G4	S1	S1	ST	Yes, SC
Little Brown Bat	<i>Myotis lucifugus</i>	G3	S3?	(S1S2)	(SE)	Yes
Tricolored Bat	<i>Perimyotis subflavus</i>	G2G3	SNR	(S1S2)	(ST)	Yes, SC
Southeastern Bat	<i>Myotis austroriparius</i>	G4	S1	(S1S2)	(ST)	Yes
Rafinesque's Big-eared Bat	<i>Corynorhinus rafinesquii</i>	G3G4	S2?	S2	SE	*
Big Brown Bat	<i>Eptesicus fuscus</i>	G5	S5	S5?		Yes
Seminole Bat	<i>Lasiurus seminolus</i>	G5	SNR	S4?		
Eastern Red Bat	<i>Lasiurus borealis</i>	G3G4	SNR	S4S5		*
Evening Bat	<i>Nycticeius humeralis</i>	G5	SNR	S5		
Brazilian Free-tailed Bat	<i>Tadarida brasiliensis</i>	G5	SNR	S4S5		
Hoary Bat	<i>Lasiurus cinereus</i>	G3G4	SNR	SNR		
Silver-haired Bat	<i>Lasionycteris noctivagans</i>	G3G4	SNR	SNR		*
Northern Yellow Bat	<i>Lasiurus intermedius</i>	G5	SNR	SNR		

^aNatureServe: G = global, S = state, SNR = not ranked, 1 = critically imperiled, 2 = imperiled, 3 = vulnerable to extirpation or extinction, 4 = apparently secure, 5 = demonstrably widespread, abundant, and secure. Rankings from Master et al. 2012.

^bFT = Federally Threatened, SE = State Endangered, ST = State Threatened, (SE) or (ST) = protection proposed, but not yet finalized.

^cSC = species that have tested positive for WNS in South Carolina, * = WNS has been detected on these species but they have not yet shown diagnostic sign of the disease.

Significant deviations: There were no significant deviations.

Objective 5: Provide WNS outreach and NLEB information to (1) NWCOs and notify them about any training opportunities, (2) local caving, scouting, and mining groups, and (3) the public via signs at critical sites, links on the DNR website, news releases and social media.

Accomplishments:

Letters updating NWCOs listed as working on bats were distributed on April 18, 2017 for a total of 131 letters sent. These letters included information about newly identified WNS suspect counties in SC from the winter of 2016/17, current WNS brochures from the whitenosesyndrome.org website and updates on WNS, and other relevant research projects and decontamination information (Appendix I). No letters were sent in the fall because there were no major WNS updates to provide at that time.

A total of 4 news releases, 7 presentations, 3 interviews/articles, and 1 newsletter provided WNS outreach and bat information.

SCDNR news releases, also shared on the SCDNR Facebook page, included: “Northern long-eared bats discovered in Beaufort County” at http://www.dnr.sc.gov/news/2017/jan/jan13_bats.html; “Fungus that causes White-nose syndrome found in three new South Carolina counties so far this year” at http://www.dnr.sc.gov/news/2017/mar/mar28_bats.html; “Fungus that causes white-nose syndrome found in Laurens County” published online at http://www.dnr.sc.gov/news/2017/may/may17_bats.html; “Northern long-eared bats found in two new counties, and breeding, on South Carolina's Coastal Plain” at http://www.dnr.sc.gov/news/2017/july/jul7_longearbats.html

SCDNR presentations, reaching at least 260 people, included: Dec 15, 2016: SCDNR update at the Georgia Bat Working Group meeting, approx. 30 people in attendance; Jan 27, 2017: Upstate Master Naturalist Association meeting, approx. 40 people in attendance; Feb 22, 2017: SCDNR Wildlife Technician meeting, approx. 50 people in attendance; Aug 16, 2017: SCDNR Wildlife Biologist meeting, approx. 40 people in attendance; Oct 25, 2017: Conservation Lecture Series for the Greenville Zoo, approx. 40 people in attendance; Dec 4, 2017: Greenwood County Forestry Association meeting, approx. 25 people in attendance; Dec 5, 2017: Southeastern State Park Program Seminar, approx. 35 people in attendance.

SCDNR interviews, articles and newsletters included: April 11, 2017: South Carolina Radio Network “Fungus that causes White-nose syndrome found in three new South Carolina counties.” <https://www.southcarolinaradionetwork.com/2017/04/12/fungus-causes-white-nose-syndrome-found-three-new-south-carolina-counties/>; April 26, 2017: The Island Packet/Beaufort Gazette video: “Catch and release: Big brown bat netted and released at Palmetto Bluff” at <http://www.islandpacket.com/news/local/news-columns-blogs/untamed-lowcountry/article147420724.html>. Bat Conservation International shared this article on their FB page; July 14, 2017: The Post and Courier “Mountain dwelling bat moves into the Lowcountry” at http://www.postandcourier.com/news/mountain-dwelling-bat-moves-into-the-lowcountry/article_2fc8502a-68b9-11e7-bf56-dba0eb26ddaa.html; September 2017: The Wildlife Society Southeastern Section Newsletter, Vol 59, #3: http://wildlife.org/wp-content/uploads/2015/08/SETWS-News_September-2017.pdf

The WNS biologist attended a field trip at Crowder’s Mountain with the Interstate Grotto and discussed the recent WNS suspect counties in SC, and an open line of communication about bats and WNS was kept with the Interstate Grotto via email as a member of the group and the National Speleological Society.

In partnership with a local business called Sunrift Adventures, a Halloween Bat Count was conducted during Bat Week (Appendix II) as an opportunity to involve the public in bat observation and learn more about bats and WNS. The WNS biologist assisted in the promotion of the event, and provided materials prior to the event, but did not attend because she was on maternity leave at that time. Approximately 80 people attended the event, during with 931 bats were counted emerging from 8 bat boxes.

A Bats of South Carolina flyer was created by the WNS biologist (though printed using a different funding source), and WNS was mentioned in these flyers (see Appendix III).

