Status and Management of the Least Bell's Vireo and Southwestern Willow Flycatcher in the Santa Ana River Watershed, 2016, and Summary Data by Site and Watershed-wide, 2000-2016

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ABSTRACT

The Santa Ana Watershed is the largest coastal river system in southern California. The Santa Ana Watershed Association (SAWA) is committed to the protection and improvement of areas within the watershed with major focus on the removal of invasive species, native habitat enhancement and the protection of endangered, threatened and other sensitive species. Since 2000, populations of endangered Least Bell's Vireos (*Vireo bellii pusillus*) and Southwestern Willow Flycatchers (*Empidonax traillii extimus*) have been studied and managed during the breeding season. Data were taken on status, distribution, breeding chronology, reproductive success, and nest site characteristics. Additionally, Brown-headed Cowbird (*Molothrus ater*) trapping in or near riparian habitat was conducted concurrently as well as during the winter at several dairies in the watershed. SAWA biologists documented 1,070 Least Bell's Vireo territories in the Santa Ana Watershed (outside of Prado Basin) in 2016, of which 497 were known to be paired. Six-hundred fifty-nine fledglings were also documented. Nesting success was 52% overall and 95 well-monitored pairs had a 2.6 reproductive success rate. Seventy percent of 206 vireo nests were placed in three species of willows (*Salix* spp.) and mulefat (*Baccharis salicifolia*). In 2016, Prado Basin reported another 511 vireos (Bonnie Johnson, personal communication, October 11, 2016), a 4% decrease from the 532 documented in 2015. Over 3,100 cowbirds were removed from 45 traps during the nesting season. Additionally, more than 5,100 cowbirds were removed from the watershed during the fall and winter of 2015-2016. Over 101,000 cowbirds have been removed from the watershed by SAWA since cowbird management began. In 2016, the watershed-wide cowbird parasitism rate of vireo nests was 3%, following a 2% rate in 2015. San Jacinto was the only site where parasitism was documented in 2016. Southwestern Willow Flycatchers were not detected by SAWA biologists in 2016; however, seven migrant Willow Flycatchers were documented within the watershed. All wildlife species detected (137 avian, 17 mammalian, 17 herpetofauna and one fish) were incidentally reported by site.

INTRODUCTION

As the largest coastal river system in Southern California, the Santa Ana Watershed area is home to more than 4.5 million people and includes portions of San Bernardino, Riverside, Orange, and Los Angeles Counties. The Santa Ana Watershed Association (SAWA) is committed to the protection and improvement of areas within the Santa Ana Watershed. Major focuses of SAWA are the removal of invasive species, native habitat enhancement and protection of endangered, threatened and other sensitive species. The largest threat in the Santa Ana Watershed is the extremely prolific invasive weed, arundo (*Arundo donax;* hereafter "arundo"). Arundo chokes riverine systems while out-competing native vegetation resulting in a loss of

habitat for native species and hampering flood control efforts. Due to its flammable nature, arundo increases the risk of fire, while consuming twice the amount of water than native plants, thereby stressing a region that already has little available water. SAWA is dedicated to the restoration of the Santa Ana Watershed to encourage natural riverine functions and enhance riparian habitat in an effort to aid the recovery of the endangered Least Bell's Vireo (*Vireo bellii pusillus*) and the Southwestern Willow Flycatcher (*Empidonax traillii extimus*).

The Least Bell's Vireo (hereafter "vireo") is a small, insectivorous bird that occupies riparian habitat in southern California and northern Baja Mexico. It is listed as endangered under the Endangered Species Act by the State of California and the federal government due to the destruction of riparian habitat and brood parasitism by the Brown-headed Cowbird (*Molothrus ater;* hereafter "cowbird"). Vireo monitoring and cowbird control began in 1986 with only 19 known vireo pairs in Prado Basin. The Prado Basin population has since increased to a high of 386 pairs and 600 territorial males in 2005 (Pike et al. 2005). The watershed-wide population (including Prado Basin) peaked at over 1,500 territorial males in 2014 (Hoffman et al. 2015). The Southwestern Willow Flycatcher (hereafter "willow flycatcher") occupies riparian habitat throughout the southwest. It too is listed as endangered by the state and federal government due to habitat loss and cowbird parasitism. These two endangered species and several other sensitive species have been monitored and managed in the Prado Basin annually since 1986 and throughout the watershed since 2000.

The work reported herein is an expansion upon the Prado Basin efforts into other portions of the watershed through the implementation of the Santa Ana Watershed Program by SAWA and the Orange County Water District (OCWD) during the year 2016. The same monitoring effort in Prado Basin is reported separately by OCWD. This monitoring program was conducted during the avian nesting season to determine the number of vireos and willow flycatchers present, their breeding status, and nesting outcomes. Cowbird trapping in or near riparian habitat is conducted concurrently as well as during the winter at several dairies in the watershed. Past efforts have included nest monitoring in the major riparian corridors of the watershed. In 2016, nest monitoring occurred at several locations discussed here as managed sites: the San Jacinto River, San Timoteo Canyon, Mockingbird Canyon, Santa Ana River from Riverside Ave. downstream to I-15, Norco Bluffs, Chino Hills, and the Santa Ana Canyon (SAC) below Prado Dam. Abundance and distribution data was documented at Temescal Canyon. Over 30 additional peripheral drainages within the watershed were sampled (≥3 visits) and incidental sightings were documented at sites visited on 1-2 occasions.

METHODS

Study Location

The Santa Ana Watershed is located in southern California and includes parts of San Bernardino, Riverside, Orange, and Los Angeles Counties (Figure 1). Nearly 3,000 square miles are covered by the watershed, and includes habitats in the mountains, foothills, valleys, and the coast. The main river is the Santa Ana River (SAR), which contains more than 50 tributaries. The Santa Ana River was monitored from Riverside Avenue in the city of Riverside downstream through the Santa Ana Canyon to Weir Canyon Road, excluding Prado Basin. Tributaries of the Santa Ana River that were monitored include San Timoteo Canyon, Mockingbird Canyon, Temescal Canyon, and fragments in Chino Hills. Portions of the San Jacinto River and San Jacinto Wildlife Area were also monitored (Figure 2). Cowbird trapping was conducted throughout the watershed at monitored and sampled sites (Figure 3).

Study sites contained typical southern Californian riparian vegetation including tall canopies of Fremont cottonwood (*Populus fremontii)* and Goodding's black willow (*Salix gooddingii)*, sub-stories of arroyo and red willow (*Salix lasiolepis* and *Salix laevigata,* respectively*)*, and mulefat (*Baccharis salicifolia)*. Vegetation classifications follow nomenclatures listed in A Manual of California Vegetation (Sawyer et al. 2009). Lush riparian habitat is abundant throughout the study sites; however, invasive arundo is dominant in many locations of the middle watershed. Other non-native plants found dispersed among the sites include perennial pepperweed (*Lepidium latifolium)*, castor bean (*Ricinus communis)*, poison hemlock (*Conium maculatum)*, and tamarisk (*Tamarix ramosissima)*. Other than natural storm flow, the river's water comes from discharged treated water, urban runoff, very limited natural springs, upwelling in the Prado Basin, and releases from the Seven Oak's and Prado Dams. The river is subjected to heavy human impacts from horseback riding, unauthorized trails, swimming, fishing, paintball gaming, homeless encampments, off-road vehicle use, trash dumping, and a variety of other illegal activities.

Monitored Sites

Monitored sites, for the purposes of this study, are those sites where territories were well-tracked (> 8 visits) and regular nest monitoring occurred. These sites included San Jacinto, San Timoteo Canyon, Mockingbird Canyon, SAR (Riverside Ave. to Van Buren Blvd., Hidden Valley - north and south sides of the river, Goose Creek, Norco to I-15, Norco Bluffs (I-15 to River Rd.), Chino Hills, and SAC (Upper Canyon, Green River Golf Course, and Featherly Regional Park).

San Jacinto

San Jacinto includes two monitored sections: the San Jacinto River from Lake Park Drive to State Street, and the San Jacinto Wildlife Area. Both sites are located within the San Jacinto Valley in Riverside County. The San Jacinto Wildlife Area is managed by the California Department of Fish and Wildlife (CDFW) while the San Jacinto River is managed by multiple land owners and managers. The San Jacinto River contains a number of invasive plant species, primarily tamarisk. To date, SAWA has only removed tamarisk from Mystic Lake. The lands surrounding these sites include upland coastal sage scrub, agricultural land, golf courses, and residential development. Additional development is a continuing threat to these areas.

The riparian zone in the San Jacinto River can be classified as a *Populus fremontii* Forest Alliance (Sawyer et al. 2009), with narrow-leaf willow (*Salix exigua*) and mulefat as co-dominants. This habitat is also interspersed with scattered Goodding's black willow. The dominant invasive plant in the riparian zone is tamarisk. The riparian zone in the San Jacinto Wildlife Area can be classified as a *Salix gooddingii* Woodland Alliance with Fremont cottonwood as a co-dominant. The area is also interspersed with red willow and mulefat. There are few invasive plants in the riparian areas, but perennial pepperweed and Russian thistle (*Salsola tragus*) can be found on adjacent land.

San Timoteo Canyon

San Timoteo Canyon is located near the city of Redlands within the counties of San Bernardino and Riverside. San Timoteo Creek originally contained many invasive plant species, most notably arundo and tamarisk. A program initiated by SAWA removed 239 acres of invasive plants from 1997 to 2001, and continues a maintenance program to control regrowth. Restoration of the native plant community through natural recruitment has taken place throughout the canyon resulting in a healthy riparian under-story, the effects of natural storm cycles notwithstanding. The canyon's immediate uplands contain citrus groves and remnants of over-grazed coastal sage scrub and chaparral. A railroad and a two-lane road border the canyon. Development of portions of the uplands continues to occur. San Timoteo Creek was surveyed from Cooper's Creek to approximately 15 miles (24 km) downstream where the creek becomes channelized.

The entire riparian zone can be classified as a *Salix laevigata* Woodland Alliance (Sawyer et al. 2009), with arroyo willow as a co-dominant. However, the creek is also interspersed with Fremont cottonwood, Goodding's black willow, and mulefat. The dominant invasive plant in the riparian zone is tamarisk. Dominant invasives in the adjacent upland zone are Russian thistle, mustard (*Brassica* sp.) and perennial pepperweed.

Mockingbird Canyon

Mockingbird Canyon is located in the city of Riverside in Riverside County and the arroyo serves as a drainage tributary to the Santa Ana River. The riparian zone can be classified as a *Salix gooddingii* Woodland Alliance (Sawyer et al. 2009), with Fremont cottonwood as a co-dominant. However, the arroyo is also interspersed with red willow and arroyo willow. The dominant invasive plant in the riparian zone is perennial pepperweed with mustard being the dominant invasive in the adjacent upland zone.

Although the reservoir and basin are protected from development at this time, residential development continues throughout Mockingbird Canyon. Damage to the habitat and potential harm to nesting vireos occurs from residents extending their living space out into the arroyo. Most of the adjacent upland habitat will soon be lost and the arroyo is becoming more fragmented by culverts and bridges. The riparian habitat throughout the entire site is continually threatened by OHV's, paintball activity, trash dumping, and other illegal activities. SAWA manages an 11-acre easement in Mockingbird Canyon at Roosevelt St. and Markham St. and will continue to work with local property owners to enhance the canyon's natural resources.

Santa Ana River (SAR) - Upstream

The upstream section extends along the Santa Ana River mainstem from Riverside Ave. in the City of Riverside downstream to Interstate 15 in Norco. The site is divided into four different sections to maintain the historic presentation of SAWA abundance and distribution data. These sections are: Riverside Ave. to Van Buren Blvd., Hidden Valley-north side of river, Hidden Valley-south side of river, and Goose Creek, Norco to I-15. A small portion of the Goose Creek section includes a mitigation area managed by the Inland Empire Resource Conservation District (IERCD). Prior to 2015, these sections of the river were not grouped together as "upstream"; all sites were reported separately. In 2015, the upstream section did not include Goose Creek, Norco to I-15; however, in 2016 a change in funding source now incorporates this area as part of SAR - upstream.

There are a variety of habitat types throughout this section of the Santa Ana River. The riparian zone is classified as a *Salix gooddingii* Woodland Alliance with Fremont cottonwood as a co-dominant (Sawyer et al. 2009). The dominant invasive plant in the riparian zone of SAR is arundo. Other invasive plant species include tamarisk, castor bean, perennial pepperweed, tree of heaven (*Ailanthus altissima*), and various palm species.

Several land managers are engaged in different stages of restoration or mitigation along this portion of the river. The surrounding land use includes commercial and residential properties, recreational trails, parks and golf courses. Within the riparian habitat itself, many large homeless encampments occur which has caused damage (vegetation clearing, trash dumping) to portions of the native habitat.

Norco Bluffs, I-15 to River Rd.

The area referred to as "Norco Bluffs" is comprised of the 3-mile long riparian zone located along the river between Interstate 15 and River Road. The Army Corps of Engineers (hereafter "Corps") considers this area as part of the Prado Basin. Vireos were monitored in select areas within Norco Bluffs, including the addition of a 250-acre parcel previously monitored by the Corps' consultant during the 2015 breeding season. The addition of this habitat precludes the possibility of comparing population level data between 2015 and 2016. Remaining Corps mitigation areas were not in SAWA's scope of work delineated in the Corps contract for the 2016 breeding season and therefore not surveyed (Figure 4).

SAWA removed arundo in the winter of 2006 and 2007 from a 15-acre area located immediately south of Eastvale Community Park. No maintenance or removal was conducted within the area SAWA monitored in 2016. Past construction activities were conducted on the north side of the river by the City of Norco (hereafter "the City") on the east and west sides of Hamner Ave. In the spring of 2011, the City constructed a large, protective stone levee east of Hamner Ave. as a result of damaging floods during the winter of the same year. Construction of the levee resulted in the removal of riparian habitat and noise disturbance to nearby vireo territories. Additional habitat was removed by the City in the spring of 2012 to allow for the widening of Hamner Ave. In the spring of 2015 the City conducted construction activities at a site located in the riparian area approximately 50 yards beyond the end of Old Hamner Rd. No existing riparian vegetation was removed. No construction activities occurred during the 2016 nesting season.

The Norco Bluffs is almost exclusively composed of riparian plant species without adjacent upland. Native species of willow, predominantly Goodding's black willow, dominate much of the landscape, but large swaths are still heavily dominated by invasive arundo. According to A Manual of California Vegetation, the habitat within the Norco Bluffs survey area is classified as a *Salix gooddingii* Woodland Alliance with arundo as a co-dominant (Sawyer et al. 2009). Areas not dominated by mature Goodding's black willow or arundo consist of early successional riparian woodland. These areas are where the river previously changed course and destroyed habitat, which has since regrown. Species in the more recently disturbed areas are

composed of Goodding's black willow, arroyo willow, yellow willow (*Salix lasiandra*), and narrow-leaf willow.

Chino Hills

The fragments of riparian habitat in Chino Hills along Highway 71 have been surveyed annually since 2003. Ten patches of riparian habitat were monitored in Chino Hills, as well as a small ravine off Butterfield Ranch Road, Slaughter Canyon Creek at Butterfield Park, a flood basin at Brookwood Lane and a patch of habitat at Slate Drive. Formerly considered assessment sites, habitat at Soquel Canyon, the Community Park at English Channel, and Rancho Hills were also monitored in 2016. One section adjacent to Butterfield Ranch Road that historically held three territories was lost to development. Most of these locations occur on private property for which access is restricted. According to the A Manual of California Vegetation, the riparian patches in Chino Hills are classified as a *Salix gooddingii* Woodland Alliance (Sawyer et al. 2009).

Santa Ana Canyon

The Santa Ana Canyon (SAC) is located downstream of the Prado Dam to Weir Canyon Road, a distance of approximately nine miles (14 km). Due to the differences in the habitat throughout the canyon, it was divided into three sites: the Upper Canyon, Green River Golf Club, and Featherly Regional Park. The Upper Canyon is located from Prado Dam downstream to the beginning of the Green River Golf Club. The Green River Golf Club covers approximately two miles (3.5 km) of the habitat, and about 4.4 miles (7 km) is in the County of Orange's Featherly Regional Park. This location description and site history discuss the entire SAC.

This site has undergone a variety of impacts in the past decade. The Freeway Complex Fire of November 2008 destroyed habitat for an estimated 43 territories in SAC. However, this did not deter the vireo returning the following spring as expected, with only moderate decreases in 2009 at Upper Canyon and Featherly Regional Park. The Corps riverbank stabilization project (Reach 9) started in the winter of 2009 and 2010 near the western half of Green River Golf Club, removing over 16 acres of mature riparian habitat that survived the fire. This particular project directly affected six territories due to excavations that were needed to reconstruct the riverbed and banks in order to protect the 91 Freeway and adjacent homes. There were additional riparian impacts in the fall/winter of 2011 as the next phase of the riverbank stabilization project got underway further upstream, removing several more acres of mature riparian habitat. In 2014, Phase 3 of the Corps project began and subsequently impacted the habitat of ten more vireo territories. In 2015, no Corps project work occurred during the nesting season in SAC. In 2016, Phase 5 of the Corps project began adjacent to La Palma Avenue in Yorba Linda, impacting nine vireo territories, though habitat was only partially

removed from two territories. Additional disturbances in SAC in 2016 include repeated vegetation removal and grove expansion by the orange grove lessee in Featherly Park and the on-going brine-line project activities in the Upper Canyon and adjacent to the Green River Golf Club.

There is a variety of habitat types throughout SAC. Vireos typically inhabit the riparian zone along the river, but also use the adjacent upland habitats for nesting and foraging. According to A Manual of California Vegetation (Sawyer et al. 2009), the riparian zone is classified as a *Salix gooddingii* Woodland Alliance, with Fremont cottonwood as a co-dominant. The least disturbed adjacent upland is classified as a *Sambucus nigra* Shrubland Alliance. There are several areas adjacent to the riparian habitat that are in various stages of restoration and cannot be classified at this time. Additionally, there are some adjacent areas that are non-native dominant, such as the Green River Golf Club and Chino Hills State Park areas. The dominant invasive plant in the riparian zone is arundo. The dominant invasives in the adjacent upland zone are Russian thistle, mustard, and tocalote (*Centaurea melitensis*). Other invasive plant species in SAC include tamarisk, tree of heaven, castor bean, perennial pepperweed, gum tree (*Eucalyptus* sp.) and Peruvian pepper tree (*Schinus molle*).

Upper Canyon

The Upper Canyon is located adjacent to Highway 91 within the County of Riverside, from downstream of Prado Dam to the northeast edge of Green River Golf Club. This site is the upstream portion of what is considered the Santa Ana Canyon. The Upper Canyon has undergone a barrage of habitat disturbances from native vegetation removal, subsequent restoration, additional vegetation removal and a devastating fire in the last decade. Heavy construction around and just below Prado Dam occurred from 2005 to 2008 and removed habitat for ten territories in 2005. Some of the habitat that was restored after construction is now upland habitat, however other restored riparian habitat is maturing and being used by the vireo. In November 2008, the Freeway Complex Fire destroyed a wide swath of habitat that had held six territories that were not detected in 2009 or 2010 (post-fire). These areas were part of Phase 2A of the Corps riverbank stabilization project which is now complete in the Upper Canyon and restoration activities are ongoing.

Green River Golf Club

The Green River Golf Club is located along the Santa Ana River in San Bernardino, Riverside, and Orange Counties, between the Upper Canyon site and Featherly Regional Park. This site is the middle portion of what is considered the Santa Ana Canyon.

Habitat at the Green River Golf Club has recovered well since the devastating Freeway Complex Fire that swept through the Santa Ana Canyon in November 2008. The Corps Reach 9 bank stabilization project removed almost 16 acres of habitat that was unburned and was occupied by six vireos. The next phase of the Corps project started during the fall/winter of 2011 with several more acres of riparian habitat removed that included mature willow and cottonwood trees that had been spared by the 2008 wildfire. This area supported an additional 13 vireo territories in 2011. The 2010 project phase was roughly 75% complete at the end of the 2012 season with some replanting underway, but the net result for the 2012 season was still a large loss of habitat and construction activities, which most likely contributed to the decline in vireo activity that season. In 2014, no additional habitat was removed. However, construction continued adjacent to occupied habitat upstream of the railroad bridge in the beginning of the nesting season. On May 1 of that season, a vireo nest was found within 100 feet of construction activities that were moving toward the nest. The Corps and the United States Fish and Wildlife Service (USFWS) were both notified immediately, but work continued toward the nest. By the next week the nest had been abandoned with two eggs. Subsequently, other vireo nests were found near construction activities and work eventually stopped in this area for the rest of the 2014 season. There were no Corps related construction activities at this site during the 2015 and 2016 nesting seasons. The Riverside County Santa Ana River Interceptor (SARI) Line project on the west side of the golf course impacted a small area in Lower Aliso Canyon. Although there was one vireo territory at this location in past years, none were documented in 2016.

Featherly Regional Park

Featherly Regional Park is located along the Santa Ana River, between the west end of the Green River Golf Club and the Yorba Linda Blvd./Weir Canyon Rd. bridge in the County of Orange. This site is the downstream portion of what is considered the Santa Ana Canyon.

The Santa Ana River Trail and Bikeway runs adjacent to the park. Public access is restricted; however, there is no fencing to deter entry into the riparian habitat. Phase 3 of the Corps reinforcement project began in 2014. Habitat was removed on both sides of the river, upstream from the Canyon RV Park. Additional riparian die-off has occurred in the surrounding area due to the project-related river diversion. Restoration is now in progress for this phase of the Reach 9 Project. Phase 5 of the Reach 9 project began in 2016 and continued throughout the nesting season. Due to access limitations and high noise levels, vireos near this project were not closely monitored. Preparations for the next phase of this project, downstream of Coal Canyon began late in the 2016 season. Vegetation in this area was prematurely removed from several vireo territories. It is unlikely that any vireo nests were disturbed by this activity since all

closely monitored vireos in SAC were no longer nesting at this time. However, many resident avian species still had active nests that may have been impacted.

Sampled Sites

Sampled sites, for the purposes of this study, are sites that were surveyed at least three times throughout the season. Only incidental nest monitoring occurred. The purpose of these surveys was to gather vireo abundance (territory, pair and fledgling) and distribution data.

Temescal Canyon

Temescal Canyon is approximately 26 miles (42 km) long and located along Interstate 15 between Lake Elsinore and Highway 91. Survey areas include Railroad Canyon, Lake Elsinore, and Temescal Wash. The wash extends from Lake Elsinore downstream to two miles upstream of the intersection of Magnolia Avenue where it becomes channelized and flows into Prado Basin.

SAWA has monitored vireo in Temescal Canyon since 2001 when it began its arundo removal program. Temescal Wash is currently being managed for arundo regrowth and native vegetation has been allowed to reestablish. Five biologists covered the canyon over three visits in 2014, 2015, and 2016 with the goal of documenting an accurate territory count and as much data on reproductive status as time allowed.

Temescal Canyon habitat is characterized by patchy, but dense riparian vegetation. Privately owned sand and gravel mines operate downstream adjacent to the creek. A commercial fishing lake is located near the middle section of the wash. Areas of complete channelization without riparian habitat occur downstream of Lake Elsinore and the most downstream section of the wash. Many sections of the wash are channelized by riprap and berms, but still allow some meandering for quality riparian habitat. According to A Manual of California Vegetation, the riparian zone in Railroad Canyon and the wash downstream of Lake Elsinore is classified as a *Salix gooddingii* Woodland Alliance (Sawyer et al. 2009). The riparian habitat surrounding Lake Elsinore is dominated by *Tamarix* spp. Semi-natural shrubland stands also occur with patches of sparse Goodding's black willow. Although SAWA has been effectively treating arundo since 2000, tamarisk has now become a dominant exotic throughout the wash, especially in areas surrounding Lake Elsinore.

Incidental Sites

Incidental sites, for the purposes of this study, are those sites that were surveyed on one or two visits and no nest monitoring occurred. Sites were visited in an attempt to obtain

numbers for territory, pairs, and fledgling abundance. See Appendix A for a complete listing of GPS coordinates for all sites.

Vireo Monitoring

The primary purpose of surveys at monitored sites was to locate all vireos and willow flycatchers to determine their breeding status and enhance their breeding output through management. Potential habitats were carefully and slowly traversed along the edges and open trails. The vegetation communities in areas of detection, including dominant native and exotic vegetation species, were recorded. All vireos encountered were noted as to location, behavior, reproductive status, etc. GPS coordinates were taken in the core area of the territory (approximate center) if accessible. The extent of the territory was often not known for birds observed only a few times during the season, therefore coordinates for those territories were placed where the birds were observed. Each point denotes a territory, not just a sighting. Nest locations were not marked with a GPS. Territory size range was estimated for monitored sites. Additional data for each territory, if applicable, can be found in the attributes linked to each point. Attributes are as follows: unique ID, notes, survey location, surveyor name, agency, category (monitored/ sampled/incidental), breeding status, GPS location (nest or approximate middle of territory), fledged (y/n), number fledged, and parasitism (y/n). A complete attribute table with detailed metadata was submitted with the shapefiles to the Corps and USFWS. Banded vireos are reported annually to Barbara Kus of the U. S. Geological Survey (USGS) and the appropriate agencies. Surveys were conducted five days per week throughout the nesting season (March through August). Occasional visits to determine continued vireo presence occurred through August. Surveys were conducted during periods of clement weather. Nest visitation and monitoring were avoided during conditions of very high winds, extreme cold, or other climatic factors that could influence survey results or cause disturbance to nesting birds. Survey dates and times were variable depending on a pair's reproductive stage. In areas subject to parasitism, nests were visited once every seven to eight days to check for cowbird eggs. Cowbird eggs and nestlings were removed from nests. No playbacks of taped vocalizations were used during any surveys.

Survey techniques and data analysis follow Pike et al. (1999). Successful nesting is defined as fledging at least one chick per nest. Depredation is defined as the loss of all eggs or nestlings in a nest. Only pairs for which nests were located, who were observed nest building, or were observed with fledglings were considered breeding pairs. Two estimates of fledgling production are given: the number of fledglings observed, which is the minimum total number fledged, and the projected number of fledglings estimated by determining the average number of fledglings produced by well-monitored pairs and ascribing that productivity to all pairs. Well-

monitored pairs are defined as those visited frequently enough to document the outcome of all breeding attempts during the season. This usually meant an effort of at least five visits per nesting attempt, several of which were needed to check for fledglings.

In addition to the standardized annual data collected above, the USFWS asked SAWA to analyze additional nesting parameters after early anecdotal sightings suggested atypical nesting behavior in the Santa Ana Canyon this year. In an attempt to quantify possible reproductive distress, the following data was taken into account in SAC only: days between first observed nest-building and first observed eggs laid, as well as eggs laid versus eggs hatched. Nests included in the observed nest-building versus egg-laying dataset were only those nests found during the building stage and eggs were subsequently observed. Nests used for eggs laid versus eggs hatched were only nests that were not depredated during incubation and survived to hatching.

In addition to vireo data, a complete list of wildlife species detected on-site is provided with sensitive species noted. Listed and sensitive species found were reported to the appropriate agencies. GPS points were taken for cowbirds detected in vireo habitat. Migrant willow flycatchers were documented in conjunction with visual and auditory searches for vireos and other species. Field biologists worked under the direction of the Principal Field Investigators and all surveys and nest manipulations were performed under, and in compliance with, all terms and conditions of Federal Endangered Species Permit #TE-839480-4 and a Memorandum of Understanding with the CDFW.

Brown-headed Cowbird Trapping

In 2016, thirty-nine cowbird traps were deployed in or near riparian habitat in drainages throughout the watershed in addition to six deployed at dairy farms, for a total of 45 traps (Figure 3). The Corps and the USFWS funded 28 habitat traps and six dairy traps. The SAWA/IERCD Reach 3B project funded seven traps in San Timoteo Canyon and the remaining four traps were contracted. All of the traps were opened by mid-March and closed by July 29.

Traps are designed after modified Australian crow traps. The cage is constructed out of wood and covered in wire mesh, then fitted with shade cloth on the top of the trap to provide shade for the birds. Ideal trap locations are in accessible open areas near riparian habitat, or near feeding areas such as stables and dairies. Most traps are placed in areas inaccessible to the general public to protect the trap from vandalism. Traps were kept free from weeds and vegetation, and labeled with signs identifying the purpose of the trap as well as SAWA contact information. Consequences for tampering with the trap, according to the Migratory Bird Treaty Act, were also specified on these signs.

Trapping procedures followed the "Santa Ana Watershed Association and Orange County Water District Cowbird Trapping Protocol" (Tenant et al. 2008). Each trap contained a food bowl, one-gallon water dispenser, a large paint tray for use as a bath, and perches. Cowbirds were fed with a basic millet seed mixture. Field assistants were hired and trained by SAWA biologists to perform daily maintenance, safely handle birds, and properly identify and release non-target species. Non-target species were released at the beginning of the check to minimize stress. Due to new permit conditions, dated August 8, 2014, SAWA is now required to dispatch all European Starlings *(Sturnus vulgaris)* and House Sparrows (*Passer domesticus*) caught in the traps. Since starlings require a different type of food and don't survive well in the traps, this permit condition required additional resources in supplies, time, and effort where these birds congregated and may hamper trapping of cowbirds. Due to these extenuating circumstances, some of these non-native species were released to avoid unnecessary distress to the birds.

Datasheets record non-target species, number of cowbirds in the trap (males, females, and juveniles), and number of cowbirds removed. Hatch-year birds were considered "juveniles" even as their adult coloring started to show. Traps were inspected daily for structural integrity. Assistants were in constant contact with their supervising biologist for quick resolution of any problems.

Traps were baited with male and female cowbirds that were captured over the winter. The ratios used were two males to three females for smaller habitat traps, and two males to five females for larger habitat traps. Large traps placed on dairies were typically baited with five males to nine females. The flight feathers on each cowbird were trimmed so they were more likely to return to the trap if they escaped. A lock was placed on the trap to prevent unauthorized access. Removed cowbirds, starlings, and House Sparrows were transferred to a licensed falconer for dispatch or temporarily housed in a holding trap until the falconer could collect the birds. Holding traps contained extra food and water containers and were closed to entry by additional birds. If applicable, banded cowbirds were reported to the U.S. Bird Banding Laboratory, but only banded males were released. At the end of July, birds were removed from all of the traps and food and water was removed. Trap entry was closed and the door locked open to prevent unintended captures. SAWA's field technicians collected traps after they had been closed.

RESULTS

Vireo Abundance

In 2016, SAWA documented a total of 1,070 vireo territories, including 497 known pairs and 659 known fledglings at all sites (Table 1 and Figure 5). OCWD reported an additional 511 territories in Prado Basin (Bonnie Johnson, personal communication, October 11, 2016). Another 42 territories were reported by other cooperating agencies for a total of 1,623 vireo territories watershed-wide. Since survey efforts were increased in 2016, watershed-wide abundance is not comparable to last year's 962 territories reported by SAWA. SAC and Temescal Canyon are the only two sites that had the same effort as compared to the prior year. Biologists documented 123 vireo territories in SAC and 93 vireo territories in Temescal Canyon. Abundance in SAC increased by 2% (n = 121) from 2015, and abundance in Temescal Canyon decreased dramatically by 24% (n = 123) from 2015 (Table 1).

In 2015, the upstream portion of SAR, which then consisted of only three sections (Riverside Ave to Van Buren Blvd, Hidden Valley North and Hidden Valley South), was only sampled (≥ 3 visits) and in 2016 these sites were regularly monitored (> 8 visits). Two-hundred seventy territories were detected in 2016 within this section, an increase of 7% (n=252) from 2015. A majority of this increase was seen in Hidden Valley South with 121 territories detected, an increase alone of 16% (n=104) from 2015 (Table 1). San Timoteo Canyon and SAR-Goose Creek, Norco to I-15, both had a slightly reduced monitoring effort in 2016 and experienced a 2% (n=176) and 11% (n=71) decrease from 2015, respectively. In 2016, increased monitoring efforts occurred at San Jacinto, Mockingbird Canyon, Norco Bluffs (I-15 to River Rd., non-mitigation) and Chino Hills. San Jacinto, which was only surveyed once in 2015, had 37 territories observed in 2016. Both Mockingbird Canyon and Chino Hills had a decrease in observed territories from 2015; a 32% decrease in Mockingbird Canyon and a 25% decrease in Chino Hills. A 250-acre parcel was added to Norco Bluffs (I-15 to River Rd, non-mitigation) in 2016 and areas previously inaccessible in prior years were able to be monitored. This site had a 110% increase from 2015, due mostly to the increase in survey area. In 2015, most sampled and incidental sites were either not surveyed or visited once at the end of the season when detectability is typically low, therefore there was a reported increase of 148% from 2015 with 205 territories observed in 2016 (Table 1).

Over 4,000 hours were spent in 2016 for the vireo management program during the season March 1 through August 31. Over 2,400 field hours were spent on vireo surveys at monitored sites (Table 2). Approximately 3,300 hours were spent on vireo management for the

USFWS/Corps Mainstem Project. Forty hours were spent at Norco Goose Creek mitigation area and 475 hours were spent in San Timoteo Canyon (Reach 3B).

Chronology of Breeding Activity

Surveys at monitored and sampled sites began between March 1 and April 11. Surveys ended between July 20 and August 23. The first vireos were detected on March 16 at San Jacinto, San Timoteo Canyon, SAR (Riverside Ave. to Van Buren Blvd and Goose Creek to I-15), and SAC. The earliest date for the arrival of 50% of the subpopulation at monitored sites was on March 29 at SAR (Hidden Valley, north side of river), Norco Bluffs and Green River Golf Club. The earliest date for 50% paired was April 12 at SAR Goose Creek to I-15. The first nest was found on March 29 at SAC and the last nest was found on July 18 in Chino Hills. The first fledging occurred on April 29 at San Timoteo Canyon and the last fledgling occurred on July 28 at SAR-Riverside Ave. to Van Buren Blvd. (Table 3).

Nesting Site Preferences

Nesting site preferences followed parameters previously documented by other observers (Pike et al. 1999). Nests were found mostly in riparian vegetation, near water, along dirt trails or roads, and on edges of riparian habitat. Three species of willow dominated the nest placement preference for vireos with 47% (97/206) of nests in 2016. Arroyo willow was the most preferred of the willows holding 22% of nests (46/206). Mulefat held 27% (55/206) of nests (Table 4). Other preferred nest-host species in 2016 included desert wild grape (*Vitis girdiana*) (8%), blue elderberry (*Sambucus nigra caerulea*) (4%), and Fremont cottonwood (3%).

Other vegetation used by vireos in the watershed included laurel sumac (*Malosma laurina*), wild rose (*Rosa californica*), golden currant (*Ribes aureum*), matilija poppy (*Romneya coulteri*), and poison oak (*Toxicodendron diversilobum*) (Appendix B-2). This suggests that Least Bell's Vireo will use a variety of vegetation for nesting in an otherwise suitable riparian area. The use of non-traditional riparian vegetation for nesting by vireos supports the need for careful monitoring of all plants during the nesting season.

Reproductive Success

Reproductive success, as measured by productivity of well-monitored pairs, was 2.6 watershed-wide in 2016 (Table 5). This rate represents a small decrease from 2.8 in 2015. Nesting success was 52% (94/180 well-tracked nests), a slight decrease from 55% (103/188) in 2015. Average clutch size was 3.4 based on 180 nests (Appendix B-3). See Appendix C for individual site data over time.

San Timoteo Canyon and SAC had similar monitoring efforts in both 2015 and 2016. San Timoteo nesting success decreased from 58% in 2015 to 51% in 2016. This also represents a decrease when compared to the historical nesting success of 57% for this site from 2001-2016. Nesting success in SAC was only 36% overall, a 10% decrease from 2015 and 33% below the historical 54% nesting success for this site from 2001-2016 (Appendix C-3).

Predation Rates

Nests are assumed depredated if all eggs or unfledged young were destroyed or removed. In 2016, the overall depredation rate was 41% (74/180 well-tracked nests). Rates varied among sites (Table 5). At sites with more than five well-tracked nests, rates varied between 17% and 75%. Historically, nest loss due to depredation is 33% watershed-wide (Appendix B-3). Most nest losses were due to unknown predators. In 2016, several nests at multiple sites were observed covered in ants with eggs or dead nestlings. At Mockingbird Canyon and San Timoteo Canyon, vireos were observed scolding California Scrub-jays (*Aphelocoma californica*) in the vicinity of nests. A vireo was observed scolding a Greater Roadrunner (*Geococcyx californianus*) at the Meridian Conservation Area in the vicinity of a nest. This nest was not well-monitored, but was gone by the next site visit, presumably depredated. Other suspected nest predators include the American Crow (*Corvus brachyrhynchos*), Common Raven (*Corvus corax*), long-tailed weasel (*Mustela frenata*), raccoon (*Procyon lotor*), and snakes. These species occur at most sites throughout the watershed.

Feral pigs (*Sus scrofa*) are another potential predator. This species occurs in high numbers in San Timoteo Canyon and the upstream portion of the Santa Ana River. Isolated sightings have been made in other areas throughout the watershed. Feral pigs are extremely disruptive to habitat by creating wallows, possibly trampling or knocking over nests, and eating a wide range of vegetation and animals.

Brown-headed Cowbird Parasitism

In 2016, 3% (6/180) of tracked nests were parasitized by cowbirds, all from the San Jacinto Wildlife Area. Two of these nests were still successful after the biologist removed the cowbird egg (manipulation) and successfully fledged six vireos (Table 5). The watershed-wide parasitism rate has ranged from 2% to 5% in the last five years, and overall nest loss due to parasitism has ranged from 0% to 3% during that time (Appendix B-3). The criteria for judging nest failure due to parasitism is the loss or abandonment of vireo eggs in the presence of a cowbird egg or nestling. Since SAWA began nest monitoring, 202 nests have been manipulated, 95 of which successfully fledged 204 vireos (Appendix B-3).

A minimum of 3,700 hours were spent on the Brown-headed Cowbird management program from March 1 through August 31, 2016 including over 2,600 field hours. Thirty-two hundred hours were spent on cowbird management for the USFWS/Corps Mainstem Project including over 2,000 field hours. Over 400 hours were spent at San Timoteo Canyon, 75 at the Meridian Conservation Area, and 130 at Chino Hills English Channel. Included are 250 hours spent on trap maintenance after the 2016 season.

Approximately 1,160 field hours were spent on winter trapping in Prado Basin dairies, a Santa Ana Canyon horse stable and a Temescal Canyon dairy from August 2015 through March 15, 2016. The SAC horse stable and a dairy in Prado Basin were closed when they proved unproductive. Two other dairy locations in Prado Basin were opened as replacement sites.

Repaired Nests

No nests required repair in 2016. Since SAWA has managed vireo nests in the watershed, 34 nests have been repaired and 70 young have fledged from those nests (Appendix B-3).

Results and Discussion by Site

Monitored Sites

San Jacinto

In 2016, 37 vireo territories were documented in San Jacinto, five of which were in the wildlife area and the remaining 32 territories in the river. This site was only surveyed once in 2015, but this is a 29% decrease from 2014. In previous years, this area has been monitored inconsistently due to funding and staff availability. This year, the population in the San Jacinto Wildlife Area was heavily monitored, with intensive nest searching. Despite differential monitoring over the years, the population at these sites has increased over sixteenfold from three territories in 2004 when SAWA began monitoring. This increase can likely be attributed to nest monitoring and cowbird management in the area. In 2016, estimated territory size of vireo in San Jacinto ranged between 0.4 to 3.3 acres.

Seventeen pairs and 12 fledglings were detected in 2016 (Table 2). Only the wildlife area was monitored for nesting success, which was 25% in 2016. Nest losses were primarily due to predation (63%), but 13% were also loss due to parasitism (Table 5). Five well-monitored pairs had a 1.2 reproductive success rate and produced six fledglings. Nesting success is 51% over 10 years of monitoring (n=102 well-tracked nests), ranging from a low of 0% in 2014 (n=1) to a high of 100% in 2010 (n=3). Depredation has been the major cause of nest loss in the last 12 years

(38%). Reproductive success based on productivity of well-monitored pairs in the last 12 years is 2.7 and has ranged from a low in 2011 of 0.0 to a high of 4.5 in 2008. Narrow-leaf willow (49%) and mulefat (31%) have been the primary plant species used for nest placement in San Jacinto since 2004 (Table 4). Goodding's black willow and coyote brush (*Baccharis pilularis*) held another 8% and 4%, respectively. Only three nests found from 2004-2016 were placed in non-native vegetation.

Cowbird trapping has occurred in San Jacinto since 2003 (excluding 2015) and a total of 11,757 cowbirds have been removed during this time (Appendix C-1-A). Parasitism has occurred sporadically over the years, including the 2016 breeding season. During 2016, 75% of well-tracked nests were parasitized by cowbirds; two of these nests were successful after the cowbird egg was removed, fledging six young. In addition to parasitized vireo nests, many cowbirds were observed in the habitat throughout the breeding season. At least four cowbird fledglings were observed in the habitat, including one being fed by a Yellow Warbler (*Setophaga petechia*).

Current threats to the riparian habitat primarily involve human encroachment. All-terrain vehicle activity takes place in the riverbed throughout the year. People also use the surrounding area to dump garbage, some of which ends up in the habitat. Adjacent to State Street, there are now several homeless camps in the habitat, which brings refuse as well as vegetation clearing to build the camps. A couple of vireo territories were located in these areas in previous years, but the area was not monitored in 2016 due to safety concerns. The San Jacinto Gateway development project poses potential future impacts to the San Jacinto River habitat. This development is planned for the intersection of Sanderson Avenue and Ramona Expressway. Before the development can be approved, improvements must be made to the levee, including an extension about a mile and a half upstream of State Street, and downstream of Sanderson Avenue. A final environmental impact report for the levee improvements was issued in May 2015 and does include mitigation for impacts to vireo, including the creation of habitat within the corridor of the project area. Ongoing drought conditions have also impacted the habitat within the river, with many trees in the upstream portion showing severe stress. The wildlife area is regularly irrigated and is not showing stress from drought. However, the area is impacted by human activity, primarily recreational bird watching and seasonal hunting.

San Timoteo Canyon

In 2016, 173 vireo territories were documented in San Timoteo Canyon, down 2% from the 176 documented in 2015. A possible reason for this decrease could be that a less intense survey effort was undertaken in 2016. However, the population in San Timoteo has experienced

a greater than 30-fold increase in 16 years. This increase can be attributed to the removal of invasive species and subsequent restoration of native vegetation, nest monitoring, and cowbird management. In 2016, estimated territory size of the vireo in San Timoteo ranged between 0.3 to 1.9 acres.

One hundred twenty-four pairs and 222 fledglings were detected in 2016. Nesting success was 51%, down from 58% in 2015 but similar to 48% in 2014. Nest losses were primarily due to depredation (42%). Thirty-nine well-monitored pairs had a 3.1 reproductive success rate, similar to 3.2 in 2015. Nesting success is 56% over 16 years of monitoring (n=884 well-tracked nests), ranging from a low of 29% in 2004 (n=31 nests) to a high of 100% in 2001 (n=4 nests). Depredation has been the major cause of nest loss in the last 16 years (35%). Overall reproductive success based on productivity of well-monitored pairs in the last 16 years is 2.9 and has ranged from a low in 2004 of 0.8 to a high of 3.9 in 2009. Mulefat (28%), arroyo willow (21%) and red willow (16%) have been the primary plant species used for nest placement in San Timoteo since 2001. Goodding's black willow and desert wild grape held another 8% and 7%, respectively. Only nine nests found from 2001-2016 were placed in non-native vegetation (n=924 nests).

Cowbird trapping has occurred in San Timoteo Canyon since 2001, and a total of 2,475 cowbirds have been removed during this time. As in 2015, no parasitism occurred in San Timoteo in 2016. In 2014, five of 88 well-tracked nests (6%) were parasitized by cowbirds; two nests successfully fledged vireo after nest manipulation, one nest failed due to predation after removal of the cowbird egg, and two were abandoned (one before nest manipulation and one after). In 2013, two of 76 well-tracked nests (3%) were parasitized however neither nest failed due to parasitism; one nest was successful after removal of a cowbird egg and the second failed due to depredation after removal of the egg. These low rates remain a marked decrease from a high of 75% in 2001. Although parasitism by cowbirds still occurs, at a rate of 14% over sixteen years (114 of 844 nests), only 3% of nests have failed due to parasitism. This low failure rate is primarily a result of intensive nest monitoring efforts which include nest manipulation.

