

Conservation of Bridge-nesting Purple Martins in Sacramento, California

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Introduction

Throughout most of the Purple Martin's (*Progne subis*) breeding range, large colonies result from human intention and action. Unmanaged western colonies are generally much smaller than managed colonies (Horvath 1999). Therefore, it is quite remarkable when large colonies of western martins (*P. s. arboricola*) establish themselves in a region of martin scarcity, without human intervention. To witness such an occurrence, let's revisit Sacramento, California, and the Purple Martin colonies described in "The Bridge-nesting Purple Martins of California and Oregon," *Update 11(1)* (Kostka et al., 2002).

California is vast, on an Eastern scale stretching from southern Pennsylvania through Georgia. The Golden State covers 156,297 square miles, but contains an estimated population of only 800-1000 breeding pairs of Purple Martins, with about 350 known pairs. California martin decline in the 1950s-70s coincided with European Starling (*Sturnus vulgaris*) colonization and expansion, although other factors, including habitat loss and pesticides, may have contributed as well. Declines were most pronounced in southern California and the Central Valley (Williams 1998).

Historically, martins nested in tree cavities locally throughout the Central Valley, but in the early-to-mid 1900s they began nesting under roof tiles in many cities and towns (Williams 1998), as they currently do in Okeechobee, Florida (Homola 2002). Martins in Sacramento began nesting inside steel and concrete box-girder freeway overpasses in the 1960s (about the



James R. Hill, III



Stan Kostka

Top: Stan Kostka in Sacramento under I-5 at I Street. The California State Railroad Museum (CSRM) complex begins at the extreme left center of this photo. Purple Martins nest inside these hollow bridges. Bottom: Mark Hada on a hydraulic lift in the parking lot of the CSRM complex aiding martins by installing wire mesh nest guards into the weepholes. In the background is the I-5 at I Street colony site.

time starlings expanded into the region), and today the bridge colonies represent the only confirmed nesting martins in the entire Central Valley (Williams 1998).

Sacramento's bridges provide thousands of potential nest cavities, alleviating nest-site competition from starlings. Bridge chambers protect Purple Martins from predators and extreme temperatures, but simultaneously expose martin nestlings and fledglings to other dangers. "Weepholes," through which martins enter vertically, are in the floor of the internal chambers. Once nestlings are old enough to move out of the nests built on that floor, they often move to the entrance to be fed and to defecate, as is typical in any nest cavity. In the flurry of activity that occurs when adults bring food, some nestlings inadvertently fall out of the weepholes, onto roadways, rail tracks, parking areas, or vacant lots. For those nestlings that fledge, attempting to fly straight up to reenter their nests at dusk can be overwhelming. Some fledglings

exhaust themselves trying and fall onto the roadway below and are killed. Others must roost outside, separated from parents, which presumably reduces survival.

The 1990s

The problem of Sacramento's nestling and fledgling mortality became apparent to Jesse Grantham and Dan Airola during their census of bridge sites in the early 1990s, when they counted about 100 pairs. Grantham, working for the *National*

Audubon Society in Sacramento, first studied martins in Pennsylvania. Airola is an ornithologist and environmental consultant living in Sacramento. From 1991-1992, they monitored the four known colonies. Grantham concentrated on 35th at T Street (where US 50 crosses Stockton Blvd.), which he continued to study until 1997. During one season, Grantham (pers. comm.) found 32 fallen nestlings under this colony site that contained an estimated 30 nestling pairs.

In 1992, Grantham began experimenting with nest guards made of 1/2-inch mesh hardware cloth (a type of metal screen), inserted into weepholes to reduce nestling and fledgling mortality. These sleeve-like inserts line the entire cylindrical vertical concrete surface of the weephole, extending above the chamber floor about an inch. This design keeps nestlings from falling out, and assists fledglings in returning to the nesting chambers to roost by allowing them to cling to the wire mesh and climb it like a ladder. All active 35th at T Street weepholes were retrofitted by 1994 and mortality was significantly reduced. Additional used and suitable weepholes were fitted with nest guards at this site through 1996.

Brian Williams, a wildlife biologist studying martins throughout California, monitored the Sacramento colonies from 1993-1995. Williams also tried reducing mortality, using sections of flexible, corrugated plastic drainage pipe as weephole liners at Hwy. 50 at 20th Street. His efforts produced mixed results and were discontinued. Although martins did nest in some of the modified weepholes, more martins used weepholes without pipe inserts, and the number of pairs using that section of the colony declined. Apparently inserts of wire mesh were more effective.