Two WNS signs were provided to owners of sites found to have *Pd* present. These signs indicate the site is WNS-positive and ask people to help prevent the spread of white-nose syndrome. One was posted at the Union County site, and one was sent to the landowners of the Laurens County site who posted it themselves. The landowners at the Greenville County site did not want to draw attention to the bats in the main rock shelter since it often has Boy Scout traffic, so they declined to post a WNS sign. These signs were purchased with an earlier WNS-State Support Grant.

Significant deviations: There were no significant deviations.

Objective 6: Review, circulate, revise, and update the SC Bat Conservation and SC WNS Response Plans.

Accomplishments:

Both the WNS Response Plan and the South Carolina Bat Conservation Plan were edited, updated and posted on the SCDNR website. The SC WNS Response Plan was updated and posted online on May 9, 2017 and Oct 13, 2017. The SC Bat Conservation Plan was updated and posted online on Oct 13, 2017. Both documents require additional updates as information, contacts, and decontamination procedures change.

Significant deviations: There were no significant deviations.

Estimated Federal Cost: \$38,800.00

Recommendations: Close the grant.

Beyond the life of this grant, we recommend continued monitoring and winter counts in South Carolina, especially in piedmont hibernacula to track the spread of *Pd* as it moves south. In addition, we recommend identifying more coastal plain hibernacula (which may potentially include insulative cypress hallows) to count bats and test for *Pd*. Lastly, we recommend continued mist netting efforts to learn more about the distribution and status of South Carolina's bat populations, especially those most at risk such as the Northern long-eared bat and other species whose populations are threatened by WNS.

Overall grant deviations: This state support grant deadline was extended to December 31, 2017 per an extension dated September 13, 2017. The extension letter states a final report is due for this grant by March 31, 2018 for the grant period of December 1, 2016 through December 31, 2017.

Appendix I: NWCO letter and attachments, which include April 12, 2016 National WNS Decontamination Protocol and April 2017 WNS Fact Sheet

South Carolina Department of Natural Resources



124 Wildlife Drive
Union, SC 29379

April 18, 2017

Alvin A. Taylor
Director

Emily C. Cope
Deputy Director for
Wildlife and Freshwater Fisheries

Dear Wildlife Control Professional,

My name is Jennifer Kindel, a Wildlife Biologist for the South Carolina Department of Natural Resources (SCDNR). I am writing you/your company because you're/it is listed on the SCDNR website as a wildlife control specialist that handles nuisance bat jobs. This letter, as well as the most current National White-nose Syndrome (WNS) Decontamination Protocol and WNS fact sheet, are being sent as a courtesy to help keep you informed on bat related issues in South Carolina.

- **New: Greenville, Lancaster, Laurens, and Union counties all tested positive for *Pd* (the fungus that causes WNS) this year.** These new counties are now considered WNS suspect. Swabs from bats in each of these counties tested positive for *Pd*, even though bats did not show visible signs of WNS. That makes a total of 7 counties either WNS positive (Greenville, Oconee, and Richland) or WNS suspect (Greenville, Lancaster, Laurens, Union) in South Carolina so far. Laurens County will be added to the WNS map soon, and we are still waiting on results from Cherokee and Abbeville Counties. See https://www.whitenosesyndrome.org/sites/default/files/wnsspreadmap_4_17_2017.jpg.
- We still must assume the entire state is WNS positive and appropriate precautions must be followed. Please consult WNS decontamination guidelines above for treating materials used on bat exclusions. Please do **not** move bat exclusion materials between states. Never move bats to new locations; you may accidentally speed the spread of WNS. Please periodically check the national WNS website for updates: <https://www.whitenosesyndrome.org/>.
- The April 2016 National WNS Decontamination Protocol continues to be the most updated protocol. Treatment of submersible equipment is in water maintained at **55°C (131°F)** for a minimum of **20 min**. Isopropyl Alcohol Wipes (70%) and Hydrogen Peroxide Wipes (3%) demonstrate immediate effectiveness following contact and associated drying time, while new ingredients found in previously approved products (pre-Apr 2016 protocol) render them ineffective against *Pd*. Please see enclosed National WNS Decontamination Protocol, also available at: https://www.whitenosesyndrome.org/sites/default/files/resource/national_wns_decon_protocol_04.12.2016.pdf
- Acceptable Management Practices for Bat Control Activities in Structures - A Guide for National Wildlife Control Operators is still available (**if you have trouble downloading this document, please contact me and I will mail you a copy**) https://www.whitenosesyndrome.org/sites/default/files/resource/wns_nwco_amp_1_april_2015_0.pdf.
- WNS does not affect non-hibernating Mexican free-tailed and evening bats. Please see enclosed WNS fact sheet for current information. If you are handling bats in SC mountains and think they are *Myotis* bats, please contact me.
- Useful SCDNR bat related links - the public can report successful bat boxes or view the SC Bat Conservation Plan at: <http://www.dnr.sc.gov/wildlife/bats/batbox.html> and <http://www.dnr.sc.gov/wildlife/bats/index.html>.

Sincerely,

Jennifer Kindel
KindelJ@dnr.sc.gov

Enclosures: April 12, 2016 National WNS Decontamination Protocol; April 2017 WNS Fact Sheet

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EQUAL OPPORTUNITY AGENCY

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National White-Nose Syndrome Decontamination Protocol - Version 04.12.2016

I. INTRODUCTION

The fungus *Pseudogymnoascus destructans* (*Pd* – formerly identified as *Geomyces destructans*) is the cause of white-nose syndrome (WNS), a disease that has resulted in unprecedented mortality of hibernating bats throughout eastern North America. Since first documented in New York in 2006, WNS continues to threaten hibernating populations of bats across the continent, having spread rapidly through the Northeast, mid-Atlantic, Midwest, and Southeast states, as well as eastern Canada.

Best available science indicates that *Pd* arrived in North America from a foreign source. Once *Pd* has been detected, either on bats or in the hibernaculum environments, the county of occurrence is considered contaminated indefinitely due to the long-term persistence of the fungus. Because of the devastating effects of WNS in North America, recommendations detailed in this document were developed to minimize the risk of human-assisted transmission. All persons who come into contact with bats, their environments, and/or associated materials for any reason (*e.g.*, research, recreation, etc.) are advised to take precautions to avoid additional, inadvertent transport of *Pd* to uncontaminated bats or habitats.