Although the riparian area is protected under existing laws, residential and utility development continues in San Timoteo Canyon. Current threats to the riparian habitat include removal of vegetation by landowners, human encroachment (i.e. paintball and all-terrain vehicle activities), and domestic sheep and cattle grazing. Feral pigs continue to disturb the habitat throughout the canyon. Another potential threat to the habitat is the reduction in volume of surface water discharge into San Timoteo Creek. A local water district began the phased reduction of 3 million gallons per day (mgd) of tertiary-treated discharge to the creek in the Fall/Winter of 2012. Hydrology and water use studies were conducted to identify the

amount of discharge necessary to maintain existing riparian conditions in the creek and studies determined that discharge could be cut to 1.6 mgd. A Habitat Management Plan was established which calls for management (i.e. increasing discharge to the creek) if a decline in native riparian cover or an increase in non-native invasive species is detected.

Mockingbird Canyon

In 2016, 25 vireo territories were detected in Mockingbird Canyon, a 32% decrease from the 37 territories in 2015, but this is most likely due to a reduced monitoring effort. Seven pairs and 11 fledglings were detected (Table 2). Three nests were found, two of which were successful (67%). Measures of reproductive success have varied over the years due in part to differential monitoring efforts. Since 2003, overall success rate of well-tracked nests is 53% (83/156) and 426 vireo fledglings have been documented during this time (Appendix C-3-E).

When monitoring began at this site, nest parasitism was high, with eight out of 13 well-tracked nests parasitized (62%) and four of those nests failing as a result (32%) (Appendix D). Beginning in 2003, an intensive cowbird management program was initiated. The parasitism rate decreased sharply after this program began. Parasitism continues to occur episodically, but seems to be controlled. Since 2003, a total of 1,967 cowbirds have been removed from Mockingbird Canyon. This year there was no documented nest parasitism or detection of cowbirds in the habitat.

Despite SAWA's efforts within the easement, habitat destruction and disturbance still takes place at Mockingbird Canyon. In 2016, a huge portion of habitat was removed along the north strip of land behind the homes off Owl Tree Rd., just west of SAWA's easement site. Although this area is not part of the easement it has historically had vireo nesting activity. This disturbance may have impacted or greatly stressed nesting birds that were on site. In addition, the possibility of Cal Fire beginning a fuel modification project on site may put the number of vireo territories in the area at risk.

Santa Ana River (SAR) - Upstream

Prior to 2015, data from the four sites grouped into the SAR-Upstream section were reported separately. In 2015, the upstream section did not include Goose Creek, Norco to I-15; however, data from all four sites has been incorporated in this overall summary for comparison. Individual site data is discussed below.

In 2016, 333 vireo territories were documented, up 3% from the 323 documented in 2015. Vireo abundance has increased throughout the upstream section since monitoring began in 2000, and may be attributed to the removal of invasive vegetation as well as vireo nest

monitoring and cowbird management. In 2016, estimated territory size of vireo in SAR-Upstream ranged between 0.4 and 3.1 acres. Differential nest monitoring efforts have been undertaken since 2000. In 2016, reproductive success for SAR-Upstream was 63% (n=54 well-tracked nests), similar to the overall of 66% from 2000-2016. Nest losses in 2016 were primarily due to depredation (33%). No nests were parasitized by cowbirds in 2016; however, three nests found incidentally in 2015 were parasitized. Since 2000, the overall parasitism rate is 8% (Appendix C-3).

Mulefat (32%) and arroyo willow (30%) have been the primary plant species used for nest placement in the upstream section of the Santa Ana River since 2000 (n= 703 nests). Goodding's black willow held another 12%. Only six nests found from 2000-2016 were placed in non-native vegetation.

Cowbird trapping has occurred in SAR-Upstream since 2000 and total of 1,995 cowbirds have been removed during this time (Appendix C-1). In 2016, five traps were located in this section of the river and a total of 77 cowbirds were removed over 670 trap days (Table 6).

SAR - Riverside Ave. to Van Buren Blvd.

In 2016, 109 vireo territories were documented along the Santa Ana River from Riverside Ave. to Van Buren Blvd., the same number as documented in 2015. Prior to the start of the 2016 nesting season, Riverside County Flood Control conducted routine mowing of vegetation from Riverside Ave. to Mission Blvd. This mowing was anticipated to disrupt the overall success of vireo in this section. While there was a decline in vireo territories in the immediate area of mowing, the overall survey site did not see a decrease in territories suggesting they shifted to new areas downstream.

Forty-three pairs and 62 fledglings were detected in 2016 (Table 2). Nesting success was 83%, but not comparable to 2015 as nest monitoring did not occur that year, with the exception of three nests that were observed incidentally to have been parasitized by Brown-headed Cowbirds. Nest losses in 2016 were due to depredation (17%) and seven well-monitored pairs had a reproductive success rate of 4.0. Mulefat (30%), arroyo willow (28%), and Goodding's black willow (9%) have been the primary plant species used for nest placement in this section of the Santa Ana River since 2000 (n= 142 nests). Only two nests found from 2000-2016 were placed in non-native vegetation. While efforts are made to ensure all territories and pairs are accounted for, the dangers in some parts of the river (e.g. homeless camps) limit the number of areas that can be safely monitored.

Brown-headed Cowbird trapping has occurred on public land, private business and residential properties since 2002. Trapping data can be found in Table 8 and Appendix C-1-F. In 2016, two large flocks of cowbirds were observed in close proximity to one another (separate shape file); this is a drastic change in the presence that was observed throughout the entire site in 2015. In 2015, three nests were observed to have been parasitized by Brown-headed Cowbirds. One nest was successful after removal of a cowbird egg and the other two failed due to predation and reproductive failure respectively. In 2016, no parasitism was observed in the 12 well-tracked nests.

SAR - Hidden Valley - North (north side of river)

Forty territories were documented in 2016, an increase of one territory from the 39 documented in 2015. Twenty-seven pairs and 33 fledglings were detected on the north side in 2016 (Table 2). This area flooded during the winter of 2010-2011 and much of the acreage was scoured. However, native vegetation is returning to the scoured area and SAWA's control of non-natives in some areas has also helped to restore native vegetation.

Differential nest monitoring efforts have occurred at this site since 2010 (Appendix C-3-G). In 2016, nesting success was 60% (n=5 well-tracked nests) and is similar to the overall of 59% over three years of monitoring (2010, 2014, 2016). Depredation and parasitism have been the major causes of nest loss (both 18%); however, parasitism has not been documented at this site since 2010. Overall reproductive success based on productivity of 13 well-monitored pairs over three years of monitoring is 2.5 and has ranged from a low of 2.0 in 2014 to a high of 3.7 in 2016. Mulefat (38%) has been the primary plant species used for nest placement in this section of the Santa Ana River (Appendix C-2-G). None of the 21 nests found have been placed in non-native vegetation.

SAR - Hidden Valley - South (south side of the river)

In 2016, 121 vireo territories were documented in Hidden Valley-South, an increase of 16% from the 104 vireos documented in 2015. Over the years, the number of vireo documented has been increasing in this area. Part of the documented increase this year can be attributed to an increased effort in this portion of the watershed. Overall, the number of territories in this area has increased 102% from 60 in 2010.

Sixty-six pairs and 97 fledglings were detected in 2016 (Table 2). Nesting success was 75% for 16 well-tracked nests (Table 5). Nest monitoring did not occur at this site in 2015 but nesting success has been 66% overall since monitoring began in 2000 (n=147 well-tracked nests). Since 2010, nesting success has ranged from a low of 41% in 2010 (n=17) to a high of

88% in 2013 (n=8). Nest losses in 2016 were primarily due to depredation (25%). Reproductive success based on productivity of well-monitored pairs over 14 years is 2.6, and since 2010 has ranged from a low of 2.1 in 2010 to a high of 3.4 in 2011. Arroyo willow (34%), mulefat (29%), and Goodding's black willow (11%) have been the primary plant species used for nest placement in Hidden Valley-South since 2000 (n=173) (Appendix C-2-H). Red willow and desert wild grape held another 8% and 7% of nests, respectively.

Prior to 2015, SAWA had conducted cowbird trapping in Hidden Valley-South, and removed a total of 708 cowbirds. Starting in 2015, the Riverside County Regional Park and Open Space District began trapping cowbirds at this site. Parasitism at Hidden Valley-South is low, with a rate of 6% (n=147 nests) overall since 2000. Parasitism has not been documented in this area since 2011 when 20% of well-tracked nests (n=10) were parasitized. In 2010, only 6% of vireo nests (n=17) were parasitized. Cowbirds were not observed in the habitat during vireo monitoring this season.

SAR - Goose Creek, Norco to I-15

In 2016, 63 vireo territories were documented along the Santa Ana River from Goose Creek, Norco to I-15, as well as thirty-one pairs and 45 fledglings (Table 2). Nesting success for 21 well-tracked nests was 43%. Nest losses were due to depredation (52%) and unknown causes (5%). The productivity of well-monitored pairs was 1.6 (Table 5). Nest placement occurred primarily in arroyo willow (41%) and mulefat (36%) (Table 4).

In 2016, 16 of the 63 vireo territories were documented within IERCD's mitigation area, including nine pairs and 12 fledglings. Nesting success for six well-tracked nests in the mitigation area was 50%. Nest losses were due to depredation. The reproductive success rate of well-monitored pairs was 1.5. Arroyo willow (83%) was the primary choice for nest placement within the mitigation area.

Brown-headed Cowbird trapping has occurred in Goose Creek, Norco to I-15 since 2004. Trapping data can be found in Table 8 and Appendix C-1-I. Five hundred sixty-eight cowbirds have been removed from this area over 2,679 trap days. Parasitism has occurred on the site in seven out of the 16 years surveyed. No cowbirds were detected in the habitat and no nest parasitism was documented during the 2016 nesting season.

At this time, work is continuing on a residential development adjacent to the northern edge of the riparian habitat. Potential risks to the vireo habitat from this development are the unauthorized removal of vegetation for additional equestrian trails, dumping, noise and other

human related disturbances. Continued active management of this area will maintain optimum conditions for its native species.

Norco Bluffs, I-15 to River Rd.

In 2016, a total of 63 vireo territories were detected in the area monitored by SAWA. Twenty eight were known to be paired and 45 fledged young were documented (Table 2). A total of 12 nests were found, all of which were well-tracked. Nesting success of well-tracked tracked nests was 58% in 2016, an 11% decrease from the 69% in 2015. The average reproductive success rate also decreased from 3.7 in 2015 to 3.0 this season, while the average clutch size of 3.4 remained the same across both years. Of the 12 well-tracked nests, 33% (n=4) were lost due to depredation, compared to 15% (n=2) in 2015. In 2016, one (8%) nest failed due to reproductive failure, compared to two (15%) in 2015 (Appendix C-3-J). No tracked nests were lost due to parasitism. Size of vireo territories ranged from approximately 0.6 to 2.8 acres.

SAWA did not conduct cowbird trapping at this location because a different contractor had previously been retained by the Corps to trap this area. Cowbirds were detected in vireo habitat on four occasions over the course of the season (see separate shapefile for coordinates). Three of the four detections occurred in the riparian areas just east and west of Hamner Ave.; a singing male on April 5 and lone females on April 13 and May 20. The fourth detection was of another female near the start of Southern California Edison access road off of Bluff St. on April 25.

The primary sources of habitat degradation this past season were invasive plants and the recent spread of a new pest insect, the polyphagous shot hole borer (PSHB). This beetle drills into trees and brings with it a pathogenic fungus (*Fusarium* sp.) that can infect, and kill, many different tree species. PSHB has been detected throughout a majority of the Norco Bluffs survey area, but due to the recent nature of its spread, has yet to cause a large scale dieback of habitat. However, the rapid and significant decline in health of riparian habitat, as observed in the Tijuana River Valley (Boland 2016), from PSHB infestation is a significant concern for the future of the habitat in Norco Bluffs. Previous to the arrival of PSHB, the Norco Bluffs habitat was characterized as healthy where arundo has yet to become dominant, but some significantly large areas are completely dominated by arundo and provide little habitat value to native wildlife. In addition to arundo, there is a relatively small, yet highly dense, stand of mature Mexican fan palm (*Washingtonia robusta*) that appears to have a rapid rate of recruitment. The understory within the stand of palms consists primarily of younger palms with no significant presence of native plant species. Much like the arundo, the palms provide relatively low-quality habitat compared to the surrounding areas dominated by native plant species. Assuming not all

of the plants are killed by PSHB, removal of the arundo and palms would allow for passive recruitment of the native riparian plant species, thereby dramatically increasing the total area of functional habitat for vireo and other sensitive species.

Chino Hills

In 2016, 18 territories, 11 pairs, and 10 fledglings were documented in Chino Hills (Table 2). This count represents a 25% decrease from the 24 territories detected in 2015. Two nests were monitored in 2016. One nest was successful and the second failed due to reproductive failure. No parasitism was documented on site. In 2016, estimated territory size of vireo in Chino Hills ranged between 0.3 and 0.9 acres.

Two cowbird traps were deployed in Chino Hills in 2016. The traps were located near the Community Center at English Channel and captured 53 cowbirds over 262 trap days. Trapping has occurred in Chino Hills since 2008, and a total of 194 cowbirds have been removed during this time. Before 2016, parasitism ranged from 43% (3/7 nests) in 2004 to 60% (3/5 nests) in 2007. No parasitism had been detected since 2008, when cowbird control began, until 2015 when one nest was parasitized. Little nest monitoring was done at this site in 2016, however no vireo were found with cowbird fledglings and few juvenile cowbirds were trapped. No cowbirds were detected in the habitat during monitoring this year. Parasitism, development, human activity, cattle grazing, and small fragmented habitat patches are factors that threaten vireo and likely reduce productivity throughout the Chino Hills area.

Santa Ana Canyon

These results are compiled from three sites (Upper Canyon, Green River Golf Club, and Featherly Park), collectively known as SAC. One hundred twenty-three vireo territories were detected in the Santa Ana Canyon in 2016, a slight increase from the 121 territories detected in 2015. Vireo territory size in SAC is estimated to be between 0.5 acre and 6.4 acres. In 2016, the vireos mean clutch size was 3.0 (n=28 clutches), a decrease of 0.1 from 2015, and the lowest since 2009 (3.0, n=16). Nesting success for 28 well-tracked nests in SAC was only 36% overall, a 4% decline from 2015 and 18% below the historical 54% nesting success for this site from 2001 to 2016 (Appendix C-3). Fifteen of 28 well-tracked nests were lost to depredation (54%) and three were lost to reproductive failure (11%). No tracked nests were lost due to parasitism. The reproductive success rate in SAC for 2016 was 1.2, the lowest in 16 years. This rate has been decreasing annually in SAC since 2011 when the rate was 2.7 (calculated from raw data at Upper Canyon, Green River Golf Club and Featherly Regional Park). For comparison, the watershed-wide rate of reproductive success in 2016 was 2.6 (n=95 well-monitored pairs) and the watershed-wide rate of fledglings produced by from 2001-2016 was 2.7 (n=1,329 well-

monitored pairs) (Appendix B-3). Sixty-eight fledglings were documented in 2016, a 17% decrease from the 82 detected in 2015 with a similar survey effort. A total of 1,037 fledglings have been documented in SAC over the last 16 years (compiled from Appendix C-1). Vireo here used a variety of plant species (n=10) for nest substrate. Of the 33 total nests found, the highest number of nests were found in mulefat (45%), blue elderberry (9%) and poison oak (9%; compiled from Table 5). Three banded vireo were detected in SAC and reported to the original bander, Barbara Kus (USGS).

SAWA cowbird trapping began in the SAC in 2001 when parasitism was documented in five of 19 nests (26%). Parasitism was again documented in one of 21 nests (5%) in 2009 after five years of no occurrences (Hoffman et al. 2013). SAWA deployed two traps within a mile of that location and no parasitism has been recorded since. In 2016, six traps were deployed at the request of the Corps (instead of the usual four) and 72 cowbirds were removed over 792 trap days. However in 2014, only four traps caught 112 cowbirds over 509 trap days (Appendix C-1). Although capture rates can fluctuate year by year, it appears that four traps cover this location adequately and perhaps the extra traps would be more useful at another site. Since 2001, a total of 2,206 cowbirds have been removed from the canyon over 11,859 trap days during the vireo's breeding season (compiled from Appendix C-1). There were no un-trapped cowbirds detected in vireo habitat in the Santa Ana Canyon in 2016.

Early in the nesting season it appeared that many pairs were delaying nest building activities. As requested by USFWS, the time observed between nest building and egg-laying, as well as the number of eggs hatched per clutch was examined. In 2016 results showed that vireo pairs in SAC averaged 11.6 days (n=12; range: 6-22) between the observed onset of nest building and the observed onset of egg-laying. Typically, vireo will build a nest in four to five days and begin laying eggs (one per day) within a day or two of nest completion (Melody Aimar, personal observation; Kus et al. 2010). Therefore, with weekly visits by the observer, seven days is a typical time between observed nest-building and egg-laying.

The second sign of reproductive distress observed at this site was the low number of eggs that hatched per clutch. Vireo will occasionally produce non-viable eggs and more infrequently, infertile eggs, but early observations in 2016 suggested a dramatic increase in this occurrence. As the season progressed several nests were found to have more typical reproduction timing and hatching success. Overall, only 71% of laid eggs hatched. This high percentage of un-hatched eggs appears atypical of this species (qualitative observation); notably so that it is not a dataset typically analyzed. All eggs in three nests (n = six eggs) from the same pair did not hatch. This pair was observed incubating the typical 14 days and one egg was opened after 21 days to reveal it was infertile. Since these data fell outside of the method

requirements, it was not included in the totals. To add them back in would reduce the number of eggs hatched to 59% (20/34). This is the first time SAWA has documented the same pair to have three unhatched nests in one season. A three-year comparison of these two datasets in SAC revealed a similar pattern in recent years at this location (Aimar et al. 2016).

Mean clutch size is another factor to consider when discussing reproductive biology. Typically vireo lay three to four eggs per nest, occasionally only two, with an average clutch size of 3.3-3.8 (Kus et al. 2010). The mean clutch size in SAC for 2016 was 3.0. This is the lowest average clutch size rate since 2009, which also happened to be a drought year. For comparison, the 2016 watershed-wide (excluding Prado Basin) average clutch size was 3.4, with a range of 3.0-4.0 (Table 5). Further review of past data and other locations will be necessary to determine the scope of this presumed abnormality in SAC.

Southern California is currently in its sixth year of a severe drought, with last year (2015) being the warmest year on record (USGS 2016). Avian nesting success has been shown to be reduced during drought years (Albright et al. 2010; Skagen and Yackel Adams 2012). Bolger et al. (2005) found nesting success had a near linear relationship to yearly precipitation in four native bird species in southern California. By surveying local arthropod abundance during years of normal precipitation and years of drought and comparing the results to nesting success of four avian species that are known to prey primarily on arthropods in the same location, they were able to show that the lack of suitable prey species was the primary cause of nest failure during dry years. This could be a driving factor in the vireo's delayed nesting and low success rates this year in SAC. The Santa Ana River runs perennially through SAC. However, being downstream of Prado Dam, SAC has a drier habitat adjacent to the river than Prado Basin (above the dam) and may have a lower rate of primary productivity, especially during drought conditions. There are other stressors at this site that should be addressed as to their potential effects on vireo reproduction, such as the multiple major construction projects conducted in SAC over the past several years, which have caused large amounts of habitat loss and disturbance from human activity.

At this time, riparian habitat in the Santa Ana Canyon is becoming infested with arundo at all three sites. The restoration edges between the golf course and the homes have opened new areas for arundo to infest along the river, while the arundo patches in the Upper Canyon continue to spread. In the lower section (Featherly Regional Park) the arundo had been treated with Imazapyr, which damaged many of the surrounding native trees. Though much, not all, of the arundo at this location is dead, the biomass remains, hampering native regeneration at this site. All vegetation, except plants in irrigated areas and directly adjacent to the river showed extreme drought stress in 2016. Additionally, there are multiple native trees that are suffering

from Imazapyr over-spray. The polyphagous shot-hole borer (PSHB) is known to have infested trees in the Canyon RV Park within Featherly Regional Park and three trees in the riparian zone appear to have been infested (unconfirmed). There is no significant native tree die-off caused by the invasive PSHB observed in SAC at this time. SAWA will deploy PSHB traps in this area to assist in a monitoring program coordinated with the University of California, Riverside (UCR). The County of Orange has implemented the Santa Ana River Canyon Habitat Management Plan and SAWA biologists sit on two subcommittees overseeing implementation of the plan, though no meetings have occurred in the last two years. Although both the Corps riverbank stabilization (Reach 9) project and the brine-line project are expected to continue for several years, as well as the Santa Ana River Trail project set to begin in 2017, we hope active management of the canyon will improve to maintain optimum conditions for its native species.

Upper Canyon

In 2016, this section of the canyon held 26 vireo territories, one more than last year. Of the 26 males found, 12 were known to be paired and 18 fledglings were documented (Table 2). Nest monitoring was minimal in this section of SAC in 2016 due mostly to access issues. Nesting success for three well-tracked nests was 100% (Table 5). Three pairs closely monitored throughout the season had successful nests that produced only seven fledglings. One pair produced four eggs, of which only one hatched. The pair fed this one fledgling most of the season and no second nesting attempt was found. Overall nesting success of well-tracked nests for this site from 2001 to 2016 is 69%. The overall reproductive success rate of well-monitored pairs during the same time is 2.6. A total of 304 fledglings have been documented over the last 16 years (Appendix C-3-M). No cowbirds were detected in the habitat. One banded vireo that was detected in this section in 2015 was not detected this year, though an un-banded, paired male was in its territory.

Cowbird trapping has occurred in the Upper Canyon since 2001 when the first vireos were detected on-site. Over 3,274 trap days, 706 cowbirds have been removed from this area. Parasitism has only been documented two of the 16 years surveyed and reached its highest rate in 2003 (18%). There has been no parasitism detected in the Upper Canyon since 2003 (Hoffman et al. 2013).

There were no construction activities from the Reach 9 project this season. However, a Riverside County SARI Line project took place on the west side of the river. This project was within 500 feet of several territories and within 100 feet of an active nest and likely affected some individuals with the extreme noise. One of the pairs moved away from the activity and pushed another pair into a smaller territory. The pair closest to construction activities did

successfully fledge three chicks early in the season, but was never observed again and presumably moved away from the activity. Reach 9 restoration activities were ongoing and did not appear to impact vireo nesting. Unfortunately, this site continues to be plagued by other human-related impacts including fisherman intrusion, trash dumping and branch-cutting, as well as large areas of invasive species (i.e. arundo) infestation.

Green River Golf Club

In 2016, the vireo population at this location increased 6% from 2015 (n=31) to 33 territories (Table 1). The vireo population at Green River Golf Club has more than tripled since monitoring began in 2001 when only ten vireos were detected (Hoffman et al. 2013). Of the 33 males found, 26 were known to be paired and 27 fledglings were documented in 2016 (Table 2). Nesting success for 13 well-tracked nests was only 31%, as compared to 63% (5/8) in 2014. Six of the tracked nests (46%) were lost to depredation. Three nests were lost to reproductive failure (23%) and all eggs in these three nests (n=6 eggs) from the same pair did not hatch. This pair was observed incubating the typical 14 days and one egg was opened after 21 days to reveal it was infertile. This is the first time SAWA has documented the same pair to have three unhatched nests in one season. No tracked nests were lost due to parasitism (Table 5). The highest numbers of nests were found in mulefat (38%), elderberry (15%), poison oak (15%) and laurel sumac (15%) at this site (Table 4). Overall nesting success for the site from 2001 to 2016 is 58%. The reproductive success rate in 2016 was a low 1.1 at this site. The overall reproductive success rate from 2001-2016 of well-monitored pairs is 2.2. A total of 351 fledglings have been documented over the last 16 years (Appendix C-3-N). Two banded vireo were detected in this section.

Cowbird trapping has occurred at the golf club since 2001 when the first vireos were detected on-site. During 4,509 trap days, 1,040 cowbirds have been removed from this site. When SAWA began monitoring this site, the parasitism rate was 44%. There has been no parasitism detected since 2001 when cowbird trapping was initiated (Hoffman et al. 2013).

Management at the Green River Golf Club has continued its cooperative relationship with SAWA and is supportive of SAWA's efforts to control cowbirds, manage vireo and other sensitive species, and enhance habitat.

Featherly Regional Park

In 2016, 64 territorial vireos were detected in Featherly Regional Park, just one less than 2015. Thirty-nine of these males were known to be paired, but only 23 fledglings were detected (Table 2). These numbers continue to emphasize that the vireo population recovery at this site

has been a success story over the last decade given that no vireos were detected in 2001, the first year of monitoring. The population's first major increase came in 2004 when it quadrupled from six in 2003 to 24 the following year (Hoffman et al. 2013). However, productivity at this site has steadily declined from 1.6 (2009) to a low of 0.9 (2016) over the last seven years. The 16-year average productivity rate for this site is only 1.4 as compared to other sites closely monitored by SAWA that range from 1.5 to 2.2 in the same time period (Appendices D-3 and C-3-O).

Nesting success for 12 well-tracked nests in 2016 was only 25%, 7% lower than last year's 32% and far below the overall nesting success from 2002 to 2016 of 42%. Eight pairs closely monitored throughout the season had a low 1.0 reproductive success rate in 2016. A total of 382 fledglings have been observed over the last 16 years and the overall reproductive success rate of well-monitored pairs during the same time is 1.7 (Appendix C-3-O). Nine of 12 tracked nests (75%) were lost to depredation (Table 5). This site typically has high depredation rates, though this is one of the highest on record. The California Scrub Jay, a well-known avian nest-predator, occurs in large numbers throughout Featherly Regional Park. One such depredation was observed as a lone scrub jay took three seven-day old nestlings from one nest in 2015. Another nest invader found in large numbers throughout the site is the Argentine ant (*Linepithema humile*). One nest was found with ants entering a small hole in the eggs on hatch day in 2015. A later visit found the eggs to be completely empty with only the same small hole in each egg. In 2016, ants were observed eating two Black-headed Grosbeak (*Pheucticus melanocephalus*) nestlings and one egg. There was no parasitism or reproductive failure documented at this site in 2016. One banded vireo that held territories in 2013 and 2014 was again detected in this section.

In November 2008, the devastating Freeway Complex Fire roared through the canyon and destroyed up to 90% of the riparian habitat in Featherly Regional Park. Thirty-four vireos, only two less than the 2008 season, returned the following season and remained in or near their former territories in 2009. Most of the breeding vireos found nest sites in unburned vegetation or the reemerging native vegetation although three pairs used non-native vegetation which included black mustard (*Brassica nigra)* and a small orange tree (*Citrus sinensis)* on the edge of a burned area. Of the 14 nests found in 2016, all were placed in native vegetation, with the highest number of nests (57%) placed in mulefat (Table 4).

Cowbird trapping has occurred in Featherly Regional Park since 2001 when the first vireos were detected on-site. Over 4,076 trap days, 460 cowbirds have been removed from this site. Parasitism has been documented three out of the 16 years surveyed, reaching its highest

rate in 2002 (67%). No parasitism has been detected in Featherly Regional Park since 2009 (Appendix C-1-O).

The habitat at Featherly Regional Park has become extremely drought-stressed, with the exception of the area immediately adjacent to the river banks. Additionally, the Polyphagus shot-hole borer has been detected within the park, though no large die-off has been observed. Other ongoing disturbances at this site include habitat destruction during nesting season by the orange grove lessee, illegal fishing, and homeless camps. Invasive plants are still a problem at this site. The highly invasive arundo began re-sprouting two weeks after the Freeway Complex Fire. In an effort to take advantage of the arundo biomass removed by the fire, Orange County Parks management were able to spray herbicide on the rapid arundo regrowth before the following nesting season, which helped control a large amount of regrowth. Unfortunately, many patches have re-established since that time and a large amount of dead arundo biomass remains, hampering native plant regeneration. Additionally, the subsequent use of Imazapyr on arundo was found to be damaging nearby native trees in 2013. Trees damaged by Imazapyr continue to suffer and many were found dead in 2016. The County of Orange is working to remedy the problem and strives toward restoration of the entire park, which should enhance the habitat for vireo and other native birds in the future. Future disturbance from the multiple construction projects slated to continue for several years may challenge future vireo recovery in the impact areas. However, proposed mitigation should expand and enhance vireo habitat in the post-construction years.

Sampled Sites

In 2005, SAWA expanded its monitoring program to all known vireo habitats in the watershed in an attempt to capture watershed-wide population numbers. These assessment surveys, now referred to as sampled areas, have proven valuable to SAWA as well as local, state and federal resource agencies by documenting previously unknown vireo occupancy and by identifying new areas in need of restoration. Sampled sites were surveyed at least three times during the nesting season in an attempt to get accurate territory numbers and incidental reproductive data. Forty-nine sites were surveyed in 2016 and 198 additional vireo territories were documented (Table 7). Most of these sites were not sampled in 2015. A similar effort at these sites in 2014 found 208 vireo territories. In 2016, no vireos were detected in 11 of the sampled sites visited. Lake Perris was a formerly sampled site that was not accessible to SAWA in 2016, but 14 vireo territories were reported by another agency at this site (Table 1). Three previously monitored sites (Meridian Conservation Area, Sycamore Canyon, and Santiago Canyon-Irvine Park) were only sampled in 2016. Peters Canyon and Carbon Canyon Regional Park were both sampled in 2015 and 2016. Peters Canyon showed a 39% (n=25) increase over

2015 (n=18), and Carbon Canyon Regional Park showed a 17% decrease (n=10) over 2015 (n=12). Chino Hills State Park was not sampled in 2015, but showed a decline of 29% (n=15) from 2014 (n=21), and an even more dramatic decline of 71% from the 51 territories detected in 2010 (Table 1). The vireo is not the only songbird that appears to be affected at this site. In 2010, SAWA biologists detected 18 Yellow Warblers and 10 Yellow-breasted Chats (*Icteria virens*) in Lower Aliso Canyon. By 2014, there were only four Yellow Warblers and two Yellow-breasted Chats in the same area. In 2016, these species were not detected in Lower Aliso Canyon (Table 8).

Temescal Canyon

Temescal Canyon was sampled by several biologists, each assigned to a section of the canyon. Ninety-three territorial vireo males were detected in 2016, compared to 123 in 2015 and 126 in 2014. This count represents a 29% decrease from the count of 131 territorial vireos in 2013, which to date, was the peak year. Nine males were known to be paired in 2016 and five fledglings were detected, a 77% decrease from the 22 detected in 2015 (Table 1). The decrease from 2014 to 2015 may be due to the reduced effort; however, the decrease from 2015 to 2016 is more likely due to the degradation of the habitat as a result of eliminated water facility effluent outflow and increasing drought stress. During these surveys, eight cowbirds were detected in the habitat, two of which were juveniles. One juvenile was detected in the northwestern corner of Lake Elsinore and the second was detected in habitat running through Dos Lagos Golf Course (see separate shapefile).

Five cowbird traps were open for the 2016 season in Temescal Canyon. Four of the traps were adjacent to riparian habitat, and the fifth was at a small dairy. The dairy is located near Lake Elsinore, where the highest parasitism rates typically occur. The five traps caught a total of 297 cowbirds during the nesting season over 644 trap days for a capture rate of 0.46 (Table 2). Cowbird trapping has occurred in Temescal Canyon annually since 2001. During these 16 years, 12,159 trap days have resulted in the removal of 3,560 cowbirds (Appendix C-1-K). Even with on-site cowbird trapping, parasitism has been documented in Temescal in nine out of the 12 years it was closely monitored, reaching its highest rate (42%) in 2007 (Appendix D). Literature suggests that cowbirds have different regional dialects and female cowbirds tend to prefer older males that use local flight whistles, to younger males or older males that have a foreign dialect (O'Loughlen and Rothstein 1995; O'Loghlen 1995). From 2012-2016, SAWA stocked the traps with bait birds that were caught locally. Local, second-year male birds were kept in the traps for the remainder of the season as they became available. This methodology was tested in San Timoteo Canyon beginning in 2007 and has shown promise with increased captures and decreased parasitism.

Drought stress is obvious throughout Temescal Wash, especially downstream of Dos Lagos Golf Course where effluent outflow by City of Corona Wastewater Treatment Plant #3 was suspended in 2013. In 2014, a SAWA biologist familiar with that area reported to CDFW massive vegetation die-off due to lack of water from the historical water treatment outflow. This die-off has been amplified by the ongoing drought conditions and habitat quality declined dramatically in 2016. In addition to these stressors, the habitat in Temescal Canyon and Lake Elsinore is regularly impacted during the nesting season by off-road vehicle use, illegal vegetation removal, and understory clearing to deter homeless encampments around Lake Elsinore. Management recommendations for this area include removal of *Tamarix* spp., enforcement of illegal vegetation removal during avian nesting season, continued cowbird trapping, especially at the dairy in Lake Elsinore, additional cowbird trap locations near areas where juvenile cowbirds were detected, and most importantly, re-established outflow to the creek near Dos Lagos Golf Course.

Incidental Sites

In 2016, four incidental sites were surveyed and five additional vireo territories were documented. A full list with the results of these sites can be found in Table 1 and the location coordinates in Appendix A.

Southwestern Willow Flycatcher

In 2016, SAWA biologists detected seven migrant Willow Flycatchers within the watershed. No breeding pairs were detected. A singing male was detected in Chino Hills, near the Chino Hills Community Center on May 26. A singing male was detected on June 3 in the Norco Bluffs area and two singing males were detected on June 8 in Telegraph Canyon within Chino Hills State Park. Two males were seen in the Prado Basin on June 2 and a third sighting on July 14 was of an individual that did not vocalize so sex could not be determined. One additional male which was present from June 13-22, was detected by an OCWD biologist at Prado Regional Park (James Pike personal communication, 5 October 2016). The highest number of detections in the Prado Basin occurred in 2003, with nine sightings. Southwestern Willow Flycatchers have been documented sporadically in Prado Basin since 1996, and a total of 37 nests have been discovered on site from 1996-2013 (Pike et al. 2015). Migrant Willow Flycatchers have been observed periodically throughout the rest of the watershed over the years; however SAWA has not documented any breeding attempts at well-monitored or sampled sites. All migrant Willow Flycatcher sightings are reported electronically to USGS Riparian Birds Working Group and to the California Natural Diversity Database.

Sightings of Interest – Incidental Species Observations

Incidental species sightings were documented at selected sites throughout the watershed during vireo monitoring. One hundred thirty-seven avian, 17 mammal, 17 herpetofauna and one fish species were observed at monitored and sampled sites. Sensitive species were documented by site and a combined total of 35 sensitive species were detected (Table 8). Sensitive species are defined as those listed as endangered, threatened, or a species of concern by the resource agencies and those covered by the Western Riverside County Multiple Species Habitat Conservation Plan (MSHCP). Observations are verified detections and are considered presence at each location and should not be considered as a complete species list for each site. For example, California Gnatcatcher (*Polioptila californica*) were detected at four sites adjacent to vireo habitat, however, many more gnatcatchers likely occur in adjacent areas biologists do not frequent. Similarly, some species are difficult to detect, such as the long-tailed weasel (*Mustela frenata*), and may occur in other locations than reported here. Sensitive species sightings are reported annually to the appropriate resource agencies.

BROWN-HEADED COWBIRD TRAPPING RESULTS

Brown-headed Cowbird Trapping, March-July 2016

Forty-five cowbird traps were deployed during the 2016 vireo season and 3,177 cowbirds were removed from all sites over 5,707 trap days (Table 6). The sex and ages of the cowbirds removed in 2016 were: 1,845 adult males, 1,143 adult females, and 189 juveniles. SAWA biologists and field assistants spent 2,612 hours servicing traps during the vireo season.

In 2016, cowbird captures increased 155% from 2015 (1,245). However, nine more traps were deployed in 2016, three of which were placed at dairies not trapped in 2015 and accounted for 2,101 of the total captures. One hundred seventy-two percent more males, 160% more females, and 49% more juveniles were trapped during the 2016 breeding season. In 2015, cowbird captures decreased 2% from 2014; however, ten fewer traps were deployed in 2015. In 2014, captures had decreased 35% from the 2013 breeding season. The decreased captures could be attributed to fewer trap days (5,408 in 2014 versus 6,355 in 2013). In 2016, the overall capture rate per day of cowbirds was 0.56, an increase from the 0.29 in 2015.

In 2016, one trap was vandalized in San Timoteo Canyon resulting in its early closing on June 3. Another trap was vandalized in Temescal Canyon and was subsequently closed on July 3. Vandalism did not occur at any other traps in the watershed.

Non-Target Captures in Cowbird Traps, March-July 2016

Twenty-five non-target species, consisting of 1,728 individual trapping occurrences, were captured in the 45 cowbird traps. The most common species were California Towhee (*Melozone crissalis*), House Finch (*Haemorhous mexicanus*), Red-winged Blackbird (*Agelaius phoeniceus*), and Yellow-headed Blackbird (*Xanthocephalus xanthocephaulus*). The mortality of non-targets in 2016 averaged 2.4% (Table 9). Numbers of European Starlings and House Sparrows either removed or released from cowbird traps are also listed in Table 9.

Fall/Winter 2015-2016 Brown-headed Cowbird Trapping and Non-Target Captures

Cowbird trapping took place at six dairies during the non-breeding season (fall/winter) of 2015-2016. One trap was located at a dairy in Temescal Canyon (Lake Elsinore), one at a large horse stable in SAC, and four at various dairies in the Prado Basin.

A total of 5,105 cowbirds were removed (1,252 adult males, 2,455 adult females, and 1,398 juveniles) over 846 trap days (Table 10). In the fall of 2014, 5,094 cowbirds were removed from nine dairies over 908 trap days. Trapping in the fall of 2014 only occurred from July 28-November 21 due to lack of funding. In 2015-2016, the capture rate per day was 6.0, a slight increase from 5.6 in the fall of 2014.

Twelve non-target species, consisting of 233 individual trapping occurrences, were captured in the six dairy traps in 2015-2016. The most common species captured were Red-winged Blackbird and California Towhee. Numbers of European Starlings and House Sparrows either removed or released from cowbird traps during this period are also reported (Table 11).

DISCUSSION

SAWA has removed over 4,600 acres of invasive arundo from the watershed, allowing for as many acres of riparian recovery. Tributaries that have been restored have experienced substantial growth in vireo numbers. For example, San Timoteo Canyon increased its vireo population from five in 2000 to a high of 176 in 2015 (Appendices C-1-B and Hoffman et al. 2013). Temescal Canyon had shown similar increases in the vireo population, increasing from seven in 2001 to a high of 131 in 2013. SAWA and OCWD biologists have removed over 150,000 cowbirds from the watershed, including Prado Basin, in the last 16 years (Figure 6). The disappearance of dairies from the Prado Basin should be an additional aid to the decline in parasitism; however, dairies remain in San Jacinto. San Jacinto, where there were no cowbird

traps near the habitat and vireo suffered a 75% parasitism rate, was the only location where parasitism was detected in 2016.

With the exception of a few years, the vireo abundance has increased since monitoring began in 2000. In 2016, a record high of 1,623 vireo territories were documented in the Santa Ana Watershed, including Prado Basin and from other reporting agencies. The dramatic population increase over 14 years of watershed-wide monitoring is illustrated for four sites in Figure 7. The two primary causes of vireo decline in the past, parasitism by the Brown-headed Cowbird and the loss of riparian habitat, are being successfully managed by SAWA through cowbird trapping and habitat restoration. The total count of 1,070 vireo detected by SAWA, up 11% from 2015, is likely due to a reinstated survey effort similar to 2014 (n=1,024). Norco Bluffs and Hidden Valley-South both reported an increase in numbers from 2015; whereas, Mockingbird Canyon and Goose Creek, Norco to I-15, both reported a decrease in numbers. All four of these sites had differing efforts between 2015 and 2016, which likely affected these results. One site showing a dramatic decline in territory numbers with a similar effort is Chino Hills State Park (CHSP). Though CHSP was not sampled in 2015, numbers declined 29% (n=15) from 2014 (n=21), and showed an even more dramatic decline of 71% from the 51 territories detected in 2010 (Table 1). These declining numbers are likely attributed to severe habitat degradation in the riparian areas of the park, caused mostly by extreme drought stress and additional stress due to illegal cattle grazing in Lower Aliso Canyon. Although this park was devastated by the Freeway Complex Fire in 2008, the riparian habitat has recovered well and the vireo numbers appeared stable in 2010. However, the adjacent upland habitat converted to primarily invasive plant species. Since vireo are known to use adjacent areas for foraging and nesting, especially when the riparian area is as narrow as it is in the park, there may be a fire-related relationship to explore. Whatever the cause, other sensitive species are being affected as well. Two sensitive species, Yellow Warbler and Yellow-breasted Chat, were plentiful in the Lower Aliso Canyon portion of CHSP in 2010 (18 and ten individuals, respectively), yet none were found in 2016. The 25% reduction of territories in Chino Hills from 2015 can be attributed to habitat loss as a result of development, which will always be a threat in these smaller, unprotected drainages. However, the 24% decline in territories and only five fledglings detected in Temescal Canyon in 2016 appears to be due to the recent elimination of effluent discharged as surface water by local water agencies, and exacerbated by drought conditions. The lack of water in most sections of Temescal Canyon has caused a massive riparian vegetation die-off. This is of particular concern at this time since several other water agencies are proposing to reduce or eliminate effluent discharge into the Santa Ana River as well. Temescal Canyon habitat may soon become unsuitable for vireo if the outflow is not reestablished. Temescal Canyon should, at the very least, be considered a cautionary example to other

agencies with the same intentions in southern California. Taking into account the variation in effort and by site, especially in 2015, overall vireo territory numbers have been slowly increasing since 2013 (Figure 5), but could decrease dramatically if large sections of habitat are lost to desiccation.

Nesting success watershed-wide was 52% in 2016, a decrease from 55% in 2015. Possible causes of lower nesting success include disturbance from the multitude of human activities observed in the watershed, as well as a six-year drought, potentially resulting in reduced resources and increased pressure from predators. Overall, in the last sixteen years, the nesting success rate is 59% for 2,334 well-tracked nests. A more precise calculation of reproductive success is the rate of the average number of fledglings produced by well-monitored pairs. In 2016, the overall reproductive success rate was 2.6, with some locations as low as 1.0 (Featherly Regional Park). Depredation remains the primary cause of nest failure, with an overall 41% of nests lost to depredation in 2016, although some sites were as high as 75% (SAC-Featherly Regional Park). Overall nest loss from reproductive failure was 6%; however, Green River Golf Club in SAC experienced a high rate of nest loss (23%) due to this reason in 2016. Examples of nest loss due to reproductive failure are non-parasitized egg abandonment, failure of the entire clutch to hatch, or failure of the vegetation to support the nest to a successful fledging. Parasitism is episodic throughout the watershed. Three percent of nests were parasitized in 2016, all of which were in the San Jacinto Wildlife Area. Documentation of continued cowbird parasitism in the San Jacinto Wildlife Area, where cowbird traps are no longer placed, lends support for the continued need for cowbird trapping (Appendix C-3-A). Figure 8 compares watershed-wide nesting success, predation, and parasitism rates from 2003-2016.

The lack of documented nesting Southwestern Willow Flycatchers in the watershed in 2016 is not surprising given the dwindling numbers over the last decade. No breeding activity from this species has been documented in the watershed since 2014. The habitat in the higher elevations of the watershed has had willow flycatcher territories in the past, and should be surveyed to ascertain the status of this imperiled species in the mountains. Unfortunately, SAWA does not currently have the funding for such an endeavor.

MANAGEMENT RECOMMENDATIONS

While the documented number of vireo territories did again exceed 1,000 as in 2013 and 2014, these numbers were somewhat offset by the lower reproductive success rates of closely monitored pairs at many locations. Additionally, a site without nearby cowbird traps

showed high parasitism rates (San Jacinto – 75%). Vireo monitoring and cowbird trapping, especially in areas like San Jacinto, should continue along with removal of non-native vegetation. The removal of arundo and other invasive vegetation and the resulting recovery of riparian habitat, in conjunction with cowbird management, have had a positive influence on vireo territory numbers in the watershed since 2000. The six-year drought that the region is currently experiencing has resulted in increased water deficits. Multiple water agencies have already, or are planning to, reduce or eliminate required discharge into the river and its tributaries.

