

**IMPLEMENTATION OF AN EFFECTIVE MIGRATORY BIRD NESTING  
PROTECTION PROGRAM FOR A 49-MILE, NEW LOCATION TOLL ROAD  
CONSTRUCTION PROJECT IN CENTRAL TEXAS:  
NEST PROTECTION MEASURES AND RESULTS OVER THREE NESTING SEASONS**

Edward B. Rashin (512-478-0858, [erashin@hicksenv.com](mailto:erashin@hicksenv.com)), Senior Environmental Scientist,  
Hicks & Company, 1504 West 5th Street, Austin, TX, USA 78703

Roy G. Frye, CWB (512-478-0858, [rfrye@hicksenv.com](mailto:rfrye@hicksenv.com)), Senior Wildlife Biologist,  
Hicks & Company, 1504 West 5th Street, Austin, TX, USA 78703

**ABSTRACT**

A migratory bird nesting protection program was implemented during the pre-construction and construction phases of a 49-mile, new location toll road that was developed under a design-build arrangement for accelerated project delivery. This program, intended to achieve full compliance with provisions of the Federal Migratory Bird Treaty Act and the State of Texas Parks and Wildlife Code, both of which generally prohibit the take of migratory birds, active nests, or eggs, was implemented as one component of a comprehensive environmental protection program. In order to achieve the project's goal of zero violations of environmental laws and regulations, the nest protection program needed to identify active nests that could potentially be impacted, and to implement best practices and protection measures to prevent impacts to potentially affected nests.

The two-pronged approach used to identify migratory bird nesting sites included conducting systematic nesting surveys of specific habitats within large segments of the right-of-way prior to initial land clearing activities, followed by vigilance on the part of environmental compliance and construction personnel during parcel walk-throughs and ongoing construction monitoring activities. Pre-construction surveys were conducted by project biologists during spring and summer in areas where initial land clearing was scheduled. Search efforts focused on locating the most conspicuous nests, particularly those of raptors, colonial waterbirds, and swallows. For nesting sites discovered within active or imminent construction areas, nest protection practices were developed on a case-by-case basis, in consideration of nest location, bird species and habitat requirements, expected duration of nesting activity, and the location, type and duration of construction disturbance. Equipment and personnel exclusion areas or setback distances were determined based on direct observations of adult bird behavior indicating disturbance threshold distances or comfort zones. Results from operational practices and protection measures implemented over three nesting seasons (2004 to 2006) to protect 31 active nesting sites along a 15-mile segment of highway construction are examined to evaluate the level of success achieved and practices found to be effective.

Vegetation clearing was conducted outside of the nesting season where practicable, thus reducing construction interactions; however, one phenomenon that became evident through monitoring is that certain ground-nesting birds are preferentially attracted to nesting sites created by ground disturbance from construction equipment. While pre-construction surveys did identify a number of nesting sites, detection of nests that required protection measures mostly resulted from the developer's ongoing environmental monitoring program augmented by the vigilance of project personnel. Results of the operational nest protection program provide useful information on best practices and protection measures that are effective at facilitating successful nesting by migratory birds while minimizing negative effects

on construction schedules. Construction exclusion zones or setback perimeters for active nests determined in consideration of both site-specific and bird-specific factors ranged from 6 feet (2 meters) to 300 feet (91 meters). Implementation of exclusion zones in conjunction with developer commitment, personnel training and an ongoing monitoring program was found to be effective at facilitating nesting success without burdensome or costly impacts on a major linear construction project.

## **PURPOSE AND BACKGROUND**

This paper describes a migratory bird nesting protection program that was implemented during the pre-construction and construction phases of Segments 1 through 4 of State Highway 130 (SH 130), a 49-mile, new location, four lane divided toll road with discontinuous frontage roads. SH 130 was developed to provide a partial outer loop route east of the Austin, Texas area, in order to help alleviate congestion on Interstate 35. The project was designed and constructed under an Exclusive Development Agreement (EDA) between the Texas Department of Transportation (TxDOT), as owner, and the developer, Lone Star Infrastructure. This agreement established and governed a design-build arrangement for accelerated project delivery. The agreement imposed an extensive set of environmental management requirements on the developer, including a goal of “zero environmental violations” throughout the life of the project. The EDA stipulated that implementation of mitigation measures, such as protection of bird nests, to minimize the construction phase and long-term impacts of development would be the responsibility of the developer. As such, a number of federal and state environmental regulatory requirements were carefully addressed including compliance with provisions of the Migratory Bird Treaty Act (16 U.S. Code 703-712) and Texas Parks and Wildlife Code (Sections 64.002 and 64.003).

The Migratory Bird Treaty Act (MBTA) of 1918 is the domestic law that affirms or implements the United States’ commitment to four conventions with Canada, Japan, Mexico and Russia for the protection of shared migratory bird resources. The MBTA prohibits the take, possession, import, export, transport, selling, purchase, barter, or offering for sale, purchase, or barter, any migratory bird, their eggs, parts, and nests, except as authorized under a valid permit. Over 800 species of migratory birds, including waterfowl, shorebirds, seabirds, wading birds, raptors, and passerines are protected by the MBTA. Generally speaking, the MBTA protects all birds occurring in the U.S. in the wild except for house (English) sparrows, European starlings, rock doves (pigeons), and non-migratory upland game birds (APLIC and USFWS 2005). While it is illegal to collect, possess, and by any means transfer possession of any migratory bird nest, the MBTA does not contain any prohibition that applies to the destruction of a bird nest alone (without birds or eggs), provided that no possession occurs during the destruction (USFWS 2003).

