



Bats of WNY – Impacts of WNS

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Bats of New York – 9 species

- Little brown bat*
- Big brown bat
- **Northern Long-eared bat***
- Eastern small-footed bat
- **Indiana bat**
- Tri-colored bat*
- Eastern red bat
- Silver haired
- Hoary bat



Big brown bat

Silver haired bat

www.batcon.org



Eastern red bat

Hoary bat

www.batcon.org



Eastern pipistrelle

Small footed myotis

www.batcon.org



Little brown bat

Northern long-eared bat

www.batcon.org



Indiana bat

www.batcon.org

Bat Research @ Fredonia

- Insect availability and diet in little brown bats
- Bat house use
- Sonar use for communication in little brown bats
- Artificial night lighting impacts on bat activity
- Habitat features and bat conservation, GIS & acoustic sampling
- Ectoparasites in big brown bats
- Bat – insect interactions

Bats of New York – 9 species

- Little brown bat
- Big brown bat
- Northern Long-eared bat **THREATENED**
- Eastern small-footed bat
- Indiana bat **ENDANGERED**
- Tri-colored bat
- Eastern red bat
- Silver haired
- Hoary bat

Is WNS affecting our bats?


YES!

- Little brown bat
- Big brown bat
- Northern Long-eared bat **THREATENED**
- Eastern small-footed bat
- Indiana bat **ENDANGERED**
- Tri-colored bat
- Eastern red bat
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Confirmed WNS Presence of fungus

White-nose Syndrome (WNS)

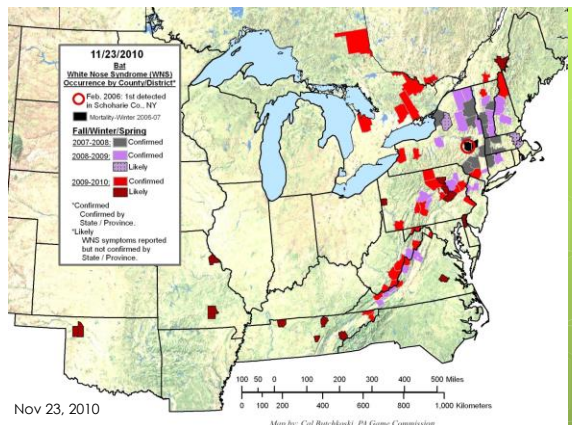
- Caused by fungus known as *Pseudogymnoascus destructans*, Pd, 2013 (formerly *Geomyces destructans*, 2009)
- First documented in NY in 2006-2007 winter, spread rapidly across eastern and midwest US and eastern Canada (USGS 2015)
- Bats at infected sites show 87-95% mortality (Bleher 2009, Frick 2010)

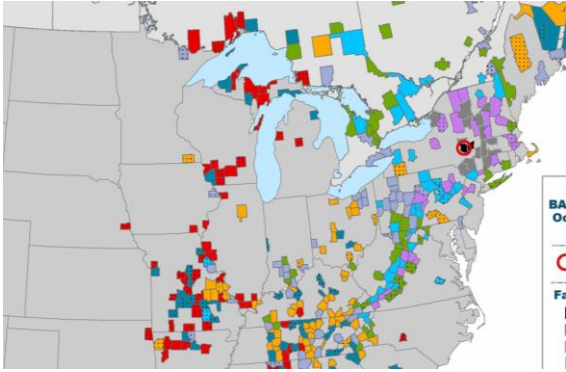


(Gargas, et al. 2009)

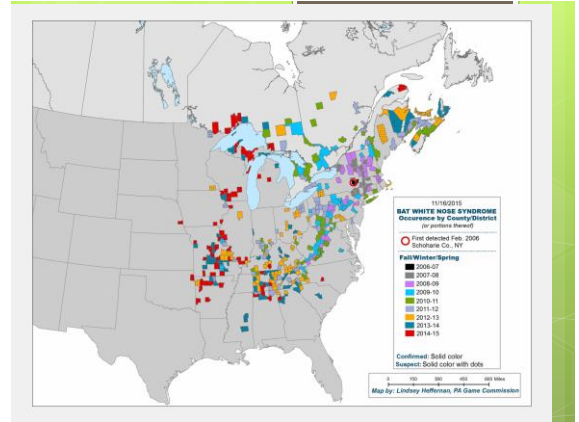


(Al Hicks, 2009)





Nov 16, 2015



WNS effects Identification

- WNS type wing scarring and damage
 - Use of light box and Reichard Wing Damage Index (WDI)

(Bat collected at Fredonia, July 2009, WDI=1)

WNS Relevant Research

- Maternity colonies at Chautauqua Institution (CI)
- Population
 - ~5,000 little brown bats in attics and crawl spaces (Neilson 1991, Syme 2001)
- Steady for 21 years with surveys conducted every 3-5 years beginning in 1990 (Syme 2001)
- My UG research surveys in 2009 in Fredonia and CI found WNS type wing scarring on bats from Fredonia, none from CI
- In winter of 2009-2010 WNS was positively identified in bats hibernating near Buffalo NY (USFWS 2010)

M.S. students 2011

Melissa First

- 35 out of 562 bats (6%) with WNY type wing scarring from CI in 2010. At 2 locations with most scarring, 30% of bats captured were affected.

