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Recreating Battered Bat Roosts
Planning & perseverance pay off at a California bridge
Dave Johnston

When floodwaters crippled a rural California bridge – nearly 2,000 feet (600 meters) of steel-and-concrete bridge and timber causeway built a half-century ago – Sacramento and San Joaquin county officials shut it down and made plans to replace it. That, however, would mean displacing one of the largest colonies of Mexican free-tailed bats in northern California. So the officials, with advice from Bat Conservation International, committed to protecting the bats during demolition and reconstruction and to incorporating bat roosts in the new structure.

The recently completed project is one of the most efficient and effective mitigation programs for bats ever undertaken in California, with important lessons for similar efforts in the future.My involvement with the Frank-lin Boulevard Bridge began when the California Depart-ment of Trans-portation asked me and two other bat biologists, Dixie Pierson and Greg Tatarian, to assess the department's bat-habitat mitigation strategies over the past five years. We counted 22 mitigation projects at California bridges, and one of them – the Franklin Boulevard Bridge Bat Protection Program in southern Sacramento County – stood out dramatically in its scope and impact.

The original structure consisted of a 230-foot-long (70-meter) steel-truss swing bridge across the Mokelumne River. A now-rare design, the bridge once swiveled on its pedestal, swinging aside to let river traffic pass – a creaking maneuver last undertaken in 1955. A causeway – a trestle built of redwood beams – stretched 1,700 feet (518 meters) across a flood plain north of the bridge.

This trestle provided ideal roosts for a nursery colony of about 40,000 Mexican free-tailed bats, plus assorted members of other species, such as the big brown bat (*Eptesicus fuscus*) and Yuma myotis (*Myotis yumanensis*).

Both the bridge and causeway were closed to traffic in 1997 due to flood damage. Plans to replace the bridge sparked concern among local landowners and conservationists, and the counties pledged to protect the bats during construction and provide roosting space in the new bridge.

The proposed mitigation plan seemed simple enough. After bat surveys were conducted in 1999, a three-stage program emerged:

1) Loss of bats during demolition would be avoided by excluding all --remaining bats before the maternity colony arrived the following summer.

2) Temporary roosting habitat (bat houses) would be provided during construction.

3) Permanent roosting habitat would be incorporated into the bridge design.

Few things are ever that straightforward, however, and this project was certainly no

exception.

Bat Conservation International Founder Merlin Tuttle visited the site and met with Transportation Depart-ment officials to encourage planning for the bats' protection. Six extra-large, experimental "bat condos" from Maberry Centre Bat Homes were erected on grasslands near river-side vegetation east of the bridge. Officials hoped each of these houses could ac-com-modate up to 16,000 bats. Bob Wise-car-ver, a private wild-life habitat-restoration enthusiast, in-stalled a seventh bat house on The Nature Con-servancy's nearby Cosumnes River Preserve. The team was excited and confident as it prepared to exclude the bats.

The plan was to seal roosting crevices in the causeway after the bridge bats departed in October and before they began returning in February and March. (Research by wild-life biologist Phil Leitner and my own observations of winter roosts and fluctuating populations suggest that many of the Mexican free-tailed bats in Cali-fornia's Central Valley spend their winters along coastal California.)

The winter of 1999-2001, refused to cooperate. High water swept under the causeway, frustrating efforts to seal most crevices until March. By then, about 500 bats had already taken up residence.

Terry Roscoe of the California De-part-ment of Fish and Game and Dave Wyatt of Sacramento City College came up with Plan B. At each roosting area, nets were attached to the underside of the bridge and secured on three sides. The fourth side was left open so the bats could leave.

Toni Barry and Tim Hawkins kept watch to ensure all the bats had left the roosts before the nets' final openings were sealed shut and none was trapped inside. This is critical, because not all bats emerge every night. Bats are often extremely loyal to roost sites and can show remarkable ingenuity in thwarting ob-structions. Quite a few managed to maneuver around the nets and back into the crevices. Others worked their way into tiny slots that opened when caulking pulled away from bridge timbers.

In June 2000, despite all these efforts, Barry and Haw-kins counted more than 2,000 newborn pups in the bridge crevices, with only 1,550 in the bat houses. The bats simply weren't ready to move.

Of the seven bat houses, meanwhile, only three were occupied that first year. One held 1,000 bats, another 500 and the third just 50.

To increase oc-cupancy of the bat houses, dataloggers filled with data were sent to BCI to determine temperature ranges in the houses. Mark Ki-ser, director of BCI's Bat House Project, Mar-vin Maberry and Bob Wise-carver proposed warming the houses by painting roofs and portions of the sides black. A bottom cover also was added to one house to reduce airflow.

Then an unexpected delay in getting permits approved forced a one-year delay in plans for demolition and construction in 2002. Hun-dreds of bats returned to the bridge in late March 2002, but the permitting delay granted them a reprieve. That winter, the netting was re-paired, the bridge was checked and rechecked for po-tential entry points and everything was caulked – again. This time it paid off: No bats were found roosting in the bridge in

spring 2003.

Bats moved into some of the bat houses, but the numbers were disappointing relative to the displaced population. We still have no idea where the remaining bats went.

The old trestle bridge was demolished by late July 2003, and replacement roosts were designed by DMJM Harris. The firm examined the spaces bats had been using in the old bridge, consulted with BCI's Kiser and Jim Kennedy, then devised an innovative approach to duplicate those spaces in the new bridge.

Workers used redwood planks about one inch (25 millimeters) thick and 13 inches (30 centimeters) wide. The planks were assembled into boxes of sorts: three (or four) planks laid parallel with spacers set every two feet or so and caps added to the bottom and ends. Each unit featured two (or three) 12-inch-deep slots, each three-quarters of an inch (19 millimeters) wide – the width preferred for roosting by Mexican free-tailed bats.

Before concrete was poured, roosting units were spaced four feet (1.2 meters) apart across the 36.7-foot (11.2-meter) width of the bridge and along its entire 1,700-foot (518-meter) length. With the concrete poured and set, they are now permanently incorporated into the bottom of the bridge. We believe these manufactured crevices should provide room for at least 600,000 Mexican freetails.

The first sections of built-in bat habitat went up in the summer of 2004. On August 20, 2004, barely 60 days after the roosting slots became available, we counted an astonishing 15,600 bats already under the causeway!

This was how bat mitigation is supposed to work. We still don't know the fate of thousands of bats that had been roosting under the trestle, but I expect the 2004 population to increase every year for the next few years. With so much new roosting space, it will be intriguing to see how large our colony might grow.

The concrete bridge provides ideal roosting space. Its thermal mass dampens temperature variations, offering warmer-than-ambient temperatures in the evenings, while keeping summer daytime temperatures from exceeding the tolerance levels of day-roosting bats. The importance of this feature should not be underestimated.

Keeping the location of the replacement habitat and its "search image" – the visual cues the bats have learned to use in finding roosts – roughly the same probably also contributes significantly to mitigation success.

Finally, the Franklin Boulevard Bridge project demonstrates that truly effective mitigation strategies often cost no more, or even less in this case, than inadequate or less desirable efforts. Sacramento County Building Inspector Scott Smith and Project Manager Dave Frankie said the redwood-slots design actually shaved $200,000 off the original $9.2 million price of the bridge.

Careful planning, strategic consultations and perseverance can make all the difference.

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All articles in this issue:

- The Ties that Bind Bats & Plants
- Recreating Battered Bat Roosts
- A Caribbean bat visits Key West
- Extreme Measures
- Bat-house bats survive
- Winter Homes