ECOLOGICAL AND ECONOMIC IMPORTANCE OF BATS

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Abstract

Abandoned mines now serve as important year-round sanctuaries for bats. Many of North America's largest remaining bat populations roost in mines. These include more than half of the continent's 45 bat species and some of the largest populations of endangered bats. Bats have lost countless traditional roosts in caves and old tree hollows and many have gradually moved into abandoned mines, which can provide similar environments. Mine closures without first surveying for bats can have potentially serious ecological and economic consequences. Bats are primary predators of night-flying insects, and many such insects rank among North America's most costly agricultural and forest pests. These include cucumber, potato, and snout beetles; corn-earworm, cotton-bollworm, and grain moths; leafhoppers; and mosquitoes. A single little brown bat (*Myotis lucifugus*) can catch more than 1,200 mosquito-sized insects in an hour. A mine roosting colony of just 150 big brown bats (*Eptesicus fuscus*) can eat sufficient cucumber beetles each summer to protect farmers from 33 million of these beetles' root worm larvae, pests that cost American farmers an estimated billion dollars annually. And a colony of Mexican free-tailed bats (*Tadarida brasiliensis*) living in the old Orient Mine consumes nearly two tons of insects nightly, largely crop-consuming moths. In the western states, pallid bats (*Antrozous pallidus*) benefit ranchers by consuming large quantities of grasshoppers and crickets. Lesser and greater long-nosed bats (*Leptonycteris curasoae* and *L. nivalis*) and long-tongued bats (*Choeronycteris mexicana*) are believed to be important pollinators for some 60 species of agave plants and serve as both pollinators and seed dispersers for dozens of species of columnar cacti, including organ pipe and saguaro, which rank among the southwestern deserts' most familiar and ecologically important plants. Despite their critical role in our environment and economy, available evidence suggests that millions of bats have already been lost during abandoned mine safety closures or renewed mining in historic districts. These actions could endanger even currently abundant species, forcing the need for Federal listing at considerable taxpayer expense. The loss of bats can increase our reliance on chemical pesticides (which often threaten both environmental and human health), jeopardize whole ecosystems of other plants and animals, and harm human economies. The cost of surveying and protecting key mine roosts is small compared to the benefits provided by these valuable night-flying allies.

Introduction

Bats are one of the most important, yet least understood, groups of animals in the world. Across North America, bats play a vital role in both natural and managed ecosystems. Bats are key predators of night-flying insects that cost American farmers and foresters a billion dollars annually, and they are pollinators of several keystone desert plants in the American southwest and Mexico. Despite their importance, bats are often persecuted both intentionally and unintentionally, and their numbers continue to decline from habitat loss, environmental toxins, and disturbance at key roost sites. Bats currently represent the most imperiled order of land mammals in the United States and Canada.

Due to disturbance of bats' traditional roosts in caves and tree hollows, abandoned and inactive underground mines have now become refuges of last resort for more than half of the 45 bat species found in the United States and Canada, including some of the largest remaining populations. As thousands of abandoned mines are being reclaimed, available evidence suggests that millions of bats have been inadvertently buried or have lost crucial habitats. Closure of abandoned mines without first evaluating their importance to bats is perhaps the single greatest threat to many North American bat populations.

The Role of Bats in Ecosystem Management

Bats are primary predators of vast numbers of insects that fly at night, including many that rank among North America's most costly agricultural and forest pests. Just a partial list of the insects these bats consume includes cucumber, potato, and snout beetles; corn-borer, corn earworm, cutworm, and grain moths; leafhoppers; and mosquitoes. Just one of the little brown bats that hibernate in Michigan's Millie Hill Mine can catch 1,200 mosquito-sized insects in an hour. Bats are just one of several groups of animals that naturally prey upon mosquitoes. Although not the only insect consumed, from 77.4 to 84.6 percent of little brown bats living in the northern U.S. and Canada eat mosquitoes (Anthony and Kunz, 1977; Fascione, et. al., 1991). A Florida colony of 30,000 southeastern myotis (*Myotis austroriparius*) eats 50 tons of insects annually, including more than 15 tons of mosquitoes (Zinn and Humphrey, 1981). The loss of bats increases our reliance upon chemical pesticides that typically cause more long-term problems than they solve. Chemical poisons often kill natural mosquito predators more effectively than mosquitoes. Over time, predators such as fish, insects, and bats die out while mosquitoes develop resistance, multiplying in ever larger numbers in a losing battle often referred to as "the pesticide treadmill."