Subsection 64.002 of the Texas Parks & Wildlife Code prohibits the disturbance or destruction of eggs, nests, or young of nongame birds, while Subsection 64.003 prohibits the disturbance or destruction of eggs, nests, or young of game birds.

In order to achieve the SH 130 project goal of zero violations of these federal and state laws, a migratory bird nesting protection program was implemented to: 1) identify active nests that could potentially be impacted by construction activities; and 2) incorporate best practices and protection measures to prevent impacts to active nests. Because little information on effective practices and few case studies existed to guide nest protection efforts, the program was developed to implement two complementary approaches: completion of systematic nest surveys for determining the need for protection measures prior to construction; and site specific monitoring with adaptive management of protection measures to protect active nests discovered during construction. Implementation of this program was a component of a comprehensive environmental protection program and an Environmental Management System (EMS) that was tailored to the particular needs of the design-build process. In 2007, the SH 130 EMS was certified at the Gold level under the Texas Commission on Environmental Quality’s Clean Texas Program.

## **METHODS**

Survey and monitoring practices used on the project were intended to facilitate identification of migratory bird nesting sites both before and during road construction. Targeted nesting surveys of specific habitats were undertaken within large segments of the right-of-way prior to initial land clearing activities, followed by vigilance on the part of Environmental Compliance Inspectors and construction personnel participating in environmental clearance walk-throughs of parcels immediately preceding construction and during ongoing construction activities.

### **Pre-Construction Nesting Surveys**

Complete avoidance of impacts to active nests would require limiting construction activity during entire the nesting season which generally runs from February through September in the Austin, Texas area. While pre-construction planning efforts considered opportunities to establish construction schedules and locations that could, at least in part, avoid certain high probability nesting areas, limitations on the ability to accelerate schedules for land clearing and construction outside of nesting seasons severely curtailed this option. Complete avoidance of nesting activity was not practicable due to the large scope of the project and resulting construction schedules, as well as the large extent of potential nesting habitat that occurred along the alignment. This elevated the importance of identifying active nests in the path of immediate land clearing activity. Surveys for active bird nests were conducted along those segments of the right-of-way scheduled for construction during the spring and summer of each year of construction. Because the nests of small birds would be often cryptic and difficult to locate, even with structured, systematic surveys, search efforts focused on locating nests of more conspicuous species, particularly larger birds including raptors and colonial water birds.

Combined vehicle windshield and pedestrian foot surveys were utilized to maximize the number of detections and overall search efficiency. Due to the length of the nesting season, follow-up surveys were required to maximize the probability for locating active nests. Nests were considered active if eggs or young were present, or if adults were observed to be nest building, perching, or sitting on the nest; or if fecal wash, molted feathers, prey remains or freshly ejected pellets were observed near the nest.

Data collected during the field surveys included species identification, activity at time of observation, age, sex, and location for each species and nest detected in the surveyed portion of the SH 130 right-of-way. Some bird species often use nests from previous years, including those constructed by other species. For this reason, all observed nests in the right-of-way, including squirrel nests, were investigated.

Survey activities were generally confined to wooded patches in upland areas and drainage corridors within and adjacent to the right-of-way as previously identified from vegetation and habitat maps developed for the project. Search areas were prioritized according to imminent land-clearing. Where road locations allowed clear visibility, windshield surveys were conducted. Where visibility was limited, pedestrian foot surveys were employed. Trees along fence lines were surveyed where accessible. Binoculars and a spotting scope were used to evaluate potential nests and identify species. When active nests were identified, location and other nest data were collected and entered into a database. Notification of active nests was made to environmental compliance managers and construction supervisors to advise of sensitive locations, so that protection measures could be implemented, including establishment of buffer zones to avoid and/or minimize disturbance, and monitoring of nesting status throughout the nesting period until the young fledged. Where existing bridges and culverts were to be affected by construction, these structures were also inspected for roosting bats and nesting cliff swallows to determine if protection measures were needed until roosting or nesting activities were completed.

### **Construction Phase Migratory Bird Protection Measures**

In anticipation of migratory bird nesting within planned and active construction zones, a process was established to develop an overall nest protection program and site specific nest protection measures. The process followed a progression of steps beginning with consideration of commitments contained in the project's environmental approval documents (Final Environmental Impact Statement and Record of Decision, FHWA and TxDOT, 2001) and in the design-build contract documents. Other steps included review of available literature on anticipated environmental management issues, development of a comprehensive training program for construction personnel, development of a set of environmental plans, and development of site-specific protection measures and practices that could be refined on a case-by-case basis. The environmental protection program included the following actions:

