

The background features a stylized illustration of a bat with large, grey wings and a brown body, flying towards the left. Below the bat, a landscape is depicted with a green hillside, a white picket fence, and a red car parked on a dirt road. The sky is a textured green. The title text is overlaid on the upper part of the image.

# Frankie

## the Free-tailed Bat

story by Nyta Hensley & Patricia Morton    illustrated by Steve Stratakos

## Introduction

If adults could only see the world through the eyes of children, they could relive the wonderment and excitement of discovery they too once experienced in their youth. New discoveries also are exciting for scientists, including those who conduct research on bats. After all, bats are creatures of the night; they often live in dark places, and thus are rarely seen directly by most people. Because of this, children and adults often develop unfounded, false attitudes toward bats that are more often based on myth than on fact. These negative attitudes can sometimes contribute to misunderstandings and false perceptions, with consequences that can have adverse impacts on these fascinating animals.

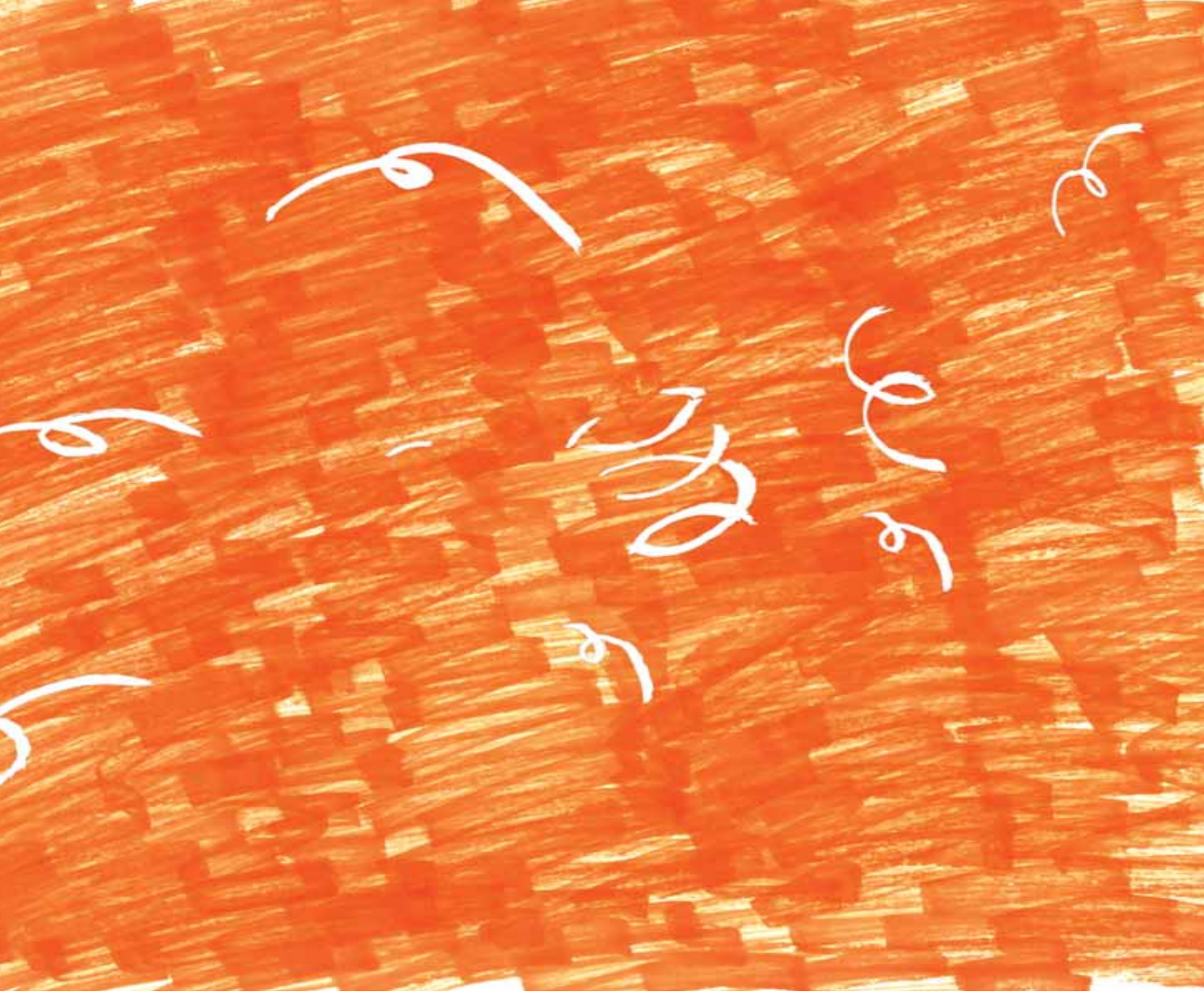
Discovery is one of the primary goals of science and for those who spend their lives seeking and gaining new knowledge. Scientific knowledge often becomes buried in highly technical journals and books that are not readily available to the public. Thus, one of the great challenges that scientists face is to discover ways to convey what they have learned to broader audiences.