Mexican free-tailed bats, like those living in the famed Carlsbad Caverns and Bracken Cave, eat incredible numbers of insects nightly and just one colony living in Colorado's old Orient Mine consumes nearly two tons of insects nightly. In Texas' largest bat caves alone, up to 1,000 tons (2 million pounds) of insects, primarily moths, are eaten each night by Mexican free-tailed bats. U.S. Department of Agriculture research shows that in early June, billions of corn earworm moths (America's number-one agricultural pest) emerge from agricultural regions of Mexico, flying at high altitudes into the U.S. on prevailing winds—often traveling more than 250 miles a night. Days later, the moth's peak egg-laying occurs on corn, cotton, and other crops in agricultural regions of Texas. Their destructive larvae, which have fattened on the crops for about three weeks, give rise to the next generation of moths that emerge and continue a northward "hopscotch," infesting crops through much of central North America.

Doppler radar studies confirm that Mexican free-tailed bats fly at altitudes from 600 to 10,000 feet or more above the ground, sharing the same winds as moths, in the season when bats have their greatest energy needs (McCracken, 1996). To prove that bats prey upon this prime agricultural pest, fecal pellets were collected as bats returned to a Texas bat cave. In mid-June, moths comprise about 96 percent of the diet of these bats (Whitaker, et. al., 1996). Using DNA markers it was confirmed that corn earworm moths were the species being consumed (McCracken, 1996). Further proof came when bat detectors were affixed to weather balloons floating freely with the moths, recording bat calls and feeding buzzes to corroborate that free-tailed bats are indeed flying and feeding at the same altitudes and locations as the moth migrations (*ibid.*). The regional impact these bats are having on corn earworm moths is staggering.

Mexican free-tailed bats are also known as "guano bats" for the enormous quantities of droppings they produce. From 1903 to 1923, at least 100,000 tons were removed from Carlsbad Caverns alone and sold to fruit growers in California (Tuttle, 1994). Railroad officials estimated that, early this century, they annually transported 65 carloads at 30,000 pounds each from Texas, making bat guano the State's largest mineral export before oil (*ibid.*). Guano extraction for use as a natural fertilizer is still being extensively used in developing countries and is making a comeback with organic gardeners. Free-tailed bats have supported several American war efforts since gun powder's most valuable ingredient, saltpeter, is made from guano. And a single ounce of guano contains billions of bacteria useful in detoxifying industrial wastes, producing natural insecticides, improving detergents, and converting waste byproducts into alcohol.

Another common North American species, the big brown bat, specializes on beetles and true bugs, including cucumber beetles, May beetles or June bugs, green and brown stinkbugs, and leafhoppers. In one summer season the 150 bats of an average Midwestern maternity colony can conservatively eat 38,000 cucumber beetles, 16,000 June bugs, 19,000 stinkbugs, and 50,000 leafhoppers (Whitaker, 1995). By eating 38,000 adult cucumber beetles in a season, these bats control about 33 million of these beetles' rootworm larvae (*ibid.*). Both cucumber beetle adults and larvae attack crops, costing U.S. farmers about one billion dollars annually, with the larvae doing considerable damage—they can reduce corn productivity 10 to 13 percent and force farmers to spray $15 to $25 in insecticides per acre (Whitaker, 1993). Adult June bugs defoliate trees and their larvae (grubworms) feed on the roots of grasses and other plants. Stinkbugs are often pests in orchards and on soybeans. Leafhoppers are serious pests of many plants since they feed on the sap, rendering the plant vulnerable to various plant diseases and reducing the plant's productivity. In one study, these four bugs collectively totaled 37.8 percent of the food eaten by 184 big brown bats from various parts of Indiana (*ibid.*). At certain times and places, however, they often total nearly 100 percent of the diet of big brown bats.

With the growing agricultural emphasis on biological control and integrated pest management, more and more farmers are using bats as a weapon in the war against insect pests. Instead of eradicating bat colonies from their farmhouses and barns, farmers are exploring ways of attracting bats to their fields. Many farmers are living with their bat allies and even encouraging their colonization by constructing artificial habitats. In addition to consuming insect pests, it is suggested that bats protect crops from pests by "chasing" away insects with their echolocation calls. Researchers saw a 50 percent reduction in damage to corn plots by corn borers when they broadcast bat-like ultrasound over test plots (Belton and Kempster, 1962).