Observations of live or dead bats (multiple individuals at a single location) should be reported to local USFWS Field Office or State agency wildlife office <http://www.whitenosesyndrome.org/partners>. **Do not handle bats unless you are properly trained, vaccinated, and, where necessary, authorized in writing to do so by the appropriate government agency.**

II. PURPOSE:

The purpose of this document is to provide recommendations based on the best available scientific information known to effectively clean and treat (herein referred to as decontaminate, or similar derivation thereof) clothing, footwear, and/or gear (herein collectively referred to as equipment) that may have been exposed to *Pd*. When activities involve contact with bats, their environments, and/or associated materials the following decontamination procedures are designed to reduce the risk of human-assisted transmission of the fungus to other bats and/or habitats.

For the protection of bats and their habitats: 1) comply with all current cave and mine closures, advisories, and regulations on federal, state, tribal, and private lands; 2) follow relevant recommendations found in this document; and 3) **do not transport any equipment into or out of the United States of America (USA)** that has been in contact with bats or their environments.

Local, state, federal, or other management agencies may have additional requirements or clarifications for equipment used on lands under their jurisdictions¹ or work involving public trust resources. Always follow all state and/or federal permit conditions. Contact the respective agency representatives for supplemental documents or additional information.

III. PRODUCT USE:

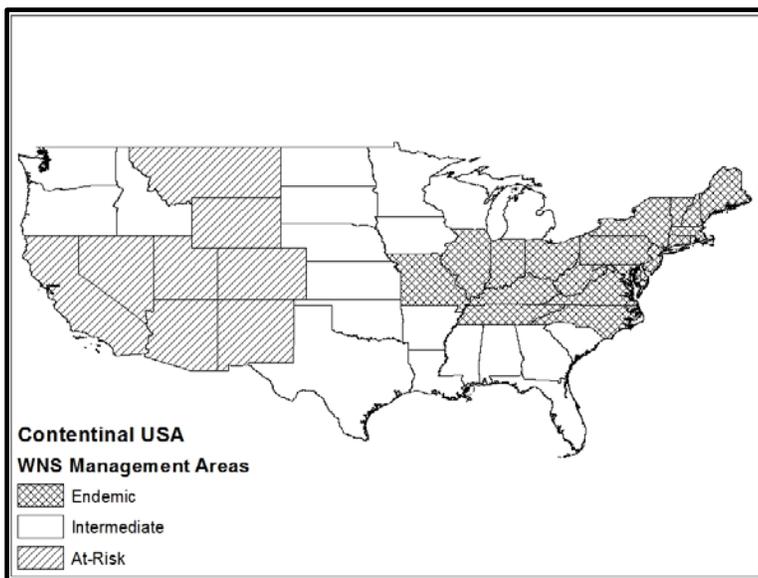
Ensuring the safety of individuals using any of the applications and/or products identified in this document must be the first priority. Safety data sheets (SDS) for chemicals and user's manuals for equipment developed by product manufacturers provide critical information on the physical properties, reactivity, potential health hazards, storage, disposal, and appropriate first aid procedures for handling, application, and disposing of each product in a safe manner. Familiarization with the SDS for chemical products, and manufacturer's product care and use standards, will help to ensure appropriate use of these materials and safeguard human health. Read

product labels in advance of intended field use. Ensure availability of adequate emergency eye-wash supplies or facilities at intended site of use. Always store cleaning products out of the reach of children or pets.

It is a violation of federal law to use, store, or dispose of a regulated product in any manner not prescribed on the approved product label and associated SDS. Products, or their contaminated rinse water, must be managed and disposed of in accordance with local environmental requirements and, where applicable, product label, to avoid contamination of groundwater, drinking water, or non-municipal water features such as streams, rivers, lakes, or other bodies of water. Follow all local, state and federal laws. Requirements for product disposal may vary by state. Note: Quaternary ammonium wastewaters should not be drained through septic systems because of the potential for system upset and subsequent leakage into groundwater.

IV. TRIP PLANNING/ORGANIZATION:

1.) Identify the appropriate WNS Management Area (Figure 1) in which the equipment has been used and will be used in the future. Users of new or site-dedicated equipment (that has been and will be used in only one site) may skip to #3.



“Site” is loosely defined in this document as the location of a discrete bat roost (cave, barn, talus slope, etc.) or as a specific field location for mist netting or other trapping. Since conditions vary considerably, delineating sites will be at the discretion of the appropriate local regulatory or land management agency.

Figure 1. WNS Management Areas by state.

2.) Once the appropriate Management Areas have been determined using Figure 1, use Figure 2 to determine appropriate uses for A. Subterranean Equipment or B. Terrestrial Equipment. **“Subterranean equipment” includes any equipment that has ever been exposed to a cave/mine environment.** **“Terrestrial equipment” includes any equipment that has not previously been exposed to a cave/mine environment.** Regardless of the equipment designation, equipment should only be reused at similarly classified or progressively more contaminated locations². In addition, given uncertainties in the distribution of *Pd* in the Pacific Northwest (i.e., ID, OR, & WA), subterranean and terrestrial equipment should not be transferred between the PNW and eastern USA (endemic/intermediate).

