

Population dynamics of

Mexican free-tailed bats at Lava Beds

By Kelly Fuhrmann

In addition to its population of Townsend's big-eared bats, Lava Beds National Monument is home to Mexican free-tailed bats (*Tadarida brasiliensis mexicana*). Adult females of this species arrive at the monument in mid- to late June. The colony probably migrates between Lava Beds and central and southern California (Denny Constantine, researcher, personal communication, 1999). The pups are born within three weeks of arrival of the adults and continue to develop for six to eight weeks after birth. They become volant (i.e., they begin flying) during this time and develop the skills necessary to forage for food with adult bats.

At more than 164,000 individuals, this seasonal maternal colony is the largest and northern-most in far western North America (Cross 1989). Researchers have yet to fully understand all of the ecological implications of this bat colony in the region; however, one undeniable benefit is the bats' service to local agriculture as natural crop pest insectivores. Analysis of radiotelemetric data has determined that during exit flights from the lava cave the colony disperses over the agricultural fields of the Tule Lake basin. The adult females initially, with the volant young later in the season, emerge from the cave around sunset each evening to feed on insects (see photo). Given the number of bats present, this maternal colony consumes as much as 200 tons (181 tonnes) of insects during the summer season.

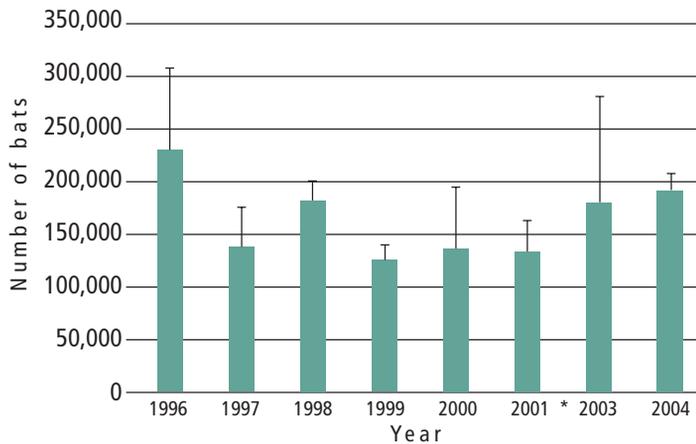
Population studies of this seasonal colony of migratory Mexican free-tailed bats began in 1988 when Dr. Steven Cross of Southern Oregon University collected baseline data. Dr. Cross used still-photo sampling protocols for monitoring the exit flights on an annual basis during the maternal season and completed an initial analysis of this colony's population. Researchers have since developed variations of this protocol for other bat population monitoring projects (O'Shea and Bogan 2003). Cross's 1988 data identified an average population of 149,681 adult bats. The still-photography method allows comparison of population estimates made



Since consistent monitoring began, the data demonstrate that the annual returning adult population of the colony is variable but stable (see graph). The population estimates gathered from 1996 to 2004 identify an average annual population of 164,816 adult bats. Several factors may contribute to the fluctuations in numbers. One is that the maternal colony is subject to a host of environmental influences inside and outside the maternal roost that may impact populations (e.g., pesticides, prey availability, water quality, and cave climate). Additionally, the migratory flight, winter roost conditions, and summer roost fidelity behavior may have an impact on colony numbers. Finally, annual reproductive rates and pup survivability also affect the annual variations in population.

The data gathered from monitoring provides natural resource managers with the information necessary for refining field protocols, assessing health of bat populations, and planning future management and protection such as habitat conservation. Other research projects associated with this colony have included foraging behavior, impacts of agricultural practices, and utilizing thermal imaging technology to assess population dynamics. Thermal imaging technology holds great promise for accurately estimating bat populations (Kunz 2003). The value of this data and findings from related studies is found in their use as an educational tool for natural resource managers and the public. By learning more about bat populations and behavior, researchers and park staff will better understand the ecological role of bats. Continued monitoring of this bat colony will further define the trend in population dynamics of the returning adult bats of this maternal colony.

Population dynamics of adult Mexican free-tailed bats at Lava Beds National Monument



* Data from 2002 are not represented because of limited collection due to colony exit-flight behavior.

early in the season, which exclude pups, with those that include them later in the season.

In 1996 park staff began consistently monitoring the colony. The goal has been to accurately estimate the returning population of adult females and their reproductive success for the season. Biologists usually sample the returning adult female population in July. They determine reproductive success after additional sampling in late August or early September when exit flights include young of the year. Various environmental and data-collection variables such as weather conditions, exit-flight timing and behavior, equipment operation and limitations, methodology, and personnel changes influence the monitoring work.

References

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