William's monitoring ended in 1995 and Grantham moved away in 1998. Meanwhile, Airola married and began raising a family. Monitoring and management activities on behalf of Sacramento's Purple Martins ended in 1996 and the birds were once again on their own.

The Summer of 2001

When charged with developing a natural history program at the *California State Railroad Museum (CSRM)*, Park Ranger Mark Hada found a ready-made project right in his own back yard, or at least in his back parking lot. In 2001, within a month of his arrival at *Old Sacramento State Historic Park*, he found nestling birds, dead and alive, in the parking area during his patrols. Hada soon realized the birds came out of the freeway off-ramp bridge directly above the parking lot, and they were Purple Martins, a species of special concern in California since 1978. Mark found 12 fallen nestlings. Six were dead, either killed from the fall, dead from exposure, or run over by cars. Unfortunately, some of the young that survived the fall sheltered themselves under the edges of tires on nearby parked cars, and were killed when those cars moved. Six live nestlings were sent to wildlife rehabilitators, and four survived to be released later at the site.

Coincidentally that same summer, *PMCA* travelers James R. Hill, III, Ken Kostka, and Stan Kostka were in Sacramento, one stop on a western martin research expedition, and they too found dead nestlings under bridges. Some of Stan's preliminary observations went on-line at the *PMCA* Forum. As luck would have it, Mark Hada's Internet search for Purple Martin information brought them together, and correspondence began. Mark was determined to act. "I really don't want to see more dead martins," he wrote, and decided to install nest guard inserts, like those developed by Jesse Grantham years before, to reduce mortality and benefit martins in this unusual and historic nest site. Contacts from Mark and Stan quickly revived Dan Airola's interest in Sacramento's martins. "This martin stuff is really getting into my blood," he wrote, and he decided to census the Sacramento colonies again, as he and Jesse Grantham had done a decade earlier.



Stan Kostka



Stan Kostka



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Top: Mark Hada installing a nest guard insert from the top of the lift. Once in place, the spring tension of the wire mesh holds the insert in place. Weepole inserts reduce nestling fallout and make reentry by fledglings easier. Middle: An SY-M Purple Martin returning with a dragonfly shortly after installation of an insert. This male quickly adapted to the nest guard after one brief exploratory perching. Soon thereafter, he returned and rocketed in without hesitation. Bottom: A female Purple Martin clings in 2002 to one of Grantham's 1990s nest guards lining a Highway 50 weepole.

The Summer of 2002

Purple Martin first arrivals in Sacramento typically occur mid-March, and the first phase of the nest guard insert project was to identify weepholes with martin activity. Mark's patrols had him in the parking area several times a day, so a few additional minutes were spent viewing the birds and recording observations. During April through June, Mark observed martin behavior at the weepholes in cooperation with Dan Airola. Multiple entries, especially with nest material, indicated probable nesting, and food-carrying or fecal sac removal provided nesting confirmation. Bird droppings on the parking lot directly below holes were also evidence of recent activity.

The CSRM sits next to one of seven confirmed Central Valley martin colonies, all in urban Sacramento bridges. The museum had 22 confirmed martin pairs in 2002 (along with 6 pairs of White-throated Swifts, *Aeronautes saxatalis*), representing 16% of the total estimated 2002 Sacramento martin population of 135 pairs. An additional 12 pairs of martins nested under Interstate 5 (I-5) immediately east of the Railroad Museum. The museum parking lot and the I-5 area form one colony site, but the insert project addressed only the parking area, because the I-5 area was inaccessible to the CSRM's 35-foot lift, due to much higher weepholes, high-speed traffic, and sloping landscaped areas.

Based on fallout recoveries in 2001, and history provided by Grantham, the project date was set for late June, when most pairs would be feeding preambulatory young. Grantham's earlier experiments demonstrated that a cavity entrance slightly altered with a wire nest guard would not deter parents from returning to feed nestlings.

Weepholes do not drain water from the road surface, so martin nests are not threatened by rainfall. The holes ventilate the

concrete bridge chambers, alleviating structural stress caused by thermal expansion and contraction. The holes also facilitate evaporation and drainage of water that may collect internally due to condensation or leakage. The *California Department of Transportation* (Caltrans) gave permission to place inserts on condition the function of the weepholes would not be impaired.

Nest guard inserts were made of 1/2-inch mesh hardware cloth, cut 7 inches wide and 16 inches long, with 1/4 inch split flexible plastic tubing wired over one edge along the length. Each piece was rolled into about a 5-inch diameter cylinder, with the tubing fitted inside the weephole (refer to photo on page 3), so that an inch of the hardware cloth with the tubing cover extended above the chamber floor. When released, the spring tension of the hardware cloth, plus the rough edges on the exposed 7-inch ends, secured the nest guard in place. The tubing protects birds from any sharp edges and provides a convenient perch for nestlings to grasp if they lose their balance at the top of the entrance. We used the CSRM maintenance lift to place nest guards in 40 weepholes in the area of martin activity, all about 25 to 30 feet above the parking lot. With afternoon temperatures over 100° F., the bottom of the bridge was cool to the touch. Mark's crisp, clean, uniform became marked with bird droppings, but he accepted this new badge of honor (with some reservation).