Established in 1950, the U.S. National Science Foundation has long supported the research of scientists to make discoveries in natural world. The content of this book is based on observations and experiments conducted by scientists who have studied the lives of free-tailed bats for over 50 years. In recent years, one of the primary goals of the National Science Foundation has been to help promote the transfer of new knowledge gained by scientists to the broader public that ranges from curious children to interested senior citizens.

This book, developed as part of an outreach effort with funds made available through a National Science Foundation grant awarded to Boston University, with collaborators from the University of Tennessee, the U.S. Department of Agriculture, and the Texas Parks and Wildlife Department. We chose to produce this as a bilingual book so that its content would be readily available to children and adults on both sides of the Texas-Mexico border whose first language may not be English.

Frankie the Free-tailed Bat is a story about a Brazilian Free-tailed Bat (*Tadarida brasiliensis*) that was born in a cave located in the Texas Hill Country, but each year migrates to and from Mexico with thousands to millions of other members of its kind (or species). It tells a delightful story, based on scientific discoveries, that not only imparts new knowledge about this fascinating bat species to young readers, but it also contains new information that will be of interest to a broader audience—that this species and others like it, are valuable members of our environment that need to be protected. Each night, Brazilian free-tailed bats feed on flying insects, many of whose larvae damage valuable crops such as cotton and corn that humans depend upon for their everyday existence. This book also conveys an important conservation message that bats are beneficial to agriculture and the environment. I hope you will read this book and discover for yourself!

Thomas H. Kunz, Principal Investigator,  
Boston University, July 2007



## **Acknowledgments**

This bilingual children's book was produced as part of the National Science Foundation grant, "Advanced Imaging and Information Technology for Assessing the Ecological and Economic Impact of Brazilian Free-Tailed Bats on Agroecosystems." The book will be distributed in both Texas and Northern Mexico to raise awareness about the importance of Brazilian Free-tailed Bats to agro-ecosystems and why conservation of this species and its habitats in Texas and Mexico is critical to sustain the many ecological services and economic benefits provided by bats.

The NSF project team wishes to acknowledge the following individuals who made substantial contributions to the production of this book: Authors, Nyta Hensley\* and Patricia Morton\*; illustrator Steve Stratakos\*; translator, Jesús G. Franco\*; content specialists and technical reviewers, (NSF researchers) Thomas Kunz, Gary McCracken and John Westbrook; teacher reviewers, Ann Miller\* and Lee Ann Linam\*; kid reviewers Abby and Frank Linam; and production staff from Texas Parks and Wildlife Department's Creative Services Branch.

Patricia Morton  
Program Leader for Wildlife Conservation Outreach  
Texas Parks and Wildlife Department\*  
July 2007

# *Frankie* *the Free-tailed Bat*

story by Nyta Hensley & Patricia Morton  
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PWD BK W7000-1423 (8/07)



***Francisca Free-tail,***  
***Frankie for short,***

squeezed her way through hundreds of thousands of winged hands and clawed feet feeling her way along the wall of the cave.

