



Bat Monitoring



Mexican free-tailed bat, a common bat species in Great Basin National Park (GRBA), flying in Rose Guano Cave, GRBA. (NPS / Joseph Danielson)

Background

Most North American bat species are the primary predators of nocturnal insect populations. Therefore, insectivorous bats play an integral role in nutrient cycling and redistribution and are of great interest for long-term monitoring.

The National Park Service has used acoustic monitoring since its development to observe bat nocturnal behavior and record echolocation calls. Bat detectors are key instruments in acoustic monitoring, as they convert bat echolocation calls to audible frequencies. So far, the Mojave Desert Inventory and Monitoring Network (MOJN) has identified 11 species in the winter hibernation season and 20 species in the summer resident season across Death Valley National Park (DEVA), Great Basin National Park (GRBA), Joshua Tree National Park (JOTR), Lake Mead National Recreation Area (LAKE), Mojave National Preserve (MOJA), and Parashant National Monument (PARA) at varying species compositions.

What are the threats to bats?

Bats are experiencing a loss of habitat and foraging sites due to climate change and extended drought. Wind energy development also poses a great threat to bat species. More pressing still is the fungal disease called

white nose syndrome (WNS), caused by the non-native fungus *Pseudogymnoascus destructans* (*Pd*).



Deploying an acoustic sampling microphone (bat detector) near a water source to record echolocation calls of summer resident species in Great Basin National Park. (NPS / Joseph Danielson)

Since its detection in New York state in 2006, WNS has killed over 8 million bats. Starved during hibernation, bats are forced to leave their communal winter roosts, or hibernacula, early to find food and often die in the harsh, winter conditions. Although no official reports of the fungus have been made in the Mojave Desert, it has been detected in Washington state, northern California, and New Mexico, and is suspected to spread through shoes, clothing, and caving gear.

Monitoring Bats and *Pd* Fungus

The Mojave Desert Inventory and Monitoring Network hopes to develop a baseline of species composition and activity during summer and winter seasons, before WNS infection becomes a local issue. The network utilizes a variety of monitoring techniques to accommodate the varying bat behavior between seasons: acoustic surveys in summer and winter seasons for species detection and mist net capturing and swabbing in the spring for early WNS detection.



Gently removing captured bat from mist net to be swabbed for *Pseudogymnoascus destructans* (not pictured) in Great Basin National Park. (NPS)

Monitoring Objectives and Questions

The main objectives of the MOJN bat monitoring program are to establish a baseline composition of residential species at each park and to detect the *Pd* fungus if it arrives in network parks. Our bat monitoring questions are:

- 1) Which species are (currently) active in the winter at each MOJN park unit, possibly indicating shortening or absence of time in torpor/hibernation?
- 2) What is the species composition at each MOJN park unit during the summer resident season?
- 3) Has the *Pseudogymnoascus destructans* fungus arrived in any MOJN park units?
- 4) What are the long-term demographics and movements of particular bat species present at each MOJN park unit?

Sample Design

The MOJN bat monitoring project is unique in that it is scaled down from, and in coordination with, the North American Bat Monitoring Program (NABat), a collaborative, national and international bat monitoring program. Target monitoring sites, therefore, are a combination of NABat priority cells, assigned according to statistical relevance, and nonrandom, MOJN-specific priority cells—sites of assumed high bat activity (Figure 1). Each selected cell contains two bat detection sites. GRBA priority cells, however, have twice as many monitoring sites, as the park and surrounding valleys have an elevational gradient from 5,000 to 13,000 feet and provide a diverse bat habitat.

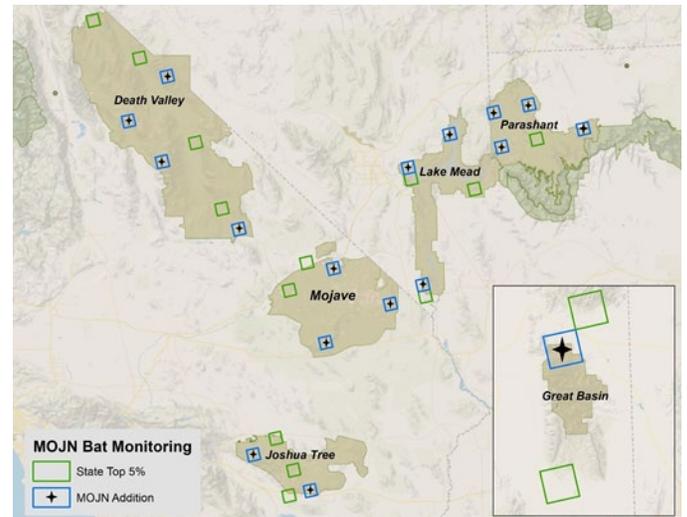


Figure 1: Map of MOJN-specific and NABat sampling cells within the MOJN park units. (NPS / Jenelle Booker)

Management Applications

Bat Monitoring will:

- Provide baseline data for early detection of WNS in bat populations and offer comprehensive evaluation of scope and severity of the threat of WNS
- Offer a rich data set that can be a springboard for research questions regarding nocturnal insect species health and bat migratory/hibernation patterns
- Unite monitoring efforts through data sharing across jurisdictional boundaries to inform response efforts at international, national, and state or provincial levels

More Information:

The protocol narrative and standard operating procedures for MOJN bat monitoring are in development.

Allen Calvert, Project Lead, MOJN I&M Program Manager
Email: allen_calvert@nps.gov; Phone: 702-293-8856

Summary by: Jenelle Booker, Mosaics in Science Diversity Internship Program

To learn more about the Mojave Desert Network Inventory and Monitoring Program, please visit our website at:

<https://www.nps.gov/im/mojn/index.htm>