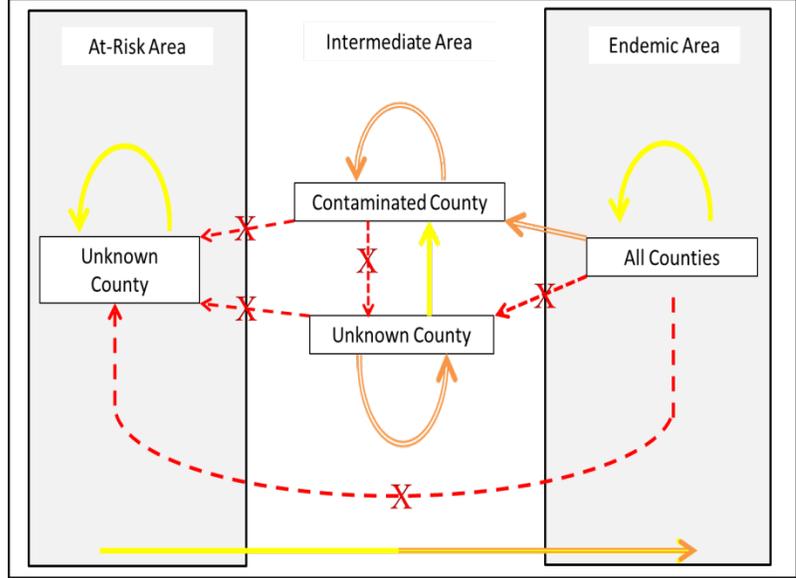
3.) Contact local state/federal regulatory or land management agencies for additional requirements, exemptions, or addendums on lands under its jurisdiction that supplement guidance provided in Figure 2A and 2B.

4.) Choose equipment that can be most effectively decontaminated [*e.g.*, rubber or synthetic rather than leather boots], otherwise commit use of equipment to a specific location (herein referred to as equipment dedication). Equipment should always be inspected for defects prior to use. Replace all defective or degraded equipment with new equipment. Brand new equipment can be used at any location where access is permitted, as long as it has not been stored or come in contact with contaminated equipment.

After cleaning and decontamination, the following symbols indicate that equipment transfer/movement is:

-  Not recommended
-  At the discretion of the responsible state/federal land management agency
-  Acceptable

A. Subterranean Equipment recommendations by WNS Management Area and COUNTY



B. Terrestrial Equipment recommendations by WNS Management Area and STATE

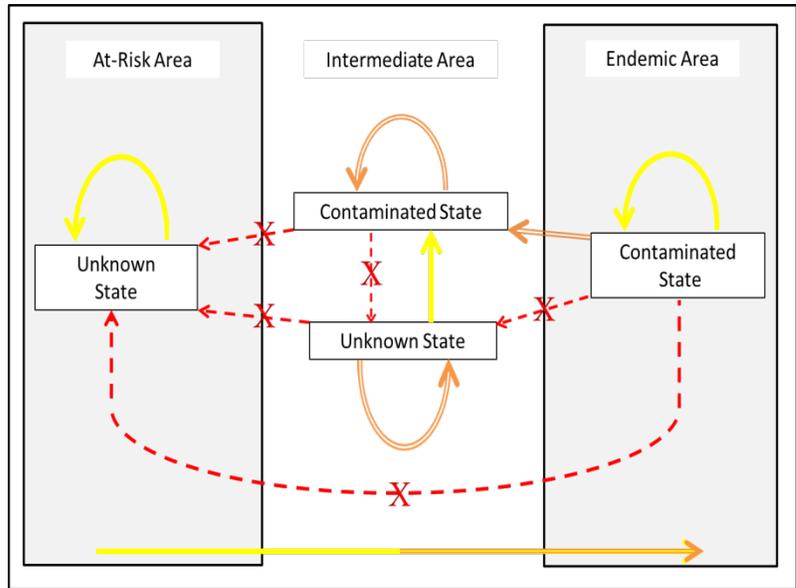


Figure 2. Movement recommendations for decontaminated (A) Subterranean and (B) Terrestrial equipment.

5.) Prepare a strategy (*i.e.*, Outline how/where all equipment and waste materials will be contained, stored, treated and/or discarded after returning to the vehicle/base area) that allows daily decontamination of equipment and, where applicable, between individual sites visited on the same day, **unless** otherwise directed by local state/federal or land management agency instructions. Confirmed *Pd* contaminated sites or those with a high index of suspicion for contamination should be visited **only after** those sites of unknown *Pd*/WNS status² have been visited, to further reduce the risk of inadvertent transmission.

V. PROCEDURES FOR DECONTAMINATION:

1.) On site:

a.) Thoroughly remove sediment/dirt from equipment immediately upon exiting from the site.

b.) Contain all exposed and potentially contaminated equipment in sealed bags/containers for treatment away from the location. Decontaminate the outside hard, non-porous surfaces of containers and bags prior to moving them to a secondary location (*e.g.*, vehicles, labs, or storage). Store all exposed and decontaminated equipment separately from unexposed equipment.

c.) Clean hands, forearms, and exposed skin using hand/body soaps/shampoos and, when feasible, change into clean clothing and footwear prior to entering a vehicle.

2.) Off site:

a.) *REMOVE* dirt and debris from the outside of vehicles (especially wheels/undercarriage) prior to additional site visits, especially when traversing WNS Management areas or scenarios categorized as “Not Recommended” (Figure 2).

b.) *CLEAN* submersible and non-submersible equipment according to manufacturer’s specifications. Sediments and debris significantly reduce the effectiveness of treatments. Laboratory trials^{3&4} demonstrate that the use of conventional cleansers like Woolite® detergent or Dawn® dish soap aided in the removal of sediments and debris prior to treatment, contributing to the effectiveness of decontamination.

c.) *TREAT* submersible or non-submersible equipment only in a safe manner according to the equipment and product labels using the most appropriate application or product listed in Table 1. For equipment that cannot safely be treated in accordance with both the manufacturer’s recommendations and product labeled instructions, dedicate to individual sites as determined appropriate in Section IV.

i. Submersible Equipment (*i.e.*, equipment that can safely withstand submersion in water or other specified product for the recommended amount of time without compromising the integrity of the item):

Treatment of submersible equipment must be done in accordance with manufacturer’s recommendations for your equipment. The preferred treatment for all submersible equipment is submersion in hot water that maintains a temperature of at least 55°C (131°F) for a minimum of 20 minutes. Ensure that all equipment surfaces remain in direct contact (*i.e.*, avoid all trapped air) with the hot water treatment for the duration of the treatment period. Consider that although many commercial and home washing machines with sanitize (or allergen) cycles may be capable of submerging gear in the recommended hot water application for the required time, it is incumbent on the user to be sure that machines to be used attain and sustain the needed temperatures throughout the process. If heat may compromise the safety and/or integrity of the otherwise submersible equipment, consider equipment dedication or other products listed in Table 1. When considering other products found in Table 1, recognize that the applicability and effect of such products on the safety and integrity of equipment remains untested. Be aware the use of preferred applications and products in Table 1 should be done with extreme caution and proper personal protective gear due to the risk of personal injury.