- The project's Environmental Compliance Manager led a team that developed a comprehensive program to address all environmental commitments. This program included a commitment by the project developer and owner to maintain full compliance with environmental laws and regulations, and development and implementation of an Environmental Management System (EMS). Among the features of the EMS was an Environmental Protection Training Program that required issue-focused training for all project employees, including all developer and subcontractor construction personnel, and standard operation procedures for addressing environmental issues.
- Environmental walk-throughs and other parcel clearance procedures were used to perform desktop and field reviews of construction areas immediately prior to ground disturbance, and to identify possible environmental constraints.
- Inspections and clearance reviews of areas were followed up with continuous monitoring and environmental oversight of construction activities by a team of professional Environmental Compliance Inspectors, as well as vigilance by construction supervisors and crews who might observe nesting activity during the normal course of their work.
- As active nests were discovered, site-specific nest protection measures were implemented that included marking and signing of protective perimeters and construction exclusion areas, maintaining communication with construction supervisors and crews about the status of nests and planned construction activities, and determining whether certain planned construction activities should be restricted, delayed or modified based on their potential for disturbing nests. Protective perimeters were marked with "Migratory Bird Nesting Area – Do Not Enter" signs that provided telephone contact information for the Environmental Compliance Inspector.
- The project's Environmental Compliance Inspectors conducted daily monitoring of the following: construction activities in the vicinity of nests; the status of and compliance with nest protection measures; and nest development and progress through fledging or nest abandonment. Preparations were made to respond to situations that might require rescue of eggs and young from abandoned nests, if appropriate.
- Construction activities in the vicinity of nests with potential to cause nest disturbance were modified and restricted as deemed necessary, which in some cases resulted in modification to construction activity schedules.
- For nesting sites discovered within active or imminent construction areas, nest protection practices were developed on a case-by-case basis, in consideration of nest location, bird species and habitat requirements, expected duration of nesting activity, and the location, type and duration of construction activities. Equipment and personnel exclusion areas or setback distances were determined based on direct observations of adult bird behavior indicating disturbance threshold distances or comfort zones. For example, in the case of ground-nesting birds, environmental compliance personnel would test the bird's disturbance threshold by walking at a calm pace towards the nest to observe at what distance the adult bird began to stand or move away from the nest and display decoy behavior.

## Rescue and Rehabilitation of Injured or Orphaned Birds

It was anticipated that during survey activities and daily construction monitoring tasks, environmental staff may locate wildlife, including migratory birds, that have been injured, abandoned, or otherwise require the care of a qualified, permitted wildlife rehabilitator. Appropriate permits were applied for and obtained from the USFWS and TPWD to allow transport of injured wildlife, including migratory birds, to appropriate permitted rehabilitators. Several local wildlife rehabilitators were identified with the permits and skills required to rehabilitate animals in captivity and release them back into the wild. Advance coordination arrangements were made with these local rehabilitators for accepting possible injured wildlife.