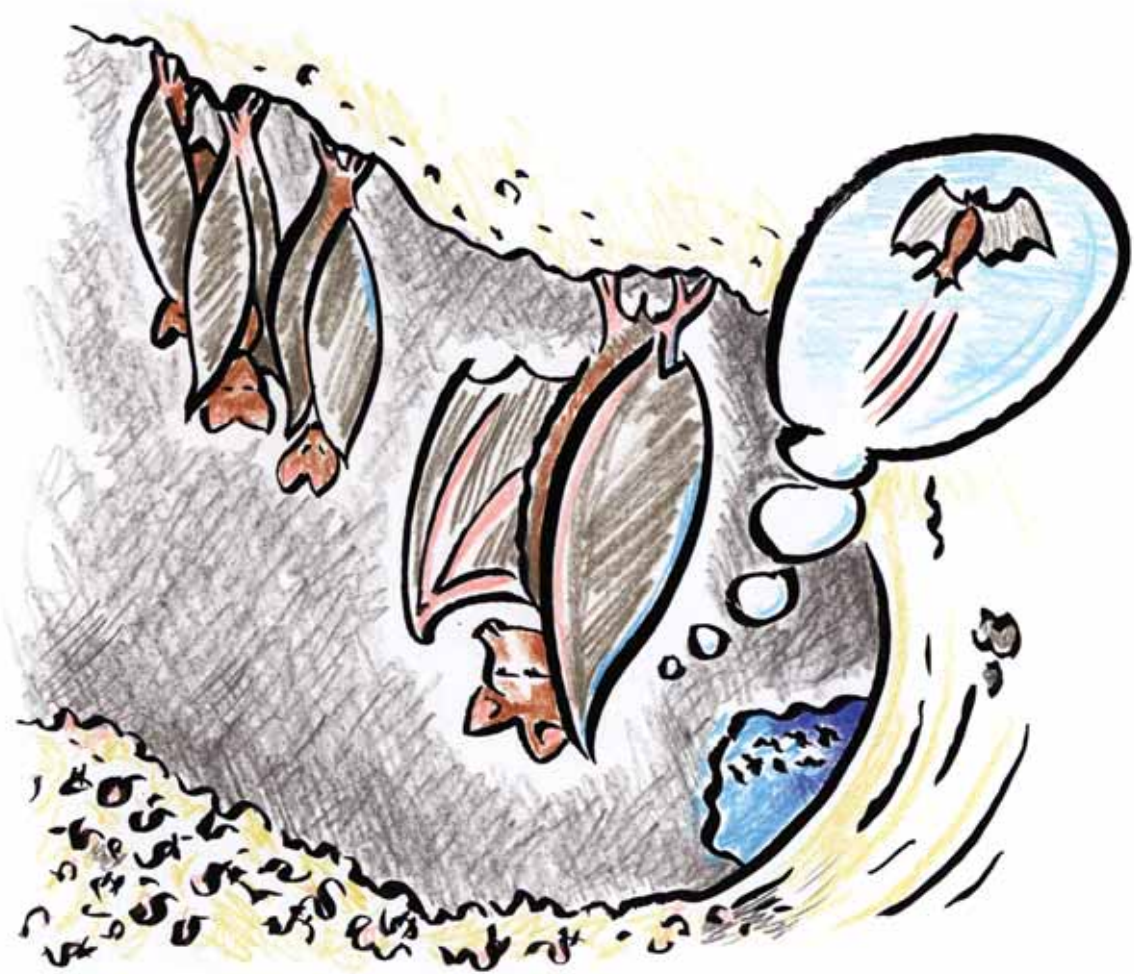


Calling out her own special call, she listened for her mother's answer. She sniffed the air hoping to detect the sweet aroma of her mother's milk, but smelled only the musky odor of her fellow pups.

Even though Frankie had eaten earlier in the afternoon, her stomach was empty and she was hungry. She stretched out leathery wings, imagining how it would feel to flex her feet and fly out into the night in search of insects just like her mother. What an adventure it must be to soar up to 10,000 feet above the ground! Only one more week and she would be six weeks old — an official “teenage” bat out flying on her own. Frankie flapped her wings again as she imagined her first flight. One week could not come soon enough for Frankie. For now, she decided to focus on smelling and calling for her mother.

