
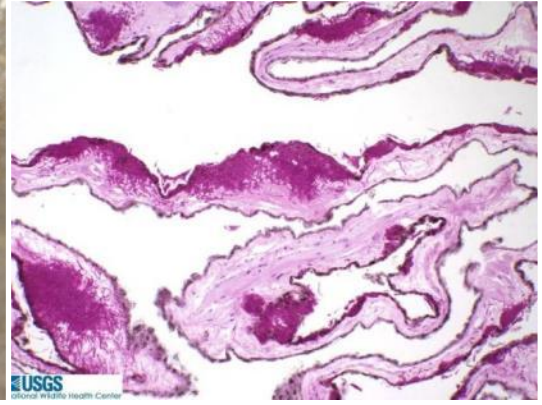


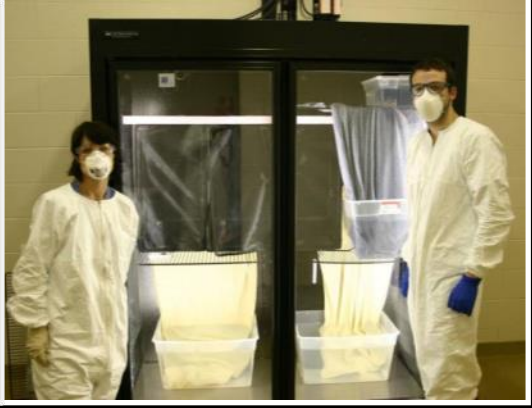

WNS Research by the National Wildlife Health Center

Anne Ballmann, DVM, PhD

OBWG - Columbus

Dec 2013

USGS
science for a changing world

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National Wildlife Health Center
Madison, Wisconsin

Our Mission-

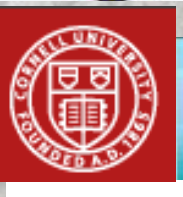
National leadership to safeguard wildlife & ecosystem health through dynamic partnerships and exceptional science

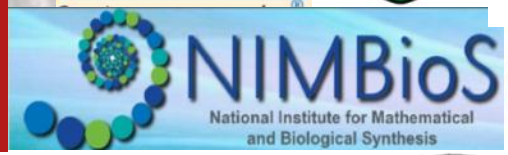
U.S. Department of the Interior
U.S. Geological Survey

www.nwhc.usgs.gov

Partners

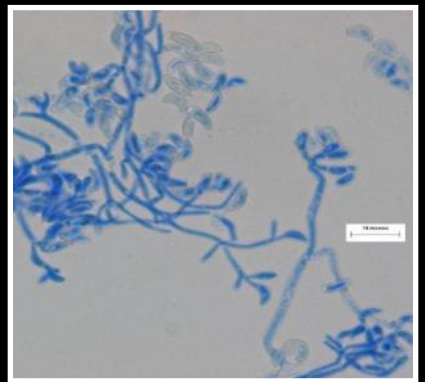
- Federal
- State
- Tribes
- Universities
- NGOs



History of NWHC Involvement

- **2007-** contacted by NYDEC to assist with unusual winter mortality of cave bats
- **2008-** field investigations; 5 states affected
- **2009-** novel fungus associated with diseased bats; histopathological criteria; PCR development



