



Common Name: GRAY BAT

Scientific Name: *Myotis grisescens* Howell

Other Commonly Used Names: gray myotis

Previously Used Scientific Names: none

Family: Vespertilionidae

Rarity Ranks: G3/S1

State Legal Status: Endangered

Federal Legal Status: Endangered

Description: Color of the gray bat varies from dark gray immediately following molt in July or August, to russet, which is especially evident in females during the spring. Woolly-looking dorsal fur is uniformly gray from root to tip and the belly fur is grayish-white. The rear edge of the wing membrane attaches at the ankle. This is Georgia's largest *Myotis* bat, with a total length of 80 - 100 mm (3 - 4 inches), forearm length of 40 - 46 mm (1⁵/₈ - 1⁷/₈ inches), wing spread of about 30 cm (12 inches) and weight of 7 - 16 grams (¼ - ½ ounces), typically 8 - 11 grams (about ¼ ounces).

Similar Species: The gray bat is very similar to several other species in the same genus: southeastern bat (*Myotis austroriparius*), little brown bat (*M. lucifugus*), northern long-eared bat (*M. septentrionalis*), and Indiana bat (*M. sodalis*). However, these other myotis bats have banded dorsal fur (not uniformly colored from base to tip), and the wing membrane attaches to the base of the first toe rather than the ankle.

Habitat: Perhaps the most cave-dependent mammal in this country, the gray bat roosts and hibernates exclusively in suitable caves in the southeastern U.S. However, some of the few specimens collected in Georgia were found in a drainage tunnel under the University of Georgia football stadium. Less than 5% of available caves in the southeastern U.S. have the right properties of temperature, humidity, and structure to make them suitable for gray bat occupation. Wintering caves are deep and vertical and serve as cold air reservoirs. The bats need constant cold, but not sub-freezing, temperatures to remain in hibernation and conserve energy; temperatures at hibernation roosts range 6 - 11 °C (43 - 52 °F). Summer caves, on the other hand, must be much warmer, especially at maternity colonies where females are raising young; temperatures there range 14 - 25 °C (57 - 77 °F). Domed ceilings help trap heat, including body heat produced by the bats, at these sites. Summer caves are almost always located within 1 km (0.6 mile) of a river or reservoir that serves as a foraging site. Most foraging occurs within 5 m (16 feet) of the surface over open water near a forested shoreline. The bats will forage 20 km (12 miles) or more from the roost sites and seem to prefer traveling within forested areas, probably because they are less vulnerable to predation from owls there. Young bats just learning to fly need forest cover in the vicinity of the maternity cave in which to forage and take shelter.

Diet: The diet is composed entirely of night-flying insects, primarily from the orders Ephemeroptera, Coleoptera, Diptera, Trichoptera, and Lepidoptera.

Life History: Gray bats are highly colonial and gather by the hundreds of thousands into only a few known caves in the southeastern U.S. to hibernate during the winter; nine caves are believed to house about 95 percent of the entire population each winter, with one cave sheltering from 50 - 66% of this total. These bats are known to migrate from 17 - 525 km (11 - 326 miles) between suitable summer and winter caves. Upon arrival at the wintering caves in September or early October, the adults mate. The females begin hibernation immediately, storing the sperm until