ii. Non-submersible Equipment (*i.e.*, equipment that may be damaged by liquid submersion):

Treat all non-submersible equipment using the most appropriate application or product in Table 1 that complies with the equipment manufacturer’s recommendations and product label instructions, where applicable. The listed applications or products may not be appropriate or safe for non-submersible equipment. Dedication of equipment should always be considered the preferred application in these circumstances.

d.) *RINSE* equipment, as appropriate, thoroughly in clean water, particularly items that may contact humans, bats, or sensitive environments. Allow all equipment to completely dry prior to the next use.

e.) DECONTAMINATE the equipment bins, sinks, countertops and other laboratory, office, or home areas with the most appropriate applications or products in Table 1.

Table 1. Applications and products with demonstrated efficacy against Pd^{3, 4, 5, 6, & 7}. Remember to consult equipment labels, registered product labels, and the appropriate SDS for regulations on safe and acceptable use.

	Tested Applications & Products ^{3, 4, 5, 6, & 7}	Federal Reg No.:	Laboratory Results
Preferred Applications	Equipment Dedication	N/A	Clean according to manufacturer standards and dedicated to a site
	Submersion in Hot Water ^{4, 6, & 7}	N/A	Laboratory effectiveness demonstrated upon submersion in water with sustained temperature $\geq 55^{\circ}\text{C}$ (131°F) for 20 minutes.
Other Products	Ethanol (60% or greater) ^{4, 6, & 7}	CAS - 64-17-5	Laboratory effectiveness demonstrated upon exposure in solution for at least 1 minute.
	Isopropanol (60% or greater) ^{4, 6, & 7}	CAS - 67-63-0	
	Isopropyl Alcohol Wipes (70%) ^{4, 6, & 7}	CAS - 67-63-0	Laboratory effectiveness demonstrated immediately following contact and associated drying time.
	Hydrogen Peroxide Wipes (3%) ^{4, 6, & 7}	CAS - 7722-84-1	
	Accel ^{®4, 5, 6, & 7}	EPA - 74559-4	Laboratory effectiveness demonstrated when used in accordance with product label.
	Clorox [®] Bleach ^{3, 4, 5, 6, & 7}	EPA - 5813-100	
	Clorox [®] Wipes ^{4, 5, 6, & 7}	EPA - 5813-79	
	Clorox [®] Clean-Up Cleaner + Bleach ^{4, 5, 6, & 7}	EPA - 5813-21	
	Hibiclens ^{®4, 5, 6, & 7}	NDA - 017768	
Lysol [®] IC Quaternary Disinfectant Cleaner ^{3, 4, 5, 6, & 7}	EPA - 47371-129		

Other effective treatments with similar water based applications or chemical formulas (e.g., a minimum of 0.3% quaternary ammonium compound) may exist but remain untested at this time. Find more information on the EPA or FDA registered product labels by accessing the individual hyperlink or searching EPA or FDA Registration Numbers at: <http://iaspub.epa.gov/apex/pesticides/f?p=PPLS:1> or <http://www.accessdata.fda.gov/scripts/cder/drugsatfda/index.cfm>.

Products with USEPA registration numbers mitigate persistence of living organisms on surfaces and are regulated by the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA, 7 USC 136, et seq.). FIFRA provides for federal regulation of pesticide distribution, sale, and use. Within FIFRA, pesticides are defined as any substance or mixture of substances intended for preventing, destroying, repelling, or mitigating any pest. FIFRA further defines pests as any insect, rodent, nematode, fungus, weed, or any other form of terrestrial or aquatic plant or animal life or virus, bacteria, or other micro-organism (except viruses, bacteria, or other micro-organisms on or in living man or other living animals) which the Administrator declares to be a pest under section 25(c)(1). Find more information on FIFRA at: <http://www.epa.gov/oecaagct/lfra.html>.

VI. EQUIPMENT AND ACTIVITY SPECIFIC RECOMMENDATIONS:

It is the responsibility of the users of this protocol to read and follow the product label and SDS. The product label is the law!

A. Clothing & Footwear:

IMPORTANT: All clothing (i.e., inner and outer layers) and footwear should be decontaminated after every site visit using the most appropriate Application/Product in Table 1 or otherwise cleaned and dedicated for use at individual sites or areas as determined appropriate in Section IV.

Use of a disposable suit (e.g., Tyvek[®] or ProShield[®]) or site-dedicated, reusable suit (i.e., coveralls) is an appropriate strategy to minimize sediment/soil accumulation on clothing during a cave/mine or bat research activity. As stated earlier, all clothing layers should still be decontaminated or otherwise cleaned and dedicated after every use.

Disposable items, regardless of condition, should not be reused. Contain all used equipment in plastic bags upon final exit from a site, separating disposable materials from reusable equipment. Seal and store plastic bags in plastic containers until trash can be properly discarded, and/or exposed reusable equipment can be properly decontaminated off site.

B. Cave/Mine and other Subterranean Equipment:

Dedicate, as necessary, or decontaminate all cave/mine equipment (e.g., backpacks, helmets, harness, lights, ropes, etc.) using the most appropriate guidance in Section V. Most types of equipment, including but not limited to, technical and safety equipment, have not undergone testing for safety and integrity after decontamination. Therefore carefully review and adhere to the manufacturer's care and use standards to maintain equipment functionality and safety protective features. If the application/product options in Table 1 are not approved by the manufacturer's care and use standards for the respective type of equipment, clean and inspect equipment according to manufacturer's specification and dedicate to similarly classified caves/mines/bat roosts and only reuse in progressively more contaminated caves/mines/bat roosts.