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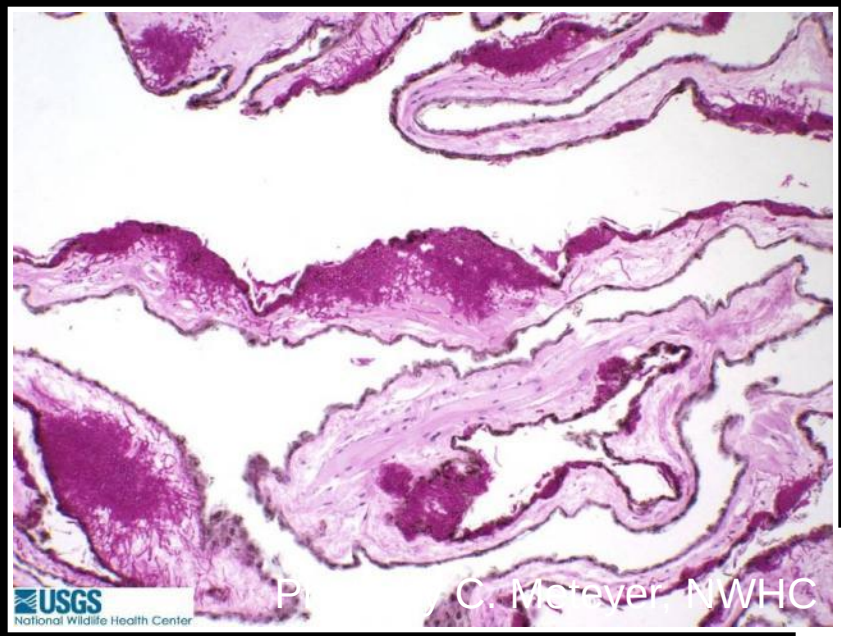
WNS Pathology – Wing Damage



<u>Bat Wings</u> – In addition to flight, they are critical for:

- **Heat Dissipation**
- **Water Control**
- **Gas Exchange**
- **Blood Pressure Regulation**

Citations:

Meteyer, et al. 2009. *JVDI* 21:411-414.
Cryan, et al. 2010. *BMC Biology* 8.
Cryan, et al. 2013. *JWD* 49:398-402.
Warnecke, et al. 2013. *Biol Letters* 9.

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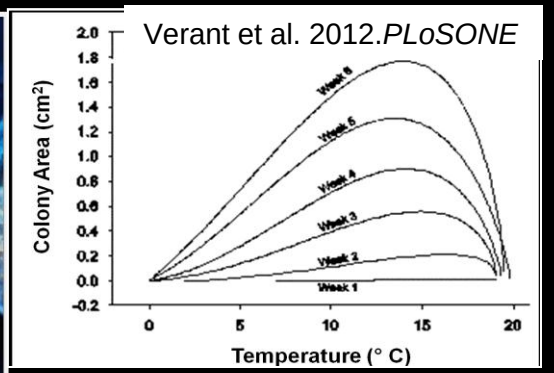
History of NWHC Involvement

- **2010-** environmental transmission study
- **2011-** infection trials; recovery with supportive care demonstrated; UVA screening
- **2012-** improved PCR assay; environmental distribution & persistence; fungal genomics; temperature dependent growth of Pd



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Environmental Distribution of *P. destructans*

- **Soil samples from caves and mines collected in states bordering and east of Mississippi River (2009-2012)**
- **Identified *P. destructans* DNA and viable fungus.**

Citations: Lorch, et al. 2013. *Appl and Environ Micro* 79:1293-1301.
Lindner, et al. 2010. *Mycologia* 103:241-246.

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Current Management-based Research

- Evaluating critical periods of Pd movement by bats
- Investigating Pd distribution within cave microclimates
- Understanding the pathophysiology of WNS mortality
- Preliminary work to develop viral vectors for orally ingestible vaccines for bats

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Summer surveillance for *P. destructans* on bats using contaminated hibernacula: Implications for timing of transmission

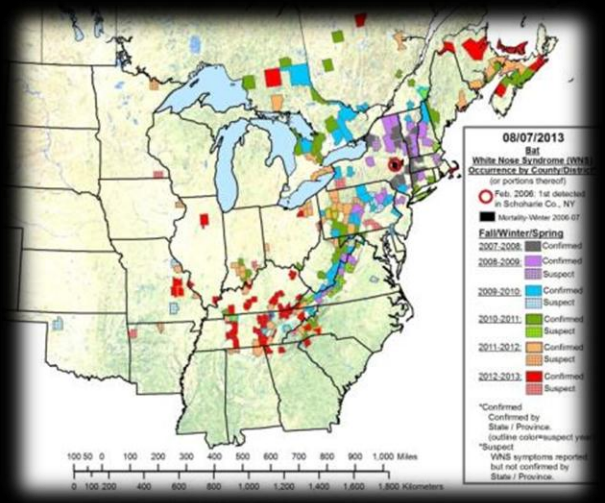
A Ballmann[1], M Torkelson[2], D Blehert[1], E Bohuski[1], M Verant[1], C Meteyer[1], and R Russell[1]