## RESULTS AND DISCUSSION

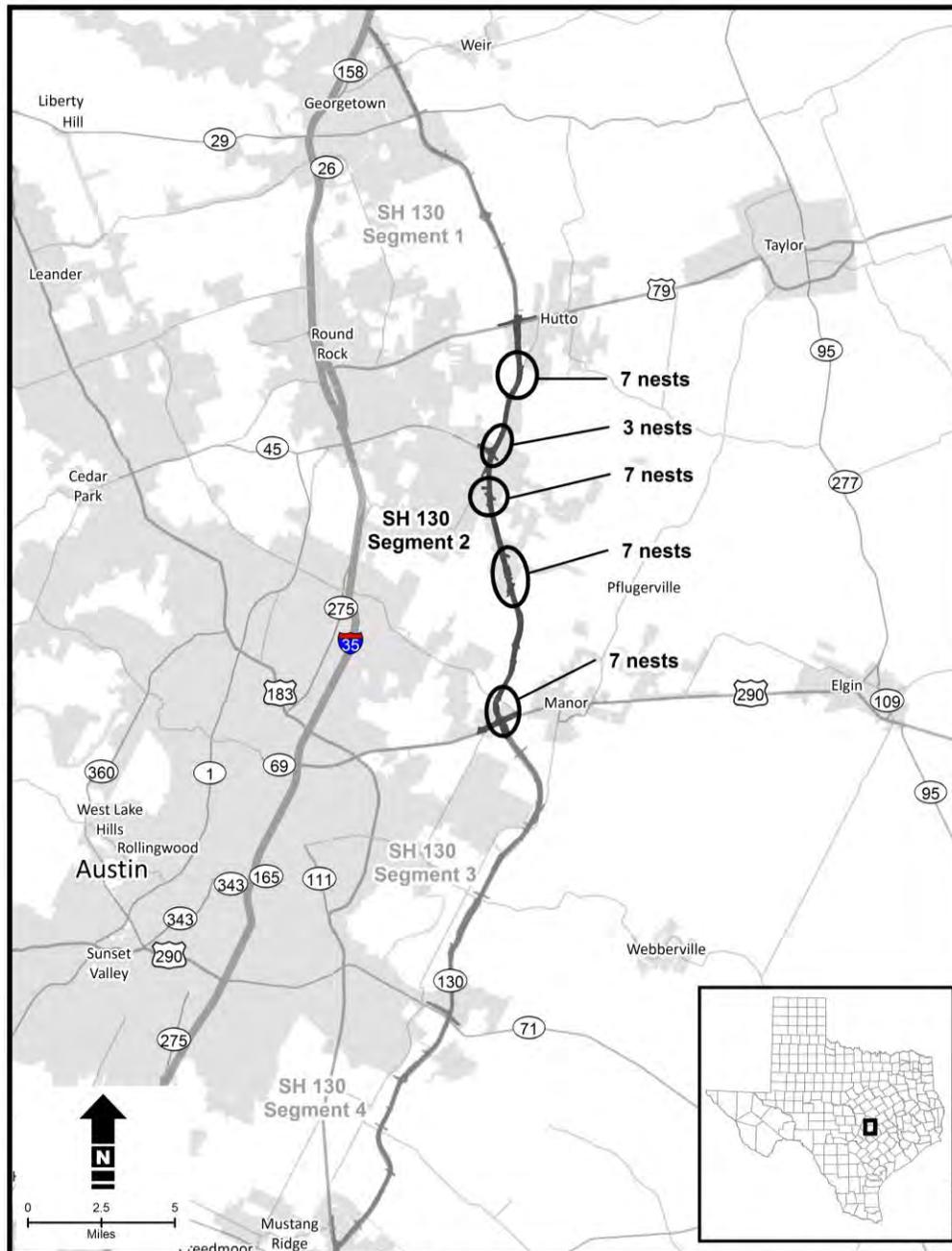
### Pre-Construction Nesting Surveys

Pre-construction nesting surveys were completed during periods of major land clearing for SH 130 Segments 1-4 which began north of Georgetown, Texas, then proceeded south around the eastern portion of Austin, and terminating north of Lockhart Texas. A snapshot of this pre-construction monitoring program is illustrated by the results of surveys that were completed in April, May, and July of 2005. During these surveys 352 birds were observed in or near the SH 130 right-of-way. Observations included the following species: Red-tailed Hawk (*Buteo amaicensis*), Swainson's Hawk (*Buteo swainsoni*), Red-shouldered Hawk (*Buteo lineatus*), Cooper's Hawk (*Accipiter cooperii*), Northern Harrier (*Circus cyaneus*), Great Horned Owl (*Bubo virginianus*), Caracara (*Caracara cheriway*), Turkey Vulture (*Cathartes aura*), Black Vulture (*Coragyps atratus*), American Crow (*Corvus brachyrhynchos*), Great Blue Heron (*Ardea herodias*), Anhinga (*Anhinga anhinga*), Killdeer (*Charadrius vociferus*), Red-bellied Woodpecker (*Melanerpes carolinus*), Downy Woodpecker (*Picoides pubescens*), Cliff Swallow (*Petrochelidon pyrrhonota*), Barn Swallow (*Hirundo rustica*), and English Sparrow (*Passer domesticus*). A total of 290 active nests were observed among the following species: Cliff Swallow (254 nests), Great Blue Heron (20 nests), Anhinga (10 nests), Red-tailed Hawk (1 nest), Red-shouldered Hawk (1 nest), American Crow (1 nest), Killdeer (1 nest), Red-bellied Woodpecker (1 nest), and English Sparrow (1 nest). The Great Blue Herons and Anhingas were observed at one colonial water bird rookery adjacent to Onion Creek north of SH 71. Although this rookery was more than 500 feet from the SH 130 right-of-way, its boundaries were determined and species identification and population estimates for all birds observed were recorded. The majority of the observed nesting activity occurred during the April and May surveys, with only a few nesting Cliff Swallows observed during the July survey. Additional species observed nesting along SH 130 during the active construction phase included Red-winged Blackbird (*Agelaius phoeniceus*) and Common Nighthawk (*Chordeiles minor*).

Active nests observed in or near construction sites were reported to the Environmental Compliance Inspectors, who staked the locations with protective markers and placed signs as appropriate for avoidance by construction activity, and coordinated with construction supervisors through the period of nesting.

### Construction Phase Nest Identification and Nest Protection Measures

While pre-construction surveys did identify a number of nesting sites, detection of nests that required protection measures resulted primarily from the developer's construction phase environmental monitoring program augmented by the vigilance of project personnel. Over the course of three nesting seasons during 2004, 2005, and 2006, a total of 31 active migratory bird nests were identified within or adjacent to zones of active road construction. The road construction project location is illustrated in Figure 1.



**Figure 1: Location of SH 130 Toll Road construction project, showing general locations of nesting sites.**

Figure 1 also shows the general locations, within five different zones, of the 31 active nests that were identified as requiring protection measures along the 15 miles (24 km) of SH 130 Segment 2, which runs from the north side of U.S. Highway 79 to the south side of U.S. Highway 290. The period of major road construction activity on Segment 2 was from December 2003 to August 2006. Results from the operational practices and protection measures implemented to protect these 31 active nests over three nesting seasons from 2004 to 2006 are summarized below. Table 1 summarizes the pertinent information for each of these nests, including nesting success, and effectiveness of nest protection measures. The

nesting occurrences in Table 1 are grouped by tree-nesting birds, ground-nesting birds, and colony-nesting birds.

As indicated by Table 1, a total of 31 active nests constructed by several different bird species were observed during the years 2004-2006 within or adjacent to zones of active construction along 15 miles (24 km) of new road location. A result that was unexpected at the time the nest protection program was developed and initially implemented is that two-thirds of all active nests were by ground-nesting birds. Among ground-nesting birds, 15 nests were established by Killdeer, and six by Common Nighthawk. Four distinct nests of four species of tree-nesting birds were identified, including one nest by Great-horned Owl, one nest by American Crow, one nest by Red-tailed Hawk, and one nest by Red-shouldered Hawk, which nested in the same tree three years in a row, presumably the same pair of hawks. Each of these nesting occurrences is summarized in Table 1 in chronological order. Colonial nesting birds included three nesting colonies of Cliff Swallow, and one nesting colony of Red-winged Blackbird.