C. Scientific Equipment:

Always consider the use of disposable scientific equipment and materials between individual bats. All disposable scientific equipment (e.g., work surfaces, bags/containers/envelopes, exam gloves, etc.) should only be used on one bat, then discarded after use. Re-useable equipment (e.g., cotton bags, plastic containers, etc.) must be decontaminated between individual bats using the most appropriate application or product in Table 1. In all cases, use breathable bags (e.g., paper, cotton, mesh, etc.).

At the completion of daily activities and when allowable by equipment and product labels, equipment may be autoclaved before reuse; otherwise use the guidance in Section V to determine the relevant procedure for decontamination of all work surface area(s) and equipment (e.g., light boxes, banding pliers, holding bags, rulers, calipers, scale, scissors, wing biopsy punches, weighing containers, etc.).

D. Mist-Nets:

Contamination of trapping equipment is possible year-round when used at *Pd* contaminated hibernacula (NWHC, unpublished data). Dedicate, as necessary, or decontaminate all netting equipment (e.g., netting, tie ropes, poles, stakes, etc.) using the most appropriate guidance in Section V for the particular equipment. All nets that are contacted by one or more bats must be decontaminated after each night of use according to the submersion in hot water application (Table 1). All nets should be completely dry prior to the next use.

E. Harp Traps:

Contamination of trapping equipment is possible year-round when used at *Pd* contaminated hibernacula (NWHC, unpublished data). Dedicate, as necessary, or decontaminate all trapping equipment (e.g., lines,

frame, feet, bags, etc.) using the most appropriate guidance in Section V for the particular equipment. All trapping equipment that comes in contact with one or more bats OR enters a cave/mine/bat roost must be decontaminated after each night of use according to the most appropriate application or product (Table 1). Explore the use of disposable trap bags or liners to reduce transmission risks throughout each trapping effort. Disposable trap bags should be discarded at the end of each night.

F. Acoustic Monitor, Camera, and Related Electronic Equipment:

Dedicate, as necessary, or decontaminate all acoustic monitoring, camera, and related electronic equipment (e.g., detector, camera, tablets, cell phones, laptops, carrying case, lenses, microphone(s), mounting devices, cables, etc.) using the most appropriate guidance in Section V for the particular equipment. The material composition of this equipment requires careful review and adherence to the manufacturer's care and use standards to maintain their functionality and protective features. If application/product options in Table 1 are not approved by the manufacturer's care and use standards for the respective type of equipment, clean equipment accordingly and dedicate to similarly classified caves/mines/bat roosts or only reuse in progressively more contaminated caves/mines/bat roost. Electronic devices used as terrestrial equipment, independent of bat handling work, pose a limited risk of transmission (i.e., driving transects or fixed point detector surveys not associated with a cave/mine/bat roost entrance).

Equipment used in a cave/mine/bat roost may be placed in a sealed plastic casing, plastic bag, or plastic wrap to reduce the potential for contact/exposure with contaminated environments. Prior to opening or removing any plastic protective wrap, first clean, then remove, and discard all protective wrap. This technique has not been tested and could result in damage to, or the improper operation of, equipment.

These recommendations are the product of the multi-agency WNS Decontamination Team, a sub-group of the Disease Management Working Group established by the National WNS Plan (A National Plan for Assisting States, Federal Agencies, and Tribes in Managing White-Nose Syndrome in Bats, finalized May 2011). On 15 March 2012 a national decontamination protocol was approved and adopted by the WNS Executive Committee, a body consisting of representatives from Federal, State, and Tribal agencies which oversees the implementation of the National WNS Plan. The protocol will be updated as necessary to include the most current information and guidance available.

1 To find published addenda and/or supplemental information, visit <http://www.whitenosesyndrome.org/topics/decontamination>.

2 Visit <http://www.whitenosesyndrome.org/resources/map> for the most updated information on the status of county and state. County and state level determination is made after a laboratory examination and subsequent classification of bats according to the current WNS case definitions. Definitions for the classification can be found at http://www.nwhc.usgs.gov/disease_information/white-nose_syndrome/Case%20Defintions%20for%20WNS.pdf. Contaminated determination includes both confirmed and suspect WNS classifications.

3 Information from : V. Shelley, S. Kaiser, E. Shelley, T. Williams, M. Kramer, K. Haman, K. Keel, and H.A. Barton – Evaluation of strategies for the decontamination of equipment for *Geomyces destructans*, the causative agent of White-Nose Syndrome (WNS) *Journal of Cave and Karst Studies*, v. 75, no. 1, p. 1–10. DOI: 10.4311/2011LSC0249

4 Efficacy of these agents and treatments are subject to ongoing investigation by the Northern Research Station, USDA Forest Service Cooperative Agreement 13-IA-11242310-036 (U.S. National Park Service and U.S. Forest Service) & 16IA11242316017 (U.S. Fish and Wildlife Service and U.S. Forest Service). Information contained in this protocol from work associated with either agreement will continue to be revised, as necessary, pending results of these investigations.

5 The use of trade, firm, or corporation names in this protocol is for the information and convenience of the reader. Such use does not constitute an official endorsement or approval by state and/or federal agencies of any product or service to the exclusion of others identified in the protocol that may also be suitable for the specified use.

6 Product guidelines should be consulted for compatibility of use with one another before using any decontamination product. Also, detergents and quaternary ammonium compounds (i.e., Lysol® IC Quaternary Disinfectant Cleaner) should not be mixed directly with bleach as this will inactivate the bleach and in some cases produce a toxic chlorine gas. All materials may present unknown hazards and should be used with caution. Although certain hazards are described herein, we cannot guarantee that these are the only hazards that exist.

7 Final determination of suitability for any decontaminant is the sole responsibility of the user. All users should read and follow all labeled instructions for the products/applications and/or understand associated risks prior to their use. Treatments and the corresponding procedures may cause irreversible harm, injury, or death to humans, bats, equipment or the environment when used improperly. Always use personal protective equipment in well-ventilated spaces to reduce exposure to these products or applications.

White-Nose Syndrome

The devastating disease of hibernating bats in North America

April 2017

What is white-nose syndrome?