It was hard to make her call heard over all the voices of the other bat pups. She thought about letting go of the wall and trying to fly closer to the entrance of the cave so she would be right there waiting for her mother. Remembering the hushed warnings that all the adult bats gave the youngsters, she stayed where she was and continued to call loudly for her mother.





Many pups had fallen to the floor of the cave, never to be seen again. Frankie glanced at the ground and noticed that it seemed to shift and move around with a life of its own. And indeed it was alive with thousands of hungry dermestid beetles found on the cave floor. These small beetles were fearsome enemies to her colony because the larvae were flesh-eaters that would devour a bat within minutes if it happened to fall from its roost on the cave wall. Frankie gripped tighter and looked out into the early dawn light hoping to see her mother.

With a hurried swish and call of her own, Frankie's mother landed on the cave wall. She folded her wings tightly and squeezed between the many other hungry pups as she crawled toward Frankie. Familiar sound and smell drew mother and daughter close, and soon Frankie was drinking her mother's rich milk. When her stomach was full, she let her mother clean and groom her. As her mother combed Frankie's furry body with her feet, she listened to all of the other Brazilian free-tailed bats talk to each other. Frankie heard mother bats

happily sharing stories of the night and laughed as a few grumbled and jostled for position in the confined space of the cave. Sometimes the noise of millions of bats could be overwhelming, but for Frankie it was a lullaby to which she soon fell asleep.

About one week later, as the sun began to set and dusk overtook the mouth of the cave, Frankie waited eagerly with her mother. Tonight would be Frankie's first real flight. For the past week she had practiced fluttering from wall to wall of her cave home. Now she was ready to go out into the night to fly and feed on her own. She was so excited about exploring the world outside the cave. As she waited to follow her fellow bats in flight, she reminded herself of her mother's advice:

- **Use your keen eyesight, hearing and sense of smell to watch out for predators – owls, snakes, hawks and raccoons will be watching for you.**
- **Fly over cotton and other crop fields as this is where you will find a tasty meal of moths and other insects.**
- **Stay alert and remember how to find your way home.**

Remembering her mother's advice, Frankie released the grip of her feet on the cave wall, flapped her wings, and for the very first time joined the counter-clockwise spiral of bats as they flew higher and higher out of the cave's opening and off into the evening sky.

Frankie's first glimpse of the outside world filled her mind with the wonder of beautiful reds, oranges, and yellows from the setting August sun as she weaved her way back and forth among her fellow bats. Higher and higher and higher she flew, following the streaming black river of bats as it drifted over the landscape below.