[1]USGS-National Wildlife Health Center

[2]UW-Madison

Background

- Continued spread of WNS
- Persistence of Pd in contaminated hibernacula
- Bat activity at hibernacula during summer
- Limited summer samples



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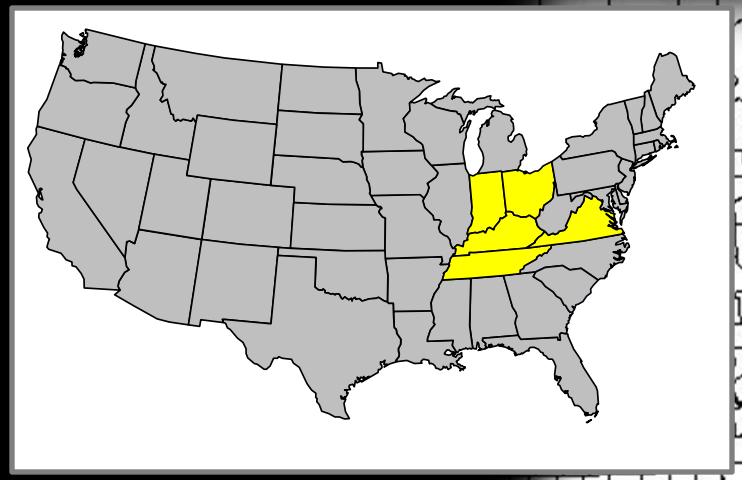
Study Objectives

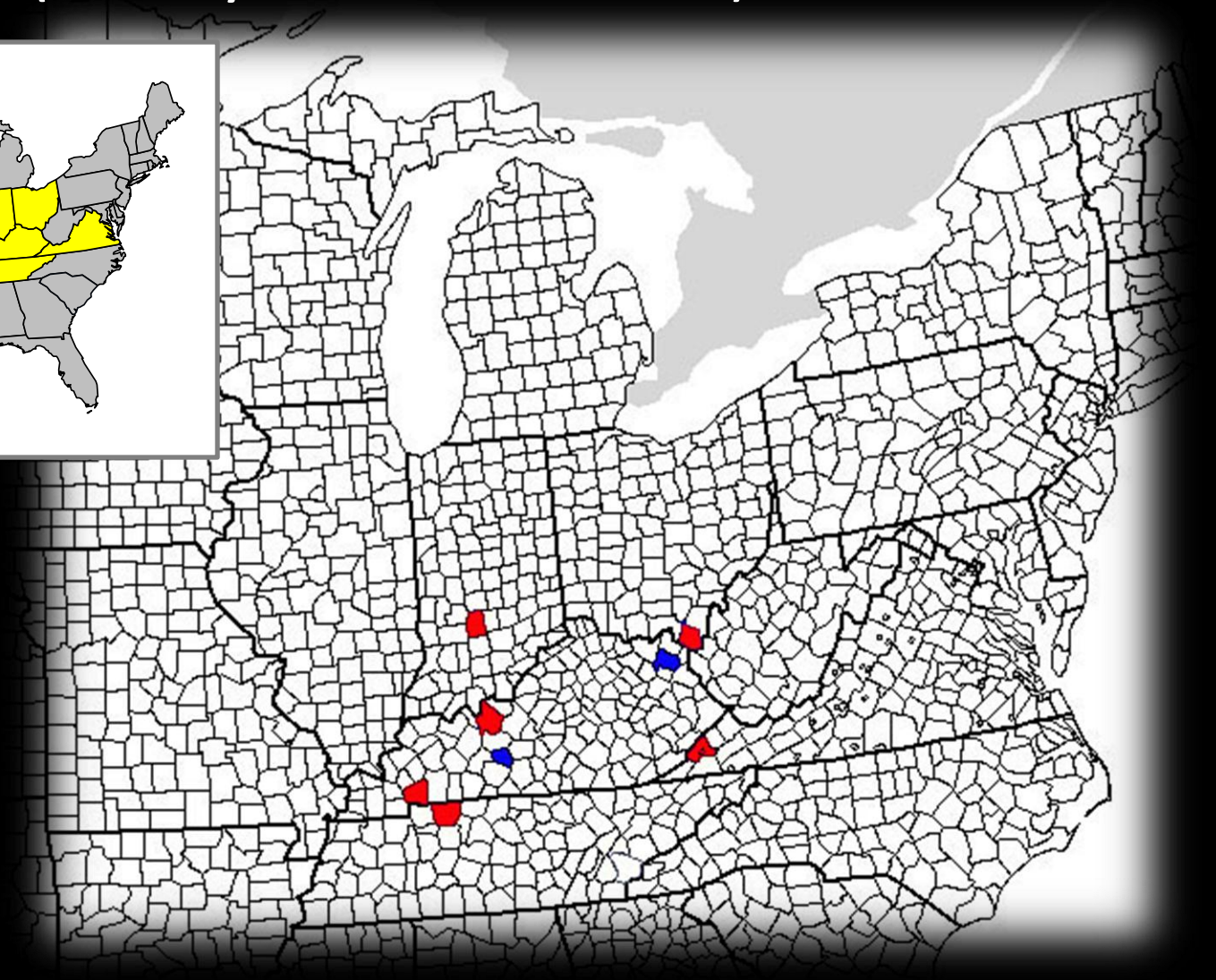
- Do bats at contaminated sites in late summer harbor viable Pd thus posing a transmission risk during fall swarm?
  - Does the prevalence of Pd on bats differ between hibernacula with different degrees of mortality?

