

# ASSESSMENT OF ZOOONOTIC DISEASE IN BAT POPULATIONS OF GRAND TETON NATIONAL PARK, WYOMING

---



---

JOSHUA PORTNER ♦ TUFTS UNIVERSITY SCHOOL OF VETERINARY MEDICINE  
NORTH GRAFTON ♦ MASSACHUSETTS

COLIN M. GILLIN ♦ TUFTS UNIVERSITY SCHOOL OF VETERINARY MEDICINE  
TUFTS CENTER FOR CONSERVATION MEDICINE

## ♦ INTRODUCTION

Many man-made structures within Grand Teton National Park (GTNP) provide suitable, if not ideal habitat for bats, especially the Little Brown Myotis (*Myotis lucifugus*) and the Big Brown Bat (*Eptesicus fuscus*). In 1995 and 1996, Tom Haraden (GTNP Naturalist) observed many maternity colonies of these species residing within park residences and other buildings. From these observations, this project was developed to expand the knowledge on the local bat populations in GTNP and assess the risk bats might pose to humans within the park buildings they share.

Public health concerns are often associated with the status of wild animal populations as potential carriers for a number of diseases. Bats have previously been shown to carry vesicular stomatitis, western equine encephalitis and rabies. Although the ability for bats to carry these and other diseases has been established, there has not been significant research, other than work done with bat Rabies Virus, on the risk that bats and their diseases pose to the human populations. This is despite the presence of bats often living in close proximity to humans.

The roofs and attics of manmade structures provide ideal habitat for bat species, especially *Myotis lucifugus* and *Eptesicus fuscus*. The ideal

daytime bat roost is warm, generally over 90 degrees Fahrenheit, high off the ground to prevent predation, dry, in proximity to a source of water, with adequate sites for clinging or hanging. Nearly every building in Grand Teton National Park fits this description due to the age of the buildings and cracks for bat entrance are common as they require a hole as small as ½" to 1" in diameter to gain access.

Vesicular Stomatitis, Western Equine Encephalitis, and Rabies Virus are zoonotic diseases that may be carried by bats. If bats of Grand Teton National Park carry these diseases, they would pose a potential risk to the wildlife, domestic animals (including livestock species), and humans living in and around Grand Teton National Park. This risk would potentially extend into the surrounding gateway communities and Yellowstone National Park. The species ranges for *Myotis lucifugus* and *Eptesicus fuscus*, the two principle species in this study, cover most of North America, leaving the potential dispersion of a disease over the entire continent and possibly even into South America if transmitted and carried by other bat or bird species. All three viruses cause disease in livestock species including pigs, horses, and cattle, and zoonotic infection in humans. Infections can cause production loss such as severe mastitis in dairy cattle or low weight gain in pigs from vesicular stomatitis, as well as disease in humans ranging from flu-like symptoms

to death due to western equine encephalitis infection. Disease from Rabies Virus infection is fatal in all mammalian species, and Vesicular Stomatitis and Western Equine Encephalitis infection does not confer immunity. The aim of this study is to identify the potential risk of bats as carriers of these diseases to provide park managers with baseline information to pursue further disease study and establish structural bat exclusion measures, if needed. As with all park research, the results of this project will also provide information for educational programs.

## ◆ METHODS

Using park maps developed by Tom Haraden and from sightings of roosts by park personnel, and personal scouting, day and night roosts were located. Roosts were also identified by finding areas in and around buildings with large amounts of guano. Entrances and exits from the roost can also be identified by staining methods. This method of roost identification has been beneficial in past work, especially for locating entrance and exit holes.

Capture methods and skills were acquired via instruction by bat researcher, Toni Piaggio, University of Colorado, Boulder and from the literature. The ideal time for capture was as bats were leaving daytime roosts to feed during the evening. Mist nets were placed near the roost exits.

Bats were removed from the mist net and placed in cloth bags until the nets are disassembled, as the net must be constantly monitored. Alternate capture methods will be explored, including a harp trap, which I have already begun constructing, and the use of a method described by Henry Harlow for vampire bats, using a home-made trap placed directly over the exit of the roost.

Three sites within the park were chosen for capture and sampling of bats. Each site was sampled for three nights at approximately nine o'clock in the evening, when bats were leaving the roost to forage. These sites included Lupine Meadows West cabin #667, Beaver Creek Resource Management Office, and the Highlands Ranch cabin #1045.

At each capture site, two 2.6 meter by 2.6 meter mist nets (Avinet, Inc, P.O. Box 1103 Dryden, NY 13053-1103) were placed outside the roost exit. Bats leaving to forage were entangled in the net, then carefully removed and placed in cloth bags. Upon placing bats in all available bags, the nets were

removed from outside the roost to prevent future capture. Pregnant bats were released immediately upon identification by visualization of developed mammary tissue.