North American bats are boosting local economies by encouraging tourism at renowned locations like Carlsbad Caverns and Austin's Congress Avenue Bridge. In Austin, just one decade ago, citizens petitioned for the bridge's bat colony to be eradicated. In 1999, Bat Conservation International (BCI) initiated a study which showed that the Congress Avenue Bridge bat colony generates nearly $8 million in tourism revenue each year (Ryser and Popovici, 2000). More than 100,000 people watch the bat emergence annually, including many who specifically travel to Austin to view the bats, spending millions on lodging, transportation, food services, and entertainment.

Bats are also key pollinators of many familiar desert plants. The endangered lesser and greater long-nosed bats, and Mexican long-tongued bat, serve as both pollinators and seed dispersers for dozens of columnar cacti species including organ pipe, and saguaro, and are important pollinators for some 60 species of agave plants. Agaves have been closely associated with man since the beginning of civilized America as a food item, a fermented beverage, and a fiber source. Today, tequila, made from distilled agave juices, is by far the best known Mexican liquor, and its rising popularity in international markets contributes to a multi-million dollar industry. Yet agave propagation, in the absence of bats, falls to 1/3000th of normal (Howell, 1980; Fleming, 1991). The bat-plant association is so strong that the disappearance of one would threaten the survival of the other.

In addition to consumptive uses, cacti rank among the southwestern desert's most ecologically important plants (Howell, 1980). Bees, moths, lizards, hummingbirds, woodpeckers, orioles, finches, sparrows and field mice all depend on plants pollinated by bats for food and shelter, and are affected indirectly by the loss of bat pollinators and subsequent decrease in plant populations, such that entire ecosystems are damaged.

Habitat destruction is likely the major factor affecting pollinating bats and contributing to their endangered or "at risk" status. Their specialized nectar diet and disappearance of their food plants could explain population declines. The fragile bat-plant relationship is magnified in the case of the long-nosed bats because of their migratory habits. These bats depend not only on the plants in a given region, but on a continuous supply of food along their migratory routes. The destruction of habitat in Mexico, for example, could have severe effects, through the bats, on the plant communities in Arizona. Mexican cattlemen, in misguided attempts to control numbers of vampire bats (*Desmodus rotundus*), have also indiscriminately destroyed countless colonies of highly beneficial bats, including pollinators.

In tropical ecosystems, bats play a critical role in seed dispersal and pollination. And because loss of rain forest habitats is one of the most serious environmental problems today, the loss of bats can have serious environmental and economic consequences. In one recent West African study, bats were shown to be far more effective seed dispersers than birds. Because most bats prefer to carry fruit away from the tree before eating, apparently to avoid predators, they cross cleared areas and sometimes travel up to 50 km or more in a single night. In Africa, up to 95 percent of forest regrowth on cleared land comes from seeds dropped by bats (Tuttle, 1983). In contrast, birds and other animals drop seeds mostly beneath existing trees.

Bats also are the primary pollinators of numerous tropical plants. More than 130 genera of trees and shrubs are already known to rely on bats for pollination, and many more such relationships await discovery (*ibid.*). Recent studies demonstrate that seed dispersal activities of bats can be critical to reforestation of clear-cut areas, and that many of the tropics' most economically important plants depend on bats for propagation. The nearly endless list of valuable products from these plants includes many grocery store fruits such as peaches, bananas, and avocados, as well as kapok and hemp fibers for surgical bandages, life preservers, and rope, latex for chewing gum, prized lumber for furniture and crafts, beads for jewelry, and carob for candy. The harvest of Durian fruits in Southeast Asia and iroko timber in West Africa accounts for annual sales of over 100 million dollars. The former requires bats for pollination and the latter for seed dispersal.

In the Old World, exaggerated reports of crop damage from fruit bats have led to bat killings. Farmers are alarmed by the sight of large bats eating fruit that ripens prematurely or that is missed during picking. Because fruit bats prefer strong-smelling, ripe fruits, commercial crops that are picked green for shipping are seldom damaged. Birds and rats are not so picky, leaving their depredations to be blamed on the more conspicuous bats. As a consequence, large colonies of big flying fox bats are being destroyed. In the Old World and throughout the South Pacific Islands, bats are considered a delicacy and are over harvested for human food, folk medicine and even aphrodisiacs. Many populations of large flying fox bats are seriously threatened. On Guam, bat dinners may sell for $25 a plate, and in West Africa, bats are so valuable that two poachers working together can make $1,000 in a single day.