In addition to restoration, as well as maintenance and procurement of new land, there needs to be increased protection of lands for wildlife values. Specifically, there continues to be a need to enforce current laws, and perhaps initiate new laws, to restrict illegal activities in sensitive riparian areas. Local landscapes are scarred with off-highway vehicle (OHV) tracks and the activity is damaging riparian habitat in areas such as Mockingbird Canyon, San Timoteo Canyon, the San Jacinto River, and the Santa Ana River. There is also increasing awareness of the need to control feral pigs throughout the watershed. Some multi-organizational planning attempts to control this destructive species have been publicized; however, a management plan has yet to be implemented. SAWA and OCWD are planning a pilot study to track feral pig populations in the Prado Basin. Additionally, laws meant to prevent other human disturbances such as streambed alteration, illegal fishing and homeless encampments must be enforced. A positive development in this area is the County of Riverside's code enforcement program that targets illegal dumping. Enforcement of these laws is sorely needed to protect riparian habitat from degradation.

With the removal of over 4,600 acres of arundo and other invasive plants, SAWA has had extraordinary success with riparian habitat restoration along the Santa Ana River and its tributaries. Since invasive plants like arundo cannot typically be eradicated within a five-year mitigation term, it is extremely important that the long-term maintenance of invasive plant regrowth continue to be funded. We recommend that funding invasive maintenance become a mitigation requirement much like cowbird trapping.

Although existing laws are meant to protect these resources, even on private land, the ability to enforce the laws and regulations is inadequate and untimely. We must strive to invest the public in these resources and identify effective ways to ensure that floodplains are protected for future generations of wildlife and humans. We will attempt this through a combination of public education, public involvement through volunteerism, and partnerships with enforcement agencies and landowners. Priorities for SAWA's vireo recovery program in the near future will continue to be based primarily on cowbird trapping, which we believe

provides the most immediate support for the recovering vireo population, the availability of ample invasive-free riparian habitat notwithstanding. SAWA will continue to provide accurate annual data on vireo status, distribution and reproductive productivity as funding allows.

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Figure 1. Map of the Santa Ana Watershed.

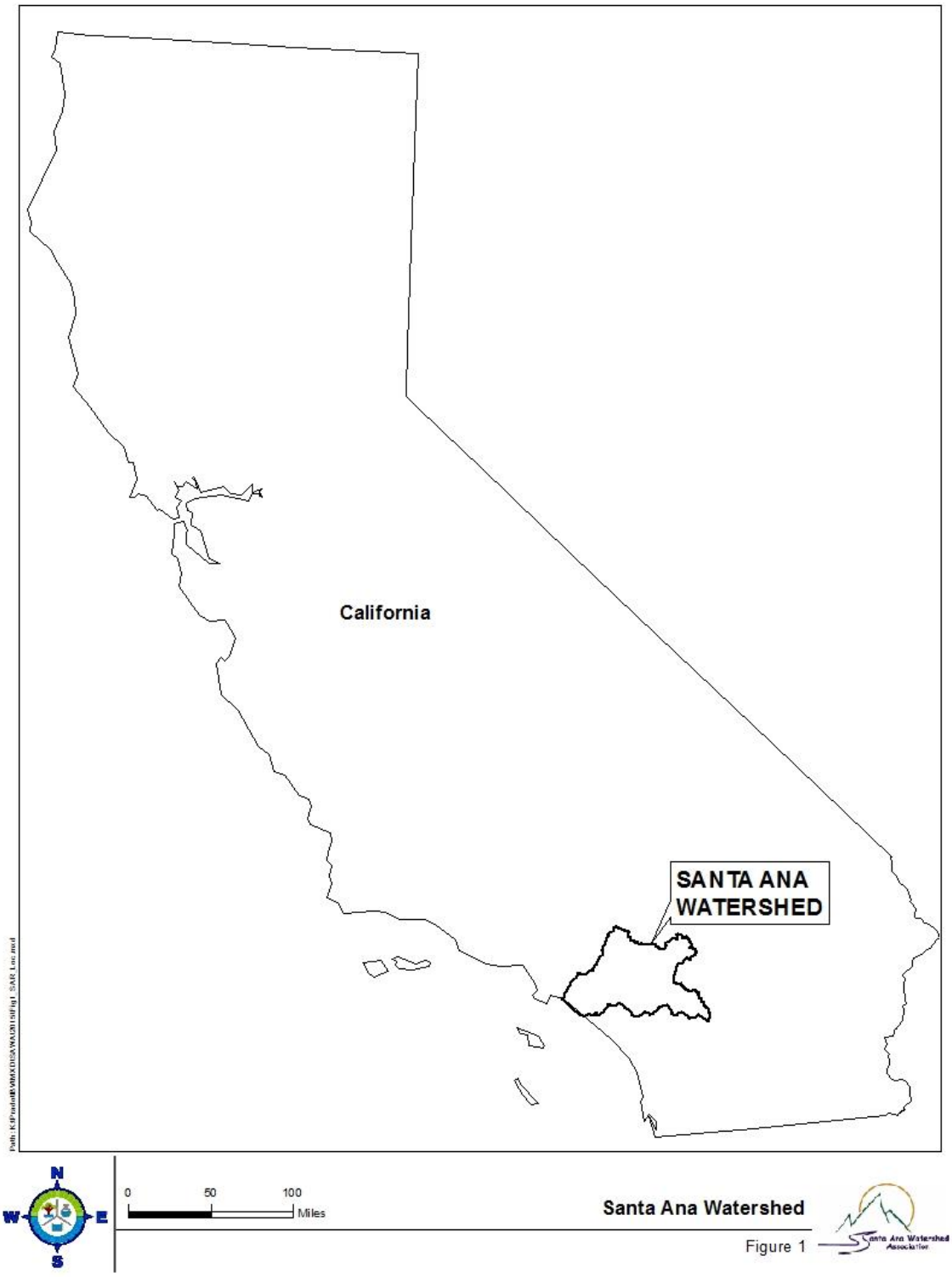

Figure 2. Least Bell's Vireo survey sites in the Santa Ana Watershed, 2016.

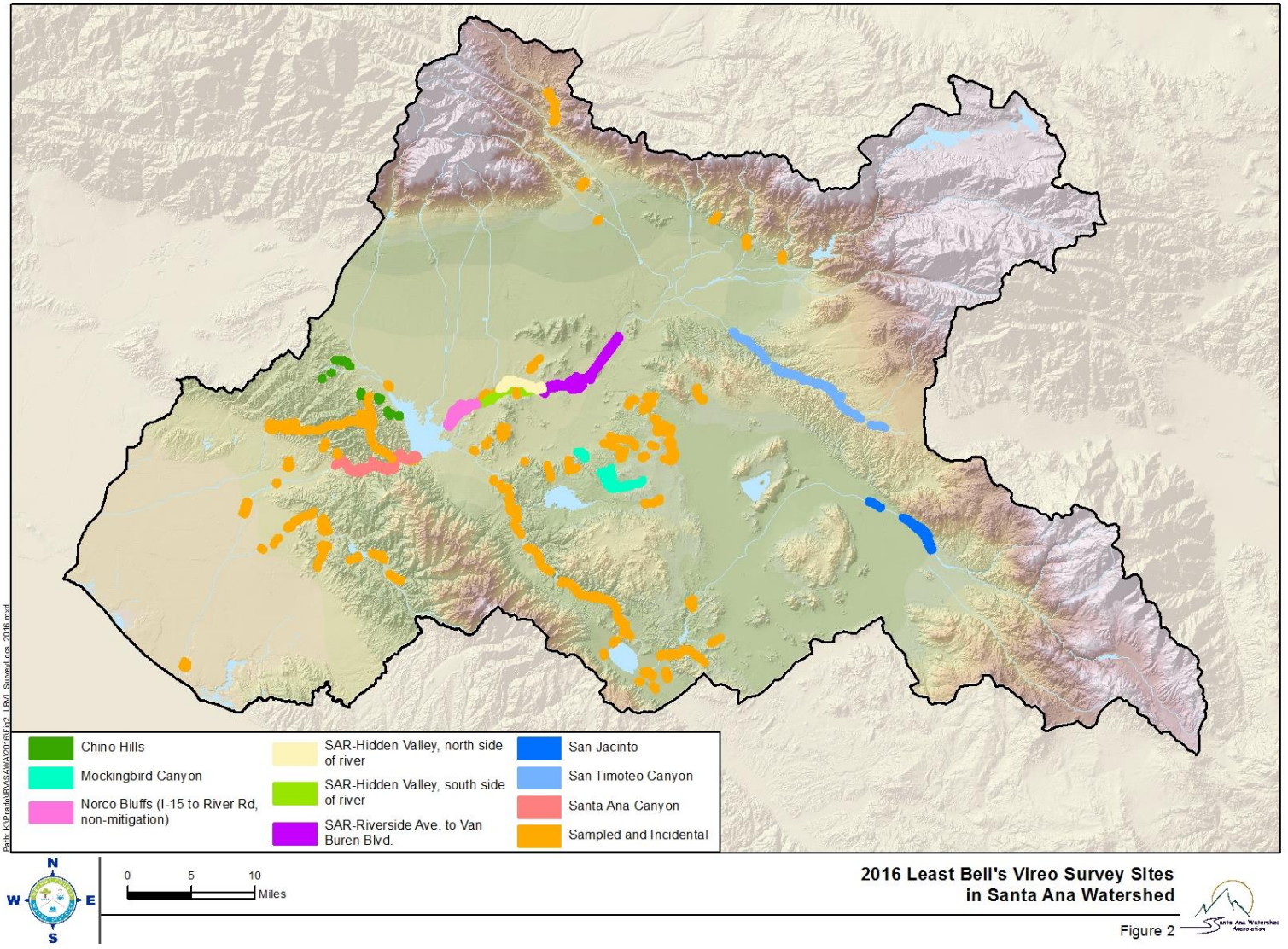

Figure 3. Brown-headed Cowbird trap locations in the Santa Ana Watershed, 2016.

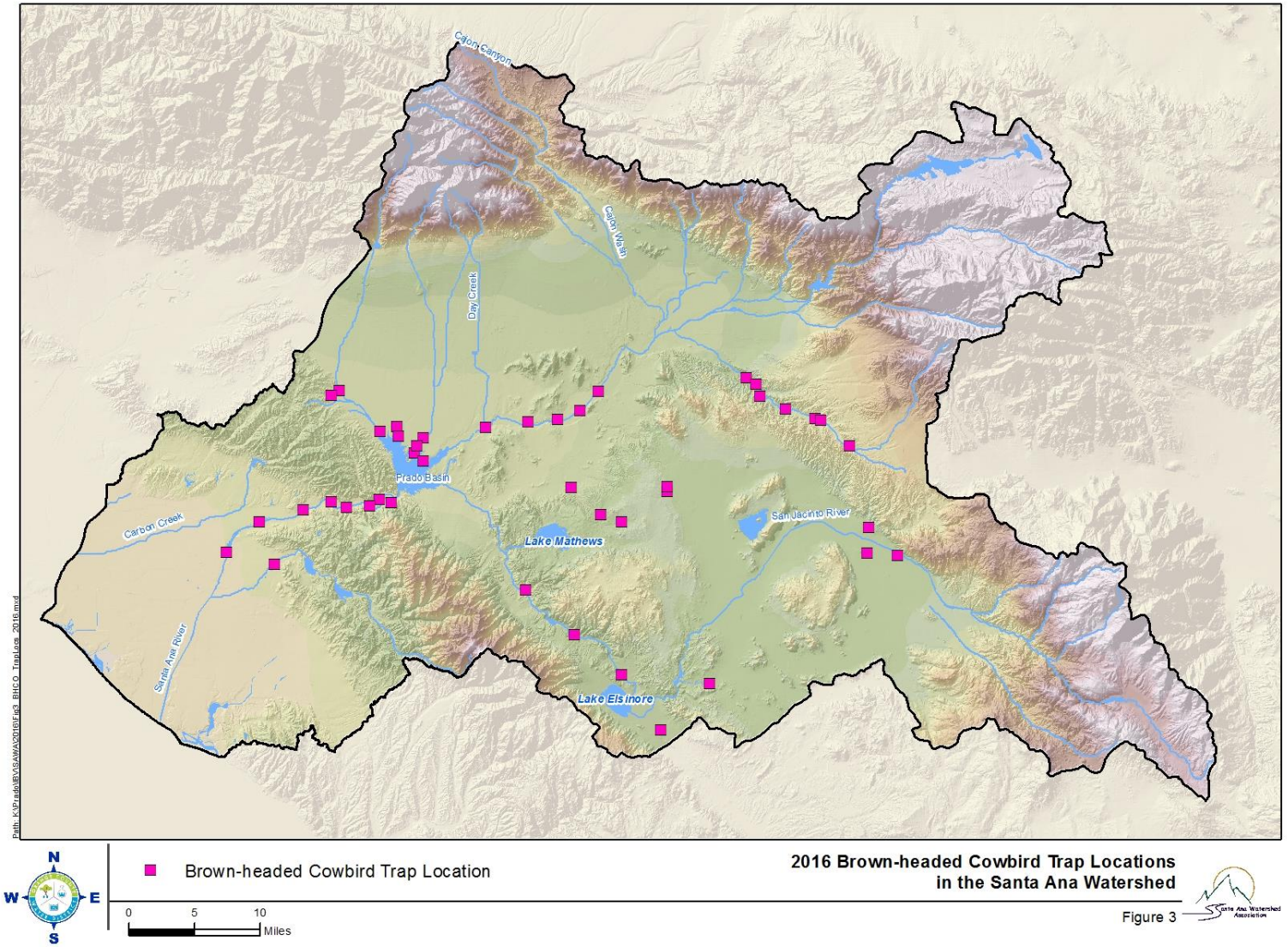

Figure 4. Norco Bluffs Vireo Survey Area.

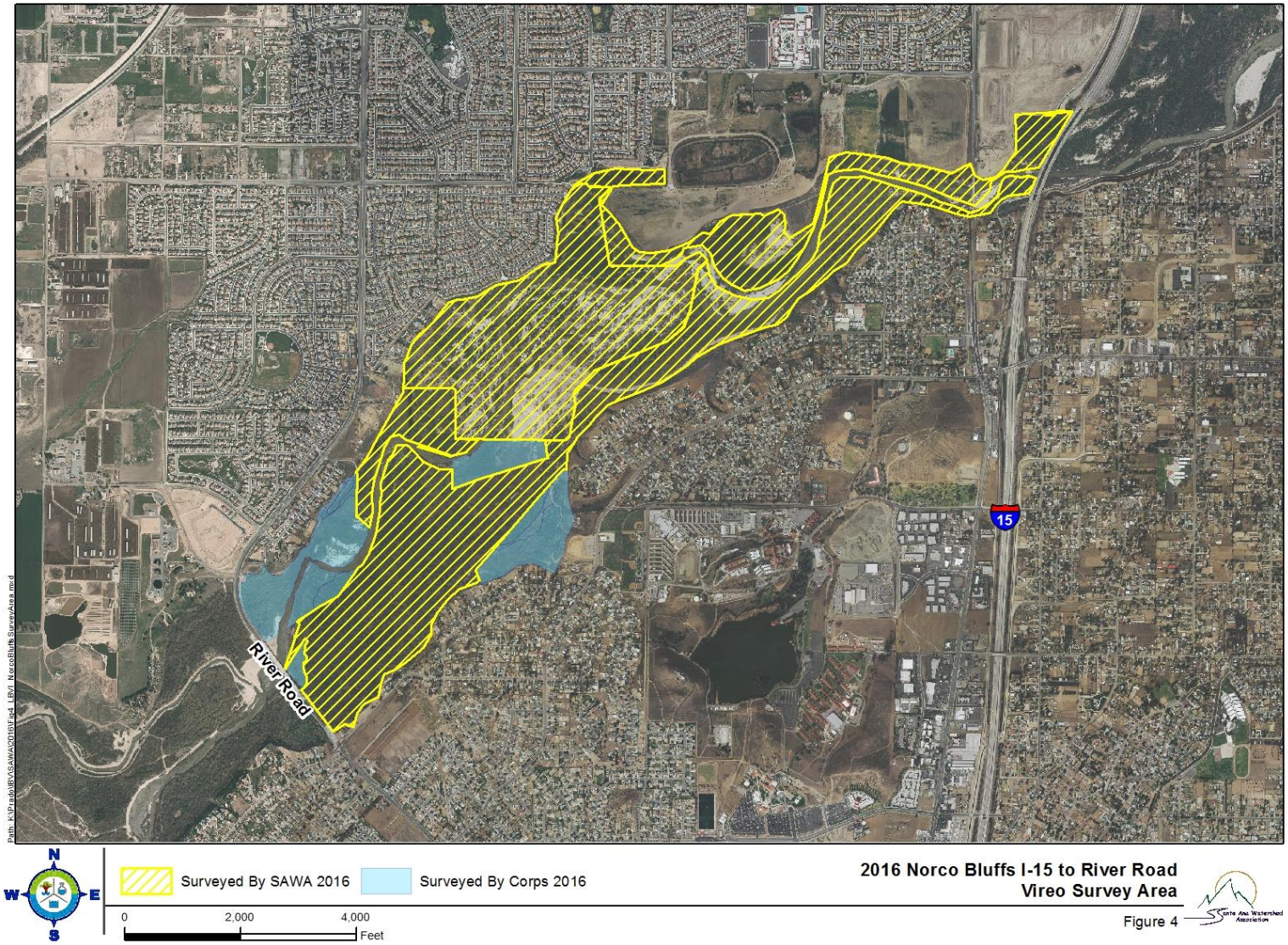

Figure 5. Least Bell's Vireo abundance in the Santa Ana Watershed, including Prado Basin, 2001-2016.

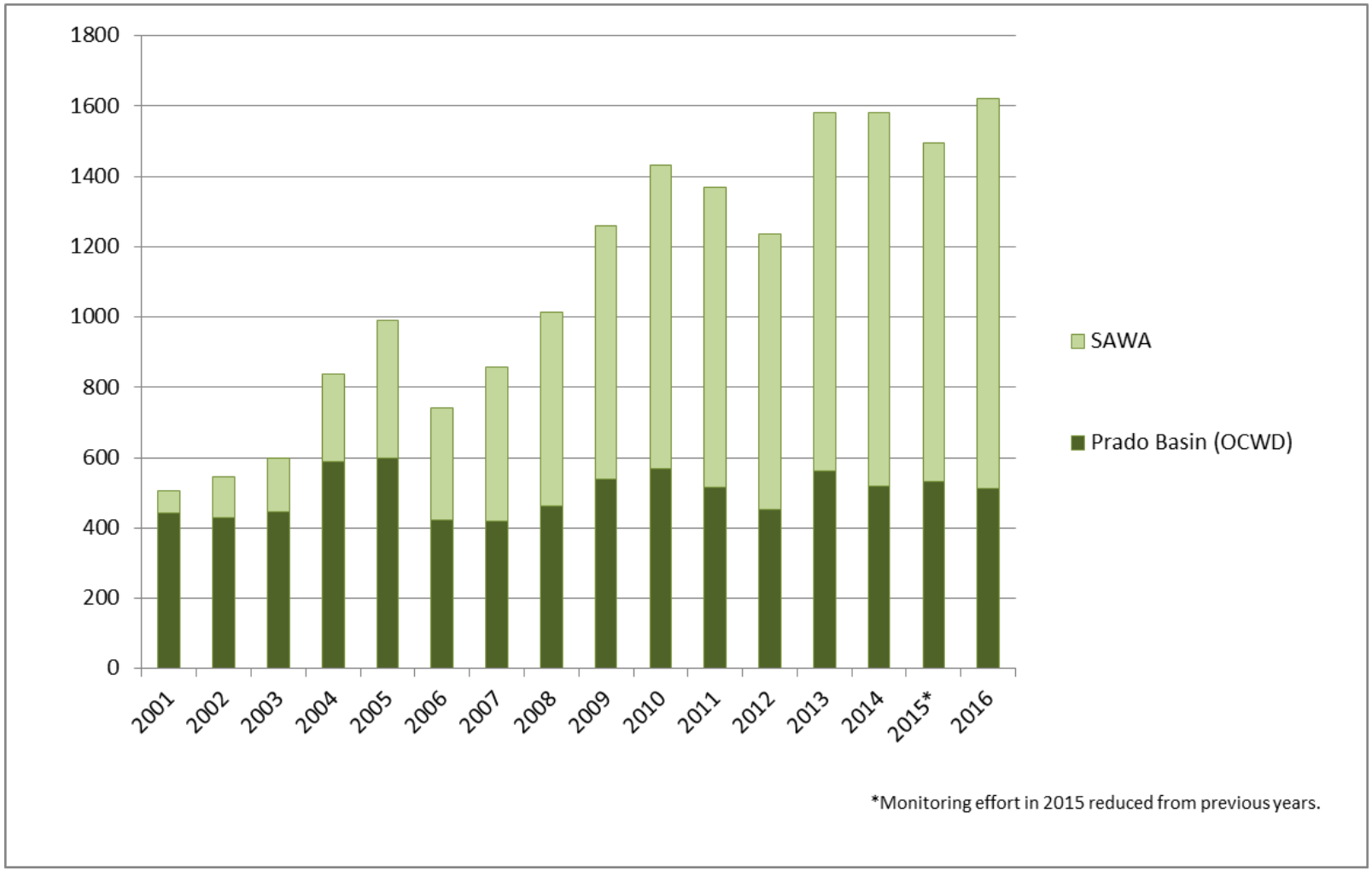

Figure 6. Brown-headed Cowbirds removed from sites in the Santa Ana Watershed, 2000-2016.

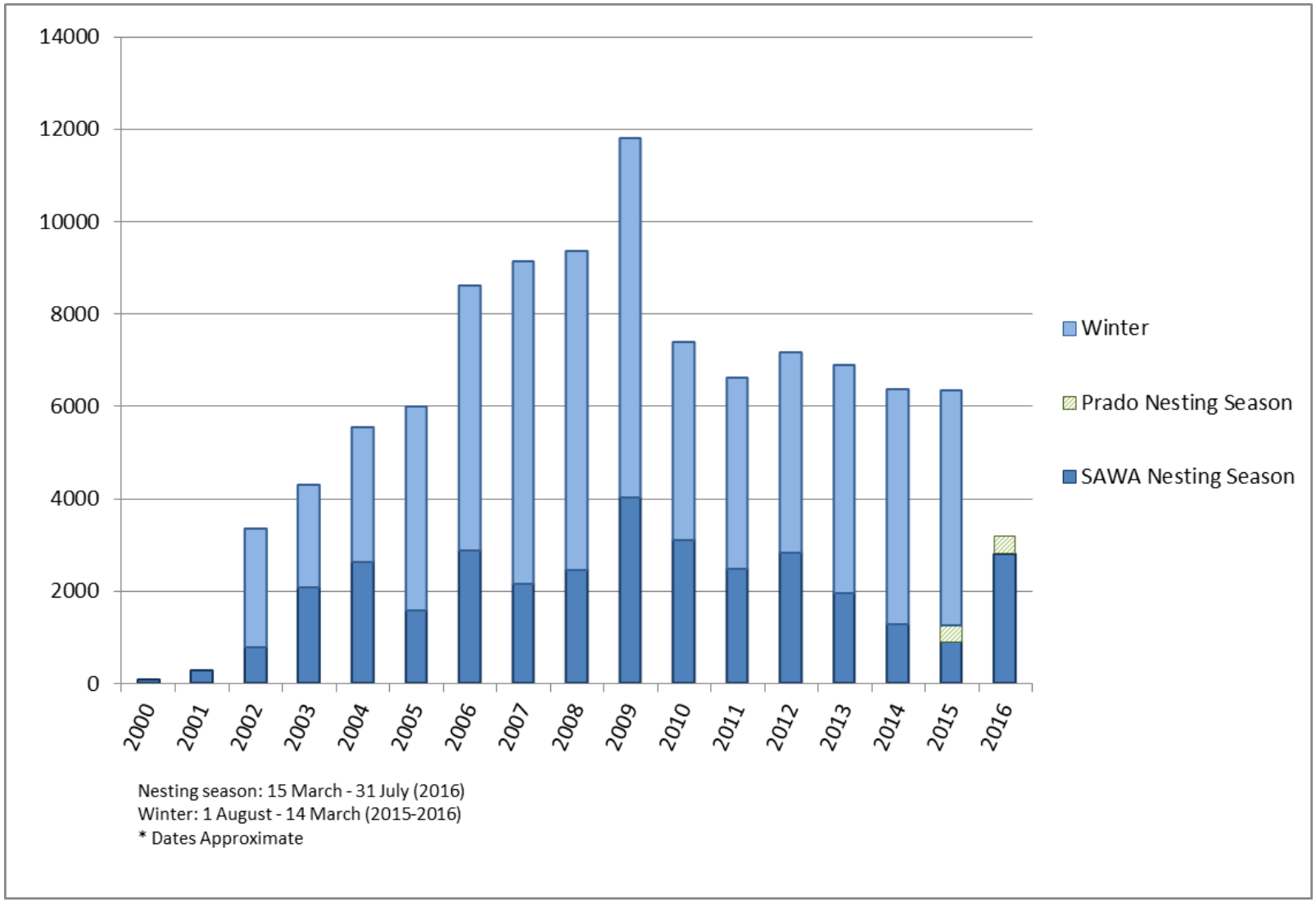

Figure 7. Least Bell's Vireo territories at four sites in the Santa Ana Watershed, 2004-2016.

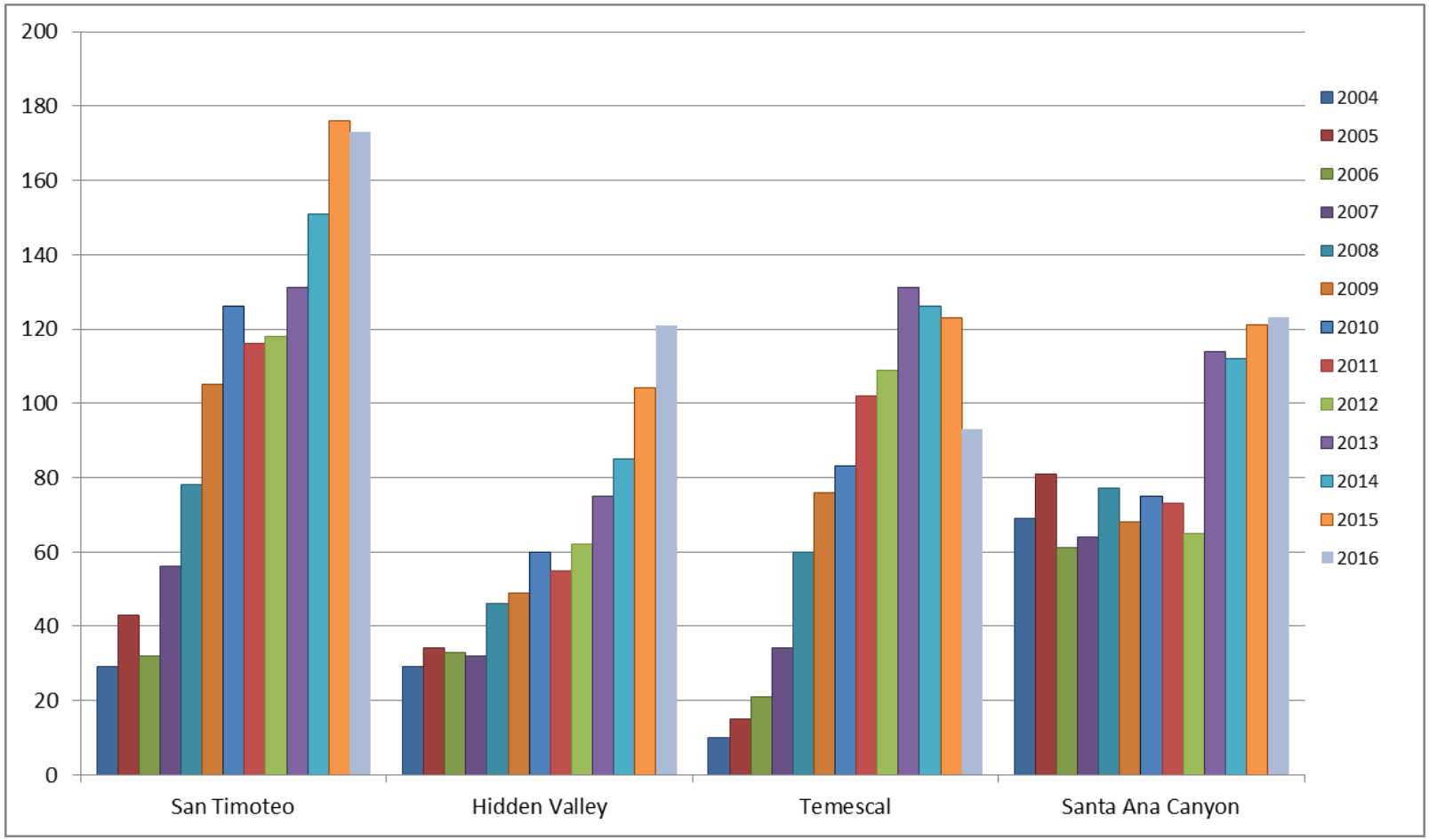

Figure 8. Least Bell's Vireo nesting success, depredation rates, and parasitism rates in the Santa Ana Watershed, 2003-2016.

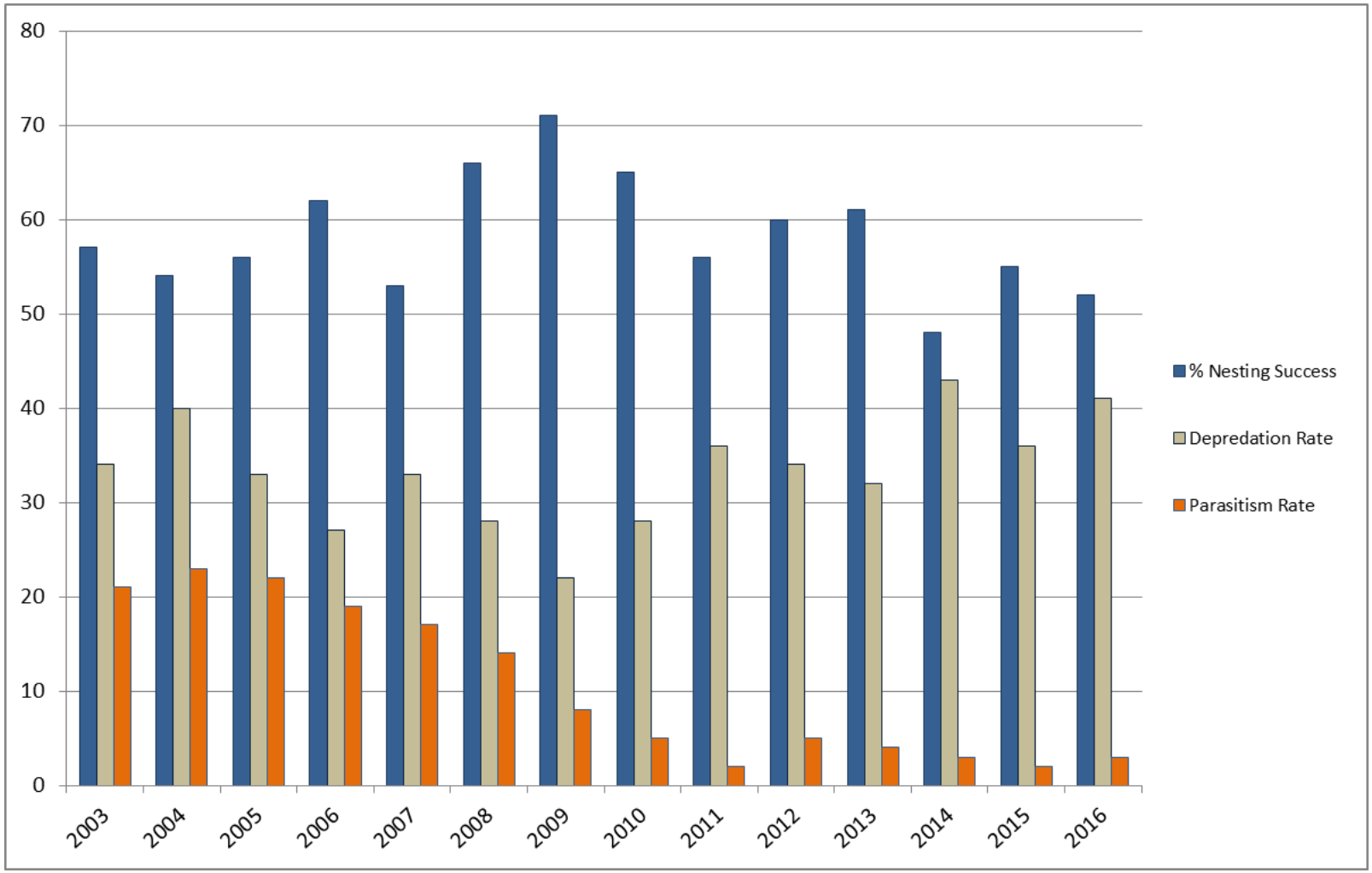

Table 1. Least Bell's Vireo abundance and distribution in the Santa Ana Watershed, 2010-2016. Numbers of territories, pairs, and fledglings detected.

Site Name	2010	2011	2012	2013	2014	2015	2016
Monitored Locations							
San Jacinto	22 / 18 / 28	41 / 25 / 18	42 / 36 / 49	53 / 29 / 39	45 / 19 / 12	29 / 7 / 8	37 / 17 / 12
San Timoteo Canyon	126 / 95 / 137	116 / 101 / 196	118 / 102 / 153	131 / 80 / 179	151 / 135 / 206	176 / 141 / 287	173 / 124 / 222
Mockingbird Canyon	43 / 34 / 25	37 / 32 / 67	28 / 26 / 39	31 / 24 / 40	23 / 7 / 7	37 / 23 / 19	25 / 7 / 11
Santa Ana River (SAR) - Upstream							
Riverside Ave. to Van Buren Blvd.	68 / 50 / 58	49 / 22 / 32	43 / 11 / 7	77 / n/a / 7	66 / 19 / 15	109 / 37 / 33	109 / 43 / 62
Hidden Valley, north side of river	15 / 12 / 18	4 / 2 / 2	9 / 3 / 1	21 / 2 / 3	21 / 14 / 19	39 / 23 / 15	40 / 27 / 33
Hidden Valley, south side of river	60 / 43 / 53	55 / 36 / 41	62 / 37 / 45	75 / 42 / 66	85 / 32 / 28	104 / 27 / 22	121 / 66 / 97
Goose Creek, Norco to I-15 (includes Goose Creek mitigation funded by IERCD)[1]	101 / 64 / 113	105 / 59 / 91	95 / 51 / 86	108 / 52 / 109	110 / 32 / 36	71 / 36 / 63	63 / 31 / 45
Norco Bluffs (I-15 to River Rd., non-mitigation)[1]	n/a	n/a	n/a	n/a	n/a	30 / 17 / 43	63 / 28 / 45
Temescal Canyon	83 / 49 / 73	102 / 65 / 113	109 / 63 / 71	131 / 50 / 48	126 / 24 / 17	123 / 21 / 22	93 / 9 / 5
Chino Hills	11 / 7 / 7	8 / 3 / 1	8 / 2 / 1	13 / 5 / 7	10 / 2 / 3	24 / 6 / 4	18 / 11 / 10
Santa Ana Canyon (SAC)							
Upper Canyon	11 / 4 / 6	14 / 5 / 5	10 / 4 / 6	28 / 14 / 23	27 / 18 / 28	25 / 9 / 10	26 / 12 / 18
Green River Golf Club	24 / 17 / 19	26 / 14 / 19	19 / 11 / 11	22 / 19 / 19	26 / 19 / 29	31 / 23 / 35	33 / 26 / 27
Featherly Regional Park	40 / 23 / 22	33 / 19 / 23	36 / 16 / 12	64 / 45 / 55	59 / 39 / 35	65 / 38 / 37	64 / 39 / 23
Sampled Locations							
Santa Ana River & Tributaries:							
Alessandro Arroyo/Prenda Arroyo	6 / 2 / 0	7 / 5 / 0	6 / 4 / 4	7 / 3 / 2	23 / 4 / 5	n/s	19 / 4 / 3
Arlington Falls	n/s	0 / 0 / 0	0 / 0 / 0	0 / 0 / 0	0 / 0 / 0	n/s	n/s
Box Springs	5 / 2 / 1	2 / 1 / 0	1 / 1 / 1	n/s	3 / 2 / 1	n/s	4 / 3 / 4
Cajalco Creek	See Temescal	3 / 2 / 0	1 / 0 / 0	0 / 0 / 0	0 / 0 / 0	n/s	See Temescal
Cajon Wash	0 / 0 / 0	0 / 0 / 0	n/s	0 / 0 / 0	n/s	n/s	0 / 0 / 0
Canyon Crest	0 / 0 / 0	0 / 0 / 0	n/s	0 / 0 / 0	1 / 1 / 0	n/s	1 / 0 / 0
Carbon Canyon (Chino Hills Pkwy.)	0 / 0 / 0	0 / 0 / 0	n/s	n/s	n/s	n/s	0 / 0 / 0
Carbon Cayon (Western Hills Golf Club)	0 / 0 / 0	0 / 0 / 0	n/s	n/s	n/s	n/s	n/s
Carbon Canyon Regional Park	8 / 6 / 3	13 / 7 / 5	12 / 7 / 7	16 / 9 / 1	16 / 6 / 5	12 / 4 / 4	10 / 2 / 0
Castleview Park	0 / 0 / 0	0 / 0 / 0	0 / 0 / 0	n/s	n/s	n/s	n/s
Chino Hills (Bayberry Dr.)	0 / 0 / 0	0 / 0 / 0	n/s	n/s	n/s	n/s	n/s
Chino Hills (End of Eucalyptus)	0 / 0 / 0	0 / 0 / 0	n/s	n/s	n/s	n/s	n/s
Chino Hills (Eucalyptus/Del Monte)	2 / 1 / 0	0 / 0 / 0	0 / 0 / 0	0 / 0 / 0	0 / 0 / 0	n/s	n/s
Chino Hills (Eucalyptus/Rancho Hills)	1 / 1 / 2	2 / 1 / 2	1 / 0 / 0	2 / 1 / 0	2 / 0 / 0	n/s	See Chino Hills
Chino Hills (Soquel Canyon/Pipeline)	n/s	2 / 0 / 0	2 / 1 / 1	3 / 2 / 0	4 / 2 / 3	n/s	See Chino Hills
Chino Hills Community Park (Eucalyptus/Peyton)	10 / 4 / 1	9 / 3 / 1	3 / 1 / 0	7 / 0 / 0	4 / 0 / 0	n/s	See Chino Hills
Chino Hills State Park (CHSP)	51 / 23 / 14	42 / 17 / 7	33 / 14 / 11	36 / 15 / 6	21 / 6 / 4	n/s	15 / 4 / 4
City Creek (Highland)	2 / 1 / 0	0 / 0 / 0	0 / 0 / 0	n/s	4 / 0 / 0	n/s	2 / 0 / 0
Clearwater Pkwy. @ Glen Helen	n/s	n/s	n/s	0 / 0 / 0	1 / 0 / 0	0 / 0 / 0	2 / 0 / 0
Conrock Basin FHQ	n/s	1 / 0 / 0	0 / 0 / 0	0 / 0 / 0	0 / 0 / 0	0 / 0 / 0	1 / 0 / 0
Corona Ave. at Gilmore	0 / 0 / 0	0 / 0 / 0	n/s	0 / 0 / 0	3 / 1 / 2	n/s	1 / 0 / 0
Fontana Power Plant	n/s	n/s	n/s	1 / 1 / 0	0 / 0 / 0	2 / 0 / 0	0 / 0 / 0
Fresno Canyon	1 / 0 / 0	1 / 1 / 1	0 / 0 / 0	1 / 1 / 0	2 / 0 / 0	2 / 0 / 0	2 / 1 / 0
Gavilan Hills	0 / 0 / 0	0 / 0 / 0	n/s	0 / 0 / 0	0 / 0 / 0	n/s	n/s
Goldenstar	0 / 0 / 0	0 / 0 / 0	0 / 0 / 0	0 / 0 / 0	2 / 1 / 0	0 / 0 / 0	1 / 0 / 0
Harrison Reservoir (aka McAllister Creek)	1 / 0 / 0	n/s	3 / 0 / 0	4 / 0 / 0	3 / 0 / 0	3 / 1 / 0	3 / 2 / 2
Hidden Valley Golf Club	3 / 0 / 0	4 / 0 / 0	6 / 0 / 0	6 / 3 / 1	8 / 1 / 0	5 / 2 / 2	7 / 2 / 0
La Sierra	3 / 0 / 0	3 / 2 / 3	2 / 1 / 1	4 / 2 / 3	5 / 1 / 1	n/s	3 / 0 / 0
Little Sand Basin	2 / 0 / 0	3 / 2 / 1	2 / 2 / 0	n/s	0 / 0 / 0	n/s	0 / 0 / 0
Mead Valley (Cajalco/Aqueduct)	8 / 0 / 0	5 / 4 / 5	4 / 1 / 2	4 / 4 / 2	5 / 2 / 0	4 / 0 / 0	7 / 3 / 3
Meridian Conservation Area (former March SKR Preserve)	14 / 12 / 25	16 / 9 / 7	13 / 11 / 8	14 / 12 / 16	21 / 16 / 23	7 / 3 / 3	14 / 5 / 6
Norco Hills Park Mitigation	0 / 0 / 0	0 / 0 / 0	0 / 0 / 0	0 / 0 / 0	0 / 0 / 0	n/s	0 / 0 / 0
Oak Glen Preserve	0 / 0 / 0	0 / 0 / 0	n/s	n/s	n/s	n/s	n/s
Plunge Creek	1 / 1 / 0	1 / 0 / 0	1 / 1 / 1	n/s	3 / 1 / 0	n/s	1 / 1 / 2
Poorman Reservoir	6 / 1 / 0	4 / 1 / 1	1 / 1 / 2	2 / 0 / 0	6 / 3 / 2	n/s	8 / 2 / 1
Promenade	2 / 2 / 4	2 / 1 / 1	2 / 1 / 1	1 / 1 / 0	2 / 1 / 1	n/s	n/s
Pyrite Channel	3 / 0 / 0	3 / 1 / 0	0 / 0 / 0	0 / 0 / 0	0 / 0 / 0	n/s	1 / 0 / 0
Quail Run	0 / 0 / 0	0 / 0 / 0	0 / 0 / 0	n/s	0 / 0 / 0	n/s	1 / 0 / 0
Riverview Golf Course, Santa Ana	n/s	n/s	n/s	n/s	n/s	n/s	n/s
Riverwalk Park	n/s	n/s	n/s	n/s	0 / 0 / 0	n/s	n/s
SAR - Riverside Ave. to Mission Blvd.	n/s	n/s	2 / 0 / 0	See SAR - Riverside Ave. to Van Buren Blvd.	See SAR - Riverside Ave. to Van Buren Blvd.	See SAR - Riverside Ave. to Van Buren Blvd.	See SAR - Riverside Ave. to Van Buren Blvd.
Santa Rosa Mine Road	n/s	n/s	n/s	n/s	n/s	n/s	n/s
Steele Valley	0 / 0 / 0	n/s	n/s	n/s	n/s	n/s	n/s
Sun Canyon Park	0 / 0 / 0	0 / 0 / 0	n/s	1 / 0 / 0	n/s	n/s	0 / 0 / 0
Sycamore Canyon	12 / 8 / 11	9 / 5 / 4	7 / 7 / 5	12 / 0 / 0	17 / 5 / 2	4 / 1 / 1	13 / 4 / 6
Talbert Park (Orange County)	n/s	1 / 0 / 0	2 / 0 / 0	3 / 1 / 0	5 / 1 / 0	1 / 0 / 0	7 / 1 / 0
Tequesquite Arroyo	0 / 0 / 0	0 / 0 / 0	n/s	0 / 0 / 0	0 / 0 / 0	n/s	0 / 0 / 0
Van Buren Blvd. (Bountiful)	0 / 0 / 0	0 / 0 / 0	0 / 0 / 0	n/s	1 / 0 / 0	2 / 0 / 0	2 / 0 / 0
Van Buren Blvd. - Plummer Rd. So.	4 / 3 / 2	3 / 2 / 3	2 / 1 / 1	n/s	See Meridian C.A.	See Meridian C.A.	See Meridian C.A.
Van Buren Blvd. (Porter Rd.)	0 / 0 / 0	0 / 0 / 0	n/s	n/s	0 / 0 / 0	n/s	0 / 0 / 0
Wardlow Wash	0 / 0 / 0	0 / 0 / 0	n/s	n/s	n/s	n/s	n/s
Woodcrest	0 / 0 / 0	0 / 0 / 0	0 / 0 / 0	0 / 0 / 0	1 / 0 / 0	1 / 1 / 3	1 / 0 / 0
Wyle Labs (at El Paso Rd. only)	1 / 1 / 2	1 / 0 / 0	1 / 1 / 1	1 / 0 / 0	1 / 0 / 0	0 / 0 / 0	1 / 0 / 0

Table 1. Least Bell's Vireo abundance and distribution in the Santa Ana Watershed, 2010-2016. Numbers of territories, pairs, and fledglings detected.