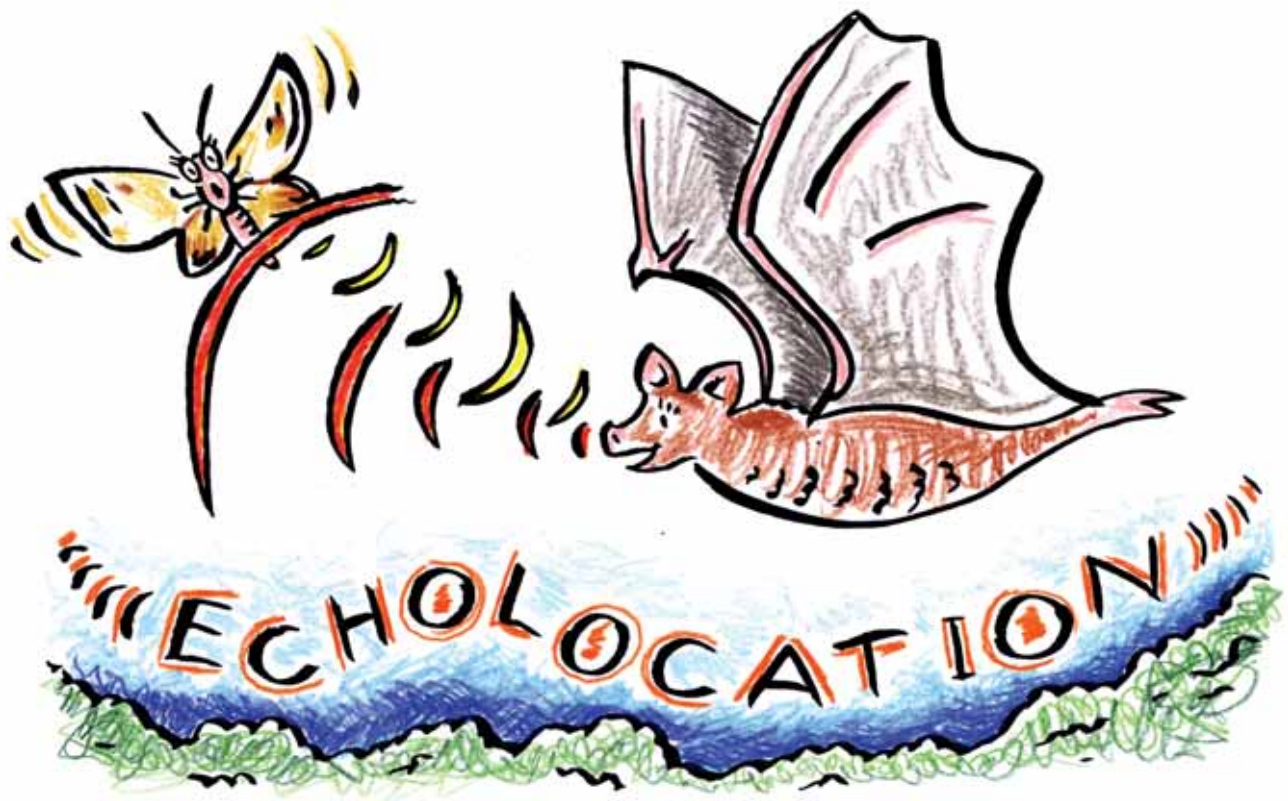
She steered a course toward water—eager to try her skill at swooping down to get a drink of water on-the-fly. She flew with other members of her colony as they approached the winding river below and glided down to the surface, sticking out her tongue to lap from the cool refreshing water.





Frankie flew even higher to get a better view of the landscape below her. What a marvelous sight greeted her. Shadowy trees swayed in the gentle evening breeze as she listened to the sounds of frogs and insects fill the air. Insects! She almost forgot; it was time to eat.

Having joined in the bat talk going on in the cave, Frankie was used to making sounds through her mouth, but this would be her first time to use echolocation to find food. Using her ears to hear the echoes created when her sounds bounced off an object, such as a moth, she would be able to locate and capture tonight's dinner by listening to the echo that returned to her ears. She knew if she did this correctly, she could tell the size and location of the moth and also how far away it was from her. As she could see the ground below, she noticed rows of leafy green plants with pinkish-white flowers, and thought to herself – it must be a cotton field. There seemed to be many insects flying around this field, so she gradually descended toward it making sounds from her mouth as she flew. At first, she slowly called out sounds, but when they echoed back, she recognized that she was very close to a moth. Next she began to emit rapid sounds at 200 times per second.





The echoes came back to her ears and suddenly there was the moth! She swooped down and then tilted up, scooping the moth into her wing. Bringing it to her mouth, she grasped it with her sharp little teeth, started to chew and soon savored a burst of flavor from what her mother had told her was her favorite food. Wanting to know more about what she was eating, she flew closer to the cotton field and saw many cotton bollworm moths land on the cotton plants, where they laid hundreds of eggs. Cotton bollworm moths love cotton fields, because this is where their eggs hatch into caterpillars and grow and feed on the juicy plants before they mature and become moths.

Frankie glanced around and noticed many other bats flying around the field. If every bat from her colony of 1 million bats ate their fill—almost 40 moths a night per bat—they might very well eat 40 million moths, or nearly all of the moths in the field. “Wow!” Frankie thought. “I hope that I can find all of my moths first.” She was glad that she could capture other kinds of insects, such as night-flying beetles, just in case she could

not find enough moths. Besides, she liked the taste of other kinds of insects too, and, in this way, she knew that she would not go hungry.

Feeling full after having eaten nearly half her weight in insects, Frankie decided it was time for exploring this new environment.