Laura Alsheimer

- 4 of 17 bats (24%) with WNS type wing scarring from CI in 2010

M.S. students 2014 & 2015

Jonathan Townsend

- Acoustic monitoring along driven transects (Jamestown & Arkwright), included Northern long-eared bat in 2013
- Northern long-eared bat confirmed through acoustic monitoring in Brocton at the 200-acre Fredonia College Lodge in 2014

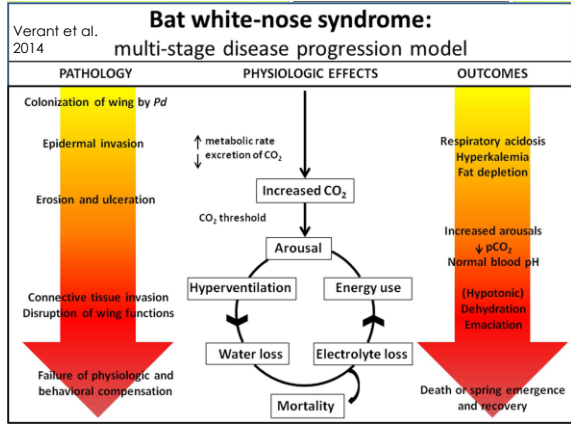
Taylor Stearns

- One little brown bat at CI in 2014, switched to big brown bats in Erie Co. for ectoparasite study
- 2 of 7 big brown bats from Erie Co. with WNS type scarring


WNS model of effect

Verant et al. 2014

- Examined fat energy utilization and monitored dissolved carbon dioxide, bicarbonate, potassium, sodium, and chloride



What Progress Has Been Made?



- March 2015 support for origins of *Pd* in Europe therefore spread through human activity (migration, agriculture).
- April 2015 6 isolates of skin bacteria, *Pseudomonas* genus, inhibited growth of *Pd*, 2 suppressed growth for more than 35 days, stronger isolates came from bats with lower mortality.
- May 2015 native soil bacteria produces natural volatiles inhibiting growth of *Pd*. Field trials had affected bats treated with the compounds. Many bats saw increased health and survival.

www.whitenosesyndrome.org

What Progress Has Been Made?



- Oct 2015 study of gene activation show initial immune response of hibernating bats to *Pd* as expected, except there is no recruitment of white blood cells
- Nov 2015 discovery of *Pd* in China (2010 discovery of *Pd* in Europe)

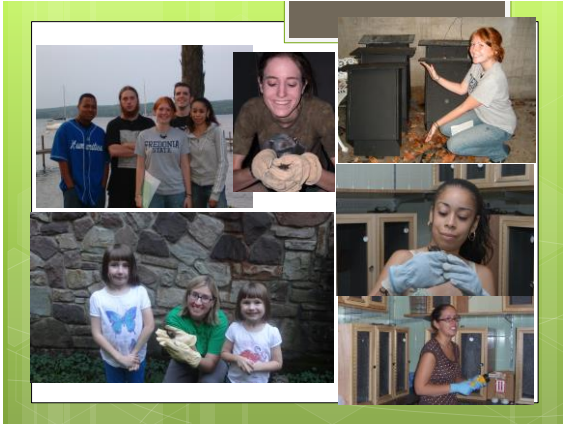
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What Research is Being Done?

- Assessment of residual northern long-eared bat reports and WNS leading-edge metrics
- Physiological changes in remnant bat populations in WNS-affected areas
- Uncovering skin immune proteins as predictors of resistance against WNS
- The potential of mycoviruses for biocontrol of white-nose syndrome of bats
- Factors of the innate immune response that protect Virginia big-eared bats from infection by *Pd*, the agent of white-nose syndrome
- Genomic differences between *Pd* and closely-related fungi from bat hibernacula: insights into fungal pathogenicity, physiology, and ecology

www.whitenosesyndrome.org





Literature

Blehert et al. 2009 Bat White-nose Syndrome: an emerging fungal pathogen? Science 323:227.

Frick et al. 2010 An emerging disease causes regional population collapse of a common North American bat species. Science 329:679-682.

Neilson 1991 Population ecology of the little brown bat, *Myotis lucifugus*, at the Chautauqua Institution, Chautauqua, NY. M.Sci. Thesis, York University, North York, Ontario.

Syme et al. 2001 Roosts and food supplies ameliorate the impact of a bad summer on reproduction by the bat, *Myotis lucifugus* LeConte (Chiroptera, Vespertilionidae). Ecoscience, 8(1):18-25.

Verant et al. 2014 White-nose syndrome initiates a cascade of physiologic disturbances in the hibernating bat host. BMC Physiology, 14:10.