Site Name	2010	2011	2012	2013	2014	2015	2016
Santa Ana River & Tributaries:							
Yorba Linda (San Antonio Rd.)	n/s	n/s	n/s	n/s	2 / 1 / 1	1 / 1 / 2	n/s
Yorba Linda (Starlight Dr.)	2 / 0 / 0	1 / 1 / 0	2 / 0 / 0	4 / 0 / 0	4 / 1 / 1	4 / 1 / 1	1 / 1 / 0
Yorba Linda Lakebed Park	1 / 1 / 1	1 / 0 / 0	1 / 0 / 0	1 / 0 / 0	1 / 0 / 0	0 / 0 / 0	1 / 0 / 0
San Jacinto River Sub-watershed:							
Cottonwood Canyon	2 / 0 / 0	3 / 0 / 0	3 / 0 / 0	2 / 0 / 0	2 / 1 / 1	n/s	2 / 1 / 1
Kabian Park	3 / 3 / 0	3 / 1 / 0	1 / 0 / 0	3 / 3 / 0	7 / 4 / 3	n/s	9 / 4 / 3
Lake Perris	6 / 4 / 4	10 / 6 / 3	8 / 4 / 4	14 / 5 / 1	20 / 7 / 8	n/s	n/s
Menifee - Haun Rd.	0 / 0 / 0	n/s	n/s	n/s	n/s	n/s	n/s
Menifee - Paloma High School	0 / 0 / 0	n/s	n/s	n/s	n/s	n/s	n/s
Menifee (Salt Creek)	n/s	n/s	n/s	8 / 2 / 3	10 / 4 / 4	6 / 1 / 1	9 / 3 / 3
Santiago Creek Sub-watershed:							
Irvine Trust Management Area	1 / 0 / 0	1 / 0 / 0	1 / 0 / 0	1 / 0 / 0	1 / 0 / 0	1 / 0 / 0	n/s
Limestone Canyon	3 / 3 / 5	3 / 2 / 1	0 / 0 / 0	3 / 1 / 2	4 / 4 / 4	n/s	n/s
Peter's Canyon	14 / 5 / 1	16 / 3 / 2	12 / 2 / 0	16 / 2 / 2	15 / 11 / 7	18 / 4 / 6	25 / 11 / 6
Santiago Basin	n/s	2 / 1 / 1	1 / 0 / 0	1 / 0 / 0	1 / 0 / 0	1 / 0 / 0	1 / 0 / 0
Santiago Canyon (Irvine Park)	24 / 14 / 18	26 / 9 / 7	29 / 5 / 5	29 / 8 / 10	27 / 9 / 12	24 / 1 / 2	17 / 1 / 0
Santiago Creek (above Irvine Lake)	6 / 0 / 0	5 / 0 / 0	4 / 1 / 2	10 / 5 / 6	13 / 6 / 7	n/s	2 / 0 / 0
Santiago Creek (Cambridge Road)	0 / 0 / 0	0 / 0 / 0	0 / 0 / 0	0 / 0 / 0	0 / 0 / 0	0 / 0 / 0	0 / 0 / 0
Santiago Creek (Cannon Road, incl. Smith Basin)	1 / 0 / 0	3 / 0 / 0	0 / 0 / 0	2 / 2 / 0	2 / 0 / 0	2 / 1 / 0	4 / 0 / 0
Santiago Creek (Chapman Ave.)	0 / 0 / 0	0 / 0 / 0	0 / 0 / 0	0 / 0 / 0	0 / 0 / 0	0 / 0 / 0	0 / 0 / 0
Santiago Creek at Santiago Canyon Rd. (unnamed tributary to Irvine Lake)	0 / 0 / 0	0 / 0 / 0	0 / 0 / 0	n/s	n/s	n/s	n/s
Santiago Oaks Regional Park	1 / 1 / 1	0 / 0 / 0	0 / 0 / 0	0 / 0 / 0	0 / 0 / 0	n/s	n/s
Silverado Canyon	0 / 0 / 0	0 / 0 / 0	0 / 0 / 0	0 / 0 / 0	0 / 0 / 0	n/s	0 / 0 / 0
Incidental Sightings							
Alberhill - Temescal	0 / 0 / 0	0 / 0 / 0	1 / 0 / 0	n/s	See Temescal	See Temescal	See Temescal
Burris Basin	n/s	n/s	n/s	n/s	n/s	n/s	2 / 1 / 4
Chino Creek Wetlands Park	2 / 1 / 1	2 / 1 / 1	1 / 0 / 0	2 / 1 / 1	1 / 0 / 0	1 / 0 / 0	1 / 0 / 0
Colonies Crossroads Shopping Center Ponds	n/s	n/s	n/s	1 / 0 / 0	n/s	n/s	n/s
Etiwanda Wildlife Preserve	1 / 0 / 0	0 / 0 / 0	n/s	n/s	n/s	n/s	n/s
Hwy. 71, OCWD Property	n/s	n/s	n/s	1 / 0 / 0	n/s	n/s	n/s
Irvine Lake	n/s	n/s	n/s	n/s	n/s	n/s	2 / 1 / 1
Mt. Baldy (Shinn Rd.)	n/s	0 / 0 / 0	n/s	n/s	n/s	n/s	n/s
Rancho La Sierra West, Riverside	1 / 1 / 0	1 / 1 / 1	1 / 1 / 1	2 / 2 / 1	1 / 0 / 0	0 / 0 / 0	1 / 0 / 0
RLC Alessandro Arroyo - 1.52 ac	n/s	n/s	n/s	n/s	n/s	n/s	1 / 0 / 0
UC Riverside	n/s	1 / 0 / 0	0 / 0 / 0	n/s	0 / 0 / 0	n/s	n/s
SUBTOTAL	818 / 517 / 655	805 / 472 / 665	751 / 430 / 539	979 / 448 / 652	1024 / 462 / 532	964 / 429 / 623	1070 / 497 / 659
Reported by other agencies							
Black Gold Golf Club, Yorba Linda[6]	Not reported	2 / 0 / 0	4 / 0 / 0	3 / 0 / 0	Not reported	Not reported	/ /
Diemer Plant, Brea, CA[6]	n/a	n/a	n/a	1 / 0 / 0	Not reported	Not reported	/ /
Estelle Mountain Reserve[3]	0 / 0 / 0	1 / 0 / 0	Not reported	Not reported	Not reported	Not reported	/ /
Lake Perris[6]	See Lake Perris above	See Lake Perris above	See Lake Perris above	See Lake Perris above	See Lake Perris above	Not reported	14 / n/a / n/a
Mud Canyon, Yorba Linda[6]	Not reported	Not reported	1 / 0 / 0	0 / 0 / 0	Not reported	Not reported	/ /
Potrero[3]	2 / 0 / 0	Not reported	Not reported	Not reported	0 / 0 / 0	Not reported	/ /
Pulte Wetlands, adjacent to CHSP[6]	Not reported	2 / 0 / 0	Not reported	Not reported	Not reported	Not reported	/ /
Rim Canyon Dr. and Blue Gum Dr. adjacent to CHSP[6]	n/s	0 / 0 / 0	n/s	n/s	See CHSP	Not reported	/ /
SAR - Norco Bluffs ACOE Mitigation Areas[8/9/10]	n/a	n/a	n/a	32 / 21 / 48	38 / 19 / 16	Not reported	14 / n/a / n/a
Santa Ana River - San Bernardino County[2]	42 / 26 / 24	42 / 23 / 30	30 / 22 / 25	Not reported	Not reported	Not reported	14 / n/a / n/a
Shipley Nature Center[7]	0 / 0 / 0	0 / 0 / 0	0 / 0 / 0	0 / 0 / 0	0 / 0 / 0	Not reported	/ /
South Coal Canyon (Santa Ana Canyon)[6]	n/a	n/a	1 / 0 / 0	1 / 0 / 0	n/a	n/s	/ /
TOTAL FOR SANTA ANA WATERSHED EXCLUDING PRADO BASIN	**862 / 543 / 679**	**852 / 495 / 695**	**787 / 452 / 564**	**1016 / 469 / 700**	**1062 / 481 / 548**	**964 / 429 / 623**	**1112 / 497 / 659**
PRADO BASIN (Pike et. al.)[4]	569 / 286 / 479	517 / 200 / 286	451 / 158 / 229	561 / 195 / 286	520 / 172 / 194	532 / 186 / 225	511 / n/a / n/a
TOTAL FOR SANTA ANA WATERSHED	**1431 / 829 / 1158**	**1369 / 695 / 981**	**1238 / 610 / 793**	**1577 / 664 / 986**	**1582 / 653 / 742**	**1496 / 615 / 848**	**1623 / 497 / 659**
Outside Watershed[5]							
Coyote Hills East Reserve (Fullerton)[5]	3 / 3 / 3	4 / 0 / 0	2 / 0 / 0	2 / 0 / 0	n/s	n/s	n/s
Chula Vista, CA[5]	1 / 0 / 0	n/s	n/s	n/s	n/s	n/s	n/s

a. Entries correspond to numbers of territorial males/pairs/'known fledged young' for designated time and locale.
b. "n/a" indicates that no data were available.
c. "n/s" indicates that no surveys were conducted.
[1]2010-2014 data combined with data previously reported as "Hidden Valley to River Rd." In 2016, approximately 250 additional acres were surveyed as compared to 2015.
[2]Reported by biologists, San Bernardino County Flood Control. In 2016, only Waterman Ave. to E St. was surveyed.
[3]Reported by MSHCP biologists
[4]Data from Pike et. al. 2010-2014
[5]Outside Santa Ana Watershed, no included in totals
[6]Reported by California State Parks
[7]Reported by Dave Telford
[8]AECOM. 2013.b. 2013 Santa Ana River Flood Control Mitigation Plan Least Bell's Vireo 45-day Report, San Bernardino, California
[9]AECOM personal communication
[10]Ultrasystems Environmental Inc. Compiled from maps in report by Ryan Ecological Consulting. "Results of Least Bell's Vireo and Southwestern Willow Flycatcher Focus Surveys for the USACE in Target Areas #1-4, pril-July 2016."

Table 2. Least Bell's Vireo status and management data at monitored and sampled sites in the Santa Ana Watershed, 2016.

					Santa Ana River (SAR) - Upstream							Santa Ana Canyon (SAC)			
	Parameter	San Jacinto	San Timoteo Canyon	Mockingbird Canyon	Riverside Ave. to Van Buren Blvd.	Hidden Valley, north side of river	Hidden Valley, south side of river	Goose Creek, Norco to I-15 (includes Goose Creek mitigation funded by IERCD)	Norco Bluffs (I-15 to River Rd., non-mitigation)	Temescal Canyon	Chino Hills	Upper Canyon	Green River Golf Club	Featherly Reg. Park	Total
A.	Number of territorial males	37	173	25	109	40	121	63	63	93	18	26	33	64	865
B.	Number of known pairs (breeding and non-breeding)	17	124	7	43	27	66	31	28	9	11	12	26	39	440
C.	Number of fledged young observed	12	222	11	62	33	97	45	45	5	10	18	27	23	610
D.	Projected total of recruitment of vireo young[a]	20	384	21	172	100	198	71	84	n/a	n/a	28	29	39	1,144
E.	Average number of fledglings per pair (C/B)	0.7	1.8	1.6	1.4	1.2	1.5	1.5	1.6	0.6	0.9	1.5	1.0	0.6	1.4
F.	Projected number of fledglings per pair (D/B)	1.2	3.1	3.0	4.0	3.7	3.0	2.3	3.0	n/a	n/a	2.3	1.1	1.0	2.6
G.	This row purposefully omitted.														
H.	Rate of cowbird nest parasitism	75% 6 / 8	0% 0 / 73	0% 0 / 3	0% 0 / 12	0% 0 / 5	0% 0 / 16	0% 0 / 21	0% 0 / 12	n/a	0% 0 / 2	0% 0 / 3	0% 0 / 13	0% 0 / 12	3% 6 / 180
I.	Number of cowbirds removed from study area	2,101	87	52	65	n/a	n/a	12	n/a	297	53	28	36	8	2,739 [b]
J.	This row purposefully omitted.														
K.	Number of trap days (1 operative trap day in the field for one day = 1 trap day)	390	832	385	534	n/a	n/a	136	n/a	644	262	134	260	398	3,975 [b]
L.	Average number of cowbirds trapped per trap day (I/K)	5.39	0.10	0.14	0.12	n/a	n/a	0.09	n/a	0.46	0.20	0.21	0.14	0.02	0.69
M.	Number of field hours - LBVI (+)	83	415	157	439	87	234	234	180	146	83	68	113	205	2,444
N.	Number of field hours - BHCO (+)	223	329	193	380	n/a	n/a	n/a	n/a	485	128	425			2,163

[a]Survival rate of fledglings in well-tracked nests was applied to nests not visited as frequently by the function (avg. # fledglings produced by well-tracked pairs x total number of pairs). These data represent minimum recruitment as defined by the Least Bell's Vireo Working Group "known fledged young."

[b]All traps are not accounted for in this total.

Table 3. Least Bell's Vireo survey dates and breeding chronology, 2016.

Survey Site	Survey Start Date[a]	Survey End Date	First Arrival Date	50% Arrived	50% Paired	First Nest Found	Last Nest Found	First Fledge Date	Last Fledge Date	Date Last Detected[b]
San Jacinto	16-Mar	28-Jul	16-Mar	30-Mar	n/a[c]	18-May	16-Jun	12-Jun	12-Jun	28-Jul
San Timoteo Canyon	15-Mar	12-Aug	16-Mar	7-Apr	29-Apr	5-Apr	29-Jun	29-Apr	18-Jul	12-Aug
Mockingbird Canyon	11-Apr	29-Jul	11-Apr	18-Apr	24-May	18-Apr	13-Jun	4-Jun	19-Jul	29-Jul
Santa Ana River (SAR) - Upstream										
Riverside Ave. to Van Buren Blvd.	16-Mar	3-Aug	16-Mar	1-Apr	26-Apr	7-Apr	21-Jun	10-May	28-Jul	3-Aug
Hidden Valley, north side of river	21-Mar	11-Aug	21-Mar	29-Mar	18-May	13-Apr	24-May	17-May	19-Jun	11-Aug
Hidden Valley, south side of river	18-Mar	10-Aug	18-Mar	13-Apr	15-Apr	11-Apr	8-Jun	5-May	13-Jun	10-Aug
Goose Creek, Norco to I-15 (including Goose Creek mitigation funded by IERCD)	16-Mar	18-Aug	16-Mar	12-Apr	12-Apr	5-Apr	20-Jun	11-May	20-Jul	18-Aug
Norco Bluffs (I-15 to River Rd., non-mitigation)	16-Mar	23-Aug	22-Mar	29-Mar	1-May	8-Apr	17-Jun	9-May	10-Jun	23-Aug
Temescal Canyon	1-Apr	20-Jul	n/a	n/a	n/a	n/a	n/a	n/a	n/a	22-Jul
Chino Hills	31-Mar	10-Aug	31-Mar	15-Apr	27-Apr	19-May	18-Jul	10-Jun	11-Jul	10-Aug
Santa Ana Canyon (SAC)	1-Mar	11-Aug	16-Mar	6-Apr	18-Apr	29-Mar	24-Jun	14-May	19-Jul	11-Aug
Upper Canyon	17-Mar	4-Aug	17-Mar	30-Mar	15-Apr	21-Apr	20-May	19-May	28-May	4-Aug
Green River Golf Course	21-Mar	11-Aug	21-Mar	29-Mar	13-Apr	29-Mar	24-Jun	14-May	25-Jun	11-Aug
Featherly Park	1-Mar	5-Aug	16-Mar	11-Apr	25-Apr	11-Apr	22-Jun	6-Jun	19-Jul	5-Aug

[a] First date of full survey specifically for Least Bell's Vireo

[b] May vary from last survey date as an incidental sighting as opposed to a targeted survey.

[c] Due to the small sample size, date for 50% paired could not be determined.

Table 4. Least Bell's Vireo nest placement preference at monitored and sampled sites in the Santa Ana Watershed, 2016.

Host Plant Species (listed in taxonomic order)	San Jacinto	San Timoteo Canyon	Mockingbird Canyon	Santa Ana River (SAR) - Upstream				Norco Bluffs (I-15 to River Rd., non-mitigation)	Temescal Canyon	Chino Hills	Santa Ana Canyon (SAC)			Total	Percentage of Total
				Riverside Ave. to Van Buren Blvd.	Hidden Valley, north side of river	Hidden Valley, south side of river	Goose Creek, Norco to I-15 (includes Goose Creek mitigation funded by IERCD)				Upper Canyon	Green River Golf Club	Featherly Reg. Park		
Coulter's Matilija Poppy[r] (*Romneya coulteri*)													1	1	<1%
Golden Currant (*Ribes aureum*)		1												1	<1%
Desert Wild Grape (*Vitis girdiana*)		8		2		1		3						14	7%
Fremont Cottonwood (*Populus fremontii*)		3			1	1							1	6	3%
Black Cottonwood (*Populus balsamifera* ssp. *trichocarpa*)													1	1	<1%
Narrowleaf Willow (*Salix exigua*)	1	1				1		1						4	2%
Goodding's Black Willow (*Salix gooddingii*)	4	4		2		1	2	2	1	1		1	1	19	9%
Red Willow (*Salix laevigata*)	2	16		1		3	1			1		1		25	12%
Arroyo Willow (*Salix lasiolepis*)		22	1	3	2	2	9	5				1	1	46	22%
Yellow Willow (*Salix lasiandra)*		3												3	1%
Bank Catclaw[e] (*Acacia redolens*)										1				1	<1%
California Wild Rose (*Rosa californica*)				1		1								2	1%
Chinese Elm[e] (*Ulmus parvifolia*)										1				1	<1%

Table 4. Least Bell's Vireo nest placement preference at monitored and sampled sites in the Santa Ana Watershed, 2016.

Host Plant Species (listed in taxonomic order)	San Jacinto	San Timoteo Canyon	Mockingbird Canyon	Santa Ana River (SAR) - Upstream				Prado Basin - Norco Bluffs (I-15 to River Rd., non-mitigation)	Temescal Canyon	Chino Hills	Santa Ana Canyon (SAC)			Total	Percentage of Total
				Riverside Ave. to Van Buren Blvd.	Hidden Valley, north side of river	Hidden Valley, south side of river	Goose Creek, Norco to I-15 (includes Goose Creek mitigation funded by IERCD)				Upper Canyon	Green River Golf Club	Featherly Reg. Park		
Laurel Sumac (*Malosma laurina*)												2		2	1%
Poison Oak (*Toxicodendron*				1								2	1	4	2%
Coyote Brush (*Baccharis pilularis*)	3													3	1%
Mulefat (*Baccharis salicifolia*)	1	19		5	2	4	8	1			2	5	8	55	27%
Dead Mulefat (*Baccharis salicifolia*)							2							2	1%
Blue Elderberry (*Sambucus nigra* ssp. *caerulea)*		1	2	1		1					1	2		8	4%
Unknown/No Data						6							2	8	4%
Total	11	78	3	16	5	21	22	12	1	4	3	14	16	206	100%

[i] = invasive
[e] = non-native
[r] = endangered, threatened, or sensitive

Table 5. Least Bell's Vireo reproductive success and breeding biology data at monitored and sampled sites in the Santa Ana Watershed, 2016.

					Santa Ana River (SAR) - Upstream							Santa Ana Canyon (SAC)			
	Parameter	San Jacinto	San Timoteo Canyon	Mockingbird Canyon	Riverside Ave. to Van Buren Blvd.	Hidden Valley, north side of river	Hidden Valley, south side of river	Goose Creek, Norco to I-15 (includes Goose Creek mitigation funded by IERCD)	Norco Bluffs (I-15 to River Rd., non-mitigation)	Temescal Canyon	Chino Hills	Upper Canyon	Green River Golf Club	Featherly Reg. Park	Total
A.	Number of known pairs	17	124	7	43	27	66	31	28	9	11	12	26	39	440
B.	Number of known breeding (nesting) pairs	10	107	4	29	20	57	28	28	4	8	11	22	25	353
C.	Number of breeding pairs that were well-monitored throughout the breeding season	5	39	1	7	3	7	9	5	0	0	3	8	8	95
D.	Number of 'known fledged young' OBSERVED	12	222	11	62	33	97	45	45	5	10	18	27	23	610
E.	Number of known fledged young produced by pairs monitored throughout the breeding season	6	119	3	28	11	21	21	15	n/a	0	7	9	8	248
F.	Average number of fledglings produced per breeding pair (minimum; D/B = 'productivity or breeding success')	1.2	2.1	2.8	2.1	1.7	1.7	1.6	1.6	1.3	1.3	1.6	1.2	0.9	1.7
G.	Average number of fledglings produced by well- monitored pairs (E/C = reproductive success)	1.2	3.1	3.0	4.0	3.7	3.0	2.3	3.0	n/a	n/a	2.3	1.1	1.0	2.6
H.	Number of nests that were discovered	11	78	3	16	5	21	22	12	1	4	3	14	16	206
I.	Number of nests that were regularly monitored or 'tracked'	8	73	3	12	5	16	21	12	0	2	3	13	12	180
J.	Number of 'tracked' nests that were successful (% = J/I x 100)	25% 2 / 8	51% 37 / 73	67% 2 / 3	83% 10 / 12	60% 3 / 5	75% 12 / 16	43% 9 / 21	58% 7 / 12	n/a	50% 1 / 2	100% 3 / 3	31% 4 / 13	25% 3 / 12	52% 93 / 180
K.	This row purposefully omitted														
L.	Number of 'tracked' nests that were parasitized by cowbirds (% = L/I x 100)	75% 6 / 8	0% 0 / 73	0% 0 / 3	0% 0 / 12	0% 0 / 5	0% 0 / 16	0% 0 / 21	0% 0 / 12	n/a	0% 0 / 2	0% 0 / 3	0% 0 / 13	0% 0 / 12	3% 6 / 180

Table 5. Least Bell's Vireo reproductive success and breeding biology data at monitored and sampled sites in the Santa Ana Watershed, 2016.

					Santa Ana River (SAR) - Upstream								Santa Ana Canyon (SAC)			
	Parameter	San Jacinto	San Timoteo Canyon	Mockingbird Canyon	Riverside Ave. to Van Buren Blvd.	Hidden Valley, north side of river	Hidden Valley, south side of river	Goose Creek, Norco to I-15 (includes Goose Creek mitigation funded by IERCD)	Norco Bluffs (I-15 to River Rd., non-mitigation)	Temescal Canyon	Chino Hills	Upper Canyon	Green River Golf Club (monitored)	Featherly Reg. Park	Total
	A. Number of 'tracked' nests that failed as a result of reproductive failure	0% 0 / 8	7% 5 / 73	0% 0 / 3	0% 0 / 12	0% 0 / 5	0% 0 / 16	0% 0 / 21	8% 1 / 12	n/a	50% 1 / 2	0% 0 / 3	23% 3 / 13	0% 0 / 12	6% 10 / 180
	B. Number of 'tracked' nests that failed as a result of parasitism	13% 1 / 8	0% 0 / 73	0% 0 / 3	0% 0 / 12	0% 0 / 5	0% 0 / 16	0% 0 / 21	0% 0 / 12	n/a	0% 0 / 2	0% 0 / 3	0% 0 / 13	0% 0 / 12	1% 1 / 180
	C. Number of 'tracked' nests that failed as a result of predation - Predation Rate according to Vireo Working Group	63% 5 / 8	42% 31 / 73	33% 1 / 3	17% 2 / 12	20% 1 / 5	25% 4 / 16	52% 11 / 21	33% 4 / 12	n/a	0% 0 / 2	0% 0 / 3	46% 6 / 13	75% 9 / 12	41% 74 / 180
M.	D. Number of 'tracked' nests that failed for unknown reasons	0% 0 / 8	0% 0 / 73	0% 0 / 3	0% 0 / 12	20% 1 / 5	0% 0 / 16	5% 1 / 21	0% 0 / 12	n/a	0% 0 / 2	0% 0 / 3	0% 0 / 13	0% 0 / 12	1% 2 / 180
	Average clutch size	4.0	3.5	3.3	3.9	3.4	3.5	3.4	3.4	4.0	3.0	3.3	2.7	3.2	3.4
N.	Number of eggs/Number of clutches	4 / 1	239 / 69	10 / 3	54 / 14	17 / 5	56 / 16	54 / 16	41 / 12	4 / 1	6 / 2	10 / 3	35 / 13	38 / 12	568 / 167
O.	Number of cowbird eggs found in or near vireo nests	8	0	0	0	0	0	0	0	0	0	0	0	0	8
P.	Number of cowbird nestlings removed from 'tracked' nests	0	0	0	0	0	0	0	0	n/a	0	0	0	0	0
Q.	Number of cowbird young fledged by vireo	0	0	0	0	0	0	0	0	n/a	0	0	0	0	0
R.	Number of 'manipulated' parasitized nests	6	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	6
S.	Number of 'successful, manipulated' nests (% = S/R x 100)	33% 2 / 6	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	33% 2 / 6
T.	Number of vireo fledged from 'manipulated' parasitized nests	6	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	6
U.	Number of repaired nests	0	0	0	0	0	0	0	0	0	0	0	0	0	0
V.	% of successful repaired nests	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
W.	Number of vireo fledged from repaired nests	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a

Table 6. Brown-headed Cowbird trapping results, March-July 2016 (grouped by funding source).

Site Name	Trap/Location	2016 Dates of Operation	Number of Trap Days	Cowbirds Removed				Daily Removed Averages		BHCO Field Hours
				Total	Male	Female	Juveniles	Adults	All	
USFWS/ACOE/SARM Project										
San Jacinto Dairies	16SanJac-BHCO-Vanderwoude 2	3/14-7/29	130	692	412	233	47	4.96	5.32	
	16SanJac-BHCO-Tuls 1	3/14-7/29	130	455	147	285	23	3.32	3.50	
	16SanJac-BHCO-Scott Bros	3/14-7/29	130	954	645	284	25	7.15	7.34	
Subtotal			**390**	**2,101**	**1,204**	**802**	**95**	**5.14**	**5.39**	**223**
Santa Ana River (upstream)	16SAR-BHCO-Fairmount Park	3/14-7/25	132	26	14	9	3	0.17	0.20	
	16SAR-BHCO-Crestmore	3/14-7/26	133	11	7	2	2	0.07	0.08	
	16SAR-BHCO-Sunnyslope	3/14-7/27	134	6	2	1	3	0.02	0.04	
	16SAR-BHCO-Riverdale	3/14-7/28	135	22	14	8	0	0.16	0.16	
	16SAR-BHCO-Goose Creek 2	3/14-7/29	136	12	3	8	1	0.08	0.09	
Subtotal			**670**	**77**	**40**	**28**	**9**	**0.10**	**0.11**	**380**
Mockingbird Canyon	16MBC-BHCO-Reservoir	3/14-7/22	129	36	16	20	0	0.28	0.28	
	16MBC-BHCO-Estates	3/14-7/22	127	14	8	1	5	0.07	0.11	
	16MBC-BHCO-Markham	3/14-7/22	129	2	0	-1	3	-0.01	0.02	
Subtotal			**385**	**52**	**24**	**20**	**8**	**0.11**	**0.14**	**193**
Prado	16Prado-BHCO-IEUA	3/14-7/27	132	35	15	14	6	0.22	0.27	
	16Prado-BHCO-Regional Park	3/15-7/26	130	2	3	-1	0	0.02	0.02	
	16Prado-BHCO-Olive Grove	3/15-7/27	131	9	3	6	0	0.07	0.07	
	16Prado-BHCO-Mill Creek	3/16-7/28	131	-1	-1	0	0	-0.01	-0.01	
	16Prado-BHCO-Viramontes	3/16-7/28	112	1	1	0	0	0.01	0.01	
	16Prado-BHCO-Trailer	3/16-7/28	131	1	1	0	0	0.01	0.01	
Subtotal			**767**	**47**	**22**	**19**	**6**	**0.05**	**0.06**	**452**
Temescal	16Tem-BHCO-New Sump	3/15-7/28	133	23	16	6	1	0.17	0.17	
	16Tem-BHCO-Rockery	3/15-7/29	134	2	1	1	0	0.01	0.01	
	16Tem-BHCO-Baker	3/14-7/27	133	3	1	2	0	0.02	0.02	
	16Tem-BHCO-Salt Creek	3/14-7/3	109	5	2	3	0	0.05	0.05	
Subtotal			**509**	**33**	**20**	**12**	**1**	**0.06**	**0.06**	**417**
Prado and Lake Elsinore Dairies										
	16Prado-BHCO-Euclid 1	3/15-7/29	133	39	23	7	9	0.23	0.29	
	16Prado-BHCO-Euclid 2	3/15-7/29	133	284	172	81	31	1.90	2.14	
	16Tem-BHCO-Dejongs	3/15-7/29	135	264	172	84	8	1.90	1.96	
Subtotal			**401**	**587**	**367**	**172**	**48**	**1.34**	**1.46**	**201**

Table 6. Brown-headed Cowbird trapping results, March-July 2016 (grouped by funding source).

Site Name	Trap/Location	2016 Dates of Operation	Number of Trap Days	Cowbirds Removed				Daily Removed Averages		BHCO Field Hours
				Total	Male	Female	Juveniles	Adults	All	
Santa Ana Canyon	16SAC-BHCO-Yorba Park	3/16-7/29	134	7	1	6	0	0.05	0.05	
	16SAC-BHCO-Savi Ranch	3/16-7/27	132	0	0	0	0	0.00	0.00	
	16SAC-BHCO-RV Park E	3/16-7/27	132	1	1	0	0	0.01	0.01	
	16SAC-BHCO-GR Golf W	3/15-7/26	128	6	2	4	0	0.05	0.05	
	16SAC-BHCO-GR Golf E	3/15-7/26	132	30	19	10	1	0.22	0.23	
	16SAC-BHCO-GR Eq	3/15-7/28	134	28	18	10	0	0.21	0.21	
Subtotal			**792**	**72**	**41**	**30**	**1**	**0.09**	**0.09**	**425**
Anaheim	16Anaheim-BHCO-Santiago	3/17-7/29	115	17	8	2	7	0.09	0.15	
	16Anaheim-BHCO-Burris Basin	3/17-7/29	114	6	2	4	0	0.05	0.05	
	16Anaheim-BHCO-Conrock1	3/17-7/25	111	31	19	9	3	0.25	0.28	
	16Anaheim-BHCO-Conrock2	3/17-7/25	111	11	8	3	0	0.10	0.10	
Subtotal			**451**	**65**	**37**	**18**	**10**	**0.12**	**0.14**	**219**
TOTAL (USFWS/ACOE/SARM)			**4,365**	**3,034**	**1,755**	**1,101**	**178**	**0.65**	**0.70**	**2,068**
IERCD										
San Timoteo	16ST-BHCO-Bees	3/14-7/28	129	3	1	1	1	0.02	0.02	
	16ST-BHCO-English	3/15-6/3	75	-4	-1	-3	0	-0.05	-0.05	
	16ST-BHCO-Headlee	3/14-7/28	129	30	14	15	1	0.22	0.23	
	16ST-BHCO-Harned	3/14-7/28	129	9	5	3	1	0.06	0.07	
	16ST-BHCO-Fishermans	3/15-7/28	128	42	33	6	3	0.30	0.33	
	16ST-BHCO-YL1	3/15-7/28	128	2	1	0	1	0.01	0.02	
	16ST-BHCO-YL3	3/15-7/14	114	5	6	-1	0	0.04	0.04	
Subtotal			**832**	**87**	**59**	**21**	**7**	**0.10**	**0.10**	**329**
Riverside Land Conservancy										
Meridian C.A.	16Meridian-BHCO-Meridian 1	3/15-7/19	124	0	0	0	0	0.00	0.00	
(former March SKR Preserve)	16Meridian-BHCO-Meridian 2	3/15-7/19	124	3	0	3	0	0.02	0.02	
Subtotal			**248**	**3**	**0**	**3**	**0**	**0.01**	**0.01**	**87**
City of Chino Hills	16CH-BHCO-Boy's Republic	3/14-7/26	131	25	14	9	2	0.18	0.19	
English Channel	16CH-BHCO-McCoy	3/14-7/26	131	28	17	9	2	0.20	0.21	
Subtotal			**262**	**53**	**31**	**18**	**4**	**0.19**	**0.20**	**128**
GRAND TOTAL			**5,707**	**3,177**	**1,845**	**1,143**	**189**	**0.52**	**0.56**	**2,612**

Table 7. Least Bell's Vireo assessment survey (sampled) results, 2016.

		SURVEY 1 4/26/16 - 5/13/16			SURVEY 2 6/2/16 - 6/17/16			SURVEY 3 7/8/16 - 7/21/16			TOTAL # VIREOS						
	Site Names															Cowbirds	Traps on
Surveyor	**Santa Ana River & Tributaries**	Terr.	Pairs	Juv.	Terr.	Pairs	Juv.	Terr.	Pairs	Juv.	Terr.	Pairs	Juv.	# Visits	# Hours	Detected	site?
CM/CC/RZ	Alessandro/Prenda Arroyo	13	1	0	14	1	2	10	2	1	19	4	3	3	26.25	No	No
MP	Box Springs	3	1	0	4	1	1	4	2	3	4	3	4	3	6	No	No
AB/JC	Cajon Wash	0	0	0	*	*	*	*	*	*	0	0	0	1	4	No	No
HA	Canyon Crest	1	0	0	1	0	0	0	0	0	1	0	0	3	3	No	No
JC	Carbon Canyon (Chino Hills Pkwy)	0	0	0	0	0	0	0	0	0	0	0	0	3	3	Yes	No
JC/CC	Carbon Canyon Regional Park	7	2	0	9	2	0	6	2	0	10	2	0	3	19	Yes	No
TR/CC	Chino Hills State Park (Bane Cyn)	1	0	0	2	1	0	2	0	0	3	1	0	3	15.5	No	No
AB/MA	Chino Hills State Park (Lower Aliso Cyn)	4	0	0	3	1	2	2	1	0	4	2	2	3	15	No	No
CM/JC	Chino Hills State Park (Telegraph Cyn)	2	0	0	1	0	0	0	0	0	2	0	0	3	14	No	No
TR/CC	Chino Hills State Park (Upper Aliso Cyn)	5	0	0	5	1	0	2	1	2	6	1	2	3	20.5	No	Yes
NH	City Creek (Highland)	0	0	0	1	0	0	1	0	0	2	0	0	3	5.5	Yes	No
JC	Clearwater Pkwy @ Glen Helen	1	0	0	2	0	0	1	0	0	2	0	0	3	3.75	Yes	No
DM	Conrock Basin (FHQ)	1	0	0	0	0	0	0	0	0	1	0	0	3	1.5	Yes	Yes
HA	Corona St. at Gilmore	0	0	0	0	0	0	1	0	0	1	0	0	3	3	No	No
JC	Fontana Power Plant	0	0	0	0	0	0	0	0	0	0	0	0	3	2.5	Yes	No
TR	Fresno Canyon	0	0	0	1	1	0	1	0	0	2	1	0	3	11	No	No
NH	Goldenstar	1	0	0	1	0	0	1	0	0	1	0	0	3	7.75	Yes	No
MP	Harrison Reservoir (aka McAllister Creek)	3	2	0	3	2	2	1	0	0	3	2	2	3	7	No	No
TR/SH	Hidden Valley Golf Club	6	0	0	5	1	0	5	2	0	7	2	0	3	24.5	No	No
HA	La Sierra	2	0	0	3	0	0	2	0	0	3	0	0	3	5.25	No	No
NH	Little Sand Basin	0	0	0	0	0	0	0	0	0	0	0	0	3	3	No	No
JL/JO	Mead Valley (Cajalco/aqueduct)	7	3	0	4	1	0	5	1	3	7	3	3	3	22	No	No
NH/TR	Meridian CA (former March SKR Preserve)	6	0	0	12	1	0	6	4	6	14	5	6	3	28.75	Yes	No
HA	Norco Hills Park Mitigation	0	0	0	0	0	0	0	0	0	0	0	0	3	1.5	No	No
NH	Plunge Creek	1	0	0	1	1	2	1	1	1	1	1	2	3	4	Yes	No
NH	Poorman Reservoir	7	1	0	7	2	1	5	1	1	8	2	1	3	7.75	Yes	No
JL/JO	Pyrite Channel	1	0	0	1	0	0	0	0	0	1	0	0	3	9.5	No	No
NH	Quail Run	1	0	0	0	0	0	0	0	0	1	0	0	3	4	No	No
HA	Sun Canyon Park	0	0	0	0	0	0	0	0	0	0	0	0	3	1.5	No	No
CM	Sycamore Canyon	7	0	0	9	3	4	7	2	3	13	4	6	3	14.75	No	No
SH	Talbert Park (Orange County)	7	1	0	2	0	0	2	0	0	7	1	0	4	14	Yes	No
HA	Tequesquite Arroyo	0	0	0	0	0	0	0	0	0	0	0	0	3	2	No	No

Table 7. Least Bell's Vireo assessment survey (sampled) results, 2016.

		SURVEY 1 4/26/16 - 5/13/16			SURVEY 2 6/2/16 - 6/17/16			SURVEY 3 7/8/16 - 7/21/16			TOTAL # VIREOS						
	Site Names															Cowbirds	Traps on
Surveyor	**Santa Ana River & Tributaries**	Terr.	Pairs	Juv.	Terr.	Pairs	Juv.	Terr.	Pairs	Juv.	Terr.	Pairs	Juv.	# Visits	# Hours	Detected	site?
CC	Van Buren Blvd. (Bountiful)	2	0	0	2	0	0	0	0	0	2	0	0	3	3.75	No	No
NH	Van Buren Blvd. (Porter Road)	0	0	0	0	0	0	0	0	0	0	0	0	3	2	No	No
NH	Woodcrest	1	0	0	0	0	0	1	0	0	1	0	0	3	1.5	No	No
HA	Wyle Labs (at El Paso only)	0	0	0	1	0	0	0	0	0	1	0	0	3	1.5	No	No
SH	Yorba Linda (Starlight Dr.)	0	0	0	1	1	0	1	0	0	1	1	0	3	9.5	No	No
SH	Yorba Linda Lakebed Park	0	0	0	0	0	0	1	0	0	1	0	0	3	8	Yes	No
	San Jacinto River Sub-watershed																
AB	Cottonwood Canyon	2	0	0	1	1	0	2	1	1	2	1	1	3	6.75	No	No
MA/BJ	Kabian Park	6	1	0	7	4	3	4	0	0	9	4	3	3	17	Yes	No
AB	Menifee (Salt Creek)	3	0	0	9	2	2	1	1	1	9	3	3	3	6.25	No	Yes
	Santiago Creek Sub-watershed																
MA	Peter's Canyon	22	5	0	18	3	1	11	5	5	25	11	6	3	12.5	No	Yes
DM	Santiago Basin	1	0	0	0	0	0	0	0	0	1	0	0	3	2.25	Yes	Yes
DM	Santiago Canyon (Irvine Park)	8	1	0	14	0	0	3	0	0	17	1	0	3	7	Yes	Yes
MP/CC	Santiago Creek (above Irvine Lake)	1	0	0	2	0	0	0	0	0	2	0	0	3	19.5	Yes	No
DM	Santiago Creek (Cambridge Road)	0	0	0	0	0	0	0	0	0	0	0	0	3	1	No	No
DM/SH	Santiago Creek (Cannon Road, incl. Smith Basin)	3	0	0	4	0	0	1	0	0	4	0	0	5	14	No	No
DM	Santiago Creek (Chapman Ave.)	0	0	0	0	0	0	0	0	0	0	0	0	3	2.5	No	No
MP/CC	Silverado Canyon	0	0	0	0	0	0	0	0	0	0	0	0	3	2	No	No
# Vireo Detected in Santa Ana Watershed during Assessment Surveys		**136**	**18**	**0**	**150**	**30**	**20**	**90**	**26**	**27**	**198**	**55**	**44**	**148**	**427.75**		

* Indicates survey not conducted

Table 8. Observations of all species by location, 2016.

Common Name	*Scientific Name*	San Jacinto	San Timoteo Canyon	Mockingbird Canyon[1]	Santa Ana River (SAR) - Upstream	Norco Bluffs (I-15 to River Rd, non-mitigation)	Temescal Canyon[1]	Chino Hills	Santa Ana Canyon (SAC)	Other[2]
Avian										
Canada Goose	*Branta canadensis*	X							X	
Mandarin Duck	*Aix galericulata*								X	
Wood Duck	*Aix sponsa*								X	
Gadwall	*Anas strepera*	X								
American Wigeon	*Anas americana*	X								
Mallard	*Anas platyrhynchos*	X	X		X	X			X	
Cinnamon Teal	*Anas cyanoptera*	X								
Northern Shoveler	*Anas clypeata*	X								
Green-winged Teal	*Anas crecca*	X								
Redhead	*Aythya americana*	X								
Ring-necked Duck	*Aythya collaris*	X								
Lesser Scaup	*Aythya affinis*	X								
Bufflehead	*Bucephala albeola*	X								
Ruddy Duck	*Oxyura jamaicensis*	X								
California Quail	*Callipepla californica*	X	X		X			X	X	
Ring-necked Pheasant	*Phasianus colchicus*	X								
Pied-billed Grebe	*Podilymbus podiceps*	X								
Eared Grebe	*Podiceps nigricollis*	X								
Western Grebe	*Aechmophorus occidentalis*								X	
Band-tailed Pigeon	*Patagioenas fasciata*								X	
Eurasian Collared-Dove	*Streptopelia decaocto*				X					
Common Ground-Dove	*Columbina passerina*	X	X		X	X				
Inca Dove	*Columbina inca*				X					
Mourning Dove	*Zenaida macroura*	X	X	X	X	X		X	X	
Greater Roadrunner	*Geococcyx californianus*	X	X		X	X		X	X	
White-throated Swift	*Aeronautes saxatalis*				X				X	
Black-chinned Hummingbird	*Archilochus alexandri*		X		X	X		X	X	
Anna's Hummingbird	*Calypte anna*	X	X	X	X	X		X	X	
Allen's Hummingbird	*Selasphorus sasin*		X	X	X	X		X	X	
American Coot	*Fulica americana*	X	X		X	X			X	

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Common Name	*Scientific Name*	San Jacinto	San Timoteo Canyon	Mockingbird Canyon[1]	Santa Ana River (SAR) - Upstream	Norco Bluffs (I-15 to River Rd, non-mitigation)	Temescal Canyon[1]	Chino Hills	Santa Ana Canyon (SAC)	Other[2]
Avian										
Black-necked Stilt	*Himantopus mexicanus*	X								
American Avocet	*Recurvirostra americana*	X								
Killdeer	*Charadrius vociferus*	X	X		X	X			X	
Dowitcher spp.	*Limnodromus spp.*	X								
Spotted Sandpiper	*Actitis macularius*								X	
Lesser Yellowlegs	*Tringa flavipes*	X								
Gull spp.	*Larus spp.*	X								
Double-crested Cormorant[r]	*Phalacrocorax auritus*			X					X	
Great Blue Heron[r]	*Ardea herodias*	X		X	X				X	
Great Egret	*Ardea alba*	X		X	X	X			X	
Snowy Egret	*Egretta thula*	X		X						
Green Heron	*Butorides virescens*				X	X			X	
Black-crowned Night-Heron[r]	*Nycticorax nycticorax*	X			X				X	
White-faced Ibis[r]	*Plegadis chihi*	X								
Turkey Vulture[r]	*Cathartes aura*	X		X	X		X	X	X	
White-tailed Kite[r]	*Elanus leucurus*		X						X	X
Bald Eagle[r]	*Haliaeetus leucocephalus*	X								
Northern Harrier[r]	*Circus cyaneus*	X								
Sharp-shinned Hawk[r]	*Accipiter striatus*				X					
Cooper's Hawk[r]	*Accipiter cooperii*	X	X	X	X	X		X	X	
Red-shouldered Hawk	*Buteo lineatus*	X	X	X	X	X			X	
Red-tailed Hawk	*Buteo jamaicensis*	X	X	X	X	X		X	X	
Barn Owl	*Tyto alba*	X	X		X					
Great Horned Owl	*Bubo virginianus*		X		X	X				
Lewis's Woodpecker	*Melanerpes lewis*								X	
Acorn Woodpecker	*Melanerpes formicivorus*		X		X				X	
Nuttall's Woodpecker	*Picoides nuttallii*	X	X	X	X	X		X	X	
Downy Woodpecker[r]	*Picoides pubescens*		X		X	X			X	
Northern Flicker	*Colaptes auratus*	X	X		X			X	X	
American Kestrel	*Falco sparverius*	X	X	X	X				X	
Peregrine Falcon	*Falco peregrinus*				X					
Western Wood-Pewee	*Contopus sordidulus*		X						X	

Table 8. Observations of all species by location, 2016.