The Importance of Mines to Bats

Although caves are numerous in some regions, most are now too frequently disturbed by humans to permit bat use. In addition, bat populations have lost countless traditional roosts in old tree hollows due to logging. Over the past 100 or more years, displaced bats have gradually moved into abandoned mines, which often provide microclimates similar to caves. In regions where natural caves do not occur, mines represent new “super habitats” that have concentrated colonial bat populations formerly distributed in smaller numbers across the landscape (Brown and Berry, 1991).

Mines are key to the life history of bats and are critical for many purposes such as rearing young in the summer, winter hibernation, gathering for social activities (such as courtship and mating), and night roosting (places where bats temporarily rest to digest their prey between foraging bouts). Mines also serve as crucial rest stops between spring and fall migration. Abandoned mines are often the only suitable shelters left midway between summer and winter roosts. Without these protected resting places, migratory mortality could increase tremendously. Although mines are utilized for many reasons, their use as bat maternity and hibernation sites is essential to the survival of several North American species. The microclimate, most importantly the temperature, determines whether bats will use a particular mine. Warm sites are selected for maternity roosts, while cold sites are chosen for hibernation.

Bats that roost in smaller groups typically require temperatures between 70 and 90EF for maternity use. Big-eared bat (*Corynorhinus* spp.) maternity roosts have sometimes been recorded in colder sites where ambient temperatures are as low as 60EF. Approximately one-quarter of the bat species in the United States and Canada are believed to hibernate almost exclusively in old mines or caves (Tuttle and Taylor, 1994). Suitable hibernation sites for bats in all regions must protect bats from freezing, and for most species, should provide stable temperatures throughout the winter above the freezing point but below 50EF. Some desert dwelling bats may be an exception and often hibernate in mines with temperatures up to 58EF (Brown, pers. com., 1997).

While any abandoned mine may be important to bats, the larger, more complex and dangerous mines, with multiple entrances, often harbor the most significant populations. This is because large and complex mines offer bats a measure of security no longer found in caves. The complexity and associated airflow of these mines provides a range of internal temperatures suitable for bats (Altenbach, 1995). These complex sites are most often found on private mining industry lands.

Of the more than 8,000 mines surveyed by researchers in Arizona, California, Colorado, New Mexico, Oregon, and Washington, approximately 45 to 75 percent showed signs of use by bats, with an average of 10 percent containing important bat colonies. From the Great Lakes Region north and eastward in the United States and Canada, up to 70 percent of open, unflooded subsurface mines having sufficient volume to protect bats from freezing, may be used by hibernating bat populations.

Abandoned Mine Closures: Effects on Bats

In the last decade alone, thousands of abandoned mines have been permanently closed by backfilling, capping, blasting, or other method, and until recently few were first evaluated for their importance to bats. Available evidence suggests that millions of bats have already been lost, or their roosts destroyed. Bats now have few alternatives to abandoned mines, and are so instinctively committed to certain sites that they often cannot change roosts in the time allowed by current rates of mine closure (Altenbach, pers. com., 1996). Due to their colonial nature, many bat species are especially vulnerable to mine closures, and hundreds of thousands of bats can be lost in a single closure.

Little brown bats are among North America's most abundant bat species. However, in the northern United States and Canada, these bats rely almost exclusively upon abandoned mines for hibernation sites. If a mine is closed during winter months (trapping the bats inside), a multi-state region can be affected. This is due to the fact that little brown bats travel from summer colonies that may be thousands of miles away to hibernate in mines. Closure of mines without first checking for bats could drastically reduce bat numbers, needlessly endangering many species.

In the western United States, Townsend's big-eared bats (*Corynorhinus townsendii*) are particularly dependent on abandoned mines (Altenbach, 1995). The largest known populations, numbering up to 10,000, have been found in deep, complex workings, however, even shallow or simple workings will often be used by small groups of up to several hundred. Endangered Indiana bats (*Myotis sodalis*) and southwestern cave myotis (*M. velifer brevis*) have been found in mines in numbers approaching 100,000. Similarly, the largest known hibernating populations of the southeastern big-eared bat (*Corynorhinus rafinesquii*), a candidate for the endangered species list, live in abandoned iron and copper mines in small groups ranging from a few dozen to more than 500.

