# BATS Research Center

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BACKGROUND

White Nose Syndrome (WNS) is a disease epidemic of unprecedented proportion which is decimating many hibernating bat species as it spreads across the country. Bats that hibernate longer (Northern tier) are affected more than ones that hibernate for shorter periods (Southern tier).

The loss of the majority of our native bat population is and will have far reaching effects on the delicate balances necessary in our ecosystem. Insect populations will rise dramatically and with that increase will come more diseases affecting humans and animals as well as crop losses due to insect impacts.

WNS is a complex disease process that is yet to be fully understood. The most likely causative agent is a cold tolerant fungus called *Geomyces destructans* (Gd) only recently identified in the United States which was most likely an inadvertent import from Europe.

Research is being conducted at numerous levels by a number of groups which include spelunkers, field biologists, independent researchers, university researchers, and federal agencies. To date, no cure for the disease is available and most probably only the hardiest of the various bats species will survive. Population rebound, if it happens at all, will take decades due to the slow reproductive rate (one offspring per year) of most bat species.

Researchers from BATS Research Center have pioneered a new research tool for the investigation of WNS. John Gumbs and Mitzi Kaiura (principal researchers) have devised a methodology which uses ultraviolet (UV) light to visualize the tissue reaction caused by Gd before other clinical signs are apparent. This research is of importance as it allows field researchers to better visualize the presence of the disease in its early stages (in early hibernation) as well as follow the progression of the disease as it invades the bat tissue. This new technique will also provide biologists along the expanding edges of the epidemic, an opportunity to determine if their bat populations are impacted during the early phase of hibernation and not have to wait until January or February when other clinical signs become visible.

Before researchers from the BATS Research Center pioneered the use of UV as an investigative tool, no field or laboratory researcher had a well identified disease progression or time line since the clinical signs of the disease only became apparent late in the hibernation period.

In addition to continued research using UV light, BATS Research Center is also investigating spore load accumulation (both fixed and airborne) in the hibernaculum to provide data on airborne or direct spore transmission of Gd between bats and between the hibernation environment and resident bats.

BATS Research Center is a collaborator with New Jersey and Pennsylvania bat biologists, the United States Geological Service – National Wildlife Health Center, Southeastern Cooperative Wildlife Disease Study at the University of Georgia, the Department of Biology at the University of North Carolina, Bucknell University, and other researchers at the state and federal level.

BATS Research Center needs funds to continue the research projects that are already underway which for the first time will offer a multi-year window of photo documentation and detailed observations following the disease.

All of the projects currently in progress interface with the others at some point and all are necessary for research to continue.

The projects underway at this time:

1. Photo documentation of all phases of the Gd disease progression during torpor (hibernation) and when the bat becomes euthermic (warm).
2. Re-introduction of euthermic bats back into hibernation that have sustained Gd infections which have healed, to observe the re-emergence time line of Gd.
3. Following research bats through multiple Gd infection/healing cycles to determine if they become resistant to the disease.
4. Developing methodology and equipment to acclimate euthermic bats to hibernation conditions and temperatures with minimal stress to the animal.
5. Investigation of vascular damage caused by the fungus and how poor tissue perfusion affects healing of wing membranes
6. Following known juvenile bats through their first hibernation to determine if a non-Gd fluorescence noted from observations taken during prior hibernation seasons can be used to differentiate juvenile from adult bats in early hibernation.
7. Air sampling for suspended spore loads in the hibernaculum during hibernation.
8. Drill hole (mine roost locations) sampling for accumulated spore loads during hibernation.

The projects underway will further the knowledge of how the fungus develops and will document through high resolution photography the various manifestations of the disease and the tissue damage associated with it.

GOALS

1. Construct a cold acclimation chamber to allow euthermic bats to be cooled to hibernation temperatures and stabilized. This is a critical step in preparing the bat for re-introduction into a natural hibernaculum. BATS Research Center has data from a pilot study which was successful and those results will be incorporated in the new and bigger chamber. Cost is estimated to be approximately $2000.
2. Refurbish the existing euthermic chamber. We have found that meal worms (bat food) actually will bore through the urethane foam of the chamber. The entire interior of the chamber needs

to be covered and sealed with high density polyethylene panels to prevent damage to the insulation. Cost is estimated to be approximately $400.

3. Purchase of a 1000x binocular microscope with CCD (camera displays directly through a computer) for in-facility studies. This device allows for analysis of spore samples taken in the field and detailed study of vascular changes in infected bat wing membranes. Cost is estimated to be approximately $1500.
4. Purchase of a high resolution DSLR camera and tripod with an additional UV lamp for use in hibernacula that are not impacted by WNS. This system is to be used in other areas not yet known to be WNS positive to prevent cross contamination and the potential spread of Gd by contaminated equipment. Cost is estimated to be approximately $3500.
5. Bat food (meal worms). Resident bats (which are held for long intervals) eat a large quantity of meal worms. Cost is approximately $100 per month averaged over a year.