Common Name	*Scientific Name*	San Jacinto	San Timoteo Canyon	Mockingbird Canyon[1]	Santa Ana River (SAR) - Upstream	Norco Bluffs (I-15 to River Rd, non-mitigation)	Temescal Canyon[1]	Chino Hills	Santa Ana Canyon (SAC)	Other[2]
Avian										
Willow Flycatcher[r]	*Empidonax traillii*					X		X		X
Pacific-slope Flycatcher	*Empidonax difficilis*		X		X	X			X	
Black Phoebe	*Sayornis nigricans*	X	X	X	X	X		X	X	
Say's Phoebe	*Sayornis saya*	X	X		X				X	
Vermilion Flycatcher	*Pyrocephalus rubinus*								X	
Ash-throated Flycatcher	*Myiarchus cinerascens*	X	X		X			X	X	
Cassin's Kingbird	*Tyrannus vociferans*		X						X	
Western Kingbird	*Tyrannus verticalis*	X	X	X	X			X	X	
Loggerhead Shrike[r]	*Lanius ludovicianus*	X								
Hutton's Vireo	*Vireo huttoni*		X		X	X				
Warbling Vireo	*Vireo gilvus*								X	
California Scrub-Jay	*Aphelocoma californica*		X	X	X	X		X	X	
American Crow	*Corvus brachyrhynchos*	X	X	X	X	X		X	X	
Common Raven	*Corvus corax*	X	X		X			X	X	
Horned Lark[r]	*Eremophila alpestris*				X					
Tree Swallow[r]	*Tachycineta bicolor*	X			X		X		X	
Violet-green Swallow	*Tachycineta thalassina*	X								
Northern Rough-winged Swallow	*Stelgidopteryx serripennis*		X		X	X			X	
Cliff Swallow	*Petrochelidon pyrrhonota*	X			X	X			X	
Barn Swallow	*Hirundo rustica*				X	X			X	
Oak Titmouse	*Baeolophus inornatus*		X							
Bushtit	*Psaltriparus minimus*	X	X	X	X	X		X	X	
House Wren	*Troglodytes aedon*	X	X		X	X			X	
Marsh Wren	*Cistothorus palustris*	X				X				
Bewick's Wren	*Thryomanes bewickii*	X	X	X	X	X		X	X	
Coastal Cactus Wren[r]	*Campylorhynchus brunneicapillus*									X
Blue-gray Gnatcatcher	*Polioptila caerulea*	X			X					
California Gnatcatcher[r]	*Polioptila californica*						X	X	X	X
Ruby-crowned Kinglet	*Regulus calendula*	X	X						X	
Wrentit	*Chamaea fasciata*		X		X	X			X	
Western Bluebird	*Sialia mexicana*	X	X		X				X	

Table 8. Observations of all species by location, 2016.

Common Name	*Scientific Name*	San Jacinto	San Timoteo Canyon	Mockingbird Canyon[1]	Santa Ana River (SAR) - Upstream	Norco Bluffs (I-15 to River Rd, non-mitigation)	Temescal Canyon[1]	Chino Hills	Santa Ana Canyon (SAC)	Other[2]
Avian										
Swainson's Thrush	*Catharus ustulatus*					X				
Hermit Thrush	*Catharus guttatus*		X							
American Robin	*Turdus migratorius*				X			X	X	
California Thrasher	*Toxostoma redivivum*	X	X	X	X	X		X	X	
Northern Mockingbird	*Mimus polyglottos*	X	X	X	X			X	X	
European Starling[i]	*Sturnus vulgaris*	X	X		X				X	
Cedar Waxwing	*Bombycilla cedrorum*								X	
Phainopepla	*Phainopepla nitens*	X	X		X				X	
Pin-tailed Whydah[i]	*Vidua macroura*								X	
Scaly-breasted Munia[i]	*Lonchura punctulata*				X				X	
House Sparrow[i]	*Passer domesticus*		X	X	X			X	X	
House Finch	*Haemorhous mexicanus*	X	X	X	X	X		X	X	
Lesser Goldfinch	*Spinus psaltria*	X	X		X	X			X	
Lawrence's Goldfinch	*Spinus lawrencei*	X	X							
American Goldfinch	*Spinus tristis*		X		X	X			X	
Orange-crowned Warbler	*Oreothlypis celata*		X		X	X			X	
Nashville Warbler	*Oreothlypis ruficapilla*	X								
Common Yellowthroat	*Geothlypis trichas*	X	X	X	X	X		X	X	
Yellow Warbler[r]	*Setophaga petechia*	X	X	X	X	X	X	X	X	X
Yellow-rumped Warbler	*Setophaga coronata*	X	X		X	X			X	
Black-throated Gray Warbler	*Setophaga nigrescens*		X		X				X	
Hermit Warbler	*Setophaga occidentalis*				X					
Wilson's Warbler[r]	*Cardellina pusilla*	X	X		X	X			X	
Yellow-breasted Chat[r]	*Icteria virens*	X	X		X	X	X	X	X	X
Spotted Towhee	*Pipilo maculatus*	X	X	X	X	X		X	X	
Rufous-crowned Sparrow[r]	*Aimophila ruficeps canescens*						X		X	X
California Towhee	*Melozone crissalis*	X	X	X	X	X		X	X	
Lark Sparrow	*Chondestes grammacus*		X						X	
Bell's Sparrow[r]	*Artemisiospiza belli*									X
Song Sparrow	*Melospiza melodia*	X	X	X	X	X		X	X	

Table 8. Observations of all species by location, 2016.

Common Name	*Scientific Name*	San Jacinto	San Timoteo Canyon	Mockingbird Canyon[1]	Santa Ana River (SAR) - Upstream	Norco Bluffs (I-15 to River Rd, non-mitigation)	Temescal Canyon[1]	Chino Hills	Santa Ana Canyon (SAC)	Other[2]
Avian										
Lincoln's Sparrow[r]	*Melospiza lincolnii*		X							
White-crowned Sparrow	*Zonotrichia leucophrys*	X	X		X	X		X	X	
Golden-crowned Sparrow	*Zonotrichia atricapilla*				X					
Western Tanager	*Piranga ludoviciana*		X						X	
Black-headed Grosbeak	*Pheucticus melanocephalus*	X	X	X	X	X		X	X	
Blue Grosbeak	*Passerina caerulea*		X		X				X	
Red-winged Blackbird	*Agelaius phoeniceus*	X	X		X	X			X	
Tricolored Blackbird[r]	*Agelaius tricolor*	X	X							
Western Meadowlark	*Sturnella neglecta*	X			X					
Yellow-headed Blackbird[r]	*Xanthocephalus xanthocephalus*	X	X							
Great-tailed Grackle	*Quiscalus mexicanus*		X		X					
Brown-headed Cowbird[i]	*Molothrus ater*	X	X	X	X	X		X	X	
Hooded Oriole	*Icterus cucullatus*	X	X	X	X	X		X	X	
Bullock's Oriole	*Icterus bullockii*	X	X	X	X			X	X	
Mammals (tracks/other evidence used)										
Virginia Opossum[i]	*Didelphis virginiana*	X	X		X					
Bats	*Unknown*								X	
California Ground Squirrel	*Otospermophilus beecheyi*	X	X		X	X		X	X	
Eastern Fox Squirrel	*Sciurus niger*								X	
Botta's Pocket Gopher	*Thomomys bottae*	X			X					
Long-tailed Weasel[r]	*Mustela frenata*	X			X					
Striped Skunk	*Mephitis mephitis*		X		X	X				
Bobcat[r]	*Lynx rufus*				X					
San Diego Black-tailed Jackrabbit[r]	*Lepus californicus bennettii*	X		X	X					X
Desert Cottontail	*Sylvilagus audubonii*	X	X	X	X			X	X	
Brush Rabbit[r]	*Sylvilagus bachmani*				X					
Big-eared Woodrat (nest)	*Neotoma macrotis*		X						X	
Raccoon	*Procyon lotor*	X	X		X	X				
Coyote[r]	*Canis latrans*	X	X	X	X	X	X	X	X	
Mountain Lion[r]	*Puma concolor*				X					

Table 8. Observations of all species by location, 2016.

Common Name	*Scientific Name*	San Jacinto	San Timoteo Canyon	Mockingbird Canyon[1]	Santa Ana River (SAR) - Upstream	Norco Bluffs (I-15 to River Rd, non-mitigation)	Temescal Canyon[1]	Chino Hills	Santa Ana Canyon (SAC)	Other[2]
Mammals (tracks/other evidence used)										
Feral Pig[i]	*Sus scrofa*		X		X	X				
Mule Deer	*Odocoileus hemionus*		X		X				X	
Herpetofauna										
Baja California Treefrog	*Pseudacris hypochondriaca*	X	X		X					
Western Toad	*Anaxyrus boreas*	X	X		X					
American Bullfrog[i]	*Lithobates catesbeianus*	X			X	X			X	
African Clawed Frog[i]	*Xenopus laevis*				X					
Southern Alligator Lizard	*Elgaria multicarinatus*		X	X	X					
Orange-throated Whiptail[r]	*Aspidoscelis hyperythra beldingi*		X	X			X			X
Tiger Whiptail[r]	*Aspidoscelis tigris*	X	X						X	
Western Fence Lizard	*Sceloporus occidentialis*	X	X	X	X	X		X	X	
Granite Spiny Lizard[r]	*Sceloporus orcutti*				X		X			
Side-blotched Lizard	*Uta stansburiana*	X	X		X	X			X	
California Kingsnake	*Lampropeltis californiae*		X		X	X			X	
Red Racer/Coachwhip	*Coluber flagellum*		X	X	X	X			X	
San Diego Gopher Snake	*Pituophis catenifer annectens*	X	X	X	X				X	
Red Diamond Rattlesnake[r]	*Crotalus ruber*								X	X
Southern Pacific Rattlesnake	*Crotalus oreganus helleri*		X						X	
Red-eared Slider[i]	*Trachemys scripta elegans*				X				X	
Texas Spiny Softshell[i]	*Apalone spinifera emoryi*					X			X	
Fish										
Arroyo Chub[r]	*Gila orcuttii*				X					

[1] - Mockingbird Canyon and Temescal Canyon reflect a reduced effort as compared to prior years.

[2] - Includes detections at sampled and incidental locations.

[i] = invasive or non-native

[r] = endangered, threatened, or sensitive: are those that are listed as endangered, threatened, or species of concern by the resource agencies and those that are covered by the Western Riverside County Multiple Species Habitat Conservation Plan (MSHCP).

Note: This list is not intended as a complete species list for these sites. This is a list of species observed in the riparian zone and adjacent habitat., caught in cowbird traps, or otherwise observed during the vireo monitoring from March 15, 2016 to August 23, 2016.

Table 9. Non-target avian captures in Brown-headed Cowbird traps, March-July 2016.

2016 Non-target Species*		USFWS/Corps/SARM Project																IERCD		Riverside Land Conservancy				2016 Total	
		San Jacinto		Santa Ana River (upstream)		Mockingbird Canyon		Prado		Temescal		Dairies		Santa Ana Canyon		Anaheim		San Timoteo		Meridian C.A.		City of Chino Hills - English Channel			
Common Name	**Scientific Name**	**caught**	**died**	**caught**	**died**	**caught**	**died**	**caught**	**died**	**caught**	**died**	**caught**	**died**	**caught**	**died**	**caught**	**died**	**caught**	**died**	**caught**	**died**	**caught**	**died**	**caught**	**died**
California Towhee	*Melozone crissalis*			12	0	89	1	7	1	57	1			542	8	21	1	113	1	4	0	4	0	**849**	**13**
House Finch	*Haemorhous mexicanus*			27	0	34	2	47	1	1	0	3	0	53	1	59	1	9	1	2	0	59	7	**294**	**13**
Red-winged Blackbird	*Agelaius phoeniceus*	50	2	2	0	1	0			3	0	63	1	2	0	28	0	95	3					**244**	**6**
Yellow-headed Blackbird	*Xanthocephalus xanthocephalus*	47	0									76	0	1	0			1	0					**125**	**0**
Northern Mockingbird	*Mimus polyglottos*			2	0	2	0	19	0			1	0	2	0	13	2			2	0	2	1	**43**	**3**
White-crowned Sparrow	*Zonotrichia leucophrys*							41	0									1	0					**42**	**0**
Song Sparrow	*Melospiza melodia*			1	0	2	0	11	0	6	0	1	0	4	0	1	1	7	0					**33**	**1**
Tri-colored Blackbird	*Agelaius tricolor*	2	0									6	0			1	0	17	0					**26**	**0**
Lark Sparrow	*Chondestes grammacus*									3	1							13	0	6	0			**22**	**1**
Bullock's Oriole	*Icterus bullockii*					3	0	3	0											2	1			**8**	**1**
Brewer's Blackbird	*Euphagus cyanocephalus*	4	1									3	0											**7**	**1**
Mourning Dove	*Zenaida macroura*	1	0											1	0			4	1					**6**	**1**
Cooper's Hawk	*Accipiter cooperii*	2	0															3	0					**5**	**0**
Great-tailed Grackle	*Quiscalus mexicanus*	4	0																					**4**	**0**
Black-headed Grosbeak	*Pheucticus melanocephalus*			1	0									1	0							1	0	**3**	**0**
Hooded Oriole	*Icterus cucullatus*					1	0							1	0	1	0							**3**	**0**
House Wren	*Troglodytes aedon*					1	0											1	0					**2**	**0**
Bewick's Wren	*Thryomanes bewickii*													1	0			1	0					**2**	**0**
Nuttall's Woodpecker	*Picoides nuttallii*			1	0															1	1			**2**	**1**
Phainopepla	*Phainopepla nitens*													2	0									**2**	**0**
Unknown														2	0									**2**	**0**
Sharp-shinned Hawk	*Accipiter striatus*	1	0																					**1**	**0**
Common Ground Dove	*Columbina passerina*																	1	0					**1**	**0**
California Scrub Jay	*Aphelocoma californica*													1	0									**1**	**0**
Western Tanager	*Piranga ludoviciana*																	1	0					**1**	**0**
TOTAL		**111**	**3**	**46**	**0**	**133**	**3**	**128**	**2**	**70**	**2**	**153**	**1**	**613**	**9**	**124**	**5**	**267**	**6**	**17**	**2**	**66**	**8**	**1,728**	**41**
#/trap day		0.3		0.1		0.3		0.2		0.1		0.4		0.8		0.3		0.3		0.1		0.3		**0.3**	
Mortality %			2.7%		0.0%		2.3%		1.6%		2.9%		0.7%		1.5%		4.0%		2.2%		11.8%		12.1%		**2.4%**

*Number of dead non-targets included in number caught

Non-native captures in Brown-headed Cowbird Traps, March-July 2016

2016 Non-native Species**		USFWS/Corps/SARM Project																IERCD		Riverside Land Conservancy				2016 Total	
		San Jacinto		Santa Ana River (upstream)		Mockingbird Canyon		Prado		Temescal		Dairies		Santa Ana Canyon		Anaheim		San Timoteo		Meridian C.A.		City of Chino Hills - English Channel			
Common Name	**Scientific Name**	**released**	**removed**	**released**	**removed**	**released**	**removed**	**released**	**removed**	**released**	**removed**	**released**	**removed**	**released**	**removed**	**released**	**removed**	**released**	**removed**	**released**	**removed**	**released**	**removed**	**released**	**removed**
House Sparrow	*Passer domesticus*	2	1	1	88	2	0	108	0	3	0	38	5	1	0	0	64	4	0	4	1	1	2	**164**	**161**
European Starling	*Sturnus vulgaris*	7	688	1	1	2	1	1	0	0	2	48	466	0	71	3	10	2	11					**64**	**1,250**
Zebra Finch***	*Taeniopygia guttata*			0	1																			**0**	**1**
TOTAL		**9**	**689**	**2**	**90**	**4**	**1**	**109**	**0**	**3**	**2**	**86**	**471**	**1**	**71**	**3**	**74**	**6**	**11**	**4**	**1**	**1**	**2**	**228**	**1,412**

**Non-natives removed under CDFW authorization to control Brown-headed Cowbirds

***Zebra Finch removed from trap and re-homed

Table 10. Brown-headed Cowbird trapping results, fall/winter 2015-2016.

Site Name	Trap/Location	Dates of Operation	Number of Trap Days	Cowbirds Removed				Daily Removed Averages	
				Total	Male	Female	Juveniles	Adults	All
Temescal	Dejong's Dairy	8/3/15-3/14/16	209	1,385	517	504	364	**4.9**	**6.6**
Santa Ana Canyon	Green River EQ	8/3/15-1/8/16	151	346	88	150	108	**1.6**	**2.3**
Prado	Euclid Dairy	8/3-3/13/16	211	2,481	450	1,234	797	**8.0**	**11.8**
	Heifer Dairy	8/3/15-9/24/15	51	30	1	5	24	**0.1**	**0.6**
	Weststeyn 1 Dairy	9/24/15-3/14/16	162	797	189	503	105	**4.3**	**4.9**
	Weststeyn 2 Dairy	1/8-3/14/16	62	66	7	59	0	**1.1**	**1.1**
Subtotal			**486**	**3,374**	**647**	**1,801**	**926**	**5.0**	**6.9**
TOTAL			**846**	**5,105**	**1,252**	**2,455**	**1,398**	**4.4**	**6.0**

Table 11. Non-target avian captures in Brown-headed Cowbird traps, fall/winter, 2015-2016.

2015-2016 Winter Non-target Species		Temescal		Santa Ana Canyon		Prado		TOTAL	
Common Name	**Scientific Name**	**caught**	**died**	**caught**	**died**	**caught**	**died**	**caught**	**died**
Red-winged Blackbird	*Agelaius phoeniceus*	63	2			55	1	**118**	**3**
California Towhee	*Melozone crissalis*			84	0			**84**	**0**
Yellow-headed Blackbird	*Xanthocephalus xanthocephalus*	12	0			6	0	**18**	**0**
House Finch	*Haemorhous mexicanus*	1	0			2	0	**3**	**0**
Tricolored Blackbird	*Agelaius tricolor*	2	0					**2**	**0**
Great-tailed Grackle	*Quiscalus mexicanus*					2	0	**2**	**0**
House Wren	*Troglodytes aedon*					1	0	**1**	**0**
Northern Mockingbird	*Mimus polyglottos*			1	0			**1**	**0**
Yellow-rumped Warbler	*Setophaga coronata*			1	0			**1**	**0**
White-crowned Sparrow	*Zonotrichia leucophrys*			1	0			**1**	**0**
Brewer's Blackbird	*Euphagus cyanocephalus*					1	0	**1**	**0**
Hooded Oriole	*Icterus cucullatus*			1	0			**1**	**0**
TOTAL		**78**	**2**	**88**	**0**	**67**	**1**	**233**	**3**
#/trap day		0.4		0.6		0.1		**0.3**	
Mortality %			2.6%		0.0%		**1.5%**		**1.3%**

Non-native Captures in Brown-headed Cowbird Traps, Winter 2015-16

2015-2016 Winter Non-native Species		Temescal		Santa Ana Canyon		Prado		TOTAL	
Common Name	**Scientific Name**	**released**	**removed**	**released**	**removed**	**released**	**removed**	**released**	**removed**
European Starling	*Sturnus vulgaris*	10	508	0	28	21	242	**31**	**778**
House Sparrow	*Passer domesticus*	0	3			1	15	**1**	**18**
TOTAL		**10**	**511**	**0**	**28**	**22**	**257**	**32**	**796**

APPENDIX A – SURVEY SITES AND COORDINATES

[All coordinates – NAD83 (Zone 11S) except where noted otherwise]

Monitored Locations

Survey Site	Starting Coordinates	Ending Coordinates
San Jacinto	506079, 3738423	503643, 3741648
	488821, 3747634	490979, 3750919
San Timoteo Canyon:		
-Riverside County	484684, 3762635	497456, 3754712
-San Bernardino County	480757, 3765851	484684, 3762635
Mockingbird Canyon	461212, 3750319	469427, 3746409
Santa Ana River (SAR):		
-Riverside Ave. to Van Buren Blvd.	466416, 3765008	455523, 3757886
-Hidden Valley, north side of river	456941, 3758360	451564, 3758587
-Hidden Valley, south side of river	455523, 3757886	451482, 3757751
-Hidden Valley to River Rd.		
-SAR-Goose Creek, Norco to I-15	451560, 3758574	448816, 3756435
-Goose Creek Mitigation, Norco	451091, 3757964	450042, 3757480
-Norco Bluffs (I-15 to River Rd, non-mitigation)	448907, 3756725	444876, 3753717
Temescal Canyon (sampled)	471486, 3720612	450724, 3746925
Chino Hills	438975, 3754612	435680, 3757858
Santa Ana Canyon (SAC):		
-Upper Canyon	440677, 3749724	438736, 3749743
-Green River Golf Club	438736, 3749743	436675, 3748403
-Featherly Park	436613, 3748409	430885, 3748343

Sampled Locations and Incidental Sighting Locations

Survey Site	Starting Coordinates	Ending Coordinates
Santa Ana River & Tributaries:		
Alessandro Arroyo/Prenda Arroyo	465993, 3754419	470391, 3751168
	465354, 3752493	470270, 3750320
Arlington Falls[2]	453856, 3748925	454753, 3748301
Box Springs	472592, 3756430	471538, 3757620
Burris Basin	419850, 3743943	419150, 3742378
Cajalco Creek[2]	453805, 3742988	453767, 3743230
Cajon Wash	456784, 3796197	457285, 3791752
Canyon Crest[2]	468569, 3757034	468569, 3757034
Carbon Canyon (Chino Hills Pkwy)	431500, 3760294	431143, 3759777
Carbon Canyon (Western Hills Golf Club)[2]	429466, 3758320	429755, 3758496
Carbon Canyon Regional Park	422957, 3752929	425648, 3754031
Castleview Park[2]	468185, 3754936	468206, 3754970
Chino Creek Wetlands Park	437620, 3758246	437395, 3758840
Chino Hills (Bayberry Dr.)[2]	432335, 3758297	431780, 3758507

Sampled Locations and Incidental Sighting Locations (cont.)

Survey Site	Starting Coordinates	Ending Coordinates
Chino Hills (End of Eucalyptus)[2]	428612, 3759298	428291, 3759409
Chino Hills Community Park (Euc/Peyton)[2]	432645, 3761036	430652, 3761849
Chino Hills State Park (Bane Cyn)	435061, 3757365	435376, 3753499
Chino Hills State Park (Easy Street Trail)[2]	427838, 3752393	427876, 3752942
Chino Hills State Park (Lower Aliso Cyn)	435288, 3753302	438033, 3749528
Chino Hills State Park (Telegraph Cyn)	434818, 3753694	424101, 3753165
Chino Hills State Park (Upper Aliso Cyn)	435114, 3753304	433810, 3754990
City Creek (Highland)	482191, 3775640	482706, 3778340
Clearwater Pkwy @ Glen Helen	462009, 3784622	461556, 3783760
Conrock Basin (FHQ)	423314, 3746089	423465, 3746370
Corona Ave. at Gilmore	448093, 3750572	448406, 3750398
Fontana Power Plant	463472, 3779349	463819, 3779791
Fresno Canyon	439703, 3749067	440954, 3749370
Gavilan Hills[2]	466730, 3741552	466846, 3740837
Golden Star	465359, 3751458	467227, 3750525
Harrison Reservoir (aka McAllister Creek)	460376, 3748576	462484, 3746911
Hidden Valley Golf Club	451644, 3752551	452349, 3753225
La Sierra	457824, 3747117	457504, 3748808
Little Sand Basin	478157, 3779714	478805, 3780527
Mead Valley (Cajalco/aqueduct)	471763, 3744714	470158, 3744092
Menifee-Haun Rd[2]	483716, 3725045	483706, 3724364
Menifee-Paloma H. S.[2]	482515, 3725307	481557, 3724847
Meridian CA (former March SKR Preserve)	473397, 3749383	470485, 3752133
Motte Rimrock Preserve[2]	475973, 3740183	475893, 3739398
Norco Hills Park Mitigation	449570, 3751384	448340, 3751225
Oak Glen Preserve[2]	505148, 3766841	505153, 3766838
Plunge Creek	486861, 3774671	487048, 3775724
Poorman Reservoir	476434, 3758610	477243, 3757320
Promenade[2]	451350, 3749618	451336, 3749919
Pyrite Channel	455745, 3761469	455281, 3760849
Quail Run	470673, 3757379	469877, 3757468
Riverwalk Park[2]	454365, 3751010	454281, 3752276
Santa Rosa Mine Road[2]	471840, 3737819	471012, 3738146
Steele Valley[2]	471322, 3736485	471266, 3735608
Sun Canyon Park	454614, 3749211	454788, 3749119
Sycamore Canyon	470287, 3756422	473225, 3753435
Talbert Park (Orange County)	411746, 3722974	411911, 3723740
Tequesquite Arroyo	467671, 3756303	467760, 3756586
Van Buren Blvd. (Bountiful)	469933, 3750024	469693, 3750007
Van Buren (Porter Road)	467009, 3749689	466421, 3750042
Wardlow Wash[2]	443306, 3747252	441873, 3749262
Woodcrest	465362, 3751501	465419, 3751271
Wyle Labs (at El Paso only)	450068, 3751818	450068, 3751818
Yorba Linda (Mud Canyon)[2]	431693, 3750752	431200, 3750802
Yorba Linda (San Antonio Rd)[2]	429199, 3750653	429322, 3750942

Sampled Locations and Incidental Sighting Locations (cont.)

Survey Site	Starting Coordinates	Ending Coordinates
Yorba Linda (Starlight Dr.)	431134, 3749819	430989, 3750218
Yorba Linda Lakebed Park	424530, 3748301	424909, 3749091
San Jacinto River Sub-watershed:		
Cottonwood Canyon[2]	475633, 3725415	477503, 3724023
Kabian Park	475841, 3730880	476184, 3783238
Lake Perris[2]	483092, 3744484	485461, 3748329
Menifee (Salt Creek)	478164, 3726524	479548, 3727246
Santiago Creek Sub-watershed:		
Irvine Lake	432717, 3736629	433698, 3737022
Irvine Trust Management Area[2]	429806, 3738346	429896, 3738306
Limestone Canyon[2]	434012, 3736548	434913, 3735769
Peter's Canyon	429752, 3738563	428604, 3735584
Santiago Basin	425344, 3740796	424678, 3740612
Santiago Canyon (Irvine Park)	440662, 3755052	429119, 3741253
Santiago Creek (above Irvine Lake)	437201, 3736263	435405, 3737556
Santiago Canyon Rd[2]	434949, 3735740	431995, 3736775
Santiago Creek (Cambridge Road)	421793, 3737067	421619, 3737952
Santiago Creek (Cannon Road, incl. Smith Basin)	425540, 3741436	428079, 3742770
Santiago Creek (Chapman Ave.)	423116, 3738554	423740, 3739316
Santiago Oaks Regional Park[2]	428069, 3742690	429133, 3742111
Silverado Canyon	437692, 3734768	438878, 3734047

Miscellaneous Locations

Survey Site	Starting Coordinates	Ending Coordinates
East Coyote Hills Preserve[2]	415417, 3750601	417337, 3751214
Etiwanda Preserve[2]	451769, 3780654	451186, 3787544
Mount Baldy (Shinn Rd)[2]	437794, 3781816	437765, 3782398
Murrieta Creek[2]	476609, 3716171	476299, 3715809
Rancho La Sierra West	453521, 3757910	453547, 3757077
University of California, Riverside[2]	470131, 3759262	470131, 3759262

[1] In 2015, Hidden Valley to River Rd was divided into separate sites due to funding constraints. These sites are SAR-Goose Creek, Norco to I-15, which also includes Goose Creek Mitigation (funded by IERCD), and Norco Bluffs (I-15 to River Rd, non-mitigation), which as of 2016 includes an additional 250 acres that was not surveyed by SAWA in 2015.

[2] Denotes sites that were not surveyed this year.

APPENDIX B: WATERSHED-WIDE ANNUAL RESULTS 2010-2016

Appendix B-1. Least Bell's Vireo status and management and Brown-headed Cowbird management data at closely monitored and sampled sites in the Santa Ana Watershed, 2000-2016.

	Parameter	2000-2009	2010	2011	2012	2013	2014	2015	2016	Total
A.	Number of territorial males	n/a	654	641	599	769	814	834	865	n/a
B.	Number of known pairs (breeding and non-breeding)	1,748	450	407	380	374	390	401	440	4,590
C.	Number of fledged young observed	3,210	613	626	494	611	472	590	610	7,226
D.	Projected total of recruitment of vireo young[a]	4,720	1,215	1,180	1,064	1,122	858	1,123	1,144	12,393
E.	Average number of fledglings per pair (C/B)	1.8	1.4	1.5	1.3	1.6	1.2	1.5	1.4	1.6
F.	Projected number of fledglings per pair (D/B)	2.7	2.7	2.9	2.8	3.0	2.2	2.8	2.6	2.7
G.	Rate of missing eggs/chicks from nests (successful and unsuccessful nests)	39% 467 / 1185	43% 60 / 138	40% 82 / 204	39% 48 / 123	40% 67 / 167	54% 80 / 149	n/a	n/a	41% 804 / 1966
H.	Rate of cowbird nest parasitism	17% 204 / 1185	5% 7 / 138	2% 5 / 204	5% 6 / 123	4% 7 / 167	5% 8 / 149	2% 4 / 188	3% 6 / 180	11% 247 / 2334
I.	Numbers of cowbirds removed from study area	18,590	3,093	2,444	2,823	1,945	1,271	1,245	3,177	34,588
J.	This row purposefully omitted.									
K.	Number of trap days (1 operative trap day in the field for one day = 1 trap day)	41,691	6,992	6,333	5,190	6,355	5,290	4,252	5,707	81,810
L.	Average number of cowbirds trapped per trap day (I/K)	0.45	0.44	0.39	0.54	0.31	0.24	0.29	0.56	0.42
M.	Number of field hours - LBVI (+)		2,589	2,738	2,364	2,942	1,952	2,192	2,444	
N.	Number of field hours - BHCO (+)	39,014	3,239	3,281	2,838	2,879	2,724	2,052	2,163	75,411

[a]Survival rate of fledglings in well-tracked nests was applied to nests not visited as frequently by the function (avg. # fledglings produced by well-tracked pairs x total number of pairs). These data represent minimum recruitment as defined by the Least Bell's VIreo Working Group "known fledged young."

Appendix B-2. Least Bell's Vireo nest placement preferences at monitored and sampled sites in the Santa Ana Watershed, 2000-2016.

Host Plant Species (listed in taxonomic order)	**2000-2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**Total**	**Percentage of Total**
Giant Reed[ie] (*Arundo donax*)	1								1	<1%
Coulter's Matilija Poppy[r] (*Romneya coulteri*)								1	1	<1%
Western Sycamore (*Platanus racemosa*)	2		1			3			6	<1%
Golden Currant (*Ribes aureum)*	1				2	1		1	5	<1%
Desert Wild Grape (*Vitis girdiana*)	38	8	17	4	7	21	17	14	126	5%
Fremont Cottonwood (*Populus fremontii*)	49	6	12	6	7	9	15	6	110	4%
Dead Fremont Cottonwood (*Populus fremontii*)				1	1				2	<1%
Black Cottonwood (*Populus balsamifera* ssp. *trichocarpa*)					1			1	2	<1%
Narrowleaf Willow (*Salix exigua*)	56	3	12	11	13	8	5	4	112	4%
Dead Narrowleaf Willow (*Salix exigua*)					1				1	<1%
Goodding's Black Willow (*Salix gooddingii*)	224	12	20	10	11	3	20	19	319	12%
Dead Goodding's Black Willlow (*Salix gooddingii*)	1								1	<1%
Dead Goodding's Black Willow covered with living Goodding's Black Willow (*Salix gooddingii*)	1								1	<1%
Red Willow (*Salix laevigata*)	118	22	39	19	23	8	26	25	280	10%
Arroyo Willow (*Salix lasiolepis*)	291	27	39	31	35	28	30	46	527	19%
Dead Arroyo Willow (*Salix lasiolepis*)		1							1	<1%
Yellow Willow (*Salix lasiandra)*	8	1	2		2	1	2	3	19	1%
Willow sp. (*Salix* sp.)	6						2		8	<1%
Dead Willow sp. (*Salix* sp.)	2			1		1			4	<1%
Castorbean[ie] (*Ricinus communis*)	1								1	<1%
Western False Indigo (*Amorpha fruticosa*)		1							1	<1%
Bank Catclaw[e] (*Acacia redolens*)								1	1	<1%
Toyon (*Heteromeles arbutifolia*)	17		1	1	1	4	3		27	1%
California Blackberry (*Rubus ursinus*)				1					1	<1%
California Wild Rose (*Rosa californica*)	5							2	7	<1%
Hollyleaf Cherry (*Prunus ilicifolia*)			1						1	<1%
Chinese Elm[e] (*Ulmus parvifolia*)								1	1	<1%

Appendix B-2. Least Bell's Vireo nest placement preferences at monitored and sampled sites in the Santa Ana Watershed, 2000-2016.

Host Plant Species (listed in taxonomic order)	**2000-2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**Total**	**Percentage of Total**
White Mulberry[e] (*Morus alba*)						1			1	<1%
Fig sp.[ie] (*Ficus* sp.)	1								1	<1%
Stinging Nettle (*Urtica dioica*)	1								1	<1%
Coast Live Oak (*Quercus agrifolia*)	1				1				2	<1%
Scrub Oak (*Quercus berberidifolia*)	4						2		6	<1%
Oak sp. (*Quercus* sp.)							1		1	<1%
Southern California Black Walnut[r] (*Juglans californica)*	5	2			4		1		12	<1%
White Alder (*Alnus rhombifolia*)	1								1	<1%
Laurel Sumac (*Malosma laurina*)	6				3	2	1	2	14	1%
Sugar Sumac (*Rhus ovata*)		1	1						2	<1%
Fragrant Sumac (*Rhus aromatica*)			1						1	<1%
Poison Oak (*Toxicodendron diversilobum*)	9				4	2	3	4	22	1%
Peruvian Pepper Tree[ie] (*Schinus molle*)	5	3	1	1			2		12	<1%
Brazilian Pepper Tree[ie] (*Schinus terebinthifolius*)				1					1	<1%
Boxelder (*Acer negundo*)	1						1		2	<1%
Tree of Heaven[ie] (*Ailanthus altissima*)						1			1	<1%
Orange Tree[e] (*Citrus sinensis*)	1		1	1					3	<1%
Black Mustard[ie] (*Brassica nigra*)	3	1					1		5	<1%
Mustard sp.[ie] (*Brassica* sp.)	5			1	1				7	<1%
Perennial Pepperweed[ie] (*Lepidium latifolium*)	4			1			1		6	<1%
Dead Perennial Pepperweed[ie] (*Lepidium latifolium*)	1								1	<1%
Tamarisk[ie] (*Tamarix ramosissima*)	3	1	1	3			1		9	<1%
Cape Leadwort[e] (*Plumbago auriculata*)				1	1				2	<1%
Fourwing Saltbush (*Atriplex canescens*)	1				1				2	<1%
Ash sp. (*Fraxinus* sp.)	1								1	<1%
Privet sp.[e] (*Ligustrum* sp.)	1								1	<1%
Lollypop Tree[i] (*Myoporum laetum*)	1								1	<1%

Appendix B-2. Least Bell's Vireo nest placement preferences at monitored and sampled sites in the Santa Ana Watershed, 2000-2016.

Host Plant Species (listed in taxonomic order)	**2000-2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**Total**	**Percentage of Total**
Goodding's Black Willow (*S. gooddingii*) and Perennial Pepperweed[ie] (*L. latifolium*)	1								1	<1%
Goodding's Black Willow (S. gooddingii) and Poison Hemlock[ie] (*C. maculatum*)	1								1	<1%
Goodding's Black Willow (*S. gooddingii*) and Blue Elderberry (*S. n. caerulea*)			1						1	<1%
Dead Goodding's Black Willow (*S. gooddingii*) and Stinging Nettle (*U. dioica*)	1								1	<1%
Red Willow (*S. laevigata*) and dead Stinging Nettle (*U. dioica*)	1								1	<1%
Red Willow (*S. laevigata*) and Unknown	1								1	<1%
Arroyo Willow (*S. lasiolepis*) and Black Mustard[ie] (*B. nigra*)	1								1	<1%
Arroyo Willow (*S. lasiolepis*) and Sweet Fennel[i] (*Foeniculum vulgare*)	1								1	<1%
Willow sp. (*Salix* sp.) and California Blackberry (*Rubus ursinus*)	1								1	<1%
Willow sp. (*Salix* sp.) and Perennial Pepperweed[ie] (*L. latifolium*)	1								1	<1%
Castorbean[ie] (*R. communis*) and Mulefat (*B. salicifolia*)				1					1	<1%
Black Mustard[ie] (*B. nigra*) and Mulefat (*B. salicifolia*)	1								1	<1%
Coyote Brush (*B. pilularis*) and Mulefat (*B. salicifolia*)					1				1	<1%
Mulefat (*B. salicifolia*) and Poison Hemlock[ie] (*C. maculatum*)				1					1	<1%
Deadfall	2	1	1				1		5	<1%
Unknown/No data			5		3	4	3	8	23	1%
Total	**1430**	**6198**	**6267**	**6176**	**6231**	**6216**	**6255**	**6254**	**2754**	**6%**

[i] = invasive

[e] = non-native

[r] = endangered, threatened, or sensitive

Appendix B-3. Least Bell's Vireo reproductive success and breeding biology data at monitored and sampled sites in the Santa Ana Watershed, 2000-2016.

	Parameter	2000-2009	2010	2011	2012	2013	2014	2015	2016	Total
A.	Number of known pairs	1,748	450	407	380	374	390	401	440	4,590
B.	Number of known breeding (nesting) pairs	1,567	361	345	287	324	301	322	353	3,860
C.	Number of breeding pairs that were well-monitored throughout the breeding season	702	87	105	74	92	81	93	95	1,329
D.	Number of 'known fledged young' OBSERVED	3,210	613	626	494	611	472	590	610	7,226
E.	Number of known fledged young produced by pairs monitored throughout the breeding season	1,895	239	308	207	277	178	256	248	3,608
F.	Average number of fledglings produced per breeding pair (minimum; D/B = 'productivity or breeding success')	2.0	1.7	1.8	1.7	1.9	1.6	1.8	1.7	1.9
G.	Average number of fledglings produced by well- monitored pairs(E/C = reproductive success)	2.7	2.7	2.9	2.8	3.0	2.2	2.8	2.6	2.7
H.	Number of nests that were discovered	1,447	184	240	142	196	178	220	206	2,813
I.	Number of nests that were regularly monitored or 'tracked'	1,185	138	204	123	167	149	188	180	2,334
J.	Number of 'tracked' nests that were successful (% = J/I x 100)	61% 720 / 1185	65% 90 / 138	56% 115 / 204	60% 74 / 123	61% 102 / 167	48% 72 / 149	55% 103 / 188	52% 93 / 180	59% 1369 / 2334
K.	Rate of missing eggs/chicks from nests (includes successful and unsuccessful nests)	39% 467 / 1185	43% 60 / 138	40% 82 / 204	39% 48 / 123	40% 67 / 167	54% 80 / 149	n/a	n/a	41% 804 / 1966
L.	Number of 'tracked' nests that were parasitized by cowbirds (% = L/I x 100)	17% 204 / 1185	5% 7 / 138	2% 5 / 204	5% 6 / 123	4% 7 / 167	5% 8 / 149	2% 4 / 188	3% 6 / 180	11% 247 / 2334
	A. Number of 'tracked' nests that failed as a result of reproductive failure	4% 45 / 1185	4% 6 / 138	5% 10 / 204	3% 4 / 123	5% 9 / 167	5% 7 / 149	10% 18 / 188	6% 10 / 180	5% 109 / 2334
	B. Number of 'tracked' nests that failed as a result of parasitism	5% 61 / 1185	3% 4 / 138	1% 3 / 204	2% 3 / 123	0% 0 / 167	3% 5 / 149	0% 0 / 188	1% 1 / 180	3% 77 / 2334
	C. Number of 'tracked' nests that failed as a result of predation - Predation Rate according to Vireo Working Group	30% 358 / 1185	28% 39 / 138	36% 74 / 204	34% 42 / 123	32% 54 / 167	43% 64 / 149	36% 67 / 188	41% 74 / 180	33% 772 / 2334
M.	D. Number of 'tracked' nests that failed for unknown reasons	<1% 1 / 1185	0% 0 / 138	1% 2 / 204	0% 0 / 123	1% 2 / 167	1% 1 / 149	0% 0 / 188	1% 2 / 180	<1% 8 / 2334
N.	Average clutch size	n/a	n/a	3.6	3.4	3.4	1.5	3.3	3.4	n/a

Appendix B-3. Least Bell's Vireo reproductive success and breeding biology data at monitored and sampled sites in the Santa Ana Watershed, 2000-2016.

	Parameter	2000-2009	2010	2011	2012	2013	2014	2015	2016	Total
O.	Number of cowbird eggs found in or near vireo nests	248	11	6	9	7	8	4	8	301
P.	Number of cowbird nestlings removed from 'tracked' nests	15	0	0	0	0	1	0	0	16
Q.	Number of cowbird young fledged by vireo	8	1	1	0	2	2	1	0	15
R.	Number of 'manipulated' parasitized nests	169	5	3	4	6	5	4	6	202
S.	Number of 'successful, manipulated' nests (% = S/R x 100)	45% 76 / 169	60% 3 / 5	67% 2 / 3	100% 4 / 4	83% 5 / 6	40% 2 / 5	25% 1 / 4	33% 2 / 6	47% 95 / 202
T.	Number of vireo fledged from 'manipulated' parasitized nests	158	8	4	10	11	5	2	6	204
U.	Number of repaired nests	19	2	7	2	1	3	0	0	34
V.	% of successful repaired nests	72% 13 / 18	50% 1 / 2	86% 6 / 7	100% 2 / 2	100% 1 / 1	67% 2 / 3	n/a	n/a	76% 25 / 33
W.	Number of vireo fledged from repaired nests	37	2	16	6	4	5	n/a	n/a	70

APPENDIX C: SUMMARY TABLES BY MANAGED SITE, 2000-2016

Appendix C-1-A. Least Bell's Vireo status and management and Brown-headed Cowbird management data at survey sites in the Santa Ana Watershed, 2000-2016.

San Jacinto

	Parameter	2000-2009	2010	2011	2012	2013	2014	2015	2016	Total
A.	Number of territorial males	n/a	22	41	42	53	45	29	37	n/a
B.	Number of known pairs (breeding and non-breeding)	43	18	25	36	29	19	7	17	194
C.	Number of fledged young observed	104	28	18	49	39	12	8	12	270
D.	Projected total of recruitment of vireo young[a]	122 (n = 4yrs)	n/a	n/a	104	38	n/a	n/a	20	285
E.	Average number of fledglings per pair (C/B)	2.4	1.6	0.7	1.4	1.3	0.6	1.1	0.7	1.4
F.	Projected number of fledglings per pair (D/B)	2.8	n/a	n/a	2.9	1.3	n/a	n/a	1.2	1.5
G.	Rate of missing eggs/chicks from nests (successful and unsuccessful nests)	33% 18 / 54	0% 0 / 3	80% 8 / 10	31% 4 / 13	69% 9 / 13	0% 0 / 1	n/a	n/a	n/a
H.	Rate of cowbird nest parasitism	11% 6 / 54	0% 0 / 3	10% 1 / 10	8% 1 / 13	0% 0 / 13	100% 1 / 1	n/a	75% 6 / 8	15% 15 / 102
I.	Numbers of cowbirds removed from study area	11,622	2,136	1,797	1,728	1,085	713	n/a	2,101	21,182
J.	This row purposefully omitted.									
K.	Number of trap days (1 operative trap day in the field for one day = 1 trap day)	6,405	993	982	984	1,058	945	n/a	390	11,757
L.	Average number of cowbirds trapped per trap day (I/K)	1.81	2.15	1.83	1.76	1.03	0.75	n/a	5.39	1.80
M.	Number of field hours - LBVI (+)		79	129	161	155	72	n/a	83	
N.	Number of field hours - BHCO (+)	4,425	525	544	711	496	462	n/a	223	8,065

[a]Survival rate of fledglings in well-tracked nests was applied to nests not visited as frequently by the function (avg. # fledglings produced by well-tracked pairs x total number of pairs). These data represent minimum recruitment as defined by the Least Bell's Vireo Working Group "known fledged young."