All of the known remaining nursery roosts of the endangered lesser long-nosed bat in the United States are found in mines. In California, all winter roosts and all but one maternity colony of California leaf-nosed bats (*Macrotus californicus*) are found in abandoned mines (Brown, pers. com., 1997). Many other bat species rely heavily on mines for hibernation, even though they may congregate in smaller colonies throughout a greater number of abandoned mines. Table 1 provides a list of North American bats known to use mines (Tuttle and Taylor, 1994).

Many examples underscore the magnitude of potential bat losses from abandoned mine closures. More than 50,000 little brown bats were temporarily entombed in a western Wisconsin mine closure before biologists were able to have the mine reopened. The old Neda Mine in Iron Ridge, Wisconsin, was threatened with closure before being acquired by a local University. It is now home to nearly half a million little brown bats, as well as large populations of big brown bats, eastern pipistrelles (*Pipistrellus subflavus*), and northern long-eared myotis (*Myotis septentrionalis*).

The largest hibernating population ever recorded of another species in decline, western big-eared bats (*Corynorhinus townsendii pallescens*), was destroyed in a New Mexico mine shaft when vandals set old timbers on fire (Altenbach, pers. com., 1996). In New Jersey, the State's largest population of hibernating bats was inadvertently trapped in the Hibernia Mine when it was capped in 1989. These bats would also have died had biologists not convinced state authorities to reopen the entrance immediately. Likewise, the Canoe Creek State Park limestone mine in Pennsylvania was reopened in time to save its bats and now shelters a population of endangered Indian bats and the largest hibernating bat population in that state.

In December 1992, an estimated three quarters of a million little and big brown bats were found in the Millie Hill Mine in Iron Mountain, Michigan. It was slated to be backfilled the following spring. Instead, BCI convinced the town to close the mine with a large steel cage, protecting the bats and human safety (Tuttle and Taylor, 1994). These bats comprise the second largest hibernating bat population ever discovered in North America. A local mine inspector from Iron Mountain, Michigan, reported that of the 12 mines closed prior to 1993, some contained significantly large bat populations, perhaps even more than were saved in the Millie Hill Mine.

Mine and cave roosting bats are exceptionally vulnerable to human disturbance in their nursery and hibernation caves. Entire populations can be destroyed in single incidents, emphasizing the need for public education and protection of critical sites. Requiring up to an hour or more to arouse from hibernation, bats cannot quickly fly away from danger, and in any event cannot survive outside of their roost in winter. Helpless, thousands at a time have been intentionally killed by vandals. Many more die as a result of inadvertent disturbance by mine or cave explorers who do not realize the dire consequences of their actions. When hibernating, bats must conserve energy until spring when insects are once again abundant. A single disturbance can cost a bat over 60 days of stored fat reserves (Thomas, et. al., 1990). Excessive disturbances can cause the bat to burn up all its fat reserves and perish.

Large colonies of bats are at risk as well. Mexican free-tailed bats have declined at Carlsbad Caverns from over 8 million to just a few hundred thousand. Likewise, the bats at Eagle Creek Cave in Arizona that once numbered between 25 and 50 million have declined by 99.9 percent to just under 30,000 (Tuttle, 1991).

Pesticide poisoning can also affect bats in many ways. By reducing non-target insects, bats are unable to find adequate sources of insect prey. Bats also can ingest sub-lethal doses of pesticides, which become stored in their fat reserves. During times of stress, such as hibernation or migration, when large stores of fats are released, pesticides are released too, sometimes at lethal levels.

Because bats are consuming vast quantities of insect pests, the general health of entire ecosystems are compromised in the absence of bats. How many bats can we lose before their numbers become too few to survive and service our ecosystems? When humans modify ecosystems for natural resource production such as timber, minerals, or agriculture, maintaining habitat for bats will not only ensure the survival of these important wildlife species, but will also benefit the sustainable production of natural resource products.