Observations indicated that sensitivity to construction disturbance varied among individual nesting birds. It was also observed that most birds had disturbance thresholds for vehicles and construction equipment that required a shorter setback distance than did pedestrian traffic. For this reason, the more restrictive pedestrian disturbance threshold distance was generally used to establish radii for exclusion zones, except in cases of birds that nested exceptionally close to ongoing construction traffic, heavy equipment or to structures under construction, indicating a degree of tolerance for such proximity. Protective perimeters marked as construction exclusion zones over the course of this project ranged from a minimum radius of 6 feet (2 meters) around the nest for certain Common Nighthawk and Killdeer nests that were established in the midst of ongoing proximate construction, to a maximum of 300 feet (91 meters) for Red-shouldered Hawk and Great-horned Owl nests. All but seven of the 24 nests with established exclusion zones had perimeters defined by a radius 30 feet (9 meters) or greater. For two of the nests located in trees immediately outside of the right-of-way boundary, perimeters were not marked, based on knowledge that there would be minimal construction-related activity in the vicinity of the nests. In these cases ongoing monitoring and communicating protective guidelines to construction personnel were sufficient to avoid nest disturbance. Specific setback distances were not necessary for two of the swallow colonies, because no construction activity was planned or reasonably expected to occur in close proximity to the colonies. This was not by chance, but rather the result of coordination and cooperation among project personnel, who achieved agreements to adapt bridge painting plans and schedules in order to accommodate the expected duration of swallow nesting. At one of the bridges with a swallow colony, installation of bridge drainage appurtenances was able to proceed so long as workers maintained a distance of 15 feet (5 m) or more from active nests, which was the observed comfort zone of the birds at this site.

As noted in Table 1, there were three instances, all associated with ground-nesting birds, where the nest protection measures were successful at preventing a direct take of the nest by construction activities immediately adjacent to the nesting site, but were not sufficient to prevent incidental disturbance leading to abandonment of the nest by the adult birds. The nesting habits of ground-nesting birds resulted in several situations where the birds established nests on bare ground in recently graded areas within very active construction zones, including locations where heavy equipment was in use to construct road base and concrete pavement. It is noteworthy that none of the nesting sites listed in Table 1 were physically damaged by construction activity, even though some of the ground nests were established within zones of active construction, as close as 10 to 30 feet (3 to 9 meters) from operating heavy equipment and crews.

**TABLE 1: Summary of 31 Active Nests Monitored Within or Adjacent to Zones of Active Construction along 15 Miles (24 Km) of New Location Toll Road Construction**

Species	Date of Nest Discovery	Date of fledging or Nest Abandonment	Radius of Construction Exclusion Perimeter in Feet (meters)	Was Nesting Success Affected by Construction? (Yes or No)*	Other Observations Regarding Nesting Success and Results
<b>Tree-Nesting Birds</b>					
Red-shouldered Hawk	3/15/2004	6/17/2004	300 (91 m)	No	Nest located in riparian area approx. 60 feet (18 meters) outside of right-of-way, near bridge construction area. Nesting was successful.
Great-horned Owl	3/24/2004	4/15/2004	300 (91 m)	No	Nest was blown from tree during a thunderstorm with high winds. One owlet was rescued from stream bank below nesting site and transferred to wildlife rehabilitation facility; it was released back into the wild on 10/06/2004 at a riparian woodland preservation area along the SH 130 alignment.
Red-shouldered Hawk	3/09/2005	6/07/2005	300 (91 m)	No	Hawks nesting at same nest tree, second year in a row. Nesting was successful.
American Crow	4/21/2005	5/19/2005	N/A	No	Nest located in riparian area approx. 80 feet (24 meters) outside of right-of-way, near bridge construction area. Nesting was successful.
Red-tailed Hawk	1/13/2006	5/26/2006	N/A	No	Nest in riparian woodland preservation area within right-of-way, approx 70 feet (21 meters) from newly constructed bridge. Nesting was successful.
Red-shouldered Hawk	3/16/2006	5/22/2006	300 (91 m)	No	Hawks nesting at same nest tree, third year in a row. Nest was damaged in wind storm, but nesting was considered a success.
<b>Ground-Nesting Birds</b>					
Killdeer	5/06/2004	6/01/2004	90 (27 m)	No	Nesting was successful.
Common Nighthawk	5/21/2004	6/17/2004	6 (2 m)	No	Nest was established on bare, recently graded ground immediately adjacent to road base construction zone. Nesting was successful.
Common Nighthawk	5/26/2004	5/27/2004	6 (2 m)	No	Nest established on bare, recently graded ground immediately adjacent to road base construction zone. Loss of nest attributed to predation.