Appendix C-1-B. Least Bell's Vireo status and management and Brown-headed Cowbird management data at survey sites in the Santa Ana Watershed, 2000-2016.

San Timoteo Canyon

	Parameter	2000-2009	2010	2011	2012	2013	2014	2015	2016	Total
A.	Number of territorial males	n/a	126	116	118	131	151	176	173	n/a
B.	Number of known pairs (breeding and non-breeding)	323	95	101	102	80	135	141	124	1,101
C.	Number of fledged young observed	635	137	196	153	179	206	287	222	2,015
D.	Projected total of recruitment of vireo young[a]	918 (n = 9yrs)	266	343	286	288	338	451	384	3,274
E.	Average number of fledglings per pair (C/B)	2.0	1.4	1.9	1.5	2.2	1.5	2.0	1.8	1.8
F.	Projected number of fledglings per pair (D/B)	2.8	2.8	3.4	2.8	3.6	2.5	3.2	3.1	3.0
G.	Rate of missing eggs/chicks from nests (successful and unsuccessful nests)	44% 150 / 338	65% 24 / 37	30% 22 / 73	42% 19 / 45	41% 31 / 76	52% 46 / 88	n/a	n/a	n/a
H.	Rate of cowbird nest parasitism	31% 103 / 338	8% 3 / 37	0% 0 / 73	2% 1 / 45	3% 2 / 76	6% 5 / 88	0% 0 / 114	0% 0 / 73	14% 114 / 844
I.	Numbers of cowbirds removed from study area	1,487	173	109	143	164	143	169	87	2,475
J.	This row purposefully omitted.									
K.	Number of trap days (1 operative trap day in the field for one day = 1 trap day)	6,463	1,113	1,191	982	1,198	1,058	996	832	13,833
L.	Average number of cowbirds trapped per trap day (I/K)	0.23	0.16	0.09	0.15	0.14	0.14	0.17	0.10	0.18
M.	Number of field hours - LBVI (+)		505	587	407	481	442	750	415	
N.	Number of field hours - BHCO (+)	6,525	503	564	326	525	504	399	329	13,262

[a]Survival rate of fledglings in well-tracked nests was applied to nests not visited as frequently by the function (avg. # fledglings produced by well-tracked pairs x total number of pairs). These data represent minimum recruitment as defined by the Least Bell's Vireo Working Group "known fledged young."

Appendix C-1-C. Least Bell's Vireo status and management and Brown-headed Cowbird management data at survey sites in the Santa Ana Watershed, 2000-2016.

Meridian Conservation Area*

	Parameter	2000-2009	2010	2011	2012	2013	2014	2015	2016	Total
A.	Number of territorial males	n/a	14	16	13	14	21	7	14	n/a
B.	Number of known pairs (breeding and non-breeding)	33	12	9	11	12	16	3	5	101
C.	Number of fledged young observed	75	25	7	8	16	23	3	6	163
D.	Projected total of recruitment of vireo young[a]	121 (n = 4yrs)	76	n/a	n/a	n/a	48	n/a	n/a	245
E.	Average number of fledglings per pair (C/B)	2.3	2.1	0.8	0.7	1.3	1.4	1.0	1.2	1.6
F.	Projected number of fledglings per pair (D/B)	4.6	6.3	n/a	n/a	n/a	3.0	n/a	n/a	2.4
G.	Rate of missing eggs/chicks from nests (successful and unsuccessful nests)	38% 6 / 16	0% 0 / 6	n/a	n/a	n/a	67% 2 / 3	n/a	n/a	n/a
H.	Rate of cowbird nest parasitism	0% 0 / 16	0% 0 / 6	n/a	n/a	n/a	0% 0 / 3	n/a	n/a	0% 0 / 25
I.	Numbers of cowbirds removed from study area	151	13	12	16	15	1	8	3	219
J.	This row purposefully omitted.									
K.	Number of trap days (1 operative trap day in the field for one day = 1 trap day)	1,203	280	200	235	250	178	260	248	2,854
L.	Average number of cowbirds trapped per trap day (I/K)	0.13	0.05	0.06	0.07	0.06	0.01	0.03	0.01	0.08
M.	Number of field hours - LBVI (+)	457	62	55	22	60	81	n/a	29	766
N.	Number of field hours - BHCO (+)	504	153	45	60	85	68	123	87	1,125

[a]Survival rate of fledglings in well-tracked nests was applied to nests not visited as frequently by the function (avg. # fledglings produced by well-tracked pairs x total number of pairs). These data represent minimum recruitment as defined by the Least Bell's Vireo Working Group "known fledged young."

*Former March SKR Preserve

Appendix C-1-D. Least Bell's Vireo status and management and Brown-headed Cowbird management data at survey sites in the Santa Ana Watershed, 2000-2016.

Sycamore Canyon

	Parameter	2000-2009	2010	2011	2012	2013	2014	2015	2016	Total
A.	Number of territorial males	n/a	12	9	7	12	17	4	13	n/a
B.	Number of known pairs (breeding and non-breeding)	35	8	5	7	0	5	1	4	65
C.	Number of fledged young observed	40	11	4	5	0	2	1	6	69
D.	Projected total of recruitment of vireo young[a]	40 (n = 4yrs)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	40
E.	Average number of fledglings per pair (C/B)	1.1	1.4	0.8	0.7	n/a	0.4	1.0	1.5	1.1
F.	Projected number of fledglings per pair (D/B)	1.1	n/a	n/a	n/a	n/a	n/a	n/a	n/a	0.6
G.	Rate of missing eggs/chicks from nests (successful and unsuccessful nests)	33% 3 / 9	n/a	n/a	n/a	n/a	100% 4 / 4	n/a	n/a	n/a
H.	Rate of cowbird nest parasitism	22% 2 / 9	n/a	n/a	n/a	n/a	50% 2 / 4	n/a	n/a	31% 4 / 13
I.	Numbers of cowbirds removed from study area	81	n/a	n/a	n/a	n/a	9	n/a		90
J.	This row purposefully omitted.									
K.	Number of trap days (1 operative trap day in the field for one day = 1 trap day)	635	n/a	n/a	n/a	n/a	75	n/a		710
L.	Average number of cowbirds trapped per trap day (I/K)	0.13	n/a	n/a	n/a	n/a	0.12	n/a	n/a	0.13
M.	Number of field hours - LBVI (+)	474	54	46	22	n/a	43	n/a	15	654
N.	Number of field hours - BHCO (+)	469	n/a	n/a	n/a	n/a	31	n/a	n/a	500

[a]Survival rate of fledglings in well-tracked nests was applied to nests not visited as frequently by the function (avg. # fledglings produced by well-tracked pairs x total number of pairs). These data represent minimum recruitment as defined by the Least Bell's Vireo Working Group "known fledged young."

Appendix C-1-E. Least Bell's Vireo status and management and Brown-headed Cowbird management data at survey sites in the Santa Ana Watershed, 2000-2016.

Mockingbird Canyon

	Parameter	2000-2009	2010	2011	2012	2013	2014	2015	2016	Total
A.	Number of territorial males	n/a	43	37	28	31	23	37	25	n/a
B.	Number of known pairs (breeding and non-breeding)	120	34	32	26	24	7	23	7	273
C.	Number of fledged young observed	218	25	67	39	40	7	19	11	426
D.	Projected total of recruitment of vireo young[a]	418 (n = 7yrs)	n/a	93	78	79	n/a	n/a	21	689
E.	Average number of fledglings per pair (C/B)	1.8	0.7	2.1	1.5	1.7	1.0	0.8	1.6	1.6
F.	Projected number of fledglings per pair (D/B)	3.5	n/a	2.9	3.0	3.3	n/a	n/a	3.0	2.5
G.	Rate of missing eggs/chicks from nests (successful and unsuccessful nests)	38% 31 / 82	n/a	60% 18 / 30	53% 9 / 17	47% 8 / 17	50% 1 / 2	n/a	n/a	n/a
H.	Rate of cowbird nest parasitism	15% 12 / 82	n/a	0% 0 / 30	6% 1 / 17	18% 3 / 17	0% 0 / 2	0% 0 / 5	0% 0 / 3	10% 16 / 156
I.	Numbers of cowbirds removed from study area	1,258	149	111	140	123	71	63	52	1,967
J.	This row purposefully omitted.									
K.	Number of trap days (1 operative trap day in the field for one day = 1 trap day)	5,395	1,028	908	495	772	603	256	385	9,842
L.	Average number of cowbirds trapped per trap day (I/K)	0.23	0.14	0.12	0.28	0.16	0.12	0.25	0.14	0.20
M.	Number of field hours - LBVI (+)		96	302	203	389	62	77	157	
N.	Number of field hours - BHCO (+)	3,661	312	176	215	323	307	117	193	6,590

[a]Survival rate of fledglings in well-tracked nests was applied to nests not visited as frequently by the function (avg. # fledglings produced by well-tracked pairs x total number of pairs). These data represent minimum recruitment as defined by the Least Bell's Vireo Working Group "known fledged young."

Appendix C-1-F. Least Bell's Vireo status and management and Brown-headed Cowbird management data at survey sites in the Santa Ana Watershed, 2000-2016.

Santa Ana River (SAR) - Upstream - Riverside Ave. to Van Buren Blvd.

	Parameter	2000-2009	2010	2011	2012	2013	2014	2015	2016	Total
A.	Number of territorial males	n/a	68	49	43	77	66	109	109	n/a
B.	Number of known pairs (breeding and non-breeding)	167	50	22	11	n/a	19	37	43	349
C.	Number of fledged young observed	283	58	32	7	7	15	33	62	497
D.	Projected total of recruitment of vireo young[a]	329 (n = 5yrs)	100	71	n/a	n/a	23	n/a	172	695
E.	Average number of fledglings per pair (C/B)	1.7	1.2	1.5	0.6	n/a	0.8	0.9	1.4	1.4
F.	Projected number of fledglings per pair (D/B)	2.7	2.0	3.2	n/a	n/a	1.2	n/a	4.0	2.0
G.	Rate of missing eggs/chicks from nests (successful and unsuccessful nests)	32% 24 / 75	36% 4 / 11	30% 3 / 10	n/a	n/a	67% 2 / 3	n/a	n/a	n/a
H.	Rate of cowbird nest parasitism	16% 12 / 75	0% 0 / 11	10% 1 / 10	n/a	n/a	0% 0 / 3	100% 3 / 3	0% 0 / 12	14% 16 / 114
I.	Numbers of cowbirds removed from study area	461	58	30	37	21	17	30	65	719
J.	This row purposefully omitted.									
K.	Number of trap days (1 operative trap day in the field for one day = 1 trap day)	3,734	530	515	468	540	256	302	534	6,879
L.	Average number of cowbirds trapped per trap day (I/K)	0.12	0.11	0.06	0.08	0.04	0.07	0.10	0.12	0.10
M.	Number of field hours - LBVI (+)		335	239	144	167	123	175	439	
N.	Number of field hours - BHCO (+)	2,333	277	315	234	230	188	104	380	5,683

[a]Survival rate of fledglings in well-tracked nests was applied to nests not visited as frequently by the function (avg. # fledglings produced by well-tracked pairs x total number of pairs). These data represent minimum recruitment as defined by the Least Bell's Vireo Working Group "known fledged young."

Appendix C-1-G. Least Bell's Vireo status and management and Brown-headed Cowbird management data at survey sites in the Santa Ana Watershed, 2000-2016.

Santa Ana River (SAR) - Upstream - Hidden Valley, north side of river

	Parameter	2000-2009	2010	2011	2012	2013	2014	2015	2016	Total
A.	Number of territorial males	n/a	15	4	9	21	21	39	40	n/a
B.	Number of known pairs (breeding and non-breeding)	n/a	12	2	3	2	14	23	27	83
C.	Number of fledged young observed	n/a	18	2	1	3	19	15	33	91
D.	Projected total of recruitment of vireo young[a]	n/a	28	n/a	n/a	n/a	28	n/a	100	156
E.	Average number of fledglings per pair (C/B)	n/a	1.5	1.0	0.3	1.5	1.4	0.7	1.2	1.1
F.	Projected number of fledglings per pair (D/B)	n/a	2.3	n/a	n/a	n/a	2.0	n/a	3.7	1.9
G.	Rate of missing eggs/chicks from nests (successful and unsuccessful nests)	n/a	11% 1 / 9	n/a	n/a	n/a	33% 1 / 3	n/a	n/a	n/a
H.	Rate of cowbird nest parasitism	n/a	33% 3 / 9	n/a	n/a	n/a	0% 0 / 3	n/a	0% 0 / 5	18% 3 / 17
I.	Numbers of cowbirds removed from study area	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
J.	This row purposefully omitted.									
K.	Number of trap days (1 operative trap day in the field for one day = 1 trap day)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
L.	Average number of cowbirds trapped per trap day (I/K)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
M.	Number of field hours - LBVI (+)	n/a	210	8	12	26	133	17	87	493
N.	Number of field hours - BHCO (+)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a

[a]Survival rate of fledglings in well-tracked nests was applied to nests not visited as frequently by the function (avg. # fledglings produced by well-tracked pairs x total number of pairs). These data represent minimum recruitment as defined by the Least Bell's Vireo Working Group "known fledged young."

Appendix C-1-H. Least Bell's Vireo status and management and Brown-headed Cowbird management data at survey sites in the Santa Ana Watershed, 2000-2016.

Santa Ana River (SAR) - Upstream - Hidden Valley, south side of river*

	Parameter	2000-2009	2010	2011	2012	2013	2014	2015	2016	Total
A.	Number of territorial males	n/a	60	55	62	75	85	104	121	n/a
B.	Number of known pairs (breeding and non-breeding)	230	43	36	37	42	32	27	66	513
C.	Number of fledged young observed	407	53	41	45	66	28	22	97	759
D.	Projected total of recruitment of vireo young[a]	512 (n = 10yrs)	90	122	104	109	n/a	n/a	198	1,136
E.	Average number of fledglings per pair (C/B)	1.8	1.2	1.1	1.2	1.6	0.9	0.8	1.5	1.5
F.	Projected number of fledglings per pair (D/B)	2.4	2.1	3.4	2.8	2.6	n/a	n/a	3.0	2.2
G.	Rate of missing eggs/chicks from nests (successful and unsuccessful nests)	36% 31 / 85	65% 11 / 17	30% 3 / 10	50% 4 / 8	25% 2 / 8	67% 2 / 3	n/a	n/a	n/a
H.	Rate of cowbird nest parasitism	7% 6 / 85	6% 1 / 17	20% 2 / 10	0% 0 / 8	0% 0 / 8	0% 0 / 3	n/a	0% 0 / 16	6% 9 / 147
I.	Numbers of cowbirds removed from study area	637	24	12	24	8	3	n/a	n/a	708
J.	This row purposefully omitted.									
K.	Number of trap days (1 operative trap day in the field for one day = 1 trap day)	4,298	252	257	348	362	252	n/a	n/a	5,769
L.	Average number of cowbirds trapped per trap day (I/K)	0.15	0.10	0.05	0.07	0.02	0.01	n/a	n/a	0.12
M.	Number of field hours - LBVI (+)		330	193	261	305	225	133	234	
N.	Number of field hours - BHCO (+)	4,157	196	228	129	136	100	n/a	n/a	6,627

[a]Survival rate of fledglings in well-tracked nests was applied to nests not visited as frequently by the function (avg. # fledglings produced by well-tracked pairs x total number of pairs). These data represent minimum recruitment as defined by the Least Bell's Vireo Working Group "known fledged young."

*As of 2010, reported as south side of the river

Appendix C-1-I. Least Bell's Vireo status and management and Brown-headed Cowbird management data at survey sites in the Santa Ana Watershed, 2000-2016.

Santa Ana River (SAR) - Upstream - Goose Creek, Norco to I-15

	Parameter	2000-2009	2010	2011	2012	2013	2014	2015*	2016**	Total
A.	Number of territorial males	n/a	101	105	95	108	110	71	63	n/a
B.	Number of known pairs (breeding and non-breeding)	233	64	59	51	52	32	36	31	558
C.	Number of fledged young observed	489	113	91	86	109	36	63	45	1,032
D.	Projected total of recruitment of vireo young[a]	696 (n = 9yrs)	211	177	184	177	n/a	90	71	1,606
E.	Average number of fledglings per pair (C/B)	2.1	1.8	1.5	1.7	2.1	1.1	1.8	1.5	1.8
F.	Projected number of fledglings per pair (D/B)	2.7	3.3	3.0	3.6	3.4	n/a	2.5	2.3	2.9
G.	Rate of missing eggs/chicks from nests (successful and unsuccessful nests)	41% 73 / 177	28% 5 / 18	45% 10 / 22	0% 0 / 17	28% 8 / 29	56% 5 / 9	n/a	n/a	n/a
H.	Rate of cowbird nest parasitism	9% 14 / 177	0% 0 / 18	0% 0 / 22	0% 0 / 17	7% 2 / 29	0% 0 / 9	0% 0 / 13	0% 0 / 22	5% 16 / 307
I.	Numbers of cowbirds removed from study area	382	49	35	34	23	4	29	12	568
J.	This row purposefully omitted.									
K.	Number of trap days (1 operative trap day in the field for one day = 1 trap day)	1,102	269	228	230	270	218	226	136	2,679
L.	Average number of cowbirds trapped per trap day (I/K)	0.35	0.18	0.15	0.15	0.09	0.02	0.13	0.09	0.21
M.	Number of field hours - LBVI (+)	2,337	183	197	232	256	204	352	234	3,995
N.	Number of field hours - BHCO (+)	624	252	n/a	230	135	100	118	n/a	n/a

[a]Survival rate of fledglings in well-tracked nests was applied to nests not visited as frequently by the function (avg. # fledglings produced by well-tracked pairs x total number of pairs). These data represent minimum recruitment as defined by the Least Bell's Vireo Working Group "known fledged young."

*Starting in 2015 Goose Creek Golf Club to I-15

**Includes Goose Creek mitigation funded by IE

Appendix C-1-J. Least Bell's Vireo status and management and Brown-headed Cowbird management data at survey sites in the Santa Ana Watershed, 2000-2016.

Norco Bluffs (I-15 to River Rd., non-mitigation)*

	Parameter	2000-2009	2010	2011	2012	2013	2014	2015	2016	Total
A.	Number of territorial males	n/a	n/a	n/a	n/a	n/a	n/a	30	63	n/a
B.	Number of known pairs (breeding and non-breeding)	n/a	n/a	n/a	n/a	n/a	n/a	17	28	45
C.	Number of fledged young observed	n/a	n/a	n/a	n/a	n/a	n/a	43	45	88
D.	Projected total of recruitment of vireo young[a]	n/a	n/a	n/a	n/a	n/a	n/a	63	84	147
E.	Average number of fledglings per pair (C/B)	n/a	n/a	n/a	n/a	n/a	n/a	2.5	1.6	2.0
F.	Projected number of fledglings per pair (D/B)	n/a	n/a	n/a	n/a	n/a	n/a	3.7	3.0	3.3
G.	Rate of missing eggs/chicks from nests (successful and unsuccessful nests)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
H.	Rate of cowbird nest parasitism	n/a	n/a	n/a	n/a	n/a	n/a	0% 0 / 13	0% 0 / 12	0% 0 / 25
I.	Numbers of cowbirds removed from study area	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
J.	This row purposefully omitted.									
K.	Number of trap days (1 operative trap day in the field for one day = 1 trap day)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	0
L.	Average number of cowbirds trapped per trap day (I/K)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
M.	Number of field hours - LBVI (+)	n/a	n/a	n/a	n/a	n/a	n/a	124	180	304
N.	Number of field hours - BHCO (+)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a

[a]Survival rate of fledglings in well-tracked nests was applied to nests not visited as frequently by the function (avg. # fledglings produced by well-tracked pairs x total number of pairs). These data represent minimum recruitment as defined by the Least Bell's Vireo Working Group "known fledged young."

*Formerly monitored as part of Goose Creek Golf Club to River Rd.

Appendix C-1-K. Least Bell's Vireo status and management and Brown-headed Cowbird management data at survey sites in the Santa Ana Watershed, 2000-2016.

Temescal Canyon

	Parameter	2000-2009	2010	2011	2012	2013	2014	2015	2016	Total
A.	Number of territorial males	n/a	83	102	109	131	126	123	93	n/a
B.	Number of known pairs (breeding and non-breeding)	164	49	65	63	50	24	21	9	445
C.	Number of fledged young observed	339	73	113	71	48	17	22	5	688
D.	Projected total of recruitment of vireo young[a]	448 (n = 8yrs)	152	189	189	n/a	n/a	n/a	n/a	977
E.	Average number of fledglings per pair (C/B)	2.1	1.5	1.7	1.1	1.0	0.7	1.0	0.6	1.5
F.	Projected number of fledglings per pair (D/B)	2.7	3.1	2.9	3.0	n/a	n/a	n/a	n/a	2.2
G.	Rate of missing eggs/chicks from nests (successful and unsuccessful nests)	39% 52 / 133	20% 3 / 15	34% 11 / 32	0% 0 / 12	n/a	n/a	n/a	n/a	n/a
H.	Rate of cowbird nest parasitism	20% 27 / 133	0% 0 / 15	3% 1 / 32	25% 3 / 12	n/a	n/a	n/a	n/a	16% 31 / 192
I.	Numbers of cowbirds removed from study area	1,350	134	204	566	380	194	435	297	3,560
J.	This row purposefully omitted.									
K.	Number of trap days (1 operative trap day in the field for one day = 1 trap day)	5,812	1,191	1,245	851	1,246	1,077	93	644	12,159
L.	Average number of cowbirds trapped per trap day (I/K)	0.23	0.11	0.16	0.67	0.30	0.18	4.68	0.46	0.29
M.	Number of field hours - LBVI (+)		335	557	531	420	90	96	146	
N.	Number of field hours - BHCO (+)	5,690	467	685	377	544	550	n/a	485	10,973

[a]Survival rate of fledglings in well-tracked nests was applied to nests not visited as frequently by the function (avg. # fledglings produced by well-tracked pairs x total number of pairs). These data represent minimum recruitment as defined by the Least Bell's Vireo Working Group "known fledged young."

Appendix C-1-L. Least Bell's Vireo status and management and Brown-headed Cowbird management data at survey sites in the Santa Ana Watershed, 2000-2016.

Chino Hills

	Parameter	2000-2009	2010	2011	2012	2013	2014	2015	2016*	Total
A.	Number of territorial males	n/a	11	8	8	13	10	24	18	n/a
B.	Number of known pairs (breeding and non-breeding)	45	7	3	2	5	2	6	11	81
C.	Number of fledged young observed	54	7	1	1	7	3	4	10	87
D.	Projected total of recruitment of vireo young[a]	53 (n = 4yrs)	12	n/a	n/a	20	n/a	8	n/a	93
E.	Average number of fledglings per pair (C/B)	1.2	1.0	0.3	0.5	1.4	1.5	0.7	0.9	1.1
F.	Projected number of fledglings per pair (D/B)	1.8	1.7	n/a	n/a	4.0	n/a	1.3	n/a	1.1
G.	Rate of missing eggs/chicks from nests (successful and unsuccessful nests)	63% 12 / 19	67% 2 / 3	n/a	100% 1 / 1	n/a	n/a	n/a	n/a	n/a
H.	Rate of cowbird nest parasitism	32% 6 / 19	0% 0 / 3	n/a	0% 0 / 1	n/a	n/a	20% 1 / 5	0% 0 / 2	23% 7 / 30
I.	Numbers of cowbirds removed from study area	11	16	16	6	12	4	76	53	194
J.	This row purposefully omitted.									
K.	Number of trap days (1 operative trap day in the field for one day = 1 trap day)	214	129	115	124	132	119	219	262	1,314
L.	Average number of cowbirds trapped per trap day (I/K)	0.05	0.12	0.14	0.05	0.09	0.03	0.35	0.20	0.15
M.	Number of field hours - LBVI (+)	388	59	54	44	36	24	60	83	748
N.	Number of field hours - BHCO (+)	179	129	115	124	83	75	95	128	928

[a]Survival rate of fledglings in well-tracked nests was applied to nests not visited as frequently by the function (avg. # fledglings produced by well-tracked pairs x total number of pairs). These data represent minimum recruitment as defined by the Least Bell's Vireo Working Group "known fledged young."

*2016 includes former assessment sites

Appendix C-1-M. Least Bell's Vireo status and management and Brown-headed Cowbird management data at survey sites in the Santa Ana Watershed, 2000-2016.

Santa Ana Canyon (SAC) - Upper Canyon

	Parameter	2000-2009	2010	2011	2012	2013	2014	2015	2016	Total
A.	Number of territorial males	n/a	11	14	10	28	27	25	26	n/a
B.	Number of known pairs (breeding and non-breeding)	126	4	5	4	14	18	9	12	192
C.	Number of fledged young observed	208	6	5	6	23	28	10	18	304
D.	Projected total of recruitment of vireo young[a]	309 (n = 8yrs)	n/a	n/a	12	42	54	18	28	463
E.	Average number of fledglings per pair (C/B)	1.7	1.5	1.0	1.5	1.6	1.6	1.1	1.5	1.6
F.	Projected number of fledglings per pair (D/B)	2.7	n/a	n/a	3.0	3.0	3.0	2.0	2.3	2.4
G.	Rate of missing eggs/chicks from nests (successful and unsuccessful nests)	41% 26 / 64	0% 0 / 1	n/a	0% 0 / 1	40% 2 / 5	33% 2 / 6	n/a	n/a	n/a
H.	Rate of cowbird nest parasitism	6% 4 / 64	0% 0 / 1	n/a	0% 0 / 1	0% 0 / 5	0% 0 / 6	0% 0 / 1	0% 0 / 3	5% 4 / 81
I.	Numbers of cowbirds removed from study area	301	165	48	62	32	56	14	28	706
J.	This row purposefully omitted.									
K.	Number of trap days (1 operative trap day in the field for one day = 1 trap day)	2,112	286	238	105	133	137	129	134	3,274
L.	Average number of cowbirds trapped per trap day (I/K)	0.14	0.58	0.20	0.59	0.24	0.41	0.11	0.21	0.22
M.	Number of field hours - LBVI (+)		324	350	325	396	365	408	386	
N.	Number of field hours - BHCO (+)	6,793	425	608	432	377	339	479	425	12,432

[a]Survival rate of fledglings in well-tracked nests was applied to nests not visited as frequently by the function (avg. # fledglings produced by well-tracked pairs x total number of pairs). These data represent minimum recruitment as defined by the Least Bell's Vireo Working Group "known fledged young."

Appendix C-1-N. Least Bell's Vireo status and management and Brown-headed Cowbird management data at survey sites in the Santa Ana Watershed, 2000-2016.

Santa Ana Canyon (SAC) - Green River Golf Club

	Parameter	2000-2009	2010	2011	2012	2013	2014	2015	2016	Total
A.	Number of territorial males	n/a	24	26	19	22	26	31	33	n/a
B.	Number of known pairs (breeding and non-breeding)	101	17	14	11	19	19	23	26	230
C.	Number of fledged young observed	192	19	19	11	19	29	35	27	351
D.	Projected total of recruitment of vireo young[a]	279 (n = 9yrs)	31	29	25	n/a	44	37	29	473
E.	Average number of fledglings per pair (C/B)	1.9	1.1	1.4	1.0	1.0	1.5	1.5	1.0	1.5
F.	Projected number of fledglings per pair (D/B)	2.8	1.8	2.1	2.3	n/a	2.3	1.6	1.1	2.1
G.	Rate of missing eggs/chicks from nests (successful and unsuccessful nests)	26% 16 / 61	71% 5 / 7	55% 6 / 11	20% 1 / 5	50% 2 / 4	25% 2 / 8	n/a	n/a	n/a
H.	Rate of cowbird nest parasitism	7% 4 / 61	0% 0 / 7	0% 0 / 11	0% 0 / 5	0% 0 / 4	0% 0 / 8	0% 0 / 15	0% 0 / 13	3% 4 / 124
I.	Numbers of cowbirds removed from study area	802	58	26	37	34	15	32	36	1,040
J.	This row purposefully omitted.									
K.	Number of trap days (1 operative trap day in the field for one day = 1 trap day)	3,101	407	119	124	130	131	237	260	4,509
L.	Average number of cowbirds trapped per trap day (I/K)	0.26	0.14	0.22	0.30	0.26	0.11	0.14	0.14	0.23
M.	Number of field hours - LBVI (+)	*See Upper Canyon Summary Sheet for all Santa Ana Canyon hours								
N.	Number of field hours - BHCO (+)									

[a]Survival rate of fledglings in well-tracked nests was applied to nests not visited as frequently by the function (avg. # fledglings produced by well-tracked pairs x total number of pairs). These data represent minimum recruitment as defined by the Least Bell's Vireo Working Group "known fledged young."

Appendix C-1-O. Least Bell's Vireo status and management and Brown-headed Cowbird management data at survey sites in the Santa Ana Watershed, 2000-2016.

Santa Ana Canyon (SAC) - Featherly Regional Park

	Parameter	2000-2009	2010	2011	2012	2013	2014	2015	2016	Total
A.	Number of territorial males	n/a	40	33	36	64	59	65	64	n/a
B.	Number of known pairs (breeding and non-breeding)	131	23	19	16	45	39	38	39	350
C.	Number of fledged young observed	175	22	23	12	55	35	37	23	382
D.	Projected total of recruitment of vireo young[a]	307 (n = 7yrs)	46	38	n/a	77	43	49	39	599
E.	Average number of fledglings per pair (C/B)	1.3	1.0	1.2	0.8	1.2	0.9	1.0	0.6	1.1
F.	Projected number of fledglings per pair (D/B)	2.3	2.0	2.0	n/a	1.7	1.1	1.3	1.0	1.7
G.	Rate of missing eggs/chicks from nests (successful and unsuccessful nests)	48% 31 / 65	71% 5 / 7	20% 1 / 5	100% 4 / 4	50% 7 / 14	64% 9 / 14	n/a	n/a	n/a
H.	Rate of cowbird nest parasitism	8% 5 / 65	0% 0 / 7	0% 0 / 5	0% 0 / 4	0% 0 / 14	0% 0 / 14	0% 0 / 19	0% 0 / 14	4% 5 / 142
I.	Numbers of cowbirds removed from study area	127	118	44	30	48	41	44	8	460
J.	This row purposefully omitted.									
K.	Number of trap days (1 operative trap day in the field for one day = 1 trap day)	1,591	514	335	244	258	241	495	398	4,076
L.	Average number of cowbirds trapped per trap day (I/K)	0.08	0.23	0.13	0.12	0.19	0.17	0.09	0.02	0.11
M.	Number of field hours - LBVI (+)	*See Upper Canyon Summary Sheet for all Santa Ana Canyon hours								
N.	Number of field hours - BHCO (+)									

[a]Survival rate of fledglings in well-tracked nests was applied to nests not visited as frequently by the function (avg. # fledglings produced by well-tracked pairs x total number of pairs). These data represent minimum recruitment as defined by the Least Bell's Vireo Working Group "known fledged young."

Appendix C-1-P. Least Bell's Vireo status and management and Brown-headed Cowbird management data at survey sites in the Santa Ana Watershed, 2000-2016.

Santiago Canyon (Irvine Park)

	Parameter	2000-2009	2010	2011	2012	2013	2014	2015	2016	Total
A.	Number of territorial males	n/a	24	26	29	29	27	24	17	n/a
B.	Number of known pairs (breeding and non-breeding)	n/a	14	9	5	8	9	1	1	47
C.	Number of fledged young observed	n/a	18	7	5	10	12	2	0	54
D.	Projected total of recruitment of vireo young[a]	n/a	52	18	n/a	n/a	14	n/a	n/a	84
E.	Average number of fledglings per pair (C/B)	n/a	1.3	0.8	1.0	1.3	1.3	2.0	0.0	1.1
F.	Projected number of fledglings per pair (D/B)	n/a	3.7	2.0	n/a	n/a	1.6	n/a	n/a	1.8
G.	Rate of missing eggs/chicks from nests (successful and unsuccessful nests)	n/a	25% 1 / 4	n/a	n/a	n/a	80% 4 / 5	n/a	n/a	n/a
H.	Rate of cowbird nest parasitism	n/a	0% 0 / 4	n/a	n/a	n/a	0% 0 / 6	n/a	n/a	0% 0 / 10
I.	Numbers of cowbirds removed from study area	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
J.	This row purposefully omitted.									
K.	Number of trap days (1 operative trap day in the field for one day = 1 trap day)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
L.	Average number of cowbirds trapped per trap day (I/K)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
M.	Number of field hours - LBVI (+)	n/a	25	21	9.5	n/a	89	n/a	7	151
N.	Number of field hours - BHCO (+)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a

[a]Survival rate of fledglings in well-tracked nests was applied to nests not visited as frequently by the function (avg. # fledglings produced by well-tracked pairs x total number of pairs). These data represent minimum recruitment as defined by the Least Bell's Vireo Working Group "known fledged young."

Appendix C-2-A. Least Bell's Vireo nest placement preferences at survey sites in the Santa Ana Watershed, 2000-2016.

San Jacinto

Host Plant Species (listed in taxonomic order)	**2000-2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**Total**	**Percentage of Total**
Narrowleaf Willow (*Salix exigua*)	26	2	8	10	9			1	56	49%
Dead Narrowleaf Willow (*Salix exigua*)					1				1	1%
Goodding's Black Willow (*Salix gooddingii*)	5							4	9	8%
Red Willow (*Salix laevigata*)								2	2	2%
Black Mustard[ie] (*Brassica nigra*)	1								1	1%
Tamarisk[ie] (*Tamarix ramosissima*)	1	1							2	2%
Coyote Brush (*Baccharis pilularis*)						1		3	4	4%
Mulefat (*Baccharis salicifolia*)	26	4	1	3				1	35	31%
Unknown/No data					3	1			4	4%
Total	**59**	**7**	**9**	**13**	**13**	**2**	**0**	**11**	**114**	**100%**

[i] = invasive

[e] = non-native

[r] = endangered, threatened, or sensitive

Appendix C-2-B. Least Bell's Vireo nest placement preferences at survey sites in the Santa Ana Watershed, 2000-2016.

San Timoteo Canyon

Host Plant Species (listed in taxonomic order)	**2000-2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**Total**	**Percentage of Total**
Western Sycamore (*Platanus racemosa*)			1						1	<1%
Golden Currant (*Ribes aureum)*	1				2	1		1	5	1%
Desert Wild Grape (*Vitis girdiana*)	10	5	10	1	2	18	10	8	64	7%
Fremont Cottonwood (*Populus fremontii*)	16	1	4		3	5	8	3	40	4%
Dead Fremont Cottonwood (*Populus fremontii*)				1					1	<1%
Narrowleaf Willow (*Salix exigua*)	13		1		2	4	2	1	23	2%
Goodding's Black Willow (*Salix gooddingii*)	52	4	1	1	4	2	5	4	73	8%
Red Willow (*Salix laevigata*)	64	8	13	6	17	6	20	16	150	16%
Arroyo Willow (*Salix lasiolepis*)	76	4	17	17	16	20	24	22	196	21%
Yellow Willow (*Salix lasiandra)*	3		2		2	1	1	3	12	1%
Willow sp. (*Salix* sp.)							1		1	<1%
Dead Willow sp. (*Salix* sp.)				1					1	<1%
Toyon (*Heteromeles arbutifolia*)	8			1	1	4	3		17	2%
White Mulberry[e] (*Morus alba*)						1			1	<1%
Scrub Oak (*Quercus berberidifolia*)							1		1	<1%
Oak sp. (*Quercus* sp.)							1		1	<1%
Southern California Black Walnut[r] (*Juglans californica)*		1							1	<1%
Fragrant Sumac (*Rhus aromatica*)			1						1	<1%
Boxelder (*Acer negundo*)	1						1		2	<1%
Tree of Heaven[ie] (*Ailanthus altissima*)						1			1	<1%
Black Mustard[ie] (*Brassica nigra*)	1								1	<1%
Mustard sp.[ie] (*Brassica* sp.)	3				1				4	<1%
Perennial Pepperweed[ie] (*Lepidium latifolium*)							1		1	<1%
Tamarisk[ie] (*Tamarix ramosissima*)				1			1		2	<1%
Fourwing Saltbush (*Atriplex canescens*)	1								1	<1%
Douglas' Sagewort (*Artemisia douglasiana*)	14		1	1	1	1	1		19	2%
Mulefat (*Baccharis salicifolia*)	101	15	25	12	26	26	34	19	258	28%

Appendix C-2-B. Least Bell's Vireo nest placement preferences at survey sites in the Santa Ana Watershed, 2000-2016.

San Timoteo Canyon

Host Plant Species (listed in taxonomic order)	**2000-2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**Total**	**Percentage of Total**
Willow Baccharis (*Baccharis salicina*)	1								1	<1%
Blue Elderberry (*Sambucus nigra* ssp. *caerulea*)	12	2	3	5	3	4	9	1	39	4%
Desert Wild Grape (*V. girdiana*) and Arroyo Willow (*S. lasiolepis*)	1								1	<1%
Arroyo Willow (*S. lasiolepis*) and Sweet Fennel[i] (*Foeniculum vulgare*)	1								1	<1%
Deadfall			1				1		2	<1%
Unknown/No data							2		2	<1%
Total	**379**	**2050**	**2091**	**2059**	**2093**	**2108**	**2141**	**2094**	**924**	**6%**

[i] = invasive

[e] = non-native

[r] = endangered, threatened, or sensitive

Appendix C-2-C. Least Bell's Vireo nest placement preferences at survey sites in the Santa Ana Watershed, 2000-2016.

Meridian Conservation Area*

Host Plant Species (listed in taxonomic order)	**2000-2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**Total**	**Percentage of Total**
Goodding's Black Willow (*Salix gooddingii*)	9	1							10	38%
Red Willow (*Salix laevigata*)	3	3				1			7	27%
Arroyo Willow (*Salix lasiolepis*)	5	1				2			8	31%
Mulefat (*Baccharis salicifolia*)		1							1	4%
Total	**17**	**6**	**0**	**0**	**0**	**3**	**0**	**0**	**26**	**100%**

[i] = invasive

[e] = non-native

[r] = endangered, threatened, or sensitive

*Former March SKR Preserve

Appendix C-2-D. Least Bell's Vireo nest placement preferences at survey sites in the Santa Ana Watershed, 2000-2016.

Sycamore Canyon

Host Plant Species (listed in taxonomic order)	**2000-2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**Total**	**Percentage of Total**
Fremont Cottonwood (*Populus fremontii*)						1			1	7%
Goodding's Black Willow (*Salix gooddingii*)	9								9	64%
Arroyo Willow (*Salix lasiolepis*)						1			1	7%
Blue Elderberry (*Sambucus nigra* ssp. *caerulea*)	1					2			3	21%
Total	**10**	**0**	**0**	**0**	**0**	**4**	**0**	**0**	**14**	**100%**

[i] = invasive

[e] = non-native

[r] = endangered, threatened, or sensitive

Appendix C-2-E. Least Bell's Vireo nest placement preferences at survey sites in the Santa Ana Watershed, 2000-2016.

Mockingbird Canyon

Host Plant Species (listed in taxonomic order)	**2000-2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**Total**	**Percentage of Total**
Western Sycamore (*Platanus racemosa*)	1								1	1%
Desert Wild Grape (*Vitis girdiana*)	6		1						7	4%
Fremont Cottonwood (*Populus fremontii*)			1	1					2	1%
Narrowleaf Willow (*Salix exigua*)							1		1	1%
Goodding's Black Willow (*Salix gooddingii*)	26		3	1	1				31	17%
Red Willow (*Salix laevigata*)	30	2	13	7	2		2		56	31%
Arroyo Willow (*Salix lasiolepis*)	2		6	3	4			1	16	9%
Willow sp. (*Salix* sp.)	1								1	1%
Dead Willow sp. (*Salix* sp.)	1								1	1%
Hollyleaf Cherry (*Prunus ilicifolia*)			1						1	1%
Southern California Black Walnut[r] (*Juglans californica)*	1								1	1%
Peruvian Pepper Tree[ie] (*Schinus molle*)	2		1	1					4	2%
Perennial Pepperweed[ie] (*Lepidium latifolium*)	3			1					4	2%
Dead Perennial Pepperweed[ie] (*Lepidium latifolium*)	1								1	1%
Fourwing Saltbush (*Atriplex canescens*)					1				1	1%
Mulefat (*Baccharis salicifolia*)	5	1	2	3	4				15	8%
Willow Baccharis (*Baccharis salicina*)	2								2	1%
Arrowweed (*Pluchea sericea*)					1				1	1%
Garden Celery[e] (*Apium graveolens*)	1								1	1%
Blue Elderberry (*Sambucus nigra* ssp. *caerulea*)	13		3	2	6	1	2	2	29	16%
Desert Wild Grape (*V. girdiana*) and Goodding's Black Willow (*S. gooddingii*)	1								1	1%
Goodding's Black Willow (*S. gooddingii*) and Perennial Pepperweed[ie] (*L.*	1								1	1%
Willow sp. (*Salix* sp.) and Perennial Pepperweed[ie] (*L. latifolium*)	1								1	1%
Coyote Brush (*B. pilularis*) and Mulefat (*B. salicifolia*)					1				1	1%
Unknown/No data						2			2	1%
Total	**98**	**3**	**31**	**19**	**20**	**3**	**5**	**3**	**182**	**100%**

[i] = invasive

[e] = non-native

[r] = endangered, threatened, or sensitive

Appendix C-2-F. Least Bell's Vireo nest placement preferences at survey sites in the Santa Ana Watershed, 2000-2016.

Santa Ana River (SAR) - Upstream - Riverside Ave. to Van Buren Blvd.

Host Plant Species (listed in taxonomic order)	**2000-2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**Total**	**Percentage of Total**
Desert Wild Grape (*Vitis girdiana*)		1	2			1	2	2	8	6%
Fremont Cottonwood (*Populus fremontii*)	7		1						8	6%
Narrowleaf Willow (*Salix exigua*)	2		1			2			5	4%
Goodding's Black Willow (*Salix gooddingii*)	10			1				2	13	9%
Dead Goodding's Black Willlow (*Salix gooddingii*)	1								1	1%
Red Willow (*Salix laevigata*)	6	1	1					1	9	6%
Arroyo Willow (*Salix lasiolepis*)	28	4	5					3	40	28%
Yellow Willow (*Salix lasiandra)*	1								1	1%
Willow sp. (*Salix* sp.)	1								1	1%
California Wild Rose (*Rosa californica*)	1							1	2	1%
Stinging Nettle (*Urtica dioica*)	1								1	1%
Scrub Oak (*Quercus berberidifolia*)	2								2	1%
Poison Oak (*Toxicodendron diversilobum*)								1	1	1%
Tamarisk[ie] (*Tamarix ramosissima*)	1								1	1%
Tree Tobacco[ie] (*Nicotiana glauca*)			1						1	1%
Mulefat (*Baccharis salicifolia*)	26	7	1	1		2		5	42	30%
Blue Elderberry (*Sambucus nigra* ssp. *caerulea*)	3		1					1	5	4%
Dead Goodding's Black Willow (*S. gooddingii*) and Stinging Nettle (*U. dioica*)	1								1	1%
Total	**91**	**13**	**13**	**2**	**0**	**5**	**2**	**16**	**142**	**100%**

[i] = invasive

[e] = non-native

[r] = endangered, threatened, or sensitive

Appendix C-2-G. Least Bell's Vireo nest placement preferences at survey sites in the Santa Ana Watershed, 2000-2016.

Santa Ana River (SAR) - Upstream - Hidden Valley, north side of river

Host Plant Species (listed in taxonomic order)	**2000-2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**Total**	**Percentage of Total**
Desert Wild Grape (*Vitis girdiana*)		2	1						3	14%
Fremont Cottonwood (*Populus fremontii*)								1	1	5%
Narrowleaf Willow (*Salix exigua*)						1			1	5%
Red Willow (*Salix laevigata*)		2							2	10%
Arroyo Willow (*Salix lasiolepis*)			1					2	3	14%
Mulefat (*Baccharis salicifolia*)		4				2		2	8	38%
Blue Elderberry (*Sambucus nigra* ssp. *caerulea*)		2				1			3	14%
Total	**0**	**10**	**2**	**0**	**0**	**4**	**0**	**5**	**21**	**100%**

[i] = invasive

[e] = non-native

[r] = endangered, threatened, or sensitive

Appendix C-2-H. Least Bell's Vireo nest placement preferences at survey sites in the Santa Ana Watershed, 2000-2016.