The North American Bats and Mines Project

BCI and the United States Bureau of Land Management founded the North American Bats and Mines Project (NABMP) in 1993 to address conservation issues facing mine-roosting bats. The purpose of the NABMP is to eliminate the loss of bats during abandoned mine-land reclamation, while still protecting human safety. The NABMP has five primary objectives: (1) to educate natural resource managers and the public on the importance of mines for bats; (2) to train wildlife and mine-land managers on mine assessment and closure methods that protect both bats and people; (3) to assist agencies and industry in protecting and enhancing bat roosts in abandoned mines; (4) to provide leadership and coordination among Federal, State, and private agencies and the mining industry, thus minimizing bat losses; and (5) to aid with active research and monitoring efforts. By establishing and achieving these goals, BCI and its agency partners will ensure that bat conservation measures are incorporated into the planning and operating procedures of agencies and organizations responsible for mine-land management and wildlife conservation. To date, we have already provided funding and technical support to protect critical habitats for more than 2 million mine roosting bats, hosted 18 bats and mines workshops, distributed 20,000 copies of our resource publication, *Bats and Mines*, and translated this publication into Spanish for our Latin American Partners. As we continue to learn about our vital and fascinating bat species, we are better suited to manage for their long-term survival.

Table 1. North American bats that use mines for maternity and/or hibernation sites.

Species	Colony Sizes	Range	Use Time
Ghost-faced bat *Mormoops megalophylla*	Dozens to hundreds	AZ & TX	Year-round
California leaf-nosed bat *Macrotus californicus*	Dozens to over a thousand	AZ, southern CA & NV	Year-round
Mexican long-tongued bat *Choeronycteris mexicana*	A dozen or fewer	AZ, southern CA & NM	Summer
Lesser long-nosed bat *Leptonycteris curasoae**	Hundreds to thousands	AZ & NM	Summer
Greater long-nosed bat *Leptonycteris nivalis**	Hundreds to thousands	TX & NM	Summer
Southeastern myotis *Myotis austroriparius*	Hundreds to thousands	Southeastern U.S.	Year-round
California myotis *Myotis californicus*	Up to a hundred	Western U.S.	Year-round
Western small-footed myotis, *Myotis ciliolabrum*	Up to hundreds	Western U.S.	Year-round
Long-eared myotis *Myotis evotis*	Dozens	Western U.S.	Year-round
Gray bat *Myotis grisescens**	Hundreds to 50,000 or more	Southeastern U.S.	Year-round
Small-footed myotis *Myotis leibii*	Dozens	Eastern U.S.	Winter
Little brown bat *Myotis lucifugus lucifugus*	Hundreds to a million or more	Northern U.S.	Year-round
Arizona myotis *M. l. occultus*	Hundreds	Southwestern U.S.	Year-round
Northern long-eared myotis *Myotis septentrionalis*	Hundreds to thousands	Eastern U.S.	Winter
Indiana bat *Myotis sodalis**	Hundreds to 100,000 or more	Eastern U.S.	Winter

Table 1. (Cont.) North American bats that use mines for maternity and/or hibernation sites.

Species	Colony Sizes	Range	Use Time
Fringed myotis *Myotis thysanodes*	Dozens to hundreds	Western U.S.	Year-round
Cave myotis *Myotis velifer*	Hundreds to 100,000 or more	Southwestern U.S.	Year-round
Long-legged myotis *Myotis volans*	Hundreds	Western U.S.	Year-round
Yuma myotis *Myotis yumanensis*	Hundreds to thousands	Western U.S.	Year-round
Western pipistrelle *Pipistrellus hesperus*	Dozens	Western U.S.	Year-round
Eastern pipistrelle *Pipistrellus subflavus*	Dozens to thousands	Eastern U.S.	Winter
Big brown bat *Eptesicus fuscus*	Dozens to hundreds	North America	Year-round
Allen's lappet-browed bat *Idionycteris phyllotis*	Dozens to about two hundred	Mostly AZ, also parts of NV & CO	Year-round
Southeastern big-eared bat *Corynorhinus rafinesquii*	Dozens to several hundred	Southeastern U.S.	Year-round
Pacific big-eared bat *C. townsendii townsendii*	Dozens to hundreds	Western U.S.	Year-round
Ozark big-eared bat *C. t. ingens**	Dozens to hundreds	Ozark Mountains	Year-round
Western big-eared bat *C. t. pallescens*	Dozens to thousands	Western U.S.	Year-round
Virginia big-eared bat *C. t. virginianus**	Dozens to thousands	KY, VA & WV	Year-round
Pallid bat *Antrozous pallidus*	Dozens to hundreds	Western U.S.	Year-round
Mexican free-tailed bat *Tadarida brasiliensis*	Hundreds of thousands	Southwestern U.S., north to OR	Mainly summer, some year-round

* Endangered

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