- Is Pd in different concentrations in hibernacula with different degrees of mortality?

- What is the risk of human-assisted movement of Pd associated with late summer trapping/ caving activity in the WNS-affected region?

Summer 2012 Study Sites
(surveyed 7/18 – 8/22)





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Site Comparison

Site ID	Type/ Access	WNS Status (Yr)	Winter Popn	Winter Species
Edmonson Co. (KY)	Cave - g	- (Spr 2012)	Stable	MYLU, PESU, MYSO, EPFU, MYSE
Carter Co. (KY)	Cave - g	- (Spr 2012)	Stable	MYSO, MYLU, MYSE, PESU, EPFU
Breckinridge Co. (KY)	Cave - p	+ (2011/2012)	Stable	MYLU, PESU, MYSE, MYSO, MYGR, MYLE
Trigg Co. (KY)	Cave - p	+(2010/2011)	Stable	MYLU, PESU, MYSO, MYSE, EPFU
Wise Co. (VA)	Cave - g	+ (2011/2012)	Stable	MYLU, PESU, MYSO, MYLE, EPFU
Montgomery Co. (TN)	Cave - o	+ (2010/2011)	>25% loss	MYLU, PESU, MYSE, EPFU
Monroe Co. (IN)	Cave - g	+ (2010/2011)	>25% loss	MYSO, MYLU, PESU, EPFU
Lawrence Co. (OH)	Mine - g	+ (2010/2011)	>25% loss	MYLU, MYSO, PESU, MYSE, EPFU

g- gated; o- open; p- private

Methods

- Capture
- Demographic data
  - Species, body wt., R forearm length, sex, repro status, age class
- WDI, UV
- Wing swab
- Feces
- Mark & release

Environmental & Gear Sampling

- Wall/ceiling swabs & sediment samples
  - Assess levels of Pd contamination among sites
- Swabs of traps, clothing, & processing equipment
  - Presence and viability of Pd