Santa Ana River (SAR) - Upstream - Hidden Valley, south side of river*

Host Plant Species (listed in taxonomic order)	**2000-2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**Total**	**Percentage of Total**
Desert Wild Grape (*Vitis girdiana*)	6		2	2		1		1	12	7%
Fremont Cottonwood (*Populus fremontii*)								1	1	1%
Narrowleaf Willow (*Salix exigua*)	1			1	1			1	4	2%
Goodding's Black Willow (*Salix gooddingii*)	15	1			2			1	19	11%
Red Willow (*Salix laevigata*)	4	1	2		2	1		3	13	7%
Arroyo Willow (*Salix lasiolepis*)	43	6	2	1	2	2		2	58	32%
Yellow Willow (*Salix lasiandra)*	1								1	1%
Willow sp. (*Salix* sp.)	2								2	1%
California Wild Rose (*Rosa californica*)								1	1	1%
Poison Oak (*Toxicodendron diversilobum*)	1								1	1%
Coyote Brush (*Baccharis pilularis*)	1								1	1%
Mulefat (*Baccharis salicifolia*)	29	9	3	2	3			4	50	28%
Blue Elderberry (*Sambucus nigra* ssp. *caerulea*)	3							1	4	2%
Desert Wild Grape (*V. girdiana*) and California Wild Rose (*R. californica*)	1								1	1%
Red Willow (*S. laevigata*) and Unknown	1								1	1%
Willow sp. (*Salix* sp.) and California Blackberry (*Rubus ursinus*)	1								1	1%
Mulefat (*B. salicifolia*) and Poison Hemlock[ie] (*C. maculatum*)				1					1	1%
Unknown/No data			2					6	8	4%
Total	**109**	**17**	**11**	**7**	**10**	**4**	**0**	**21**	**179**	**100%**

[i] = invasive

[e] = non-native

[r] = endangered, threatened, or sensitive

*As of 2010, reported as south side of the river

Appendix C-2-I. Least Bell's Vireo nest placement preferences at survey sites in the Santa Ana Watershed, 2000-2016.

Santa Ana River (SAR) - Upstream - Goose Creek, Norco to I-15

Host Plant Species (listed in taxonomic order)	**2000-2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015***	**2016****	**Total**	**Percentage of Total**
Desert Wild Grape (*Vitis girdiana*)	9			1	5		4		19	5%
Fremont Cottonwood (*Populus fremontii*)	11	1		1	1				14	4%
Dead Fremont Cottonwood (*Populus fremontii*)					1				1	<1%
Narrowleaf Willow (*Salix exigua*)	8	1	1			1	1		12	3%
Goodding's Black Willow (*Salix gooddingii*)	39	1	5	2			4	2	53	15%
Red Willow (*Salix laevigata*)				2	2		3	1	8	2%
Arroyo Willow (*Salix lasiolepis*)	70	5	5	9	11	1		9	110	31%
Dead Arroyo Willow (*Salix lasiolepis*)		1							1	<1%
Yellow Willow (*Salix lasiandra)*							1		1	<1%
Willow sp. (*Salix* sp.)							1		1	<1%
Dead Willow sp. (*Salix* sp.)						1			1	<1%
Southern California Black Walnut[r] (*Juglans californica)*					1				1	<1%
Ash sp. (*Fraxinus* sp.)	1								1	<1%
Mulefat (*Baccharis salicifolia*)	63	13	10	4	10	10	4	8	122	34%
Dead Mulefat (*Baccharis salicifolia*)	2							2	4	1%
Poison Hemlock[ie] (*Conium maculatum*)	4								4	1%
Blue Elderberry (*Sambucus nigra* ssp. *caerulea*)	2		1						3	1%
Goodding's Black Willow (S. gooddingii) and Poison Hemlock[ie] (*C. maculatum*)	1								1	<1%
Unknown/No data			3						3	1%
Total	**210**	**22**	**25**	**19**	**31**	**13**	**18**	**22**	**360**	**100%**

[i] = invasive

[e] = non-native

[r] = endangered, threatened, or sensitive

*Starting in 2015 Goose Creek Golf Club to 1-15 only. Formerly monitored as Goose Creek Golf Club to River Rd.

**Includes Goose Creek mitigation funded by IERCD

Appendix C-2-J. Least Bell's Vireo nest placement preferences at survey sites in the Santa Ana Watershed, 2000-2016.

Norco Bluffs (I-15 to River Rd., non-mitigation)*

Host Plant Species (listed in taxonomic order)	**2000-2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**Total**	**Percentage of Total**
Desert Wild Grape (*Vitis girdiana*)								3	3	12%
Narrowleaf Willow (*Salix exigua*)								1	1	4%
Goodding's Black Willow (*Salix gooddingii*)							3	2	5	19%
Arroyo Willow (*Salix lasiolepis*)							5	5	10	38%
Mulefat (*Baccharis salicifolia*)							5	1	6	23%
Desert Wild Grape (*V. girdiana*) and Mulefat (*B. salicifolia*)							1		1	4%
Total	**0**	**0**	**0**	**0**	**0**	**0**	**14**	**12**	**26**	**100%**

[i] = invasive

[e] = non-native

[r] = endangered, threatened, or sensitive

*Formerly monitored as part of Goose Creek Golf Club to River Rd.

Appendix C-2-K. Least Bell's Vireo nest placement preferences at survey sites in the Santa Ana Watershed, 2000-2016.

Temescal Canyon

Host Plant Species (listed in taxonomic order)	**2000-2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**Total**	**Percentage of Total**
Western Sycamore (*Platanus racemosa*)	1								1	<1%
Fremont Cottonwood (*Populus fremontii*)	2		2						4	2%
Narrowleaf Willow (*Salix exigua*)			1						1	<1%
Goodding's Black Willow (*Salix gooddingii*)	18	2	7	2	1			1	31	13%
Red Willow (*Salix laevigata*)		1	10	3					14	6%
Arroyo Willow (*Salix lasiolepis*)	61	7	2	1	1				72	30%
Yellow Willow (*Salix lasiandra)*	3	1							4	2%
Dead Willow sp. (*Salix* sp.)	1								1	<1%
Toyon (*Heteromeles arbutifolia*)	1								1	<1%
California Blackberry (*Rubus ursinus*)				1					1	<1%
Sugar Sumac (*Rhus ovata*)		1	1						2	1%
Poison Oak (*Toxicodendron diversilobum*)	1								1	<1%
Mustard sp.[ie] (*Brassica* sp.)				1					1	<1%
Perennial Pepperweed[ie] (*Lepidium latifolium*)	1								1	<1%
Tamarisk[ie] (*Tamarix ramosissima*)	1		1	2					4	2%
Brittlebush (*Encelia farinosa*)				1					1	<1%
Douglas' Sagewort (*Artemisia douglasiana*)	1								1	<1%
Coyote Brush (*Baccharis pilularis*)	1		1						2	1%
Mulefat (*Baccharis salicifolia*)	65	6	7	2	1				81	33%
Dead Mulefat (*Baccharis salicifolia*)	3								3	1%
Sunflower (*Helianthus annuus*)	1								1	<1%
Arrowweed (*Pluchea sericea*)	1			1					2	1%
Blue Elderberry (*Sambucus nigra* ssp. *caerulea*)	1	3	3	1					8	3%
Red Willow (*S. laevigata*) and dead Stinging Nettle (*U. dioica*)	1								1	<1%
Deadfall	2	1							3	1%
Total	**166**	**22**	**35**	**15**	**3**	**0**	**0**	**1**	**242**	**100%**

[i] = invasive

[e] = non-native

[r] = endangered, threatened, or sensitive

Appendix C-2-L. Least Bell's Vireo nest placement preferences at survey sites in the Santa Ana Watershed, 2000-2016.

Chino Hills

Host Plant Species (listed in taxonomic order)	**2000-2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**Total**	**Percentage of Total**
Desert Wild Grape (*Vitis girdiana*)	1								1	3%
Goodding's Black Willow (*Salix gooddingii*)	9						5	1	15	38%
Red Willow (*Salix laevigata*)	3	2		1				1	7	18%
Arroyo Willow (*Salix lasiolepis*)	1								1	3%
Bank Catclaw[e] (*Acacia redolens*)								1	1	3%
Toyon (*Heteromeles arbutifolia*)	1								1	3%
Chinese Elm[e] (*Ulmus parvifolia*)								1	1	3%
Coast Live Oak (*Quercus agrifolia*)					1				1	3%
Scrub Oak (*Quercus berberidifolia*)							1		1	3%
Douglas' Sagewort (*Artemisia douglasiana*)	3								3	8%
Mulefat (*Baccharis salicifolia*)	4	1					1		6	15%
Blue Elderberry (*Sambucus nigra* ssp. *caerulea*)	2								2	5%
Total	**24**	**3**	**0**	**1**	**1**	**0**	**7**	**4**	**40**	**100%**

[i] = invasive

[e] = non-native

[r] = endangered, threatened, or sensitive

Appendix C-2-M. Least Bell's Vireo nest placement preferences at survey sites in the Santa Ana Watershed, 2000-2016.

Santa Ana Canyon (SAC) - Upper Canyon

Host Plant Species (listed in taxonomic order)	**2000-2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**Total**	**Percentage of Total**
Desert Wild Grape (*Vitis girdiana*)	4								4	3%
Fremont Cottonwood (*Populus fremontii*)	5	1			1	1			8	7%
Narrowleaf Willow (*Salix exigua*)	1								1	1%
Goodding's Black Willow (*Salix gooddingii*)	10		1						11	9%
Red Willow (*Salix laevigata*)	3								3	3%
Arroyo Willow (*Salix lasiolepis*)	2				1				3	3%
Willow sp. (*Salix* sp.)	1								1	1%
Castorbean[ie] (*Ricinus communis*)	1								1	1%
Toyon (*Heteromeles arbutifolia*)	1								1	1%
California Wild Rose (*Rosa californica*)	3								3	3%
Coast Live Oak (*Quercus agrifolia*)	1								1	1%
Scrub Oak (*Quercus berberidifolia*)	2								2	2%
Poison Oak (*Toxicodendron diversilobum*)	5								5	4%
Peruvian Pepper Tree[ie] (*Schinus molle*)	1						1		2	2%
Mustard sp.[ie] (*Brassica* sp.)	2								2	2%
Milk Thistle[ie] (*Silybum marianum*)	1								1	1%
Coyote Brush (*Baccharis pilularis*)	1								1	1%
Mulefat (*Baccharis salicifolia*)	33				3	7		2	45	38%
Desertbroom Baccharis (*Baccharis sarothroides*)	1								1	1%
Rough Cockelburr (*Xanthium strumarium*)	1								1	1%
Poison Hemlock[ie] (*Conium maculatum*)	2								2	2%
Blue Elderberry (*Sambucus nigra* ssp. *caerulea*)	14	1	1	1	1			1	19	16%
Desert Wild Grape (*V. girdiana*) and Mulefat (*B. salicifolia*)				1					1	1%
Goodding's Black Willow (S. gooddingii) and Poison Hemlock[ie] (*C. maculatum*)	1								1	1%
Total	**96**	**2**	**2**	**2**	**6**	**8**	**1**	**3**	**120**	**100%**

[i] = invasive

[e] = non-native

[r] = endangered, threatened, or sensitive

Appendix C-2-N. Least Bell's Vireo nest placement preferences at survey sites in the Santa Ana Watershed, 2000-2016.

Santa Ana Canyon (SAC) - Green River Golf Club

Host Plant Species (listed in taxonomic order)	**2000-2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**Total**	**Percentage of Total**
Giant Reed[ie] (*Arundo donax*)	1								1	1%
Desert Wild Grape (*Vitis girdiana*)	1		1				1		3	2%
Fremont Cottonwood (*Populus fremontii*)	4					1	2		7	5%
Narrowleaf Willow (*Salix exigua*)	1				1				2	1%
Goodding's Black Willow (*Salix gooddingii*)	5	2	1	3			2	1	14	10%
Red Willow (*Salix laevigata*)	4						1	1	6	4%
Arroyo Willow (*Salix lasiolepis*)	2					2		1	5	3%
Toyon (*Heteromeles arbutifolia*)	1		1						2	1%
Southern California Black Walnut[r] (*Juglans californica)*		1							1	1%
Laurel Sumac (*Malosma laurina*)	3							2	5	3%
Poison Oak (*Toxicodendron diversilobum*)	1					1	1	2	5	3%
Peruvian Pepper Tree[ie] (*Schinus molle*)	2	3					1		6	4%
Brazilian Pepper Tree[ie] (*Schinus terebinthifolius*)				1					1	1%
Cape Leadwort[e] (*Plumbago auriculata*)				1	1				2	1%
Privet sp.[e] (*Ligustrum* sp.)	1								1	1%
Lollypop Tree[i] (*Myoporum laetum*)	1								1	1%
California Sagebrush (*Artemisia californica*)	1								1	1%
Douglas' Sagewort (*Artemisia douglasiana*)						1			1	1%
Coyote Brush (*Baccharis pilularis*)	2		1						3	2%
Mulefat (*Baccharis salicifolia*)	35	1	5	2	1	2	4	5	55	38%
Poison Hemlock[ie] (*Conium maculatum*)	2								2	1%
Blue Elderberry (*Sambucus nigra* ssp. *caerulea*)	4		2		2	2	3	2	15	10%
Yerba Santa sp. (*Eriodictyon* sp.)						1			1	1%
Desert Wild Grape (*V. girdiana*) and Peruvian Pepper Tree[ie] (*S. molle*)			1						1	1%
Desert Wild Grape (*V. girdiana*) and Blue Elderberry (*S. n. caerulea*)	1								1	1%
Goodding's Black Willow (*S. gooddingii*) and Blue Elderberry (*S. n. caerulea*)			1						1	1%
Unknown/No data							1		1	1%
Total	**72**	**7**	**13**	**7**	**5**	**10**	**16**	**14**	**144**	**100%**

[i] = invasive

[e] = non-native

[r] = endangered, threatened, or sensitive

Appendix C-2-O. Least Bell's Vireo nest placement preferences at survey sites in the Santa Ana Watershed, 2000-2016.

Santa Ana Canyon (SAC) - Featherly Regional Park

Host Plant Species (listed in taxonomic order)	**2000-2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**Total**	**Percentage of Total**
Coulter's Matilija Poppy[r] (*Romneya coulteri*)								1	1	1%
Western Sycamore (*Platanus racemosa*)						3			3	2%
Desert Wild Grape (*Vitis girdiana*)	1								1	1%
Fremont Cottonwood (*Populus fremontii*)	4	3	4	4	2	1	5	1	24	12%
Black Cottonwood (*Populus balsamifera* ssp. *trichocarpa*)					1		1	1	3	2%
Narrowleaf Willow (*Salix exigua*)	4						1		5	3%
Goodding's Black Willow (*Salix gooddingii*)	13	1	2		3		1	1	21	11%
Dead Goodding's Black Willow covered with living Goodding's Black Willow (*Salix gooddingii*)	1								1	1%
Red Willow (*Salix laevigata*)	2	2							4	2%
Arroyo Willow (*Salix lasiolepis*)	3		1				1	1	6	3%
Willow sp. (*Salix* sp.)	1								1	1%
Toyon (*Heteromeles arbutifolia*)	1								1	1%
Southern California Black Walnut[r] (*Juglans californica)*	4				3		1		8	4%
White Alder (*Alnus rhombifolia*)	1								1	1%
Laurel Sumac (*Malosma laurina*)	3				3	2	1		9	5%
Poison Oak (*Toxicodendron diversilobum*)	1				4	1	2	1	9	5%
Orange Tree[e] (*Citrus sinensis*)	1		1	1					3	2%
Black Mustard[ie] (*Brassica nigra*)	1	1					1		3	2%
Black Sage (*Salvia mellifera*)						1			1	1%
Yellowspine Thistle[ie] (*Cirsium ochrocentrum*)	2								2	1%
Mulefat (*Baccharis salicifolia*)	23	1	2		3	4	1	8	42	22%
Rough Cockelburr (*Xanthium strumarium*)	1								1	1%
Poison Hemlock[ie] (*Conium maculatum*)	2						1		3	2%
Blue Elderberry (*Sambucus nigra* ssp. *caerulea*)	11	3	2	2	2	5	4		29	15%
Fiddleneck sp. (*Amsinckia* sp.)					1				1	1%
Thickleaf Yerba Santa (*Eriodictyon crassifolium*)					1		2		3	2%

Appendix C-2-O. Least Bell's Vireo nest placement preferences at survey sites in the Santa Ana Watershed, 2000-2016.

Santa Ana Canyon (SAC) - Featherly Regional Park

Host Plant Species (listed in taxonomic order)	**2000-2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**Total**	**Percentage of Total**
Desert Wild Grape (*V. girdiana*) and Mulefat (*B. salicifolia*)	2								2	1%
Arroyo Willow (*S. lasiolepis*) and Black Mustard[ie] (*B. nigra*)	1								1	1%
Castorbean[ie] (*R. communis*) and Mulefat (*B. salicifolia*)				1					1	1%
Unknown/No data						1		2	3	2%
Total	**83**	**2021**	**2023**	**2020**	**2036**	**2032**	**2037**	**2032**	**193**	**1%**

[i] = invasive

[e] = non-native

[r] = endangered, threatened, or sensitive

Appendix C-2-P. Least Bell's Vireo nest placement preferences at survey sites in the Santa Ana Watershed, 2000-2016.

Santiago Canyon (Irvine Park)

Host Plant Species (listed in taxonomic order)	**2000-2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**Total**	**Percentage of Total**
Desert Wild Grape (*Vitis girdiana*)						1			1	8%
Goodding's Black Willow (*Salix gooddingii*)						1			1	8%
Western False Indigo (*Amorpha fruticosa*)		1							1	8%
Mulefat (*Baccharis salicifolia*)		3				4			7	58%
Blue Elderberry (*Sambucus nigra* ssp. *caerulea*)		1	1						2	17%
Total	**0**	**5**	**1**	**0**	**0**	**6**	**0**	**0**	**12**	**100%**

[i] = invasive

[e] = non-native

[r] = endangered, threatened, or sensitive

Appendix C-3-A. Least Bell's Vireo reproductive success and breeding biology data at survey sites in the Santa Ana Watershed, 2000-2016.

San Jacinto

	Parameter	2000-2009	2010	2011	2012	2013	2014	2015	2016	Totals
A.	Number of known pairs	43	18	25	36	29	19	7	17	194
B.	Number of known breeding (nesting) pairs	39	15	20	22	28	15	7	10	156
C.	Number of breeding pairs that were well-monitored throughout the breeding season	29	0	1	9	6	0	0	5	50
D.	Number of 'known fledged young' OBSERVED	104	28	18	49	39	12	8	12	270
E.	Number of known fledged young produced by pairs monitored throughout the breeding season	93	n/a	0	26	8	n/a	n/a	6	133
F.	Average number of fledglings produced per breeding pair (minimum; D/B = 'productivity or breeding success')	2.7	1.9	0.9	2.2	1.4	0.8	1.1	1.2	1.7
G.	Average number of fledglings produced by well- monitored pairs (E/C = reproductive success)	3.2	n/a	0.0	2.9	1.3	n/a	n/a	1.2	2.7
H.	Number of nests that were discovered	59	7	14	13	17	2	0	11	123
I.	Number of nests that were regularly monitored or 'tracked'	54	3	10	13	13	1	n/a	8	102
J.	Number of 'tracked' nests that were successful (% = J/I x 100)	59% 32 / 54	100% 3 / 3	10% 1 / 10	69% 9 / 13	38% 5 / 13	0% 0 / 1	n/a	25% 2 / 8	51% 52 / 102
K.	Rate of missing eggs/chicks from nests (includes successful and unsuccessful nests)	33% 18 / 54	0% 0 / 3	80% 8 / 10	31% 4 / 13	69% 9 / 13	0% 0 / 1	n/a	n/a	41% 39 / 94
L.	Number of 'tracked' nests that were parasitized by cowbirds (% = L/I x 100)	11% 6 / 54	0% 0 / 3	10% 1 / 10	8% 1 / 13	0% 0 / 13	100% 1 / 1	n/a	75% 6 / 8	15% 15 / 102
	A. Number of 'tracked' nests that failed as a result of reproductive failure	6%* 3 / 54	0% 0 / 3	0% 0 / 10	0% 0 / 13	8% 1 / 13	0% 0 / 1	n/a	0% 0 / 8	4% 4 / 102
	B. Number of 'tracked' nests that failed as a result of parasitism	6-7% 3-4 / 54	0% 0 / 3	10% 1 / 10	0% 0 / 13	0% 0 / 13	0% 0 / 1	n/a	13% 1 / 8	5-6% 5-6 / 102
	C. Number of 'tracked' nests that failed as a result of predation - Predation Rate according to Vireo Working Group	28% 15 / 54	0% 0 / 3	80% 8 / 10	31% 4 / 13	54% 7 / 13	0% 0 / 1	n/a	63% 5 / 8	38% 39 / 102
M.	D. Number of 'tracked' nests that failed for unknown reasons	0% 0 / 54	0% 0 / 3	0% 0 / 10	0% 0 / 13	0% 0 / 13	0% 0 / 1	n/a	0% 0 / 8	0% 0 / 102
N.	Average clutch size	n/a	3.3	3.7	3.3	3.5	3.0	n/a	4.0	n/a

Appendix C-3-A. Least Bell's Vireo reproductive success and breeding biology data at survey sites in the Santa Ana Watershed, 2000-2016.

San Jacinto

	Parameter	2000-2009	2010	2011	2012	2013	2014	2015	2016	Totals
O.	Number of cowbird eggs found in or near vireo nests	9	0	1	1	0	1	n/a	8	20
P.	Number of cowbird nestlings removed from	0	0	0	0	0	0	n/a	0	0
Q.	Number of cowbird young fledged by vireo	2	0	1	0	2	2	n/a	0	7
R.	Number of 'manipulated' parasitized nests	4	0	0	1	0	0	n/a	6	11
S.	Number of 'successful, manipulated' nests (% = S/R x 100)	40% 2 / 5	n/a	n/a	100% 1 / 1	n/a	n/a	n/a	33% 2 / 6	42% 5 / 12
T.	Number of vireo fledged from 'manipulated' parasitized nests	4	n/a	n/a	3	n/a	n/a	n/a	6	13
U.	Number of repaired nests	2	0	0	1	0	0	n/a	0	3
V.	% of successful repaired nests	100% 2 / 2	n/a	n/a	100% 1 / 1	n/a	n/a	n/a	n/a	100% 3 / 3
W.	Number of vireo fledged from repaired nests	6	n/a	n/a	4	n/a	n/a	n/a	n/a	10

*corrected from Appendix D

Appendix C-3-B. Least Bell's Vireo reproductive success and breeding biology data at survey sites in the Santa Ana Watershed, 2000-2016.

San Timoteo Canyon

	Parameter	2000-2009	2010	2011	2012	2013	2014	2015	2016	Totals
A.	Number of known pairs	323	95	101	102	80	135	141	124	1,101
B.	Number of known breeding (nesting) pairs	287	76	78	73	67	114	126	107	928
C.	Number of breeding pairs that were well-monitored throughout the breeding season	183	24	31	32	35	48	56	39	448
D.	Number of 'known fledged young' OBSERVED	635	137	196	153	179	206	287	222	2,015
E.	Number of known fledged young produced by pairs monitored throughout the breeding season	497	67	104	90	127	121	181	119	1,306
F.	Average number of fledglings produced per breeding pair (minimum; D/B = 'productivity or breeding success')	2.2	1.8	2.5	2.1	2.7	1.8	2.3	2.1	2.2
G.	Average number of fledglings produced by well- monitored pairs (E/C = reproductive success)	2.7	2.8	3.4	2.8	3.6	2.5	3.2	3.1	2.9
H.	Number of nests that were discovered	388	55	80	47	80	94	126	78	948
I.	Number of nests that were regularly monitored or 'tracked'	338	37	73	45	76	88	114	73	844
J.	Number of 'tracked' nests that were successful (% = J/I x 100)	57% 192 / 338	62% 23 / 37	60% 44 / 73	64% 29 / 45	57% 43 / 76	48% 42 / 88	58% 66 / 114	51% 37 / 73	56% 476 / 844
K.	Rate of missing eggs/chicks from nests (includes successful and unsuccessful nests)	44% 150 / 338	65% 24 / 37	30% 22 / 73	42% 19 / 45	41% 31 / 76	52% 46 / 88	n/a	n/a	44% 292 / 657
L.	Number of 'tracked' nests that were parasitized by cowbirds (% = L/I x 100)	30% 103 / 338	8% 3 / 37	0% 0 / 73	2% 1 / 45	3% 2 / 76	6% 5 / 88	0% 0 / 114	0% 0 / 73	14% 114 / 844
M.	A. Number of 'tracked' nests that failed as a result of reproductive failure	2% 7 / 338	11% 4 / 37	8% 6 / 73	0% 0 / 45	5% 4 / 76	6% 5 / 88	10% 11 / 114	7% 5 / 73	5% 42 / 844
	B. Number of 'tracked' nests that failed as a result of parasitism	7% 25 / 338	0% 0 / 37	0% 0 / 73	2% 1 / 45	0% 0 / 76	2% 2 / 88	0% 0 / 114	0% 0 / 73	3% 28 / 844
	C. Number of 'tracked' nests that failed as a result of predation - Predation Rate according to Vireo Working Group	34% 114 / 338	27% 10 / 37	30% 22 / 73	33% 15 / 45	36% 27 / 76	44% 39 / 88	32% 37 / 114	42% 31 / 73	35% 295 / 844
	D. Number of 'tracked' nests that failed for unknown reasons	0% 0 / 338	0% 0 / 37	1% 1 / 73	0% 0 / 45	3% 2 / 76	0% 0 / 88	0% 0 / 114	0% 0 / 73	<1% 3 / 844
N.	Average clutch size	n/a	3.4	3.5	3.3	3.4	3.2	3.3	3.5	n/a

Appendix C-3-B. Least Bell's Vireo reproductive success and breeding biology data at survey sites in the Santa Ana Watershed, 2000-2016.

San Timoteo Canyon

	Parameter	2000-2009	2010	2011	2012	2013	2014	2015	2016	Totals
O.	Number of cowbird eggs found in or near vireo nests	118	3	0	1	2	4	0	0	128
P.	Number of cowbird nestlings removed from	6	0	0	0	0	1	0	0	7
Q.	Number of cowbird young fledged by vireo	2	0	0	0	0	0	0	0	2
R.	Number of 'manipulated' parasitized nests	84	3	n/a	0	2	4	n/a	n/a	93
S.	Number of 'successful, manipulated' nests (% = S/R x 100)	49% 41 / 84	100% 3 / 3	n/a	n/a	50% 1 / 2	50% 2 / 4	n/a	n/a	51% 47 / 93
T.	Number of vireo fledged from 'manipulated' parasitized nests	88	8	n/a	n/a	1	5	n/a	n/a	102
U.	Number of repaired nests	3	1	2	1	1	0	0	0	8
V.	% of successful repaired nests	67% 2 / 3	0% 0 / 1	100% 2 / 2	100% 1 / 1	100% 1 / 1	n/a	n/a	n/a	75% 6 / 8
W.	Number of vireo fledged from repaired nests	5	0	7	2	4	n/a	n/a	n/a	18

Appendix C-3-C. Least Bell's Vireo reproductive success and breeding biology data at survey sites in the Santa Ana Watershed, 2000-2016.

Meridian Conservation Area*

	Parameter	2000-2009**	2010	2011	2012	2013	2014	2015	2016	Totals
A.	Number of known pairs	34	12	9	11	12	16	3	5	102
B.	Number of known breeding (nesting) pairs	30	8	5	6	9	16	3	1	78
C.	Number of breeding pairs that were well-monitored throughout the breeding season	9	3	0	0	0	1	0	0	13
D.	Number of 'known fledged young' OBSERVED	75	25	7	8	16	23	3	6	163
E.	Number of known fledged young produced by pairs monitored throughout the breeding season	38	19	n/a	n/a	n/a	3	n/a	n/a	60
F.	Average number of fledglings produced per breeding pair (minimum; D/B = 'productivity or breeding success')	2.5	3.1	1.4	1.3	1.8	1.4	1.0	6.0	2.1
G.	Average number of fledglings produced by well- monitored pairs (E/C = reproductive success)	4.2	6.3	n/a	n/a	n/a	3.0	n/a	n/a	4.6
H.	Number of nests that were discovered	17	6	0	0	0	3	0	1	27
I.	Number of nests that were regularly monitored or 'tracked'	16	6	n/a	n/a	n/a	3	n/a	0	25
J.	Number of 'tracked' nests that were successful (% = J/I x 100)	69% 11 / 16	100% 6 / 6	n/a	n/a	n/a	33% 1 / 3	n/a	n/a	72% 18 / 25
K.	Rate of missing eggs/chicks from nests (includes successful and unsuccessful nests)	38% 6 / 16	0% 0 / 6	n/a	n/a	n/a	67% 2 / 3	n/a	n/a	32% 8 / 25
L.	Number of 'tracked' nests that were parasitized by cowbirds (% = L/I x 100)	0% 0 / 16	0% 0 / 6	n/a	n/a	n/a	0% 0 / 3	n/a	n/a	0% 0 / 25
	A. Number of 'tracked' nests that failed as a result of reproductive failure	0% 0 / 16	0% 0 / 6	n/a	n/a	n/a	0% 0 / 3	n/a	n/a	0% 0 / 25
	B. Number of 'tracked' nests that failed as a result of parasitism	0% 0 / 16	0% 0 / 6	n/a	n/a	n/a	0% 0 / 3	n/a	n/a	0% 0 / 25
	C. Number of 'tracked' nests that failed as a result of predation - Predation Rate according to Vireo Working Group	31% 5 / 16	0% 0 / 6	n/a	n/a	n/a	67% 2 / 3	n/a	n/a	28% 7 / 25
M.	D. Number of 'tracked' nests that failed for unknown reasons	0% 0 / 16	0% 0 / 6	n/a	n/a	n/a	0% 0 / 3	n/a	n/a	0% 0 / 25
N.	Average clutch size	n/a	3.5	n/a	n/a	n/a	3.3	n/a	4	n/a

Appendix C-3-C. Least Bell's Vireo reproductive success and breeding biology data at survey sites in the Santa Ana Watershed, 2000-2016.

Meridian Conservation Area*

	Parameter	2000-2009**	2010	2011	2012	2013	2014	2015	2016	Totals
O.	Number of cowbird eggs found in or near vireo nests	0	1	n/a	n/a	n/a	0	n/a	0	1
P.	Number of cowbird nestlings removed from 'tracked' nests	0	0	n/a	n/a	n/a	0	n/a	0	0
Q.	Number of cowbird young fledged by vireo	0	0	n/a	n/a	n/a	0	n/a	n/a	0
R.	Number of 'manipulated' parasitized nests	0	0	n/a	n/a	n/a	n/a	n/a	n/a	0
S.	Number of 'successful, manipulated' nests (% = S/R x 100)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
T.	Number of vireo fledged from 'manipulated' parasitized nests	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	0
U.	Number of repaired nests	0	0	n/a	n/a	n/a	0	n/a	0	0
V.	% of successful repaired nests	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
W.	Number of vireo fledged from repaired nests	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a

*Former March SKR Preserve

**n = 4 years monitored

Appendix C-3-D. Least Bell's Vireo reproductive success and breeding biology data at survey sites in the Santa Ana Watershed, 2000-2016.

Sycamore Canyon

	Parameter	2000-2009	2010	2011	2012	2013	2014	2015	2016	Totals
A.	Number of known pairs	35	8	5	7	0	5	1	4	65
B.	Number of known breeding (nesting) pairs	19	6	3	4	n/a	3	1	0	36
C.	Number of breeding pairs that were well-monitored throughout the breeding season	6	0	0	0	n/a	0	0	0	6
D.	Number of 'known fledged young' OBSERVED	40	11	4	5	n/a	2	1	6	69
E.	Number of known fledged young produced by pairs monitored throughout the breeding season	12	n/a	n/a	n/a	n/a	n/a	n/a	n/a	12
F.	Average number of fledglings produced per breeding pair (minimum; D/B = 'productivity or breeding success')	2.1	1.8	1.3	1.3	n/a	0.7	1.0	n/a	1.9
G.	Average number of fledglings produced by well- monitored pairs (E/C = reproductive success)	2.0	n/a	n/a	n/a	n/a	n/a	n/a	n/a	2.0
H.	Number of nests that were discovered	10	0	0	0	n/a	4	0	0	14
I.	Number of nests that were regularly monitored or 'tracked'	9	n/a	n/a	n/a	n/a	4	n/a	n/a	13
J.	Number of 'tracked' nests that were successful (% = J/I x 100)	67% 6 / 9	n/a	n/a	n/a	n/a	25% 1 / 4	n/a	n/a	54% 7 / 13
K.	Rate of missing eggs/chicks from nests (includes successful and unsuccessful nests)	33% 3 / 9	n/a	n/a	n/a	n/a	100% 4 / 4	n/a	n/a	54% 7 / 13
L.	Number of 'tracked' nests that were parasitized by cowbirds (% = L/I x 100)	22% 2 / 9	n/a	n/a	n/a	n/a	50% 2 / 4	n/a	n/a	31% 4 / 13
	A. Number of 'tracked' nests that failed as a result of reproductive failure	0% 0 / 9	n/a	n/a	n/a	n/a	0% 0 / 4	n/a	n/a	0% 0 / 13
	B. Number of 'tracked' nests that failed as a result of parasitism	11% 1 / 9	n/a	n/a	n/a	n/a	50% 2 / 4	n/a	n/a	23% 3 / 13
	C. Number of 'tracked' nests that failed as a result of predation - Predation Rate according to Vireo Working Group	22% 2 / 9	n/a	n/a	n/a	n/a	25% 1 / 4	n/a	n/a	23% 3 / 13
M.	D. Number of 'tracked' nests that failed for unknown reasons	0% 0 / 9	n/a	n/a	n/a	n/a	0% 0 / 4	n/a	n/a	0% 0 / 13
N.	Average clutch size	n/a	n/a	n/a	n/a	n/a	3.3	n/a	n/a	n/a

Appendix C-3-D. Least Bell's Vireo reproductive success and breeding biology data at survey sites in the Santa Ana Watershed, 2000-2016.

Sycamore Canyon

	Parameter	2000-2009	2010	2011	2012	2013	2014	2015	2016	Totals
O.	Number of cowbird eggs found in or near vireo nests	2	n/a	n/a	n/a	n/a	3	n/a	n/a	5
P.	Number of cowbird nestlings removed from 'tracked' nests	0	n/a	n/a	n/a	n/a	0	n/a	n/a	0
Q.	Number of cowbird young fledged by vireo	0	n/a	n/a	n/a	n/a	0	n/a	n/a	0
R.	Number of 'manipulated' parasitized nests	1	n/a	n/a	n/a	n/a	1	n/a	n/a	2
S.	Number of 'successful, manipulated' nests (% = S/R x 100)	100% 1 / 1	n/a	n/a	n/a	n/a	0% 0 / 1	n/a	n/a	50% 1 / 2
T.	Number of vireo fledged from 'manipulated' parasitized nests	1	n/a	n/a	n/a	n/a	0	n/a	n/a	1
U.	Number of repaired nests	0	n/a	n/a	n/a	n/a	0	n/a	n/a	0
V.	% of successful repaired nests	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
W.	Number of vireo fledged from repaired nests	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a

Appendix C-3-E. Least Bell's Vireo reproductive success and breeding biology data at survey sites in the Santa Ana Watershed, 2000-2016.

Mockingbird Canyon

	Parameter	2000-2009	2010	2011	2012	2013	2014	2015	2016	Totals
A.	Number of known pairs	120	34	32	26	24	7	23	7	273
B.	Number of known breeding (nesting) pairs	110	26	31	21	22	4	16	4	234
C.	Number of breeding pairs that were well-monitored throughout the breeding season	37	0	16	5	6	0	0	1	65
D.	Number of 'known fledged young' OBSERVED	218	25	67	39	40	7	19	11	426
E.	Number of known fledged young produced by pairs monitored throughout the breeding season	113	n/a	46	15	20	n/a	n/a	3	197
F.	Average number of fledglings produced per breeding pair (minimum; D/B = 'productivity or breeding success')	2.0	1.0	2.2	1.9	1.8	1.8	1.2	2.8	1.8
G.	Average number of fledglings produced by well- monitored pairs (E/C = reproductive success)	3.0	n/a	2.9	3.0	3.3	n/a	n/a	3.0	3.0
H.	Number of nests that were discovered	99	3	31	19	20	3	5	3	183
I.	Number of nests that were regularly monitored or 'tracked'	82	0	30	17	17	2	5	3	156
J.	Number of 'tracked' nests that were successful (% = J/I x 100)	55% 45 / 82	n/a	50% 15 / 30	47% 8 / 17	59% 10 / 17	50% 1 / 2	40% 2 / 5	67% 2 / 3	53% 83 / 156
K.	Rate of missing eggs/chicks from nests (includes successful and unsuccessful nests)	38% 31 / 82	n/a	60% 18 / 30	53% 9 / 17	47% 8 / 17	50% 1 / 2	n/a	n/a	45% 67 / 148
L.	Number of 'tracked' nests that were parasitized by cowbirds (% = L/I x 100)	15% 12 / 82	n/a	0% 0 / 30	6% 1 / 17	18% 3 / 17	0% 0 / 2	0% 0 / 5	0% 0 / 3	10% 16 / 156
	A. Number of 'tracked' nests that failed as a result of reproductive failure	9% 7 / 82	n/a	3% 1 / 30	6% 1 / 17	6% 1 / 17	0% 0 / 2	20% 1 / 5	0% 0 / 3	7% 11 / 156
	B. Number of 'tracked' nests that failed as a result of parasitism	7% 6 / 82	n/a	0% 0 / 30	0% 0 / 17	0% 0 / 17	0% 0 / 2	0% 0 / 5	0% 0 / 3	4% 6 / 156
	C. Number of 'tracked' nests that failed as a result of predation - Predation Rate according to Vireo Working Group	29% 24 / 82	n/a	43% 13 / 30	47% 8 / 17	35% 6 / 17	0% 0 / 2	40% 2 / 5	33% 1 / 3	35% 54 / 156
M.	D. Number of 'tracked' nests that failed for unknown reasons	0% 0 / 9	n/a	3% 1 / 30	0% 0 / 17	0% 0 / 17	50% 1 / 2	0% 0 / 5	0% 0 / 3	1% 2 / 156
N.	Average clutch size	n/a	3.0	3.6	3.5	2.9	3.0	3.4	3.3	n/a

Appendix C-3-E. Least Bell's Vireo reproductive success and breeding biology data at survey sites in the Santa Ana Watershed, 2000-2016.

Mockingbird Canyon

	Parameter	2000-2009	2010	2011	2012	2013	2014	2015	2016	Totals
O.	Number of cowbird eggs found in or near vireo nests	22	1	0	1	3	0	0	0	27
P.	Number of cowbird nestlings removed from 'tracked' nests	2	n/a	0	0	0	0	0	0	2
Q.	Number of cowbird young fledged by vireo	1	n/a	0	0	0	0	0	0	1
R.	Number of 'manipulated' parasitized nests	10	0	n/a	1	2	n/a	n/a	n/a	13
S.	Number of 'successful, manipulated' nests (% = S/R x 100)	10% 1 / 10	n/a	n/a	100% 1 / 1	100% 2 / 2	n/a	n/a	n/a	31% 4 / 13
T.	Number of vireo fledged from 'manipulated' parasitized nests	2	n/a	n/a	1	5	n/a	n/a	n/a	8
U.	Number of repaired nests	1	0	2	0	0	0	0	0	3
V.	% of successful repaired nests	100% 1 / 1	n/a	100% 2 / 2	n/a	n/a	n/a	n/a	n/a	100% 3 / 3
W.	Number of vireo fledged from repaired nests	1	n/a	6	n/a	n/a	n/a	n/a	n/a	7

Appendix C-3-F. Least Bell's Vireo reproductive success and breeding biology data at survey sites in the Santa Ana Watershed, 2000-2016.

Santa Ana River (SAR) - Upstream - Riverside Ave. to Van Buren Blvd.

	Parameter	2000-2009	2010	2011	2012	2013	2014	2015	2016	Totals
A.	Number of known pairs	167	50	23	11	n/a	19	37	43	350
B.	Number of known breeding (nesting) pairs	149	39	19	7	n/a	10	27	29	280
C.	Number of breeding pairs that were well-monitored throughout the breeding season	51	9	7	0	0	5	0	7	79
D.	Number of 'known fledged young' OBSERVED	283	58	30	7	7	15	33	62	495
E.	Number of known fledged young produced by pairs monitored throughout the breeding season	133	18	22	n/a	n/a	6	n/a	28	207
F.	Average number of fledglings produced per breeding pair (minimum; D/B = 'productivity or breeding success')	1.9	1.5	1.6	1.0	n/a	1.5	1.2	2.1	1.8
G.	Average number of fledglings produced by well- monitored pairs (E/C = reproductive success)	2.6	2.0	3.1	n/a	n/a	1.2	n/a	4.0	2.6
H.	Number of nests that were discovered	94	13	14	2	n/a	6	11	16	156
I.	Number of nests that were regularly monitored or 'tracked'	75	11	10	0	n/a	3	3	12	114
J.	Number of 'tracked' nests that were successful (% = J/I x 100)	68% 51 / 75	55% 6 / 11	60% 6 / 10	n/a	n/a	67% 2 / 3	33% 1 / 3	83% 10 / 12	67% 76 / 114
K.	Rate of missing eggs/chicks from nests (includes successful and unsuccessful nests)	32% 24 / 75	36% 4 / 11	30% 3 / 10	n/a	n/a	67% 2 / 3	n/a	n/a	33% 33 / 99
L.	Number of 'tracked' nests that were parasitized by cowbirds (% = L/I x 100)	16% 12 / 75	0% 0 / 11	10% 1 / 10	n/a	n/a	0% 0 / 3	100% 3 / 3	0% 0 / 12	14% 16 / 114
	A. Number of 'tracked' nests that failed as a result of reproductive failure	3% 2 / 75	9% 1 / 11	0% 0 / 10	n/a	n/a	0% 0 / 3	0% 0 / 3	0% 0 / 12	3% 3 / 114
	B. Number of 'tracked' nests that failed as a result of parasitism	8% 6 / 75	0% 0 / 11	10% 1 / 10	n/a	n/a	0% 0 / 3	0% 0 / 3	0% 0 / 12	6% 7 / 114
	C. Number of 'tracked' nests that failed as a result of predation - Predation Rate according to Vireo Working Group	21% 16 / 75	36% 4 / 11	30% 3 / 10	n/a	n/a	33% 1 / 3	67% 2 / 3	17% 2 / 12	25% 28 / 114
M.	D. Number of 'tracked' nests that failed for unknown reasons	0% 0 / 75	0% 0 / 11	0% 0 / 10	n/a	n/a	0% 0 / 3	0% 0 / 3	0% 0 / 12	0% 0 / 114
N.	Average clutch size	n/a	3.2	3.5	3.0	n/a	3.5	3.7	3.9	n/a

Appendix C-3-F. Least Bell's Vireo reproductive success and breeding biology data at survey sites in the Santa Ana Watershed, 2000-2016.

Santa Ana River (SAR) - Upstream - Riverside Ave. to Van Buren Blvd.

	Parameter	2000-2009	2010	2011	2012	2013	2014	2015	2016	Totals
O.	Number of cowbird eggs found in or near vireo nests	15	0	2	1	n/a	0	3	0	21
P.	Number of cowbird nestlings removed from 'tracked' nests	0	0	0	n/a	n/a	0	0	0	0
Q.	Number of cowbird young fledged by vireo	1	1	0	n/a	n/a	0	1	0	3
R.	Number of 'manipulated' parasitized nests	10	n/a	1	n/a	n/a	n/a	3	n/a	14
S.	Number of 'successful, manipulated' nests (% = S/R x 100)	20% 2 / 10	n/a	0% 0 / 1	n/a	n/a	n/a	33% 1 / 3	n/a	21% 3 / 14
T.	Number of vireo fledged from 'manipulated' parasitized nests	5	n/a	0	n/a	n/a	n/a	2	n/a	7
U.	Number of repaired nests	1	0	0	0	n/a	0	0	0	1
V.	% of successful repaired nests	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
W.	Number of vireo fledged from repaired nests	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a

Appendix C-3-G. Least Bell's Vireo reproductive success and breeding biology data at survey sites in the Santa Ana Watershed, 2000-2016.