Species	Date of Nest Discovery	Date of fledging or Nest Abandonment	Radius of Construction Exclusion Perimeter in Feet (meters)	Was Nesting Success Affected by Construction? (Yes or No)*	Other Observations Regarding Nesting Success and Results
Common Nighthawk	5/26/2004	5/27/2004	6 (2 m)	Yes	Nest established on bare, recently graded ground immediately adjacent to road base construction zone. Nest was abandoned; one egg recovered from abandoned nest and transferred to wildlife rehabilitation facility for artificial incubation attempt (unsuccessful).
Common Nighthawk	7/26/2004	8/09/2004	50 (15 m)	No	Discovery of nesting-rearing area with 1 adult and 1 mobile young in area of drainage easement; not at specific site. Nesting was successful.
Killdeer	4/18/2005	4/26/2005	15 to 90 (5 to 27 m)	No	Nesting was successful.
Killdeer	5/05/2005	6/01/2005	50 (15 m)	No	Nesting was successful.
Killdeer	6/03/2005	7/01/2005	50 (15 m)	No	Nesting was successful.
Killdeer	6/06/2005	6/14/2005	85 (26 m)	No	Nest either successfully hatched out, or may have been lost to predation.
Killdeer	6/06/2005	6/24/2005	90 (27 m)	No	Nesting was successful.
Killdeer	6/10/2005	7/01/2005	90 (27 m)	No	Nesting was successful.
Common Nighthawk	6/15/2005	6/28/2005	20 to 100 (6 to 31 m)	Yes	Nest established in median, immediately adjacent to concrete pavement construction zone. Nest was abandoned; two eggs recovered from abandoned nest and transferred to wildlife rehabilitation facility for artificial incubation attempt (unsuccessful).
Killdeer	6/13/2005	6/21/2005	30 to 60 (9 to 18 m)	Yes	Nest established in median, immediately adjacent to concrete pavement construction zone. Nest was abandoned; four eggs recovered from abandoned nest and transferred to wildlife rehabilitation facility for artificial incubation attempt (unsuccessful).
Killdeer	6/22/2005	6/30/2005	30 to 80 (9 to 24 m)	No	Nesting was successful.

Species	Date of Nest Discovery	Date of fledging or Nest Abandonment	Radius of Construction Exclusion Perimeter in Feet (meters)	Was Nesting Success Affected by Construction? (Yes or No)*	Other Observations Regarding Nesting Success and Results
Killdeer	6/27/2005	6/27/2005	N/A	No	Nest was discovered the same day eggs hatched. Nesting was successful.
Killdeer	5/11/2006	6/09/2006	80 (24 m)	No	Nesting was successful.
Killdeer	5/23/2006	5/26/2006	30 (9 m)	No	Nest was discovered when eggs were partially hatched. Nesting was successful.
Killdeer	6/02/2006	6/07/2006	50 (15 m)	No	Nest was established at corner of concrete batch plant site. Nesting was successful.
Killdeer	6/05/2006	6/26/2006	6 to 50 (2 to 15 m)	No	Nest was established at top of bridge header, approx. 6 feet (2 m) from edge of pavement. Nest either successfully hatched out or may have been washed off the slope during major storm event.
Killdeer	6/07/2006	6/13/2006	50 (15 m)	No	Nest was established on topsoil stockpile. Nest was discovered when it was partially hatched out. Nesting was successful.
Common Nighthawk	6/16/2006	7/7/2006	75 (23 m)	No	Nesting was successful.
Colony-Nesting Birds					
Red-winged Blackbird (colony)	6/1/2004	6/10/2004	50 (15 m)	No	Colony established in perennial stream was lost to a flooding event associated with 6 inches (152 mm) of rainfall over a 3-day period.
Cliff Swallow (colony)	6/30/2005	8/22/2005	N/A	No	Colony with 200-plus nests established on newly constructed bridge over perennial stream. Nesting was successful.
Cliff Swallow (colony)	5/04/2006	8/2/2006	15 (5 m)	No	Colony with 250-plus nests established on newly constructed bridge over perennial stream. Nesting was successful.
Cliff Swallow (colony)	5/18/2006	6/29/2006	N/A	No	Colony established on newly constructed bridge over perennial stream, in area with little construction activity. Minor colony, did not fully establish and was abandoned.

\* "Nesting Success Affected by Construction" is rated "No" in cases where young were successfully fledged or loss of nest was attributable to predation or other natural cause. "Yes" indicates that abandonment of nest was likely attributable construction-related disturbance.

### **Rescue of Abandoned Young and Eggs**

Recovery of abandoned young and eggs for purposes of rescue was implemented as a measure to minimize impacts to migratory birds, whether or not the need was associated with project construction activity. The only instance where rescue of young occurred involved a Great-horned Owl nest that was being monitored near the edge of the highway right-of-way and within a marked construction exclusion zone. The owl nest was blown from its tree during a thunderstorm. One owlet, who was affectionately nick-named “Bounce”, was found on the ground at the edge of a stream bank below the former nesting site, where it was no longer protected and was exposed to predation. The owlet was transferred to a permitted wildlife rehabilitation facility, where it was reared with other rescued owls and then released back into the wild about six months later, along with two other rehabilitated owls, at a riparian woodland along Gilleland Creek. The release site was within a nominated habitat preservation area established within the SH 130 right-of-way, where the owls would have access to a relatively intact riparian woodland that extends along the perennial stream, with agricultural and undeveloped land nearby.

