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News Release

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Research Proves Bats Help Control Insect Pests

AUSTIN, Texas — New research shows bats suppress agricultural insect pests, saving farmers millions of dollars in avoided pesticide costs and better crop yields. Although the study area focuses on eight counties in Texas, scientists say insect suppression by bats benefits farmers up into the Midwest and Canada, and that this underscores the need to protect large bat colonies and promote public education and bat ecotourism.

A team of researchers from Boston University, University of Tennessee, U.S. Department of Agriculture and Texas Parks and Wildlife Department is this summer entering the fourth year of a five-year research project funded by a \$2.4 million National Science Foundation grant. Researchers are focusing on an eight-county region in South Texas near Uvalde, studying how free-tailed bats (*Tadarida brasiliensis*) protect corn, cotton and other crops against insect infestation.

In a 2006 article in the scientific journal *Frontiers in Ecology and the Environment*, the research team reported that the annual value of insect pest suppression provided by bats approaches \$1.7 million dollars. This figure reflects the cumulative value of avoided yield loss and avoided pesticide costs for cotton grown in the eight-county study region.

The study area includes Uvalde, Medina, Zavala, Frio, Dimmitt, LaSalle, McMullen and Atascosa counties, known as the Winter Garden agricultural area. But researchers say the benefits of insect suppression by bats extend far beyond the Texas study region.

“Large bat colonies in Texas provide value nationwide, because they intercept moths that would otherwise migrate out of the area to infest fields elsewhere in Texas or in other states, especially in the Corn Belt of the upper Midwest,” said John Westbrook, Ph.D., USDA meteorologist, and a co-principal investigator on the research team. “I’m seeing new interest in this research among scientists in states as far away as Iowa and Minnesota. Nationally, producers are planting more corn because of the higher commodity price for corn, which is one of the most suitable hosts for the corn earworm. This comes at a time when there is increased national interest in biofuels from crops like corn.”

Westbrook says the corn earworm, also known as the cotton bollworm, and another pest, the tobacco budworm, cost farmers about \$1 billion per year nationwide, representing the cost of pesticide use and yield losses due to crop damage. These pests start as caterpillar larvae and turn into moths.

Researchers have been tracking the way insect pests progress among plant species, revealing a surprising link with the Texas state flower, the bluebonnet.

“Corn earworms start with bluebonnets in early stages, then move to corn in the second and third generations, and cotton in the fifth and sixth generations,” said Thomas Kunz, Ph.D., of Boston University, the NSF research project principal investigator. “They could almost be called bluebonnet worm. Prior to corn and cotton, fields that now support crops most certainly had more abundant wildflowers that provided food for these moth larvae.”

Using thermal imaging cameras, researchers from Boston University have for the first time been able to accurately count the numbers of bats that emerge nightly from their day-time roosts. Kunz explained that “our research has revealed that current bat population estimates are an order of magnitude less than what scientists reported 50 years ago. These lower estimates may in part reflect actual population decreases due to previous use of pesticides, but they also may reflect the fact that Texas free-tailed bats now have more places to roost—especially beneath highway bridges. Scores of bridges in Texas are now occupied by bats, where before bat friendly bridges did not exist.”

The NSF research project originally focused on natural bat caves, which remain the primary roosting resource for most bats; however, large bat colonies now commonly roost under highway bridges. This behavior has fostered a growing partnership between bat scientists and highway engineers, who have actually begun designing bridges to accommodate bats. Today, sites such as Congress Avenue Bridge in Austin and Waugh Drive Bridge in Houston are becoming important tourism attraction and public education venues.

Much of the current research developed after the National Weather Service installed NEXRAD Doppler radar in the early 1990s. These weather surveillance radars detected large, mysterious “clouds” in areas where no storm activity was expected. The clouds turned out to be hundreds of thousands of bats emerging from cave roosts.

Soon after, another radar system operated by the U.S. Department of Agriculture, under the guidance of John Westbrook, detected additional radar images that were intersected by the bats at altitudes of thousands of feet. These images were found to be millions of migrating moths—a favorite food of free-tailed bats.

It took a decade for researchers to learn how to precisely measure and demonstrate the presence of insect pests in the diet of bats. It turned out that specific insects could be detected from DNA gene fragments in bat feces. Today researchers can not only determine which bats eat moths, but can specify which insect species the bats eat and even estimate the quantity of moths consumed.

“What’s really impressed me is that the bats are tracking the availability of these major crop pests,” said Gary McCracken, PhD, an evolutionary biologist with the University of Tennessee and a research co-principal investigator. “The pests are very episodic,” he explained, “characterized by dramatic increases in numbers, followed by down times. They flush and then disappear, and the bats are somehow able to track these things. This speaks strongly for the bats as effective control agents, because when the insect populations erupt, the bats are demonstrating their ability to cue in and take them out.”

Alongside the agricultural pest research, the NSF grant is also funding public education. Texas Parks and Wildlife Department is producing a bilingual book and DVD for schools connected with the bat research. The department and partners such as Bat Conservation International, the Texas Department of Transportation and cities and counties who host bat sites are also promoting public bat viewing sites and bat-

related tourism.

“This project demonstrates a key value of bats, showing why it’s critical to dispel all the myths and superstitions about bats,” said Pat Morton, TPWD wildlife diversity education coordinator. “In order to generate those economic benefits, bats have to exist in large numbers, and that means their roosts in Texas and Mexico must be protected. This is a migratory species that winters in Mexico and spends spring and summer in Texas and other states. And that is why educational materials, including the bilingual children’s book and DVD, are going to be distributed on both sides of the border.”

The upcoming book “Frankie the Free-tailed Bat” is about a female free-tailed bat which migrates to Texas, where she has a baby. The story tells the adventures of Frankie and her son as they migrate back and forth, which Morton describes as “kind of a year in the life of a Mexican free-tailed bat.” The book is geared to older elementary and middle school children. About 20,000 copies will be printed in September, and will be distributed free to schools. An electronic version will also be available free on the TPWD Web site.

A new booklet is also available, “Bat Watching Sites of Texas,” produced by TPWD in partnership with the Bat Viewing Sites Forum coalition of partners. The booklet covers basic information about free-tailed bats, plus bat-watching etiquette for the public. It includes maps and information about 10 established sites across Texas where people can witness evening bat emergences from caves, tunnels and highway bridges. The booklet is available for \$2 at any of the bat watching sites, or people can order it by sending a check for \$2 made to “Texas Nongame Fund,” mailed to Wildlife Diversity Program, Texas Parks and Wildlife Department, 4200 Smith School Road, Austin, TX 78744.

More information about free-tailed bats, as well as photos of research activity for news media use, is on the TPWD Web site.

On the Net:

- News Media Resources: http://www.tpwd.state.tx.us/newsmedia/releases/news_roundup/
- Bat Conservation International: <http://www.batcon.org/>