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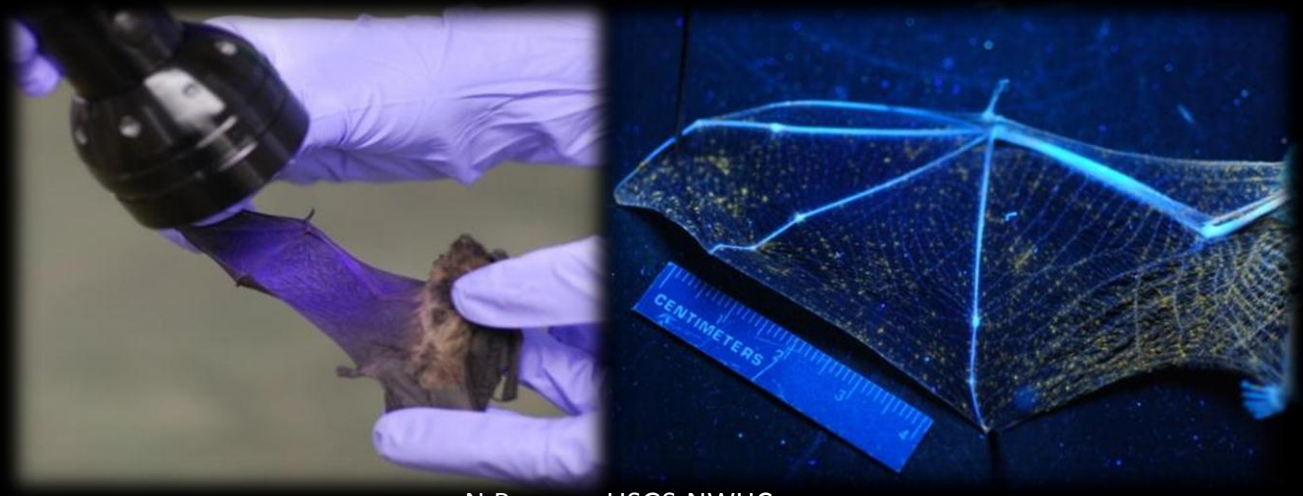
Summer Bat Abundance at Hibernacula

Site	No. Trap Events	Capture Effort (bats/hr)	Capture Method(s)	No. of Bats In	Out
Edmonson Co. (KY)	2	19.8	Harp trap, Hand	98	2
Carter Co. (KY)	2	53.9	Hand	89	0
Breckinridge Co. (KY)	2	21.6	Harp trap	101	62
Trigg Co. (KY)	1	86.3	Harp trap	115	10
Wise Co. (VA)	2	7.1	Mist net	49	44
Montgomery Co. (TN)	3	3.0	Mist net	48	53
Monroe Co. (IN)	2	8.9	Harp trap (modified)	45	0
Lawrence Co. (OH)	3	4.8	Harp trap, Mist net	72	63

Only 5 recaptures in all (0.5%)

Long Wave UV Fluorescence

- 3 bats (2 sites) with suspicious fluorescence
- Negative by PCR, histopathology, culture



N.Ramsay, USGS-NWHC

Summary of Pd Detection

Site	Bats	Gear	
Edmonson Co. (KY)	+	-	
Carter Co. (KY)	-	-	
Breckinridge Co. (KY)	+	+ (2 equiv)	Harp trap strings (Catch bag, backpack)
Trigg Co. (KY)	+	-	
Wise Co. (VA)	-	-	
Montgomery Co. (TN)	-	-	
Monroe Co. (IN)	-	+	Backpack
Lawrence Co. (OH)	-	+	Harp trap catch bag

Apparent summer prevalence on bats: 0.5%

Conclusions

- Pd prevalence on bats is low (but not 0) during mid-late summer at contaminated hibernacula
  - Viable Pd detected on bat trapped in August
- Summer bat movement likely does not contribute substantially to Pd dispersal on the landscape
  - Edmonson Co. “clean” cave?
- Human activities at hibernacula during the summer in the WNS endemic area do pose a risk

Recommendations

- Surveillance for Pd on bats should occur winter through spring
- UV screening bats during the summer is not advised
- Nightly decontamination of mist nets or harp traps in leading edge & adjacent states during the summer is warranted

Thanks to our collaborators and volunteers!