Over the course of the three nesting seasons, eggs from one abandoned Killdeer nest and two abandoned Common Nighthawk nests were rescued from nests and transferred to licensed wildlife rehabilitators for artificial incubation. The reasoning behind decisions to intervene and recover eggs from these nests was based on: 1) close monitoring that determined when the adult birds left the nests; 2) monitoring of the whereabouts of the adults and the ability to confirm that they were not returning; and, professional judgments made in consultation with project biologists about how much time the eggs might survive unprotected during hot summer conditions. None of the eggs from these interventions hatched.

### **Effects of Nest Protection Measures on Construction Activities**

At all of the nesting sites where protection measures were implemented, consideration was given to the type of construction activity that was reasonably expected to occur in the vicinity, including specific locations, duration of activities, the equipment to be used, noise and vibration levels, number of people, whether nighttime work is planned, and other factors. For many activities, there was no need for restrictions other than the marking of exclusion zones. Activities that were restricted or delayed and re-scheduled in one or more cases in order to help avoid impacts to migratory bird nesting included:

- Sediment excavation from drainage easements and culvert outfall areas;
- Traffic by construction vehicles where alternative routes were available;
- Planned excavation and clean-up of contaminated soils;
- Restrictions on nighttime illumination;
- Structure demolition activities and hauling;
- Trench burning of brush;
- Restrictions on noise made by equipment or by construction crews when working in close proximity to nests, including loud talking;
- Access routes for asphalt paving activities, including establishment of a temporary access ramp to by-pass nesting areas;
- Bridge painting on spans occupied by swallow colonies;

There were special cases where a particular restricted activity with potential to disturb nesting sites was deemed important to undertake for a limited period of time, depending on the tolerance of nesting birds, or was considered necessary, for example, to avert adverse environmental or public welfare effects. In a few such cases the activity was allowed to proceed so long as the area was closely monitored by an Environmental Compliance Inspector, and the disturbance was limited and short-lived.

## CONCLUSIONS AND LESSONS LEARNED

In spite of the nest protection measures developed and implemented for the large-scale highway construction project discussed in this paper, complete avoidance of interactions between construction activity and migratory bird nesting activity was not practicable, while limited avoidance was achievable. In some cases, vegetation clearing was conducted outside of the nesting season, where this practice was found to be practicable and beneficial to the overall project schedule to avoid construction interactions and conflicts with nesting activities. However, this accommodation could not always be made, thus requiring the need for implementation of nest protection strategies. Another measure adopted by the owner and developer of SH 130 that facilitated nest avoidance in certain areas and likely contributed to overall nesting success, particularly for raptor species, was the nomination and demarcation of riparian habitat preservation areas within the SH 130 right-of-way. Within Segment 2, this measure intended to minimize impacts to both streams and wildlife habitat, resulted in the preservation of 7.5 acres of high quality riparian woodland along Brushy, Wilbarger, and Gilleland creeks (Rashin, *et al.* 2005)

Although numerous nests were established within disturbed zones and construction areas during each year of the project, negative impacts to both the road development project and to migratory birds were minimal. Implementation of exclusion zones to protect active nests, in conjunction with developer commitment, personnel training and an ongoing monitoring, compliance assurance and inspection program, was found to be effective at facilitating nesting success without excessively burdensome or costly impacts on this major road construction project. Among the most remarkable results illustrating the effectiveness of these protection measures, a pair of Red-shouldered Hawks was able to complete nesting activities successfully and fledge young at a nest within 150 feet (46 meters) of the construction zone for the SH 130 bridge over Brushy Creek during each of the years 2004, 2005 and 2006.

The vast majority of road construction projects undertaken in most areas of Texas are smaller-scale projects with a limited extent of ground disturbance, and are frequently implemented within existing rights-of-way. While MBTA requirements apply regardless of project size and scope, interactions between road construction and bird nesting activities for small scale projects may be limited or even non-existent, unless demolition or modifications are made to existing bridges or other structures used for nesting. Furthermore, some small-scale projects are of limited duration, in which case there may be little or no overlap with nesting seasons. On such small-scale projects, impact avoidance and monitoring and management of project impacts is less complicated, with lower overall likelihood of negative impacts on either migratory birds or construction progress. However, greater care will be needed regardless of project size on projects that entail demolition or modification of existing bridge or box culvert structures that are used as nesting sites by swallows.

Larger road construction projects developed on new location alignments, or ones that entail substantial parcels of additional right-of-way along existing alignments, will likely require a more comprehensive bird nesting protection program that includes construction worker and supervisor awareness training, ongoing professional monitoring, and effective operational procedures for prevention and minimization of impacts.

We found that pre-construction nesting surveys did identify areas of active nesting along the project right-of-way; however, 30 of the 31 nests that required active management for protection within Segment 2 of SH 130 were identified during active construction. Twelve of these nests were discovered by Environmental Compliance Inspectors, twelve were discovered by construction crews, and six were discovered by construction quality control inspectors, with one nest identified during a systematic nesting survey conducted by project biologists. This finding highlights the importance of effective environmental protection training programs that emphasize compliance issues and reporting requirements for nest discoveries, and of ongoing monitoring and vigilance by project inspectors and construction crews.