Santa Ana River (SAR) - Upstream -Hidden Valley, north side of river

	Parameter	2000-2009	2010	2011	2012	2013	2014	2015	2016	Totals
A.	Number of known pairs	n/a	12	2	3	2	14	23	27	83
B.	Number of known breeding (nesting) pairs	n/a	9	2	2	2	10	11	20	56
C.	Number of breeding pairs that were well-monitored throughout the breeding season	n/a	6	0	0	0	4	0	3	13
D.	Number of 'known fledged young' OBSERVED	n/a	18	2	1	3	19	15	33	91
E.	Number of known fledged young produced by pairs monitored throughout the breeding season	n/a	14	n/a	n/a	n/a	8	n/a	11	33
F.	Average number of fledglings produced per breeding pair (minimum; D/B = 'productivity or breeding success')	n/a	2.0	1.0	0.5	1.5	1.9	1.4	1.7	1.6
G.	Average number of fledglings produced by well- monitored pairs (E/C = reproductive success)	n/a	2.3	n/a	n/a	n/a	2.0	n/a	3.7	2.5
H.	Number of nests that were discovered	n/a	10	2	0	0	4	0	5	21
I.	Number of nests that were regularly monitored or 'tracked'	n/a	9	0	0	n/a	3	n/a	5	17
J.	Number of 'tracked' nests that were successful (% = J/I x 100)	n/a	56% 5 / 9	n/a	n/a	n/a	67% 2 / 3	n/a	60% 3 / 5	59% 10 / 17
K.	Rate of missing eggs/chicks from nests (includes successful and unsuccessful nests)	n/a	11% 1 / 9	n/a	n/a	n/a	33% 1 / 3	n/a	n/a	17% 2 / 12
L.	Number of 'tracked' nests that were parasitized by cowbirds (% = L/I x 100)	n/a	33% 3 / 9	n/a	n/a	n/a	0% 0 / 3	n/a	0% 0 / 5	18% 3 / 17
	A. Number of 'tracked' nests that failed as a result of reproductive failure	n/a	0% 0 / 9	n/a	n/a	n/a	0% 0 / 3	n/a	0% 0 / 5	0% 0 / 17
	B. Number of 'tracked' nests that failed as a result of parasitism	n/a	33% 3 / 9	n/a	n/a	n/a	0% 0 / 3	n/a	0% 0 / 5	18% 3 / 17
	C. Number of 'tracked' nests that failed as a result of predation - Predation Rate according to Vireo Working Group	n/a	11% 1 / 9	n/a	n/a	n/a	33% 1 / 3	n/a	20% 1 / 5	18% 3 / 17
M.	D. Number of 'tracked' nests that failed for unknown reasons	n/a	0% 0 / 9	n/a	n/a	n/a	0% 0 / 3	n/a	20% 1 / 5	6% 1 / 17
N.	Average clutch size	n/a	3.5	n/a	n/a	n/a	4.0	n/a	3.4	n/a

Appendix C-3-G. Least Bell's Vireo reproductive success and breeding biology data at survey sites in the Santa Ana Watershed, 2000-2016.

Santa Ana River (SAR) - Upstream -Hidden Valley, north side of river

	Parameter	2000-2009	2010	2011	2012	2013	2014	2015	2016	Totals
O.	Number of cowbird eggs found in or near vireo nests	n/a	4	0	n/a	n/a	0	n/a	0	4
P.	Number of cowbird nestlings removed from 'tracked' nests	n/a	0	n/a	n/a	n/a	0	n/a	0	0
Q.	Number of cowbird young fledged by vireo	n/a	0	0	n/a	n/a	0	n/a	0	0
R.	Number of 'manipulated' parasitized nests	n/a	2	n/a	n/a	n/a	n/a	n/a	n/a	2
S.	Number of 'successful, manipulated' nests (% = S/R x 100)	n/a	0% 0 / 2	n/a	n/a	n/a	n/a	n/a	n/a	0% 0 / 2
T.	Number of vireo fledged from 'manipulated' parasitized nests	n/a	0	n/a	n/a	n/a	n/a	n/a	n/a	0
U.	Number of repaired nests	n/a	0	0	n/a	n/a	0	n/a	0	0
V.	% of successful repaired nests	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
W.	Number of vireo fledged from repaired nests	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a

Appendix C-3-H. Least Bell's Vireo reproductive success and breeding biology data at survey sites in the Santa Ana Watershed, 2000-2016.

Santa Ana River (SAR) - Upstream -Hidden Valley, south side of river

	Parameter	2000-2009	2010	2011	2012	2013	2014	2015	2016	Totals
A.	Number of known pairs	230	43	36	37	42	32	27	66	513
B.	Number of known breeding (nesting) pairs	212	36	33	31	37	25	18	57	449
C.	Number of breeding pairs that were well-monitored throughout the breeding season	56	9	5	4	8	0	0	7	89
D.	Number of 'known fledged young' OBSERVED	407	53	41	45	66	28	22	97	759
E.	Number of known fledged young produced by pairs monitored throughout the breeding season	142	19	17	11	21	n/a	n/a	21	231
F.	Average number of fledglings produced per breeding pair (minimum; D/B = 'productivity or breeding success')	1.9	1.5	1.2	1.5	1.8	1.1	1.2	1.7	1.7
G.	Average number of fledglings produced by well- monitored pairs (E/C = reproductive success)	2.5	2.1	3.4	2.8	2.6	n/a	n/a	3.0	2.6
H.	Number of nests that were discovered	114	18	11	8	10	4	0	21	186
I.	Number of nests that were regularly monitored or 'tracked'	85	17	10	8	8	3	n/a	16	147
J.	Number of 'tracked' nests that were successful (% = J/I x 100)	68% 58 / 85	41% 7 / 17	60% 6 / 10	63% 5 / 8	88% 7 / 8	67% 2 / 3	n/a	75% 12 / 16	66% 97 / 147
K.	Rate of missing eggs/chicks from nests (includes successful and unsuccessful nests)	36% 31 / 85	65% 11 / 17	30% 3 / 10	0% 0 / 8	25% 2 / 8	67% 2 / 3	n/a	n/a	37% 49 / 131
L.	Number of 'tracked' nests that were parasitized by cowbirds (% = L/I x 100)	7% 6 / 85	6% 1 / 17	20% 2 / 10	0% 0 / 8	0% 0 / 8	0% 0 / 3	n/a	0% 0 / 16	6% 9 / 147
	A. Number of 'tracked' nests that failed as a result of reproductive failure	4% 3 / 85	0% 0 / 17	0% 0 / 10	0% 0 / 8	0% 0 / 8	0% 0 / 3	n/a	0% 0 / 16	2% 3 / 147
	B. Number of 'tracked' nests that failed as a result of parasitism	5% 4 / 85	6% 1 / 17	10% 1 / 10	0% 0 / 8	0% 0 / 8	0% 0 / 3	n/a	0% 0 / 16	4% 6 / 147
	C. Number of 'tracked' nests that failed as a result of predation - Predation Rate according to Vireo Working Group	24% 20 / 85	53% 9 / 17	30% 3 / 10	38% 3 / 8	13% 1 / 8	33% 1 / 3	n/a	25% 4 / 16	28% 41 / 147
M.	D. Number of 'tracked' nests that failed for unknown reasons	0% 0 / 85	0% 0 / 17	0% 0 / 10	0% 0 / 8	0% 0 / 8	0% 0 / 3	n/a	0% 0 / 16	0% 0 / 147
N.	Average clutch size	n/a	3.4	3.1	3.2	3.3	3.0	n/a	3.5	n/a

Appendix C-3-H. Least Bell's Vireo reproductive success and breeding biology data at survey sites in the Santa Ana Watershed, 2000-2016.

Santa Ana River (SAR) - Upstream -Hidden Valley, south side of river

	Parameter	2000-2009	2010	2011	2012	2013	2014	2015	2016	Totals
O.	Number of cowbird eggs found in or near vireo nests	4	2	2	0	0	0	n/a	0	8
P.	Number of cowbird nestlings removed from 'tracked' nests	2	0	0	0	0	0	n/a	0	2
Q.	Number of cowbird young fledged by vireo	0	0	0	0	0	0	n/a	0	0
R.	Number of 'manipulated' parasitized nests	2	0	1	n/a	n/a	n/a	n/a	n/a	3
S.	Number of 'successful, manipulated' nests (% = S/R x 100)	100% 2 / 2	n/a	100% 1 / 1	n/a	n/a	n/a	n/a	n/a	100% 3 / 3
T.	Number of vireo fledged from 'manipulated' parasitized nests	6	n/a	2	n/a	n/a	n/a	n/a	n/a	8
U.	Number of repaired nests	0	0	0	0	0	0	n/a	0	0
V.	% of successful repaired nests	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
W.	Number of vireo fledged from repaired nests	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a

*As of 2010, reported as south side of the river

Appendix C-3-I. Least Bell's Vireo reproductive success and breeding biology data at survey sites in the Santa Ana Watershed, 2000-2016.

Santa Ana River (SAR) - Upstream -Goose Creek, Norco to I-15

	Parameter	2000-2009	2010	2011	2012	2013	2014	2015*	2016**	Totals
A.	Number of known pairs	233	64	59	51	52	32	36	31	558
B.	Number of known breeding (nesting) pairs	224	60	56	48	50	28	29	28	523
C.	Number of breeding pairs that were well-monitored throughout the breeding season	105	12	12	8	20	0	13	9	179
D.	Number of 'known fledged young' OBSERVED	489	113	91	86	109	36	63	45	1,032
E.	Number of known fledged young produced by pairs monitored throughout the breeding season	315	39	36	29	68	n/a	33	21	541
F.	Average number of fledglings produced per breeding pair (minimum; D/B = 'productivity or breeding success')	2.2	1.9	1.6	1.8	2.2	1.3	2.2	1.6	2.0
G.	Average number of fledglings produced by well- monitored pairs (E/C = reproductive success)	3.0	3.3	3.0	3.6	3.4	n/a	2.5	2.3	3.0
H.	Number of nests that were discovered	212	22	25	19	31	13	18	22	362
I.	Number of nests that were regularly monitored or 'tracked'	177	18	22	17	29	9	13	21	306
J.	Number of 'tracked' nests that were successful (% = J/I x 100)	65% 115 / 177	89% 16 / 18	45% 10 / 22	71% 12 / 17	83% 24 / 29	44% 4 / 9	77% 10 / 13	43% 9 / 21	65% 200 / 306
K.	Rate of missing eggs/chicks from nests (includes successful and unsuccessful nests)	41% 73 / 177	28% 5 / 18	45% 10 / 22	0% 0 / 17	28% 8 / 29	56% 5 / 9	n/a	n/a	37% 101 / 272
L.	Number of 'tracked' nests that were parasitized by cowbirds (% = L/I x 100)	9% 15 / 177	0% 0 / 18	0% 0 / 22	0% 0 / 17	7% 2 / 29	0% 0 / 9	0% 0 / 13	0% 0 / 21	6% 17 / 306
	A. Number of 'tracked' nests that failed as a result of reproductive failure	3% 6 / 177	0% 0 / 18	14% 3 / 22	12% 2 / 17	0% 0 / 29	0% 0 / 9	8% 1 / 13	0% 0 / 21	4% 12 / 306
	B. Number of 'tracked' nests that failed as a result of parasitism	2% 4 / 177	0% 0 / 13	0% 0 / 22	0% 0 / 17	0% 0 / 29	0% 0 / 9	0% 0 / 13	0% 0 / 21	1% 4 / 306
	C. Number of 'tracked' nests that failed as a result of predation - Predation Rate according to Vireo Working Group	29% 51 / 177	11% 2 / 18	41% 9 / 22	18% 3 / 17	14% 4 / 29	56% 5 / 9	15% 2 / 13	52% 11 / 21	28% 87 / 306
M.	D. Number of 'tracked' nests that failed for unknown reasons	1% 1 / 177	0% 0 / 18	0% 0 / 22	0% 0 / 17	3% 1 / 29	0% 0 / 9	0% 0 / 13	5% 1 / 21	1% 3 / 306
N.	Average clutch size	n/a	3.7	3.8	3.6	3.7	3.3	3.5	3.4	n/a

Appendix C-3-I. Least Bell's Vireo reproductive success and breeding biology data at survey sites in the Santa Ana Watershed, 2000-2016.

Santa Ana River (SAR) - Upstream -Goose Creek, Norco to I-15

	Parameter	2000-2009	2010	2011	2012	2013	2014	2015*	2016**	Totals
O.	Number of cowbird eggs found in or near vireo nests	20	0	0	0	2	0	0	0	22
P.	Number of cowbird nestlings removed from 'tracked' nests	1	0	0	0	0	0	0	0	1
Q.	Number of cowbird young fledged by vireo	0	0	0	0	0	0	0	0	0
R.	Number of 'manipulated' parasitized nests	14	n/a	n/a	n/a	2	n/a	n/a	n/a	16
S.	Number of 'successful, manipulated' nests (% = S/R x 100)	64% 9 / 14	n/a	n/a	n/a	100% 2 / 2	n/a	n/a	n/a	69% 11 / 16
T.	Number of vireo fledged from 'manipulated' parasitized nests	13	n/a	n/a	n/a	5	n/a	n/a	n/a	18
U.	Number of repaired nests	2	0	0	0	0	0	0	0	2
V.	% of successful repaired nests	50% 1 / 2	n/a	n/a	n/a	n/a	n/a	n/a	n/a	50% 1 / 2
W.	Number of vireo fledged from repaired nests	4	n/a	n/a	n/a	n/a	n/a	n/a	n/a	4

*Starting in 2015 Goose Creek Golf Club to I-15 only. Formerly monitored as Goose Creek Golf Club to River Rd.

**Includes Goose Creek mitigation funded by IERCD

Appendix C-3-J. Least Bell's Vireo reproductive success and breeding biology data at survey sites in the Santa Ana Watershed, 2000-2016.

Norco Bluffs (I-15 to River Rd., non-mitigation)*

	Parameter	2000-2009	2010	2011	2012	2013	2014	2015	2016	Totals
A.	Number of known pairs	n/a	n/a	n/a	n/a	n/a	n/a	17	28	45
B.	Number of known breeding (nesting) pairs	n/a	n/a	n/a	n/a	n/a	n/a	17	28	45
C.	Number of breeding pairs that were well-monitored throughout the breeding season	n/a	n/a	n/a	n/a	n/a	n/a	3	5	8
D.	Number of 'known fledged young' OBSERVED	n/a	n/a	n/a	n/a	n/a	n/a	43	45	88
E.	Number of known fledged young produced by pairs monitored throughout the breeding season	n/a	n/a	n/a	n/a	n/a	n/a	11	15	26
F.	Average number of fledglings produced per breeding pair (minimum; D/B = 'productivity or breeding success')	n/a	n/a	n/a	n/a	n/a	n/a	2.5	1.6	2.0
G.	Average number of fledglings produced by well- monitored pairs (E/C = reproductive success)	n/a	n/a	n/a	n/a	n/a	n/a	3.7	3.0	3.3
H.	Number of nests that were discovered	n/a	n/a	n/a	n/a	n/a	n/a	14	12	26
I.	Number of nests that were regularly monitored or 'tracked'	n/a	n/a	n/a	n/a	n/a	n/a	13	12	25
J.	Number of 'tracked' nests that were successful (% = J/I x 100)	n/a	n/a	n/a	n/a	n/a	n/a	69% 9 / 13	58% 7 / 12	64% 16 / 25
K.	Rate of missing eggs/chicks from nests (includes successful and unsuccessful nests)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
L.	Number of 'tracked' nests that were parasitized by cowbirds (% = L/I x 100)	n/a	n/a	n/a	n/a	n/a	n/a	0% 0 / 13	0% 0 / 12	0% 0 / 25
	A. Number of 'tracked' nests that failed as a result of reproductive failure	n/a	n/a	n/a	n/a	n/a	n/a	15% 2 / 13	8% 1 / 12	12% 3 / 25
	B. Number of 'tracked' nests that failed as a result of parasitism	n/a	n/a	n/a	n/a	n/a	n/a	0% 0 / 13	0% 0 / 12	0% 0 / 25
	C. Number of 'tracked' nests that failed as a result of predation - Predation Rate according to Vireo Working Group	n/a	n/a	n/a	n/a	n/a	n/a	15% 2 / 13	33% 4 / 12	24% 6 / 25
M.	D. Number of 'tracked' nests that failed for unknown reasons	n/a	n/a	n/a	n/a	n/a	n/a	0% 0 / 13	0% 0 / 12	0% 0 / 25
N.	Average clutch size	n/a	n/a	n/a	n/a	n/a	n/a	3.4	3.4	n/a

Appendix C-3-J. Least Bell's Vireo reproductive success and breeding biology data at survey sites in the Santa Ana Watershed, 2000-2016.

Norco Bluffs (I-15 to River Rd., non-mitigation)*

	Parameter	2000-2009	2010	2011	2012	2013	2014	2015	2016	Totals
O.	Number of cowbird eggs found in or near vireo nests	n/a	n/a	n/a	n/a	n/a	n/a	0	0	0
P.	Number of cowbird nestlings removed from 'tracked' nests	n/a	n/a	n/a	n/a	n/a	n/a	0	0	0
Q.	Number of cowbird young fledged by vireo	n/a	n/a	n/a	n/a	n/a	n/a	0	0	0
R.	Number of 'manipulated' parasitized nests	n/a	n/a	n/a	n/a	n/a	n/a	0	0	0
S.	Number of 'successful, manipulated' nests (% = S/R x 100)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
T.	Number of vireo fledged from 'manipulated' parasitized nests	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	0
U.	Number of repaired nests	n/a	n/a	n/a	n/a	n/a	n/a	0	0	0
V.	% of successful repaired nests	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
W.	Number of vireo fledged from repaired nests	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a

*Formerly monitored as part of Goose Creek Golf Club to River Rd.

Appendix C-3-K. Least Bell's Vireo reproductive success and breeding biology data at survey sites in the Santa Ana Watershed, 2000-2016.

Temescal Canyon

	Parameter	2000-2009	2010	2011	2012	2013	2014	2015	2016	Totals
A.	Number of known pairs	164	49	65	63	50	24	21	9	445
B.	Number of known breeding (nesting) pairs	146	38	57	48	42	n/a	20	4	355
C.	Number of breeding pairs that were well-monitored throughout the breeding season	81	11	18	8	0	n/a	0	0	118
D.	Number of 'known fledged young' OBSERVED	339	73	113	71	48	17	22	5	688
E.	Number of known fledged young produced by pairs monitored throughout the breeding season	217	34	52	24	n/a	n/a	n/a	n/a	327
F.	Average number of fledglings produced per breeding pair (minimum; D/B = 'productivity or breeding success')	2.3	1.9	2.0	1.5	1.1	n/a	1.1	1.3	1.9
G.	Average number of fledglings produced by well- monitored pairs (E/C = reproductive success)	2.7	3.1	2.9	3.0	n/a	n/a	n/a	n/a	2.8
H.	Number of nests that were discovered	166	22	35	16	3	3	0	1	246
I.	Number of nests that were regularly monitored or 'tracked'	133	15	32	12	0	0	n/a	0	192
J.	Number of 'tracked' nests that were successful (% = J/I x 100)	62% 82 / 133	87% 13 / 15	69% 22 / 32	58% 7 / 12	n/a	n/a	n/a	n/a	65% 124 / 192
K.	Rate of missing eggs/chicks from nests (includes successful and unsuccessful nests)	39% 52 / 133	20% 3 / 15	34% 11 / 32	0% 0 / 12	n/a	n/a	n/a	n/a	34% 66 / 192
L.	Number of 'tracked' nests that were parasitized by cowbirds (% = L/I x 100)	20% 27 / 133	0% 0 / 15	3% 1 / 32	25% 3 / 12	n/a	n/a	n/a	n/a	16% 31 / 192
	A. Number of 'tracked' nests that failed as a result of reproductive failure	4% 5 / 133	0% 0 / 15	0% 0 / 32	0% 0 / 12	n/a	n/a	n/a	n/a	3% 5 / 192
	B. Number of 'tracked' nests that failed as a result of parasitism	3% 4 / 133	0% 0 / 15	0% 0 / 32	17% 2 / 12	n/a	n/a	n/a	n/a	3% 6 / 192
	C. Number of 'tracked' nests that failed as a result of predation - Predation Rate according to Vireo Working Group	32% 42 / 133	13% 2 / 15	31% 10 / 32	25% 3 / 12	n/a	n/a	n/a	n/a	30% 57 / 192
M.	D. Number of 'tracked' nests that failed for unknown reasons	0% 0 / 133	0% 0 / 15	0% 0 / 32	0% 0 / 12	n/a	n/a	n/a	n/a	0% 0 / 192
N.	Average clutch size	n/a	3.7	3.5	3.5	3.7	n/a	n/a	4.0	n/a

Appendix C-3-K. Least Bell's Vireo reproductive success and breeding biology data at survey sites in the Santa Ana Watershed, 2000-2016.

Temescal Canyon

	Parameter	2000-2009	2010	2011	2012	2013	2014	2015	2016	Totals
O.	Number of cowbird eggs found in or near vireo nests	33	0	1	5	0	0	n/a	0	39
P.	Number of cowbird nestlings removed from 'tracked' nests	2	0	0	0	n/a	n/a	n/a	n/a	2
Q.	Number of cowbird young fledged by vireo	2	0	0	0	n/a	n/a	n/a	n/a	2
R.	Number of 'manipulated' parasitized nests	29	n/a	1	2	n/a	n/a	n/a	n/a	32
S.	Number of 'successful, manipulated' nests (% = S/R x 100)	41% 12 / 29	n/a	100% 1 / 1	100% 2 / 2	n/a	n/a	n/a	n/a	47% 15 / 32
T.	Number of vireo fledged from 'manipulated' parasitized nests	26	n/a	2	6	n/a	n/a	n/a	n/a	34
U.	Number of repaired nests	0	0	3	0	0	0	n/a	0	3
V.	% of successful repaired nests	n/a	n/a	67% 2 / 3	n/a	n/a	n/a	n/a	n/a	67% 2 / 3
W.	Number of vireo fledged from repaired nests	n/a	n/a	3	n/a	n/a	n/a	n/a	n/a	3

Appendix C-3-L. Least Bell's Vireo reproductive success and breeding biology data at survey sites in the Santa Ana Watershed, 2000-2016.

Chino Hills

	Parameter	2000-2009	2010	2011	2012	2013	2014	2015	2016*	Totals
A.	Number of known pairs	45	7	3	2	5	2	6	11	81
B.	Number of known breeding (nesting) pairs	37	4	1	2	4	0	3	8	59
C.	Number of breeding pairs that were well-monitored throughout the breeding season	15	3	0	1	1	0	3	0	23
D.	Number of 'known fledged young' OBSERVED	54	7	1	1	7	3	4	10	87
E.	Number of known fledged young produced by pairs monitored throughout the breeding season	19	5	n/a	0	4	n/a	4	n/a	32
F.	Average number of fledglings produced per breeding pair (minimum; D/B = 'productivity or breeding success')	1.5	1.8	1.0	0.5	1.8	n/a	1.3	1.3	1.5
G.	Average number of fledglings produced by well- monitored pairs (E/C = reproductive success)	1.3	1.7	n/a	0.0	4.0	n/a	1.3	n/a	1.4
H.	Number of nests that were discovered	24	3	0	1	1	n/a	7	4	40
I.	Number of nests that were regularly monitored or 'tracked'	19	3	n/a	1	1	n/a	5	2	31
J.	Number of 'tracked' nests that were successful (% = J/I x 100)	32% 6 / 19	67% 2 / 3	n/a	0% 0 / 1	100% 1 / 1	n/a	20% 1 / 5	50% 1 / 2	35% 11 / 31
K.	Rate of missing eggs/chicks from nests (includes successful and unsuccessful nests)	63% 12 / 19	33% 1 / 3	n/a	100% 1 / 1	0% 0 / 1	n/a	n/a	n/a	58% 14 / 24
L.	Number of 'tracked' nests that were parasitized by cowbirds (% = L/I x 100)	32% 6 / 19	0% 0 / 3	n/a	0% 0 / 1	0% 0 / 1	n/a	20% 1 / 5	0% 0 / 2	23% 7 / 31
	A. Number of 'tracked' nests that failed as a result of reproductive failure	5% 1 / 19	0% 0 / 3	n/a	0% 0 / 1	0% 0 / 1	n/a	20% 1 / 5	50% 1 / 2	10% 3 / 31
	B. Number of 'tracked' nests that failed as a result of parasitism	11% 2 / 19	0% 0 / 3	n/a	0% 0 / 1	0% 0 / 1	n/a	0% 0 / 5	0% 0 / 2	6% 2 / 31
	C. Number of 'tracked' nests that failed as a result of predation - Predation Rate according to Vireo Working Group	53% 10 / 19	33% 1 / 3	n/a	100% 1 / 1	0% 0 / 1	n/a	60% 3 / 5	0% 0 / 2	48% 15 / 31
M.	D. Number of 'tracked' nests that failed for unknown reasons	0% 0 / 19	0% 0 / 3	n/a	0% 0 / 1	0% 0 / 1	n/a	0% 0 / 5	0% 0 / 2	0% 0 / 31
N.	Average clutch size	n/a	3.7	n/a	3.0	4.0	n/a	3.4	3.0	n/a

Appendix C-3-L. Least Bell's Vireo reproductive success and breeding biology data at survey sites in the Santa Ana Watershed, 2000-2016.

Chino Hills

	Parameter	2000-2009	2010	2011	2012	2013	2014	2015	2016*	Totals
O.	Number of cowbird eggs found in or near vireo nests	9	0	n/a	0	0	n/a	1	0	10
P.	Number of cowbird nestlings removed from 'tracked' nests	0	0	n/a	0	0	n/a	0	0	0
Q.	Number of cowbird young fledged by vireo	0	0	n/a	0	0	n/a	0	0	0
R.	Number of 'manipulated' parasitized nests	6	n/a	n/a	n/a	n/a	n/a	1	n/a	7
S.	Number of 'successful, manipulated' nests (% = S/R x 100)	0% 0 / 6	n/a	n/a	n/a	n/a	n/a	0% 0 / 1	n/a	0% 0 / 7
T.	Number of vireo fledged from 'manipulated' parasitized nests	0	n/a	n/a	n/a	n/a	n/a	0	n/a	0
U.	Number of repaired nests	0	0	n/a	0	0	n/a	0	0	0
V.	% of successful repaired nests	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
W.	Number of vireo fledged from repaired nests	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a

*2016 includes former assessment sites

Appendix C-3-M. Least Bell's Vireo reproductive success and breeding biology data at survey sites in the Santa Ana Watershed, 2000-2016.

Santa Ana Canyon (SAC) - Upper Canyon

	Parameter	2000-2009	2010	2011	2012	2013	2014	2015	2016	Totals
A.	Number of known pairs	126	4	5	4	14	18	9	12	192
B.	Number of known breeding (nesting) pairs	110	3	5	4	12	16	6	11	167
C.	Number of breeding pairs that were well-monitored throughout the breeding season	46	0	0	1	4	4	1	3	59
D.	Number of 'known fledged young' OBSERVED	208	6	5	6	23	28	10	18	304
E.	Number of known fledged young produced by pairs monitored throughout the breeding season	118	n/a	n/a	3	12	12	2	7	154
F.	Average number of fledglings produced per breeding pair (minimum; D/B = 'productivity or breeding success')	1.9	2.0	1.0	1.5	1.9	1.8	1.7	1.6	1.8
G.	Average number of fledglings produced by well- monitored pairs (E/C = reproductive success)	2.6	n/a	n/a	3.0	3.0	3.0	2.0	2.3	2.6
H.	Number of nests that were discovered	97	2	2	2	6	8	1	3	121
I.	Number of nests that were regularly monitored or 'tracked'	64	1	0	1	5	6	1	3	81
J.	Number of 'tracked' nests that were successful (% = J/I x 100)	64% 41 / 64	100% 1 / 1	n/a	100% 1 / 1	80% 4 / 5	83% 5 / 6	100% 1 / 1	100% 3 / 3	69% 56 / 81
K.	Rate of missing eggs/chicks from nests (includes successful and unsuccessful nests)	41% 26 / 64	0% 0 / 1	n/a	0% 0 / 1	40% 2 / 5	33% 2 / 6	n/a	n/a	39% 30 / 77
L.	Number of 'tracked' nests that were parasitized by cowbirds (% = L/I x 100)	6% 4 / 64	0% 0 / 1	n/a	0% 0 / 1	0% 0 / 5	0% 0 / 6	0% 0 / 1	0% 0 / 3	5% 4 / 81
M.	A. Number of 'tracked' nests that failed as a result of reproductive failure	5% 3 / 64	0% 0 / 1	n/a	0% 0 / 1	0% 0 / 5	0% 0 / 6	0% 0 / 1	0% 0 / 3	4% 3 / 81
	B. Number of 'tracked' nests that failed as a result of parasitism	3% 2 / 64	0% 0 / 1	n/a	0% 0 / 1	0% 0 / 5	0% 0 / 6	0% 0 / 1	0% 0 / 3	2% 2 / 81
	C. Number of 'tracked' nests that failed as a result of predation - Predation Rate according to Vireo Working Group	28% 18 / 64	0% 0 / 1	n/a	0% 0 / 1	20% 1 / 5	17% 1 / 6	0% 0 / 1	0% 0 / 3	25% 20 / 81
	D. Number of 'tracked' nests that failed for unknown reasons	0% 0 / 64	0% 0 / 1	n/a	0% 0 / 1	0% 0 / 5	0% 0 / 6	0% 0 / 1	0% 0 / 3	0% 0 / 81
N.	Average clutch size	n/a	4.0	4.0	3.0	3.5	3.2	4.0	3.3	n/a

Appendix C-3-M. Least Bell's Vireo reproductive success and breeding biology data at survey sites in the Santa Ana Watershed, 2000-2016.

Santa Ana Canyon (SAC) - Upper Canyon

	Parameter	2000-2009	2010	2011	2012	2013	2014	2015	2016	Totals
O.	Number of cowbird eggs found in or near vireo nests	3	0	0	0	0	0	0	0	3
P.	Number of cowbird nestlings removed from 'tracked' nests	1	0	n/a	0	0	0	0	0	1
Q.	Number of cowbird young fledged by vireo	0	0	n/a	0	0	0	0	0	0
R.	Number of 'manipulated' parasitized nests	1	n/a	n/a	n/a	n/a	n/a	n/a	n/a	1
S.	Number of 'successful, manipulated' nests (% = S/R x 100)	100% 1 / 1	n/a	n/a	n/a	n/a	n/a	n/a	n/a	100% 1 / 1
T.	Number of vireo fledged from 'manipulated' parasitized nests	1	n/a	n/a	n/a	n/a	n/a	n/a	n/a	1
U.	Number of repaired nests	2	0	0	0	0	0	0	0	2
V.	% of successful repaired nests	0% 0 / 2	n/a	n/a	n/a	n/a	n/a	n/a	n/a	0% 0 / 2
W.	Number of vireo fledged from repaired nests	0	n/a	n/a	n/a	n/a	n/a	n/a	n/a	0

Appendix C-3-N. Least Bell's Vireo reproductive success and breeding biology data at survey sites in the Santa Ana Watershed, 2000-2016.

Santa Ana Canyon (SAC) - Green River Golf Club

	Parameter	2000-2009	2010	2011	2012	2013	2014	2015	2016	Totals
A.	Number of known pairs	101	17	14	11	19	19	23	26	230
B.	Number of known breeding (nesting) pairs	92	14	12	8	15	18	19	22	200
C.	Number of breeding pairs that were well-monitored throughout the breeding season	44	4	7	4	2	4	8	8	81
D.	Number of 'known fledged young' OBSERVED	192	19	19	11	19	29	35	27	351
E.	Number of known fledged young produced by pairs monitored throughout the breeding season	118	7	15	9	0	9	13	9	180
F.	Average number of fledglings produced per breeding pair (minimum; D/B = 'productivity or breeding success')	2.1	1.4	1.6	1.4	1.3	1.6	1.8	1.2	1.8
G.	Average number of fledglings produced by well- monitored pairs (E/C = reproductive success)	2.7	1.8	2.1	2.3	0.0	2.3	1.6	1.1	2.2
H.	Number of nests that were discovered	73	7	13	7	5	10	16	14	145
I.	Number of nests that were regularly monitored or 'tracked'	61	7	11	5	4	8	15	13	124
J.	Number of 'tracked' nests that were successful (% = J/I x 100)	72% 44 / 61	43% 3 / 7	45% 5 / 11	60% 3 / 5	25% 1 / 4	63% 5 / 8	47% 7 / 15	31% 4 / 13	58% 72 / 124
K.	Rate of missing eggs/chicks from nests (includes successful and unsuccessful nests)	26% 16 / 61	71% 5 / 7	55% 6 / 11	20% 1 / 5	50% 2 / 4	25% 2 / 8	n/a	n/a	33% 32 / 96
L.	Number of 'tracked' nests that were parasitized by cowbirds (% = L/I x 100)	7% 4 / 61	0% 0 / 7	0% 0 / 11	0% 0 / 5	0% 0 / 4	0% 0 / 8	0% 0 / 15	0% 0 / 13	3% 4 / 124
	A. Number of 'tracked' nests that failed as a result of reproductive failure	7% 4 / 61	0% 0 / 7	0% 0 / 11	20% 1 / 5	0% 0 / 4	13% 1 / 8	7% 1 / 15	23% 3 / 13	8% 10 / 124
	B. Number of 'tracked' nests that failed as a result of parasitism	2% 1 / 61	0% 0 / 7	0% 0 / 11	0% 0 / 5	0% 0 / 4	0% 0 / 8	0% 0 / 15	0% 0 / 13	1% 1 / 124
	C. Number of 'tracked' nests that failed as a result of predation - Predation Rate according to Vireo Working Group	20% 12 / 61	57% 4 / 7	55% 6 / 11	20% 1 / 5	75% 3 / 4	25% 2 / 8	47% 7 / 15	46% 6 / 13	33% 41 / 124
M.	D. Number of 'tracked' nests that failed for unknown reasons	0% 0 / 61	0% 0 / 7	0% 0 / 11	0% 0 / 5	0% 0 / 4	0% 0 / 8	0% 0 / 15	0% 0 / 13	0% 0 / 124
N.	Average clutch size	n/a	4.0	3.4	3.2	3.0	3.0	2.8	2.7	n/a

Appendix C-3-N. Least Bell's Vireo reproductive success and breeding biology data at survey sites in the Santa Ana Watershed, 2000-2016.

Santa Ana Canyon (SAC) - Green River Golf Club

	Parameter	2000-2009	2010	2011	2012	2013	2014	2015	2016	Totals
O.	Number of cowbird eggs found in or near vireo nests	4	0	0	0	0	0	0	0	4
P.	Number of cowbird nestlings removed from 'tracked' nests	0	0	0	0	0	0	0	0	0
Q.	Number of cowbird young fledged by vireo	0	0	0	0	0	0	0	0	0
R.	Number of 'manipulated' parasitized nests	2	n/a	n/a	n/a	n/a	n/a	n/a	n/a	2
S.	Number of 'successful, manipulated' nests (% = S/R x 100)	100% 2 / 2	n/a	n/a	n/a	n/a	n/a	n/a	n/a	100% 2 / 2
T.	Number of vireo fledged from 'manipulated' parasitized nests	6	n/a	n/a	n/a	n/a	n/a	n/a	n/a	6
U.	Number of repaired nests	4	0	0	0	0	1	0	0	5
V.	% of successful repaired nests	75% 3 / 4	n/a	n/a	n/a	n/a	100% 1 / 1	n/a	n/a	80% 4 / 5
W.	Number of vireo fledged from repaired nests	7	n/a	n/a	n/a	n/a	3	n/a	n/a	10

Appendix C-3-O. Least Bell's Vireo reproductive success and breeding biology data at survey sites in the Santa Ana Watershed, 2000-2016.

Santa Ana Canyon (SAC) - Featherly Regional Park

	Parameter	2000-2009	2010	2011	2012	2013	2014	2015	2016	Totals
A.	Number of known pairs	131	23	19	16	45	39	38	39	350
B.	Number of known breeding (nesting) pairs	109	18	18	11	37	34	30	25	282
C.	Number of breeding pairs that were well-monitored throughout the breeding season	36	3	7	2	10	10	9	8	85
D.	Number of 'known fledged young' OBSERVED	175	22	23	12	55	35	37	23	382
E.	Number of known fledged young produced by pairs monitored throughout the breeding season	73	6	14	0	17	11	12	8	141
F.	Average number of fledglings produced per breeding pair (minimum; D/B = 'productivity or breeding success')	1.6	1.2	1.3	1.1	1.5	1.0	1.2	0.9	1.4
G.	Average number of fledglings produced by well- monitored pairs (E/C = reproductive success)	2.0	2.0	2.0	0.0	1.7	1.1	1.3	1.0	1.7
H.	Number of nests that were discovered	83	11	12	8	23	18	22	16	193
I.	Number of nests that were regularly monitored or 'tracked'	65	7	5	4	14	14	19	12	140
J.	Number of 'tracked' nests that were successful (% = J/I x 100)	49% 32 / 65	29% 2 / 7	100% 5 / 5	0% 0 / 4	50% 7 / 14	29% 4 / 14	32% 6 / 19	25% 3 / 12	42% 59 / 140
K.	Rate of missing eggs/chicks from nests (includes successful and unsuccessful nests)	48% 31 / 65	71% 5 / 7	20% 1 / 5	100% 4 / 4	50% 7 / 14	64% 9 / 14	n/a	n/a	52% 57 / 109
L.	Number of 'tracked' nests that were parasitized by cowbirds (% = L/I x 100)	8% 5 / 65	0% 0 / 7	0% 0 / 5	0% 0 / 4	0% 0 / 14	0% 0 / 14	0% 0 / 19	0% 0 / 12	4% 5 / 140
	A. Number of 'tracked' nests that failed as a result of reproductive failure	5% 3 / 65	0% 0 / 7	0% 0 / 5	0% 0 / 4	7% 1 / 14	7% 1 / 14	5% 1 / 19	0% 0 / 12	4% 6 / 140
	B. Number of 'tracked' nests that failed as a result of parasitism	3% 2 / 65	0% 0 / 7	0% 0 / 5	0% 0 / 4	0% 0 / 14	0% 0 / 14	0% 0 / 19	0% 0 / 12	1% 2 / 140
	C. Number of 'tracked' nests that failed as a result of predation - Predation Rate according to Vireo Working Group	43% 28 / 65	71% 5 / 7	0% 0 / 5	100% 4 / 4	43% 6 / 14	64% 9 / 14	63% 12 / 19	75% 9 / 12	52% 73 / 140
M.	D. Number of 'tracked' nests that failed for unknown reasons	0% 0 / 65	0% 0 / 7	0% 0 / 5	0% 0 / 4	0% 0 / 14	0% 0 / 14	0% 0 / 19	0% 0 / 12	0% 0 / 140
N.	Average clutch size	n/a	4.0	3.6	4.0	3.4	3.1	3.2	3.2	n/a

Appendix C-3-O. Least Bell's Vireo reproductive success and breeding biology data at survey sites in the Santa Ana Watershed, 2000-2016.

Santa Ana Canyon (SAC) - Featherly Regional Park

	Parameter	2000-2009	2010	2011	2012	2013	2014	2015	2016	Totals
O.	Number of cowbird eggs found in or near vireo nests	4	0	0	0	0	0	0	0	4
P.	Number of cowbird nestlings removed from 'tracked' nests	1	0	0	0	0	0	0	0	1
Q.	Number of cowbird young fledged by vireo	0	0	0	0	0	0	0	0	0
R.	Number of 'manipulated' parasitized nests	3	n/a	n/a	n/a	n/a	n/a	n/a	n/a	3
S.	Number of 'successful, manipulated' nests (% = S/R x 100)	33% 1 / 3	n/a	n/a	n/a	n/a	n/a	n/a	n/a	33% 1 / 3
T.	Number of vireo fledged from 'manipulated' parasitized nests	2	n/a	n/a	n/a	n/a	n/a	n/a	n/a	2
U.	Number of repaired nests	4	1	0	0	0	2	0	0	7
V.	% of successful repaired nests	100% 4 / 4	100% 1 / 1	n/a	n/a	n/a	50% 1 / 2	n/a	n/a	86% 6 / 7
W.	Number of vireo fledged from repaired nests	14	2	n/a	n/a	n/a	2	n/a	n/a	18

Appendix C-3-P. Least Bell's Vireo reproductive success and breeding biology data at survey sites in the Santa Ana Watershed, 2000-2016.

Santiago Canyon (Irvine Park)

	Parameter	2000-2009	2010	2011	2012	2013	2014	2015	2016	Totals
A.	Number of known pairs	n/a	14	9	5	8	9	24	1	70
B.	Number of known breeding (nesting) pairs	n/a	9	5	5	6	8	1	0	34
C.	Number of breeding pairs that were well-monitored throughout the breeding season	n/a	3	1	0	n/a	5	0	0	9
D.	Number of 'known fledged young' OBSERVED	n/a	18	7	5	10	12	2	0	54
E.	Number of known fledged young produced by pairs monitored throughout the breeding season	n/a	11	2	n/a	n/a	8	n/a	n/a	21
F.	Average number of fledglings produced per breeding pair (minimum; D/B = 'productivity or breeding success')	n/a	2.0	1.4	1.0	1.7	1.5	2.0	n/a	1.6
G.	Average number of fledglings produced by well- monitored pairs (E/C = reproductive success)	n/a	3.7	2.0	n/a	n/a	1.6	n/a	n/a	2.3
H.	Number of nests that were discovered	n/a	5	1	0	n/a	6	0	0	12
I.	Number of nests that were regularly monitored or 'tracked'	n/a	4	1	n/a	n/a	5	n/a	n/a	10
J.	Number of 'tracked' nests that were successful (% = J/I x 100)	n/a	75% 3 / 4	100% 1 / 1	n/a	n/a	60% 3 / 5	n/a	n/a	70% 7 / 10
K.	Rate of missing eggs/chicks from nests (includes successful and unsuccessful nests)	n/a	25% 1 / 4	n/a	n/a	n/a	80% 4 / 5	n/a	n/a	56% 5 / 9
L.	Number of 'tracked' nests that were parasitized by cowbirds (% = L/I x 100)	n/a	0% 0 / 4	0% 0 / 1	n/a	n/a	0% 0 / 5	n/a	n/a	0% 0 / 10
	A. Number of 'tracked' nests that failed as a result of reproductive failure	n/a	0% 0 / 4	0% 0 / 1	n/a	n/a	0% 0 / 5	n/a	n/a	0% 0 / 10
	B. Number of 'tracked' nests that failed as a result of parasitism	n/a	0% 0 / 4	0% 0 / 1	n/a	n/a	0% 0 / 5	n/a	n/a	0% 0 / 10
	C. Number of 'tracked' nests that failed as a result of predation - Predation Rate according to Vireo Working Group	n/a	25% 1 / 4	0% 0 / 1	n/a	n/a	40% 2 / 5	n/a	n/a	30% 3 / 10
M.	D. Number of 'tracked' nests that failed for unknown reasons	n/a	0% 0 / 4	0% 0 / 1	n/a	n/a	0% 0 / 5	n/a	n/a	0% 0 / 10
N.	Average clutch size	n/a	3.5	2	n/a	n/a	3.2	n/a	n/a	n/a

Appendix C-3-P. Least Bell's Vireo reproductive success and breeding biology data at survey sites in the Santa Ana Watershed, 2000-2016.

Santiago Canyon (Irvine Park)

	Parameter	2000-2009	2010	2011	2012	2013	2014	2015	2016	Totals
O.	Number of cowbird eggs found in or near vireo nests	n/a	4	0	n/a	n/a	0	n/a	n/a	4
P.	Number of cowbird nestlings removed from 'tracked' nests	n/a	0	0	n/a	n/a	0	n/a	n/a	0
Q.	Number of cowbird young fledged by vireo	n/a	0	0	n/a	n/a	0	n/a	n/a	0
R.	Number of 'manipulated' parasitized nests	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	0
S.	Number of 'successful, manipulated' nests (% = S/R x 100)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a 0 / 0
T.	Number of vireo fledged from 'manipulated' parasitized nests	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	0
U.	Number of repaired nests	n/a	0	0	n/a	n/a	0	n/a	n/a	0
V.	% of successful repaired nests	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
W.	Number of vireo fledged from repaired nests	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a

APPENDIX D: SUMMARY TABLES BY MANAGED SITE, 2000-2009

Available by request under separate header.