White-nose syndrome (WNS) is a disease affecting hibernating bats. Named for a white fungus that appears on the muzzle and other parts of bats, WNS is associated with extensive mortality of these animals in eastern and mid-western North America. First documented in New York in the winter of 2006-2007, WNS has spread rapidly across the eastern and midwestern United States and eastern Canada, and has been confirmed as far west as the state of Washington.

Bats with WNS act strangely during cold winter months, including flying outside during the day and clustering near the entrances of caves and other hibernation areas. Bats have been found sick and dying in unprecedented numbers in and around caves and mines. WNS is estimated to have

killed more than 6 million bats in the Northeast and Canada. In some sites, 90 to 100 percent of bats have died.

Many non-governmental organizations, universities and state and federal agencies are investigating the cause of the bat deaths. A fungus, *Pseudogymnoascus destructans*, has been demonstrated to cause WNS. Scientists are investigating the dynamics of fungal infection and transmission and are developing ways to control it.

What bats are being affected?

More than half of the 47 bat species living in the United States hibernate to survive the winter. Eight cave-hibernating bats, including two endangered and one threatened federally listed species, have been confirmed with WNS. The fungus has been detected on an additional 14 species, including one endangered species, with no confirmation of disease.

Bat species confirmed with WNS:

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

Bat species on which *Pseudogymnoascus destructans* has been detected with no confirmation



Ryan von Linden/NYDEC

Eastern small-footed bat with white fungus on nose, arms and wings

of disease:

- Cave Myotis (*Myotis velifer*)
- Eastern red bat (*Lasiurus borealis*)
- Silver-haired bat (*Lasionycteris noctivagans*)
- Rafinesque's big-eared bat (*Corynorhinus rafinesquii*)
- Townsend's big-eared bat (*Corynorhinus townsendii*)
- Virginia big-eared bat (*Corynorhinus townsendii virginianus*) **endangered**

Federally listed species found in the affected area that have not yet been confirmed with WNS or fungal infection:

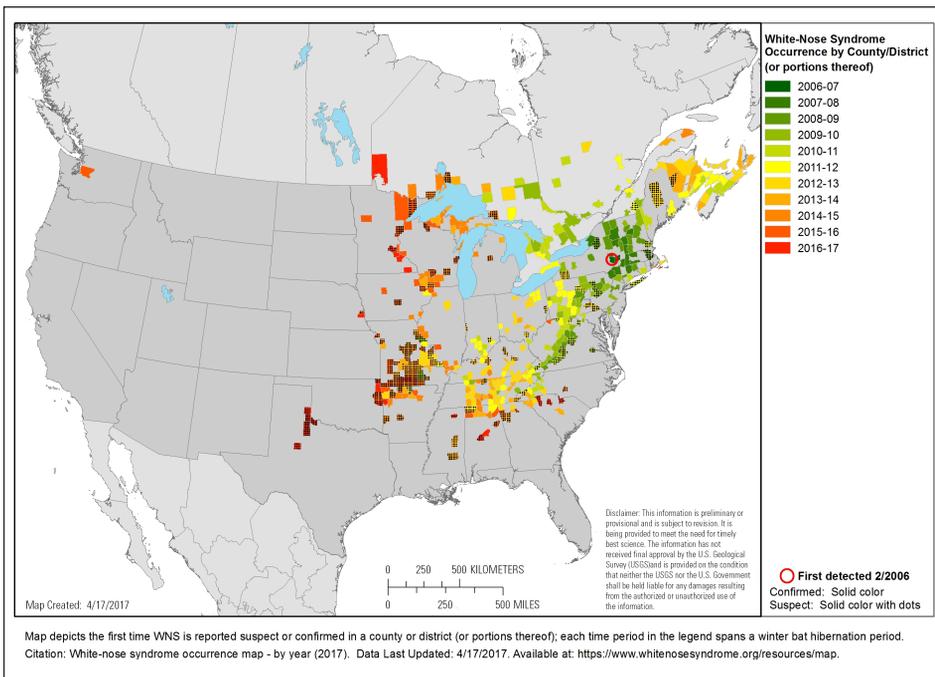
- Ozark big-eared bat (*Corynorhinus townsendii ingens*) **endangered**

In Europe, 13 bat species have been confirmed with WNS or the fungus, but there has been no mortality associated with these observations.



Jeremy Coleman/USFWS

Vermont Fish and Wildlife Department biologists remove the gate to conduct a winter survey at Plymouth Cave



- Researchers have made significant strides in understanding disease response of hibernating bats and factors that influence bat vulnerability to WNS.
- Studies of natural bacteria and skin microbioma of bats have led to new lines of research for treatments using biological or biologically derived agents for bats at risk of WNS infection. Some of the potential treatments are moving to limited field testing.
- Other treatments under consideration include altering climate in hibernation areas to slow fungal growth or improve bat survival, and vaccines to boost resistance to WNS.
- Researchers are looking into molecular and genetic tools to reduce the ability of *P. destructans* to cause disease.

Where is it now?

White-nose syndrome has continued to spread rapidly. As of April 2017, bats with WNS were confirmed in 31 states:

- Alabama
- Arkansas
- Connecticut
- Delaware
- Georgia
- Illinois
- Iowa
- Indiana
- Kentucky
- Maine
- Maryland
- Massachusetts
- Michigan
- Minnesota
- Missouri
- Nebraska
- New Hampshire
- New Jersey
- New York
- North Carolina
- Ohio
- Oklahoma
- Pennsylvania
- Rhode Island
- South Carolina
- Tennessee
- Vermont
- Virginia
- Washington
- West Virginia

and five Canadian provinces:

- New Brunswick
- Nova Scotia
- Ontario
- Prince Edward Island
- Quebec

Evidence of *Pseudogymnoascus destructans* has been detected in two additional states:

- Mississippi
- Texas

What is being done?

Partnerships

The U.S. Fish and Wildlife Service leads an extensive network of state and federal agencies, tribes, organizations, institutions and individuals in working

cooperatively to investigate the source, spread and cause of bat deaths associated with WNS and develop management tools and strategies to minimize the impacts of the disease.