springtime when insemination actually occurs. However, the males remain active for a few more weeks, replenishing fat supplies depleted during mating activities. The males and juveniles join the females in hibernation by early November. Gray bats hang from the ceiling, clustered tightly together, and averaging 1,828 individuals per square meter (yard). (Population estimates are derived by measuring the surface area covered by roosting bats and multiplying by the known average density.) Historical numbers have been estimated by measuring ceiling stains where the bats roosted in the past, or by measuring the old piles of droppings, or guano, beneath the roost sites. In late March or early April, the adult females emerge, begin their pregnancy, and disperse to maternity caves within the summer ranges to bear their young. The adult males and juveniles (gray bats take 2 years to mature) emerge in mid-April to mid-May and disperse to bachelor caves within the same summer ranges. The spring migration is especially hazardous because fat reserves and food supplies are low; mortality is high at this time. The summer caves are always near a reservoir or large river. Each adult female delivers a single offspring during late May or early June. In large maternity colonies, the pups are able to fly after about 20 - 25 days and are completely weaned by 2 months of age; development is enhanced by the warmer temperatures created by large numbers of bats. However, colonies that have been reduced in size typically experience lower temperatures and slower development of the young. If development is slowed too much, the young might die before learning to fly. Once on the wing, growth rate and survival of juveniles is inversely proportional to the distance they must travel to reach the nearest foraging area over water. During late summer, most gray bats leave their summer caves and disperse and mix throughout their summer range. A few weeks later, they again assemble at the winter caves for mating and hibernation.

Survey Recommendations: Gray bats can usually be detected by mist netting over canopied streams during spring and summer. New roost sites can be identified through knowledgeable cave exploration, but roosting bats should not be disturbed. Mist nests and harp traps are sometimes used at roost entrances to confirm species identification and gather demographic data.

Range: In Georgia, gray bats are known to occupy only three caves regularly during the summer in Chattooga, Walker, and Catoosa Counties. However, it is likely that additional roost caves in the northwest part of the state have yet to be discovered. There are occurrence records from two caves in Polk County and one in Dade, and a reported capture in Bartow County. The most important caves to gray bats, those that house large populations, are found in Alabama, Missouri, Arkansas, Kentucky and Tennessee. The range of the species also includes parts of Florida, Kansas, Indiana, Illinois, Oklahoma, Mississippi, Virginia, and North Carolina.

Threats: Gray bats are very intolerant of disturbance, which usually comes in the form of intentional vandalism or careless, inexperienced cave exploration. During wintertime, human visitation can cause them to emerge from hibernation, a process that burns valuable fat reserves needed to help them survive the winter. Fat reserves cannot be replaced during the winter, and each arousal from hibernation consumes enough energy to carry the bat through 20 - 30 days of hibernation. During the summer, disturbed females sometimes drop or abandon their young, which then perish. Alteration of important caves due to vandalism, closure, commercialization, and inundation as a result of dam construction can impact large percentages of the gray bat population. Since so few available caves are suitable, it is likely that gray bats do not find alternate caves once their primary ones become unavailable. Deforestation of flight corridors

between caves and foraging areas leads to increased predation by raptors. Pesticide use, along with pollution and siltation of waterways, has decreased and contaminated food supplies. At the turn of the century, gray bats were probably among the most abundant mammals in the eastern U.S. However, by 1970 the population had declined an estimated 47% to about 2.25 million. During the next six years the population dropped another 54%. Total numbers were estimated at about 1.5 million through the 1980s. In more recent years, the numbers appear to have been increasing at surveyed roost sites and the species could be downlisted soon.

Georgia Conservation Status: Probably this species is relatively stable in Georgia, but roost cave surveys were recently initiated to provide trend estimates.

Conservation and Management Recommendations: Protection of occupied caves, as well as suitable management of the surrounding forest and nearby aquatic foraging sites, will be necessary to maintain and enhance gray bat populations. Caves can be gated or fenced to prevent human entry, but the gates must be properly designed such that bat movement and the cave microclimate are not affected. A gate is being designed for one Georgia cave that has been subject to excessive disturbance from careless cave visitors. The U.S. Fish and Wildlife Service has acquired some of the most important caves in other states, and the Southeastern Cave Conservancy owns the most important known Georgia gray bat cave. A continuing educational effort must be aimed at the general public, but particularly at cave owners and explorers. Every effort must be made to avoid losing additional occupied caves to commercialization and inundation.

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J. Ozier, Aug. 2008: original account

K. Owers, Sept. 2009: updated status and ranks, added picture