The use of planning and scheduling to avoid interactions with bird nesting is sometimes discussed in environmental assessments and other environmental approval documents as a mitigative or preventative measure; however, such measures may be impracticable and of limited effectiveness for large linear construction projects that traverse nesting habitats and entail year-round construction activity. On such large-scale projects interactions between construction and bird nesting is probable, if not inevitable. Environmental documents prepared to satisfy National Environmental Policy Act (NEPA) and transportation agency requirements for environmental project clearance may also include additional measures such as removal of inactive nests prior to the start of nesting seasons, which may prove effective if nesting seasons are accurately defined and if followed up with ongoing vigilance during the nesting season. Strategic scheduling of bridge structure demolition activities to occur outside of the nesting seasons of swallows can be particularly effective at avoiding impacts to these species.

Statements that impose commitments on construction contractors to implement measures to prevent migratory birds from building nests within construction areas that may serve as nesting habitat for locally occurring migratory species are not likely to be fully effective, and should not, in and of themselves, lead to confidence that impacts will be prevented. Recognition of the limitations of such commitments is important; however, a requirement to implement measures to prevent nest establishment, to the extent practicable, can be an important part of a more comprehensive migratory bird protection program. An important factor affecting both nesting success by birds and the effectiveness of measures to comply with the Migratory Bird Treaty Act is the rapidity with which some birds build and occupy their nests. We have observed that well-meaning attempts at vigilance and nesting deterrence are on occasion defeated by certain natural instincts and abilities of some avian species to initiate nest construction and establish nests “from one day to the next” or between morning and afternoon site visits.

From the standpoint of managing environmental compliance during the active construction phase, the habits and behaviors of ground-nesting birds such as Common Nighthawk and Killdeer present one of the biggest challenges to road builders and their compliance personnel. One observation that was not expected, yet which was re-occurring on several areas of the SH 130 project, is that certain pairs or even groups of ground nesting birds are preferentially attracted to recently cleared areas of bare soil, as compared to adjacent agricultural or fallow, undeveloped fields adjacent to the cleared right-of-way. It was noted that Killdeer preferred cleared land with gravel-sized small rocks, which were used to form shallow nests, while the Common Nighthawk nested on bare ground without gravel and did not necessarily construct a formed nest. Because some of the ground nesters did not appear to be deterred by ongoing proximate activity of construction equipment or crews, it is recommended that project construction or compliance management personnel take the step of identifying one or more permitted wildlife rehabilitation facilities that are available to take abandoned eggs or young, as a measure to help minimize adverse impacts on protected migratory birds.

Nesting season start and end dates may or may not be stated in environmental approval documents. In either case, the definition of nesting seasons for particular migratory bird species and for nest protection measures outlined in operating procedures and construction plans should be based on local knowledge of nesting behavior. For example, we have found active nesting occurring as early as the month of January on Texas road construction projects, whereas environmental clearance documents generally define nesting seasons as beginning either February 1 or February 15. Most importantly, vigilance for nesting activity should begin when the first early nesters arrive in the project area, not when the majority of birds are expected to begin nesting.

In conclusion, our experience with environmental compliance management of road construction and the results from this project indicate that a high level of confidence for achieving nest protection goals and compliance with the Migratory Bird Treaty Act will be attained if nest protection programs include all of

the following components: 1) personnel training; 2) active monitoring to identify nesting activity in the vicinity of construction; 3) clear environmental reporting requirements for nest discovery; 4) builder and owner commitment to regulatory compliance; and, 5) a set of actions to respond to the discovery of active nests with adequate protections.

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## **AUTHORS**

**Edward B. Rashin** is a Senior Environmental Scientist and Environmental Compliance Specialist at Hicks & Company, a consulting firm that provides environmental, ecological, archeological, and planning services. He has 30 years of professional experience in environmental compliance management, environmental impact assessment, scientific investigations and natural resources management. This experience includes work on multiple aspects of environmental management for transportation project development, from preparing environmental clearance documents to design phase review and construction phase environmental compliance management. Mr. Rashin is trained as an ISO 14001 Environmental Management System Auditor, and his project experience includes environmental compliance verification and management for seven Design-Build highway development projects. He manages and verifies regulatory compliance issues addressing water quality, wetlands, wildlife and endangered species hazardous materials and waste management, air quality, and cultural resources. His professional experience includes managing water quality programs for a state regulatory agency and serving as principal investigator for a cooperative adaptive management research program focused on water quality and aquatic resources.

**Roy G. Frye** is a Senior Wildlife Biologist and Senior Project Manager at Hicks & Company. He assists clients with the planning, coordination, development, and management of projects to assure regulatory compliance with state and federal environmental regulations. He is a certified wildlife biologist (CWB) with 39 years of experience in wildlife ecology, conservation, and management, including 26 years with the Texas Parks and Wildlife Department and 13 years as an environmental consultant. He has worked with local, county, state, and federal agencies and private interests in evaluating impacts of projects on fish and wildlife resources, including rare or endangered species, wetlands, riparian ecosystems, and other important habitats that may be subject to state or federal permitting, funding, or authorization. Mr. Frye has worked extensively with the United States Fish and Wildlife Service, U.S. Army Corps of Engineers, and with state agencies including the Texas Water Development Board, Texas Commission on Environmental Quality, and Texas Department of Transportation. He has assisted with the development of interagency mitigation plans and with the development of Habitat Conservation Plans required by the Endangered Species Act.

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