Newly-placed nest guards had no apparent effect on White-throated Swift behavior. They returned and rocketed up into their nests without hesitation, often when we were installing other

inserts a few meters away. Martins, however, tended to be wary of the change. Food-carrying parents returned and made circling runs, approached the holes and turned away at the last second. Eventually they hung on the newly-inserted wire guards to inves-



Stan Koska



Stan Koska

Top: A flash shot inside the darkness of a hollow box bridge in Sacramento, California taken by reaching up into a weephole with a digital camera while standing on a hydraulic lift. Note the nestling martin sitting in its nest bowl next to one of the walls of a bridge chamber. Also note that the nest has a mud dam that directly faces the weephole entrance. **Bottom:** All observed martin nests were adjacent to some vertical element within the chamber, either remnant construction lumber (as seen here), or next to the sidewalls. Nests were within a few feet of weepholes and never as far as possible from one.

tigate and called to nestlings. Usually within about ten minutes of the first landing on the guard, and a couple of flights around the parking area, the martins climbed up into the hole. After a couple of climbs into the chamber, the parents were soon swooping up through the hole again, avoiding the nest guards altogether. Most adults were back to their routine within 15-30 minutes, and the longest observed delay was 90 minutes.

Only one fallout was found after the nest guards were installed, a dead martin nestling on 14 July, and we are optimistic for the 2003 season. Based on years of site reuse observed at insert-lined weepholes at 35th and T Street, martins will return to the newly-lined weepholes at *CSRM* and experience enhanced reproductive success, thereby increasing the local population and providing more opportunities for research.

The Future

The apparent increase in numbers of breeding Purple Martins and colonies in Sacramento over the past decade is certainly heartening in light of past decline throughout much of California. However, considering that martins have thousands of nest cavities throughout the city, and the region contains adequate amounts of insect prey (judging from the appearance of a car windshield after a summer drive through the Central Valley), an increase of 35% over a decade is small. The *CSRM* parking lot alone has 75 weepholes spread out over 525 feet adjacent to the Sacramento River. Western Purple Martin recovery programs in Oregon, Washington, and British Columbia, using artificial cavities to mitigate natural cavity loss and starling competition, have produced much higher rates of population expansion in a similar time period (Fouts 1996, Copley et al., 1999). Observations at 35th and T Street indicate the addition of wire mesh nest guards do not encourage use by starlings, a significant early concern. Pre-insert mortality rates observed by Grantham, Airola, and Hada likely exist at all unaltered Sacramento sites, potentially slowing expansion of the population. Therefore, additional nest guard projects at other colonies seem advisable and are being planned for 2003.

Other Conservation Needs

In addition to reducing nestling and fledgling mortality, a variety of other conservation priorities exist for the Sacramento colonies, as described below.

Providing Appropriate Protection for Martins During Construction Projects: The future of Purple Martins in bridges will depend to some extent on the activities of conservation volunteers and state agencies. Wildlife use of transportation structures as nest sites is controversial. Unsolicited comments we received during the two days we worked in the *CSRM* parking lot ranged from appreciation of our actions to benefit the martins, to disappointment that the screens weren't meant to block the birds out of the bridge altogether (a reaction to bird droppings on parked cars).

Nesting birds can restrict operating periods for maintenance,

repair, and replacement of transportation structures. Exclusion or avoidance of nesting migratory birds is required for transportation agencies and contractors to be in compliance with Federal and State law (Ryan et al., 2002). In October 1999, the *Sacramento Regional Transit Agency (SRTA)* prepared for construction of a Light Rail line below the largest colony at Hwy 50 and 20th Street. As a part of the environmental permitting process, the *California Department of Fish and Game (CDFG)* required that *SRTA* install exclusionary devices on weepholes to prevent nesting by Purple Martins. *CDFG* maintained that upcoming construction activities beneath the nests would be too disruptive to the breeding birds. Forty-four weepholes in the colony were blocked from 2000 to 2002 (see photos, at left, of the red weephole exclusionary devices). As a result, the colony that supported about 40 pairs in the early-to-mid 1990s declined to 14 pairs in 2002. However, the displaced martins may have established new colonies elsewhere and bred successfully without interruption, since there seems to be a relatively unlimited number of weepholes. Since 2000, martins have used three previously undocumented sites around Sacramento, two of which were definitely not used



Dan Airola



Dan Airola

Top & Bottom: Weephole plugs placed in 44 holes by the *Sacramento Regional Transit Agency* prior to the 1999 Purple Martin breeding season as required by the *California Department of Fish & Game* to prevent potential disturbance to breeding martins during a construction project underneath.

in the early-to-mid 1990s.