Playfully, she flexed the fingers in her wings as she flapped her wings faster, bringing her on an upward direction toward the midnight moon. Forgetting to watch carefully, she did not hear the nearly silent beat of the Great Horned Owl's wings as it sneaked up behind her. Frankie didn't know it, but these night flying birds can be up to two feet tall from beak to claw and have a wing-span of almost five feet. Even with its large size, Great Horned Owls move silently through the sky because the structure of their velvety flight feathers and soft body feathers help to muffle their flight sounds.





As the owl moved closer and closer, Frankie began to notice that she was flying in the open sky. Suddenly the owl attacked, rapidly plunging toward Frankie with his massive claws aimed directly at her. Looking around frantically, Frankie searched for a place to hide. She knew she was too far from her cave home, so she darted quickly from right to left, up and down, finally descending in zigzag-fashion through the warm night air. Frankie used almost all of her energy, flying as fast as her wings could carry her. The owl dove at her again with eyes blazing and sharp claws extended ready to grab her. Frankie was fast, but the owl was stronger. She knew she had to think and act quickly. She spotted a barn below her and with a renewed burst of speed closed her wings and dove rapidly toward it.

The wind whipped past her small body, making Frankie's eyes close. She could feel the owl's breath upon her back as she opened her wings and raced into the barn loft. Gripping onto a beam, Frankie looked out the small loft opening, just in time to see the Great Horned Owl stop short of slamming face first into the side of the barn. The owl continued to circle the barn looking for a larger opening to find Frankie. Finding none, the owl gave up his pursuit and flew away searching for something else to eat.



Frankie breathed in deeply, trying to calm her pounding heart. Then she let out a call of relief, realizing she had avoided certain death and had escaped the largest known aerial predator of Brazilian free-tailed bats. However, her joy was short-lived as she soon realized that she was very far from home. In her rush to escape the Great Horned Owl she had not paid much attention to where she had flown. She really hoped she could find her way to the cave when she had grown up!



Rested and eager to be on her way, Frankie took flight. Taking care to fly near the cover of trees, she let her instincts guide her. Soon she was again flying over familiar fields of leafy-green cotton only a few miles from home. Flying low over the cotton field, she saw many of her fellow roost mates still feeding happily on the swarming moths and other insects. Frankie's stomach rumbled with hunger so she decided to look for a few more moths. As she flew over the cotton fields, she noticed some cotton plants full of holes caused by many small caterpillars and began searching again for the moths that emerged from the destructive larvae. Frankie didn't realize it, but she and her free-tailed bat cousins saved more than just the cotton crop. They also saved the farmers money on costly pesticides. Fewer chemicals used on crops meant they were helping to keep the environment healthy for many plants, animals, and even humans!

Tired and growing sleepy, Frankie veered higher into the sky, joining other bats as they headed for home. As they neared the cave just before sunrise, they could see the farmers in trucks driving to inspect their cotton fields. One-by-one, the bats folded their wings next to their bodies and flew rapidly towards the cave at 50 miles per hour! Like speeding black bullets, they zoomed into the cave opening their wings at the last moment as they swooshed into their dark, but comfortable cave roost. The sun was just beginning to rise as Frankie's colony mates called out to one another, sharing stories of their nightly adventures. Frankie was happy that she now could join the colony with a story of her own.





The rest of the summer and early fall, Frankie spent her time exploring the hills and fields of the Texas Hill Country at night. Flying out each evening with other members of her colony, she ate her fill in moths and watched as the cotton fields flourished and prospered. Soon the nights became chilly, and even during the day their cave home was becoming cooler. Also, their insect food was getting difficult to find. Frankie knew that, as fall progressed and it continued to get colder, she and her colony mates would need to begin migrating back to their winter home in Mexico. But the older bats whispered to the young ones that before they left something very special would happen. In advance of the first cold winds in late fall, insects from up north also would migrate south and flood into Texas in huge numbers providing the bats one last huge meal.