Bats were restrained by placing the animal headfirst into a 12-cc syringe case that had the top removed or a 20-cc dosing syringe barrel, depending on the size of the animal. A nylon stocking was placed between the abdomen of the animal and the side of the case/barrel to prevent the bat from biting. Once restrained, bats were weighed on an electronic gram scale.

Venipuncture technique was developed with Dr. Gillin. The hind limbs were gently pulled out of the restraint mechanism and one leg held down by placing the middle finger on the patagium and the index finger on the interfemoral membrane, leaving the saphenous vein exposed. The vein was lanced with a 25 g, 1/4" needle, and blood was drawn into a heparinized 100 microliter hematocrit tubes. The vein was then clotted using Quik-Stop styptic powder and pressure. An additional method will be used in 2002 that was developed at Tufts University. This method uses Pasteur pipettes that have been drawn out to have a sharp end and calibrated for blood volume measurement. This pipette is attached to a tuberculin syringe by a short piece of rubber tubing. Blood is drawn into the pipette, which can then be plugged using clay, broken off and centrifuged as a capillary tube. Bats with a significant amount of blood drawn receive 0.15 to 0.3 cc of lactated Ringer's solution. Once the vein has clotted, the bat is marked and released. Blood smears and fecal samples will be analyzed for the presence of parasites, including *Eimeria* and *Trypanosoma* species. Bats were marked using a non-toxic, water-soluble nail polish to prevent resampling and released.

Microhematocrit tubes were kept refrigerated until they could be processed in the laboratory at the UW-NPS Biological Research Station, GTNP. Microhematocrit tubes were centrifuged to separate serum. The amount of recovered serum was measured (Precision pipette: Eppendorf series 2100 pipette 20-200,  $\mu$ L), Cat. No. 2247205-4). Serum for WEE analysis was diluted by a 1:5 ratio with saline (0.9% saline solution, NDC 50989-368-16, Vedco inc., St. Joseph, MO 64504) while serum for VS analysis was left undiluted. The samples were stored in a freezer in Eppendorf Tubes (Safe-Lock 2.0 mL, PP/US Pat. No 4,713,219. Cat. No.: 2236335-2). The undiluted WEE serum samples

were shipped overnight to Dr. Todd Cornish in the Wyoming State Veterinary Laboratory in Laramie, Wyoming for VS analysis and the diluted VS samples shipped to the USDA-APHIS National Veterinary Laboratory in Ames, Iowa. Recently deceased bats were to be sent to the Wyoming State Veterinary laboratory in Laramie for rabies testing.

## ◆ RESULTS

In June and July of 2001, bats were sampled in GTNP for the presence of Vesicular Stomatitis and Western Equine Encephalitis. Males and non-pregnant female bats were sampled from buildings and serum was analyzed for antibodies to these diseases. A total of 177 bats were captured, and 112 blood samples obtained. 56 of these samples were submitted for VS and 56 for WEE viral neutralization tests. At any sampling site, all bats captured were of the same species (Table 1). All samples were submitted and results are pending at the diagnostic laboratories. Samples of guano collected from handled bats were viewed via microscopic inspection for the presence of intestinal parasites. Coccidia and Ascarid eggs were noted in this cursory examination.

Table 1. Capture sites, species and number of bats sampled for vesicular stomatitis and western equine encephalitis in GTNP, 2001.

Capture Site	Species	Number	Disease Tested:	
			VS	WEE
Highlands	<i>E. fuscus</i>	53	15	12
Beaver Creek	<i>M. lucifugus</i>	22	8	4
Lupine Meadows	<i>M. lucifugus</i>	100	33	40
Other sites	<i>M. lucifugus</i>	2	0	0

## ◆ DISCUSSION

Mist netting proved effective but required multiple people to handle and untangle captured bats when more than one was captured simultaneously. During the next field season we will utilize a harp trap. The trap captures multiple bats safely while depositing them in a holding area or bag and does not require labor and time intensive untangling measures. This form of bat capture allows blood samples to be drawn while bats are being captured, rather than having to hold bats in separate bags and wait until all bats were captured before beginning the sampling process. This will reduce the time needed for sampling and reduce stress on the animals. Dr.

Henry Harlow, Director of UW-NPS Biological Research Station, GTNP, described a capture method using a 2" PVC pipe elbow which is placed over the roost exit hole where bats are directed into a nylon stocking for safe capture. This method should also reduce handling time and improve sample size.

This preliminary examination for zoonotic diseases within the GTNP bat populations will be conducted over 3 field seasons pending funding. Upon completion of the project, research findings will be submitted to the National Park Service via the Investigator's Annual Report, Grand Teton National Park officials, the UW-NPS Research Station Annual Report, and Bat Conservation International.

## ◆ ACKNOWLEDGEMENTS

We would like to thank the following people for their assistance in conducting this research: Toni Piaggio, University of Colorado, Steven Cain, Senior Park Biologist, GTNP, Dr. Hank Harlow, Director, UW-NPS Biological Research Station, and the many University of Wyoming students who helped with field sampling.