There is no way to know with certainty whether the *CDFG* and *SRTA* action either benefited or harmed the Sacramento population. However, martins display site fidelity, and in general are tolerant of human activity around their nest sites. Since these birds in particular nested successfully for decades directly above existing rail lines and roadways, and beneath the vehicle decks of urban freeways, perhaps the only aspects of the construction project that adversely impacted martin reproduction here were those *CDFG* and *SRTA* exclusion actions taken to protect the birds. Lacking data or anecdotal evidence to the contrary, we assert exclusion should NOT be used when structures involve Purple Martins, unless the

defined activity would be directly harmful, such as bridge demolition, or significant manipulation of the nesting chambers. Avoidance, including scheduling major construction during the non-nesting season, should be used whenever possible with regard to this rare state species.

Protecting Airspace Beneath Colonies: A major conservation need for bridge-nesting colonies is protection of the colony sites from land uses that encroach on the airspace that martins need to access nest sites and conduct their nesting behaviors. Although much bridge habitat that appears to be suitable is unoccupied, the high degree of nest-site fidelity displayed by the Sacramento martins over 30+ years argues for protecting existing sites as a management priority. The most immediate threat to martin colonies is the use of lands underneath the bridge sites for purposes that diminish the available airspace for martins.

Dan Airola has documented that all occupied colonies occur at elevated roadway sites with at least 18 feet of vertical space over a length of at least 350 feet. He also documented the abandonment of two nesting sites used in the 1970s, following construction of buildings and two-story parking lots adjacent to and directly under the freeway. Other uses adjacent to colonies that may impinge on martin airspace include parking of buses and other large vehicles, and growth of vegetation that blocks access to sites. Lands beneath six of the seven colony sites in Sacramento are owned by Caltrans. While four of seven colony sites are "protected" by existing land uses (i.e., use as city streets and railroad rights-of-way, which are compatible with martin breeding and not likely to change), the other sites are vacant and available for, or under lease. We are currently attempting to work with Caltrans and lessees to safeguard these sites from future incompatible uses.

Establishing New Colonies at Suitable Sites. Establishment of new colonies, using management techniques of social attraction (dawnsong, decoys, etc.), at inactive bridge sites not threatened with incompatible uses may be another possible conservation action. Monitoring existing sites during establishment of new colonies may indicate whether or not new colonies are comprised of additional breeders or birds relocated from other bridge sites. We do not favor relocating martins from existing bridge colonies into nestboxes, which would require perpetual management to exclude competition from starlings and House Sparrows. However, nestboxes could become an effective martin recovery and conservation tool elsewhere in California where bridge chambers or other suitable nesting substrates are absent.

Assessing Road Kill Mortality. The extent to which martin mortality occurs in Sacramento as a result of collisions with high-speed vehicles, as is the case at Lake Pontchartrain in Louisiana (Kimmerle 1993) is not well known and requires investigation. Cliff

Swallows (*Hirundo pyrrhonota*) are frequently killed by vehicles along roads, given their propensity to nest in culverts and on bridges (Brown 1998). Only a few dead adult martins have been found below Sacramento colonies to date.

Conclusion

Steel and concrete box-girder bridges may be the only common and widespread landscape feature in the Purple Martin's entire range where significant breeding populations have recently become established, and are apparently increasing, without direct human intervention. Since this increase is occurring in a region where the overall population has otherwise significantly declined, we consider it a high priority to preserve, promote, enhance, further document, and investigate this phenomenon.

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Stan Kostka owns a small construction company near Seattle, Washington and blames his brother Ken for infecting him with a Purple Martin obsession. Dan Airola is a wildlife biologist and environmental consultant who studies the Sacramento colonies during his lunch breaks, in the evenings, and on weekends (before his wife and daughter wake up). Mark Hada enjoys natural history as much as historical interpretation, and wonders why he waited so long to become a California State Park Ranger.



Dan Airola

The Hwy. 50 and 20th Street Purple Martin colony site above vacant Caltrans land that is available for lease. The site has been used to store vehicles and to stockpile landscaping and construction materials. Incompatible uses, especially construction of two-story parking lots, eliminated several martin colonies at similar sites in the early 1980s.