And one night it happened! While Frankie and her friends were out looking for the few remaining moths they suddenly found themselves flying in thick clouds of insects. It was a real circus as the bats flew loop-de-loops and somersaults while they snatched insects out of the air. Their bellies grew so full they could barely fly! The adult bats laughed and laughed, watching the aerobatics of the youngsters. And they told Frankie and the others that the arrival of so many insects was a sign that it was time to leave. This big meal would provide extra energy for the long trip to their winter homes.

The next evening a bitter north wind whipped Frankie into the air as she flew from the cave. Finding few insects to eat, she realized it was time to migrate. After eating the few insects she could find that night, she let the north wind help push her south on her first journey to Mexico.



She followed the layout of the land, looking for mountains and streams to guide her to the Texas border and on into Mexico. She flew until the first rays of the morning sun streaked across the sky and then found shelter in small crevices beneath a highway bridge. Other bats wandered in through the early morning chatting about their experiences and looking forward to spending the winter in warm Mexican caves, in a climate where insects were more abundant.

Each evening, Frankie flew farther and farther, and, within a few nights, she was flying into the warm desert regions of central Mexico. Since this was Frankie's first trip to Mexico, she followed other Brazilian free-tailed bats to the cave that would become her winter home. She enjoyed the bright stars and marveled at the varied beauty of her Mexican home – bursts of green cactus stretched across brown deserts that rose to the edge of craggy mountains.





All grown up, it was now time for Frankie to start a family of her own. She waited anxiously for the first signs of spring to arrive so that she could begin her return journey to Texas to mate and give birth to a pup of her own. She looked forward to her northward migration back to Texas.

On a late day in March, Frankie joined a few hundred thousand other female Brazilian free-tailed bats and began migrating back across the Mexican border into Texas. She would soon become pregnant and give birth to a baby that would weigh nearly one-fourth of her own body weight. Frankie feared the long journey but, remembering her escape from the Great Horned Owl, she knew she could do anything if she set her mind to it.

Within a few nights, she found the cave in Texas where she had been born. Frankie enjoyed seeing old friends and flying out each night to find insects over familiar landscapes. After a few months she now waited for the approaching birth of her own baby. She was very hungry, so each night she left her cave roost to feed on the abundance of moths that hovered over the fields of corn and cotton. Each night Frankie and the other pregnant bats helped Texas farmers to have fewer insect pests in their field. Reducing the number of moths in Texas meant there would be fewer moths migrating north where they could damage crops in states as far away as Iowa, Illinois, and Minnesota.

The month of June approached quickly, and soon Frankie found herself caring for and nursing a pink and hairless newborn pup that she named Franco. She called to him softly as she learned how he smelled, and Franco in turn learned his mother's scent, too. Raising one wing she nursed him with her milk, and Franco happily drank his fill.



Within five weeks, Franco was almost the size of his mother and eager to exercise his wings to fly. Frankie cautioned him to be careful, reminding him that many of his fellow pups would die before they were even one year old. She advised him to grip tightly to the rough cave walls to prevent a dangerous fall to the dark cave floor below. She told him of the dangers outside, including the silent stealth of the Great Horned Owl.

Finally the special day arrived. Franco at six weeks of age pushed through hundreds of thousands of winged hands and clawed feet, feeling his way along the wall of the cave. As the sun set and daylight turned to dusk, he waited with his mother at the mouth of the cave. Franco was so excited as tonight was going to be his first real flight!

With great excitement, Franco released his feet from the cave ceiling, flapped his wings and for the very first time joined Frankie in the swirling, counter clockwise flight of his fellow roost mates they flew out of the cave and higher and higher

into the night sky, finally winding their way across the countryside. Just like his mother, Franco's first glimpse of the outside world beyond the cave filled his mind with the colors of the setting August sun as he weaved through the spiral of bats. Soon he and Frankie were soaring off to the green fields to hunt and feed.

Franco had survived the dangers of growing up in a cave and was now an expert flyer. Frankie was very proud of him. Doing their part to protect the fields of corn and cotton, Frankie and Franco spent their summer eating many thousands of crop pests and other insects. Franco flew and explored, just as Frankie had done before him. When the summer turned into fall they waited for a cold north wind to blow and assist them in migrating south to Mexico. They looked forward to traveling to their warm winter home and continuing the annual life cycle of a Brazilian free-tailed bat.