WNS National Plan

In 2011, the Service and a team of federal and state agencies and tribes prepared a national white-nose syndrome response plan to address the threat to hibernating bats. The plan is a framework for coordinating and managing the national investigation and response to WNS. The *National Plan for Assisting States, Federal Agencies, and Tribes in Managing White-Nose Syndrome in Bats* outlines actions necessary for state, federal and tribal coordination, and provides an overall strategy for investigating ways to manage WNS and conserve bats.

What have we learned?

- Biologists in New York and Vermont have found up to 50 percent of marked little brown bats at a few test sites surviving from one winter to the next in recent years, giving some hope that this species might one day be able to recover. Little brown bat populations at these sites remain at less than 10 percent of their pre-WNS size, however.
- Scientists have developed new ways to detect *Pseudogymnoascus destructans* on bats and in the environment, including using UV light and molecular analyses.

Research Funding

From 2008 to 2016 the Service has allocated \$36 million to meet high priority needs for research and field support. This includes more than \$27 million in grants to other federal agencies, academic institutions, non-governmental organizations and state natural resources agencies.

For more information on recent research developments see www.WhiteNoseSyndrome.org

Federal Relay Service
for the deaf and hard-of-hearing
1 800/877 8339

U.S. Fish & Wildlife Service
1 800/344 WILD
<http://www.fws.gov>

April 2017



Appendix II: Halloween Emergence Count at Sunrift Adventures

Sunrift Adventures &

South Carolina Department of Natural Resources

invite you to their 2nd annual

Halloween Bat Count!

Sunrift bat houses foster many beneficial insect-eating bats that emerge in an impressive display at sunset. Please join us in observing and counting these mysterious creatures, and learn why a world without bats would be scary indeed!

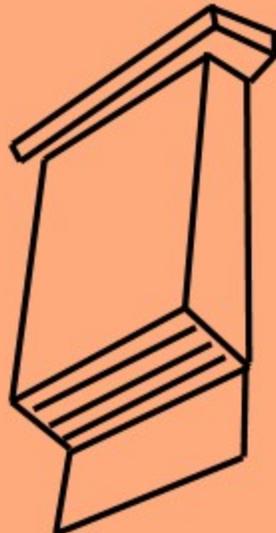
Friday, Oct 27th

6:00 pm

Sunrift Adventures

1 Center St

Travelers Rest, SC



Appendix III: Bats of South Carolina flyer providing some WNS info. Printing of this flyer was funded by the Harry Hampton Memorial Wildlife Fund.



Brazilian Free-Tailed Bats

South Carolina has 14 different bat species - 9 are known to roost in colonies; 5 generally roost singly in trees.

- Bats are the **only mammals capable of sustained flight**, and can fly up to 100 mph and as high as 10,000 feet!
- They break rules on longevity: Little Brown Bats can live for **30 years** or more, while most small rodents the same size only live around 1.5 years.
- **Less than 1% of natural bat populations are known to carry rabies.** BUT, people are more likely to contract rabies from bats because they pick them up more often than a rabid raccoon or cat.
- Bats in our state can consume **15 mosquitoes in 60 seconds.**
- **Common bats in SC buildings** are Big Brown Bats, Evening Bats, Brazilian Free-tailed Bats, and sometimes Little Brown Bats.

Learn more at:

<http://www.dnr.sc.gov/wildlife/bats/index.html>

Excluding Bats from Buildings

If bats are causing a problem, you can remove them safely and humanely through exclusion devices. The best time of year to exclude bats is in the early spring (March-April) or in the fall (August-October). We recommend you do not attempt to exclude bats in May through mid-July or August, because exclusion will result in flightless young (called pups) trapped within the structure.

For the **SCDNR Bats in Buildings** document: <http://www.dnr.sc.gov/wildlife/publications/nuisance/SCbatsinbldgs.pdf>

List of **Nuisance Wildlife Control Operators**: <http://www.dnr.sc.gov/wildlife/control.html>

For more information, please contact:

Jennifer Kindel
SCDNR Wildlife Biologist
Email: Kindelj@dnr.sc.gov
Phone: (864) 419-0739



Funding provided by the Hampton Wildlife Fund.
Profile bat photographs © MerlinTuttle.org; other photos by Mary Bunch.



MERLIN TUTTLE'S
BAT CONSERVATION

The South Carolina Department of Natural Resources prohibits discrimination on the basis of race, gender, color, national origin, religion, disability or age. Direct inquiries to the Office of Human Resources, P.O. Box 167, Columbia, S.C. 29202.



Printed on recycled paper.



BATS OF SOUTH CAROLINA

Bats are an integral part of South Carolina's ecosystem and economy, and need your help.



Bats are beneficial

- A study in 2011 (Boyles et al.) showed bats provide an annual pest suppression service to South Carolina's agricultural industry equal to **\$115 million**. Nationwide, that service is **\$22.9 billion**.
- With the use of less pesticides, bats help **reduce the impact of chemicals** on many other wildlife species that call South Carolina home.

Bats are in trouble

- **White-nose Syndrome** has killed over 6 million bats since 2006, causing significant local extinctions.
- Due to this, **bats are being listed** under the ESA.

What can you do to help?

- **Don't disturb bats** in winter when they're hibernating.
- **Decontaminate gear** after entering caves and mines the rest of the year.
- Provide **habitat** and multi-chamber **bat boxes**.
- **Educate** others, **volunteer** or **donate** to bat organizations



Big Brown



Brazilian Free-tailed



Eastern Red



Eastern Small-footed



Little Brown



Northern Long-eared



Northern Yellow



Rafinesque's Big-eared



Seminole



Silver-haired



Southeastern



Tri-colored

© MerlinTuttle.org

We depend on bats. Like secret superheroes, they fly at night to suppress forest and agricultural pests while we sleep.



Evening



Hoary

© MerlinTuttle.org

For more details on SC bats, see the **South Carolina Bat Conservation Plan:** <http://www.dnr.sc.gov/wildlife/bats/index.html>

For information on **Gear Decontamination**, search for "national protocol" in the search bar at www.whitenosesyndrome.org.

To learn more about **Bat Boxes**, see: <http://www.batcon.org/resources/getting-involved/bat-houses>