



ARTICLE

Bat Inventory of Golden Gate National Recreation Area

[Golden Gate National Recreation Area \(https://www.nps.gov/goga/\)](https://www.nps.gov/goga/)



The fringed myotis is among at least eight bat species found in Golden Gate National Recreation Area.

USGS

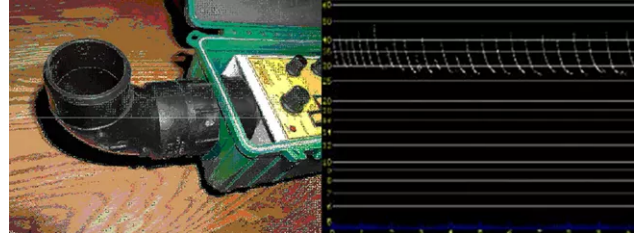
Importance

Bats are both economically and ecologically important, providing ecosystem services such as predation of insects and pollination.

Biodiversity of bats in the United States is relatively low (i.e. 45 species) compared to other groups of organisms. California's central coast is known to support 17 species, nine of which are believed to be at risk and have special status under state or federal law. Bats are nocturnal and use inaccessible roost sites, making them difficult to study in the wild. In general, bat populations are declining because of direct and indirect human impacts, including destruction of foraging and roosting sites. Most species also have very low reproductive rates, resulting in long recovery periods after population declines. In addition, many populations are constrained by a limited number of specific roosting sites for a large number of individuals.

Inventory Methods

Between July 2004 and July 2005, researchers detected bat vocalizations in Golden Gate using Anabat bat detectors. The graph of each call can often be used to determine the species based on the frequency, call shape, call duration, and time intervals.



Left: An Anabat bat detector inside a waterproof box. Right: A sample vocalization of a big brown bat with the time between each call removed.

NPS

The first bat inventory station in the National Park Service San Francisco Bay Area Network was set up in December 1999 at Point Reyes National Seashore.

Since then, they have installed twelve additional stations including three in Golden Gate: one each at Fort Baker, Fort Funston, and Tennessee Valley. Because the Anabat system requires 24-hour access to 110-volt power, all sample sites were constrained to be on or near structures. Whenever possible, researchers placed bat monitoring stations near apparently good bat habitat and a water source (such as a pond or stream).

The Anabat bat detector records ultrasonic sounds, lowers them into a frequency range that can be heard by the human ear, and stores them as a graph on a computer. For most bat calls, each vocalization sweeps down in frequency (pitch). The slope of this sweep and the lowest frequency are important features that assist in analysis and species identification. However, the characteristics of a call can vary depending on a bat's actions. For example, when an individual bat is flying in the open, it will tend to produce lower pitched calls that sweep through a small range of frequencies. If the bat flies through the more cluttered understory of a forest, the calls tend to increase in pitch, sweep through a wider range of frequencies, and occur more frequently. Calls also change when a bat detects a flying insect.

The variability in vocalizations within each species means that not all calls can be easily assigned to one species. As part of this inventory, researchers developed software to examine eight to ten features of each call and compare them to those of calls from known species. Calls that were a close match were assigned to a particular species.

Inventory Findings

A total of over 360,000 bat calls were recorded at the three Golden Gate monitoring sites, ranging from 12,000 at Ft. Baker to over 200,000 at Ft. Funston (Table 1). Researchers identified at least eight species of bats (Table 2).

The difference in the numbers of calls recorded at the three different monitoring sites can likely be attributed to both the number of individual bats in the vicinity of the detector at each site and the activity of a few bats that might be foraging in the vicinity of the detector.

Site	Days	Total # of Calls	Average # of Calls per Day
Ft Baker 2004	129	10,201*	79
Ft Baker 2005	189	1,765*	9
Ft Funston 2004	128	76,359	597
Ft Funston 2005	189	133,263	705
Tennessee Valley 2004	128	80,140	626
Tennessee Valley 2005	192	59,579	310
Totals	955	361,307	378

Table 1. Bat calls detected at each of the monitoring sites, July 2004-July 2005.

*Researchers do not know why the number of recordings of bats at Fort Baker declined between 2004 and 2005.

Scientific Name	Common Name	Fort Baker	Fort Funston	Tennessee Valley
<i>Myotis yumanensis</i>	California or Yuma Myotis	-	+	+
<i>Myotis lucifugus</i>	Little Brown Myotis	+	+	-
<i>Myotis thysanodes</i>	Fringed Myotis	-	+	+
<i>Eptesicus fuscus</i>	Big Brown Bat	-	+	+
<i>Lasionycteris noctivagans</i>	Silver-haired bat	-	+	+
<i>Lasiurus blossevillei</i>	Red Bat	+	+	+
<i>Lasiurus cinereus</i>	Hoary bat	+	+	+
<i>Tadarida brasiliensis</i>	Mexican free-tailed bat	+	+	+

Table 2. Species of bats detected at each of the monitoring sites, July 2004-July 2005.

+Detected

-Not Detected

*Federal Species of Management Concern (insufficient information for listing under the Endangered Species Act).

The red bat, hoary bat, and Mexican free-tailed bat were detected at all stations. Two of the most common bats in the San Francisco area (California myotis and Yuma myotis) cannot be distinguished acoustically, so they are lumped together for the purposes of this inventory. Researchers have detected one moderately uncommon bat, the long-eared myotis (*Myotis eyotis*), in other parts of the Bay Area, but not in this study. Bat inventory and monitoring research at various sites in Golden Gate is ongoing.

Additional Resources

[Contact Information \(https://www.nps.gov/im/sfan/contactus.htm\)](https://www.nps.gov/im/sfan/contactus.htm)

Fellers, Gary M. 2005. [Acoustic Inventory and Monitoring of Bats at Golden Gate National Recreation Area \(https://irma.nps.gov/DataStore/Reference/Profile/603311\)](https://irma.nps.gov/DataStore/Reference/Profile/603311). USGS.

Links

[San Francisco Bay Area Inventory & Monitoring Network \(https://www.nps.gov/im/sfan/what-we-inventory.htm\)](https://www.nps.gov/im/sfan/what-we-inventory.htm)

[Pacific Coast Science & Learning Center \(https://www.nps.gov/rlc/pacificcoast/bats.htm\)](https://www.nps.gov/rlc/pacificcoast/bats.htm)

[USGS Western Ecological Research Center \(https://www.usgs.gov/science/mission-areas/ecosystems/status-and-trends-program/science/bats?qt-science_center_objects=0#qt-science_center_objects\)](https://www.usgs.gov/science/mission-areas/ecosystems/status-and-trends-program/science/bats?qt-science_center_objects=0#qt-science_center_objects) - Play phase calls, feeding buzzes, and social vocalizations.

[San Francisco Bay Area Network Species Lists \(https://www.nps.gov/im/sfan/species-lists.htm\)](https://www.nps.gov/im/sfan/species-lists.htm)

- Certified Species lists including residency, abundance, and native/non-native status.

[Article: Collaborative Bat Study Begins in Marin County](https://www.nps.gov/articles/collaborative-bat-study-begins-in-marin-county.htm)

[\(https://www.nps.gov/articles/collaborative-bat-study-begins-in-marin-county.htm\)](https://www.nps.gov/articles/collaborative-bat-study-begins-in-marin-county.htm) - Update on more current, ongoing bat research.

[Bat Inventory of Muir Woods \(https://www.nps.gov/articles/bat-inventory-muir-woods.htm\)](https://www.nps.gov/articles/bat-inventory-muir-woods.htm) -

Compare bat species found at Muir Woods.

Summary by Alison Williams for the Pacific Coast Science and Learning Center, February 2009.

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